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# SERVICE STATION MANUAL

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**X10 350ie**

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# SERVICE STATION MANUAL

## X10 350ie

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# SERVICE STATION MANUAL

## X10 350ie

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.

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## **Rules**

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

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### **Safety rules**

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

### **Maintenance rules**

- Use original PIAGGIO spare parts and lubricants recommended by the Manufacturer. Non-original or non-conforming spares may damage the vehicle.
  - Use only the appropriate tools designed for this vehicle.
  - Always use new gaskets, sealing rings and split pins upon refitting.
  - After removal, clean the components using non-flammable or low flash-point solvents. Lubricate all the work surfaces, except tapered couplings, before refitting these parts.
  - After refitting, make sure that all the components have been installed correctly and work properly.
  - 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.
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## Vehicle identification

Identification registration numbers are made up of a prefix and a number, stamped on the chassis and on the engine. These numbers must always be quoted when ordering spare parts. We recommend checking that the chassis registration number stamped on the vehicle corresponds with that on the vehicle documentation.

**CAUTION**



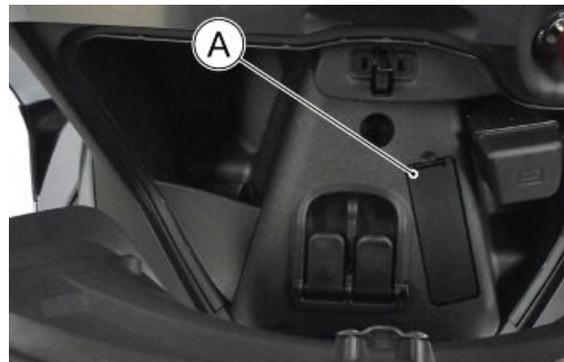
**PLEASE REMIND THAT ALTERING IDENTIFICATION REGISTRATION NUMBERS CAN LEAD TO SERIOUS PENAL SANCTIONS (IMPOUNDING OF THE VEHICLE, ETC.).**

### VEHICLE IDENTIFICATION

Specification	Desc./Quantity
Chassis prefix	ZAPM76201 - 10000001
Engine prefix	M762M 1001

#### Chassis number

To read the chassis number, remove the port **A** in the front case.

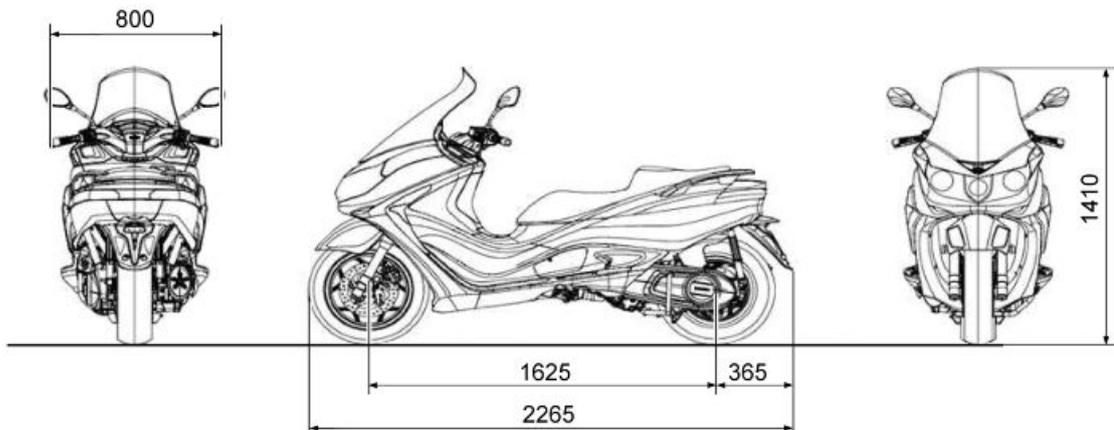


#### Engine number

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



## Dimensions and mass



## VEHICLE TECHNICAL DATA

Specification	Desc./Quantity
Chassis	A closed double cradle in steel tubes
Front suspension	Hydraulic telescopic fork Ø 35 mm
Rear suspension	Two double-acting shock absorbers, adjustable to four positions at preloading.
Front brake	Double disc Ø280 with hydraulic control actuated by the right lever; braking assisted by ABS system.
Integral brake	Disc Ø240 with hydraulic control actuated by the left lever; the front disc Ø280 is served by a pressure relief valve; braking assisted by ABS system.
Wheel rim type	Light alloy wheel rims.
Front wheel rim	3.50"x15"
Rear wheel rim	4.00"x13"
Front tyre	120/70-15" M/C 56S Tubeless
Rear tyre	150/70-13" M/C 64S Tubeless
Front tyre pressure (with passenger)	2.3 bar (2.3 bar)
Rear tyre pressure (with passenger)	2.4 bar (2.6 bar)
Kerb weight	203 kg
Maximum weight allowed	400 kg
Battery	SEALED 12V/10Ah

## Engine

### ENGINE SPECIFICATIONS

Specification	Desc./Quantity
Type	Single-cylinder, 4-stroke
Engine capacity	330 cm <sup>3</sup>
Bore x stroke	78 x 69 mm
Compression ratio	11 ± 0.5 : 1
Engine idle speed	1700±100 rpm
Timing system	Four valves, single overhead camshaft, chain-driven.
Valve clearance	Intake: 0.10 mm Exhaust: 0.15 mm
Max power to the shaft	24.5 kW at 8250 rpm
MAX. torque	32.3 Nm at 6250 rpm
Lubrication	Engine lubrication with trochoidal pump (inside the crankcase), oil filter and pressure adjustment by-pass.
Cooling	Forced coolant circulation system.
Fuel system	IAWM3G electronic injection with 38 mm diameter throttle body, electric fuel pump.

Specification	Desc./Quantity
Fuel	Unleaded petrol (95 RON)
Silencer	Absorption-type exhaust silencer with a three-way catalytic converter and lambda probe to the exhaust.
Emissions compliance	EURO 3

## Transmission

### TRANSMISSION

Specification	Desc./Quantity
Transmission	With continuously variable transmission, torque server, V belt, centrifugal automatic clutch in oil bath.
Final reduction	Gear reduction unit in oil bath.

## Capacities

### CAPACITIES

Specification	Desc./Quantity
Engine oil	about 1.5 l
Transmission oil	about 500 cc
Cooling system fluid	1.75 l
Fuel tank	15.5 litres (2 l of which is reserve)

## Electrical system

### ELECTRICAL SYSTEM

Specification	Desc./Quantity
Starter	Electric
Ignition	Electronic, inductive, high efficiency ignition, integrated with the injection system, with variable advance and separate H.V. coil.
Ignition advance	Three-dimensional map managed by control unit
Spark plug	NGK CR7EKB
Alternative spark plug	-
Battery	12V-12Ah
Generator	alternating current

## Tightening Torques

### SWINGING ARM - 350

Name	Torque in Nm
Self locking nut fastening pin chassis side	50 to 55
Retainer nut of silent block support bracket on bushing	89 to 108
Lower pin bushing	5 - 7
Self locking nut pin fastening engine side	40 to 45
Self locking nut engine attachment fixing	54 ÷ 60
Self locking nut of fixing silent block support bracket	67 - 75
Rod fixing nut	40 to 45
Rod pin fixing nut	40 to 45

### STEERING

Name	Torque in Nm
Handlebar fixing screw	50 to 55
Fixing screws for the handlebar control unit U-bolts	7 ÷ 10
Steering tube upper ring nut	40 to 45
Steering tube lower ring nut	14 - 17

Name	Torque in Nm
Throttle grip cables right control fastener screw	3 ÷ 4
Hand grip counterweight retainer screw	9 - 11
Mirrors fastening long nut	24 - 26

### FRAME

Name	Torque in Nm
Centre stand bolt	40 to 45
Side stand fixing bolt	40 to 45
Side stand sensor fixing screws	5 - 7
Throttle cable pipe grommet screw	6 - 10

### FRONT BRAKE

Name	Torque in Nm
Brake fluid pump-hose fitting	13 to 18 Nm
Oil bleed screw	12 - 16
Pad fastening pin	19.6 to 24.5
Screw tightening calliper to support	20 ÷ 25
Brake disc screws	24 ÷ 27
Brake fluid pipe-calliper fitting	20 ÷ 25
Pump pipe grommet screw - clamp	6 - 10

### REAR BRAKE

Name	Torque in Nm
Brake fluid pump-hose fitting	13 to 18 Nm
Oil bleed screw	12 - 16
Pad fastening pin	19.6 to 24.5
Rear brake calliper fixing screws	41 - 51
Brake disc screws	8 ÷ 10
Rear brake calliper-pipe fitting	20 ÷ 25
Pump pipe grommet screw - clamp	6 - 10
Screws fixing the distribution mechanism	10 to 11
Front calliper pipe tightening - distribution mechanism	20 ÷ 25
Brake pipes fixing screw at the distribution mechanism	20 ÷ 25
Screw fixing parking brake calliper to supporting plate	24 to 27

### ABS SYSTEM

Name	Torque in Nm
Front ABS sensor tightening screw	6 to 8 Nm (Loctite 243)
Rear ABS sensor tightening screw	6 to 8 Nm (Loctite 243)
M6x16 screws fastening the ABS control unit to the support	10 to 12 Nm
Pipe fittings - ABS control unit	13 - 18
ABS control unit supporting bracket fixing screw	10 to 11 Nm
ABS control unit bracket fixing screws	8 to 10 Nm
Front elastic plate fixing screws	10 to 11 Nm
Side elastic plate fixing screw	10 to 11 Nm

### FRONT SUSPENSION

Name	Torque in Nm
Front wheel axle nut	110 - 120
Wheel axle clamp screws	6 - 7 Nm
Hydraulic rod fixing screw	25 to 35 Nm
Fork locking screws cap	35 - 55
Stem support clamp tightening screws	Apply a torque of 25-34 Nm to lower screw «1» Lock upper screw «2» a torque of 25-34 Nm Lock lower screw «1» a torque of 25-34 Nm
Fixing screw for mudguard plate to fork	9 - 11
front mudguard to plate fixing screw	4.5 to 7

### REAR SUSPENSION

Name	Torque in Nm
Lower shock absorber clamp	32 to 40
Upper shock absorber fixing - self locking nut M10	40 to 44

Name	Torque in Nm
Shock absorber to crankcase bracket fastener	20 to 25
Silencer support bracket fixing screws	20 ÷ 25
Rear wheel nut	102 - 123

### **BODYWORK**

Name	Torque in Nm
Handlebar upper cover fixing screws	5 - 8
Lower cover fixing screws - handlebar	4 to 5
Central cover fixing screws - handlebar	9
Front frame fixing screws - chassis	13 - 15
Wheel housing fixing screws - front frame	4.5 to 7
Wheel housing fixing screws - chassis	4.5 to 7
Wheel housing fixing screws - shield - lower shield	1 to 1.7
Front case fixing screws - wheel housing	1 to 1.7
Front case fixing screws - central tunnel	1 to 1.7
Front case fixing screws - chassis	4.5 to 7
Fairings fixing screws - front case	1 to 1.7
Fairing fixing screws - central tunnel	1 to 1.7
Shield fixing screws - front case	1 to 1.7
Shield fixing screws - lower shield	1 to 1.7
Shield fixing screws - rear dashboard	1 to 1.7
Shield upper cover fixing screws - front headlight assembly	4.5 to 7
Shield upper cover fixing screws - rear dashboard	1 to 1.7
Front dashboard fixing screws - front frame	1 to 1.7
Front dashboard fixing screws - rear dashboard	1 to 1.7
Dashboard cover fixing screws - rear dashboard	1 to 1.7
Rear dashboard fixing screws - front case	1 to 1.7
Rear dashboard covers fixing screws - rear dashboard	1 to 1.7
Rear dashboard covers fixing screws - rear dashboard	1 to 1.7
Windshield fixing screws - front frame	4.5 to 7
Instrument panel fixing screws	1 to 1.7
Front headlight assembly fixing screws - shield	4.5 to 7
Turn indicator fixing screws - headlight	1 to 1.7
Footrests fixing screws - deflectors - lower shield	1 to 1.7
Footrests front fixing screws	1 to 1.7
Footrests central fixing screws	4.5 to 7
Footrests rear fixing screws	4.5 to 7
Footrest fixing screws - fairings	1 to 1.7
Passenger footrest fixing screws	4.5 to 7
Passenger footrest rubber fixing screws	4.5 to 7
Lower cover fixing screws	1 to 1.7
Saddle fixing screws	8 ÷ 10
Fixing screws pneumatic spring - saddle	15 to 20
Fixing screws pneumatic spring - frame	15 to 20
Handgrips fixing screws	15 to 20
Handgrips upper cover fixing screws	1 to 1.7
Helmet compartment fixing screws	4.5 to 7
Helmet compartment fixing screws - cover	1 to 1.7
Fairing fixing screws - helmet compartment	1 to 1.7
Engine access cover fixing screws	1 to 1.7
Battery door fixing screws	1 to 1.7
Fuses cover retainer screws	1 to 1.7
Spark plug inspection cover fixing screws	1 to 1.7
Upper rear cover fixing screws - helmet compartment	1 to 1.7
Upper rear cover fixing screws	1 to 1.7
Side frame fixing screws	1 to 1.7
Splash guard fixing screws	4.5 to 7

### **MUFFLER**

Name	Torque in Nm
Silencer heat guard fixing screw	4 to 5
Screw for fixing silencer to supporting arm	20 ÷ 25
Lambda probe tightening on exhaust manifold	40 - 50
Exhaust manifold-silencer clamp tightening	15.5 - 18.5
Nuts fixing the exhaust manifold to the head	16 to 18

**TRANSMISSION AND FINAL REDUCTION**

Name	Torque in Nm
Transmission cover screws	11 to 13
Clutch cover retainer screws	11 to 13
Driven pulley shaft nut	120 to 130
Driven pulley M10x1.25 screw	74 to 80
Driven pulley ring nut	50 to 60
Nut M14x1.5 securing the driving pulley	120 to 130
Final reduction cover screws	24 to 27
M12x1.25 gear clutch shaft retainer nut	95 to 105
Oil relief screw	15 to 17
Reduction unit oil drainage screw	15 to 17
Bearing lock screw	9 - 11

**LUBRICATION**

Name	Torque in Nm
Crankcase timing cover screws	11 to 13
Screws fixing oil pump to the crankcase	5 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)
Oil radiator fixing screw	9 - 11
Fitting fixing of the oil filter	20
Oil filter	4 to 6

**CRANKCASE**

Name	Torque in Nm
Calibrated fixing dowel	5 - 7
Bearing lock screw	9 - 11
Oil filter cover	24 to 30
Oil pump command sprocket screw	9 - 11
Oil pump chain slider locking screws	5 to 6
Engine oil level shaft	1.3 to 1.7
Engine-crankcase coupling screws	11 to 13

**FLYWHEEL COVER**

Name	Torque in Nm
Pick-up screws	3 - 4
Stator fixing screws	8 to 10
Stator cable plates clamping screws	3 - 4
Oil drain screw	20 to 24
Flywheel cover retainer screws (2 screws) - PRE-TIGHTENING	5 to 6
Flywheel cover retainer screws (12 screws) - TIGHTENING	11 to 13
Fixing clamps of head pump cover by-pass pipe	1.5 to 1.9
Water pump cover fixing screw M5	3 - 4
Water pump cover fixing screw M6	11 to 13
Impeller on the pump shaft	4 to 6
Water pump impeller cover screws	3 - 4
Water pump impeller driving joint	13 - 15
Coil fixing screw	11 to 13

**HEAD AND CYLINDER**

Name	Torque in Nm
Injector locking screw on the big end	5 to 6
Head cover screws	6 to 7
Cylinder head nut (PRE-TIGHTENING)	6 - 8
Cylinder head nut (TIGHTENING)	9 to 11 (Tighten to 9 to 11 Nm then proceed for 270.0° ±5.0° of rotation)
Cylinder stud bolt fitting	See section ENGINE/LUBRICATION/STUD BOLT
Screws fixing cylinder head to crankcase	20 to 24
Timing system gear sprocket fixing screw	11 to 15
Throttle body clamp screws	1.3 to 1.7
Big end / throttle body union fitting clamps	1.3 to 1.7

Name	Torque in Nm
Tensioner spring retaining screw	5 to 6
Fastener chain tensioner	11 to 13
Chain tensioner rod fastener screw	10 to 12
E.I. threaded dowel	5 - 8
Thermostat cover screws	3 - 4
Water temperature sensor	21 - 23
Starter sprocket locking	11 to 15
Bleed screw	2 - 3
Pressure reducer ground washer fastening screw	7 to 8.5
Camshaft retainer plate screw	4.5 to 5.5
Pressure reducer counterweight retainer screw	7 to 8.5

**FLYWHEEL**

Name	Torque in Nm
Flywheel cover screw	11 ÷ 13
Flywheel fixing nut	100 to 110
Screw fixing freewheel to flywheel	13 - 15
Starter sprocket check fixing screw	5 to 6
Starter motor fixing screws	11 to 13

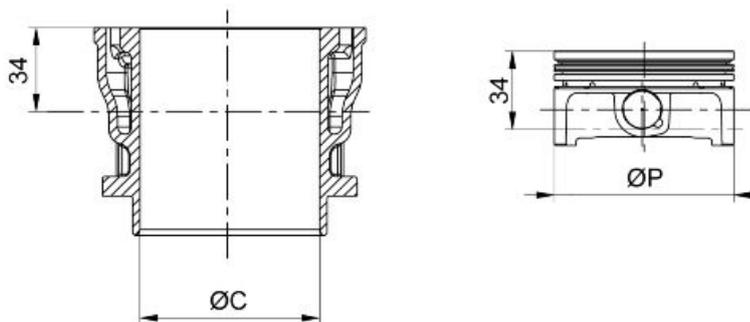
**ELECTRICAL SYSTEM**

Name	Torque in Nm
Side stand sensor fixing screws	5 - 7
Locking the spark plug	10 to 12
Rear wheel speed sensor tightening screw	7 - 11

**Overhaul data**

**Assembly clearances**

**Cylinder - piston assy.**



**CYLINDER - PISTON**

Specification	Desc./Quantity
Piston diameter	77.967 (±0.014 mm)
Cylinder diameter	78 (+0.038 +0.01) mm

**COUPLING CATEGORIES**

Name	Initials	Cylinder	Piston	Play on fitting
cylinder-piston	M	78.01 to 78.017	77.953 to 77.960	0.050 ÷ 0.064
cylinder-piston	N	78.017 to 78.024	77.960 to 77.967	0.050 ÷ 0.064
cylinder-piston	O	78.024 to 78.031	77.967 to 77.974	0.050 ÷ 0.064
cylinder-piston	P	78.031 to 78.038	77.974 to 77.981	0.050 ÷ 0.064

**N.B.**

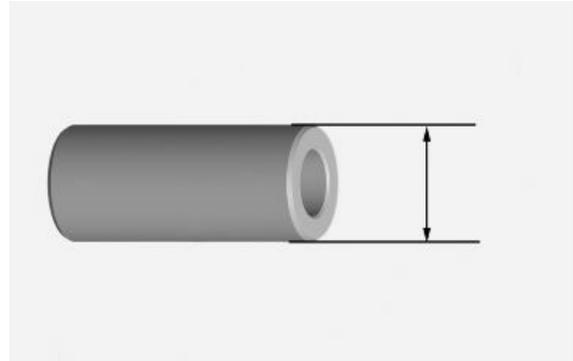
**THE PISTON MUST BE INSTALLED WITH THE ARROW FACING TOWARDS THE EXHAUST SIDE, THE PISTON RINGS MUST BE INSTALLED WITH THE WORD «TOP» OR THE STAMPED MARK FACING UPWARDS.**

- Measure the outer diameter of the gudgeon pin.

**Characteristic**

**Pin outside diameter**

17 (+0 -0.004) mm

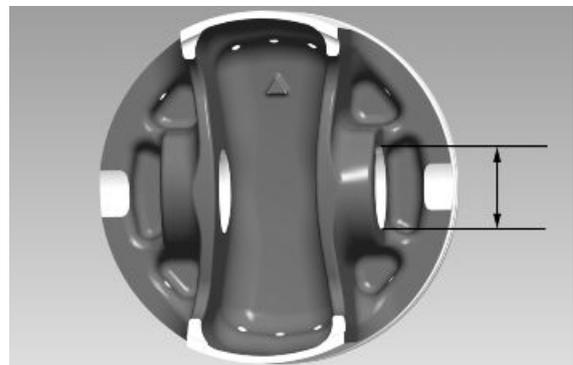


- Measure the diameter of the housings on the piston.

**Characteristic**

**Standard diameter**

17 (+0.006 +0.001) mm



- Calculate the piston pin coupling clearance.

**N.B.**

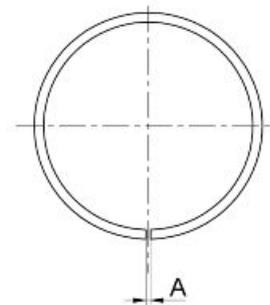
**THE PIN HOUSINGS HAVE 2 LUBRICATION CHANNELS. FOR THIS REASON, MEASUREMENT MUST BE MADE ACCORDING TO THE PISTON AXIS**

**Characteristic**

**Standard clearance:**

0.001 - 0.010 mm

- Carefully clean the 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:

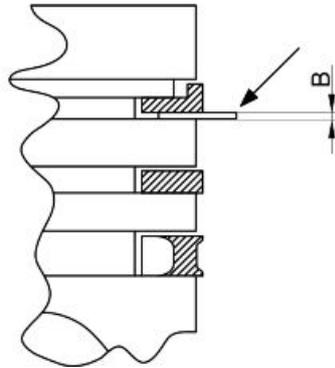


**N.B.**

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

**ASSEMBLY CLEARANCE OF BANDS - SEAL RINGS**

DESIGNATION	SIZES	ASSEMBLY CLEARANCES (A)	STANDARD COUPLING CLEARANCE (B)
1° compression ring (mm)	78x1	0.15 ÷ 0.35	0.06 to 0.033
2° compression ring (mm)	78x1	0.30 to 0.50	0.06 to 0.033
Oil ring segments (mm)	78x2	0.15 to 0.45	0.06 to 0.033



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



**Characteristic**

**Maximum allowable run-out:**

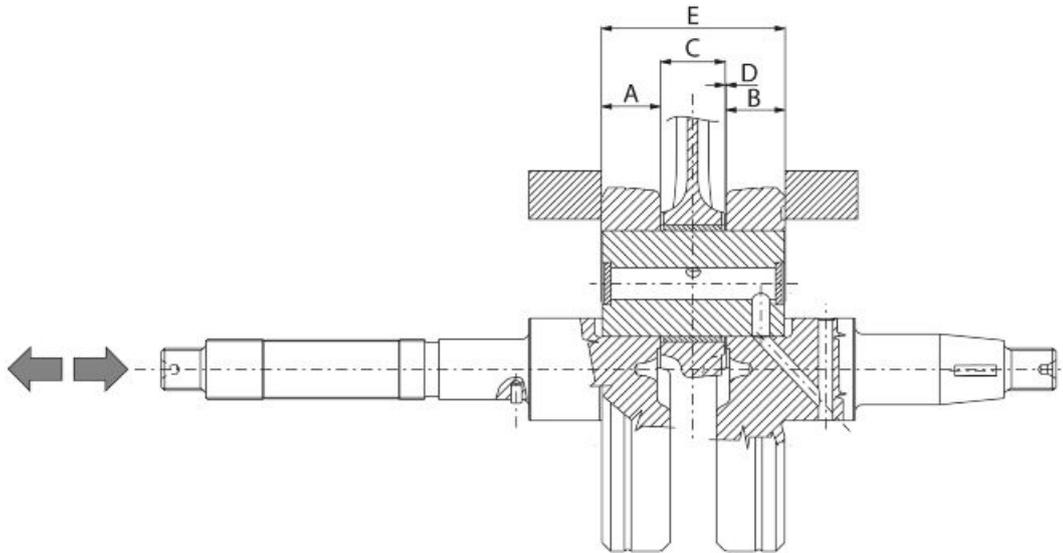
0.001 over 0.05 mm

**Crankcase - crankshaft - connecting rod**

**CRANKSHAFT**

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

*Axial clearance between crankshaft and connecting rod*

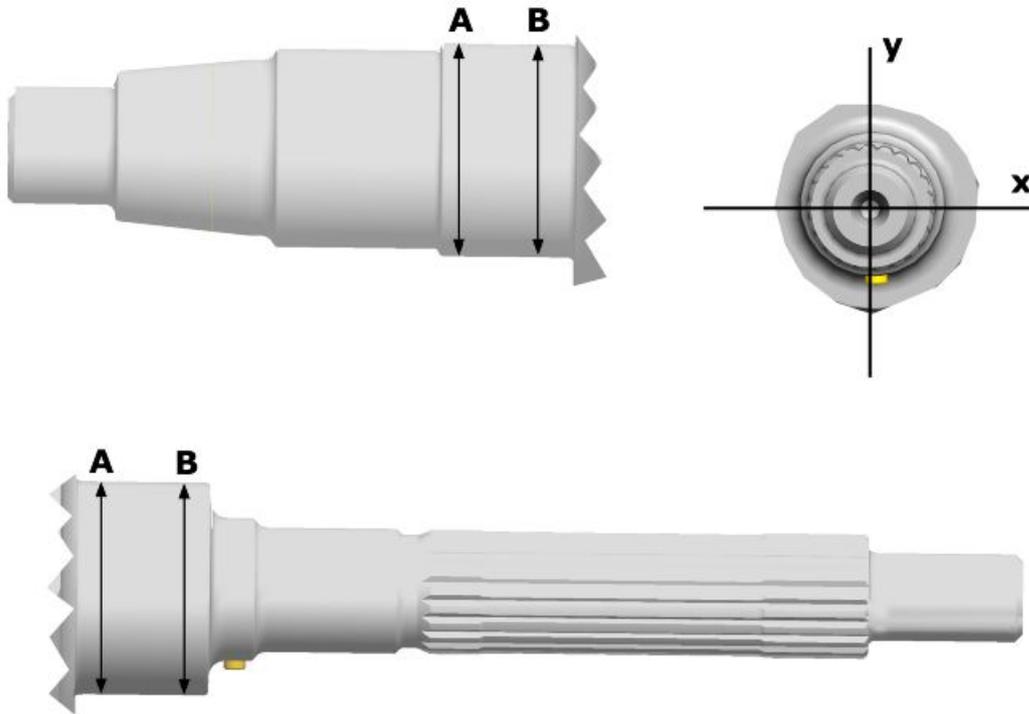


### AXIAL CLEARANCE BETWEEN CRANKSHAFT AND CONNECTING ROD

Name	Code	Sizes	Assembly clearance
Transmissionside half-shaft	A	18.4 (+0; -0.05) mm	D = 0.20 - 0.50
Flywheel-side halfshaft	B	18.4 (+0; -0.05) mm	D = 0.20 - 0.50
Connecting rod	C	19 (-0.10; -0.15) mm	D = 0.20 - 0.50
Spacer tool	E	56 (+0; +0.05) mm	D = 0.20 - 0.50

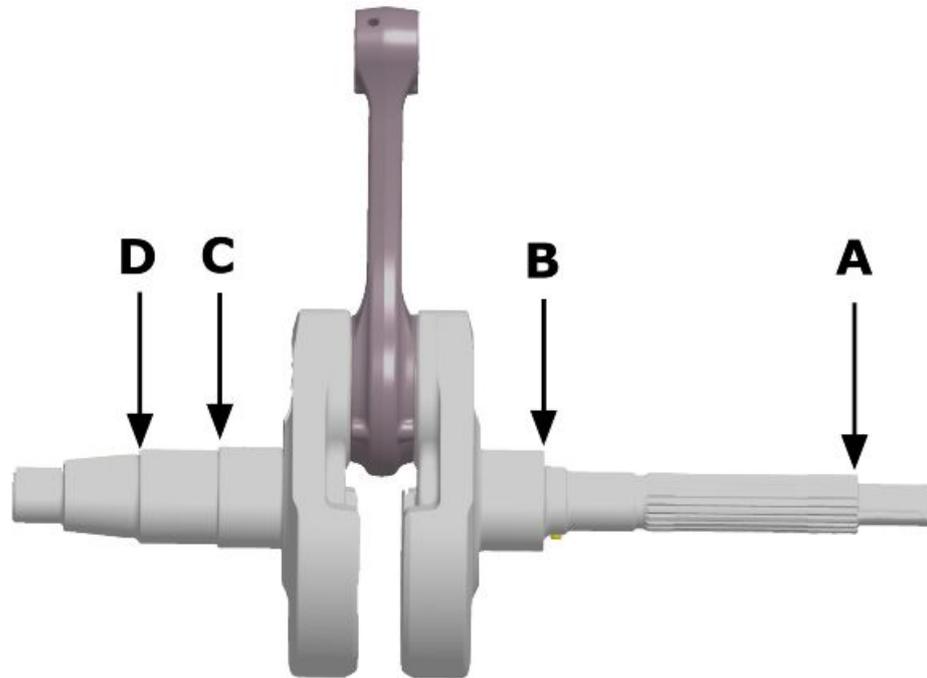
#### Diameter of crankshaft bearings.

Measure the bearings on both axes x-y.

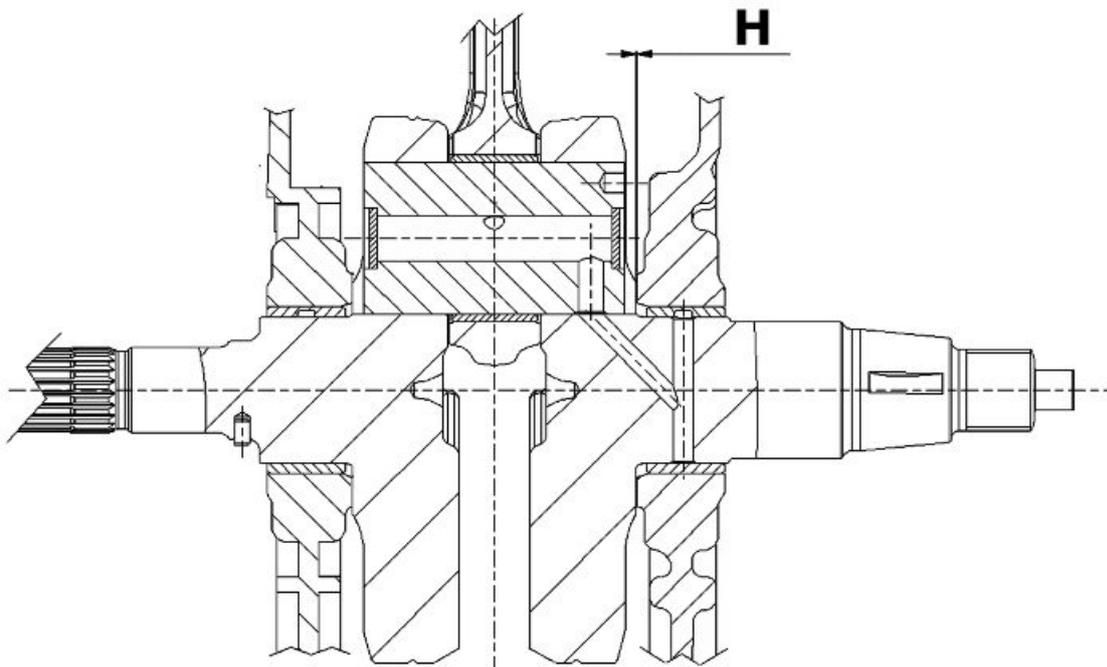


**CRANKSHAFT**

Specification	Desc./Quantity
Crankshaft bearings: Standard diameter: Cat. 1	36.003 to 36.009 mm
Crankshaft bearings: Standard diameter: Cat. 2	36.009 to 36.015 mm

**MAX. ADMISSIBLE DISPLACEMENT**

Specification	Desc./Quantity
A =	0.2 mm
B =	0.010 mm
C =	0.010 mm
D =	0.10 mm



**Characteristic**

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

0.15 ÷ 0.43 mm

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

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



**Characteristic**

**Standard diameter (with fitted bushing)**

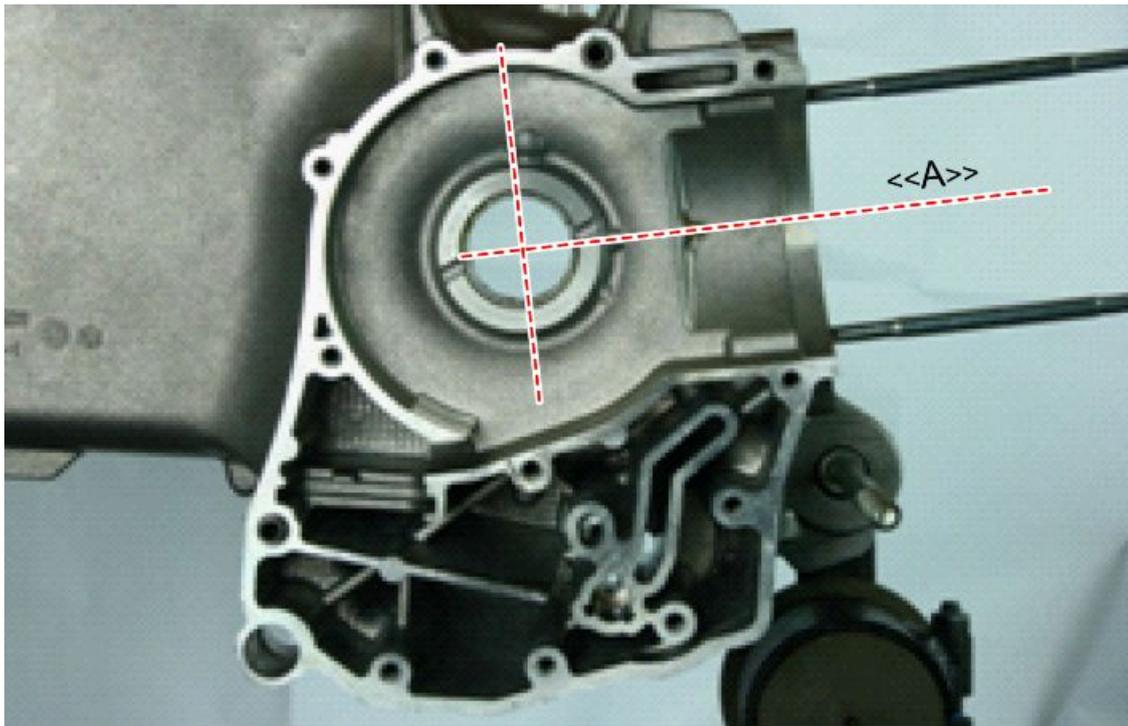
Ø 17 (+0.015 +0.025) mm

- 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.

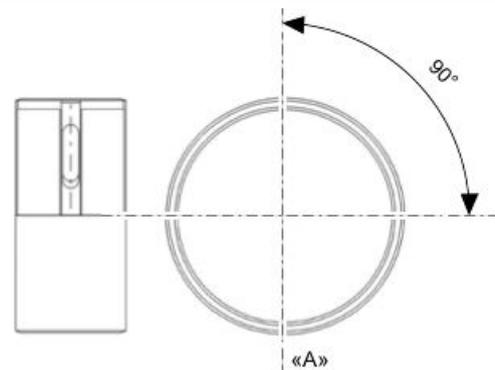
**Characteristic**

«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	1.970 to 1.974
C	YELLOW	1.974 to 1.978
E	GREEN	1.978 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.

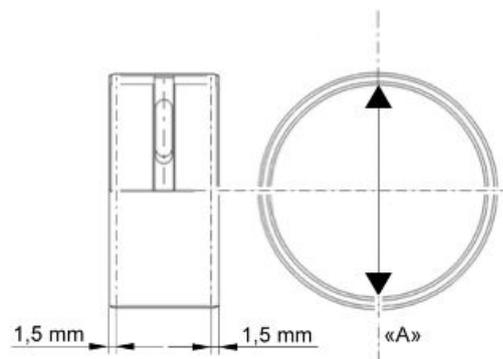


**N.B.**

**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

- After measuring the crankshaft, check the maximum clearance allowed.

**Characteristic**

**Crankshaft-bushing maximum clearance admitted:**

0.08 mm

- 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	39.953 to 39.959 mm
CAT 2	39.959 to 39.965 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.

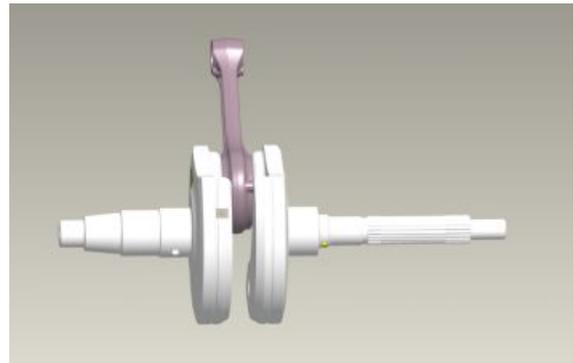
- According to the classification of the shaft CAT.1 - CAT.2 combine a complete crankcase pre-fitted with suitable bushings according to the starting shaft.

**CATEGORIES**

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

**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

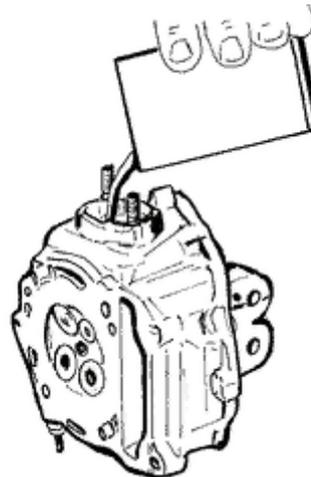
- Using a trued bar and a feeler gauge check that the cylinder head surface is not worn or distorted.

**Characteristic**  
**Maximum allowable run-out:**  
 0.001 over 0.05 mm

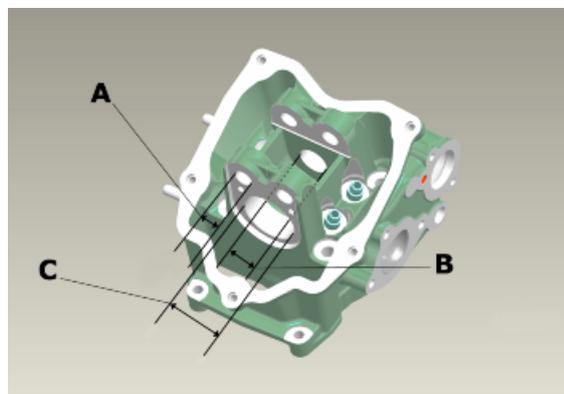
- In case of faults, replace the head.
- Check the sealing surfaces for the exhaust manifold.
- Check that the camshaft and the rocking lever pin capacities exhibit no wear.
- Check that the head cover show no signs of wear.
- Check that there is no cooling liquid leakage from the seals.



- 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.



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



**HEAD BEARINGS**

Specification	Desc./Quantity
bearing «A»	Ø 13.000 to 13.018 mm
bearing «B»	Ø 18.000 to 18.021 mm
bearing «C»	Ø 37.000 - 37.025 mm

Measure the unloaded spring length

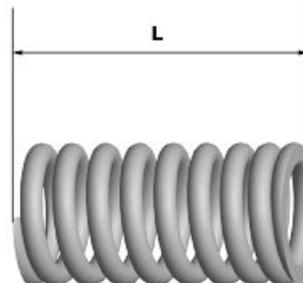
**Characteristic**

**Standard length**

40.7 mm

**Allowable limit after use:**

39.2 mm



- Remove any carbon deposits from the valve seats.

- Check the width of the mark on the valve seat «V» with Prussian blue.

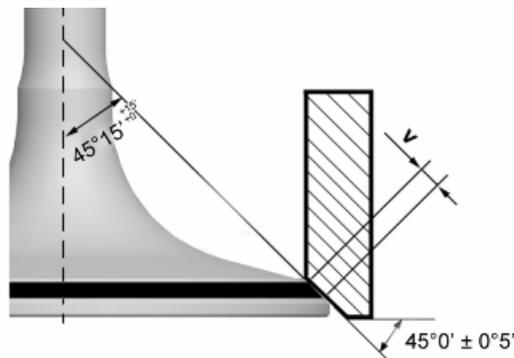
**Characteristic**

**Standard value:**

1 - 1.3 mm

**Admissible limit:**

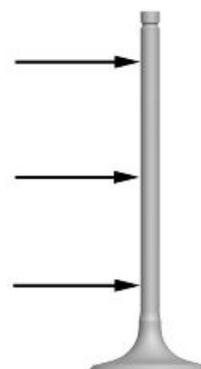
1.6 mm



- 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**

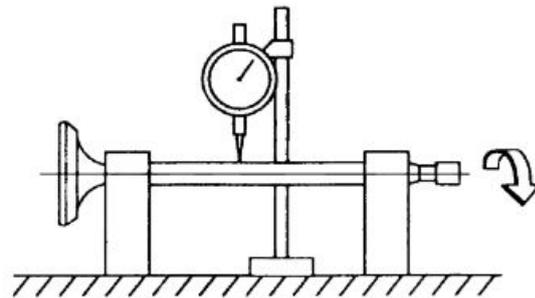
Specification	Desc./Quantity
Intake:	4.957 to 4.972 mm
Exhaust:	4.935 to 4.950 mm

**MINIMUM ADMISSIBLE DIAMETER**

Specification	Desc./Quantity
Intake:	4.942 mm
Exhaust:	4.92 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.

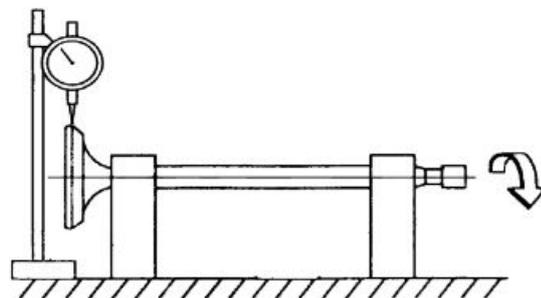


**Characteristic**

**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:**

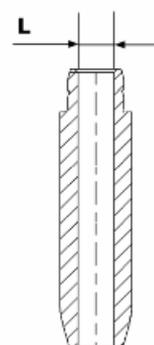
0.2 mm

Measure the valve guide.

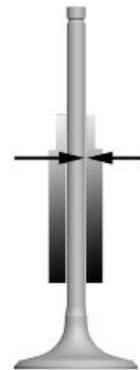
**Characteristic**

**Valve guide:**

5 (+0 +0.012 mm)



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



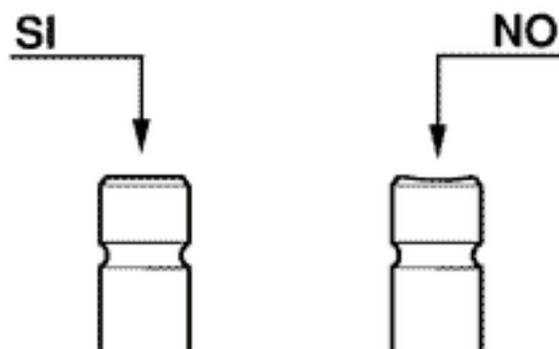
**INTAKE**

Specification	Desc./Quantity
Standard clearance:	0.028 to 0.055 mm
Admissible limit:	0.08 mm

**EXHAUST**

Specification	Desc./Quantity
Standard clearance:	0.05 to 0.077 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).**

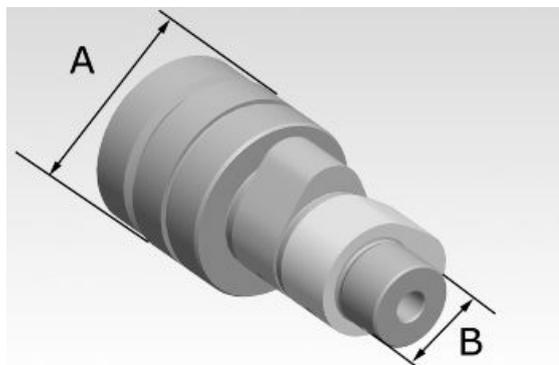
- Check that the camshaft bearings exhibit no scores or abnormal wear.
- Using a micrometer, measure the camshaft bearings.

**STANDARD DIAMETER**

Specification	Desc./Quantity
Camshaft check: Standard diameter	Bearing A Ø: 36.95 ÷ 36.975 mm
Camshaft check: Standard diameter	Bearing B diameter: 17.966 to 17.984 mm

**MINIMUM ADMISSIBLE DIAMETER**

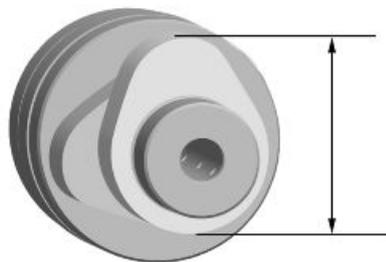
Specification	Desc./Quantity
Camshaft check: Minimum admissible diameter	Bearing A Ø: 36.94 mm
Camshaft check: Minimum admissible diameter	Bearing B diameter: 17.957 mm



- Using a gauge, measure the height of the cams.

**STANDARD HEIGHT**

Specification	Desc./Quantity
Camshaft check: Standard height	Intake: 31.008 mm ± 0.03 mm
Camshaft check: Standard height	Exhaust: 30.005 mm ± 0.03 mm
Camshaft check: Wear limit	Intake: 30.948 mm
Camshaft check: Wear limit	Exhaust: 29.945 mm



Check the axial clearance of the camshaft

**CAMSHAFT AXIAL CLEARANCE**

Specification	Desc./Quantity
Camshaft check: Standard axial clearance:	0.09 to 0.41 mm

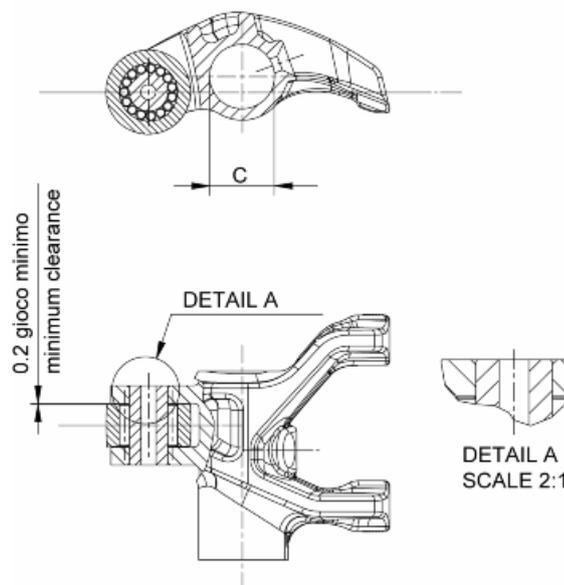


- Measure the outside diameter of the rocking lever pins
- Check the rocking lever pins do not show signs of wear or scoring.
- Measure the internal diameter of each rocker.

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 13.015 to 13.035 mm
Rocking lever pin diameter: Standard diameter (D)	Ø 12.977 - 12.985 mm
Nominal clearance	0.030 to 0.058 mm
Maximum clearance allowed	0.08 mm



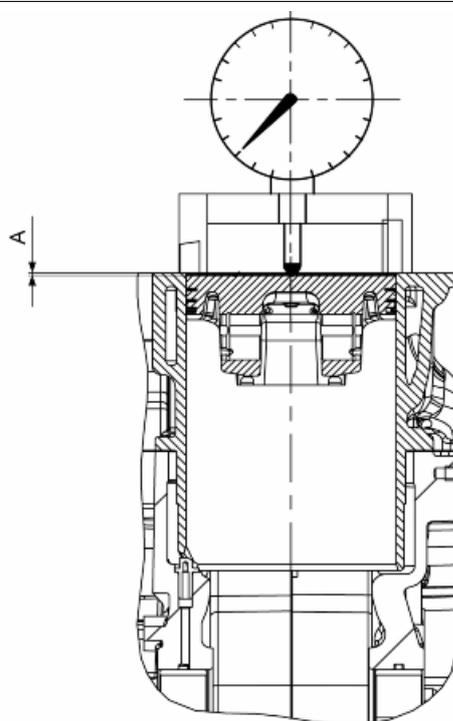


## Slot packing system

### Characteristic

#### Compression ratio

11.7 ± 12.3: 1



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

**N.B.**

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

### ENGINE 350 SHIMMING

Name	Measure A	Thickness
Shimming	0.775 to 0.875	0.2
Shimming	0.625 to 0.775	0.3
Shimming	0.525 to 0.625	0.4

## Products

### RECOMMENDED PRODUCTS TABLE

Product	Description	Specifications
AGIP GEAR SAE 80W-90	Lubricant for gearboxes and transmissions.	API GL-4
AGIP FILTER OIL	Special product for the treatment of foam filters.	-
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
eni i-Ride PG 15W-50	Synthetic-based lubricant for four stroke engines.	JASO MA, MA2 - API SJ - ACEA A3
AGIP BRAKE 4	Brake fluid.	Synthetic fluid SAE J 1703 -FMVSS 116 - DOT 3/4 - ISO 4925 - CUNA NC 956 DOT 4
AGIP PERMANENT SPEZIAL	Ethylene glycol-based antifreeze fluid with organic inhibition additives. Red, ready to use.	ASTM D 3306 - ASTM D 4656 - ASTM D 4985 - CUNA NC 956-16
AGIP FORK 10 W	Oil for fork.	-

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

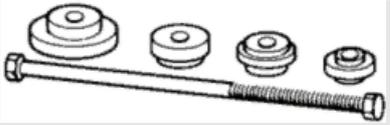
Specification	Desc./Quantity
1 Inch (in)	25.4 Millimetres (mm)
1 Foot (ft)	0.305 Meter (m)
1 Mile (mi)	1.609 Kilometre (km)
1 US Gallon (USgal)	3.785 Litre (l)
1 Pound (lb)	0.454 Kilogram (kg)
1 Cubic inch (in <sup>3</sup> )	16.4 Cubic centimetres (cm <sup>3</sup> )
1 Foot pound (ft lb)	1,356 Newton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

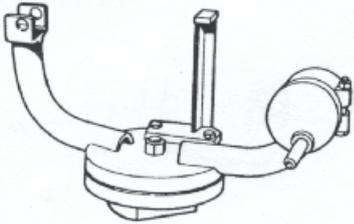
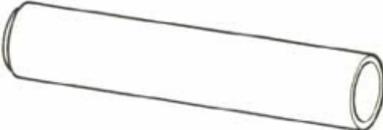
## INDEX OF TOPICS

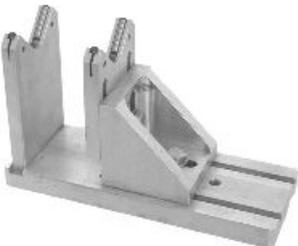
TOOLING

TOOL

**ATTREZZATURA SPECIFICA**

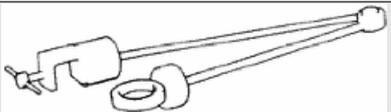
Stores code	Description	
001330Y	Tool for fitting steering seats	
001467Y002	Driver for OD 73 mm bearing	
001467Y005	Screw	
001467Y006	Pliers to extract 20 mm bearings	
001467Y007	Driver for OD 54-mm bearings	
001467Y013	Pliers to extract ø 15-mm bearings	
001467Y014	Calliper to extract ø 15-mm bearings	

Stores code	Description	
001467Y017	Driver for OD 36 mm bearings	
001467Y035	Bearing housing, outside ø 47 mm	
002465Y	Pliers for circlips	
005095Y	Engine support	
006029Y	Punch for fitting fifth steering bearing on steering tube	
020004Y	Punch for removing fifth wheels from headstock	
020055Y	Wrench for steering tube ring nut	

Stores code	Description	
020074Y	Support base for checking crankshaft alignment	

020084Y 20-mm diameter punch



020150Y	Air heater support	
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020115Y Ø 18 punch



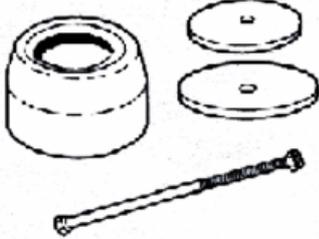
020151Y	Air heater	
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020163Y Crankcase splitting plate

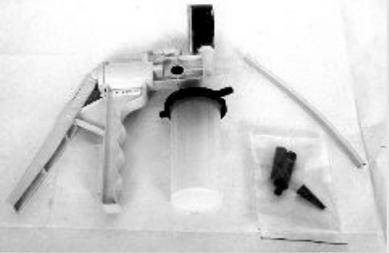


Stores code	Description	
020193Y	Oil pressure check gauge	

020244Y	15-mm diameter punch	
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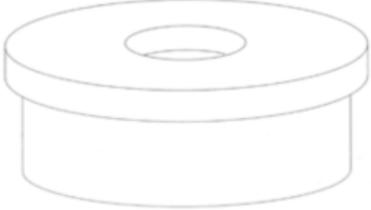
020271Y	Tool for removing-fitting silent bloc	
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020306Y	Punch for assembling valve seal rings	
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020329Y	Mity-Vac vacuum-operated pump	
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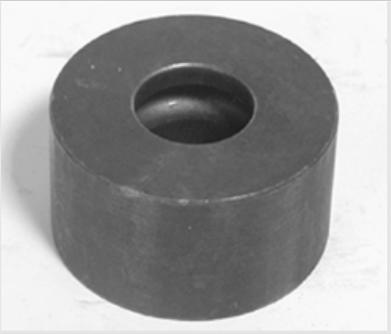
020330Y	Stroboscopic light to check timing	
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Stores code	Description	
020331Y	Digital multimeter	
020332Y	Digital rpm indicator	
020334Y	Multiple battery charger	
020335Y	Magnetic support for dial gauge	
020357Y	32x35-mm Adaptor	
020358Y	37x40-mm Adaptor	

Stores code	Description	
020359Y	42x47-mm Adaptor	
020360Y	52x55-mm Adaptor	
020363Y	20-mm guide	
020375Y	28 x 30 mm adaptor	
020376Y	Adaptor handle	
020382Y	Valve cotters equipped with part 012 removal tool	

Stores code	Description	
020382Y011	adapter for valve removal tool	
020382Y012 020412Y	bush (valve removing tool) 15-mm guide	
020431Y	Valve oil seal extractor	
020434Y	Oil pressure check fitting	
020439Y	17-mm guide	

Stores code	Description	
020442Y	Pulley lock wrench	
020444Y	Tool for fitting/ removing the driven pulley clutch	
020444Y009	wrench 46 x 55	
020456Y	Ø 24-mm adaptor	
020458Y	Puller for lower bearing on steering tube	
020467Y	Flywheel extractor	

Stores code	Description	
020477Y	37 mm adaptor	
020480Y	Petrol pressure check kit	
020483Y	30-mm guide	
020487Y	Fork oil seal extractor	
020489Y	Hub cover support stud bolt kit	
020512Y	Piston fitting fork	

Stores code	Description	
020621Y	HV cable extraction adaptor	
020627Y	Flywheel lock wrench	
020922Y	Diagnosis Tool	
020916Y	Support plate	
020917Y	Driven pulley lock	
020918Y	Clutch retainer	
020919Y	Clutch discs disassembly tool	

**Stores code**

**Description**

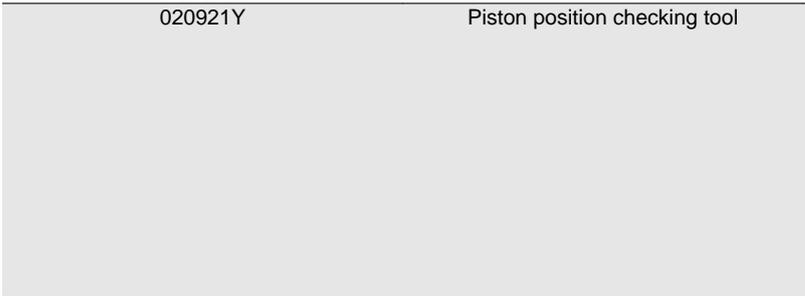
020920Y

Piston assembly band



020921Y

Piston position checking tool



020927Y

Retainer



## INDEX OF TOPICS

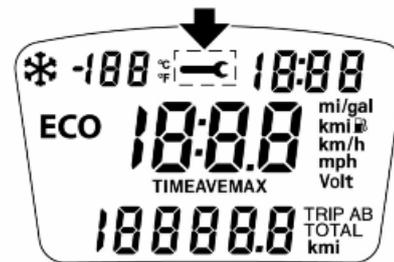
**MAINTENANCE**

**MAIN**

**RESET SERVICE WARNING LIGHT**

At vehicle ignition, immediately after the ignition check, if there are less than 300 km (187.5 miles) to the next scheduled service, the corresponding icon flashes for 5 seconds. Once the service mileage has been reached, the icon remains steadily on until it is reset.

The resetting of the service is done by holding down the SET key to the key connection for more than 10 seconds. For the first 5 seconds, the instrument panel will not give any signal, for the next 5 seconds the key icon will blink at a frequency of 1Hz. If the button is released before the 10 seconds, the service is not reset.



**Maintenance chart**

**SCHEDULED MAINTENANCE TABLE**

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

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

*\* Perform maintenance more frequently when riding in unusually wet or dusty areas*

*\*\* Check, however, the level every time you use your vehicle*

*\*\*\* Perform maintenance more frequently if you drive mainly at full acceleration*

*\*\*\*\* Replace every 2 years*

km x 1,000	1	10	15	20	30	40	45	50	60
Safety fasteners	I	I		I	I	I		I	I
Spark plug		R		R	R	R		R	R
Centre stand bracket	L	L		L	L	L		L	L
Drive belt				R		R			R
Throttle control	I	I		I	I	I		I	I
Roller housing / Roller counter				C/I		C/I			C/I
Engine air filter (*)		C		C	C	C		C	C
Engine oil filter	R	R		R	R	R		R	R
Belt compartment filter(*)		C		C	C	C		C	C
Parking brake	A	A		A	A	A		A	A
Valve clearance						I			
Electrical system and battery	I	I		I	I	I		I	I
Coolant (****)	I	I		I	I	I		I	I
Brake fluid (****)	I	I		I	I	I		I	I
Engine oil (**)	R	R		R	R	R		R	R
Hub oil	R					I			
Brake pads	I	I		I	I	I		I	I
CVT sliders and rollers				R		R			R
Brake pumps			R		R		R		R
Tyre pressure and wear	I	I		I	I	I		I	I
Vehicle road test	I	I		I	I	I		I	I
Crankcase breather (***)				C		C			C
Suspension	I	I		I	I	I		I	I
Steering	A	I		I	I	I		I	I

km x 1,000	1	10	15	20	30	40	45	50	60
Labour (minutes)	70	70	160	210	220	240	160	70	360

## Spark plug

Proceed as follows:

- Remove the case that grants access to the spark plug located on the right side fairing by unscrewing the indicated screw.
- Disconnect spark plug HV wire cap «A».
- Unscrew the spark plug using the wrench supplied.
- When refitting, place the spark plug into the hole at the corresponding angle and finger tighten it as far as it will go. Use the wrench only to tighten it.
- Place cap «A» fully over the spark plug.

### WARNING



SPARK PLUG MUST BE REMOVED WHEN THE ENGINE IS COLD. REPLACE THE SPARK PLUG AS INDICATED IN THE SCHEDULED MAINTENANCE TABLE. USE OF SPARK PLUGS OTHER THAN THE INDICATED TYPE CAN SERIOUSLY DAMAGE THE ENGINE.

### N.B.

USE OF SPARK PLUGS OTHER THAN THE INDICATED TYPE OR UNSHIELDED SPARK PLUG CAPS CAN LEAD TO FAULTS IN THE VEHICLE 'S ELECTRICAL SYSTEM.



WHEN REFITTING THE ACCESS DOOR, PAY ATTENTION TO THE FITTING FINS REQUIRED FOR THE CORRECT POSITIONING AND FIXING OF THE SAME DOOR.

### Characteristic

#### Spark plug

NGK CR7EKB



## Hub oil

## Check

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

1. Rest the vehicle onto its centre stand, on level ground.
2. Unscrew the screw «A» and if oil comes out or touches the screw hole the level is correct. Otherwise, top up the oil.
3. Screw the screw back in, checking that it is locked in place.



### CAUTION



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

### CAUTION



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

### CAUTION



**UPON REPLACING HUB OIL, AVOID THE OIL COMING INTO CONTACT WITH THE REAR WHEEL AND TYRE.**

### CAUTION



**FOR OIL REPLACEMENT, CONTACT ANY AUTHORISED SERVICE CENTRE AS THEY ARE EQUIPPED TO DISPOSE OF USED OILS IN AN ENVIRONMENTALLY FRIENDLY AND LEGAL WAY.**

## Recommended products

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

API GL-4

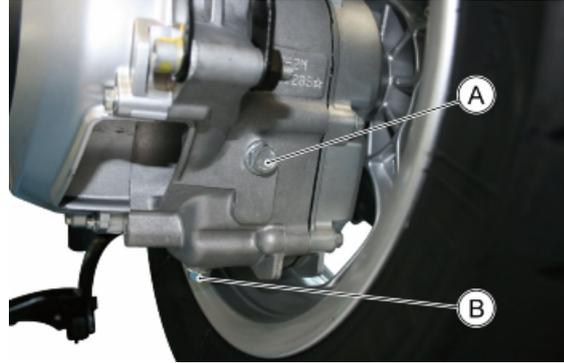
## Characteristic

### Transmission oil

About 500 cc

## Replacement

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



### Recommended products

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

API GL-4

### Characteristic

#### Transmission oil

about 500 cc

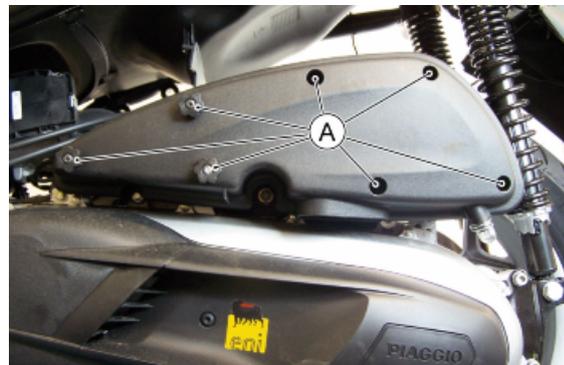
### Locking torques (N\*m)

**Oil relief screw 15 to 17 Reduction unit oil drainage screw 15 to 17**

## Air filter

To reach the air filter:

- Remove the left semi-tail fairing.
- Undo the seven screws «A» and remove the air filter cover.



### AIR FILTER CLEANING

- Clean the air filter as described.

1. Blow with compressed air from the white cotton side.
2. Wash with mild soap and water, without bending or twisting the filter, then dry with compressed air.
3. Soak in a solution of 50% unleaded petrol and specified oil, using a brush.

#### CAUTION



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



THE AIR FILTER MORE OFTEN TO AVOID DAMAGING THE ENGINE.

### Recommended products

**AGIP FILTER OIL** Special product for the treatment of foam filters.

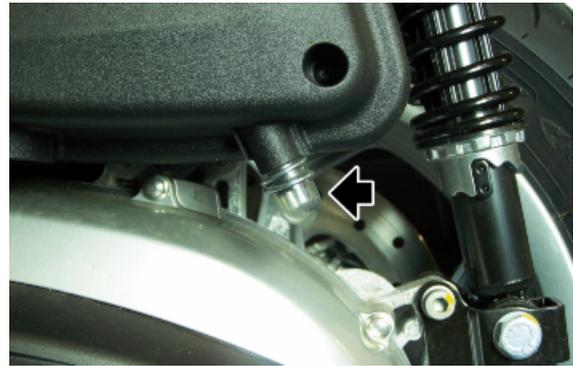
-

#### 4. Check the lower part of the bleed cap for dirt.



**REMOVE ANY DEPOSIT THAT MAY HAVE FORMED IN THE BLEED PIPE, COMING FROM THE FILTER BOX. PROCEED AS FOLLOWS:**

1. remove the cap;
2. discharge the contents into a container and send it to a recycling bank.



#### 5. Operando dal lato destro del veicolo, rimuovere la fascetta per permettere di rimuovere il tappo per verificare la presenza di olio dovuto alla condensa dei vapori.



**REMOVE ANY DEPOSIT THAT MAY HAVE FORMED IN THE BLEED PIPE, COMING FROM THE FILTER BOX. PROCEED AS FOLLOWS:**

1. remove the cap;
2. discharge the contents into a container and send it to a recycling bank.



## 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

- Remove the oil filling cap/dipstick «A».
- Unscrew the oil drainage cap «B» shown in the figure and drain out all the oil.
- Screw in the drainage cap again and fill with the prescribed oil.

### Recommended products

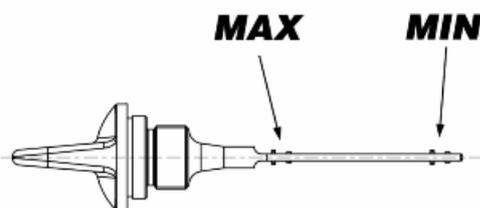
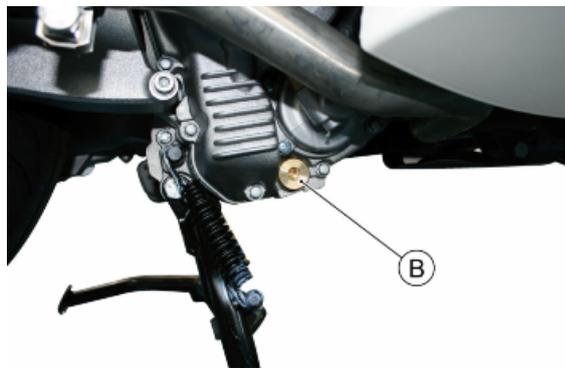
eni i-Ride PG 15W-50 Synthetic-based lubricant for four stroke engines.

JASO MA, MA2 - API SJ - ACEA A3

### Characteristic

#### Engine oil

about 1.5 l

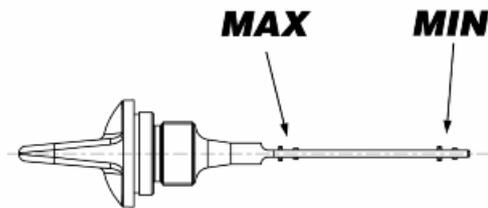


## Check

Every time the vehicle is used, visually inspect the level of the engine oil when the engine is cold (after **completely unscrewing** the oil cap/dipstick). The oil level should be somewhere between the MAX and MIN index marks on the level rod; «A»; while the oil is being checked, the vehicle must be resting on its centre stand on an even, horizontal surface.



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 filter

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

Use new oil of the recommended type for topping up and changing purposes and comply with the regulations regarding timing and mileage, as described in the periodic maintenance table.

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 oil filter being careful to lubricate the O-ring before fitting it.

Change the engine oil.

### 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.**

### Recommended products

**eni i-Ride PG 15W-50 Synthetic-based lubricant for four stroke engines.**

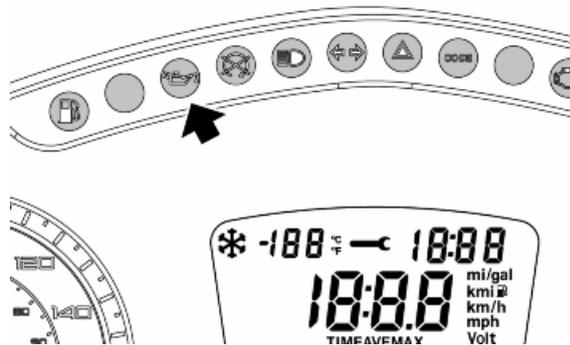
JASO MA, MA2 - API SJ - ACEA A3



## 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.**

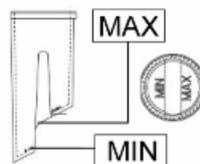
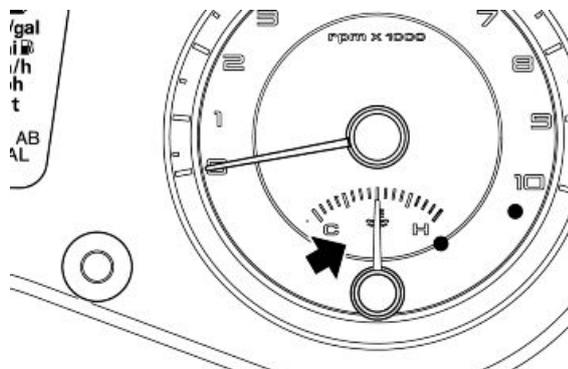


## Cooling system

Engine cooling is carried out by a forced-circulation coolant system. The coolant consists of a mixture 50% de-ionised water and 50% glycol ethylene-based antifreeze solution with corrosion inhibitors. The coolant supplied with the scooter is already mixed and ready for use.

For the proper functioning of the engine it is necessary for the coolant temperature to be maintained at about 90°C (indicator at mid-scale of instrument, approximately). If the needle of the gauge enters the red zone, stop the engine, let it cool down and check the coolant level; If it is regular check the components of the cooling system. Check coolant when the engine is cold and as indicated in the scheduled maintenance tables, following the steps below.

1. Place the scooter upright on its stand and turn the handlebar to the left (until the limit stop).
2. Open the right dashboard glove-box by lifting it.
3. Remove the expansion tank cap «A» by turning it anticlockwise.
4. Look inside the expansion tank and check that the fluid level is always between the «MIN» and «MAX» level marks.
5. Top-up the fluid when it is close to the minimum mark.



If the level is not correct, proceed to top-up when the engine is cold. If the coolant needs to be topped up frequently or the expansion tank is completely dry, check the cooling system to find the cause of the problem. It is then essential to inspect the cooling system.

**WARNING**

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

**WARNING**

**IN ORDER TO AVOID HARMFUL FLUID LEAKS WHILE RIDING, IT IS IMPORTANT TO MAKE SURE THAT THE LEVEL DOES NOT EXCEED THE REFERENCE TONGUE TOO MUCH.**

**TO ENSURE CORRECT ENGINE OPERATION, KEEP THE RADIATOR GRILLE CLEAN.**

**Recommended products**

**AGIP PERMANENT SPEZIAL Ethylene glycol-based antifreeze fluid with organic inhibition additives. Red, ready to use.**

ASTM D 3306 - ASTM D 4656 - ASTM D 4985 - CUNA NC 956-16

**Characteristic**

**Cooling system fluid**

1.75 l

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## Braking system

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### Level check

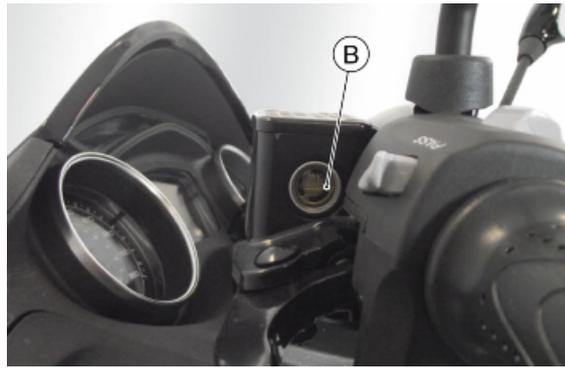
The front and rear brake fluid reservoirs are both positioned on the handlebar. Proceed as follows:

- Rest the vehicle on its centre stand with the handlebars perfectly horizontal;
- Check the fluid level using the relative transparent indicator «**A**» (front brake) and «**B**» (rear brake).

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



lower than the minimum, perform an accurate check of the braking system and the top-up.



## Top-up

- To top-up the brake fluid, unscrew the two screws "A" and remove the cap "B" from the brake pump to restore the optimal level.

### WARNING

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

### CAUTION

**ONLY USE DOT 4-CLASSIFIED BRAKE FLUID.**

### WARNING

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

### WARNING

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

### Recommended products

**AGIP BRAKE 4 Brake fluid.**

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

- ISO 4925 - CUNA NC 956 DOT 4

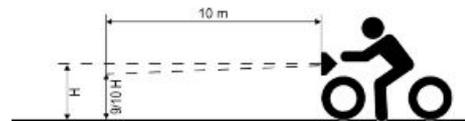
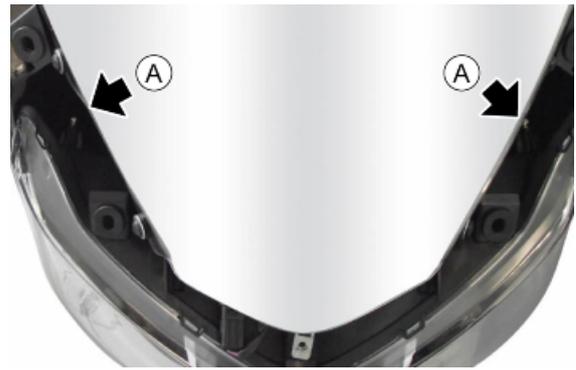


## Headlight adjustment

- First remove the windshield, the front dashboard cover and the front dashboard.

Proceed as follows:

1. Position the unloaded vehicle, in running order and with the tyres inflated to the prescribed pressure, onto a flat surface, 10 m away from a half-lit white screen; make sure the vehicle axis is perpendicular to the screen;
2. Turn on the headlight and check that the boundary of the light beam projected onto the screen is not higher than  $9/10$  or lower than  $7/10$  of the distance between the centre of the headlight and the ground.
3. Otherwise, adjust the headlight with the screw «A» indicated in the figure.



**N.B.**

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

**See also**

[Flyscreen](#)  
[Legshield](#)

## INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

This section makes it possible to find what solutions to apply when troubleshooting.  
 For each failure, a list of the possible causes and pertaining operations is given.

## Engine

### Excessive oil consumption/Exhaust smoke

#### EXCESSIVE CONSUMPTION

Possible Cause	Operation
Wrong valve adjustment	Adjust the valve clearance properly
Overheated valves	Remove the head and the valves, grind or replace the valves
Misshapen/worn valve seats	Replace the head unit
Worn cylinder, Worn or broken piston rings	Replace the piston cylinder assembly or piston rings
Worn or broken piston rings or piston rings that have not been fitted properly	Replace the piston cylinder unit or just the piston rings
Oil leaks from the couplings or from the gaskets	Check and replace the gaskets or restore the coupling seal
Worn valve oil 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
The motor runs but the vehicle does not move	<ul style="list-style-type: none"> <li>- Check that the belt shows no signs of wear and is not damaged or bent.</li> <li>- Check that the mobile half-pulley shows no signs of wear and is not damaged on the faying surface with the belt.</li> <li>- Check that the sliding bushing of the mobile pulley shows no signs of wear and is not damaged on the faying surface with the shaft and in the shaped seats of the pins.</li> <li>- Check the correct positioning of the fixing appendices of the torque server on the mobile pulley.</li> <li>- Check that the clearance recovery springs and clutch springs show no signs of wear and are not damaged.</li> <li>- Check that there is no damage to the final reduction gear.</li> </ul>
The clutch slips	<ul style="list-style-type: none"> <li>- Check that the torque server spring shows no signs of wear and is not damaged or bent.</li> <li>- Check the correct positioning of the fixing appendices of the torque server on the mobile pulley.</li> <li>- Check the sliding of the mobile half-pulley.</li> <li>- Check that the discs clearance recovery springs show no signs of damage or wear.</li> </ul>

Possible Cause	Operation
Difficulty in starting	<ul style="list-style-type: none"> <li>- Check the clutch discs for damage or signs of wear.</li> <li>- Check that the clutch assembly works properly.</li> <li>- Check that the belt shows no signs of wear and is not damaged or bent.</li> <li>- Make sure there is no oil on the inner surfaces of the pulleys and belt.</li> <li>- Check that the mobile pulley works and slides properly.</li> <li>- Check that the mobile pulley shows no signs of wear or damage on the contact surface with the shaft and in the shaped seats of the pins.</li> <li>- Check that the torque driver pins rotate correctly.</li> <li>- Check that the clutch discs show no signs of wear or damage.</li> </ul>

## Insufficient braking

### INEFFICIENT BRAKING SYSTEM

Possible Cause	Operation
Inefficient braking system	Check the pad wear (1.5 min). Check that the brake discs are not worn, scored or warped. Check the correct level of fluid in the pumps and change brake fluid if necessary. Check there is no air in the circuits; if necessary, bleed the air. Check that the front brake calliper moves in axis with the disc.
Fluid leakage in hydraulic braking system	Failing elastic fittings, plunger or brake pump seals, replace
Brake disc slack or distorted	Check the brake disc screws are locked; measure the axial shift of the disc with a dial gauge and with wheel mounted on the vehicle.

## Brakes overheating

### BRAKE OVERHEAT

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

## Steering and suspensions

### Heavy steering

### STEERING HARDENING

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

## Excessive steering play

### EXCESSIVE STEERING CLEARANCE

Possible Cause	Operation
Torque not conforming	Check the tightening of the top and bottom ring nuts. If irregularities continue in turning the steering even after making the above adjustments, check the seats in which the ball bearings rotate: replace them if they are recessed or if the balls are flattened.

## Noisy suspension

### NOISY SUSPENSION

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

## Suspension oil leakage

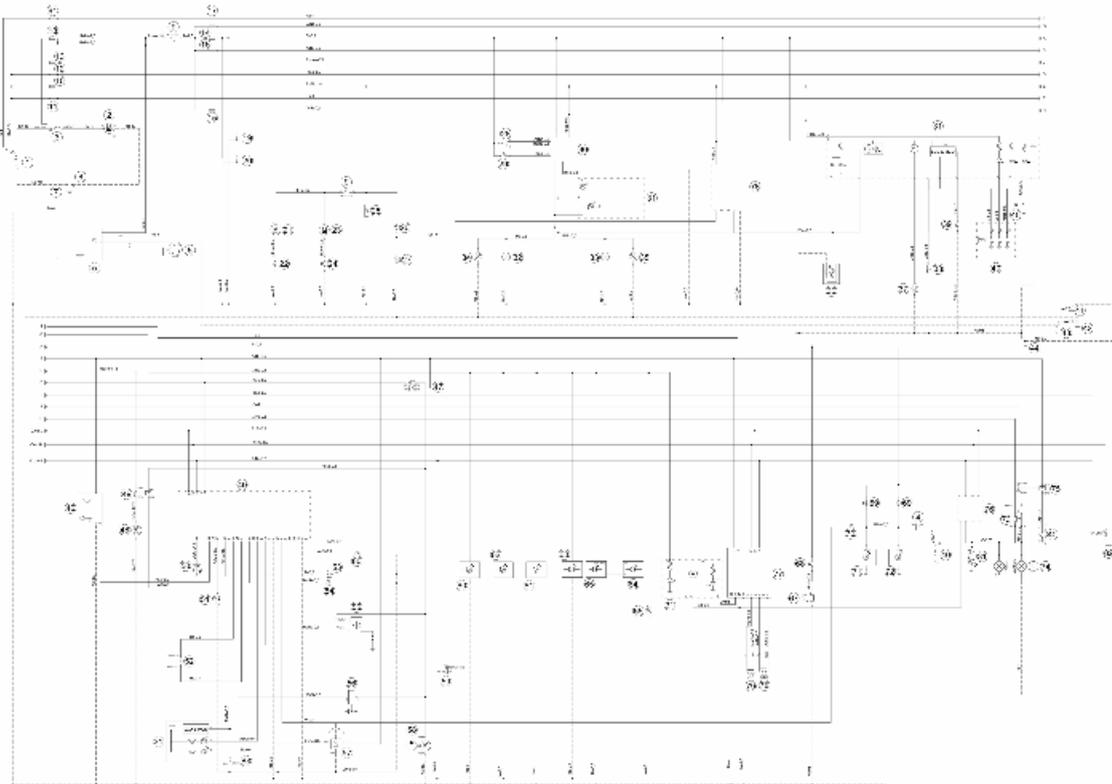
### OIL LEAKAGE FROM SUSPENSION

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

## INDEX OF TOPICS

ELECTRICAL SYSTEM

ELE SYS

**KEY**

1. 12v-10Ah battery
2. Starter motor
3. Starter remote control contact
4. Starter solenoid coil
5. Regulator
6. Flywheel
7. Chassis ground
8. Chassis engine-ground
9. Ignition switch
10. Fuse No. 1 - 15A
11. Fuse No. 2 - 10A
12. Fuse No. 3 - 7.5A
13. Fuse No. 4 - 7.5A
14. Fuse No. 5 - 7.5A
15. Fuses No. 6 - 7.5A
16. Fuse No. 7 - 5A
17. Fuse No. 8 - 3A
18. Fuse No. 9 - 30A
19. USB socket

20. Preinstallation for satellite navigation system
21. Fuel tank flap actuator
22. Fuel tank flap button
23. Saddle actuator
24. Saddle button
25. LV socket
26. Helmet compartment light switch
27. 12v-5w light unit bulb
28. Turn indicator control
29. Emergency light bulb button
30. Turn indicators control device
31. Instrument panel
32. Front left turn indicator
33. Front right turn indicator
34. Rear left turn indicator
35. Rear right turn indicator
36. Fuel gauge
37. Engine temperature sensor (instrument)
38. Ambient temperature sensor
39. «Mode» button
40. Injection electronic control unit
41. Front ground node
42. Rear ground node
43. Rear ground regulator
44. Instrument panel ground node
45. Oil pressure sensor
46. Immobilizer
47. Injection relay
48. Radiator electric fan
49. Radiator electric fan solenoid
50. Lambda probe
51. Engine temperature sensor (C.D.I.)
52. Engine speed sensor
53. Engine stop button
54. Stand button
55. H.V. coil
56. Fuel injector
57. Anti-tipping sensor

- 58. Fuel pump
- 59. Diagnostics socket
- 60. Left front daylight running light
- 61. Right front daylight running light
- 62. Left rear tail light bulb
- 63. Right rear tail light bulb
- 64. Left side control lighting
- 65. Right side control lighting
- 66. License plate light bulb 12V-5W
- 67. Horn
- 68. Horn button
- 69. N.2 stop buttons
- 70. Engine starter button
- 71. Left stop light
- 72. Right stop light
- 73. Light switch
- 74. Headlight
- 75. Headlight relay
- 76. Pre-installation of «blue dash / anti-theft device»
- 77. ABS control unit
- 78. Front speed sensor
- 79. Rear speed sensor
- 80. ASR Button
- 81. Fuse No. 10 - 40A
- 82. CAN line termination resistance
- 83. «ECO» mode switch

**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

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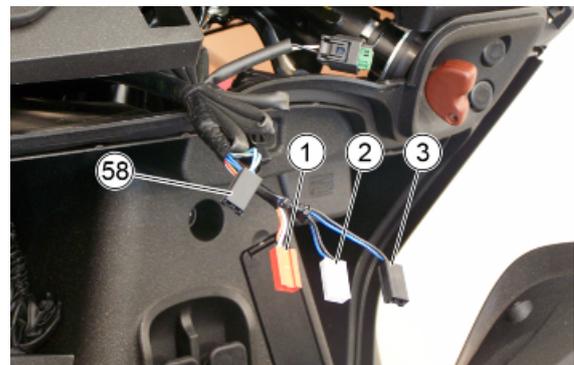
Components arrangement





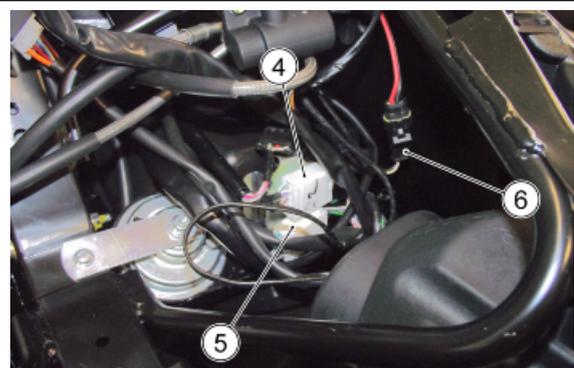
- 1. Saddle opening switch
- 2. Emergency light button
- 3. Fuel tank flap opening button

- to reach them remove the moulding of the buttons.



- 4. Hand grip device right side
- 5. Hand grip device left side
- 6. USB socket device

- remove the front headlight assembly to reach it.

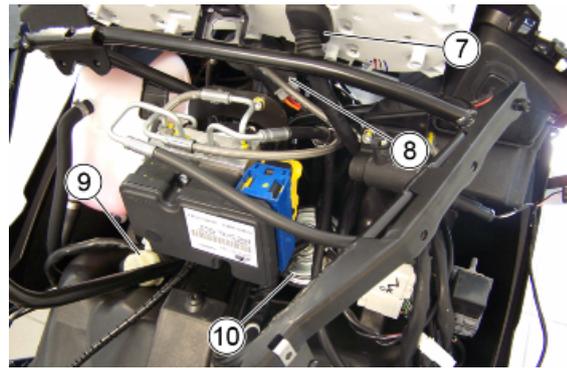


**7. Instrument panel****8. Ignition switch****9. Pre-installation of accessories (Blue Dash pre-installation)**

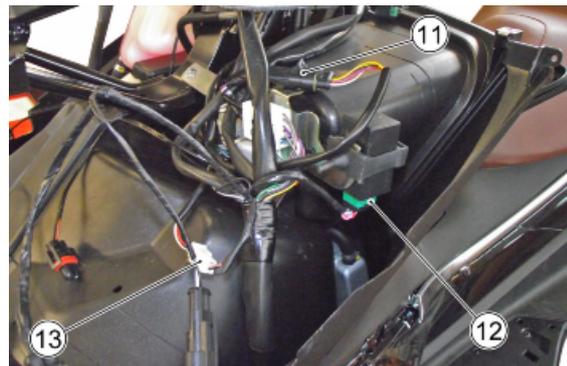
- remove the windshield unit to reach it.

**10. Horn**

- remove the front headlight assembly to reach it.

**11. Headlight connection flange****12. Turn indicator control device****13. Stop buttons**

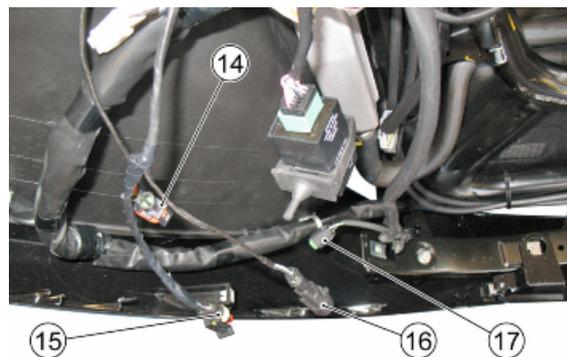
- remove the front headlight assembly to reach it.

**14. Left low beam headlight****15. Front left turn indicator****16. USB socket**

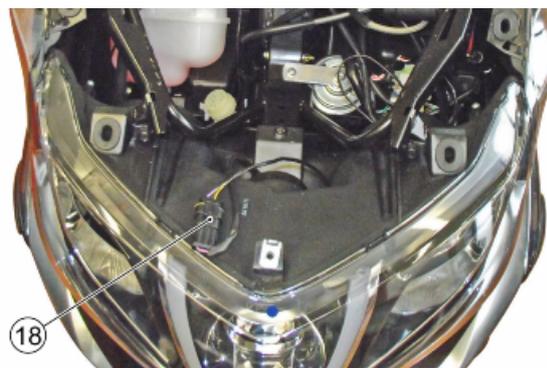
- remove the front headlight assembly to reach it.

**17. GPS navigator**

- to reach it remove the moulding of the buttons and the left side moulding.

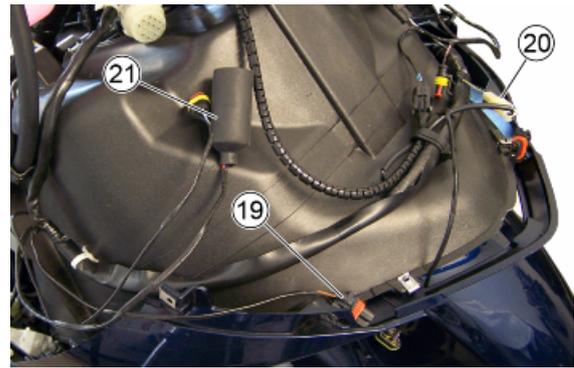
**18. High-beam headlight and front daylight running light**

- remove the windshield unit to reach it.



**19. Right low beam headlight****20. External air temperature sensor****21. LV socket**

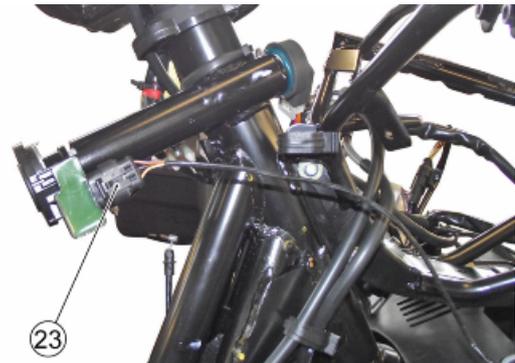
- remove the front headlight assembly to reach it.

**22. Front right turn indicator**

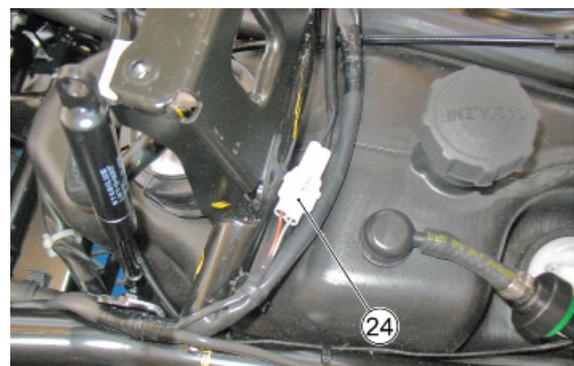
- remove the front headlight assembly to reach it.

**23. Immobilizer aerial**

- remove the central cover and the glove-box compartment to reach it.

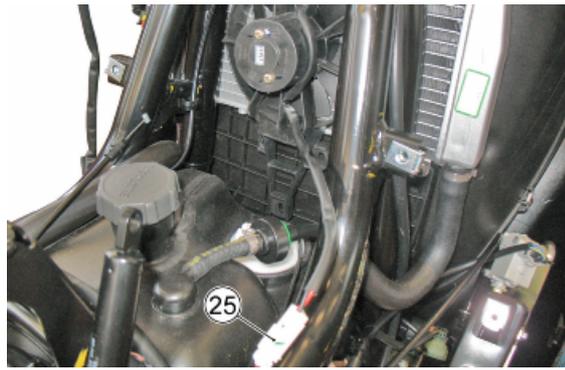
**24. Side stand switch**

- remove the bottom cover and the fuel door to reach it.



**25. Radiator electric fan**

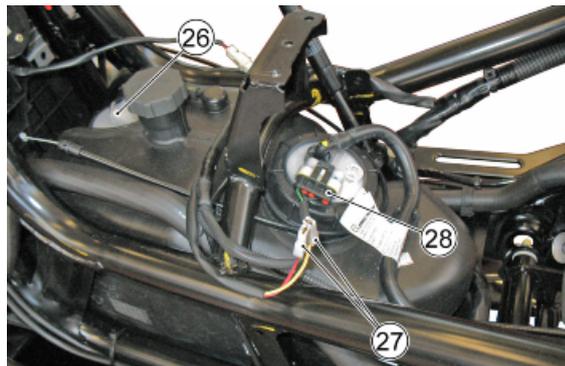
- remove the bottom cover and the fuel door to reach it.

**26. Fuel gauge**

- remove the bottom cover and the fuel door to reach it.

**27. Helmet compartment light switch****28. Fuel pump**

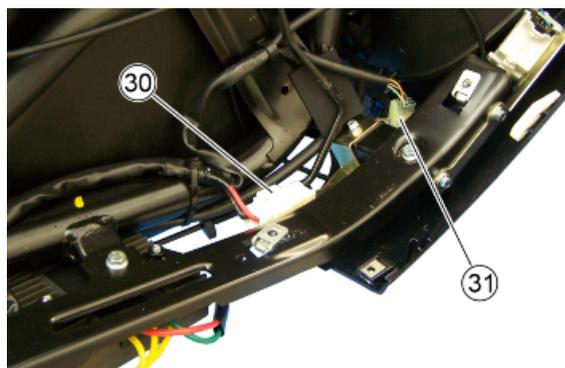
- remove the helmet compartment to reach it.

**29. Saddle opening actuator**

- remove the left semi-tail fairing to reach it.

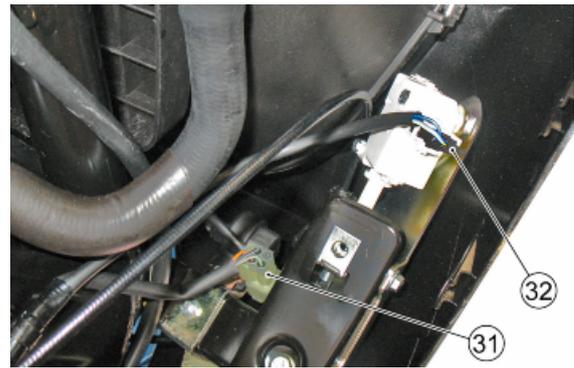
**30. Voltage regulator connection****31. Anti-tipping sensor**

- remove the footrest and the right side fairing to reach it.

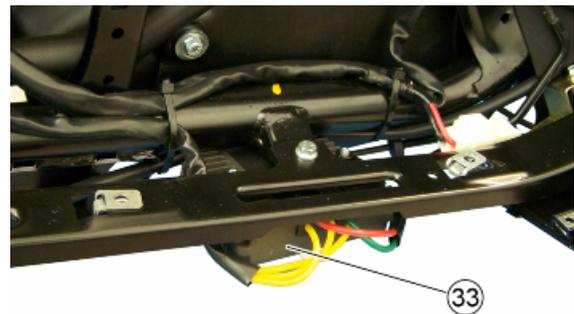


**32. Fuel door opening actuator**

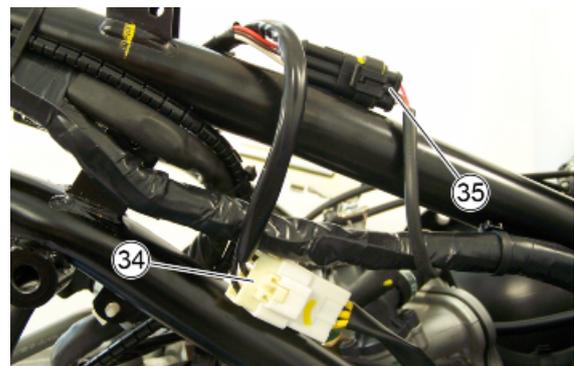
- remove the footrest and the right side fairing to reach it.

**33. Voltage regulator**

- remove the footrest and the right side fairing to reach it.

**34. Stator connection****35. Connection of engine speed sensor and oil pressure sensor**

- remove the footrest and the right semi-tail fairing to reach it.

**36. Injection ECU**

- Remove the helmet compartment door to reach it.

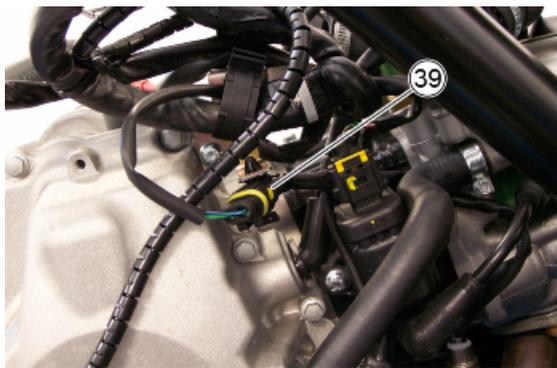
**37. Injector****38. Engine temperature sensor**

- remove the helmet compartment to reach it.

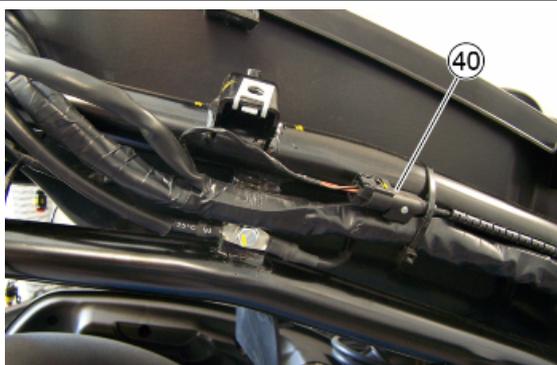


**39. Lambda sensor**

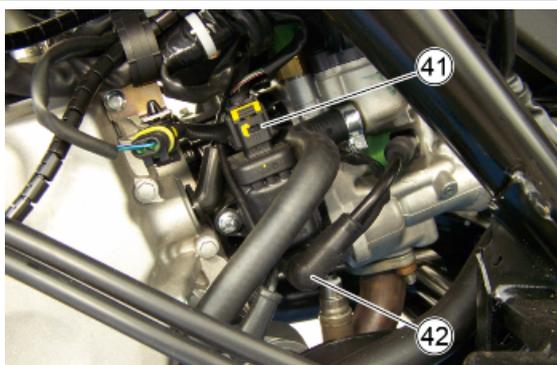
- remove the helmet compartment to reach it.

**40. Rear speed sensor**

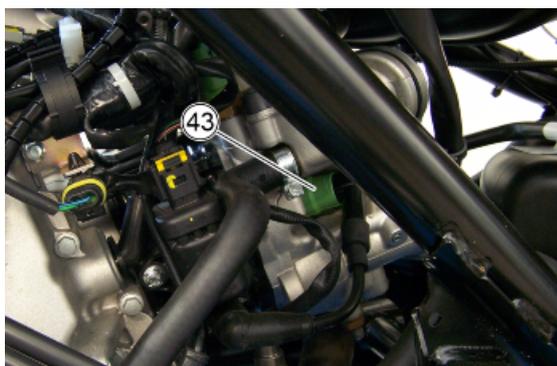
- remove the helmet compartment to reach it.

**41. H.V. coil****42. H.V. coil cap**

- remove the helmet compartment and the right semi-tail fairing to reach it.

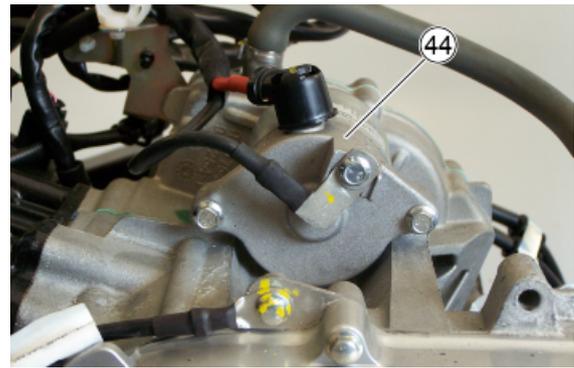
**43. Ignition spark plug cap**

- remove the spark plug inspection cover to access the spark plug.



**44. Starter motor**

- remove the helmet compartment to reach it.

**45. Diagnostic socket****46. Battery negative****47. Battery positive****48. Start-up solenoid**

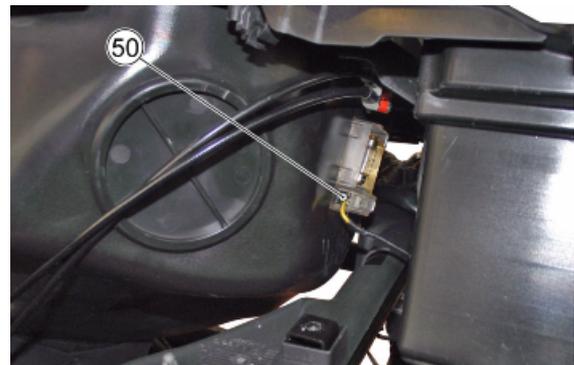
- remove the battery compartment cover to reach it.

**49. Fuse-box and relay**

- remove the battery compartment cover and lift the starter solenoid to reach it.

**50. Helmet compartment internal light**

- remove the light unit of the helmet compartment to reach it.

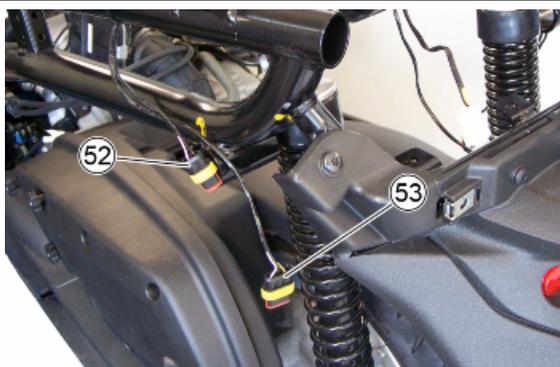


**51. License plate light**

- remove the license plate support to reach it.

**52. Rear left turn indicator****53. Rear left light**

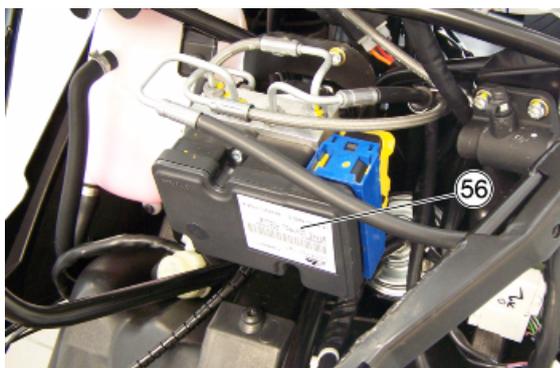
- remove the semi-tail fairing and the left rear light unit to reach it.

**54. Rear right turn indicator****55. Rear right light**

- remove the semi-tail fairing and the right rear light unit to reach it.

**56. ABS control unit**

- remove the windshield unit to reach it.



**57. Front speed sensor**

- remove the front headlight assembly to reach it.

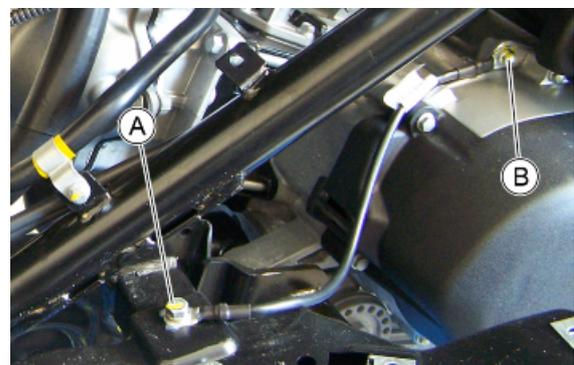
**58. ASR Button**

- to reach them remove the moulding of the buttons.

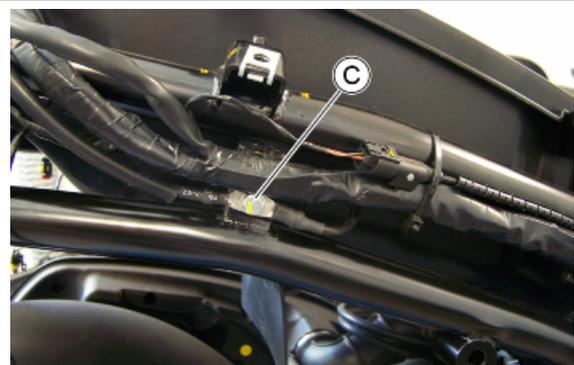
**Ground points**

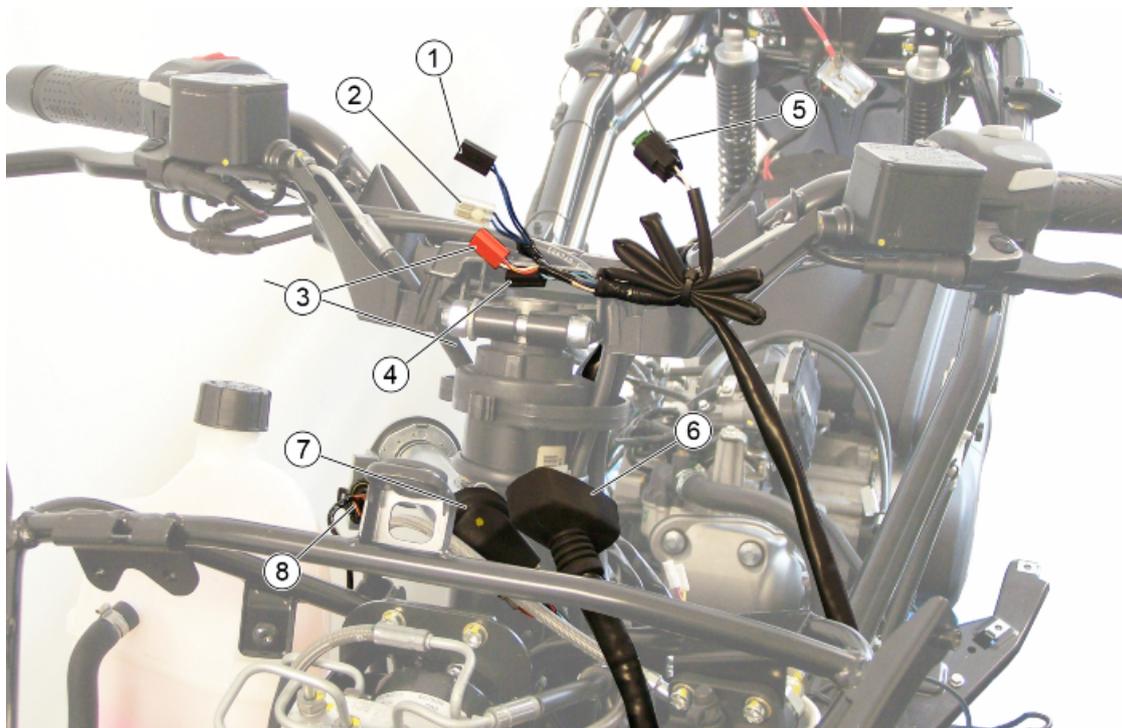
**A. Situato sulla parte sinistra del telaio, sotto la pedana appoggiapiedi** - per accedervi rimuovere la fiancata laterale sinistra.

**B. Situato sul motore nella parte sinistra del veicolo** - per accedervi rimuovere la fiancata laterale sinistra.

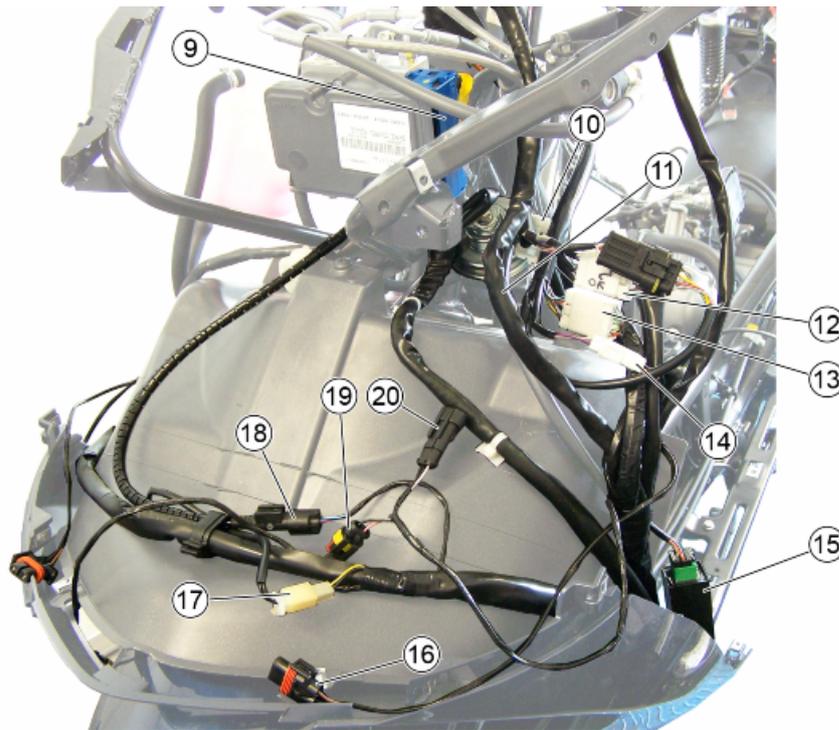


**C. Situato sul telaio nella parte destra del veicolo** - per accedervi rimuovere il semi codone ed il gruppo ottico posteriore destro.

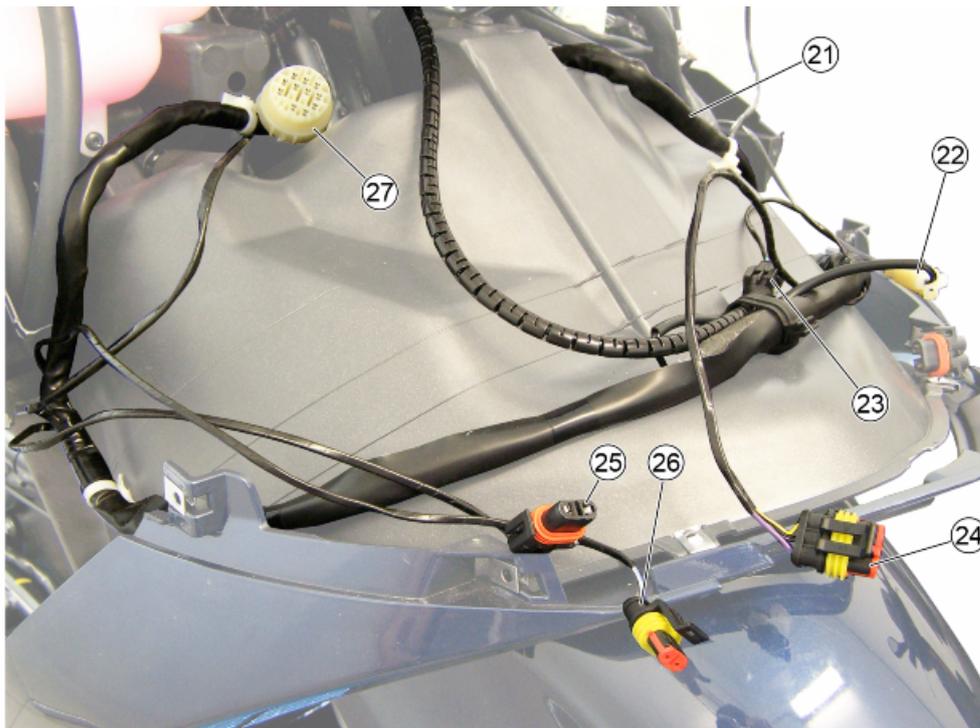
**Electrical system installation**

**Front side**

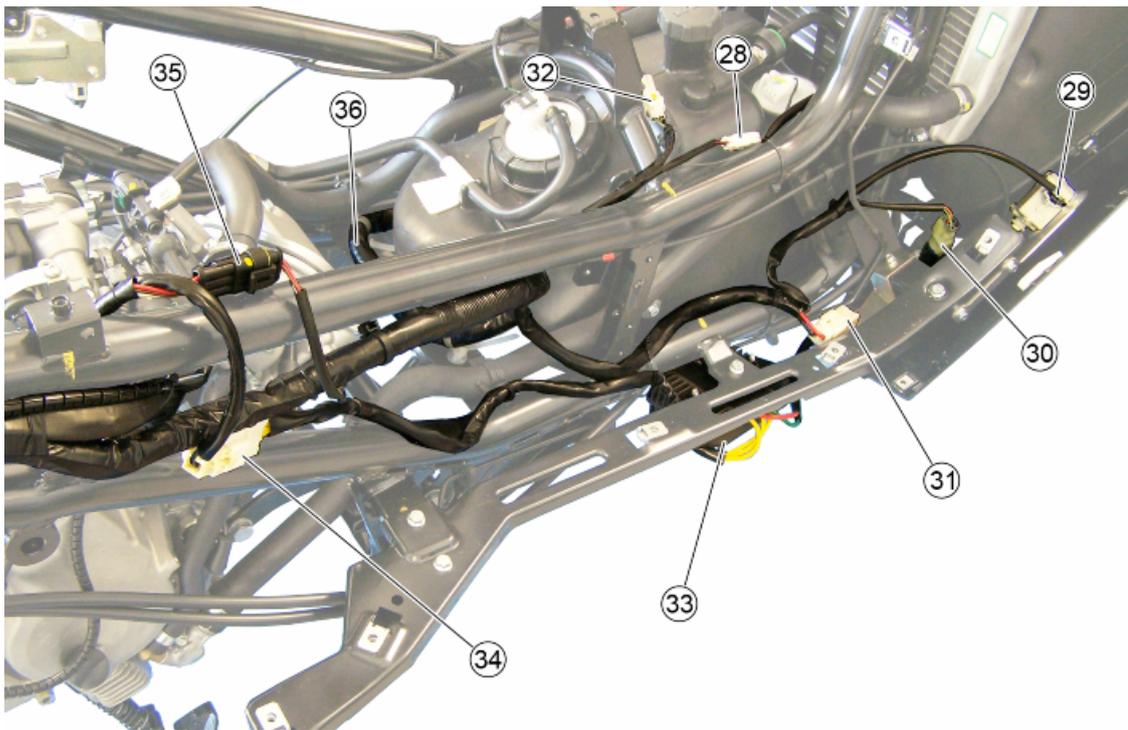
1. Fuel tank flap opening button connector
2. Emergency light button connector
3. Saddle opening switch connector
4. ASR Button connector
5. GPS navigator connection
6. Instrument panel connector
7. Key switch connector
8. Immobilizer antenna connector



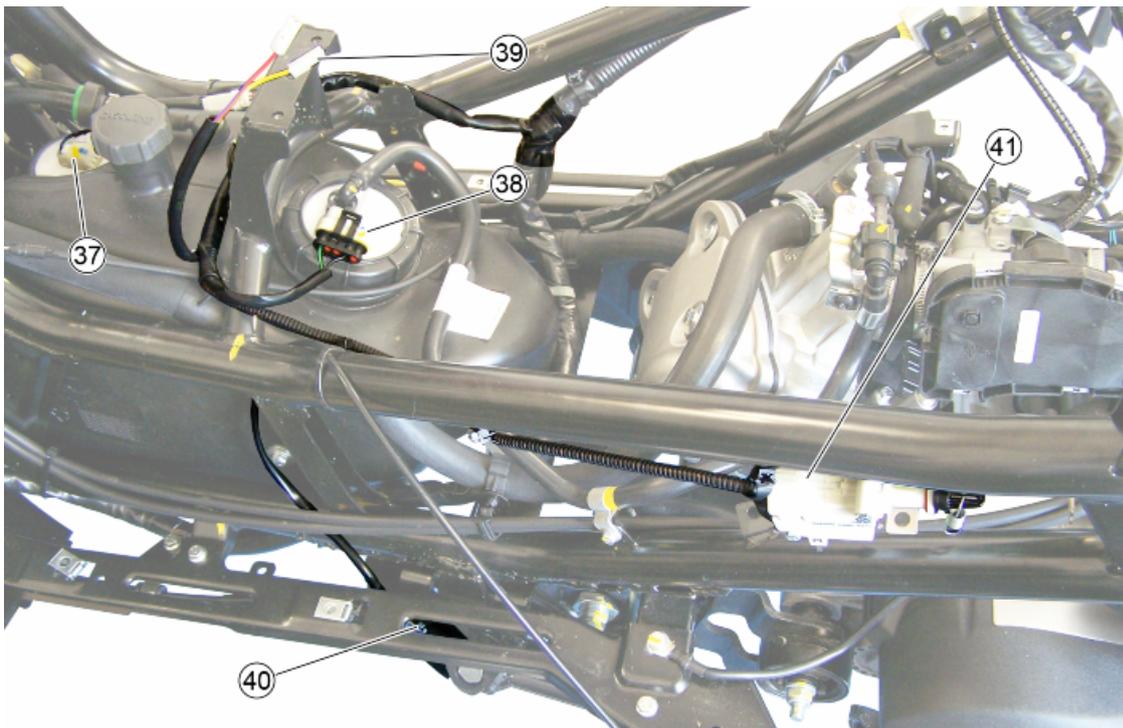
- 9. ABS control unit connector
- 10. Horn connections
- 11. Instrument panel connection branch
- 12. Controls device connection on left hand grip
- 13. Controls device connection on right hand grip
- 14. Stop buttons connector
- 15. Turn indicator control device
- 16. Left low beam headlight connector
- 17. Ambient temperature sensor connector
- 18. Front speed sensor connector
- 19. Front left turn indicator connector
- 20. Connection for USB socket



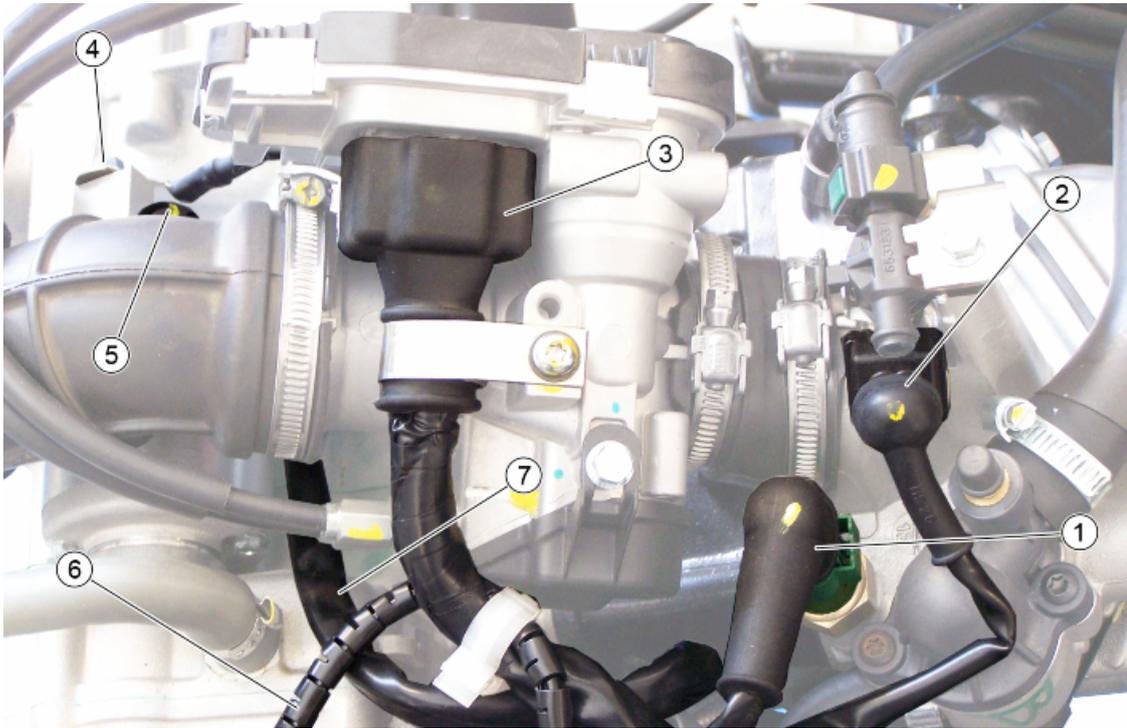
- 21. ABS control unit connection branch
- 22. Ambient temperature sensor connection
- 23. Front speed sensor connector
- 24. High-beam headlight and front daylight running light connector
- 25. Right low beam headlight connector
- 26. Front right turn indicator connector
- 27. Connector for pre-installation of accessories (or Blue Dash pre-installation)



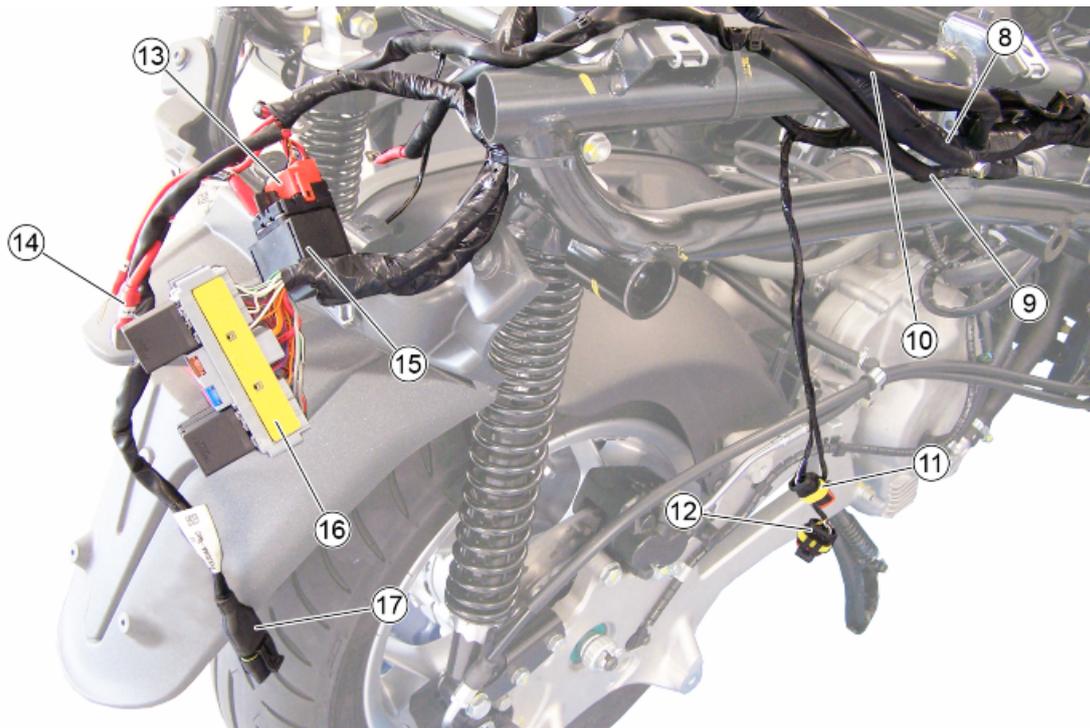
- 28. Radiator electric fan connector
- 29. Fuel door opening actuator connector
- 30. Anti-tipping sensor connector
- 31. Connection to the voltage regulator
- 32. Connection to side stand switch
- 33. Voltage regulator
- 34. Connection to the stator
- 35. Connector between engine speed sensor and oil pressure sensor
- 36. Branch connection to the controls on the handlebars, to the headlights and the front lights



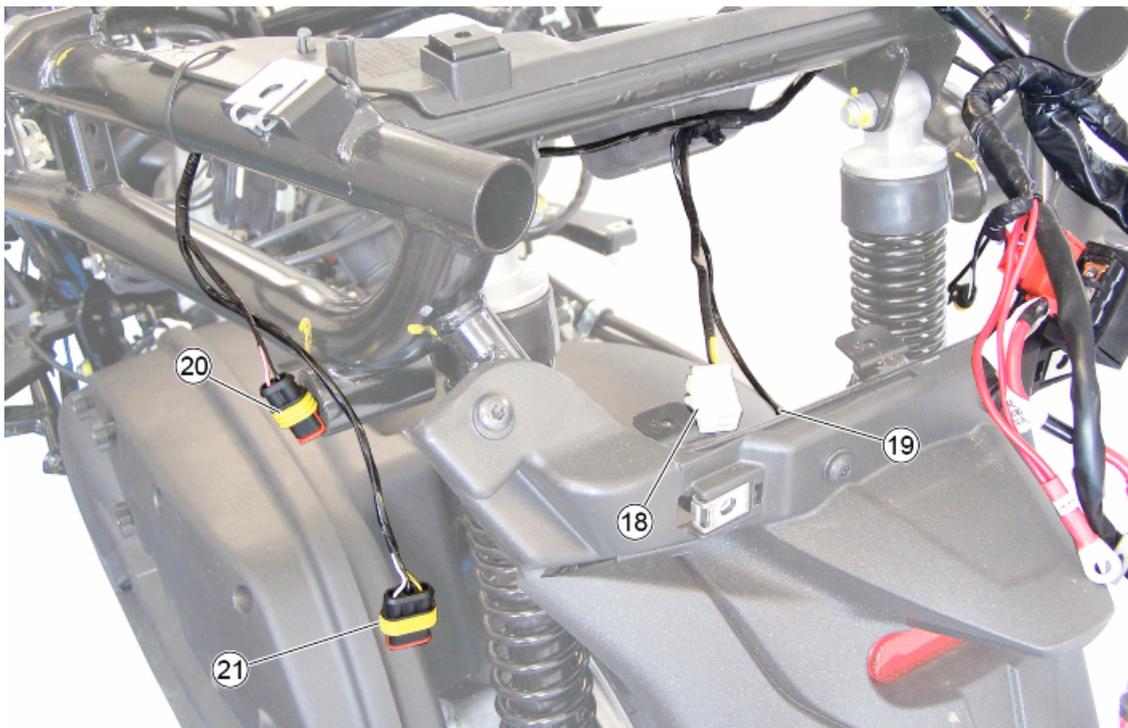
- 37. Fuel gauge connector
- 38. Fuel pump connector
- 39. Connections for the helmet compartment light switch
- 40. Side stand switch
- 41. Saddle opening actuator connector

**Back side**

1. Engine temperature sensor connector
2. Injector connector
3. Injection electronic control unit connection
4. Starter motor negative pole
5. Starter motor positive pole
6. To the connector of the speed sensor
7. Starter motor connection branch



- 8. Connection branch of connections of left rear side lights, license plate and helmet compartment lighting
- 9. Connection to chassis ground point
- 10. Positive pole connection cable between starter motor and starter solenoid
- 11. Rear right turn indicator connector
- 12. Right taillight connector
- 13. Start-up remote control switch connection
- 14. Positive battery connection
- 15. Start-up remote control switch
- 16. Fuse-box and relay
- 17. Diagnostic socket



**18.** Helmet compartment internal light connector

**19.** License plate light connector

**20.** Rear left turn indicator connector

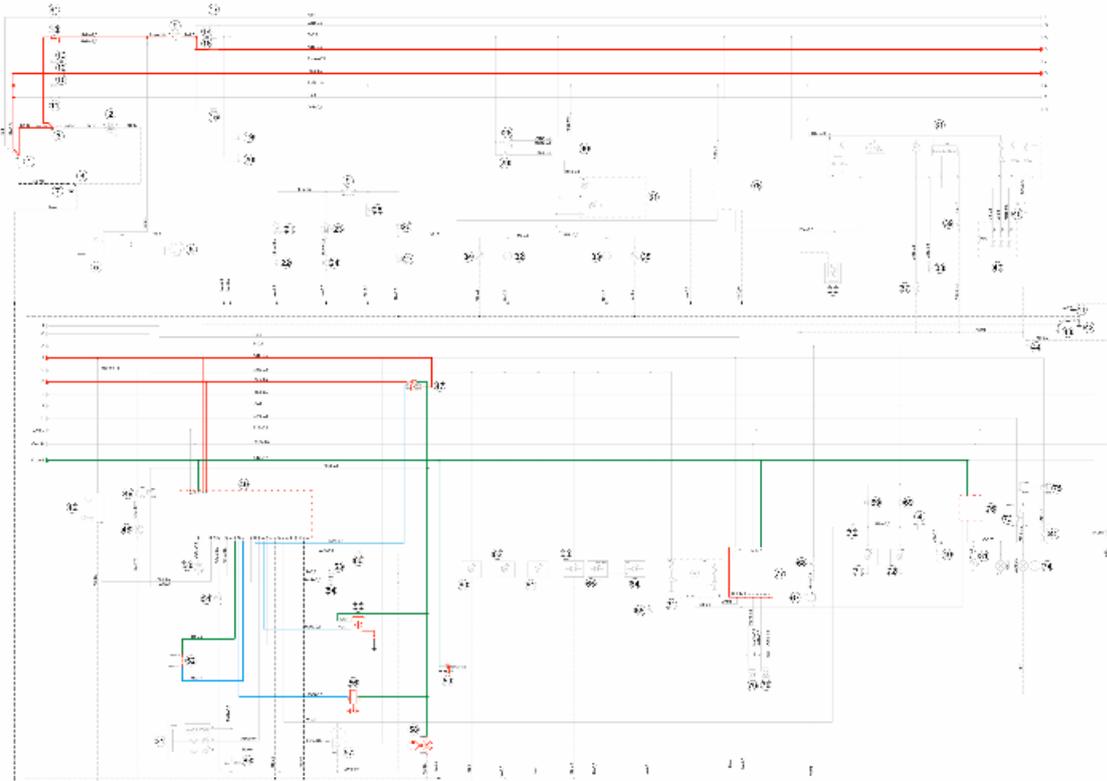
**21.** Rear left light connector

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## Conceptual diagrams

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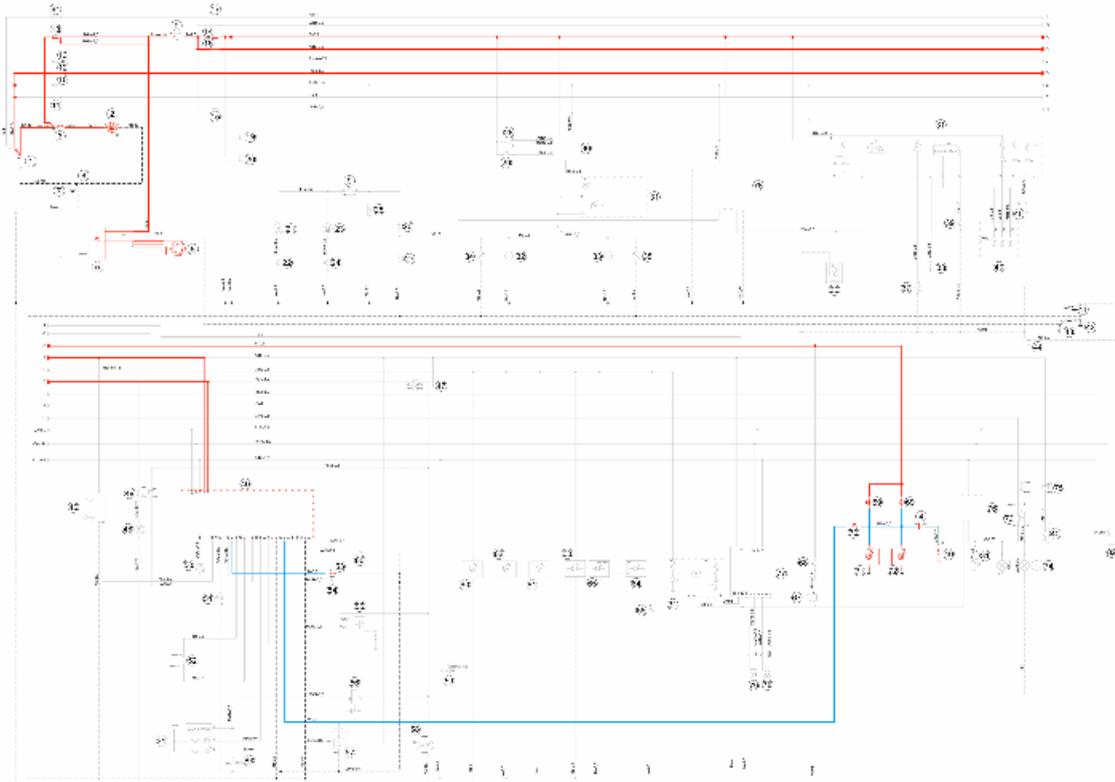
## Ignition



### KEY

- 1. 12v-10Ah battery
- 7. Chassis ground
- 9. Ignition switch
- 12. Fuse No. 3 - 7.5A
- 16. Fuse No. 7 - 5A
- 18. Fuse No. 9 - 30A
- 40. Injection electronic control unit
- 41. Front ground node
- 42. Rear ground node
- 43. Rear ground regulator
- 47. Injection relay
- 52. Engine speed sensor
- 55. H.V. coil
- 56. Fuel injector
- 58. Fuel pump
- 59. Diagnostics socket
- 76. Pre-installation of «Blue dash / anti-theft device»

## 77. ABS control unit

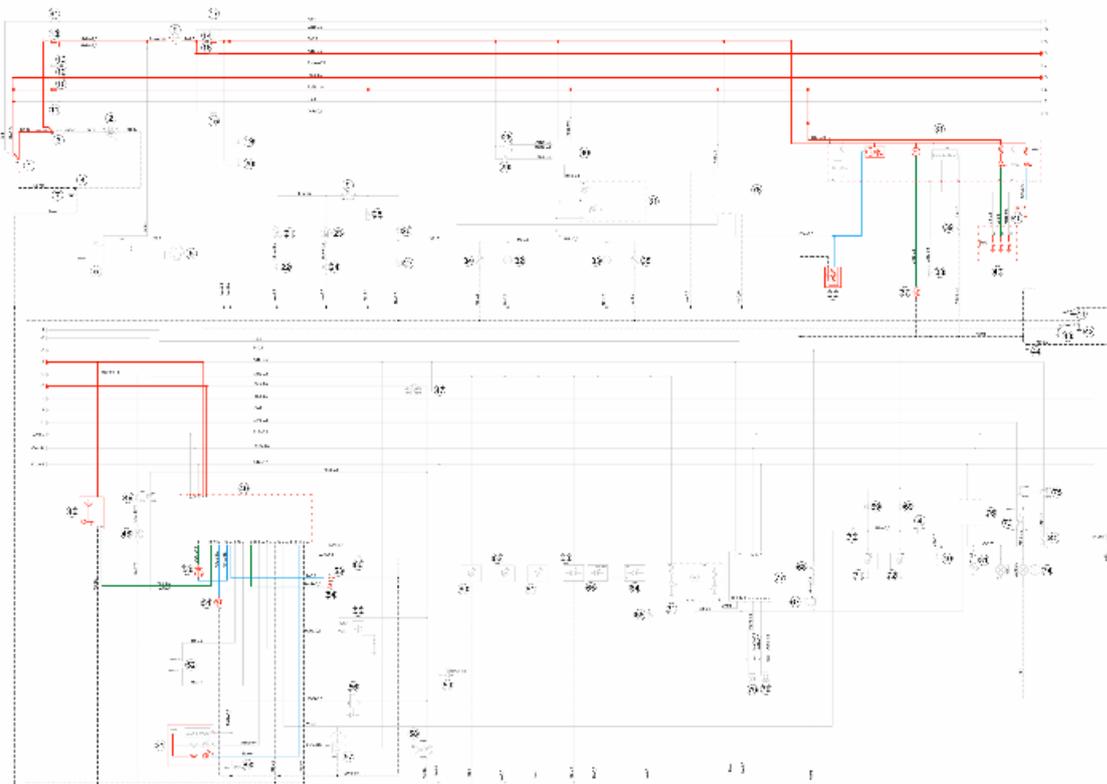
**Battery recharge and starting****KEY**

1. 12v-10Ah battery
2. Starter motor
3. Starter remote control contact
4. Starter solenoid coil
5. Regulator
6. Flywheel
7. Chassis ground
8. Chassis engine-ground
9. Ignition switch
12. Fuse No. 3 - 7.5A
14. Fuse No. 5 - 7.5A
16. Fuse No. 7 - 5A
18. Fuse No. 9 - 30A
40. Injection electronic control unit
41. Front ground node
42. Rear ground node

- 43. Rear ground regulator
- 53. Engine stop button
- 69. N.2 stop buttons
- 70. Engine starter button
- 71. Left stop light
- 72. Right stop light

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## Level indicators and enable signals section

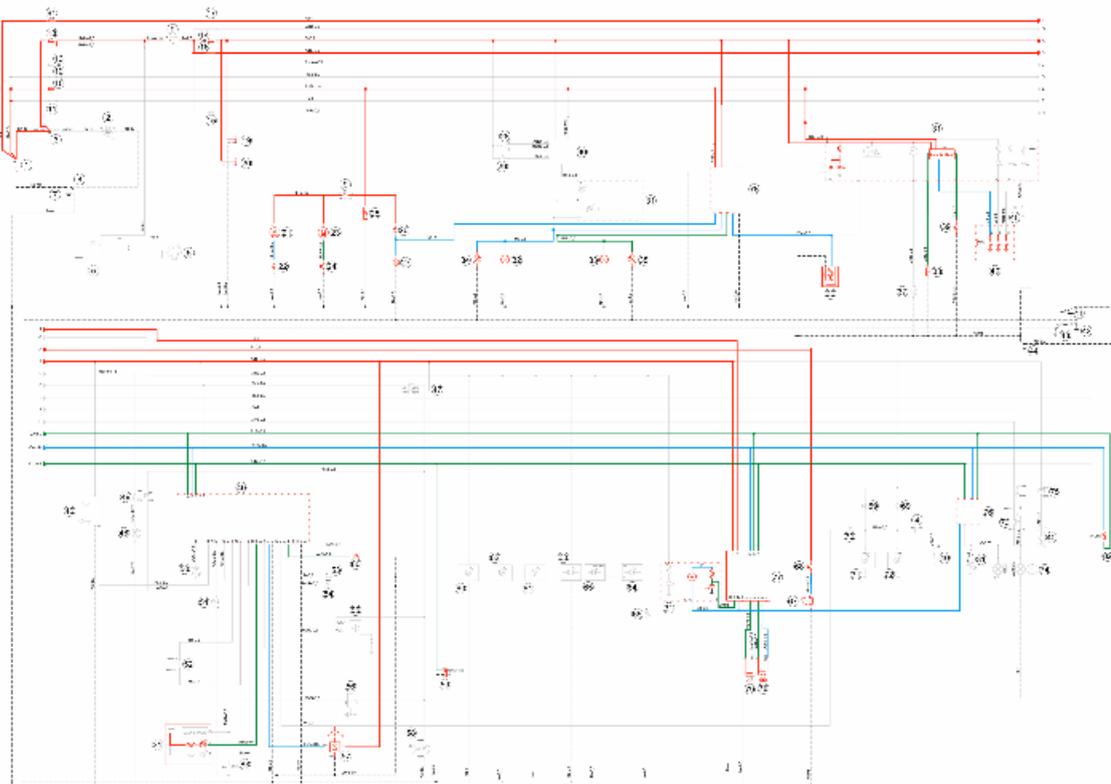


### KEY

- 1. 12v-10Ah battery
- 7. Chassis ground
- 9. Ignition switch
- 10. Fuse No. 1 - 15A
- 12. Fuse No. 3 - 7.5A
- 14. Fuse No. 5 - 7.5A
- 16. Fuse No. 7 - 5A
- 18. Fuse No. 9 - 30A
- 31. Instrument panel
- 36. Fuel gauge
- 37. Engine temperature sensor (instrument)

- 40. Injection electronic control unit
- 41. Front ground node
- 42. Rear ground node
- 43. Rear ground regulator
- 44. Instrument panel ground node
- 45. Oil pressure sensor
- 46. Immobilizer
- 50. Lambda probe
- 51. Engine temperature sensor (C.D.I.)
- 53. Engine stop button
- 54. Stand button

## Devices and accessories

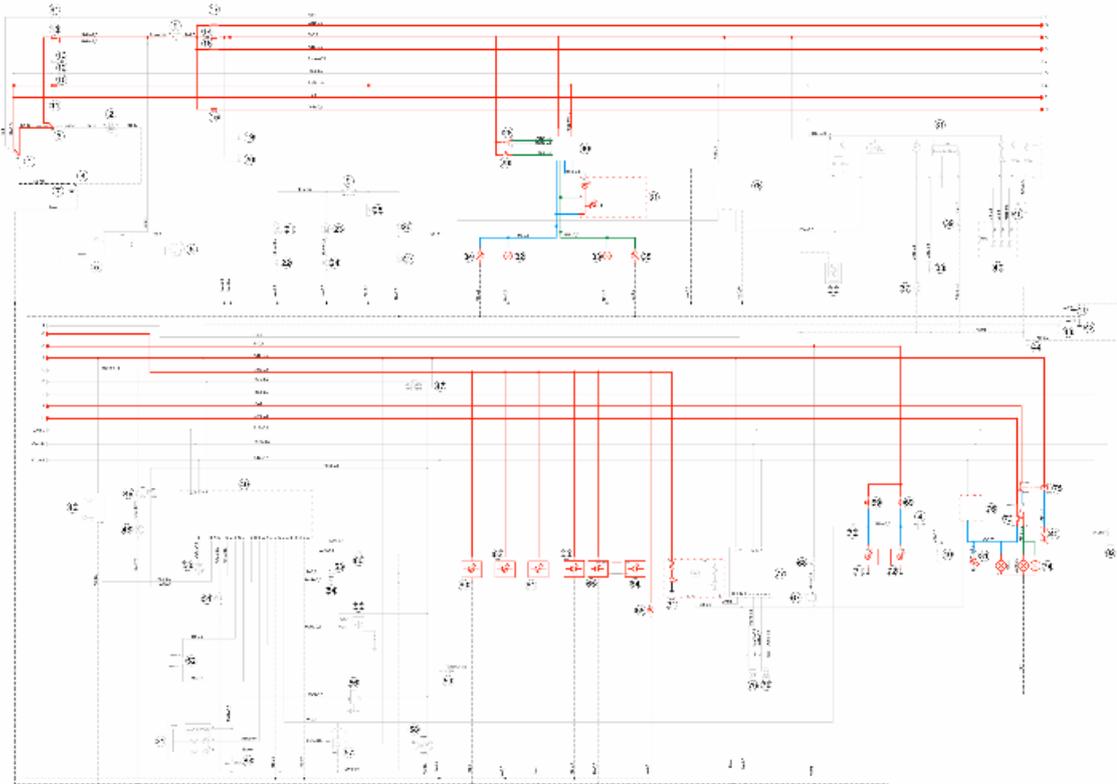


### KEY

- 1. 12v-10Ah battery
- 7. Chassis ground
- 9. Ignition switch
- 10. Fuse No. 1 - 15A
- 14. Fuse No. 5 - 7.5A
- 16. Fuse No. 7 - 5A

- 18. Fuse No. 9 - 30A
  - 19. USB socket
  - 20. Preinstallation for satellite navigation system
  - 21. Fuel tank flap actuator
  - 22. Fuel tank flap button
  - 23. Saddle actuator
  - 24. Saddle button
  - 25. LV socket
  - 26. Helmet compartment light switch
  - 27. 12v-5w light unit bulb
  - 31. Instrument panel
  - 32. Front left turn indicator
  - 33. Front right turn indicator
  - 34. Rear left turn indicator
  - 35. Rear right turn indicator
  - 36. Fuel gauge
  - 38. Ambient temperature sensor
  - 39. "Mode" button
  - 40. Injection electronic control unit
  - 41. Front ground node
  - 42. Rear ground node
  - 43. Rear ground regulator
  - 44. Instrument panel ground node
  - 57. Anti-tipping sensor
  - 59. Diagnostics socket
  - 67. Horn
  - 68. Horn button
  - 76. Pre-installation of "blue dash / anti-theft device"
  - 77. ABS control unit
  - 78. Front speed sensor
  - 79. Rear speed sensor
  - 80. ASR Button
  - 81. Fuse No. 10 - 40A
  - 82. CAN line termination resistance
-

## Lights and turn indicators

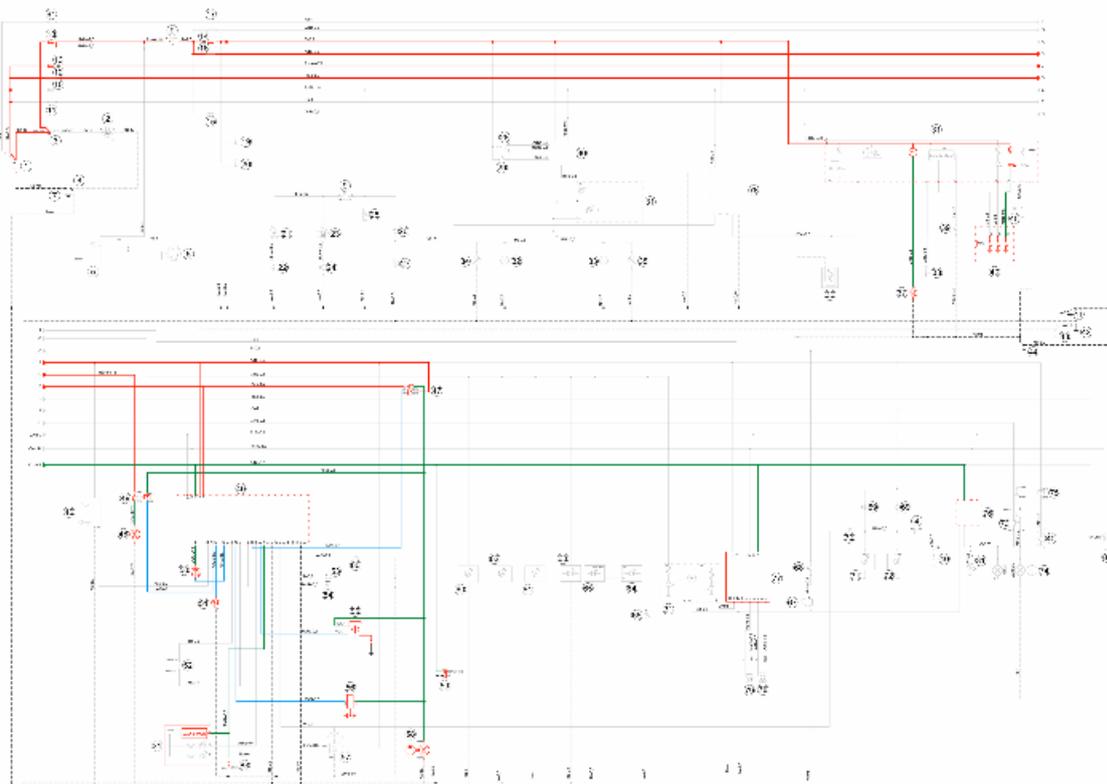


### KEY

- 1. 12v-10Ah battery
- 7. Chassis ground
- 9. Ignition switch
- 10. Fuse No. 1 - 15A
- 11. Fuse No. 2 - 10A
- 14. Fuse No. 5 - 7.5A
- 15. Fuses No. 6 - 7.5A
- 16. Fuse No. 7 - 5A
- 17. Fuse No. 8 - 3A
- 18. Fuse No. 9 - 30A
- 28. Turn indicator control
- 29. Emergency light bulb button
- 30. Turn indicators control device
- 31. Instrument panel
- 32. Front left turn indicator
- 33. Front right turn indicator
- 34. Rear left turn indicator

35. Rear right turn indicator
41. Front ground node
42. Rear ground node
59. Diagnostics socket
60. Left front daylight running light
61. Right front daylight running light
62. Left rear tail light bulb
63. Right rear tail light bulb
64. Left side control lighting
65. Right side control lighting
66. License plate light bulb 12V-5W
69. N.2 stop buttons
70. Engine starter button
71. Left stop light
72. Right stop light
73. Light switch
74. Headlight
75. Headlight relay
76. Pre-installation of «blue dash / anti-theft device»

### Injection



**KEY**

- 1. 12v-10Ah battery
- 7. Chassis ground
- 9. Ignition switch
- 12. Fuse No. 3 - 7.5A
- 13. Fuse No. 4 - 7.5A
- 14. Fuse No. 5 - 7.5A
- 16. Fuse No. 7 - 5A
- 18. Fuse No. 9 - 30A
- 31. Instrument panel
- 37. Engine temperature sensor (instrument)
- 40. Injection electronic control unit
- 41. Front ground node
- 42. Rear ground node
- 44. Instrument panel ground node
- 47. Injection relay
- 48. Radiator electric fan
- 49. Radiator electric fan solenoid
- 50. Lambda probe
- 51. Engine temperature sensor (C.D.I.)
- 55. H.V. coil
- 56. Fuel injector
- 58. Fuel pump
- 59. Diagnostics socket
- 76. Pre-installation of «Blue dash / anti-theft device»
- 77. ABS control unit
- 83. «ECO» mode switch

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**Checks and inspections**

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

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**Immobiliser**

The electronic ignition system is controlled by the control unit with the integrated Immobilizer system. The 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:

- an electronic control unit

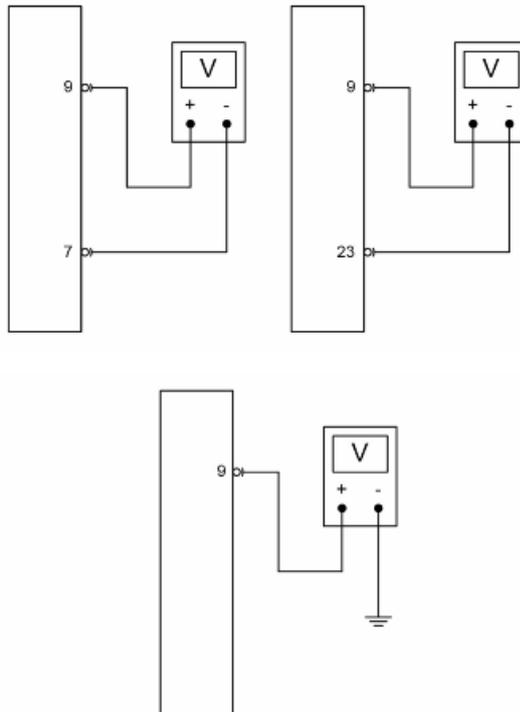
- immobilizer aerial
- master key with built-in transponder
- service key with built-in transponder
- diagnosis LED

The diagnosis LED also works as a theft-deterrent blinker. This function is activated every time the key switch is set to «OFF» or the engine emergency cut-off switch is set to «OFF». It remains activated for 48 hours in order not to affect the battery charge. When the ignition switch is turned to «ON», the deterring blinker function is deactivated. Subsequently, a flash confirms the switching to «ON». The duration of the flash depends on the programming of the electronic control unit. If the LED is off regardless of the position of the ignition switch and/or the instrument panel is not initiated, check if:

- there is battery voltage
- fuses 1, 3, 7, 9 are in working order
- there is power to the control unit as specified below:

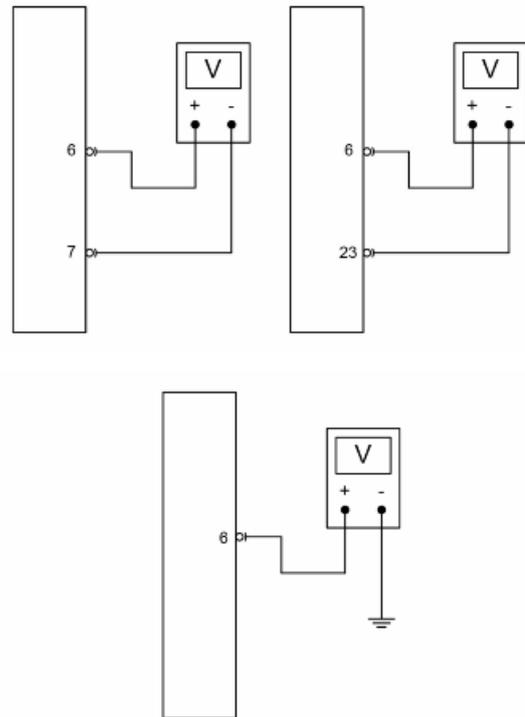
**With the key switch set to OFF:**

- if there is battery voltage between terminals 9-7, 9-23 and terminal 9-chassis ground (fixed power supply). If there is no voltage check that fuse 3 and its cable are in working order.

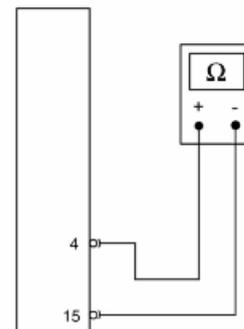


**With the key switch in the ON position:**

if there is battery voltage between terminals 6-7, 6-23 and terminal 6-chassis ground (fixed power supply). If there is no voltage, check the key switch contacts, and that fuses no. 7 and 9 and their cable harnesses are in working order.



- Continuity tests between terminals 4 and 15 with the emergency switch set to «RUN». If there is no continuity check the contacts of the switch.



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

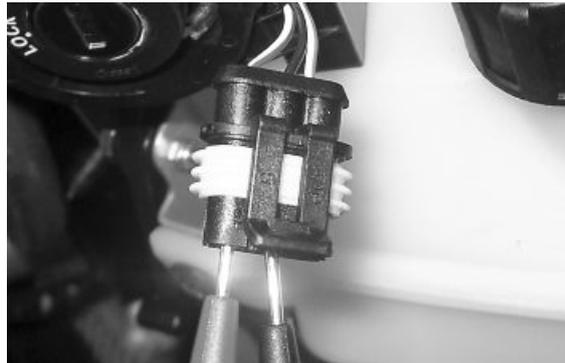


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Remove the protective base from the connector.



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



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

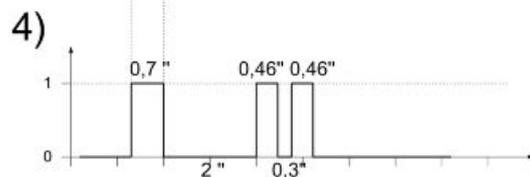
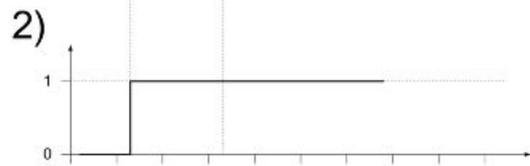
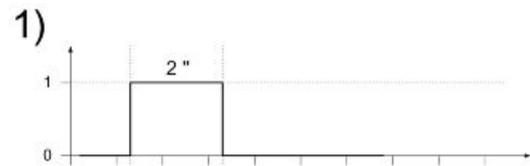
**1. Previously unused control unit - key inserted:** a single 2 second flash is displayed, after which the LED remains off permanently. The keys can be stored to memory, the vehicle can be started but with a limitation imposed on the number of revs.

**2. Previously unused control unit - transponder absent or cannot be used:** The LED is permanently ON; in this condition, no operations are possible, not even starting the vehicle.

**3. Programmed control unit - service key inserted (normal conditions of use):** a single 0.7 second flash is displayed, after which the LED remains off permanently. The engine can be started.

**4. Programmed control unit - Master key inserted:** 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.

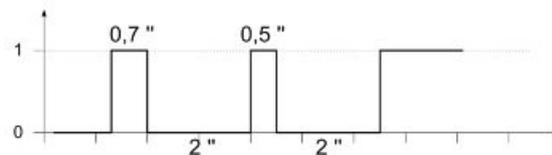
**5. Programmed control unit - fault detected:** a light code is displayed according to the fault detected, after which the LED remains on permanently. The engine cannot be started. The codes that can be transmitted are:



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

### Diagnostic code - 1 flash

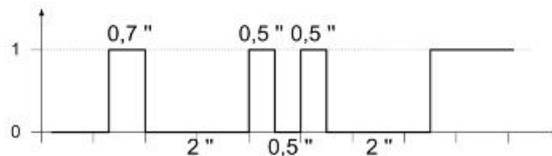
A one-flash code indicates a system where the serial line is not present or is not detected. Check the Immobilizer aerial wiring and change it if necessary.



### Diagnostic code - 2 flashes

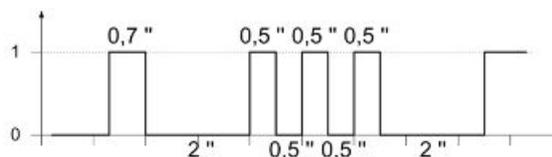
A two-flash code shows a system where the control unit does not show the transponder signal. This might depend on the inefficiency of the immobiliser aerial or the transponder.

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



### Diagnostic code - 3 flashes

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



## Ignition circuit

### No spark plug

#### WARNING

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

#### HV coil primary resistance value:

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

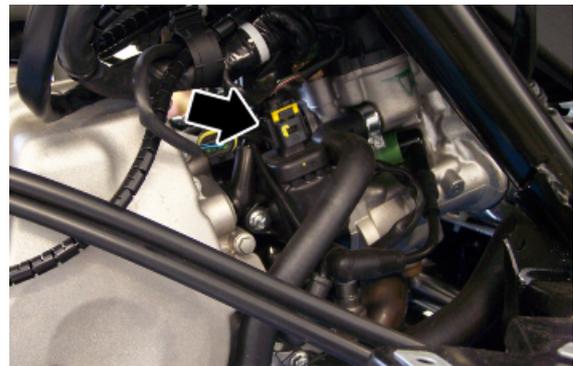
#### Characteristic

#### HV coil resistance primary value:

~ 670 mΩ ± 10%

#### Spark plug cable resistance value

~ 5 kΩ



### Battery recharge circuit

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

The generator is directly connected to the voltage regulator.

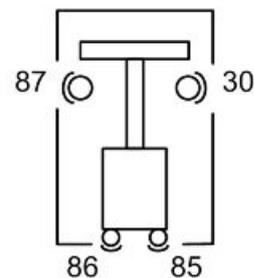
This, in its turn, is connected directly to the ground and the battery positive terminal passing through the 30A protective fuse.

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

### Remote controls check

To check the operation of a solenoid:

- 1) Check that, given regular conditions, there is no continuity between terminals 87 and 30.
- 2) Apply a 12V voltage to power terminals 86 and 85 of the solenoid.
- 3) With the solenoid fed, check that there is continuity between terminals 87 and 30.
- 4) If these conditions are not met, the solenoid is surely damaged and, therefore, it should be replaced.



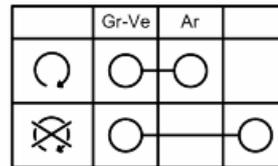
### Switches check

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

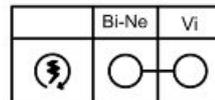
**KEY**

**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

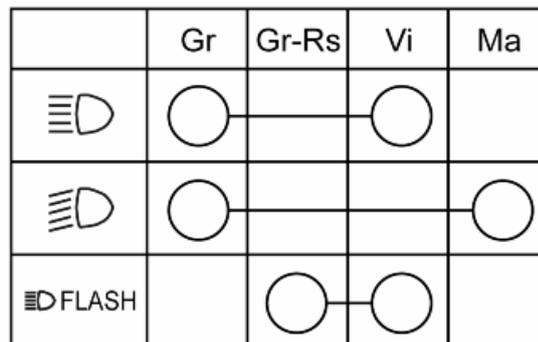
**ENGINE STOP SWITCH**



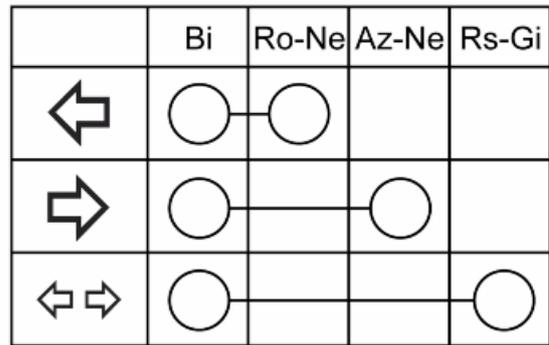
**STARTER BUTTON**



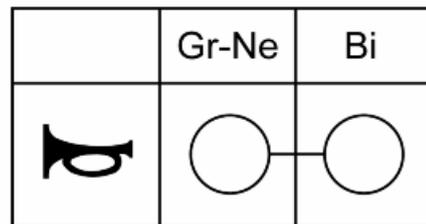
**Light switch**



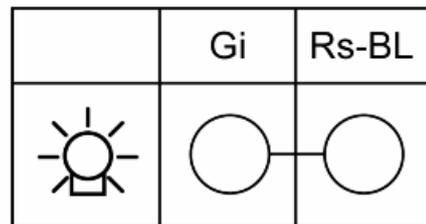
Turn indicator switch



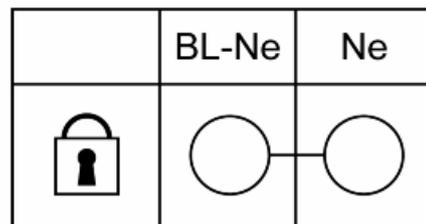
Horn button



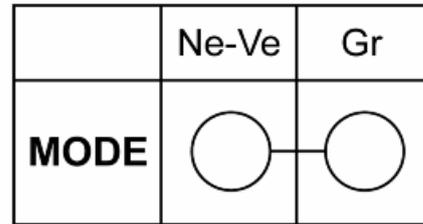
HELMET COMPARTMENT LIGHT SWITCH



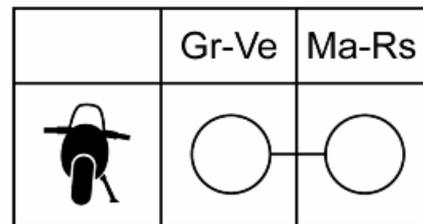
SADDLE OPENING SWITCH



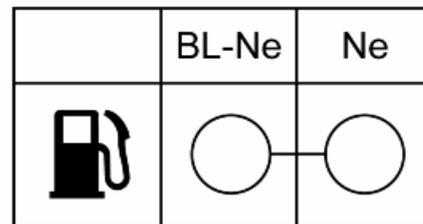
**MODE BUTTON**



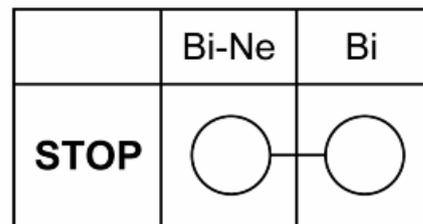
**STAND BUTTON**



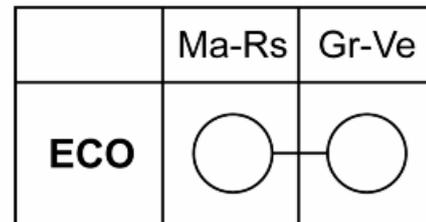
**FUEL TANK FLAP BUTTON**



**STOP BUTTONS**



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**ECO SWITCH**

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**ASR BUTTON**

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**Stator check****Checking the stator windings****WARNING****THIS CHECK-UP CAN BE MADE WITH THE STATOR PROPERLY INSTALLED.**

- 1) Remove the right side panel.
- 2) Disconnect the connector between stator and regulator with the three yellow cables as shown in the picture.
- 3) Measure the resistance between each of the yellow terminals and the other two.
- 4) Check that there is insulation between the each yellow cable and the ground.

**Electric characteristic****Resistance:**0.2 - 1  $\Omega$

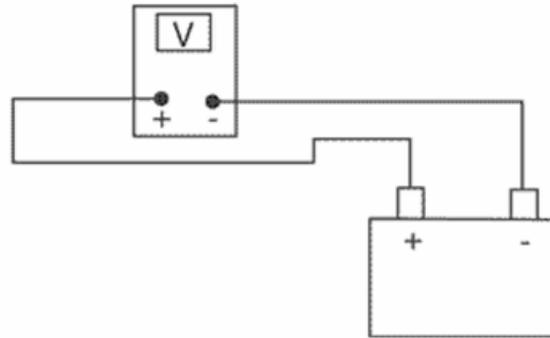
## Voltage regulator check

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

Voltage should not exceed 15 Volt.

In case higher voltages are detected, replace the regulator.

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



### Electric characteristic

#### Control voltage

14÷15 V to 1500÷12000 rpm

## Recharge system voltage check

### Look for any leakage

- 1) Access the battery by removing its cover under the saddle.
- 2) Check that the battery does not show signs of losing fluid before checking the output voltage.
- 3) Turn the ignition key to «OFF», connect the multimeter leads between the battery negative pole (-) and the Black cable. Only then disconnect the Black cable from the battery negative pole (-).
- 4) With the ignition key always «OFF», the reading indicated by the ammeter must be must be  $\leq 0.5$  mA.

### Charging current check

#### WARNING

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

- 1) Place the vehicle on its centre stand
- 2) With the battery correctly connected to the circuit, place the multimeter leads between the battery terminals..
- 3) Turn on the engine, increase the engine rpm and, at the same time, measure the voltage.

### Electric characteristic

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

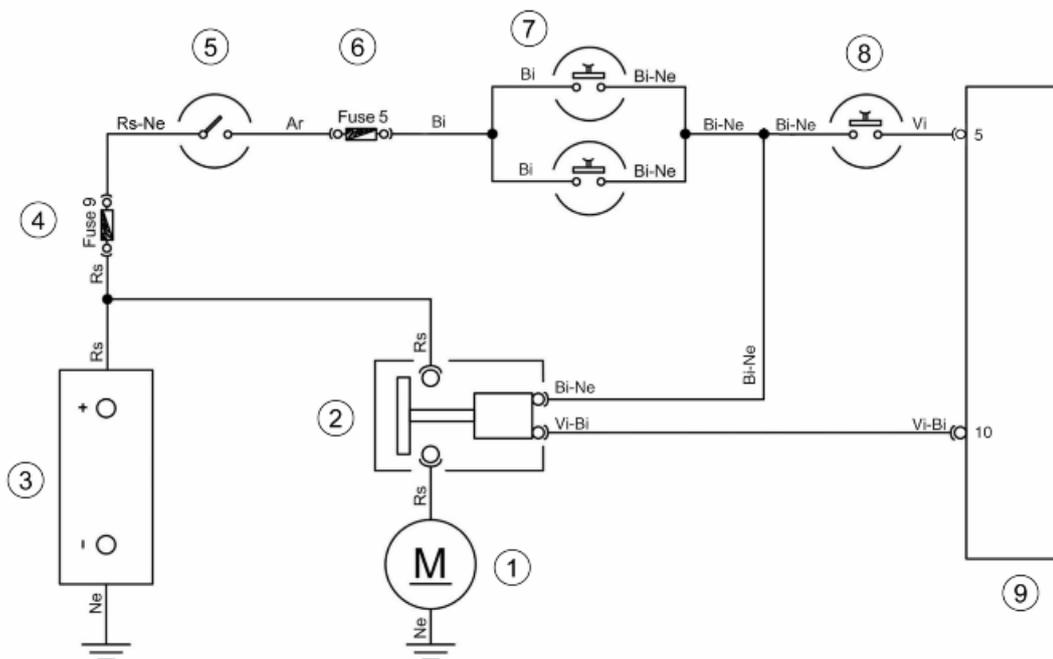
#### Maximum current output check.

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

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

**VOLTAGE REGULATOR/RECTIFIER**

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

**Starter motor****KEY**

1. Starter motor
2. Starter solenoid
3. Battery
4. Fuse No. 9
5. Ignition key contacts
6. Fuse No. 5
7. Stop buttons
8. Starter button
9. Injection ECU

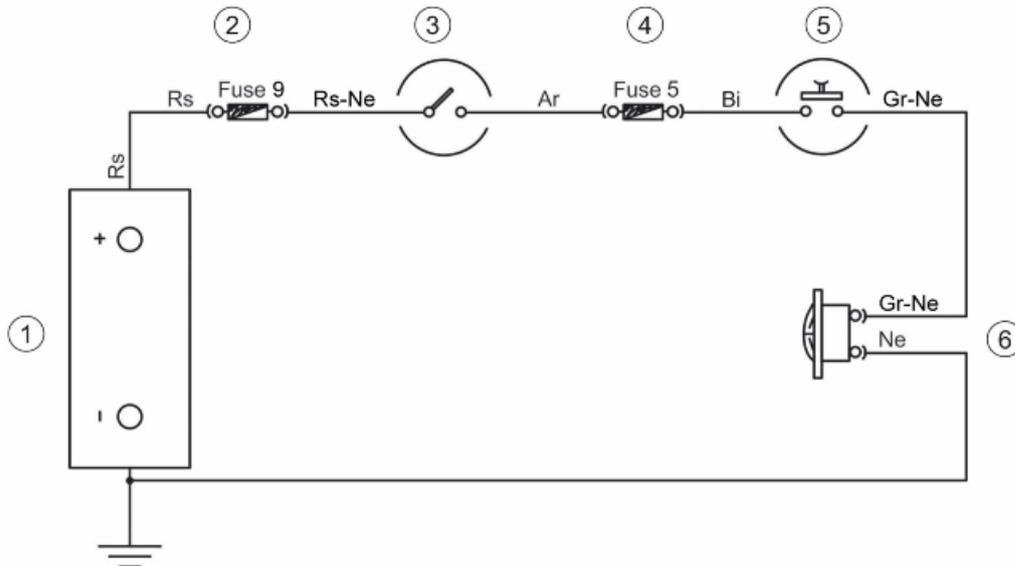
**WARNING**

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

- 1) Check if there is continuity of the Red cable connecting the battery, the start-up solenoid and the starter motor.
- 2) Check fuses No. 9 and 5, the ignition key contacts, the stop buttons and the starter button.
- 3) Check the start-up solenoid.
- 4) If components are in good condition, check that the cable harness connecting them is not interrupted.

5) Check if there is continuity of the Purple-White cable between the start-up relay and the control unit connector.

## Horn control



### KEY

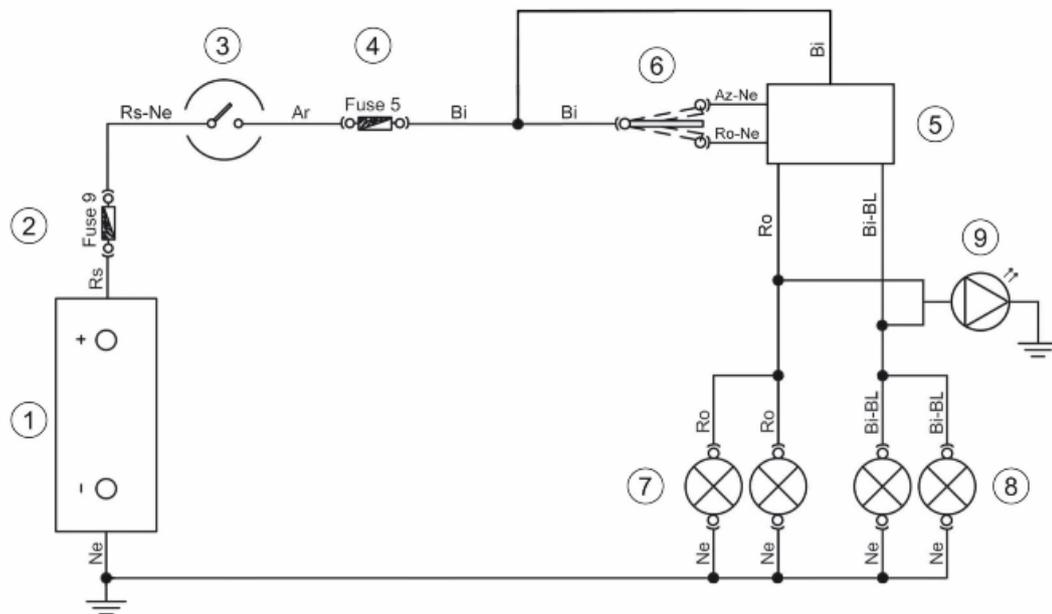
1. Battery
2. Fuse No. 9
3. Ignition switch contacts
4. Fuse No. 5
5. Horn button
6. Horn

### WARNING

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

- 1) Check fuses No. 9 and 5, the ignition key contacts and the horn button.
- 2) If the components are not damaged, check wiring for continuity.
- 3) Check that the Grey-Black cable between the horn and horn button is not interrupted.
- 4) Check that the Black cable of the horn is grounded.

## Turn signals system check

**KEY**

1. Battery
2. Fuse No. 9
3. Ignition switch contacts
4. Fuse No. 5
5. Turn indicators control device
6. Turn indicator control
7. LH indicators
8. RH indicators
9. Turn indicator warning light bulb

**WARNING**

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

- 1) Check the working order of bulbs.
- 2) Check fuses No. 9 and 5 and the ignition key contacts.
- 3) Check for voltage between the White cable of the turn indicators and ground command device.
- 4) If there is no voltage, check that the cable harness is not interrupted.
- 5) Check the turn indicator control.
- 6) Check that the Blue-Black and Pink-Black cables between the control and turn indicator device is not interrupted.
- 7) Check that the Pink and White-Blue cables connecting the bulbs and the turn indicator device are not interrupted.

8) Check the bulbs ground connection.

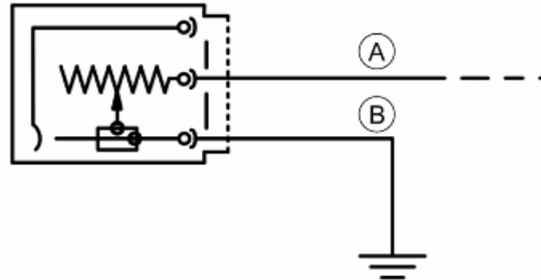
## level indicators

**WARNING**

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

If faults are detected:

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



**COMPONENT CABLE KEY:**

- A - White-green cable
- B - Black ground cable

**Electric characteristic**

**Resistance value when the tank is full**

$\leq 7 \Omega$

**Resistance value when the tank is empty**

$90 + 13/-3 \Omega$

## Lights list

**BULBS**

	Specification	Desc./Quantity
1	Low beam light bulb	Type: Halogen H7 Quantity: 1 Right - 1 Left Power: 12V - 55W
2	High beam light bulb	Type: Halogen H7 Quantity: 1 Power: 12V - 55W
3	Front tail light bulb	Type: LED Quantity: 1 Power: -
4	Turn indicator bulb	Type: Spherical BAU 15s Quantity: 1 Right - 1 Left (front); 1 Right - 1 Left (rear) Power: 12V - 10W
5	Stop light/rear daylight running light bulb	Type: LED Quantity: 1 Right - 1 Left Power: -
6	License plate light bulb	Type: All glass W5W Quantity: 1 Power: 12V - 5W
7	Helmet compartment light bulb	Type: Cylindrical C5W Quantity: 1

Specification		Desc./Quantity
8	Instrument panel lighting bulb	Power: 12V - 5W Type: LED Quantity: 10 Power: -
9	Lighting bulb switches	Type: LED Quantity: 2 Power: -

### Line for daylight running lights and instrument panel lighting line

In the event of a malfunction, check:

- Efficiency of the bulbs
- Fuses No. 7, 8 and 9
- Ignition key contacts
- Cable harness continuity

### High beam/low beam light line

In the event of a malfunction, check:

- Efficiency of the bulbs
- Light switch
- Headlight from solenoid
- Fuses No. 2, 6 and 9
- Ignition key contacts
- Cable harness continuity

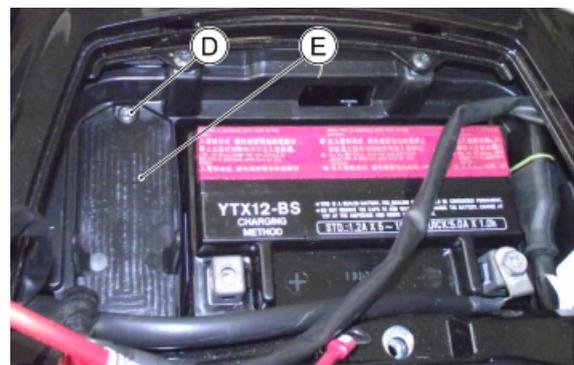
## Fuses

The electrical system is equipped with:

- a 30A main fuse installed on the starter relay;
- a 40A secondary fuse installed on the left hand side of the battery;
- 8 protection fuses situated under the starter relay and to the right of the battery;
- a 30A auxiliary fuse situated next to the starter relay;

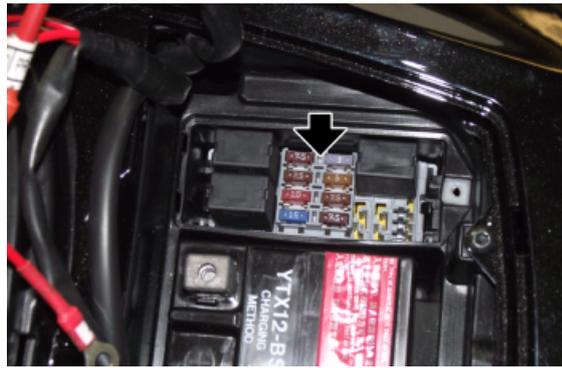
To reach them:

- rest the vehicle on its centre stand;
- open the saddle as described above;
- undo the screw «A» and remove the battery retainer bracket «B»;
- lift and remove the starter relay «C»;



- undo the screw «D» and remove the cover of the fuse-box «E».

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



**CAUTION**

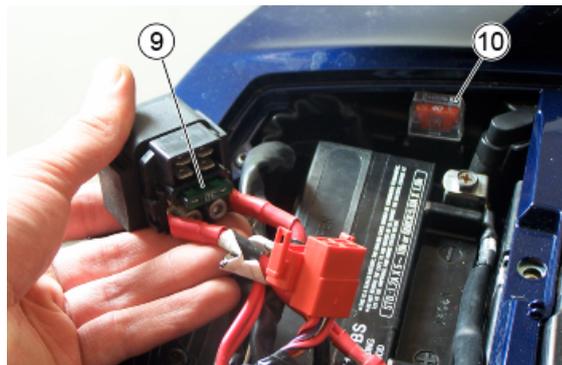
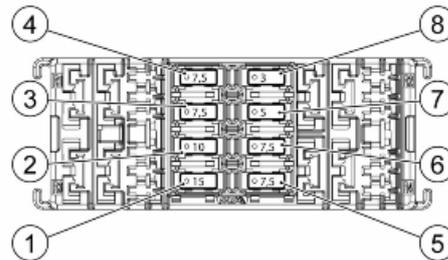


**BEFORE REPLACING A BLOWN FUSE, FIND AND SOLVE THE FAILURE THAT CAUSED IT TO BLOW. NEVER TRY TO REPLACE THE FUSE WITH ANY OTHER MATERIAL (E.G., A PIECE OF ELECTRIC WIRE).**

**CAUTION**



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

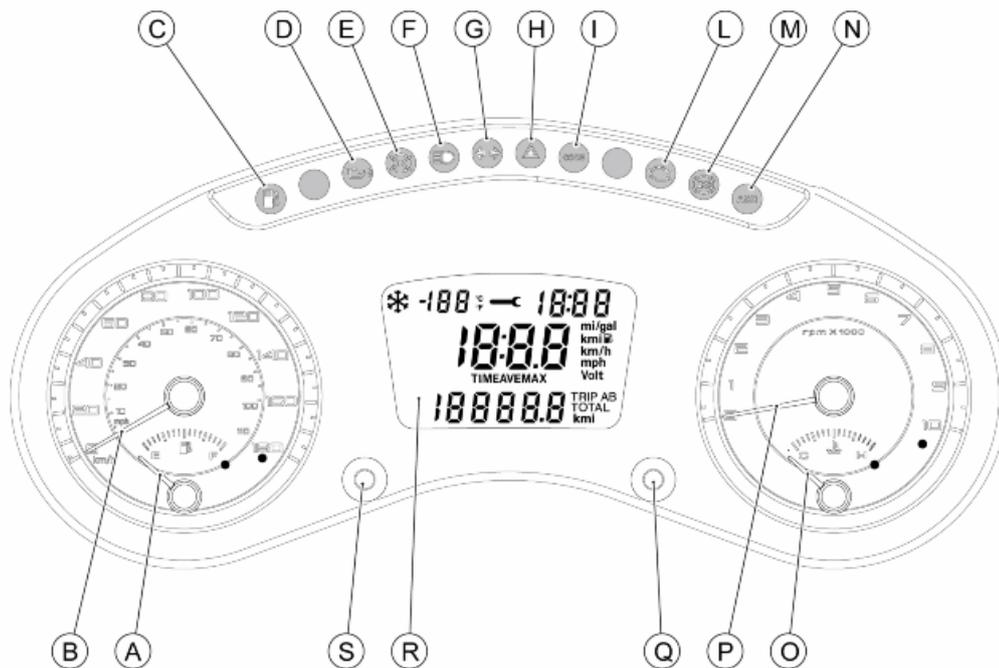


**FUSES**

Specification	Desc./Quantity
Fuse No. 1	<b>Capacity:</b> 15 A <b>Protected circuits:</b> LV socket, helmet compartment lighting button, actuators and buttons for the fuel door and saddle release (live), turn indicators control device, instrument panel, antitheft-device pre-installation.
Fuse No. 2	<b>Capacity:</b> 10A <b>Protected circuits:</b> Light solenoid, light switch.
Fuse No. 3	<b>Capacity:</b> 7.5 A <b>Protected circuits:</b> control unit, injection load relay.
Fuse No. 4	<b>Capacity:</b> 7.5 A <b>Protected circuits:</b> Electric fan relay.
Fuse No. 5	<b>Capacity:</b> 7.5 A <b>Protected circuits (live):</b> Turn indicators control device, instrument panel, antitheft-device pre-installation, horn, stop buttons.
Fuse No. 6	<b>Capacity:</b> 7.5 A <b>Protected circuits (live):</b> Light switch.
Fuse No. 7	<b>Capacity:</b> 5A <b>Protected circuits (live):</b> Control unit, ABS control unit, immobilizer antenna, anti-tipping sensor, injection load solenoid, Light solenoid.

Specification	Desc./Quantity
Fuse No. 8	<b>Capacity: 3A</b> <b>Protected circuits (live):</b> Daylight running light, license plate light, control lighting, instrument lighting.
Fuse No. 9	<b>Capacity: 30 A</b> <b>Protected circuits:</b> Recharge, fuses No. 5, No. 6, No. 7 and No. 8 (live).
Fuse No. 10	<b>Capacity: 40A</b> <b>Protected circuits:</b> ABS ECU (power circuit).

**Dashboard**



- A - Fuel gauge
- B - Speedometer
- C - Fuel reserve warning light
- D - Insufficient oil pressure warning light
- E - Engine not startable warning light
- F - Low beam warning light
- G - Turn indicator warning light
- H - Hazard warning light
- I - Immobilizer LED
- L - Engine control telltale light and engine failure warning light
- M - ABS warning light
- N - ASR warning light
- O - Coolant temperature indicator
- P - Engine rpm indicator
- Q - SET Button

- R - Digital display
- S - ODO/TRIP Button

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## 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

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## Battery installation

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

#### WARNING

**BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH YOUR EYES, SKIN AND CLOTHING. IF COMING INTO CONTACT WITH EYES OR SKIN, WASH ABUNDANTLY WITH WATER FOR APPROX. 15 MIN. AND SEEK IMMEDIATE MEDICAL ATTENTION.**

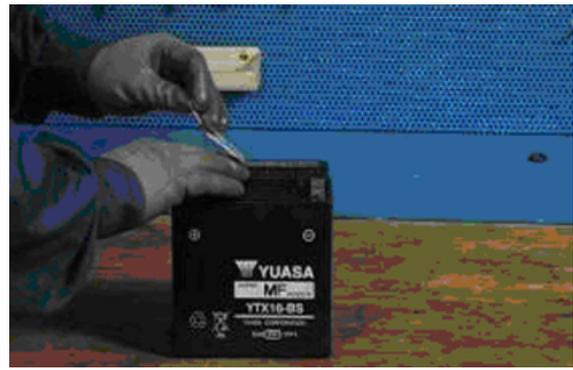
**IN THE EVENT OF ACCIDENTAL INGESTION OF THE LIQUID, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR MILK, MAGNESIUM MILK, BATTERED EGG OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.**

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

**ALWAYS WEAR EYE PROTECTION WHEN WORKING IN THE PROXIMITY OF BATTERIES. KEEP OUT OF THE REACH OF CHILDREN**

**1) Battery preparation**

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

**2) Electrolyte preparation.**

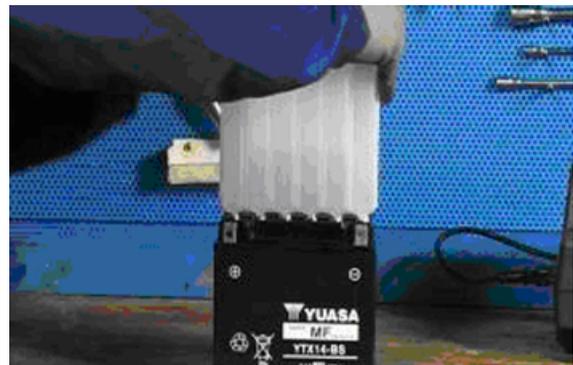
Remove the container of the electrolyte from the pack. Remove and preserve cover strips from the container, in fact, the strip will later be used as a closing cover.

**Note:** Do not pierce the sealing of the container or the container itself because inside there is 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

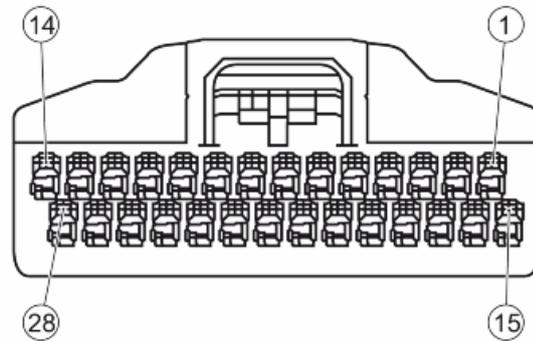


i - The battery is now completely activated, disconnect the battery charger from the fuel supply grid, disconnect the clamps from the battery and proceed to fitting the battery on the vehicle.

## Connectors

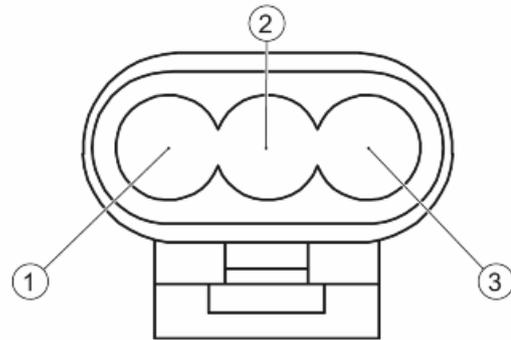
### INSTRUMENT PANEL CONNECTOR

1. Battery-powered (Red-Blue)
2. Live power supply (White)
3. Instrument panel ground (Black)
4. Speed sensor signal (Sky blue)
5. Not connected
6. Ambient temperature sensor (Yellow-Blue)
7. Signal for engine temperature indicator (Yellow-Pink)
8. Fuel level indicator (White - Green)
9. High-beam warning light (Violet)
10. Power supply for instrument panel lighting (Yellow-Black)
11. Left turn indicator warning light (Pink)
12. Right turn indicator warning light (White-Blue)
13. Emergency warning light (White-Black)
14. Oil pressure warning light (White-Purple)
15. Engine check warning light (Brown-White)
16. ABS Warning Light (Orange)
17. ABS Warning Light (Light blue-Red)
18. Parking brake warning light (Black)
19. Engine unable to start warning light (Blue)
20. Not connected
21. Rpm indicator signal (Green)
22. ECO switch (brown-red)
23. P.B. Mode (Grey)
24. Not connected
25. Not connected
26. Not connected
27. Not connected
28. Immobilizer LED (Yellow)

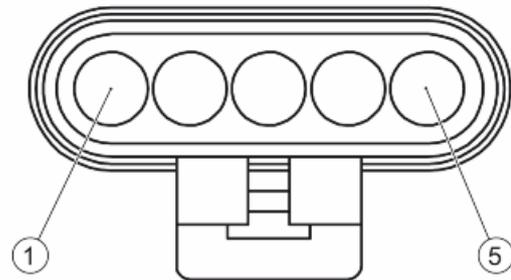


**IMMOBILIZER ANTENNA CONNECTOR**

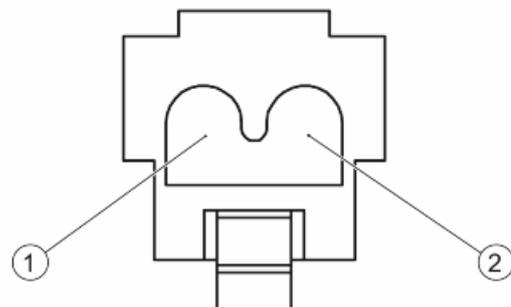
1. Live (Orange-Blue)
2. Ground lead (Black)
3. Ignition enabling signal (Orange-White)

**FUEL PUMP CONNECTOR**

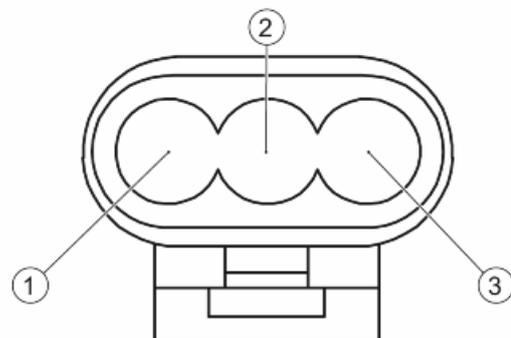
1. Not connected
2. Ground lead (Black)
3. Not connected
4. Not connected
5. Power from injection relay (Black-Green)

**ELECTRIC FAN CONNECTOR**

1. Ground lead (Black)
2. Power via electric fan relay (Red-Green)

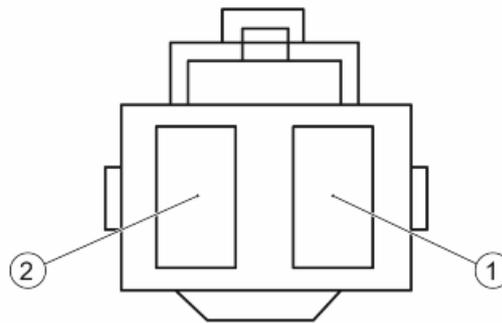
**PICKUP CONNECTOR**

1. Engine speed sensor positive signal (Red)
2. Engine speed sensor negative signal (Brown)
3. Oil pressure sensor signal (White-Purple)

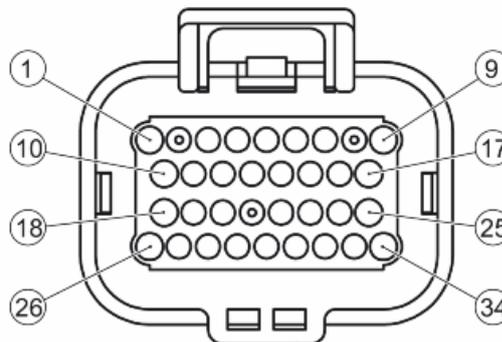


**REGULATOR CONNECTOR**

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

**INJECTION ELECTRONIC CONTROL UNIT CONNECTOR**

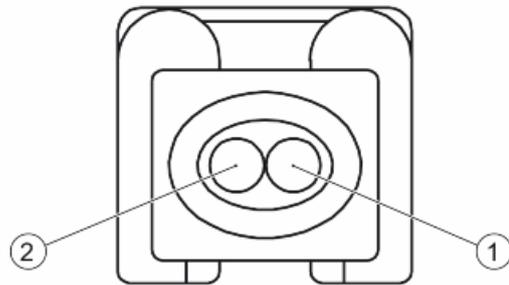
1. H.V. COIL (Pink-Black)
2. Not connected
3. Anti-tipping sensor (Grey-Black)
4. Engine switch (Orange)
5. Starter button (Purple)
6. Ignition switched live (Orange-Blue)
7. Ground No. 1 (Black)
8. Not connected
9. Battery power (Red-White)
10. Start-up enabling switch (Purple-White)
11. Lambda probe positive (Green-Blue)
12. Lambda probe negative (Sky 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. ASR button (Light blue-White)
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. Electric fan enabling (Green-White)
25. Injection warning light (Brown-White)
26. CAN H line (Pink-Red)
27. CAN L Line (Pink-White)



- 28. ECO switch (brown-red)
- 29. Speed sensor positive (Red)
- 30. Rpm indicator (Green)
- 31. ABS Warning Light (Light blue-Red)
- 32. Engine unable to start signal (Blue)
- 33. Low beam lights automatic ignition enabling (White-Black)
- 34. Fuel injector (Red-Yellow)

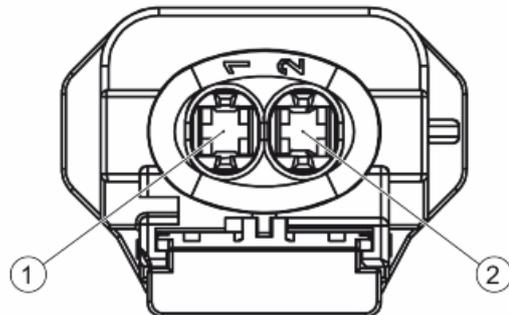
**INJECTOR CONNECTOR**

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



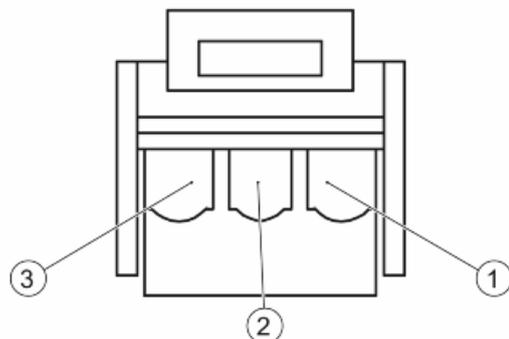
**H.V. COIL CONNECTOR**

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



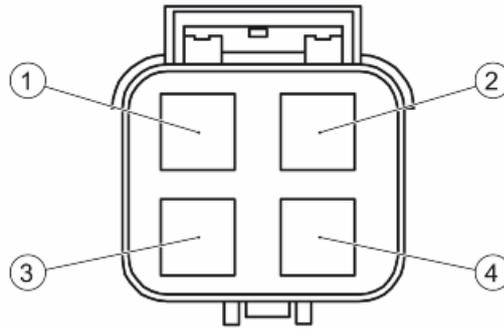
**FUEL LEVEL TRANSMITTER CONNECTOR**

- 1. Fuel level indicator (White-Green)
- 2. Ground lead (Black)
- 3. Not connected



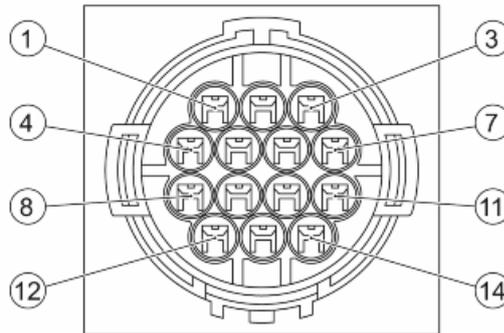
**COOLANT TEMPERATURE SENSOR CONNECTOR**

- 1. Electronic injection control unit (Sky blue - Green)
- 2. Instrument panel (Yellow-Pink)
- 3. Ground lead (Grey-Green)
- 4. Ground lead (Black)



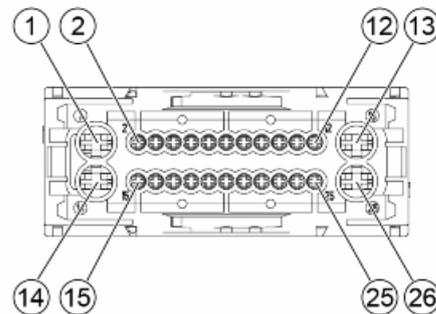
**CONNECTOR FOR PRE-INSTALLATION OF ACCESSORIES / BLUE DASH**

- 1. Ground lead (Black)
- 2. Fuel level indicator (White-Green)
- 3. CAN H line (Pink-Red)
- 4. CAN L Line (Pink-White)
- 5. Serial line K (Orange-Black)
- 6. Helmet compartment lighting signal (Yellow)
- 7. Battery-powered (Red-Blue)
- 8. Live power supply (White)
- 9. Not connected
- 10. Not connected
- 11. Left side turn indicator signal (Pink)
- 12. Right side turn indicator signal (White-Blue)
- 13. High-beam light signal (Purple)
- 14. Speed sensor signal (Sky blue)



**ABS CONTROL UNIT CONNECTOR**

- 1. Battery-powered (Red)
- 2. Rear speed sensor negative (Brown-Black)
- 3. Rear speed sensor positive (Brown-Red)
- 4. Not connected
- 5. Not connected
- 6. Not connected
- 7. Not connected
- 8. Front speed sensor negative (Light blue-Black)
- 9. Front speed sensor positive (Light blue-Red)
- 10. ABS Warning Light (Orange)
- 11. Not connected
- 12. Not connected



- 13. Not connected
- 14. Not connected
- 15. Not connected
- 16. Not connected
- 17. Speedometer (Light blue)
- 18. Serial line K (Orange-Black)
- 19. Not connected
- 20. Live (Orange-Blue)
- 21. CAN L Line (Pink-White)
- 22. Ground lead (Black)
- 23. CAN H line (Pink-Red)
- 24. Not connected
- 25. Not connected
- 26. Ground lead (Black)

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## Strumento di diagnosi

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### ADJUSTMENTS

On this screen page you can adjust some parameters of the control unit.



**THE INJECTION CONTROL UNIT SUPPLIED AS A SPARE, NEEDS AN ACTIVATION PROCEDURE FOR THE RECOGNITION OF THE ASR SYSTEM.**

Until performing the activation, this condition is shown on the screen page «**STATUSES**» under «**ASR (Anti-Slip Regulation)**», where the status will be «**Not present**».

**FOR ACTIVATION, PROCEED AS FOLLOWS:**

- access the menu «**ADJUSTMENTS**»;
- select «**ASR (Anti-Slip Regulation)**»;
- when asked for confirmation, select «**YES**» to activate.

The injection control unit is now properly configured.

---

**ECU INFO**

On this screen the user can read general data relating to the control unit, for example the type of software, mapping and programming data of the control unit.



**PARAMETERS**

On this screen the user can read the parameters measured by various sensors (engine rpm, engine temperature, ...) or values set by the control unit (injection time, ignition advance, ...).



**PARAMETERS**

Characteristic	Value/example	Units of measurement	Notes
Speed of the front wheel	0	km/h	With the wheel stopped, 0 km/h appears
Speed of the rear wheel	0	km/h	With the wheel stopped, 0 km/h appears
Battery voltage	12.1	V	

**ACTIVATION**

This screen page is used to delete errors in the control unit memory and to activate some systems controlled by the control unit.



**ACTIVATION**

Characteristic	Value/example	Units of measurement	Notes
ABS Warning Light			The ABS warning light is made to flash.
Reading of the environmental parameters of the errors (1)			There are 4 environmental parameters: Number of error detections, Operation cycles from the last detection, Battery voltage, Speed
Reading of the environmental parameters of the errors (2)			Number of error detections: number of times that the error has been detected by the control unit;

Characteristic	Value/example	Units of measurement	Notes
Reading of the environmental parameters of the errors (3)			for example if 2 is indicated, it means that the error has been detected (ATT), it is then no longer detected (switched to MEM) and then is detected again
Reading of the environmental parameters of the errors (4)			Operation cycles from the last detection: a cycle is counted if you perform: key ON and exceed 20 km/h
Reading of the environmental parameters of the errors (5)			If, for example, 5 appears it means that the last time the error was detected was 5 cycles ago.
Error cancellation (1)			Pressing the "enter" key switches the errors from stored (MEM) to historical (STO).
Error cancellation (2)			At the next connection between Navigator and the control unit, the historical errors (STO) will no longer appear.

**ERRORS**

This screen page shows potential errors detected in the vehicle (ATT) or stored in the control unit (MEM) and it allows to check error clearing (STO).



**ERRORS**

Characteristic	Value/example	Units of measurement	Notes
Front speed sensor: 5D90 electric malfunction			Electrically defective wiring or sensor
Front speed sensor: 5D91 the signal works irregularly			Faulty sensor or signal interference
Front speed sensor: 5D92 the signal decreases periodically			Possible tone wheel fault due to deformations or dirt, possible alteration of the surface of the wheel bearings. In very rare cases, abnormal tone wheel vibrations
Front speed sensor: 5D93 missing signal or too low speed detected compared to the rear wheel			Faulty sensor or missing sensor or tone wheel or excessive distance between the sensor and the tone wheel or tone wheel with wrong number of teeth
Front speed sensor: 5D94 missing acceleration after pressure reduction			Faulty sensor or missing sensor or tone wheel or excessive distance between the sensor and the tone wheel
Front speed sensor: 5D95 Excessive speed detected			Faulty sensor or tone wheel or tone wheel with wrong number of teeth or wrong tyre size
Rear speed sensor: 5DA0 electrical malfunction			Electrically defective wiring or sensor
Rear speed sensor: 5DA1 the signal works irregularly			Faulty sensor or signal interference
Rear speed sensor: 5DA2 the signal decreases periodically			Possible tone wheel fault due to deformations or dirt, possible alteration of the surface of the wheel bearings. In very rare cases, abnormal tone wheel vibrations
Rear speed sensor: 5DA3 missing signal or too low speed detected compared to the rear wheel			Faulty sensor or missing sensor or tone wheel or excessive distance between the sensor and the tone wheel or tone wheel with wrong number of teeth

Characteristic	Value/example	Units of measurement	Notes
Rear speed sensor: 5DA4 missing acceleration after pressure reduction			Faulty sensor or missing sensor or tone wheel or excessive distance between the sensor and the tone wheel
Rear speed sensor: 5DA5 Excessive speed detected			Faulty sensor or tone wheel with wrong number of teeth or wrong tyre size
5DD3 Control unit			Possible control unit fault
5DF0 Recirculation pump			Possible control unit fault
5DF1 Recirculation pump			Possible control unit fault
5DF2 Control unit			Possible control unit fault
5DF5 Control unit			Possible control unit fault
5DF3 Low electrical voltage - long period detection			Too low voltage detected for 30 seconds to PIN 1 of the ABS control unit
5DF4 Low electrical voltage			Excessively low voltage detected to PIN 1 of the ABS control unit
5DF7 High electrical voltage			Excessive voltage detected to PIN 1 of the ABS control unit
5E59 Vehicle encoding			This error appears if the control unit detects an inconsistency between its encoding and that detected by the CAN signal received by the control unit

## ENGINE TEMPERATURE SENSOR

### Function

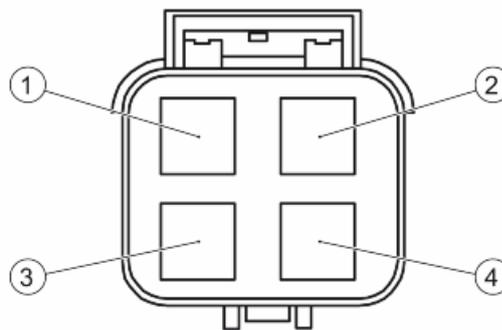
Serves the purpose of communicating the engine temperature to the control unit in order to optimise performance.

### Operation / Operating principle

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

### Pinout:

1. Injection ECU
2. Instrument panel
3. Control unit ground
4. Ground lead



**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.
- Verify continuity of the cabling between the sensor connector and the control unit connector: Control unit PIN 13 - sensor PIN 1 and control unit PIN 15 - sensor PIN 3. 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.

Short circuit 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.

Short circuit 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.
- 

## **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

Short circuit 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).
- 

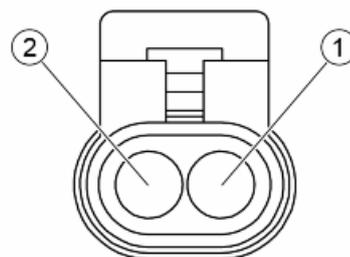
## **LAMBDA PROBE**

### **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 volt-



age which is read and interpreted by the injection control unit.

**Pinout:**

1. Signal to the control unit (+)
2. Signal to the control unit (-)

**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

Short circuit to positive: excessive voltage to PIN 11 or PIN 12 of the control unit connector. Open circuit or short circuit to negative: interruption of the circuit or zero voltage between the pins 11 and 12 of the control unit connector.

Troubleshooting

Short circuit to positive:

- Disconnect the control unit connector and the sensor connector.
- Verify that there is no short circuit with the battery positive on the PIN 1 of the sensor connector (corresponding to the PIN 11 of the control unit connector); in the presence of short circuit, restore the cable harness.
- Verify that there is no short circuit with the battery positive on the PIN 2 of the sensor connector (corresponding to the PIN 12 of the control unit connector); 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: PIN 11 of the control unit - PIN 1 of the sensor and PIN 12 of the control unit - PIN 2 of the sensor. 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 insulation from the ground of PIN 1 of the sensor connector. If there is no insulation, restore the cable harness.
  - Check the insulation from the ground of PIN 2 of the sensor connector. If there is no insulation, restore the cable harness.
  - If PIN 1 and 2 are insulated from ground and the error persists, it means that there is a probable defect in the control unit.
-

**INJECTOR****Function**

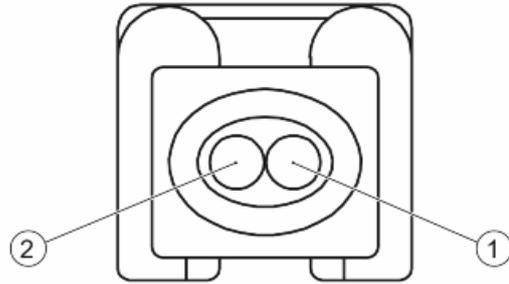
Provide the correct amount of fuel at the correct time.

**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

Shorted 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.

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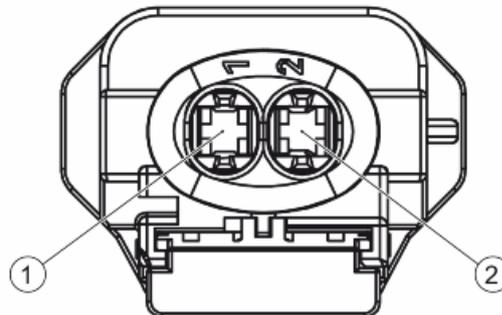
## COIL

### Function

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

### Pinout:

1. Activation by control unit (control unit side PIN 1)
2. Relay powered (PIN 87 relay side)



## ELECTRICAL ERRORS

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

### Error cause

Shorted 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 1: 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 1 - control unit PIN 1. In the absence of continuity restore the cabling.
- Verify, with the key turned ON, the presence of voltage on the coil connector PIN 2: If no voltage is detected, check that the cable harness between the coil and injection relay is not interrupted: Coil PIN 2 - relay PIN 87.
- 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 1 ground insulation (or control unit connector PIN 1). Restore the cabling if necessary.
- 

## **ELECTRIC FAN CIRCUIT**

### **Function**

Radiator fan and coolant - Operation.

### **Operation / Operating principle**

The control unit closes the fan control relay excitation circuit to ground until the temperature drops.

## **ELECTRICAL ERRORS**

**Fan relay P0480** - shorted to positive / shorted to negative / open circuit.

### Error cause

Shorted to positive: excessive voltage at PIN 24 of the control unit connector.

Shorted to negative: null voltage at PIN 24 of the control unit connector.

Open circuit: circuit interruption.

### Troubleshooting

Short circuit to positive:

- Disconnect the fan control relay and, turning the key to ON position, measure the voltage read at PIN 85 of the relay connector to the cable harness: if the voltage is 12V restore the cabling. If the voltage is zero replace the relay.

Short circuit to negative:

- Disconnect the fan control relay and the control unit.
- Verify ground insulation of the cable between the fan control relay (PIN 85) and the control unit (PIN 24). Restore the cabling if necessary.

Open circuit:

- Carry out the check procedure of the control unit and relay connectors.
  - Verify electrical continuity of the cable between the relay connector (PIN 85) and the control unit connector (PIN 24).
  - Verify electrical continuity of the cable between the relay connector (PIN 30) and the secondary fuse holders.
-

- Verify continuity between relay PIN 85 and PIN 86. If there is no continuity replace the relay.

**See also**

[Guide to diagnosis](#)

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## INDEX OF TOPICS

ENGINE FROM VEHICLE

ENG VE

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

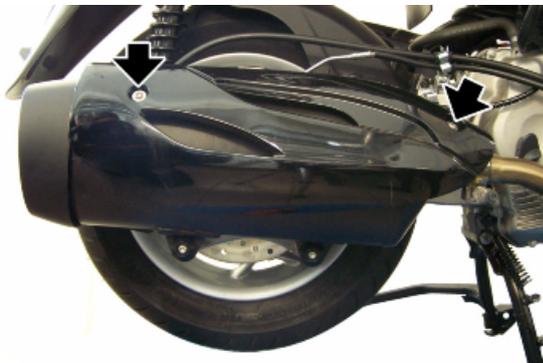
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## Exhaust assy. Removal

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### SILENCER REMOVAL

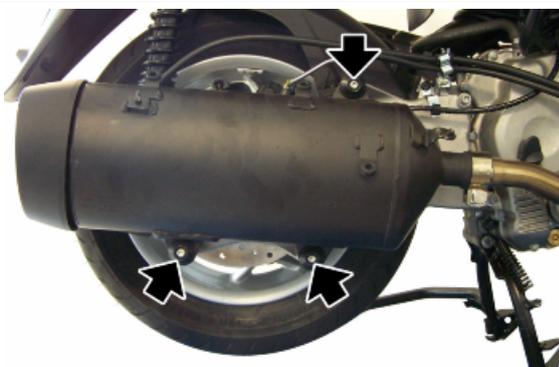
- Undo the two screws indicated and remove the heat guard.



- Loosen the silencer clamp and remove towards the front.

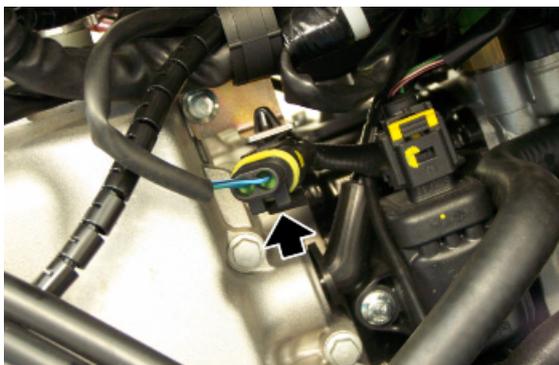


- While supporting the silencer, loosen the three fixing screws and retrieve their collars.
- Remove the silencer.

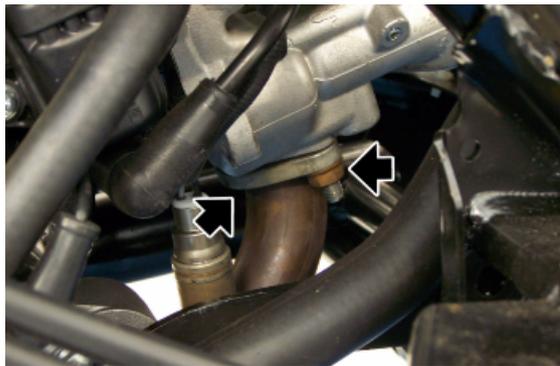


### REMOVAL OF EXHAUST MANIFOLD

- Remove the exhaust silencer.
- Remove the RHS footrest.
- Disconnect the lambda probe connector.



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



### See also

[Footrest](#)

For the refitting of the exhaust, operate in the following order, respecting the tightening torques described:

- pre-assemble the exhaust pipe on the vehicle;
- Position and fix the silencer on the plate and on the exhaust pipe;
- complete the tightening on the plate, the pipe, the silencer-pipe connection.

**N.B.**

**ALWAYS REPLACE THE GRAPHITE BUSHING BETWEEN THE MANIFOLD AND THE SILENCER.**

### MUFFLER

Name	Torque in Nm
Silencer heat guard fixing screw	4 to 5
Screw for fixing silencer to supporting arm	20 ÷ 25
Lambda probe tightening on exhaust manifold	40 - 50
Exhaust manifold-silencer clamp tightening	15.5 - 18.5
Nuts fixing the exhaust manifold to the head	16 to 18

## Removal of the engine from the vehicle

**CAUTION**



**SUPPORT THE VEHICLE ADEQUATELY.**

Support the engine adequately, from the front, rear and lower side.

Preventively remove:

- the helmet compartment,
- the tail fairing,
- the rear shock absorbers,
- the parking brake,
- the lateral footrests,
- the complete silencer and the silencer supporting plate,
- the rear wheel,

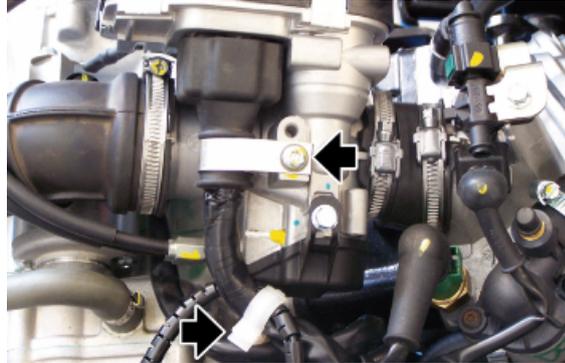
- the filter box,

Drain off the cooling system.

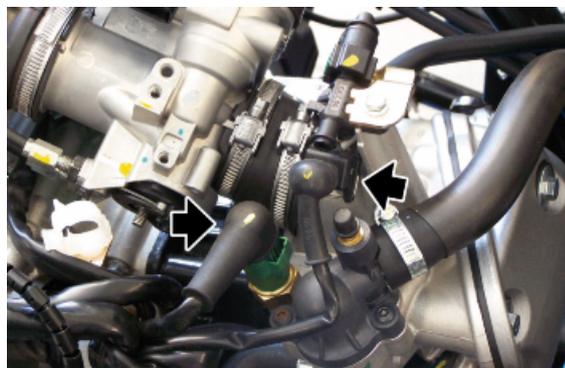
**WARNING**

**CARRY OUT THESE OPERATIONS WHEN THE ENGINE IS COLD**

- Undo and remove the screw, collect the washer and release the control unit cables from the cable grommet.



- Disconnect the connections of the main cable harness from the injector and from the head temperature sensor.



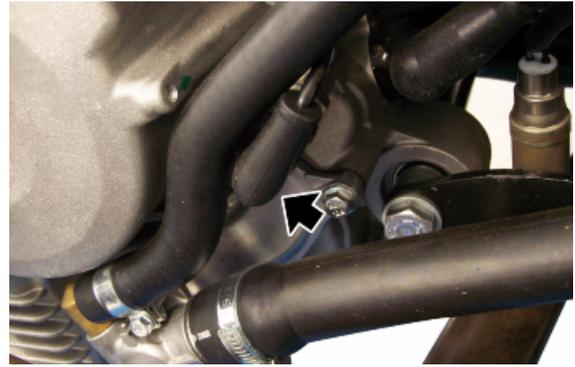
- Undo the cable grommet fixing screw and release the fuel pipe from the injector.



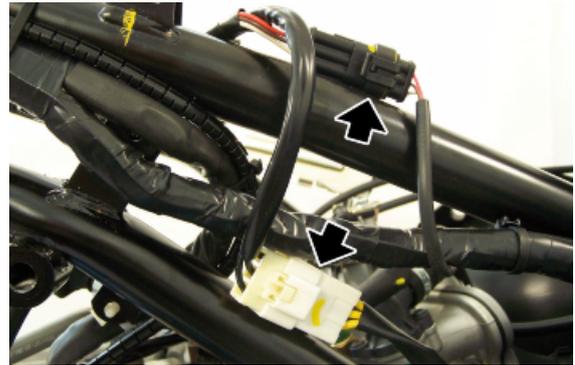
- Unscrew the two fixing screws and slide off the thermostat.



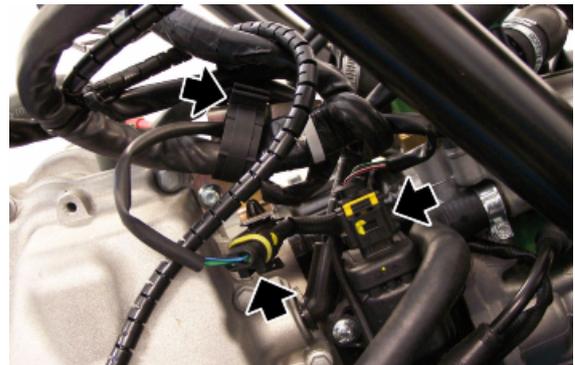
- Disconnect the oil pressure sensor.



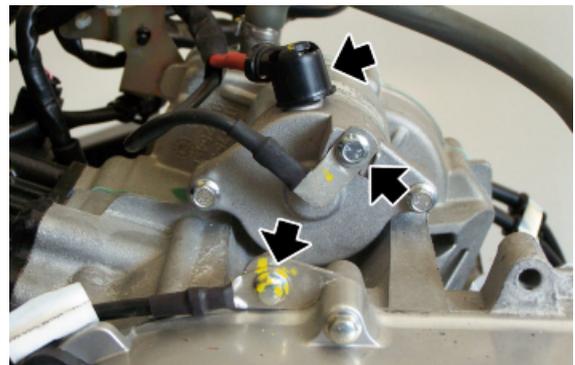
- Working from the right side of the chassis, disconnect the pick-up connector.
- Disconnect the regulator connector.



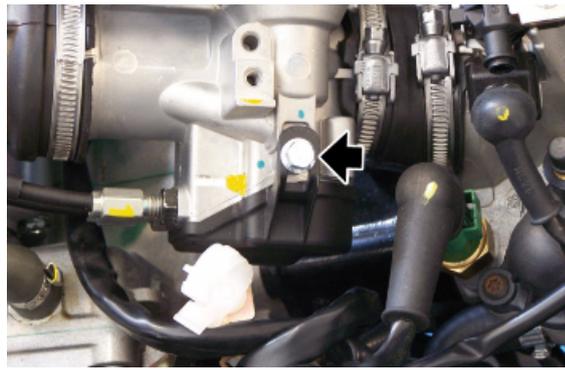
- Disconnect the lambda probe connector.
- Disconnect the coil connector.
- Release the cable grommet cables.



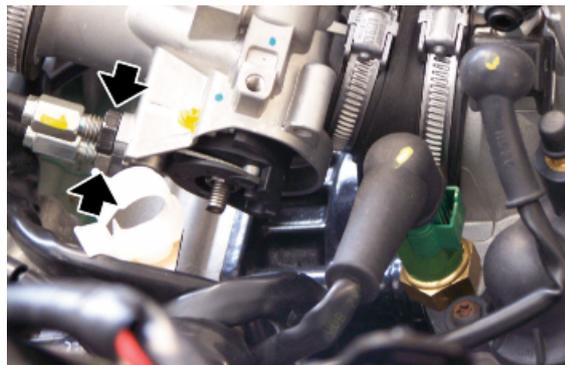
- Remove the supply cable and the two ground cables.



- Unscrew the screw and remove the throttle grip cables cover.



- Loosen the adjuster screws and disconnect the throttle grip cables.



- Working on the left side of the vehicle, undo the nut and collect the washer.
- Remove the pin from the opposite side.



- Operating with care and with the necessary precautions, remove the engine from the vehicle.
- If necessary, remove the swinging arm as described in the section "Suspensions/Swinging arm".

When refitting the engine onto the vehicle, carry out the removal operations but in reverse order and respect the tightening torques shown in the Specifications Chapter.

- Check the engine oil level and if necessary, top it up with the recommended type.
- Fill and bleed the cooling circuit.
- Check accelerator and electric devices for correct functioning.

#### CAUTION

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

#### See also

[Helmet bay](#)  
[Tail guard](#)  
[Removal](#)  
[Parking](#)  
 brake

Footrest  
Exhaust assy. Removal  
Removing the rear wheel

Air filter  
Tightening Torques

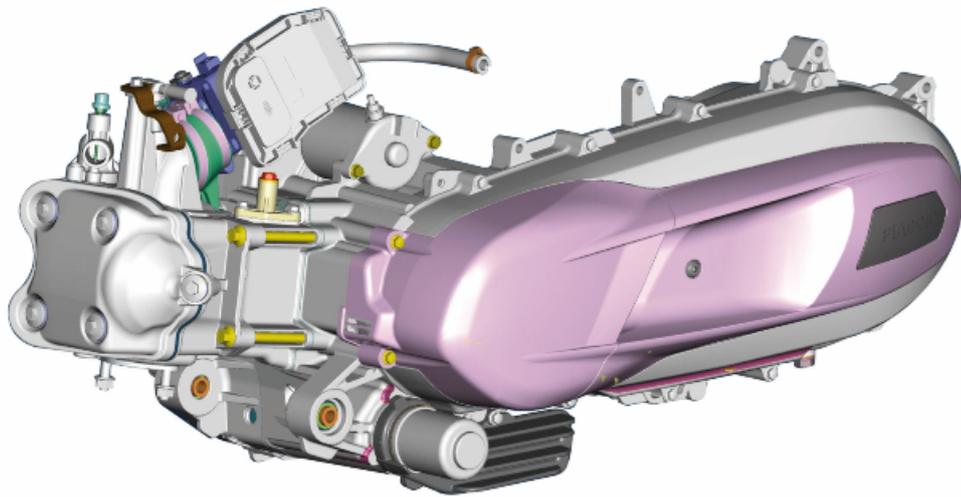
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# INDEX OF TOPICS

ENGINE

ENG

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



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## Automatic transmission

---

### Transmission cover

---

- Remove the air duct.
- Insert the specific tools, rotate the engine until the driven pulley stops and remove the screw, recovering the washer.

#### Specific tooling

020917Y Driven pulley lock



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

**See also**[Air duct](#)

---

**Air duct**

- Remove the plastic cover.



- Unscrew the four 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.



- Using the housing to support the cover of the transmission, interpose a few layers of heavy cloth so as not to damage the outer surface of the cover.
- Using appropriate tools, remove the bearing.

### Specific tooling

020376Y Adaptor handle

020357Y 32x35-mm Adaptor

020439Y 17-mm guide

001467Y002 Driver for OD 73 mm bearing



## Refitting the driven pulley shaft bearing

- Use the heat gun to heat the inner part of the lid.

### CAUTION

DO NOT HEAT EXCESSIVELY SO AS NOT TO DAMAGE THE PAINTWORK.

### Specific tooling

020151Y Air heater



Using the equipment, mount a new bearing, apply grease on the adaptor and on the guide in order to maintain the position of the bearing during operation on the vertical axis.

### Specific tooling

020376Y Adaptor handle

020358Y 37x40-mm Adaptor

020439Y 17-mm guide



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



## Removing the driven pulley

- Remove the stationary driving half-pulley.
- Remove the driven pulley complete with belt.

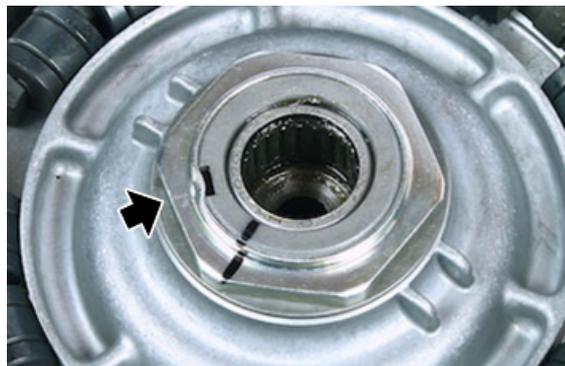
### WARNING

AS A RESULT OF THE OPERATION THERE MAY BE A LIGHT "HAMMERING" BETWEEN THE KNURLING OF THE PULLEY AXLE. THIS CAN MAKE REMOVAL BY HAND DIFFICULT. IN CASE OF NEED USE AN EXTRACTOR.



## Inspecting the clutch drum

- To remove the housing from the driven pulley shaft it is necessary to remove the complete clutch assembly from the engine as described in section «Disassembling the clutch».
- Remove the protection caulking.



- Using the specific tool to maintain the clutch housing in position, unscrew the nut to recover the washer.

### Specific tooling

**020917Y Driven pulley lock**





- Remove the housing from the shaft.



- To fit, follow the removal steps but in reverse order, being careful to tighten to the specified torque.

**CAUTION**

**ALWAYS USE A NEW NUT FOR RETAINING THE CLUTCH OUTPUT SHAFT, THEN PROCEED TO THE CAULKING.**

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

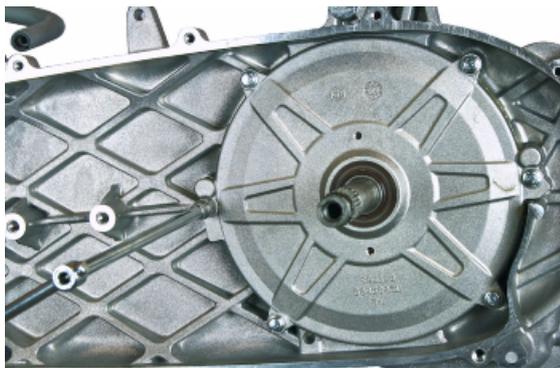
**Clutch output shaft nut 120 to 130**

## Removing the clutch

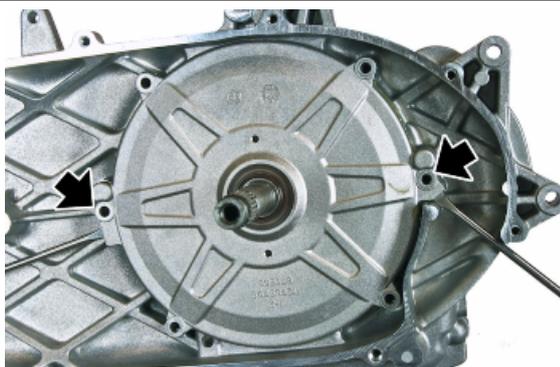
- To remove the clutch assembly it is necessary to remove the inlet pinion to the final reduction unit, operating as described in the section «**Dismounting the hub cover**».



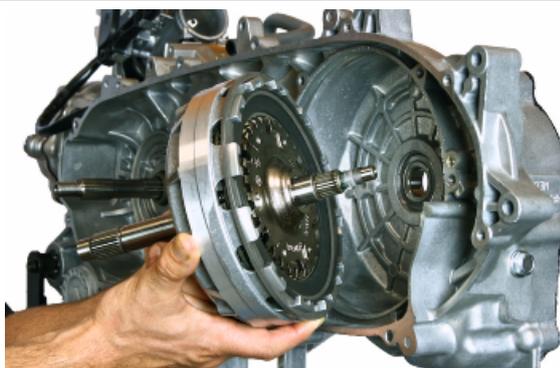
- Working from the automatic transmission side, remove the driven pulley.
- Unscrew the six fixing screws from the clutch cover.



- By using two screwdrivers work on the appendices and remove the cover taking care not to drop the clutch assembly.



- Remove the clutch assembly.



### See also

[Removing the hub cover](#)

## Inspecting the clutch

### COVER REVISION

- Adequately support the cover and using a screwdriver remove the seal ring.

### Specific tooling

001467Y007 Driver for OD 54-mm bearings



- Working from the opposite side, supporting the cover, proceed to the removal of the bearing.

**Specific tooling**

**001467Y007 Driver for OD 54-mm bearings**

**020376Y Adaptor handle**

**020358Y 37x40-mm Adaptor**



- Heat the crankcase by means of specific tools and then insert a new bearing.

- 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**

**020360Y 52x55-mm Adaptor**

**020364Y 25-mm guide**



- Insert a new seal ring and grease the seal lips.

**Specific tooling**

**020376Y Adaptor handle**

**020360Y 52x55-mm Adaptor**



- Replace the outer O-ring and grease properly.

**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.**





- Disengage the upper ring of the specific tool.
- Remove the outer ring with the seat for the Belleville spring.
- Remove the Belleville spring.



- Remove the spring door upper disc.



- Remove the discs separation spring.
- Remove the semi-trimmed duct disc (trimmed on one side).
- Remove a conductor disc.
- Remove the discs clearance recovery spring
- Remove a duct metallic disc.
- Remove a conductor disc (trimmed on both sides).







- Remove the discs clearance recovery spring
- Remove a non-trimmed duct metallic disc.
- Remove a conductor disc (trimmed on both sides).
- Remove the discs clearance recovery spring
- Remove the semi-trimmed duct disc (trimmed on one side).

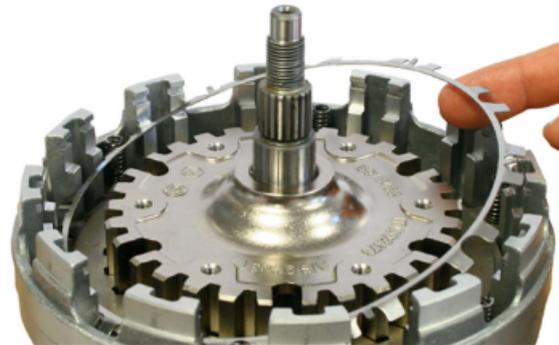




**CAUTION**



THE CLEARANCE RECOVERY SPRING DISCS ARE FITTED INDIVIDUALLY. THE FIRST IN THE ASSEMBLY PHASE MUST BE POSITIONED TOWARDS THE INSIDE OF THE HOUSING, AS SHOWN IN FIGURE.



- Remove the hub.
- Remove the shaft.



- 
- Remove the lower spring holder disc complete with the six springs.



- 
- Remove the rollers.



- 
- Check that there is no abnormal wear on the rollers, the support channels for rollers and those for discs.



---

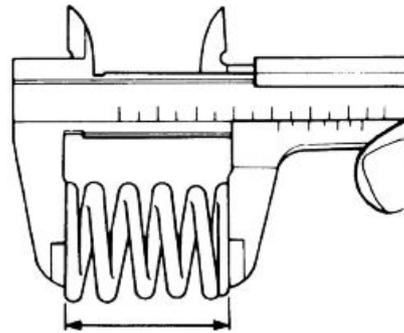
### CLUTCH SPRING REVISION

**Characteristic****Clutch springs**

Free spring measurement 15.3 mm

**Clutch spring wear limit**

15.0 mm




---

### CLEARANCE RECOVERY SPRING REVISION

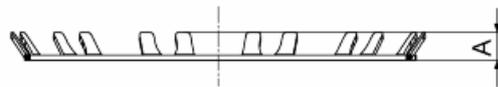
Check for any deformation or abnormal wear.

**Characteristic****Clearance recovery spring «A» standard dimensions**

3.2±0.1 mm

**Clearance recovery spring wear limit**

2.8 mm




---

### CLUTCH DISCS REVISION

Check the clutch discs for damage or signs of wear: In this case, replace them all.

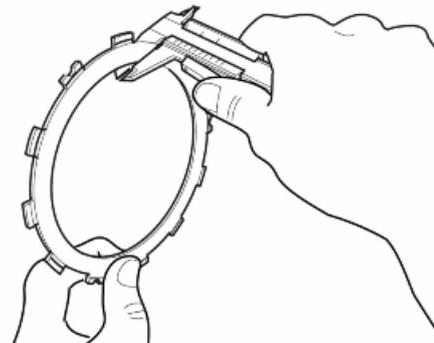
Measure the thickness of the discs in four positions, and if they do not meet specifications, replace them all.

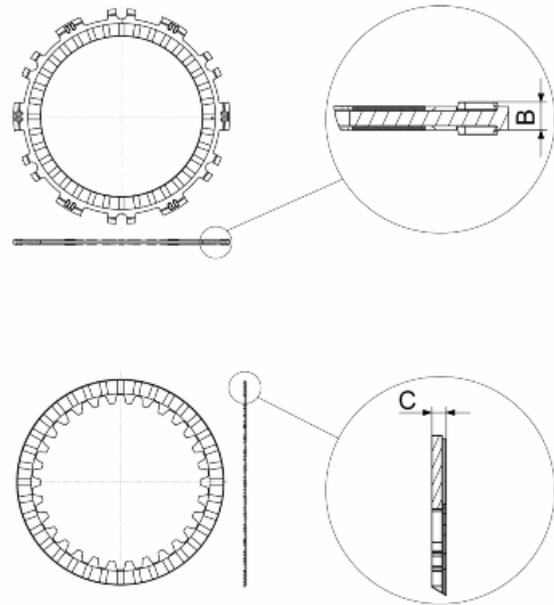
**Characteristic****Clutch discs thickness**

Conductor disc thickness «B» = 3.00±0.08 mm

Trimmed duct disc thickness «C» = 1.95±0.05 mm

Duct disc thickness «D» = 1.400±0.035 mm





### DISCS WEAR LIMIT

If the discs exceed the following wear limits, replace them all.

#### Characteristic

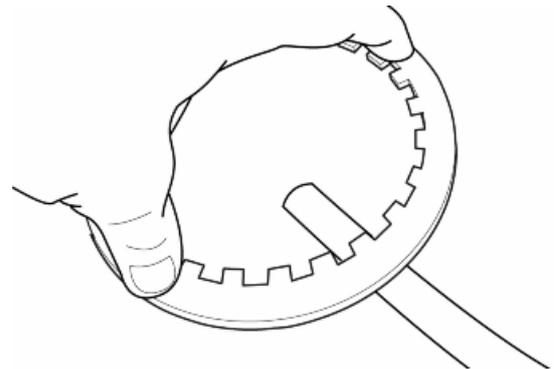
##### Clutch discs wear limit

Conductor disc wear limit «**B**» = 2.6 mm

Trimmed duct wear limit «**C**» = 1.7 mm

### CLUTCH DISCS REVISION: MAXIMUM DEFORMATION

Measure the maximum deformation of the discs by positioning them on a reference plane and checking with a feeler gauge. If out of specification, replace them all.



#### Characteristic

##### Clutch discs maximum deformation

Max. duct disc unevenness «**D**» **0.2 mm**

**REASSEMBLY**

- Working in reverse order to the removal, insert the components while taking care to follow the following guidelines:
- Place the rollers as shown in the photo, after every two leave a clearance so that each pair has its opposite for proper balance.



- Lubricate the parts of the clutch pack with the recommended product.

**Recommended products**

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

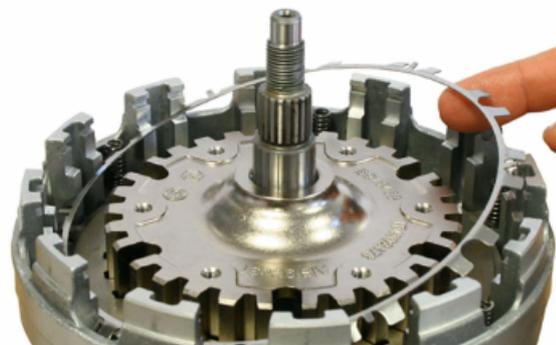
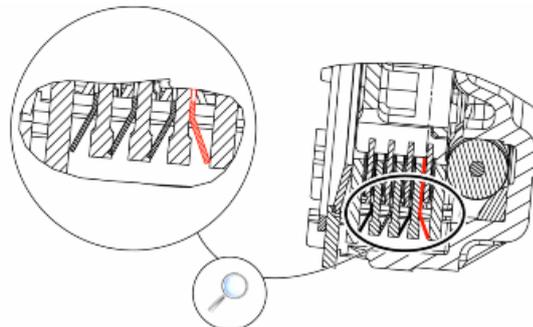
API GL-4



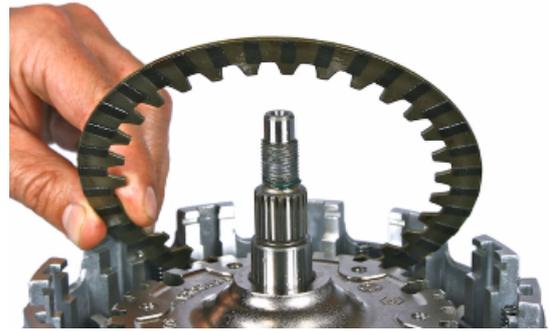
**CAUTION**



**THE CLEARANCE RECOVERY SPRING DISCS ARE FITTED INDIVIDUALLY. THE FIRST IN THE ASSEMBLY PHASE MUST BE POSITIONED TOWARDS THE INSIDE OF THE HOUSING, AS SHOWN IN FIGURE.**



- Insert the semi-trimmed disc with the trimmed surface facing the lower support disc



- Respect the indicated position of the discs clearance recovery spring.

**CAUTION**



**THE CLEARANCE RECOVERY SPRING DISCS ARE FITTED INDIVIDUALLY. THE LAST IN THE ASSEMBLY PHASE MUST BE POSITIONED TOWARDS THE INSIDE OF THE HOUSING, AS SHOWN IN FIGURE.**



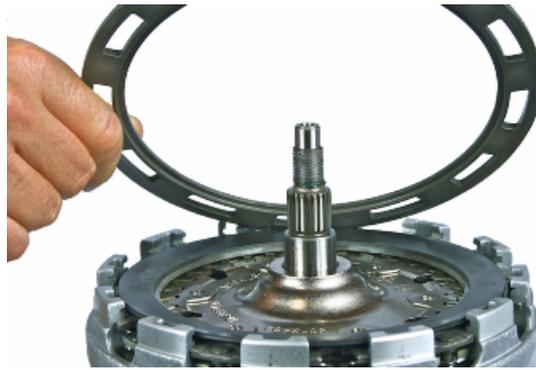
- Insert the semi-trimmed disc with the trimmed surface facing the upper support disc



- Insert the upper support disc in the spring.



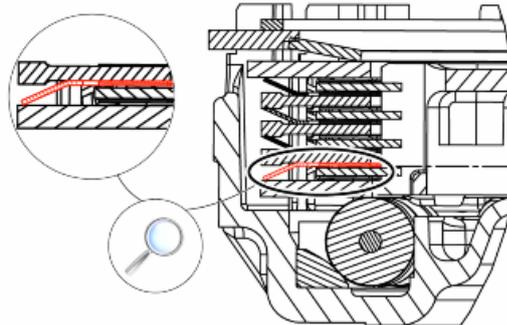
- Insert the Belleville spring facing upwards, taking care to insert it properly into the seat in the closure ring.



- Fit the specific tool to compress the clutch pack and place the retaining ring at the specified location.

### Specific tooling

**020919Y Clutch discs disassembly tool**

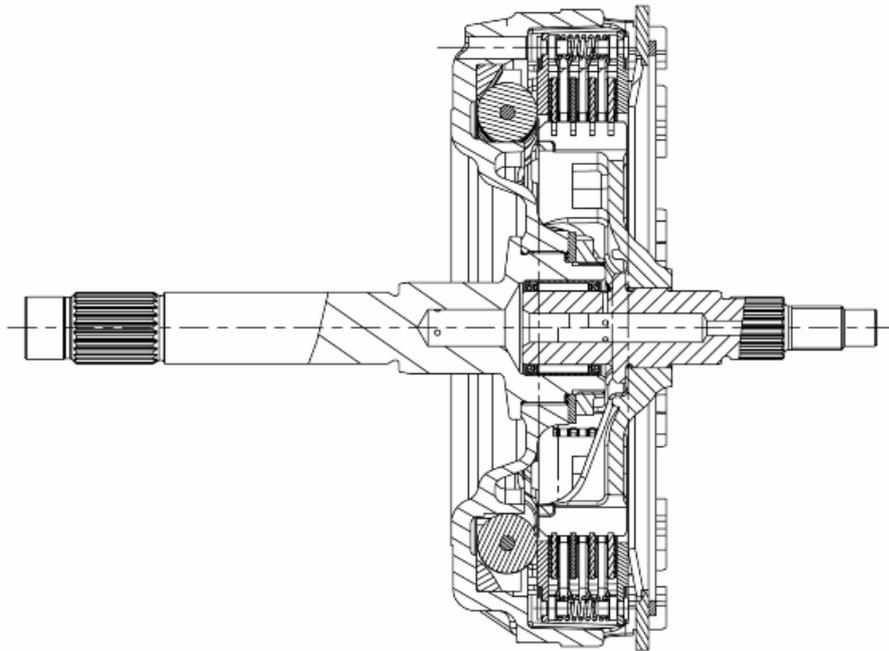


### FINAL CHECK

Once the clutch is assembled, turn by hand the exit axis to the final reduction.

The rotation must be free.

If you feel resistance in the movement, or if you detect impediments, disassemble the clutch again and check the correct installation.



---

#### CLUTCH OUTPUT SHAFT ROLLER CASING INSPECTION

- Using specific tools, remove the roller casing

##### Specific tooling

001467Y006 Pliers to extract 20 mm bearings

001467Y007 Driver for OD 54-mm bearings



- Insert a new roller casing and set it with specific tools.

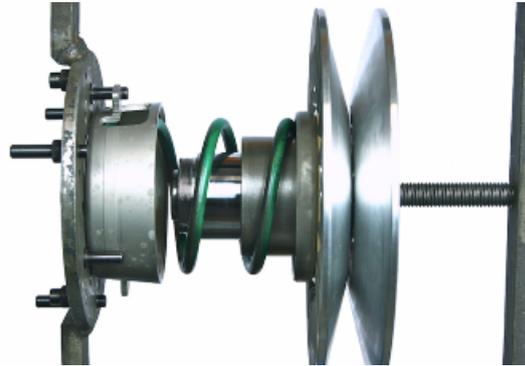
##### Specific tooling

020084Y 20-mm diameter punch



## Pin retaining collar

- Use the tool equipped with medium length pins in "C" position screwing them from the inside of the tool.
- Install the driven pulley into the tool providing the support of an appendix against a pin.
- Ensure the centring of the driven pulley by means of the key inserted on the nut.

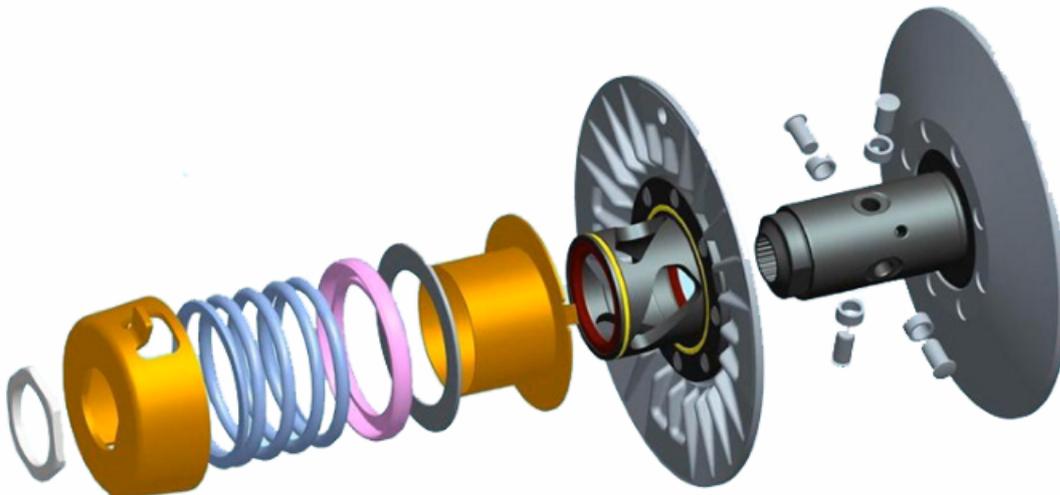
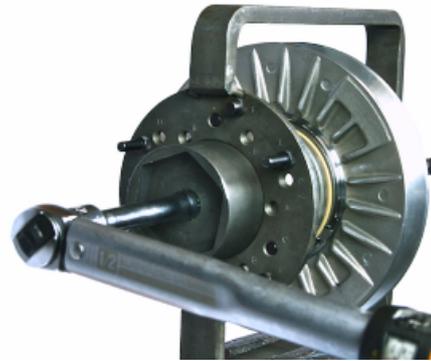


### Specific tooling

**020444Y Tool for fitting/ removing the driven pulley clutch**

**020444Y009 wrench 46 x 55**

- Turn the key to unscrew the nut.
- Adjust the specific tool command screw to release the torque server spring.



---

- Remove the following components in this order:

- upper cap;
- spring;
- lower spring support;
- synthetic ring.



---

- Using two screwdrivers lift the locking sheath of the torque server and remove it.



- Remove the two O-rings and replace them, making sure to lubricate them during installation.



- Thoroughly clean the slots and pins.
- Check that the bushings on the pins and the slots of the torque server are free from wear and rotate freely.
- Then grease with recommended product using a syringe, in order to inject the oil directly into the holes in the bushing.



**CAUTION**



THE TORQUE SERVER PINS ARE SET ON THE BUSHING WITH INTERFERENCE, AND ARE THEREFORE NOT REMOVABLE. WHEN IT IS NECESSARY TO REPLACE THE INTERNAL SEAL RINGS OR THE PULLEY SURFACES IF THERE IS ABNORMAL WEAR, REPLACE THE DRIVEN PULLEY UNIT.

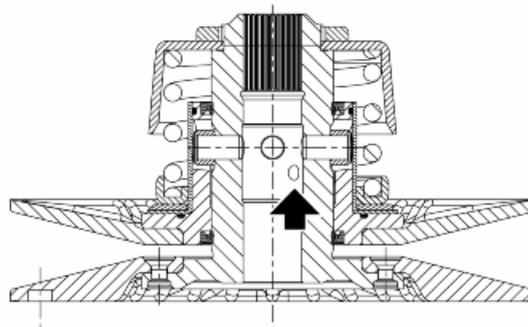
**Recommended products**

**MONTBLANC MOLYBDENUM GREASE -**

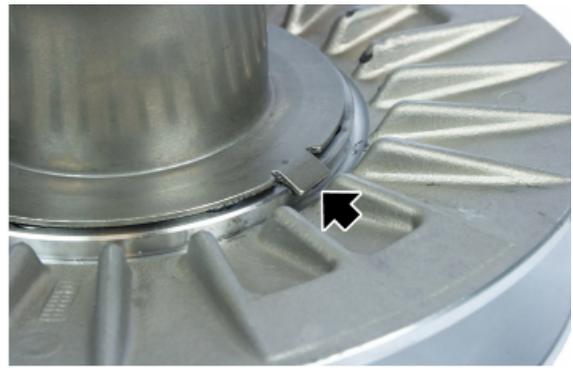
Grease with molybdenum disulphide

**N.B.**

**GREASE USING THE CHANNELS IN THE PULLEY.**



- Insert the closure sheath of the torque server taking care to respect the positioning of the appendices in their corresponding seats.



### Refitting the driven pulley

- Insert the synthetic ring.



- Insert the lower spring support.



- Insert the spring, lubricating the ends.



- Insert the upper cap.



- Insert the belt paying attention to the direction of rotation.

**Specific tooling**

**020444Y Tool for fitting/ removing the driven pulley clutch**



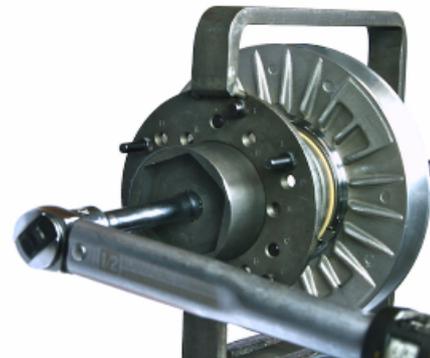
- Turn the control screw of the specific tool and spring preloading.
- Insert the fixing nut and using the specific wrench, tighten to torque.

**Specific tooling**

**020444Y009 wrench 46 x 55**

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

**Driven pulley nut 50 to 60**



**Inspecting the clutch spring**

- Check the free length of the spring of the mobile driven half-pulley.

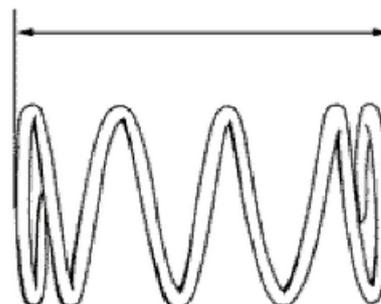
**Characteristic**

**Unloaded spring length**

101.5 mm

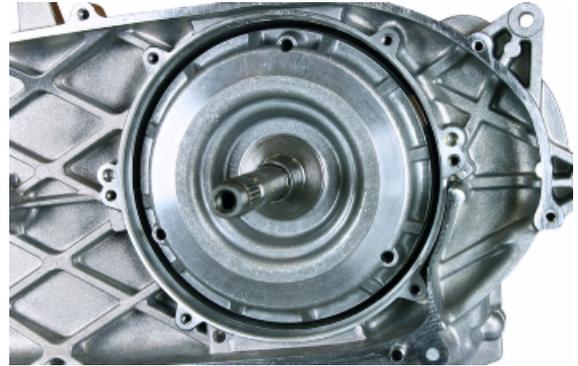
**Acceptable limit after use**

98 mm



## Refitting the clutch

- Insert the complete clutch assembly.



- Insert the clutch cover and tighten the six screws to the specified 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.

### WARNING

THE OUTER O-RING MUST BE PROPERLY GREASED. DUE TO THE HIGH STRENGTH OF THE O-RING IT IS RECOMMENDED TO TIGHTEN IN CROSSED SEQUENCE UNTIL COMPLETING THE INSERTION.



### Locking torques (N\*m)

**Clutch cover retainer screws 11 to 13**

- Working as described in section «Fitting the hub cover» proceed to the locking of the clutch assembly.

## Refitting the driven pulley

- Insert the driven pulley, complete with belt, on the shaft.



## 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

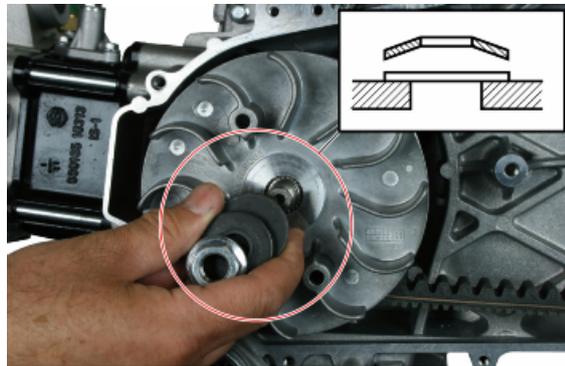
- Using specific tools, lock the driving pulley and loosen the flanged nut.

### Specific tooling

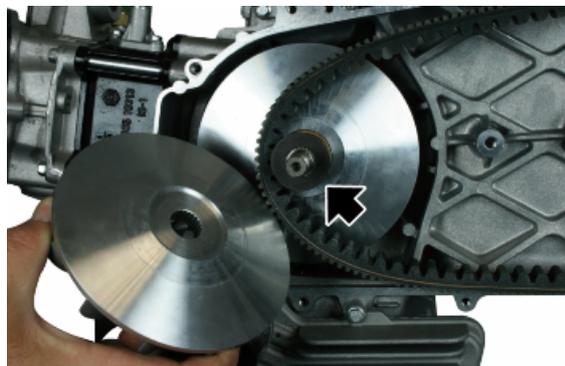
**020442Y Pulley lock wrench**



- 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: Standard Diameter**

30 mm (+0 +0.021)

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

Ø 26.12 mm

**Sliding bushing: Standard Diameter**

Ø 30 mm (-0.02 +0.041)

**Sliding bushing: Minimum admissible diameter**

Ø 25.95 mm

**Roller: Standard diameter**

Ø 25 mm±0.1



## 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.

### Specific tooling

020442Y Pulley lock wrench

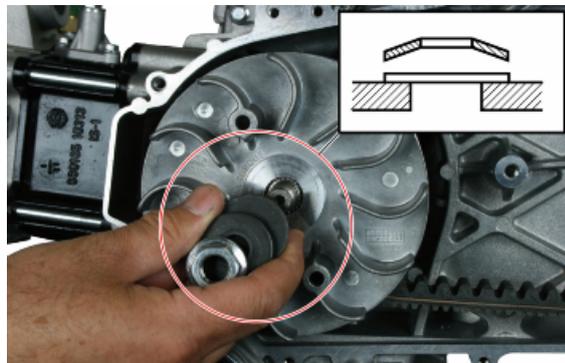
### Locking torques (N\*m)

Nut M14x1.5 securing the driving pulley 120 to 130



### CAUTION

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



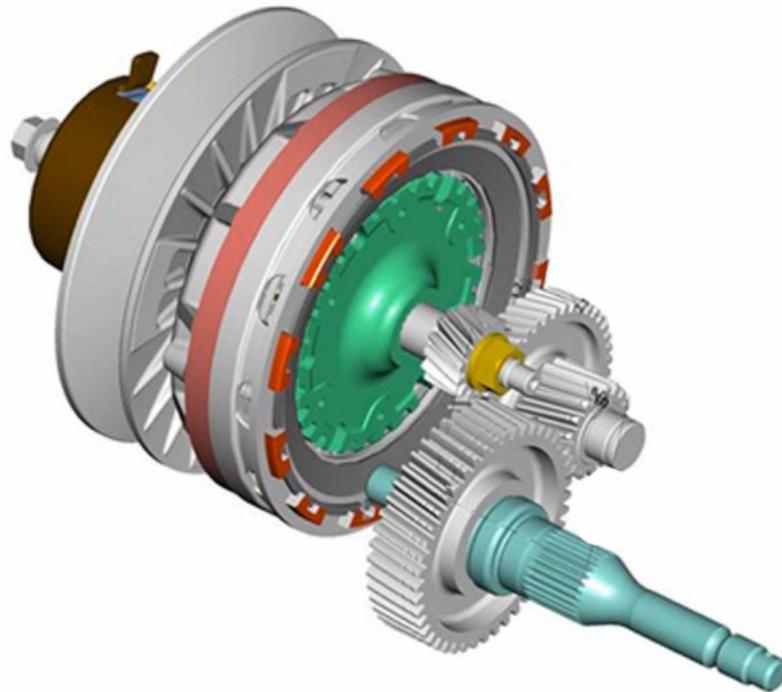
## Refitting the transmission cover

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

### Locking torques (N\*m)

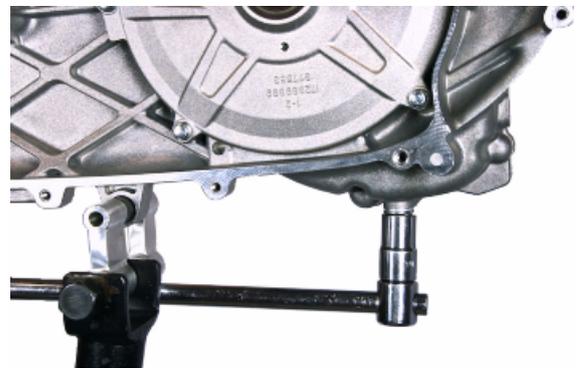
Transmission cover screws 11 to 13 Driven pulley M10x1.25 screw 74 to 80

## 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.



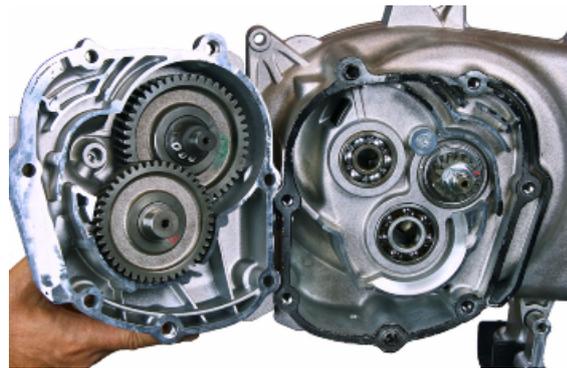
- Unscrew the seven hub cap fixing screws.



- Using a suitable screwdriver use leverage on the upper and lower appendices to detach the sealant.



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



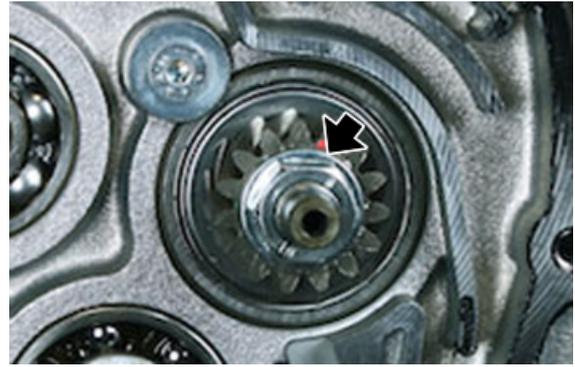
- Remove the final reduction cap.
- Turn the shaft of the driven pulley until aligning a slot with the axis of the intermediate bearing and insert the specific tool.

### Specific tooling

**020918Y Clutch retainer**



- 
- Remove the nut and incorporated washer securing the pinion.



- The pinion is symmetrical: mark the outer surface to avoid reversed reassembly.
- Remove the pinion and the specific tool.

**CAUTION**

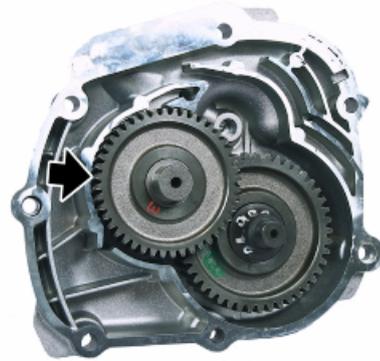
CLEAN THE THREAD FROM ANY RESIDUAL THREAD-LOCK.



---

## Removing the wheel axle

- Remove the intermediate gear.



- Remove the wheel axle.



## Removing the hub bearings

### REMOVAL

#### Removing the clutch shaft bearing

- Remove the screw and countersunk washer.
- Using the specific tools remove the bearing.

#### Specific tooling

020376Y Adaptor handle

020357Y 32x35-mm Adaptor

020363Y 20-mm guide



#### Removing the Wheel axle bearing

- Using the specific tools remove the bearing.

#### Specific tooling

020376Y Adaptor handle

020357Y 32x35-mm Adaptor

020363Y 20-mm guide



#### Removing the intermediate gear bearing

- Using the specific tools remove the bearing.

#### Specific tooling

020376Y Adaptor handle

020456Y Ø 24-mm adaptor

020412Y 15-mm guide



### FITTING

- Heat the crankcase by means of the specific tool and then insert the bearings.

#### Specific tooling

020151Y Air heater

**Fitting the Wheel axle bearing**

- Using the equipment set a new bearing.

**Specific tooling**

020376Y Adaptor handle

020359Y 42x47-mm Adaptor

020363Y 20-mm guide



**Fitting the Clutch shaft bearing**

- Using the equipment set a new bearing.

**Specific tooling**

020376Y Adaptor handle

020360Y 52x55-mm Adaptor

020363Y 20-mm guide



**Fitting the Intermediate gear bearing**

- Using the equipment set a new bearing.

N.B.

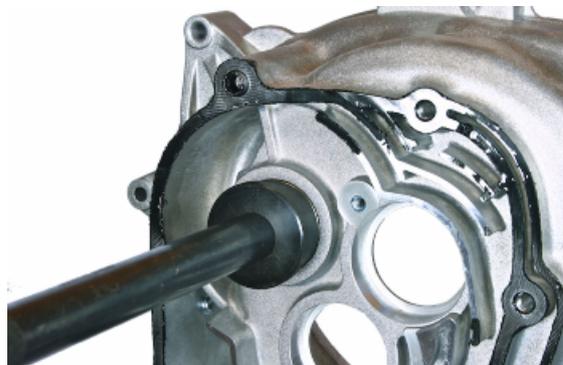
IF THE BEARING HAS AN ASYMMETRICAL BALL RETAINER, PLACE IT SO THAT THE BALLS ARE VISIBLE FROM THE HUB INNER SIDE.

**Specific tooling**

020376Y Adaptor handle

020359Y 42x47-mm Adaptor

020412Y 15-mm guide



- After completing the insertions, tighten the lock screw of the clutch shaft bearing, respecting the direction of the washer and apply the recommended product.

**Recommended products**

**Loctite 242 product description**

Apply LOCTITE medium type 242 threadlock

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

Bearing lock screw 9 - 11



## 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 standard sizes

A: 25mm -0.01 -0.02

B: 19.6mm -0.20 -0.33

#### Clutch output shaft standard sizes

C: 20mm -0 -0.013

D: 20mm -0.01 -0.02

#### Wheel axle

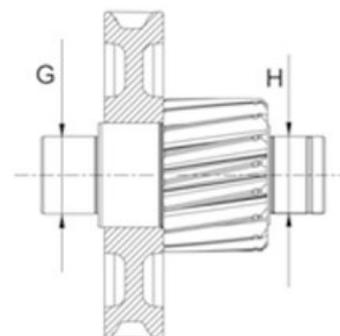
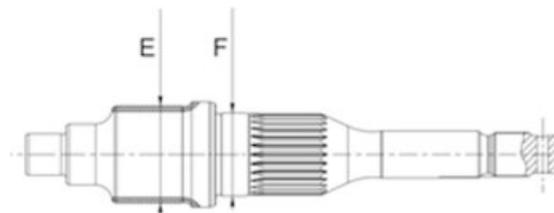
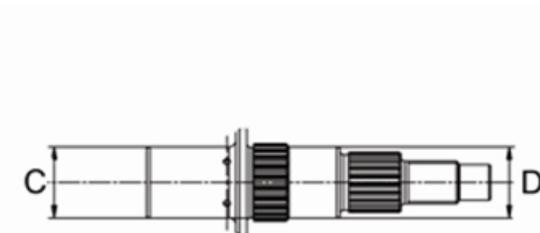
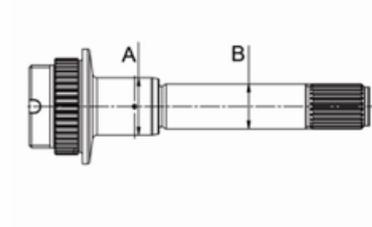
E: 35mm -0 -0.013

F: 30mm -0.13 -0.26

#### Intermediate gear

G: 0.7874(-0.0004 -0.0008)in (20(-0.01 -0.02)mm)

H: 0.7874(-0.0004 -0.0008)in (20(-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.
- Check the thorough cleaning of lubrication duct.



## Refitting the hub cover bearings

### REMOVAL

#### Removing the Wheel axle bearing

- Remove the Seeger ring.



- Using the specific tools, support the hub cover.
- Using the specific tools remove the bearing.

### N.B.

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

### Specific tooling

020489Y Hub cover support stud bolt kit

020376Y Adaptor handle

020357Y 32x35-mm Adaptor

020483Y 30-mm guide



- Remove the hub cover from the stud bolts and using the specific tools pull out the oil seal.

### Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm Adaptor



**Removing the intermediate gear bearing**

- Take out the bearing using the specific tool.

**Specific tooling**

001467Y003 Nut

001467Y004 Lug / Taper pin

001467Y005 Screw

001467Y006 Pliers to extract 20 mm bearings

001467Y035 Bearing housing, outside  $\varnothing$  47 mm

**FITTING****Fitting the Intermediate gear bearing**

- Heat the crankcase by means of the specific tool and then insert the bearings.

**Specific tooling**

020151Y Air heater



- Using the equipment set a new bearing.

**Specific tooling**

020376Y Adaptor handle

020359Y 42x47-mm Adaptor

020363Y 20-mm guide

**Fitting the Wheel axle bearing**

- 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**

020376Y Adaptor handle

020360Y 52x55-mm Adaptor

020483Y 30-mm guide



- 
- Fit the seeger ring.



- 
- Insert a new seal ring with the seal facing the inside of the hub by means of the appropriate tool.
  - Grease the sealing lips.

### Specific tooling

020376Y Adaptor handle

020360Y 52x55-mm Adaptor



---

## 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.



- 
- Insert the intermediate gear.



## Refitting the ub cover

- Working in reverse order to the removal and using the specific tool, insert the control pinion, use the recommended product and tighten the torque.

### CAUTION

FOR THE INSTALLATION, ALWAYS USE NEW NUTS ALREADY PROVIDED WITH SCOTCH GRIP.

### Specific tooling

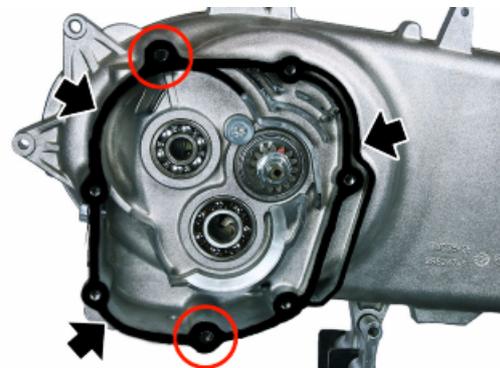
**020918Y Clutch retainer**

### Locking torques (N\*m)

**M12x1.25 gear clutch shaft retainer nut 95 to 105**



- Pay attention to the correct positioning of the alignment dowels.
- Thoroughly clean the surfaces of the engine crankcase and reduction cover and seal, with the recommended product, the matching surface around the entire outer perimeter of the duct that leads to the breather.



### CAUTION



AN IMPROPER SEALING OF THE VENTILATION CIRCUIT MEANS A LOSS OF OIL INTO THE AUTOMATIC TRANSMISSION HOUSING.

### Recommended products

**THREE BOND TB1207B Liquid sealant**

Liquid gasket Three Bond TB1207B

- Remove 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)

**Final reduction cover screws 24 to 27 Reduction unit oil drainage screw 15 to 17**



### CAUTION



**THE FOLLOWING OIL REDUCTION FILLING PROCEDURE MUST BE CARRIED OUT ONLY WITH THE MOTOR FITTED ON THE VEHICLE, ON THE CENTRE STAND IN FLAT LAND.**

- 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

**Final reduction unit oil**

about 500 cc

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

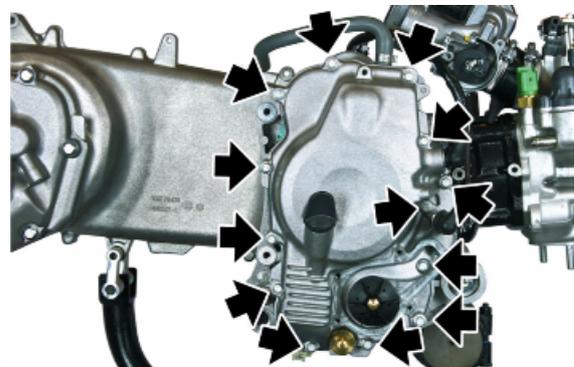
Oil relief screw 15 to 17



## Flywheel cover

### Removing the hub cover

- Perform the actions described in the section «Removing the flywheel cover components».
- Unscrew the 13 fixing screws of the flywheel cover.



- Remove the cover.

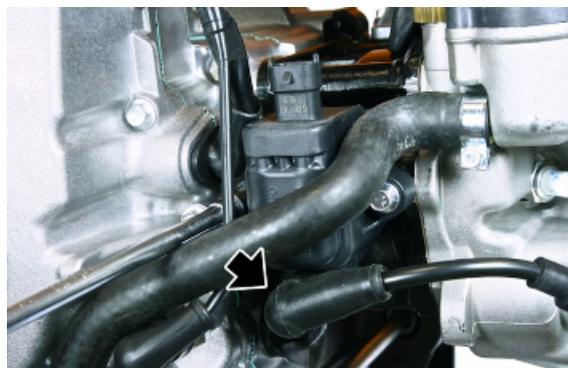


- Remove the gasket.

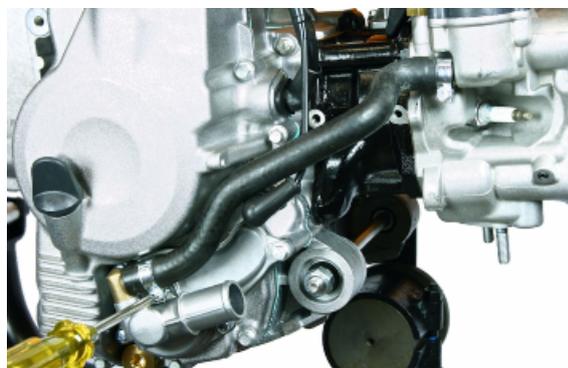


## Removing the flywheel cover components

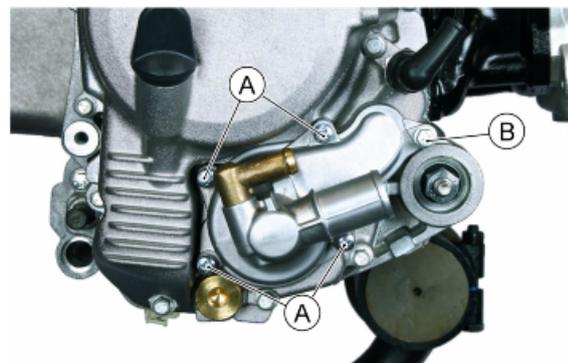
- Disconnect the spark plug cap.
- Undo the two fixing screws of the coil.



- Loosen the two clamps and remove the coolant internal recirculation pipe.



- Undo the four screws «A» and the fixing screw «B» of the coolant pump cover.



- Remove the cover and the relative gasket.



- The flywheel cover can be removed without unscrewing the impeller.
- Should it be necessary to remove the impeller, loosen the moulded nut.

**CAUTION**

THE THREAD IS ANTICLOCKWISE.

**CAUTION**

IF THE EFFORT REQUIRED TO UNSCREW THE IMPELLER IS HIGHER THAN THE NORMAL LOCKING TORQUE, REFERENCE SHOULD BE MADE TO THE REMOVAL OF THE DISMOUNTED FLYWHEEL COVER IMPELLER.

FAILURE TO FOLLOW THIS WARNING WILL CAUSE ABNORMAL AXIAL THRUST THAT CAN CAUSE DAMAGE TO THE CERAMIC SEAL.



## Removing the stator

- Remove the flywheel cover.
- Unscrew the three 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.



### Characteristic

#### Pick-up rotor measurement

0.4 to 0.75 mm

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

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

## Refitting the flywheel cover components

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

### Locking torques (N\*m)

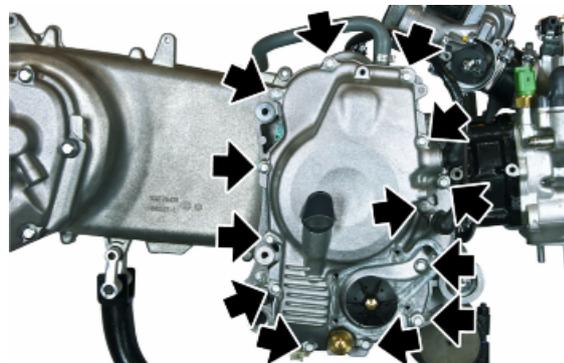
Pick-up screws 3 ÷ 4 Coil fixing screw 11 to 13 Oil drain screw 20 to 24

## Refitting the flywheel cover

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



- Paying attention to the alignment of the coolant pump shaft insert the crankcase with the command screw.
- Tighten the screws and tighten to the specified torque.



### Locking torques (N\*m)

Flywheel cover retainer screws (2 screws) - PRETIGHTENING 5 to 6 Flywheel cover retainer screws (12 screws) - TIGHTENING 11 to 13 TCIC M5x10 flywheel cover retainer screw 2.9 to 3.9

---

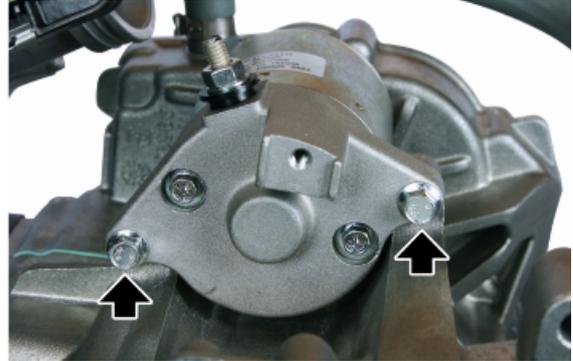
## Flywheel and starting

---

### Removing the starter motor

---

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

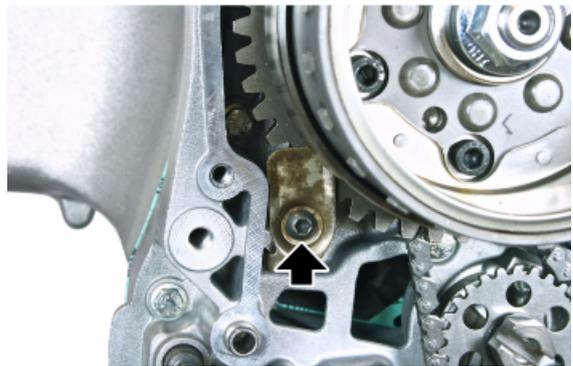


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### Removing the flywheel magneto

---

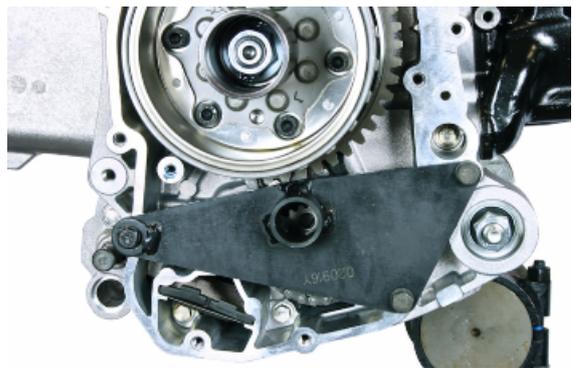
- Undo the screw indicated and remove the plate.



- Install the support plate.

#### Specific tooling

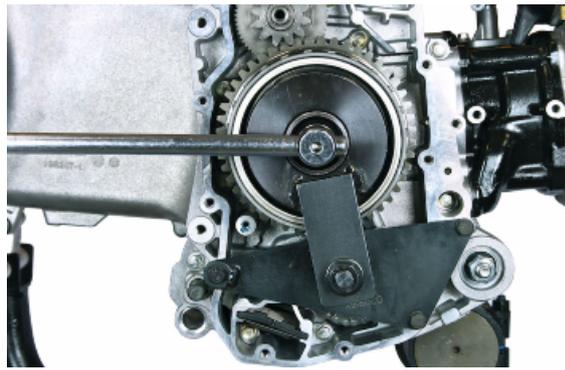
020916Y Support plate



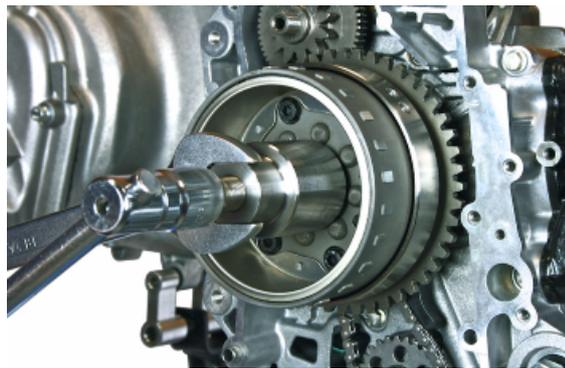
- Install the specific tool and unscrew the retainer nut of the flywheel, recovering the washer.

### Specific tooling

**020627Y Flywheel lock wrench**



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



### CAUTION



SCREWING UP THE NUT WITHOUT WASHER HELPS PROTECT THE THREAD AGAINST THE STRAIN EXERTED BY THE EXTRACTOR AND ALSO PREVENTS DROPPING THE FLYWHEEL ACCIDENTALLY UPON EXTRACTING IT. POTENTIAL DROPS MAY DAMAGE THE CERAMIC INSERTS.

### Specific tooling

**020467Y Flywheel extractor**

- Remove the tool and unscrew the nut.
- Remove the complete flywheel paying attention to recover the tongue.



## Inspecting the flywheel components

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

## Starter gear rim

**See also**

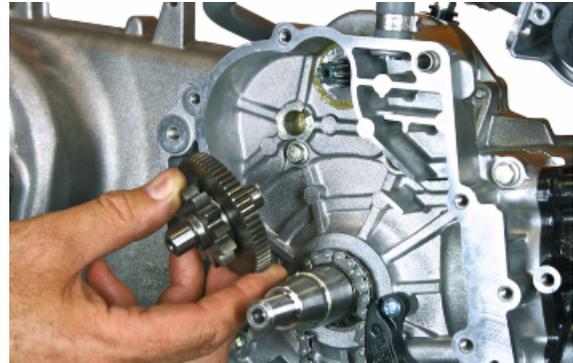
---

### Removing the flywheel magneto

---

#### Intermediate gear

- Remove the flywheel.
- Remove the intermediate gear from its housing.



- Visually inspect the surfaces, if there is no abnormal wear, grease the housing thoroughly and insert the intermediate gear.

---

#### Refitting the free wheel

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

#### Recommended products

##### Loctite 243 Medium-strength threadlock

Medium Loctite 243 threadlock

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



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

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

- Oil the free wheel "rollers".



## Refitting the flywheel magneto

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

### Locking torques (N\*m)

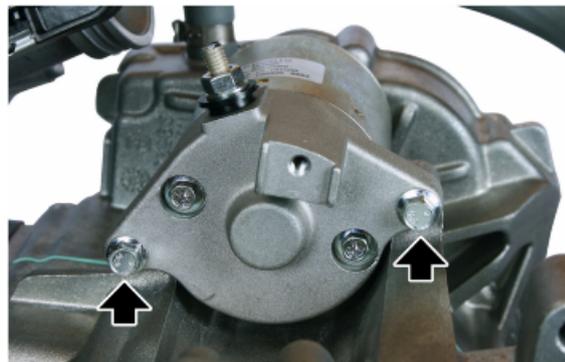
Starter crown plate fixing screws 5 to 6 Flywheel fixing nut 100 to 110

## 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 2 screws to the prescribed torque.

### Locking torques (N\*m)

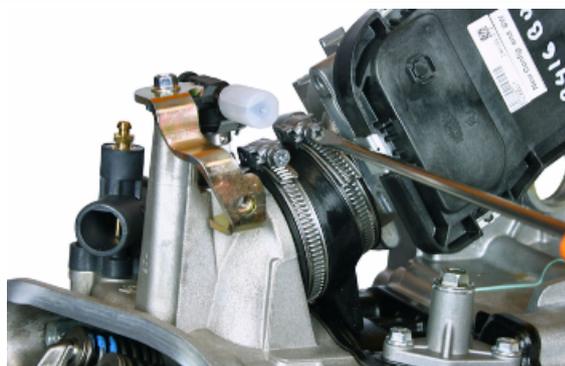
Starter motor screws 11 - 13

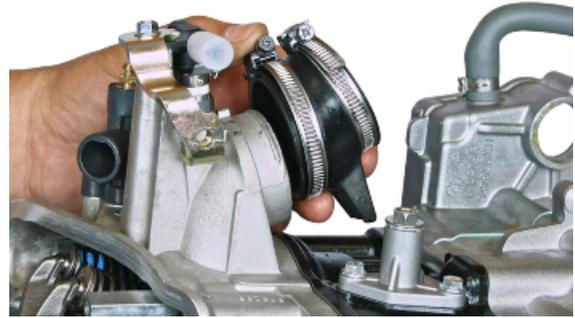


## Cylinder assy. and timing system

### Removing the intake manifold

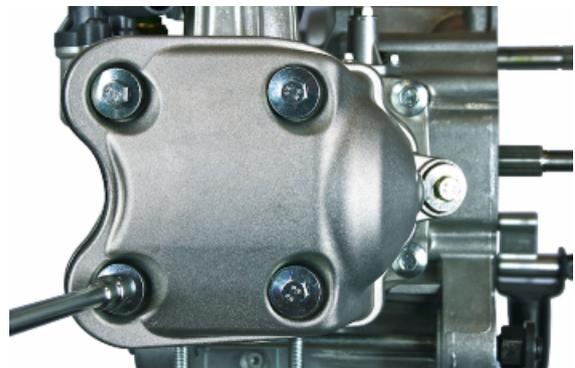
- The intake manifold is housed in the cylinder head, loosen the clamps and remove the sleeve connecting to the throttle body.





### Removing the rocker-arms cover

- Unscrew the five screws and remove the screws complete with the rubber buffers.

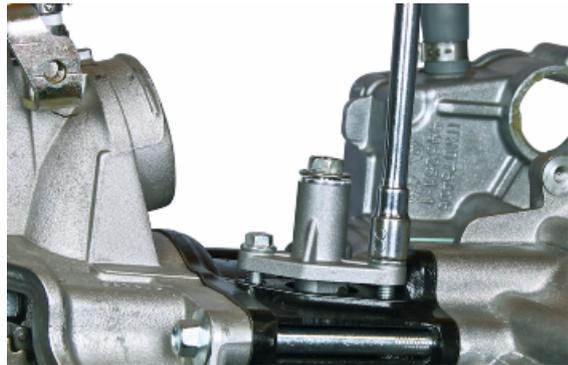
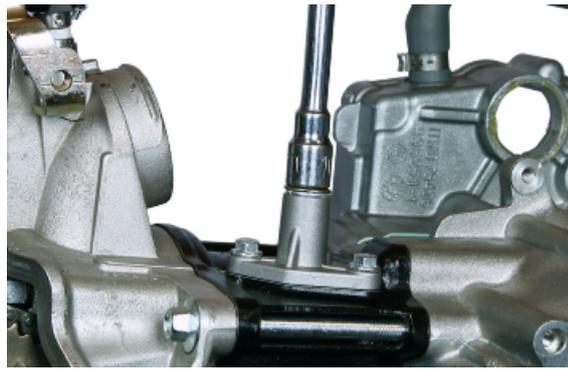


### Removing the timing system drive

- Before working on the timing system it is recommended to place the engine at TDC in compression, aligning the references as shown in the figure.



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



- Loosen the screw



- Undo the fixing screw and remove the washer.





- Remove the complete mass of the return spring.



- Unscrew the screw and remove the counterweight.



- Disengage the chain from the sprocket and remove the camshaft control sprocket.

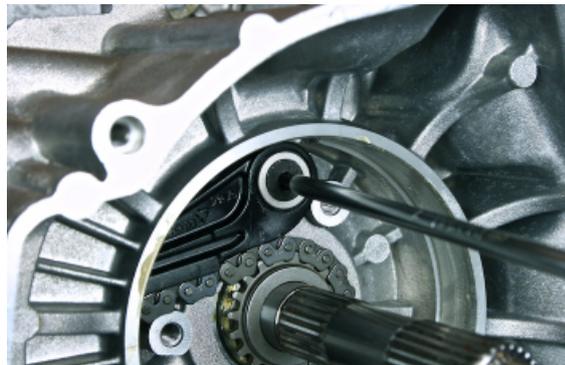


- Remove the plate.



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 guide slider.



- 
- Release the timing chain from the crankshaft



- 
- Remove the control gear.



---

## Removing the cam shaft

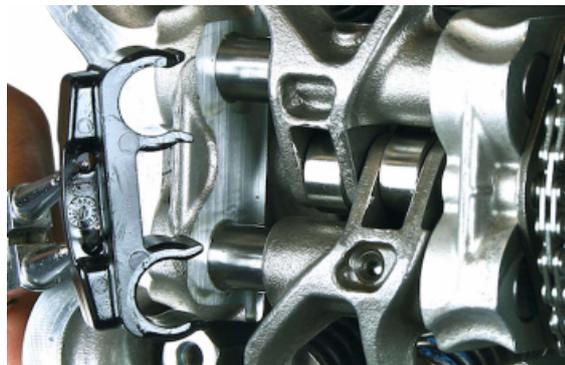
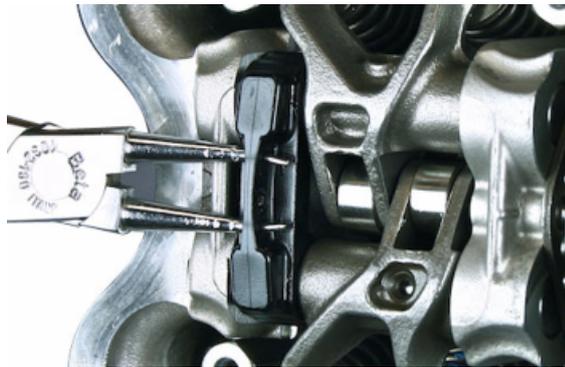
- 
- Unscrew the two screws of the camshaft lock.



- 
- Remove the lock and the camshaft.



- 
- Remove the lock of the rockers to allow them to slide on the pins to access the calibrated pads.



- Remove the calibrated pads

**CAUTION**

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

**CAUTION**

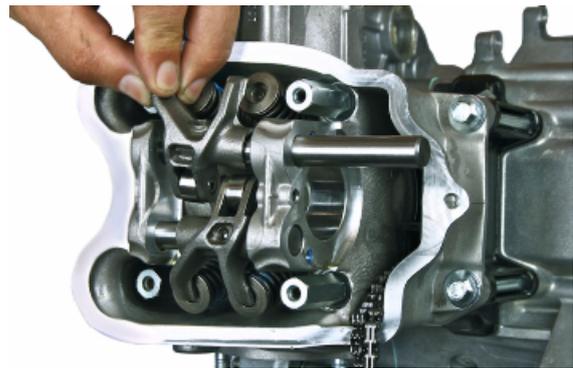
IF NECESSARY USE A TELESCOPIC MAGNET TO REMOVE THE PADS, PAY PARTICULAR ATTENTION THAT THEY DO NOT FALL IN THE TRANSMISSION HOUSING.



- Remove the pins and the rockers.

**N.B.**

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

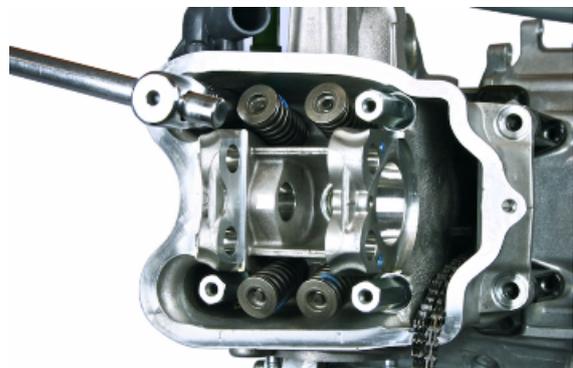


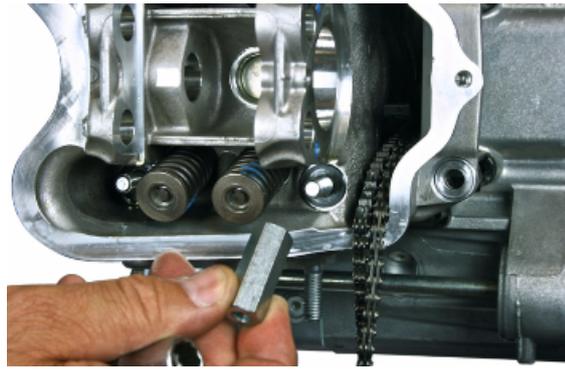
## Removing the cylinder head

- Undo the two external screws.



- Gradually loosen the four columns in crossed sequence, recovering the washers.

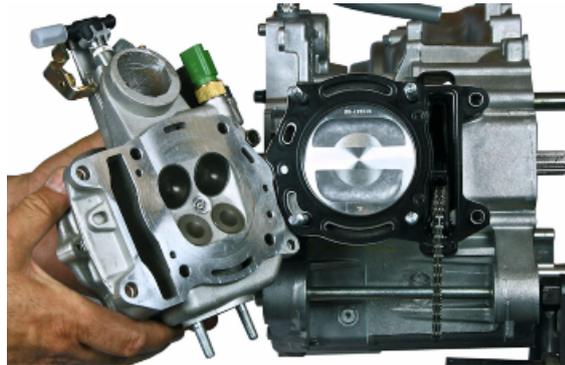




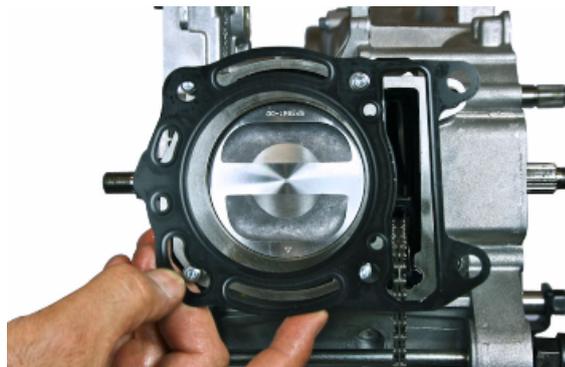
- Remove the cylinder head.

**N.B.**

**IF NEEDED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, PINS AND ROCKING LEVERS WITHOUT REMOVING THE DRIVING PULLEY UNIT. REMEMBER TO HOLD THE TIMING CHAIN WITH A PIECE OF METAL CABLE AND TO ADJUST THE CHAIN TIGHTENER UPON RE-FITTING.**



- Remove the gasket.



## Removing the valves

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

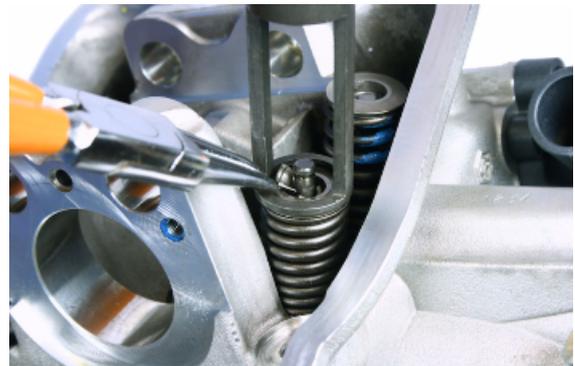
**CAUTION**

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

**Specific tooling**

020382Y Tool to extract valve cotters

020382Y012 bush (valve removing 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.

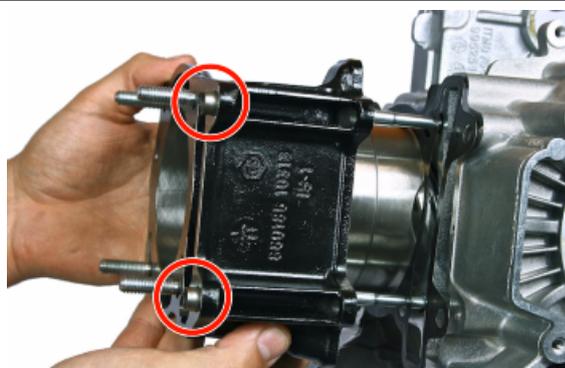
- Remove the cylinder, paying attention to the cylinder - head alignment dowels.

### N.B.

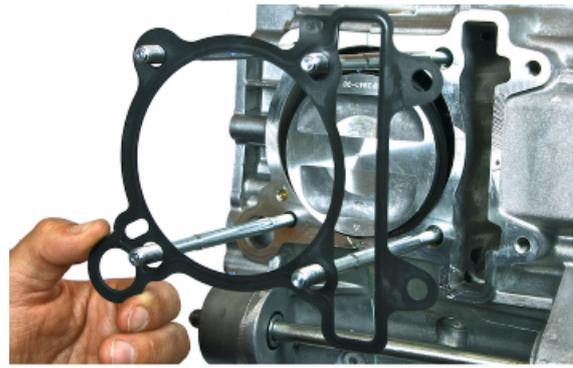
IN ORDER NOT TO DAMAGE THE BASE GASKET WITH THE PISTON LOCK FORK 020512Y DURING THE MOUNTING PHASE, IT IS RECOMMENDED TO INSERT THE ALIGNMENT DOWELS OF THE CYLINDER - CRANKCASE UNDER THE CYLINDER DURING THE ASSEMBLY.

### CAUTION

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



- 
- 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.](#)

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## Inspecting the piston

N.B.

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

See also

[Cylinder - piston assy.](#)

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## Inspecting the piston rings

N.B.

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

See also

[Piston rings](#)

---

## Removing the piston

- Insert the pin.
- Insert the retainer rings.

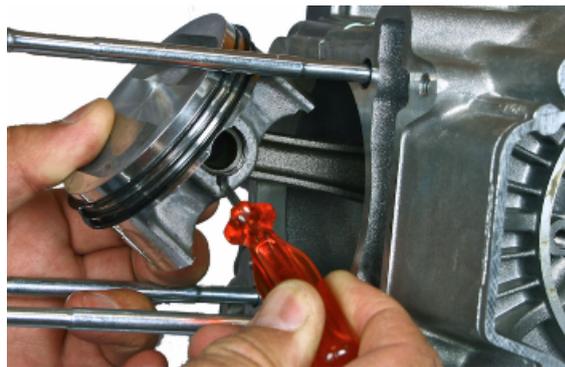
**CAUTION**

POSITION THE ARROW PRINTED ON THE PISTON CROWN TOWARDS THE EXHAUST OPENING. THE WRIST PIN SNAP RINGS MUST BE POSITIONED ON THE PISTON WITH THE SPECIFIC TOOL

**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

#### 020921Y Piston position checking 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

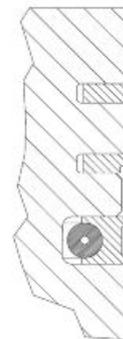
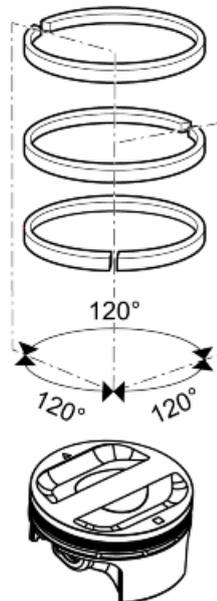
[Slot packing system](#)

## Refitting the piston rings

- Pistons (like cylinders) are supplied in 4 categories: M,N,O,P, must be mounted so that the reference arrow is pointing towards 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  $120^\circ$  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 piston lock in the flywheel side piston, directing the bands in the indicated position, lubricate with the recommended product and place the piston in the specific tool.

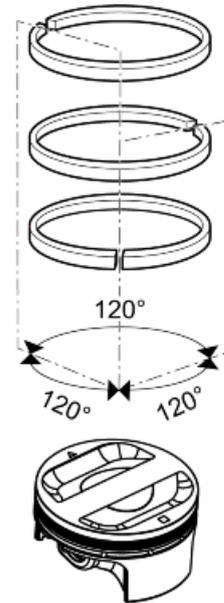
### Specific tooling

**020927Y Piston assembly band**

### Recommended products

**eni i-Ride PG 15W-50 Synthetic-based lubricant for four stroke engines.**

JASO MA, MA2 - API SJ - ACEA A3



- Acting on the piston, insert it in the specified tool until half of the seat of the piston goes out from the lower part.





- Lubricate the cylinder with the recommended product.
- Place the piston installed in the tool in the cylinder, the lower part will be the guide.
- Use a handle positioned in the centre of the piston and in one movement push the piston inside the cylinder.



### Recommended products

**eni i-Ride PG 15W-50 Synthetic-based lubricant for four stroke engines.**

JASO MA, MA2 - API SJ - ACEA A3

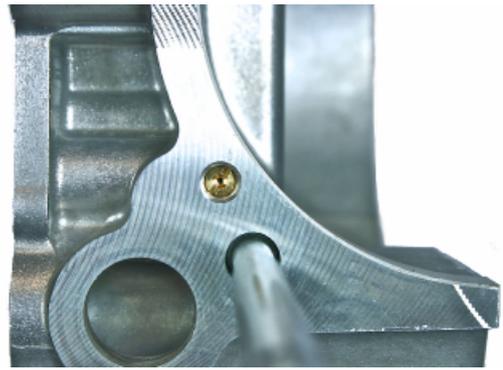
- Insert the piston, position it so that you can carry out the fitting the connecting rod, until the seat of the pin goes out from the lower part.



**N.B.**

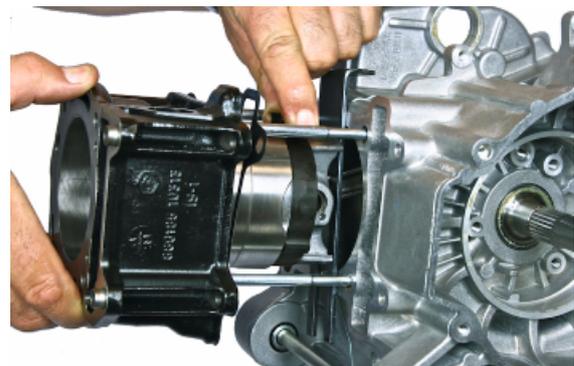
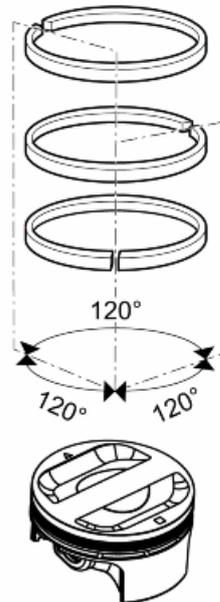
**BEFORE FITTING THE CYLINDER, CAREFULLY BLOW OUT THE LUBRICATION DUCT AND OIL THE CYLINDER LINER.**

- 
- Check the position of the dowels and insert the gasket with the previously determined thickness.



---

In addition to the above procedure, the piston can be fitted with another special tool:



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## Inspecting the cylinder head

N.B.

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

See also

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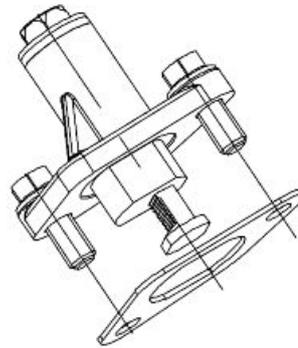
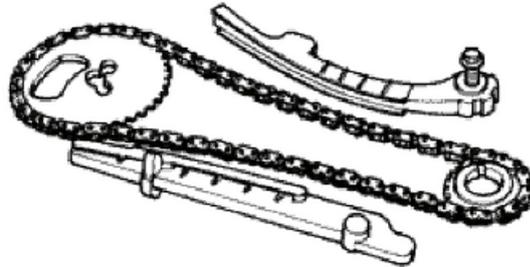
[Cylinder Head](#)

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## Inspecting the timing system components

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- 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](#)

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## Inspecting the valves

**N.B.**

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

**See also**

[Cylinder Head](#)

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**VALVE CLEARANCE CHECK**

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



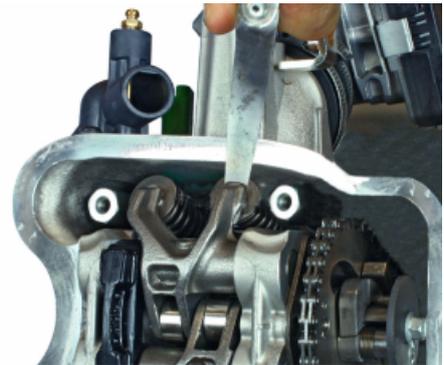
- Using a feeler gauge check the valve clearance.

**CAUTION**

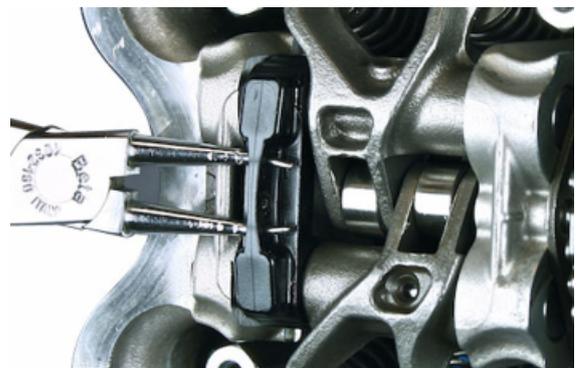
- USE THE FEELER GAUGE LATERALLY, IN LINE WITH THE VALVES, IN ORDER TO PREVENT ACCIDENTAL BENDING OF THE BLADE THAT MAY AFFECT THE MEASUREMENTS.

**Characteristic****Valve clearance**

Intake: 0.10 mm Exhaust: 0.15 mm



- Detecting incorrect values, proceed with the replacement of the calibrated pad. To perform this operation you must remove the rockers lock.
- Using pliers, remove the lock.





- Move the rocker and replace the interested pad, correcting the clearance in the pre-set value.

**N.B.**

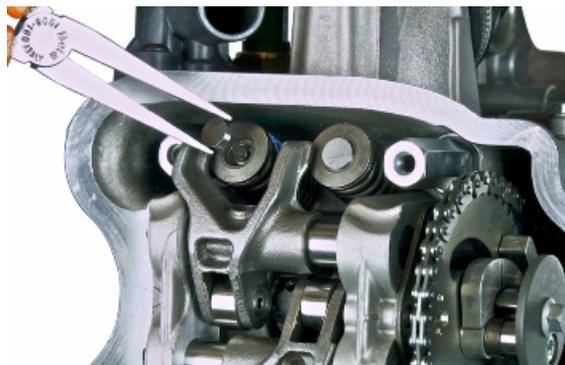
INSERT THE CALIBRATED PADS WITH THE WORDS SIDE VALVE IN ORDER TO PRESERVE THE INDICATION OF THICKNESS OVER TIME.

THE OUTLET ROCKER SLIDES ON THE AXIS ONLY AFTER THE INTAKE ROCKER HAS BEEN MOVED. MAKE SURE THAT THE PADS DO NOT FALL INSIDE THE ENGINE COMPARTMENT.

**Characteristic**

**Valve clearance**

Intake: 0.10 mm Exhaust: 0.15 mm



- Insert the rockers lock.
- Fit the valve cover.



## 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

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



**N.B.**

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

### Specific tooling

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

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

**020382Y012** bush (valve removing tool)



## Inspecting the cam shaft

**N.B.**

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

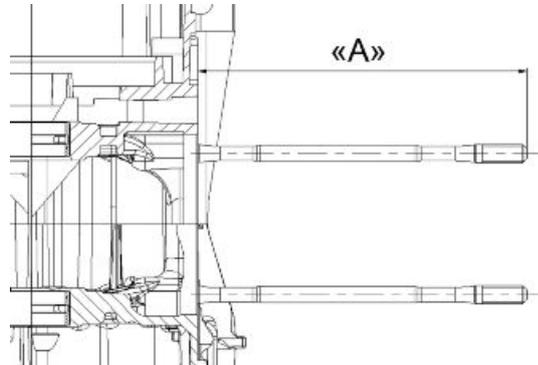
**See also**

## Cylinder Head

## Refitting the head and timing system components

**CAUTION**

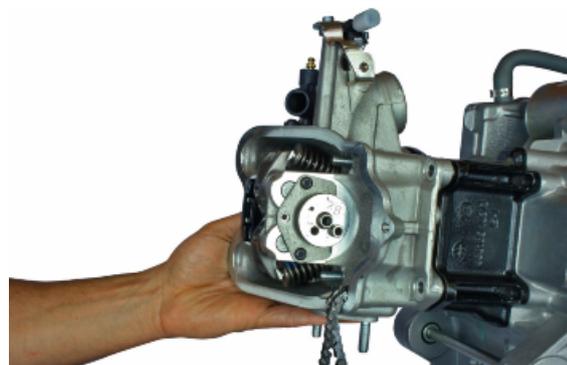
AT EACH REMOVAL OF THE CYLINDER HEAD IT IS NECESSARY TO REPLACE THE STUD BOLTS. FOR FITTING QUOTA SEE THE SECTION "MOTOR/STUD BOLT SHAFT CRANKCASE"



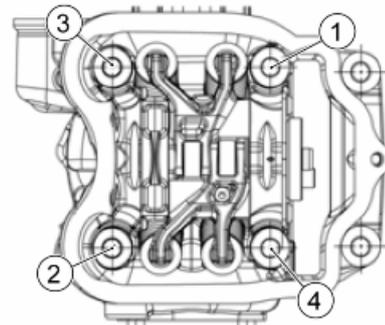
- Position the crankshaft to the TDC in compression



- 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 up the nuts to an initial pre-torque of 9-11 ± 1 Nm.
- Tighten up the nuts by rotating 270.0±5.0° with crossed sequence.
- Fit the two screws on the outside of the timing chain side and tighten them to the specified torque.



**N.B.**

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

**CAUTION**



**ALWAYS USE A NEW HEAD GASKET UPON REFITTING.**

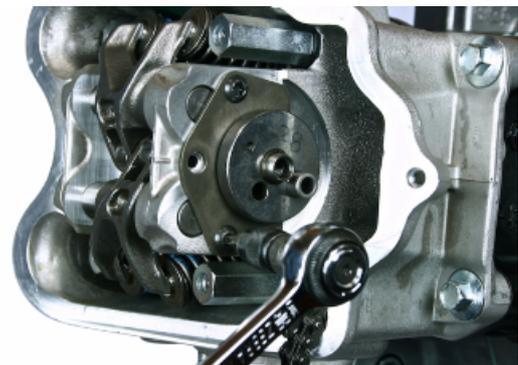
**Locking torques (N\*m)**

**Screws fixing cylinder head to crankcase 20 to 24**  
**Cylinder head nut (PRE-TIGHTENING) 6 - 8**  
**Cylinder head nut (TIGHTENING) 9 to 11** (Tighten to 9 to 11 Nm then proceed for 270.0° ±5.0° of rotation)



Fit the pins and rocking levers.

- Lubricate the two rockers through the upper holes.
- Lubricate the two housings and insert the camshaft in the cylinder head with the cams opposing the rockers.
- Insert the calibrated pads and block the sliding of the rockers by inserting the lock.
- Insert the retention plate and tighten the three screws locking them to the specified torque. Clean any threadlock remains from the seats, do not use threadlock, the new screws to use during mounting have scotch-grip application.

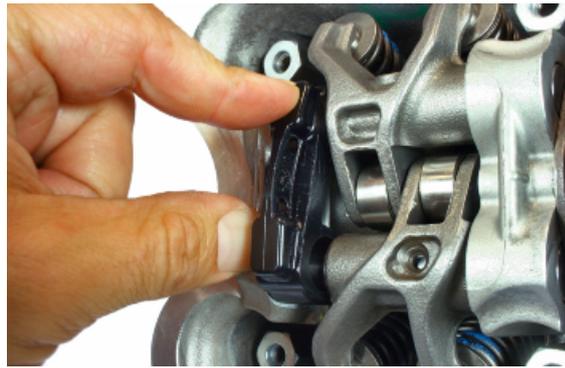


**CAUTION**

**FOR THE INSTALLATION, ALWAYS USE NEW NUTS ALREADY PROVIDED WITH SCOTCH GRIP.**

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

**Containing plate retainer screws 4.5 to 5.5**



- Working in reverse order, assemble the camshaft command components, respecting the phase position.
- To tighten the decompressor, bring the mass screw to a stop and, holding it tightly, tighten the central locking screw of the starter crown.
- Then tighten the central screw.



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

**Pressure reducer counterweight retainer screw 7 to 8.5 Timing system gear sprocket fixing screw 11 to 15**



Set the tensioner cursor to the rest position.

- Fit the chain tensioner on the cylinder, using a new gasket, and tight the two screws to the prescribed torque.
- Insert the chain tensioning screw, together with the spring and washer, tightening it to the prescribed torque.

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

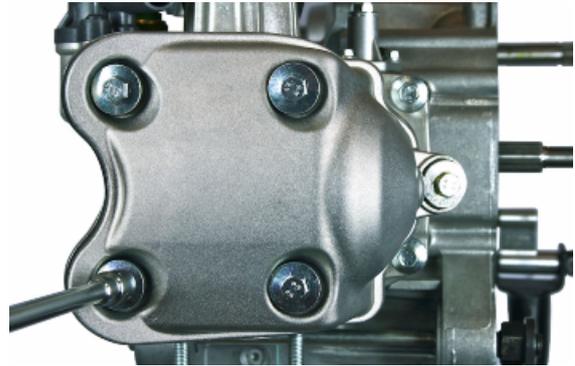
**Mount the locking chain tensioner with 2 screws 11 to 13 Locking the chain tensioner support hood 5 to 6**

---

**Refitting the rocker-arms cover**

---

- Refit the cylinder head cover and tighten the 5 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.

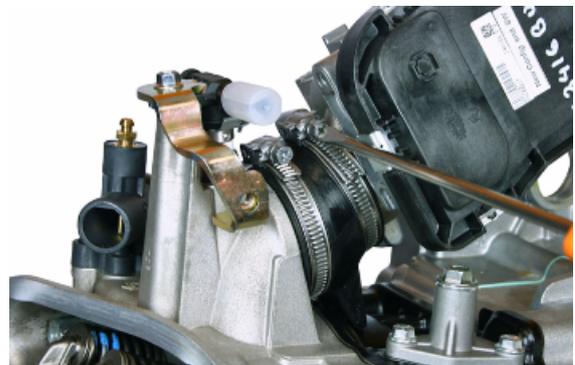
**Locking torques (N\*m)****Head cover screws 6 to 7**

---

**Refitting the intake manifold**

---

- Insert the joint sleeve between the manifold and the control unit on the cylinder head, insert the throttle body and tighten the screws to the specified torque.

**Locking torques (N\*m)****Throttle body clamp screws 1.3 to 1.7**

---

**Crankcase - crankshaft**

---

## Splitting the crankcase halves

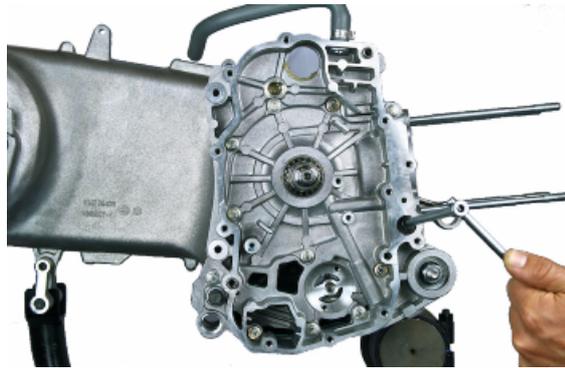
- Undo the twelve crankcase coupling screws.
- Separate the crankcase halves while keeping the crankshaft in one of these two halves.
- Only after the halves have been separated, can the crankshaft be checked.

### CAUTION

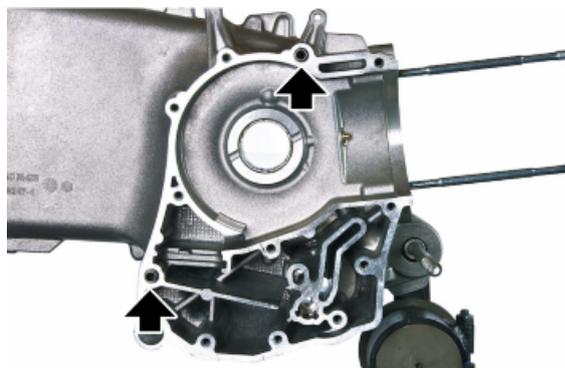
WHILE OPENING THE CRANKCASES AND REMOVING THE CRANKSHAFT, CHECK THAT THE THREADED SHAFT ENDS DO NOT INTERFERE WITH THE MAIN BUSHINGS. FAILURE TO OBSERVE THIS PRECAUTION CAN DAMAGE THE MAIN BUSHINGS.

### 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.



- Remove the by-pass and the oil bulkhead.



- 
- After removing the oil bulkhead, blow and clean thoroughly before fitting.



---

## 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 (see diagram).
- Take particular care, also, that there are no signs wear in the oil by-pass valve housing (see Chapter Lubrication), as this could prevent a good seal in the piston, which regulates the oil pressure.
- On the flywheel side crankcase half, take particular care cleaning the oil ducts for the main bushings, the oil duct for the jet that lubricates the



cylinder head and the oil drainage duct at the fly-wheel 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.**

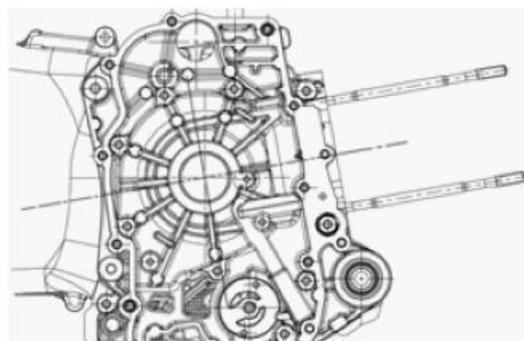
THE JET IS FED THROUGH THE MAIN BUSHINGS. PROPER OPERATION OF THIS COMPONENT IMPROVES PISTON CROWN COOLING. CLOGGING HAS EFFECTS THAT ARE DIFFICULT TO DETECT (PISTON TEMPERATURE INCREASE). FAILURE OR LEAKS CAN CAUSE A CONSIDERABLE DROP IN THE LUBRICATION PRESSURE FOR MAIN BUSHINGS AND CONNECTING ROD.

**N.B.**

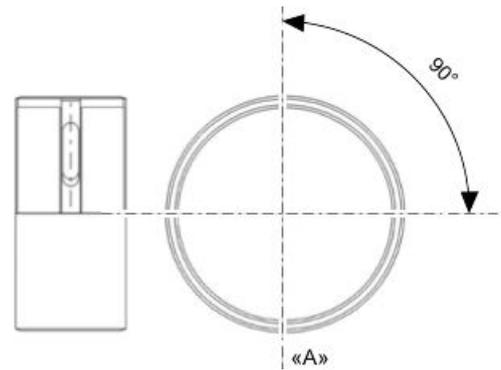
THE HEAD LUBRICATION CHANNEL IS PROVIDED WITH A SHUTTER JET; THIS GIVES A "LOW PRESSURE" HEAD LUBRICATION; THIS CHOICE WAS MADE TO REDUCE THE OIL TEMPERATURE IN THE SUMP. THE JET CLOGGING IMPAIRS THE HEAD LUBRICATION AND THE TIMING MECHANISMS. A JET FAILURE CAUSES A DECREASE OF THE MAIN BUSHING AND CONNECTING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



- 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 and the oil bulkhead.
- 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.

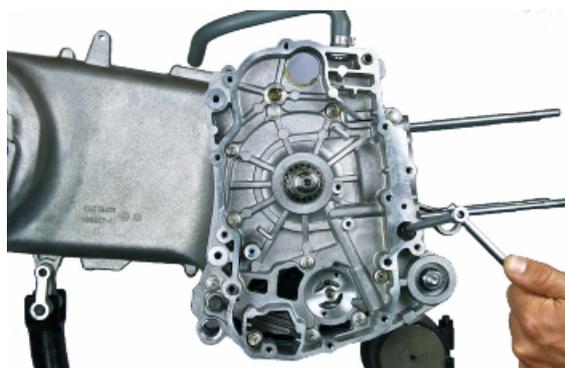
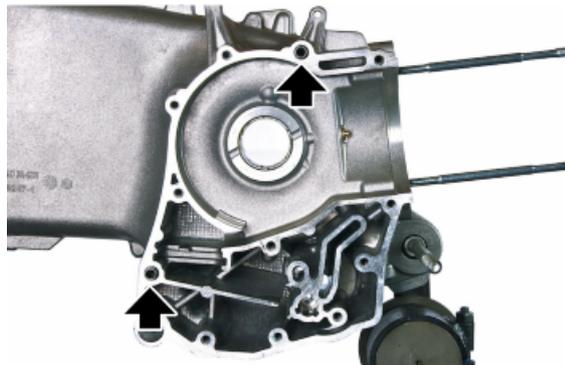
CAUTION



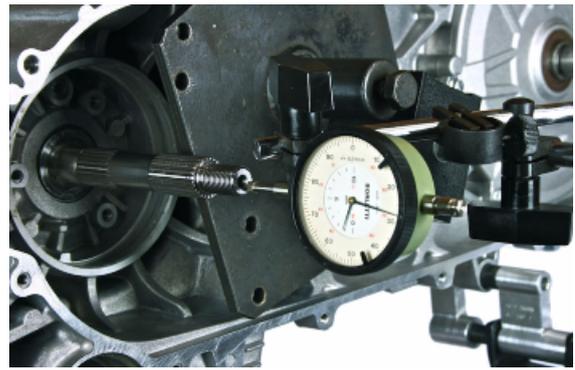
IT IS ADVISABLE TO INSERT THE CRANKSHAFT IN THE FLYWHEEL SIDE CRANKCASE HALF TO PREVENT, WITH ACCIDENTAL MOVEMENTS DURING INSERTION, THE OIL PUMP CONTROL TOOTHING FROM DAMAGING THE BUSHINGS.

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

Engine-crankcase coupling screws 11 to 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.



### Specific tooling

**020163Y Crankcase splitting plate**

**020335Y Magnetic support for dial gauge**

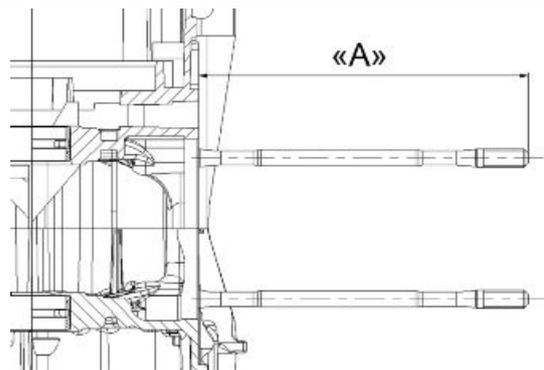
### Characteristic

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

0.15 ÷ 0.43 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.**

**THE STUD BOLTS MUST BE REPLACED AT EACH REMOVAL OF THE CYLINDER HEAD.**

**N.B.**

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

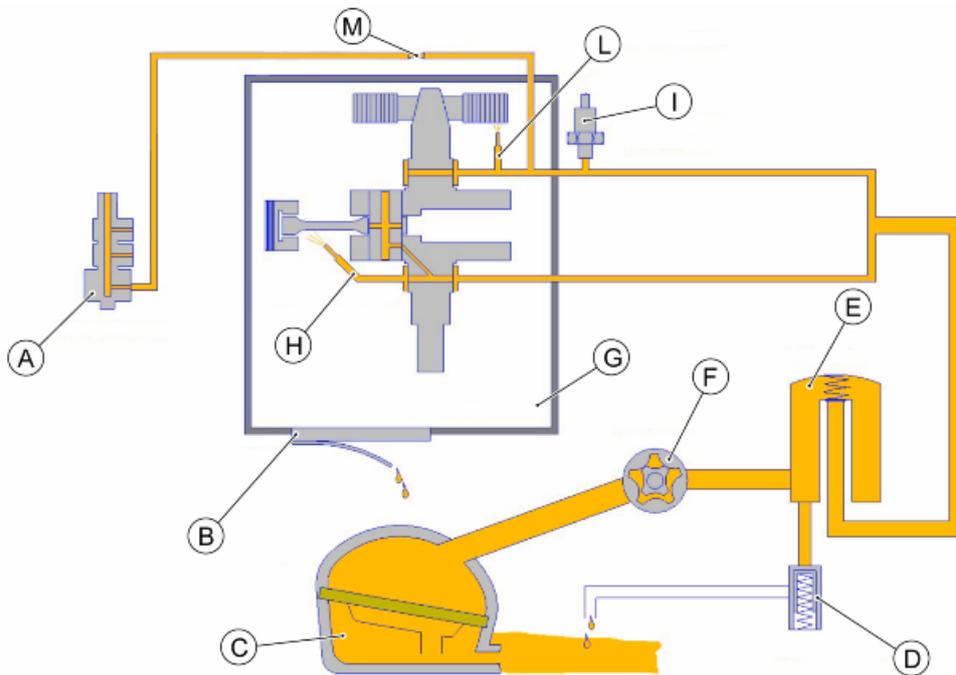
### Characteristic

**Driving depth of stud bolts «A»**

139.5 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».

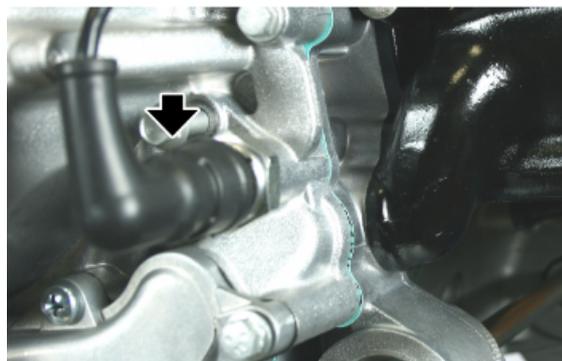
Through the suitable passages found in the crankcases, the oil enters the crank chamber «G» where the main bearings are lubricated and the big end (with high pressure), the piston pin and connecting rod small end via spray «H».

Afterwards, the oil, through a nozzle «M» whose function is to reduce the flow rate, reaches the timing system where it lubricates the camshaft «A» and from there, the 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

- Remove the electrical minimum oil pressure switch connection and remove the switch.
- Check that the oil pressure reading is between 0.5 and 1.2 bar with the engine idling at 1650 rpm and the oil at the required temperature (wait for at least one electric ventilation).



- Check that the oil pressure is between 3.2 and 4.2 bar with the engine running at 6000 rpm and the oil at the required temperature.
- Remove the appropriate tools once the measurement is complete, refit the oil pressure switch and washer, tightening it to the prescribed 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 1650 rpm: 0.5 - 1.2 bar
- At 6000 rpm: 3.2 - 4.2 bar

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

**Minimum oil pressure sensor 12 to 14**

---

**Crankshaft oil seals**

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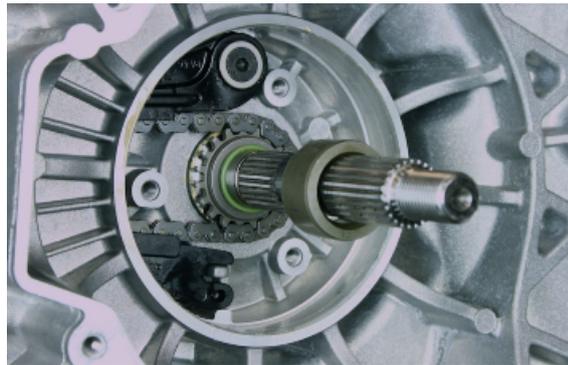
**Removal**

- 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.

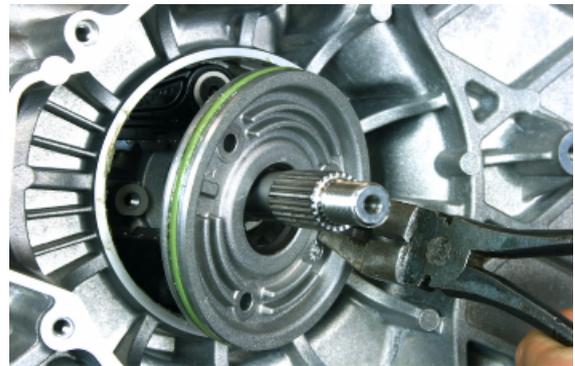
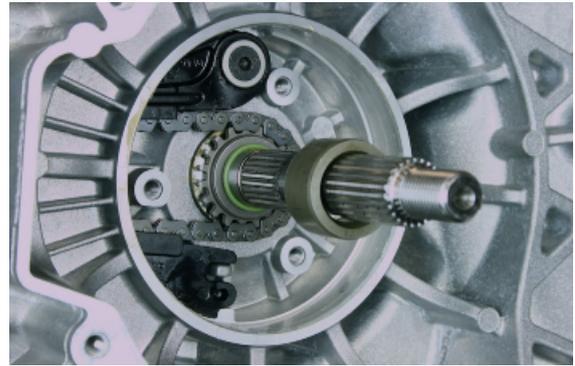
### WARNING



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



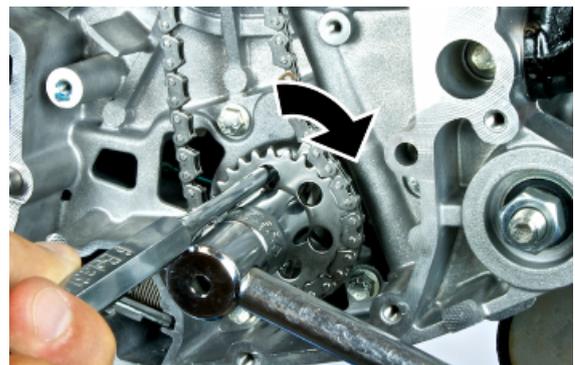
## Oil pump

### Removal

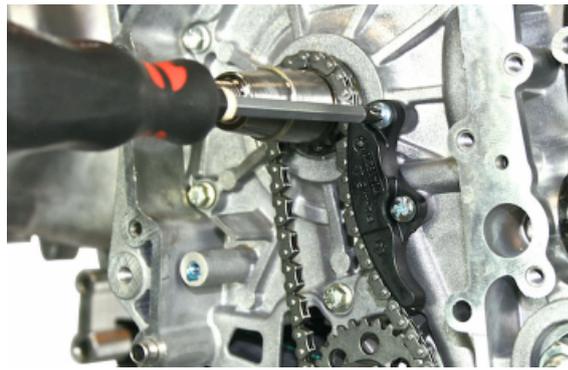
- Remove the flywheel.
- Preventing rotation, unscrew the water pump command screw and collect the washer.

### CAUTION

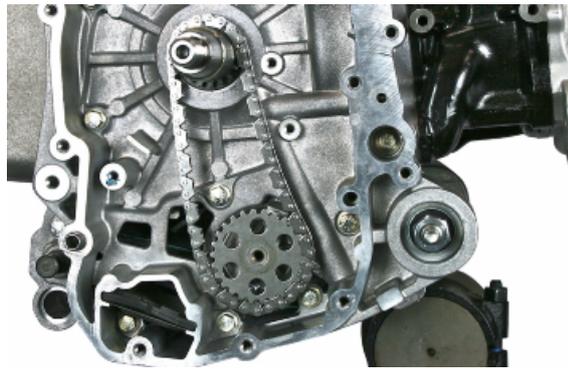
THE THREAD IS ANTICLOCKWISE.



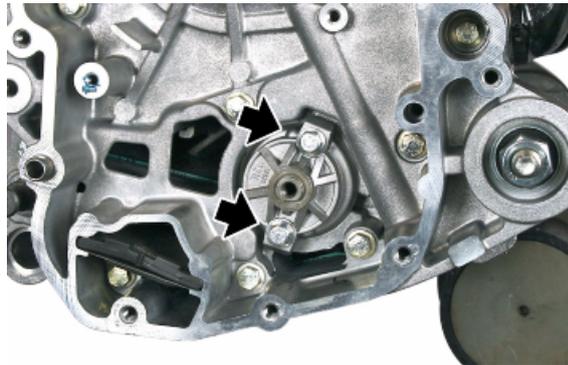
- Unscrew the two screws and remove the tensioner pad



- 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 trued bar as shown in the figure.

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

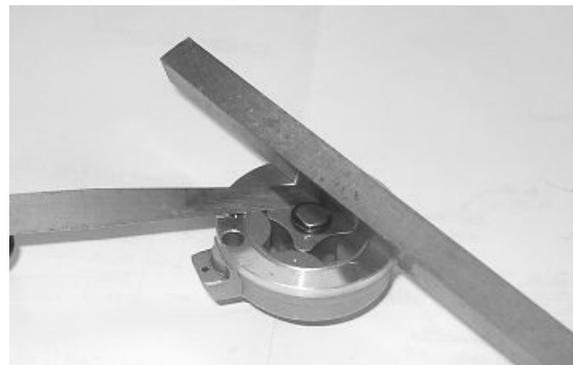
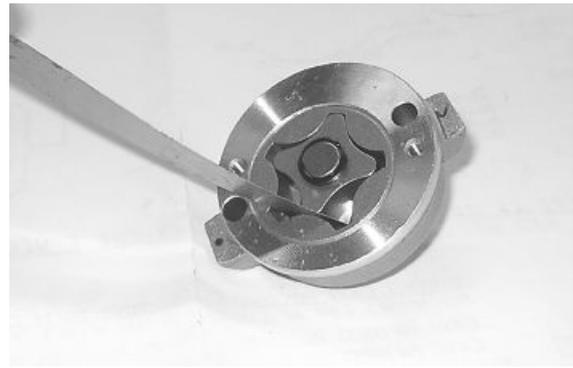
Limit values admitted: 0.09 mm

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

Admissible limit clearance: 0.20 mm

**Distance between the rotors**

Admissible limit clearance: 0.12 mm



## Refitting

- 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.
- Insert the tensioner slider and tighten the two screws using the recommended product.

**N.B.**

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

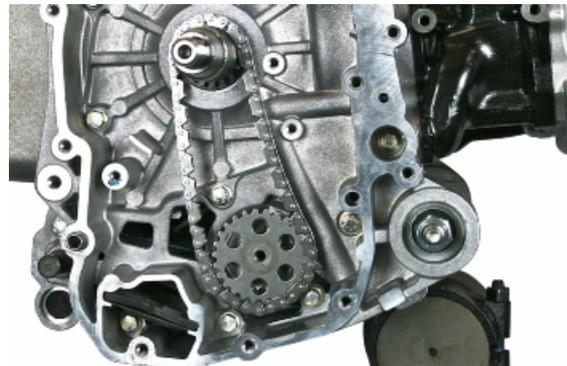
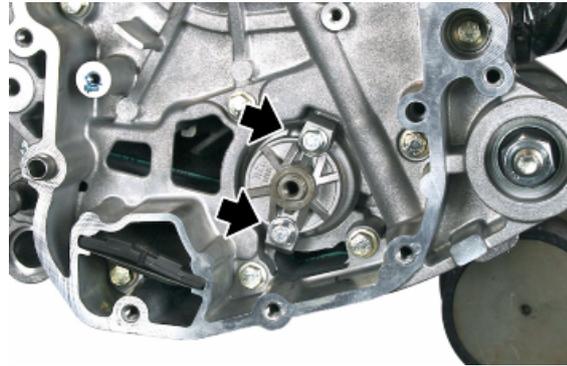
### Recommended products

**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.

**CAUTION**

THE THREAD IS ANTICLOCKWISE.

### Locking torques (N\*m)

**Oil pump command sprocket screw 9 - 11**



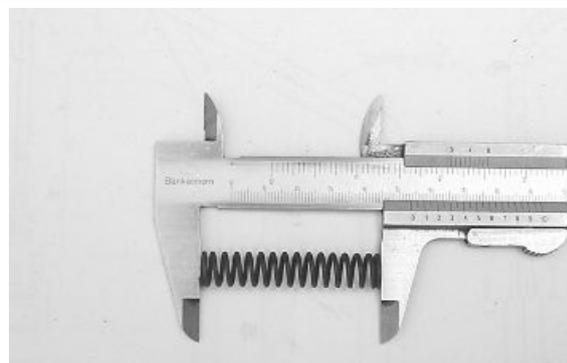
## Inspecting the by-pass valve

- 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

## Engine oil cooler

### REMOVAL

- Drain the oil from the sump.
- Remove the oil filter cartridge.



- Remove the fitting fixing the oil filter, paying attention to retrieve the washer.



- Undo the screw indicated and remove the oil radiator.



**FITTING**

- Replace the O-ring, properly grease and mount the radiator by following the disassembly steps in reverse, observing the prescribed torques.

**Recommended products**

**Loctite 243 Medium-strength threadlock**

Medium Loctite 243 threadlock

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

**Oil radiator fixing screw 9 - 11 Fitting fixing of the oil filter 20 Oil filter 4 to 6**

**Water pump****Removal**

- Before removing the flywheel cover, loosen the impeller.

**CAUTION**

THE THREAD IS ANTICLOCKWISE.

**CAUTION**

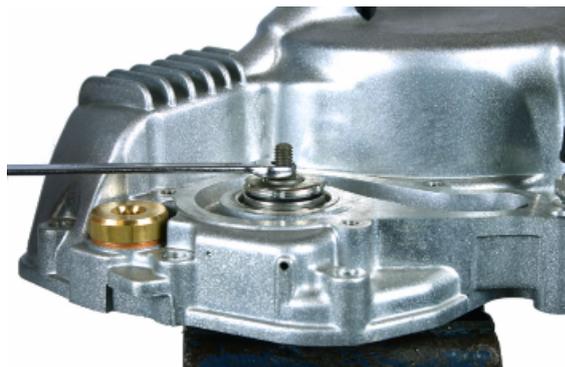
IF THE LOCKING TORQUE IS EXCESSIVE, DO NOT INSIST WITH THE OPERATION BUT CARRY IT OUT AFTER THE REMOVAL OF THE FLYWHEEL COVER. AFTER REMOVING THE FLYWHEEL COVER, LOCK THE IMPELLER (DRIVE SIDE OF MOTORCYCLE) IN THE CLAMP AND, ACTING FROM THE OPPOSITE SIDE, LOOSEN THE IMPELLER SHAFT (LEFT-HAND THREAD).

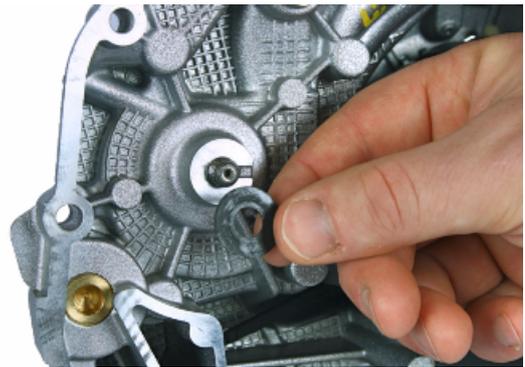
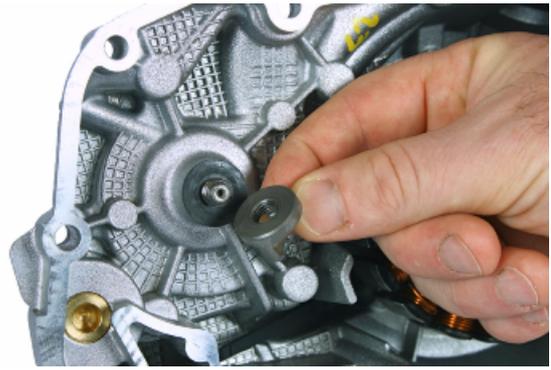


- Keeping the cover locked in a vice, unscrew the impeller shaft drive. During removal, support the flywheel crankcase. Remove the drive and the shim washer underneath.

**CAUTION**

THE THREAD IS ANTICLOCKWISE.

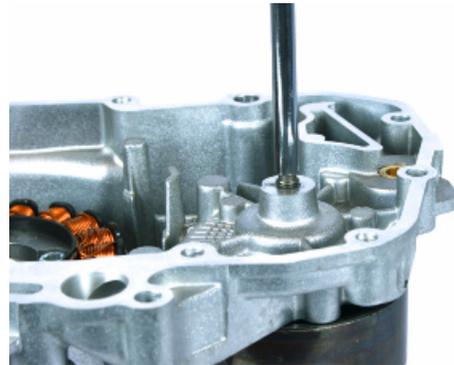




- Using the special tool and appropriate supports, ensure a proper support surface. Using a hammer and a plug (of diameter less than 8 mm and being careful not to damage the shaft seat) remove the shaft and ceramic seal.

### **Specific tooling**

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

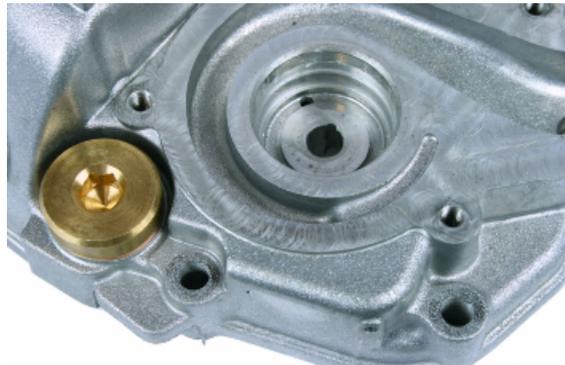


- Supporting the ceramic seal properly, remove the impeller shaft, acting from the mobile side of the seal.





- Using a screwdriver, remove the seal ring from the flywheel cover.
- Check that the shaft housing hole on the crankcase does not show abnormal wear. Make sure the ceramic seal seat does not show signs of scoring. Check the cleaning of the drain and lubrication holes.



## Fitting

- Lubricate the new seal ring with grease and insert it in the flywheel cover.

### Specific tooling

020376Y Adaptor handle

020375Y 28 x 30 mm adaptor





- Grease the shaft and insert it in the seat. Insert the shim washer and manually start-up the drive.



- Locking the drive in a vice, properly lock the shaft.
- Check that the shaft rotates freely (considering the friction of the oil seal) and that the axial clearance is noticeable but not excessive.

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

**Water pump impeller driving joint 13 - 15**



- Insert the new ceramic seal using the specific tool.
- Start the tool.
- Insert the new ceramic seal.
- Insert the housing of the tool and tighten the nut with a wrench while holding the central pin locked. Screw until the seal stops on the crankcase.
- The special tool provides for processing that ensures the proper preloading of the ceramic seal.
- Remove the tool.

### Specific tooling

**020661Y Water pump overall seal replacement kit**





- Insert and screw the impeller to the specified torque.

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

**Impeller on the pump shaft 4 to 6**



## INDEX OF TOPICS

INJECTION

INJEC



### **COMPONENT LAYOUT**

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

### **MIU injection system**

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

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

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

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

- Coolant temperature.
- Intake air temperature
- Lambda probe

The system implements 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 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 two pipes provided with quick couplings. This allows obtaining a continuous circulation, thereby avoiding the risk of fuel boiling. The pressure regulator is situated at the end of the circuit.

The fuel pump is controlled by the MIU; 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.

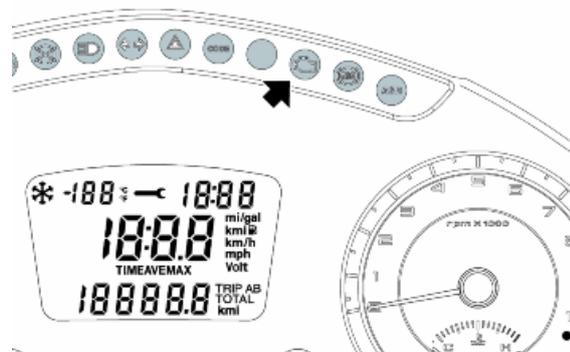
The MIU injection-ignition system controls engine functions by means of a pre-set program.

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.

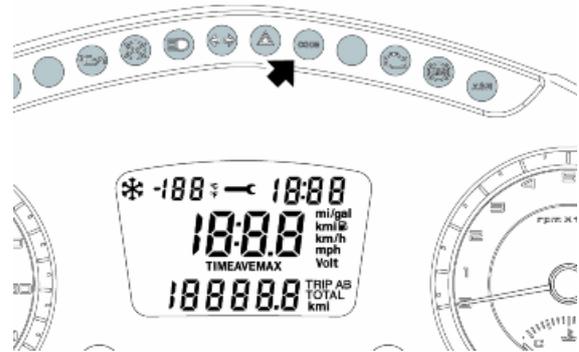
### Specific tooling

#### 020922Y Diagnosis Tool

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

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

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



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

## Precautions

### Troubleshooting hints

1. An injection system fault is more likely to be caused by a connection than a component.

Before troubleshooting the system, carry out the following checks:

#### **A:** Electrical power supply

- a. Battery voltage
- b. Blown fuse
- c. Solenoids
- d. Connectors

#### **B:** Chassis ground

#### **C:** Fuel system

- a. Broken fuel pump
- b. Dirty fuel filter

#### **D:** Ignition system

- a. Faulty spark plug
- b. Broken coil
- c. Broken shielded cap

#### **E:** Intake circuit

- a. Dirty air filter
- b. Dirty by-pass circuit
- c. Faulty Stepper motor

**F: Other**

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

**2.** EMS faults may be caused by loose connectors. Make sure that all connections are properly implemented.

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 failure changes if the connector is slightly vibrating.

**3.** Before replacing the EMS ECU, check the whole system thoroughly. If the fault is fixed even by replacing the control unit, install the original control unit again and check if the fault occurs again.

**4.** Use a multimeter with an internal resistance over 10 KW/V for troubleshooting. Using unsuitable instruments may damage the ECU. The instruments to be preferred have a definition over 0.1V and 0.5W and an accuracy over  $\pm 2\%$ .

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**1.** Before repairing any part of the injection system, check if any faults have been stored. Do not disconnect the battery before checking for faults.

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

**3.** When repairing electric components, the battery must always be disconnected unless it is strictly necessary for the battery to be connected.

**4.** When carrying out functional tests, ensure that battery voltage is above 12V.

**5.** Before attempting to start the vehicle, ensure that there are at least two litres of fuel in the tank. Failure to respect this norm will damage the fuel pump.

**6.** If a long period is envisaged with the vehicle not in use, fill the tank to at least the halfway mark. This will ensure the pump will be covered by fuel.

**7.** When washing the vehicle, do not spray excessive water on electric components and wiring.

**8.** In the event of ignition problems, begin troubleshooting from the battery and the injection system connections.

**9.** Before disconnecting the 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 system connectors only if required. Before reconnecting, check that the connectors are dry.

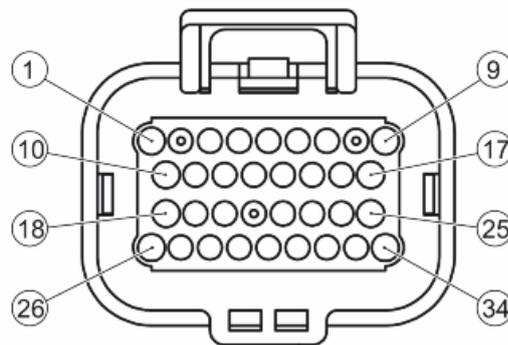
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12. When carrying out electric inspections, do not force the tester probes into the connectors. Do not take measurements not specifically foreseen by the manual.

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 control unit.

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

## Terminals setup

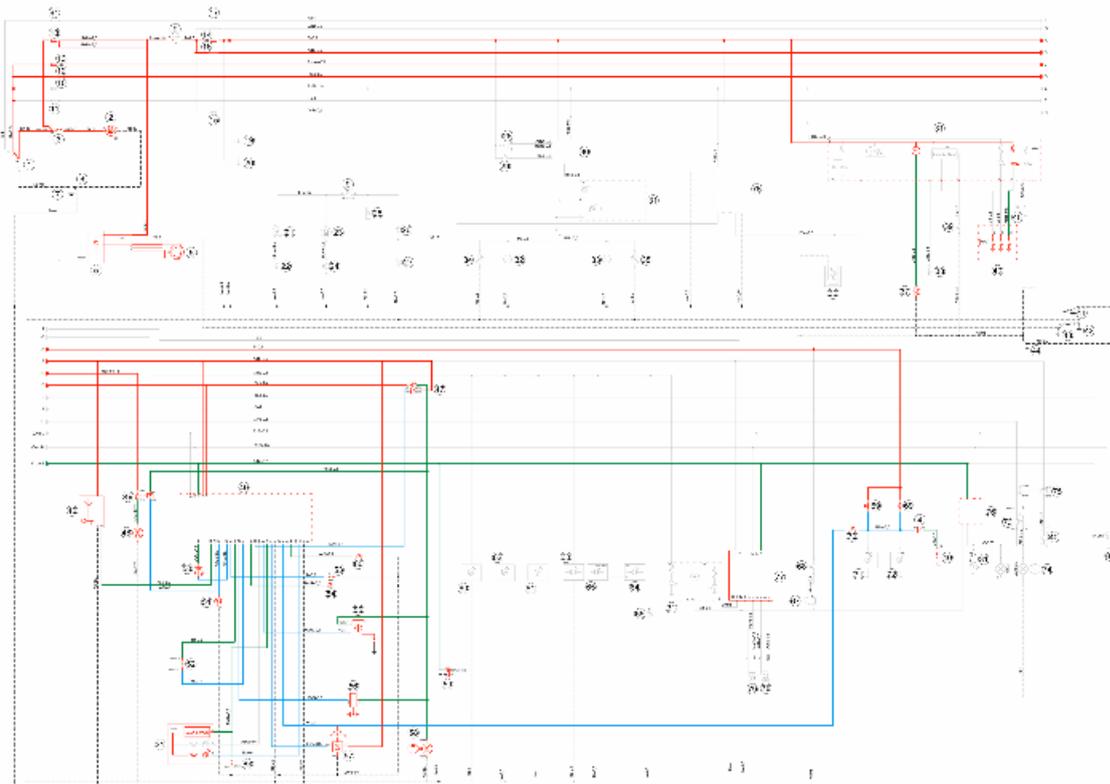


### INJECTION ELECTRONIC CONTROL UNIT CONNECTOR

1. H.V. COIL (Pink-Black)
2. Not connected
3. Anti-tipping sensor (Grey-Black)
4. Engine switch (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 (Sky 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. ASR button (Light blue-White)
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. Electric fan enabling (Green-White)
- 25. Injection warning light (Brown-White)
- 26. CAN H line (Pink-Red)
- 27. CAN L Line (Pink-White)
- 28. ECO switch (brown-red)
- 29. Speed sensor positive (Red)
- 30. Rpm indicator (Green)
- 31. ABS Warning Light (Light blue-Red)
- 32. Engine unable to start signal (Blue)
- 33. Low beam lights automatic ignition enabling (White-Black)
- 34. Fuel injector (Red-Yellow)

## EMS circuit diagram



### KEY

- 1. 12v-10Ah battery
- 2. Starter motor
- 3. Starter remote control contact
- 4. Starter solenoid coil

- 5. Regulator
  - 6. Flywheel
  - 7. Chassis ground
  - 8. Chassis engine-ground
  - 9. Ignition switch
  - 12. Fuse No. 3 - 7.5A
  - 13. Fuse No. 4 - 7.5A
  - 14. Fuse No. 5 - 7.5A
  - 16. Fuse No. 7 - 5A
  - 18. Fuse No. 9 - 30A
  - 31. Instrument panel
  - 37. Engine temperature sensor (instrument)
  - 40. Injection electronic control unit
  - 41. Front ground node
  - 42. Rear ground node
  - 43. Rear ground regulator
  - 44. Instrument panel ground node
  - 46. Immobilizer
  - 47. Injection relay
  - 48. Radiator electric fan
  - 49. Radiator electric fan solenoid
  - 50. Lambda probe
  - 51. Engine temperature sensor (C.D.I.)
  - 52. Engine speed sensor
  - 53. Engine stop button
  - 54. Stand button
  - 55. H.V. coil
  - 56. Fuel injector
  - 57. Anti-tipping sensor
  - 58. Fuel pump
  - 59. Diagnostics socket
  - 69. N.2 stop buttons
  - 70. Engine starter button
  - 76. Pre-installation of «Blue dash / anti-theft device»
  - 77. ABS control unit
  - 83. «ECO» mode switch
-

## 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 Parameter reliability	Shielded spark plug cap HV coil (secondary insulation) Coolant temperature Distribution timing - injection ignition Air temperature
End of compression pressure	End of compression pressure

### Starting difficulties

#### ENGINE STARTER PROBLEMS

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature
Start-up speed	Starter motor and solenoid Battery Ground connections
End of compression pressure Power to the spark plug	End of compression pressure Spark plug Shielded cap HV coil Speed-timing sensor Ignition advance
Fuel system	Fuel pressure (low) Injector capacity (low) Injector sealing (poor)
Correctness of the parameters	Coolant temperature Stepper throttle valve position intake air temperature (steps and actual opening) Cleaning of the auxiliary air pipe and throttle valve Air filter efficiency

### Engine stops at idle

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

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor

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

Possible Cause	Operation
Fuel system (low pressure)	Fuel pump Pressure regulator Fuel filter Injector capacity
Exhaust system sealing (infiltrations)	Manifold - head Manifold - silencer silencer welding

## Engine revs irregularly

### ENGINE IRREGULAR PERFORMANCE WITH VALVE SLIGHTLY OPEN

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

## Poor performance at full throttle

### POOR ENGINE PERFORMANCE AT FULL POWER/ ENGINE IRREGULAR PERFORMANCE ON PICKUP

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature Lambda probe
Spark plug power supply	Spark plug Shielded cap HV cable HV coil
Intake system	Air filter Filter box (sealing) Intake sleeve (sealing)
Parameter reliability	Throttle valve position signal Coolant temperature indicator Intake air temperature indicator Ignition advance
Fuel system	Fuel level in the tank Fuel pressure Fuel filter Injector capacity

## Engine knocking

### PRESENCE OF KNOCKING (COMBUSTION SHOCKS)

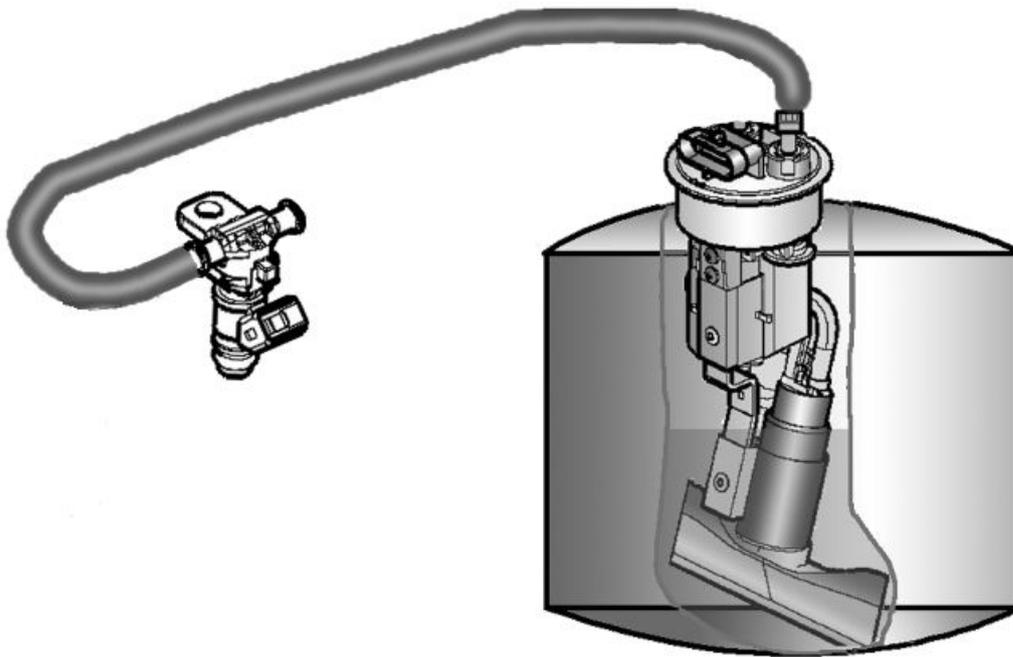
Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature Lambda probe
Ignition efficiency Parameter reliability	Spark plug Throttle valve position signal Coolant temperature indicator Intake air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

## Fuel supply system

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

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

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



## Removing the butterfly valve

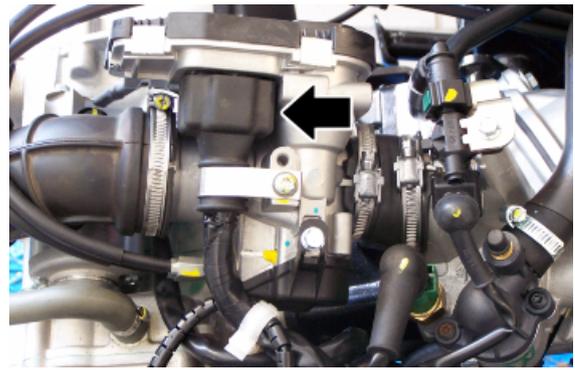
- First remove the semi-tail fairing, the air filter box and the helmet compartment inspection cover.
- Remove the screw of the MIU control unit cable grommet shown in the figure.



- Remove the throttle body fastening clamp to the manifold.



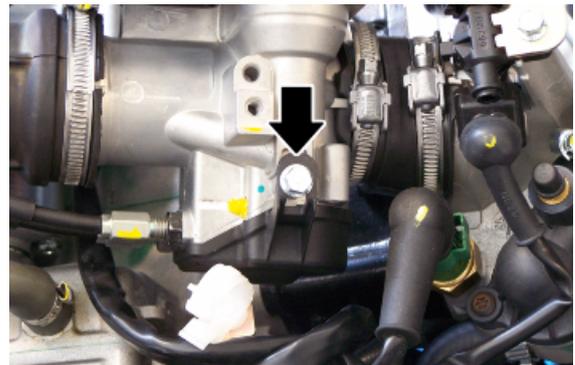
- 
- Remove the MIU ECU connector.



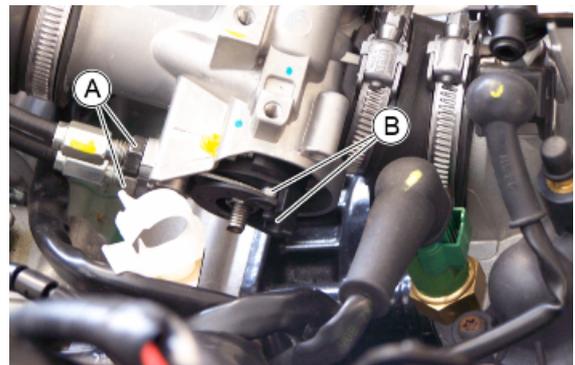
- 
- Remove the throttle body fastening clamp to air cleaner bellows.



- 
- Remove the throttle control transmission cover.



- 
- Disconnect the throttle cables from the throttle control by loosening the cable adjuster screws «A» and removing the cables from the seats on the mounting «B».

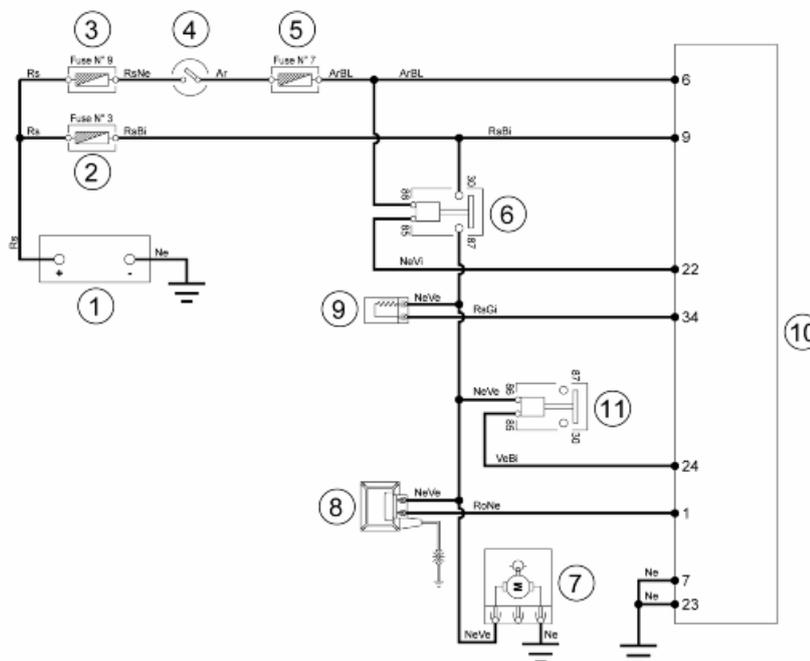


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## Refitting the butterfly valve

- To refit, perform the removal operations in reverse.
-

**Pump supply circuit**



**INJECTION LOADS**

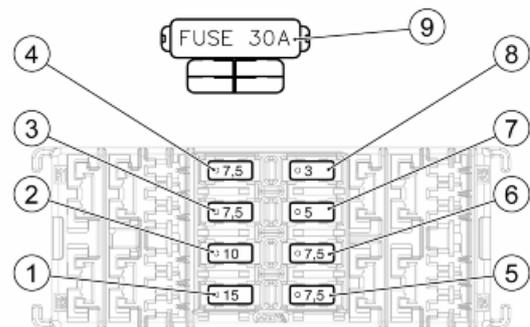
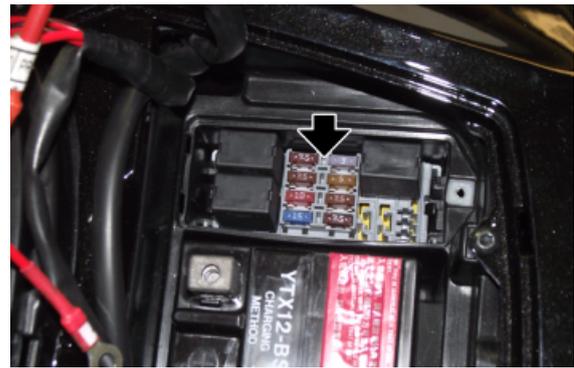
	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse No. 3	7.5 A
3	Fuse No. 9	30A
4	Ignition switch contacts	
5	Fuse No. 7	5A
6	Injection load solenoid	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Injection ECU	
11	Electric fan solenoid	

When switched to «ON», the fuel pump starts to rotate for 2 seconds and then stops. When the engine starts, in the presence of rpm timing signal the pump is continuously supplied.

**ELECTRICAL DATA**

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

Check function of fuses No. 3 and 7 for the ECU and injection load solenoid.



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



**WARNING**

TO INDICATE THE RELAY OF THE DESIRED FUNCTION, REFER TO THE PIN-CABLE COLOUR RELATIONSHIP WITH THE ATTACHED ELECTRIC SYSTEM DIAGRAM.





Check the power supply line of the injection load solenoid energising coil: switching to «ON» check the presence of battery tension, for 2 seconds, between the Orange-Blue cable and the Black-Purple cable of the relay base. Otherwise check the continuity of the Orange-Blue cable between the fuse-box and the relay base and of the Black-Purple cable between pin 22 of the control unit and the relay base.

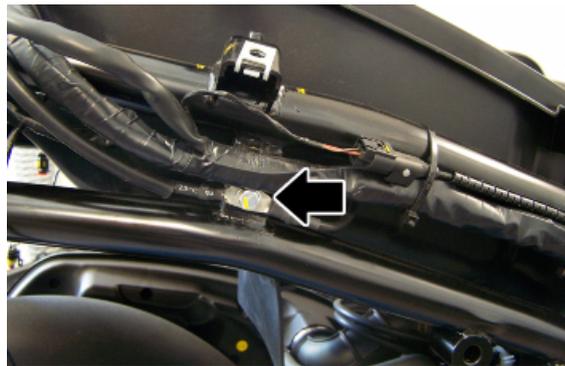
**N.B.**

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

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. 3, 7.5 A) and the relay base.

**N.B.**

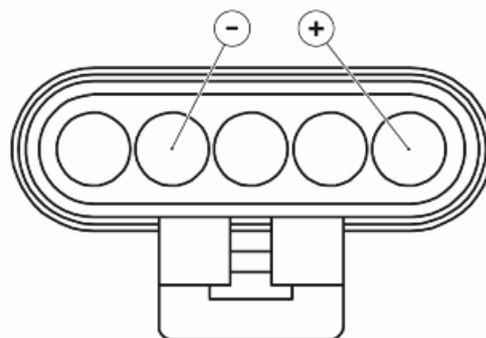
**CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (RELAYS, CONTROL UNIT, FUSES ETC.).**



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

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

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



lay disconnected, that the Black-Purple cable (pin 22) is insulated from the ground.

### Specific tooling

020331Y Digital multimeter



## Circuit leak test

Install the specific tool for checking the fuel pressure, with the pipe fitted with the gauge.

Check during regular operation by placing the appropriate tool between the pump and the injector. With the battery voltage > 12 V check that the fuel pressure is 2.5 BAR and that the input current is 1.4 to 1.8 A



With the battery voltage > 12 V, check the capacity of 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 flowrate 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, in fifteen seconds, the pump has a flowrate of around 110cc.

### Specific tooling

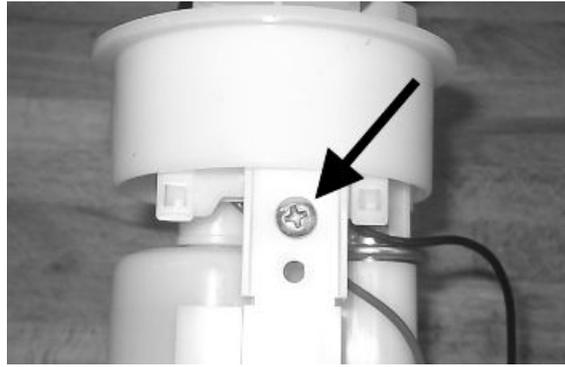
020480Y Petrol pressure check kit

## Fuel filter check

Disconnect the terminals from the electric pump



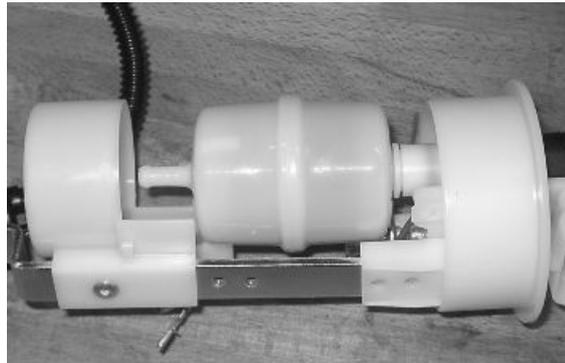
Remove the screw shown in the picture



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



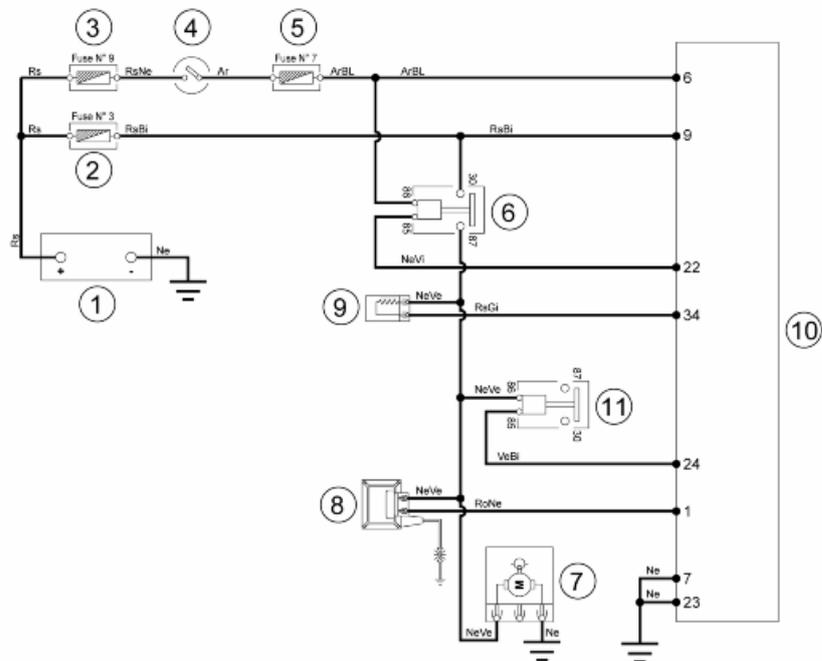
Separate the lower part of the pump mounting as shown in the picture.



Remove the filter from the pump mounting



Inspecting the injector circuit



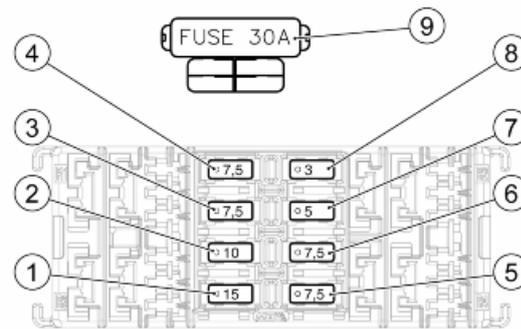
**INJECTION LOADS**

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse No. 3	7.5 A
3	Fuse No. 9	30A
4	Ignition switch contacts	
5	Fuse No. 7	5A
6	Injection load solenoid	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Injection ECU	
11	Electric fan solenoid	

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

Check function of fuses No. 3 and 7 for the ECU and injection load solenoid.





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

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

**WARNING**

TO INDICATE THE RELAY OF THE DESIRED FUNCTION, REFER TO THE PIN-CABLE COLOUR RELATIONSHIP WITH THE ATTACHED ELECTRIC SYSTEM DIAGRAM.



Check the power supply line of the injection load solenoid energising coil: switching to «ON» check the presence of battery tension, for 2 seconds, between the Orange-Blue cable and the Black-Purple cable of the relay base. Otherwise check the continuity of the Orange-Blue cable between the fuse-box and the relay base and of the Black-Purple cable between pin 22 of the control unit and the relay base.

**N.B.**

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

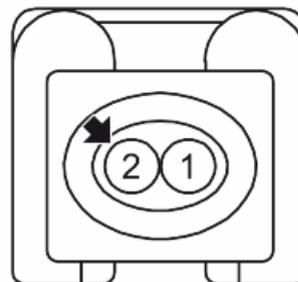
Check the presence of fixed voltage between the Red-White cable of the relay base and ground. Otherwise, check the continuity of the Red-White cable between the fuse-box (No. 3, 7.5 A) and the relay base.

**N.B.**

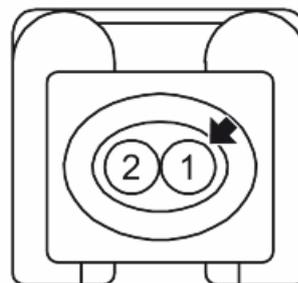
**CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (RELAYS, CONTROL UNIT, FUSES ETC.).**



With the control unit and the injector disconnected, check if there is continuity in the Red-Yellow cable between pin 34 of the control unit connector and the injector connector



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



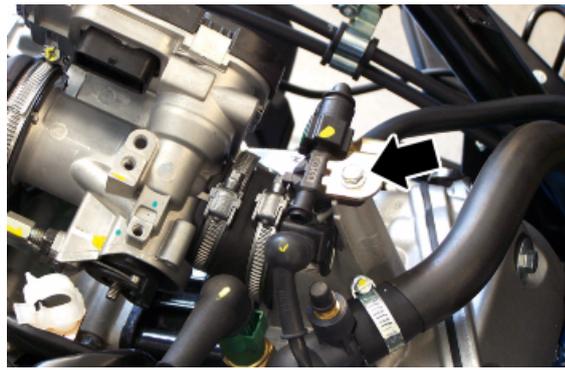
With injector disconnected and the injector load solenoid disconnected, check the continuity of the Black-Green cable between the injector connector and solenoid base.

## Inspecting the injector hydraulics

Lift the saddle and remove the engine compartment access cover.

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Remove the injector, by unscrewing the screw indicated in figure.



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

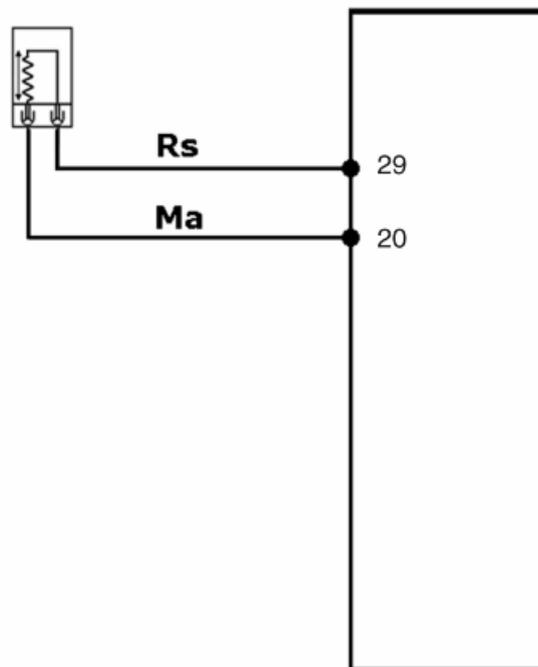


### **Specific tooling**

**020480Y Petrol pressure check kit**

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## Tachometer



Disconnect the fuel pipe connector. Start up the engine and wait for it to stop. With the wiring connected to the control unit and system try to start up the engine and check that the voltage between pins 29 and 20 is around 2.8 V

- Check the continuity between pin 29 of the injection control unit and the red cable of the engine speed sensor.
- Check the continuity between pin 20 of the injection control unit and the brown cable of the engine speed sensor.

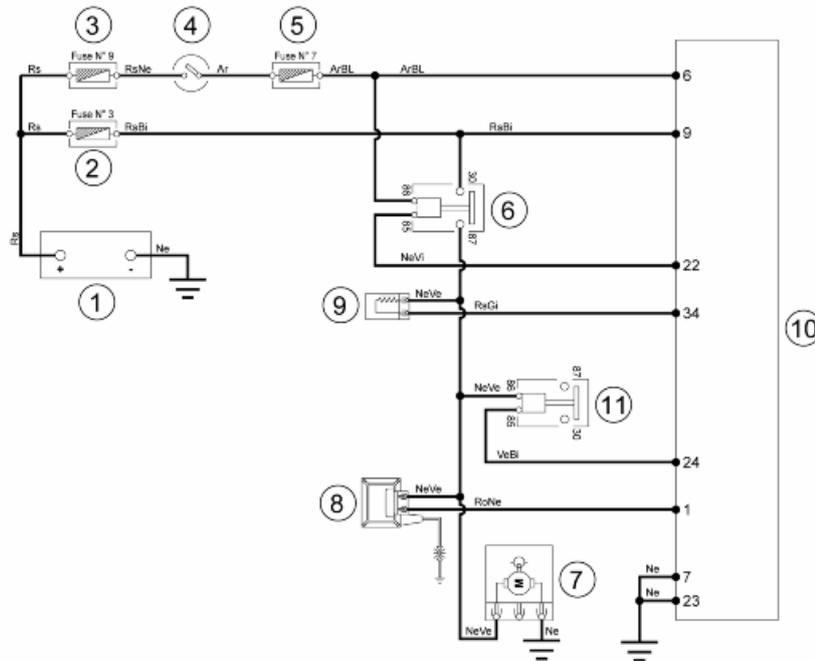


- Check that the pins 20 and 29 of the control unit are insulated from each other and insulated from the ground.

**Specific tooling**

020331Y Digital multimeter

**HT coil**



**INJECTION LOADS**

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse No. 3	7.5 A
3	Fuse No. 9	30A
4	Ignition switch contacts	
5	Fuse No. 7	5A
6	Injection load solenoid	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Injection ECU	
11	Electric fan solenoid	

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

The control unit controls two important parameters:

- Ignition advance

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

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

- Magnetisation time

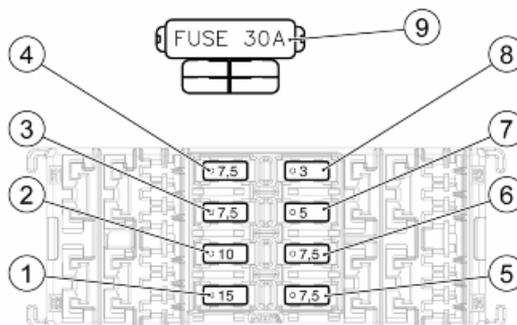
The coil magnetisation time is controlled by the control unit. The ignition power is increased during the engine start-up phase.

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

**Specific tooling**

**020331Y Digital multimeter**

Check function of fuses No. 3 and 7 for the ECU and injection load solenoid.



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



**WARNING**  
 TO INDICATE THE RELAY OF THE DESIRED FUNCTION, REFER TO THE PIN-CABLE COLOUR RELATIONSHIP WITH THE ATTACHED ELECTRIC SYSTEM DIAGRAM.





Check the power supply line of the injection load solenoid energising coil: switching to «ON» check the presence of battery tension, for 2 seconds, between the Orange-Blue cable and the Black-Purple cable of the relay base. Otherwise check the continuity of the Orange-Blue cable between the fuse-box and the relay base and of the Black-Purple cable between pin 22 of the control unit and the relay base.

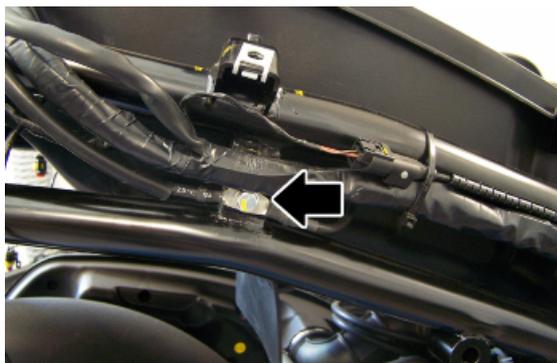
**N.B.**

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

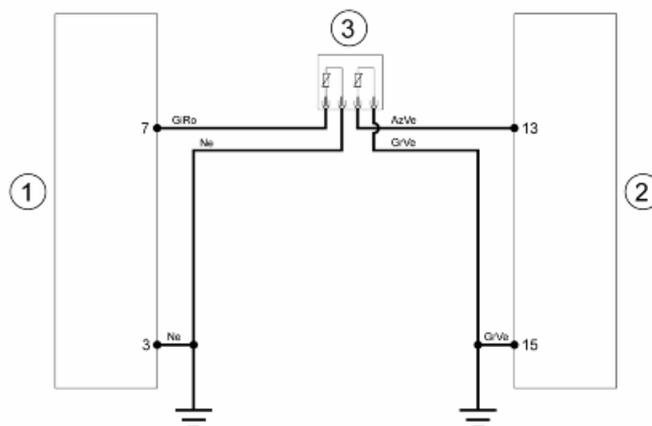
Check the presence of fixed voltage between the Red-White cable of the relay base and ground. Otherwise, check the continuity of the Red-White cable between the fuse-box (No. 3, 7.5 A) and the relay base.

**N.B.**

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



## Coolant temperature sensor



### TEMPERATURE SENSOR

	Specification	Desc./Quantity
1	Instrument panel	
2	Injection ECU	
3	Water temperature sensor	

With the connector on the control unit side disconnected and the coolant temperature sensor connector connected, check that the resistance values between pin 13 and the ground lead correspond with the engine temperature.

20° = 2500 ± 100 Ω

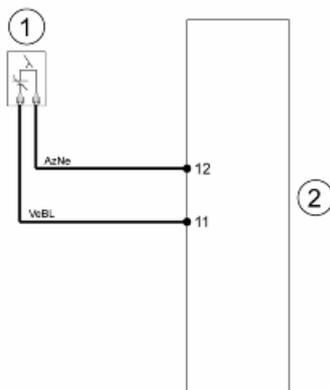
80° = 308 ± 6 Ω

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

### Specific tooling

020331Y Digital multimeter

## Lambda probe



### LAMBDA PROBE

	Specification	Desc./Quantity
1	Lambda sensor	
2	Injection ECU	

### PIN RELATIONSHIP

PIN	PIN	Component	Reference value
12	11	Lambda sensor	~ 0V with throttle valve closed; ~ 1V with throttle valve fully opened

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

### CONTROLLO DEL SEGNALE

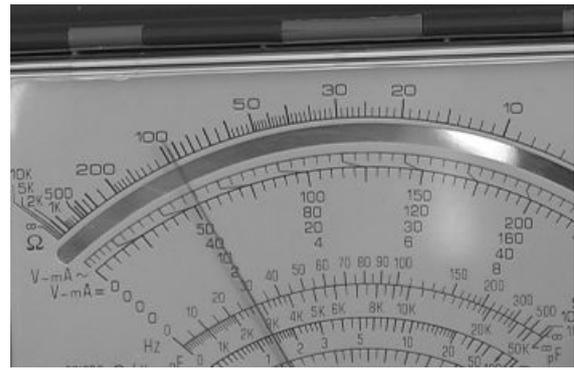
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With the engine running at idle speed, check that the voltage oscillates between 0V and 1V

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

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

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



## INDEX OF TOPICS

**SUSPENSIONS**

**SUSP**

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

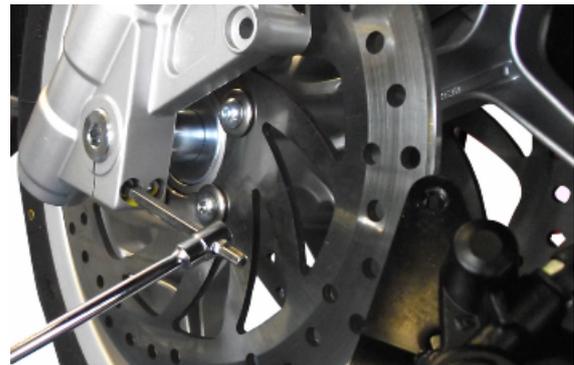
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## Front

---

### Removing the front wheel

- Remove the front brake calliper.
- Support the vehicle from the front side.
- Operating on the left fork, loosen the two calliper mounting bracket screws.



- Loosen the clamp of the front wheel acting on the nut (right side of the vehicle) and on the pin (left side).
- Slide off the pin and collect the nut.
- Remove the front wheel.



### See also

[Removal](#)

---

### Front wheel hub overhaul

- Support the wheel with two wooden shims that make it possible to avoid scratching in the case of contact with the rim.
- Working on both sides, remove the external spacer and the cap.



- Verify, checking on both sides, that the wheel bearings do not show signs of wear. If necessary, replace the bearings as described.
- Heat the bearing seat on the left side of the wheel using the heat gun.
- Using an extractor, remove the first and second bearing.

**Specific tooling****020151Y Air heater****001467Y003 Nut****001467Y009 Bell for OD 42-mm bearings****001467Y019 Extraction pliers for  $\varnothing$  18 mm bearings**

- Retrieve the internal spacer and remove the Seeger ring.



- Working on the right side of the wheel, heat up using the heat gun and pull out the right bearing from the seat with the suitable bearing extraction kit.

**Specific tooling****020151Y Air heater****001467Y019 Extraction pliers for  $\varnothing$  18 mm bearings****001467Y009 Bell for OD 42-mm bearings**

- Working on the left side of the wheel, insert the spacer in the seat and, after heating the bearing seat using the heat gun, insert the two left bearings using the appropriate punch.



### Specific tooling

020151Y Air heater

020376Y Adaptor handle

020358Y 37x40-mm Adaptor

### FITTING THE HUB

- Working on the right side of the wheel, position the Seeger ring, heat the bearing seat using the heat gun and, using the appropriate punch, push the right bearing into its seat.

### Specific tooling

020151Y Air heater

020376Y Adaptor handle

020358Y 37x40-mm Adaptor

## Refitting the front wheel

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

### Locking torques (N\*m)

Front wheel axle nut 110 - 120 Wheel axle clamp screws 6 - 7 Nm

## Handlebar

### Removal

- Remove the handlebar covers.
- Remove the handlebar wiring retaining straps and disconnect the electric connectors from the brake levers.
- Unscrew the fittings, then remove the front and rear brake pump piping.
- Remove the flexible transmissions of the throttle grip and remove the throttle control.
- Detach the cable grommet clamp and release the brake pipes and the cables.



- Loosen and remove the fixing screw of the handlebar to the steering tube and remove the handlebar upwards.

**N.B.**

IF THE HANDLEBAR IS BEING REMOVED TO REMOVE THE STEERING, IT IS ONLY NECESSARY TO TILT THE HANDLEBAR FORWARD ONTO THE FRONT PART OF THE VEHICLE WITHOUT REMOVING THE PARTS FITTED SO AS TO AVOID DAMAGING THE SHAFTS.

**Refitting**

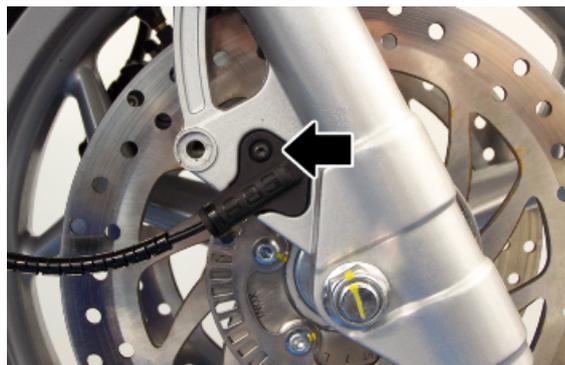
Carry out the above operations by working in the reverse order from that used for removal.

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

Handlebar fixing screw 50 to 55

**Front fork****Removal**

- Remove the speed sensor on the right hand side of the vehicle.



- 
- Unscrew the stem closing cap and slide off the complete fork leg from the corresponding support, keeping it in a vertical position.

**CAUTION**

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



The following operations are valid for both fork stems.

- Remove the steering tube, so as to arrange the stems fitted on the steering yoke.
- Remove the front mudguard
- Safely fasten the steering tube/plate/forks unit in a vice, using the shoes so as not to damage the plate.
- Loosen the two tightening screws of the stem on the steering yoke.

**See also**

[Removal](#)  
[Radiator fan](#)

---

**Overhaul**

- 
- Support the fork in a vice.
  - Remove the main spring and drain the oil from the fork leg.



- 
- Undo the lower screw and collect the washer. Collect any residual oil that may not have been previously drained.



- 
- Pull off the dust guard from the stem.



- 
- Remove the circlip retaining the oil seal.



- 
- From the left side, remove the hydraulic rod.



- Take out the stem.
- From the right side of the stem, remove the bushing and the guide.



- Using the specific tools remove the oil seal.

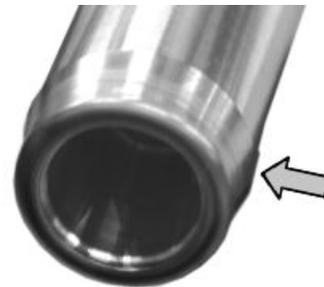


### COMPONENT CHECK

#### CAUTION

#### CLEAN ALL THE COMPONENTS THOROUGHLY.

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



- 
- The integrity of the caulking of the hydraulic rod and the seal ring.



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



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



---

## Refitting

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

### Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm Adaptor



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



- 
- Fit the oil seal retaining circlip.



- Grease and fit a new dust guard.



- Fill the fork leg with the recommended product.

**Recommended products**

**AGIP FORK 10 W Oil for fork.**

-

**Characteristic**

**Oil quantity per stem**

**155 cm<sup>3</sup>**

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

**CAUTION**



**FIT THE SPRING WITH THE SMALLER PITCH TO THE UPPER PART OF THE STEM.**



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

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

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

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

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

**Stem support clamp tightening screws** Apply a torque of 25-34 Nm to lower screw «1» Lock upper screw «2» a torque of 25-34 Nm Lock lower screw «1» a torque of 25-34 Nm



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

### Locking torques (N\*m)

Fork locking screws cap 35 - 55



- Repeat the procedure for the other fork leg.

#### N.B.

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

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

#### CAUTION

**ALWAYS USE NEW COPPER WASHER.**

### Locking torques (N\*m)

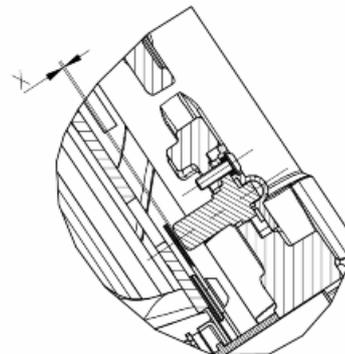
Hydraulic rod fixing screw 25 to 35 Nm

**PAY PARTICULAR ATTENTION TO THE FITTING OF THE SPEED SENSOR; PROCEED AS FOLLOWS:**

- install the speed sensor with its washer.
- Measure the height «X» with the aid of a feeler gauge and check that its value is correct.

**X = 0.4 to 1.65 mm**

- If the measurement «X» is too large, remove the washer and measure again.



### Locking torques (N\*m)

Front wheel speed sensor fastener screw 6 - 8

## Steering column

### Removal

- Support the vehicle from the front side, anchoring the clamp to the chassis: steering tube removal includes removal of the steering unit (handlebar, steering tube, steering yoke, front forks, front wheel removal).
- First remove the front wheel and the handlebar.

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



- Operating on both sides, inside the front wheel housing, undo and remove the screw and release the brake pipes.



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

- Extract the fork.

**N.B.**

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

### Specific tooling

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

### See also

[Removal](#)  
[Removing the front wheel](#)



## Refitting

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

**N.B.**

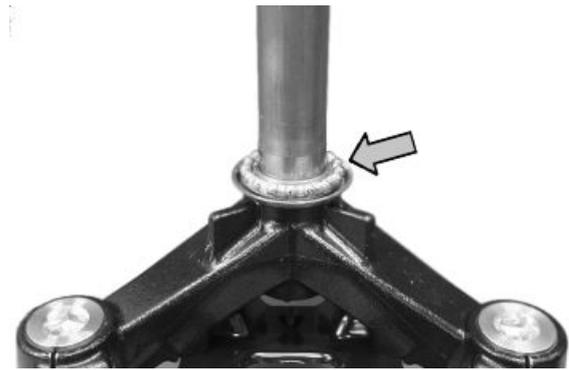
**LUBRICATE THE STEERING FIFTH WHEEL TRACKS WITH RECOMMENDED GREASE BEFORE USE.**

### Recommended products



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

TL 9150 066, NATO G 460 symbol



- Fit the upper steering bearing.

**CAUTION**

**INSERT THE UPPER STEERING BEARING WITH THE CAGE FACING UPWARDS.**



- Fit the steering bearing upper seat.



- Fit the cover plate.



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

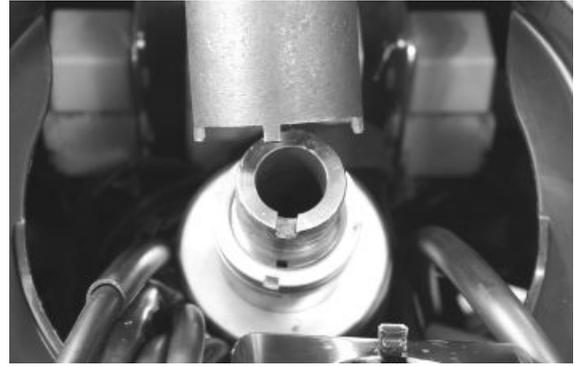
**Specific tooling****020055Y Wrench for steering tube ring nut****Locking torques (N\*m)****Steering tube lower ring nut 14 - 17**

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



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

**Specific tooling****020055Y Wrench for steering tube ring nut****Locking torques (N\*m)****Steering tube upper ring nut 40 to 45**



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

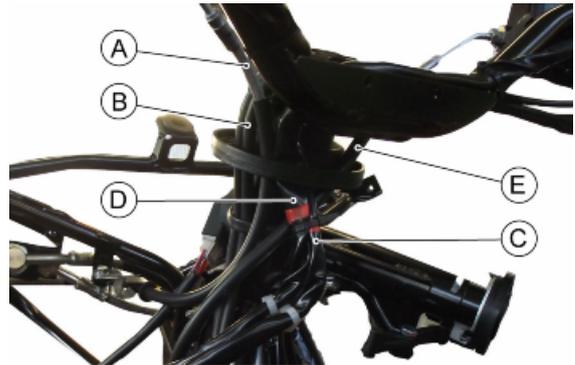
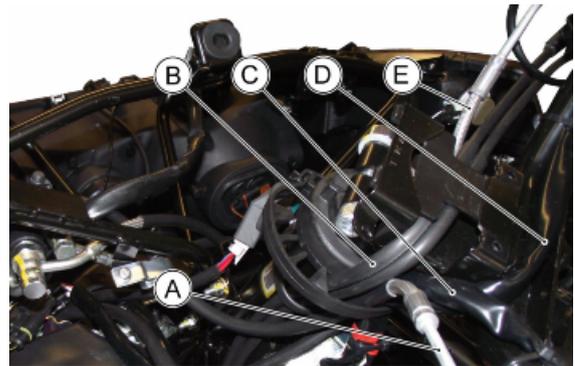
A - Left brake lever pump pipe.

B - Throttle grip cables.

C - Left control block cable harness.

D - Right control block cable harness.

E - Right brake lever pump pipe.



- Fit the front wheel.

---

## Steering bearing

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## Removal

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



- Check the lower steering bearing for wear.



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

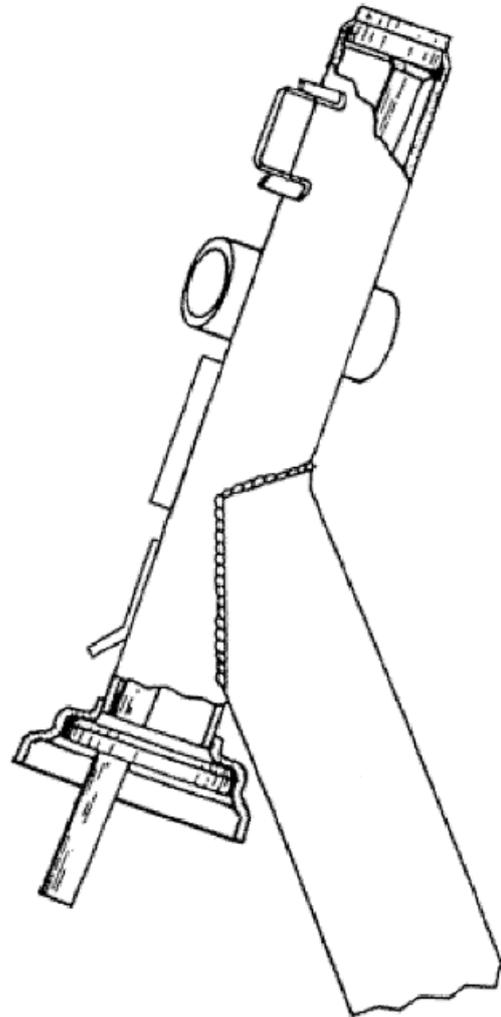
### **STEERING FIFTH WHEEL TRACK REMOVAL**

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



### **Specific tooling**

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



- Repeat the procedure for the lower steering bearing track.

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

### Specific tooling

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



## Refitting

### STEERING FIFTH WHEEL TRACK FITTING

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

**N.B.**

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

### Specific tooling

001330Y Tool for fitting steering seats

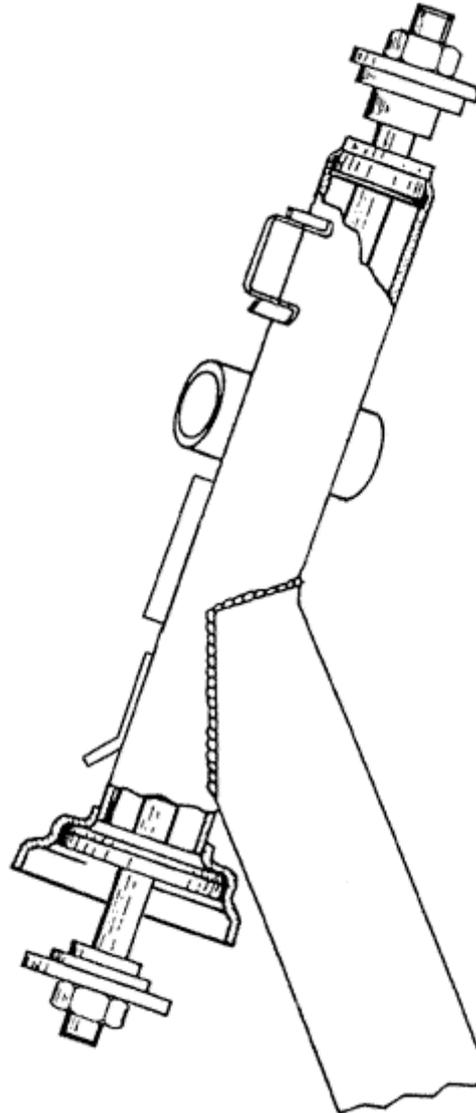
001330Y014 Tool for fitting steering seats

001330Y015 Tool for fitting steering seats

### Recommended products

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

TL 9150 066, NATO G 460 symbol



- Fit the lower steering bearing seat on the steering tube.
- With a tube of the indicated sizes, fit the lower seat until it stops. Inside Ø: 40.0 mm; Length: 400 mm.

**N.B.**

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

### Recommended products

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

TL 9150 066, NATO G 460 symbol



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## Rear

---

### Removing the rear wheel

---

- Remove the silencer mounting bracket;
- Retrieve the conical spacer and remove the wheel.



#### See also

[Removal](#)

---

### Refitting the rear wheel

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

#### **REAR SUSPENSION**

Name	Torque in Nm
Lower shock absorber clamp	32 to 40
Upper shock absorber fixing - self locking nut M10	40 to 44
Shock absorber to crankcase bracket fastener	20 to 25
Silencer support bracket fixing screws	20 ÷ 25
Rear wheel nut	102 - 123

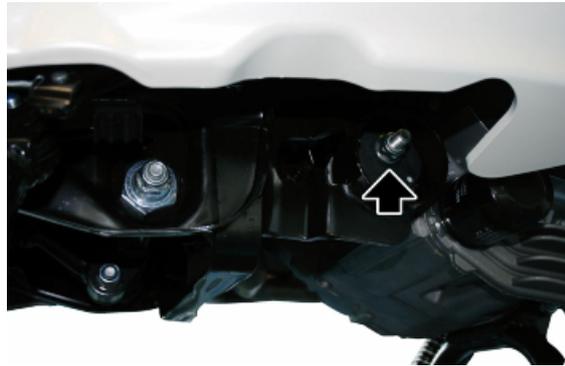
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### Swing-arm

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## Removal

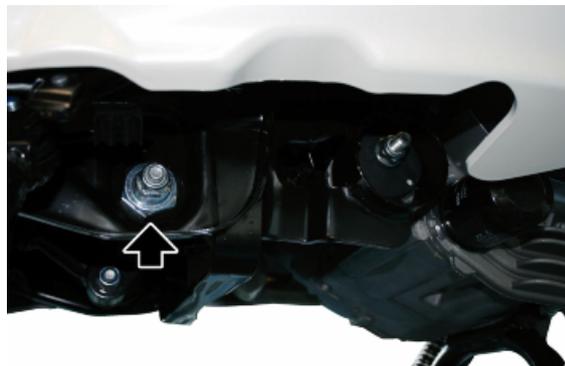
- Place the vehicle on its centre stand;
- Support the engine adequately;
- Undo the nut indicated in the figure and remove the respective pin from the right side.



- Loosen the swinging arm tightening nut, positioned on the pin, inner left side.



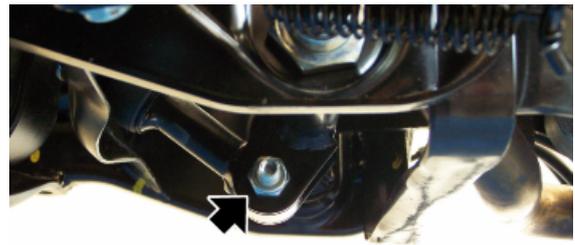
- Loosen the nut and lock nut on the left-hand side of the vehicle (see figure) and unscrew the pin from the opposite side.



- Unscrew the inner nut until the complete removal of the same.
- Then slide off the pin from the right-hand side of the vehicle.
- Release the spring.



- Unscrew the nut on the left-hand side of the vehicle and slide the relative pin on the opposite side.



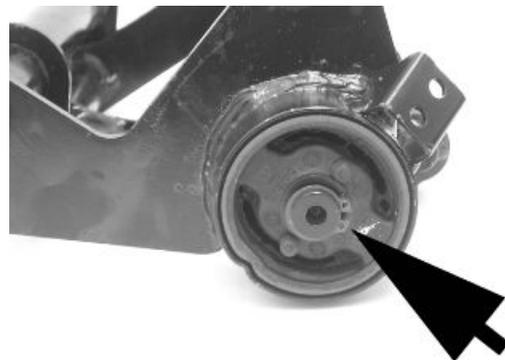
- It is now possible to remove the swinging arm complete with retainer brackets to the engine.

- If necessary break down the swinging arm by removing the retainer brackets to the engine, once the whole swinging arm is removed, unscrew the nut on the right side and remove the pin, recovering the washers.
- Release the swinging arm from the brackets fixing it to the engine.



## Overhaul

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



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

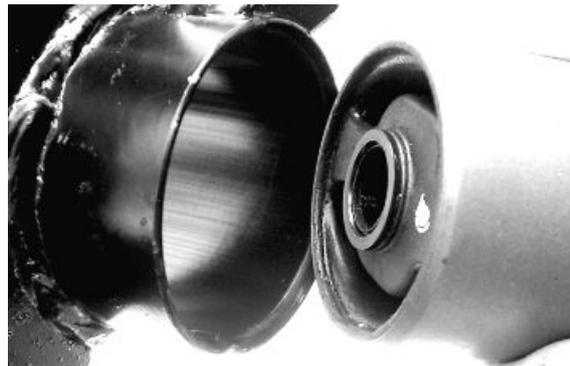


### Specific tooling

**020271Y Tool for removing-fitting silent bloc**



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



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

**Specific tooling**

**020271Y Tool for removing-fitting silent bloc**



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

**Characteristic**

**Allowable limit after use:**

1 mm

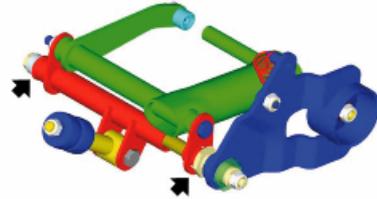
**standard clearance**

0.40 - 0.70 mm



- In order to check the clearance of the swinging arm on the frame side, prepare a retainer using the fixing pin of the swinging arm on the frame and two rings from the special tool 020229Y.

Alternatively, use two washers with inside diameter of 12 mm for pins, outside diameter min. 30 mm and thickness min. 4 mm.



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

- Remove the internal spacer shown in the picture



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



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

**Specific tooling**

**020115Y Ø 18 punch**

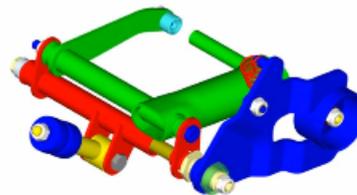
**020244Y 15-mm diameter punch**



**SWINGING ARM SERVICE**

Specification	Desc./Quantity
Length of the internal swinging arm spacer on the frame side	235 mm + 0.1 / -0.3
Length of the swinging arm tube on the frame side	228 mm
Length of the internal swinging arm spacer on the engine side	198 mm
Length of the swinging arm tube on the engine side	190.3 mm

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



**Recommended products**

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

TL 9150 066, NATO G 460 symbol

**Refitting**

- Pre-fit the mounting brackets by inserting the pin from the left side and tightening the nut to the specified torque.



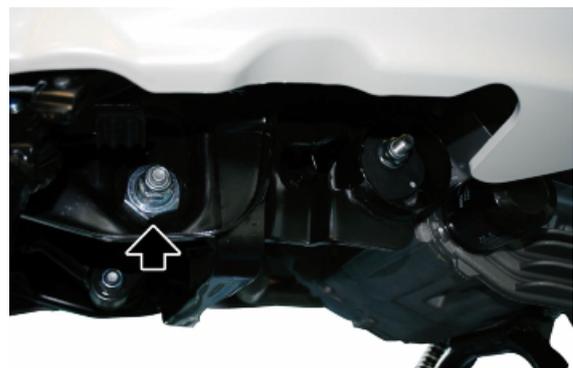
- Insert the washers and the rear pin from the right side of the vehicle and tighten the nut to the specified torque.



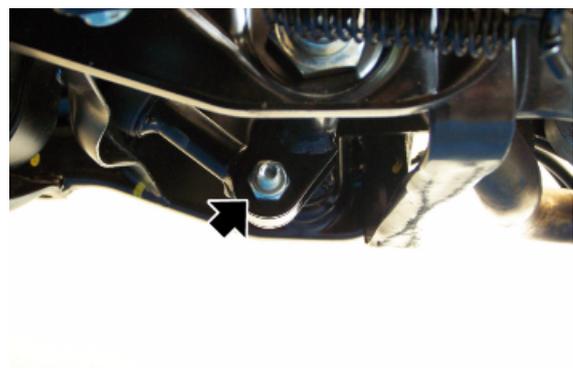
- Insert the pin from the right side of the vehicle and pretighten the inner nut to the frame, on the left side.



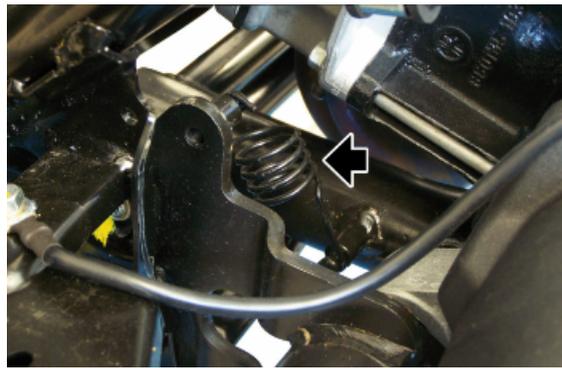
- Tighten the nut and finish tightening the inner nut to the specified torques.
- Tighten the lock nut to the specified torque.



- Insert the rod pin from the right side and tighten the nut to the prescribed torque.



- Fit the spring.



**SWINGING ARM - 350**

Name	Torque in Nm
Self locking nut fastening pin chassis side	50 to 55
Retainer nut of silent block support bracket on bushing	89 to 108
Lower pin bushing	5 - 7
Self locking nut pin fastening engine side	40 to 45
Self locking nut engine attachment fixing	54 ÷ 60
Self locking nut of fixing silent block support bracket	67 - 75
Rod fixing nut	40 to 45
Rod pin fixing nut	40 to 45

**Shock absorbers**

**Removal**

To remove the shock absorbers, first remove the specific semi half fairing next to the shock absorber to be removed.

- Support the vehicle from the rear side with a hoist.

**RIGHT SHOCK ABSORBER**

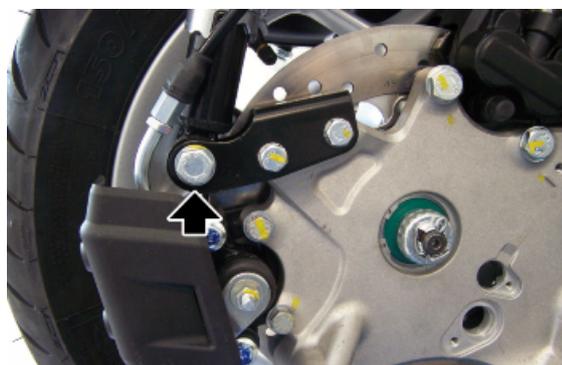
- Undo and remove the upper screw, collecting the nut.
- Undo and remove the lower screw and collect the washer.



- Remove the shock absorber.

**LEFT SHOCK ABSORBER**

- Undo and remove the upper screw, collecting the nut.
- Undo and remove the lower screw and collect the washer.



- Remove the shock absorber from the left, releasing it from the pin and remove it.

**See also**[Tail guard](#)

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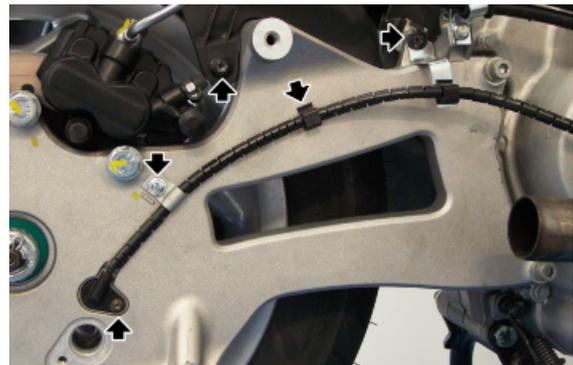
**Exhaust bracket**

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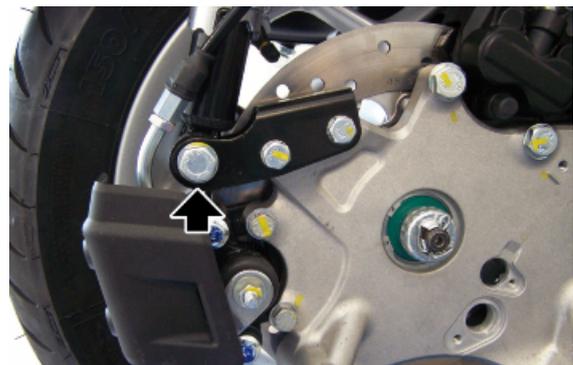
**Removal**

- Before dismantling, secure the vehicle on the centre stand, on a flat surface.

- Remove the silencer;
- Remove the parking brake;
- Remove the speed sensor;
- Undo the two rear mudguard fixing screws;
- Undo the screw and release the pipe grommet;
- Release the cable from the spring;



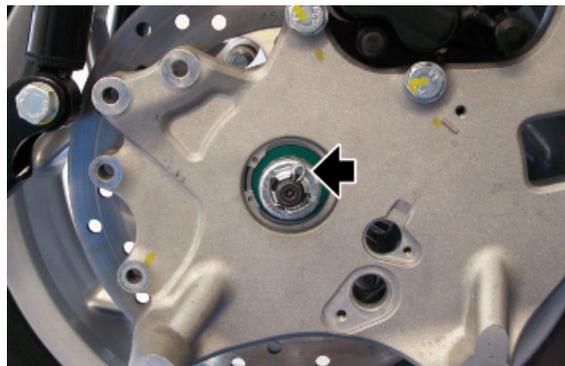
- Unscrew and remove the lower screw fixing the right rear shock absorber and collect the washer.



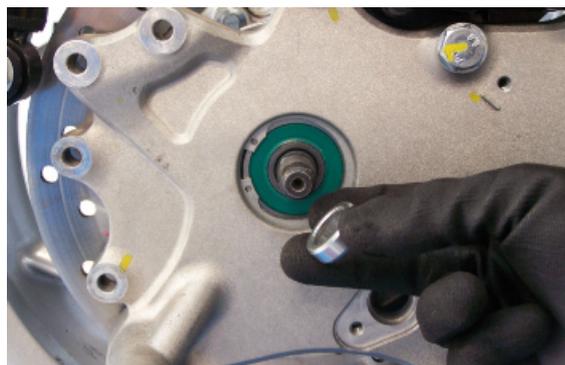
- Loosen the upper clamp of the right shock absorber and fix it above the chassis.



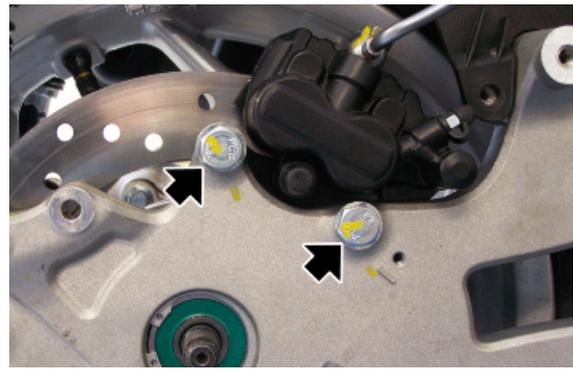
- Remove the safety cotter pin, aligning it with the recess on the bracket.
- Remove the nut cover cap.



- Brake the rear wheel, locking the lever.
- Unscrew the nut securing the rear wheel and recover the spacer.



- Release the rear brake lever and then remove the rear brake calliper.
- Unscrew the two screws fastening the silencer mounting bracket to the engine and collect the washers.
- Remove the bracket.



## Overhaul

### Plate disassembly

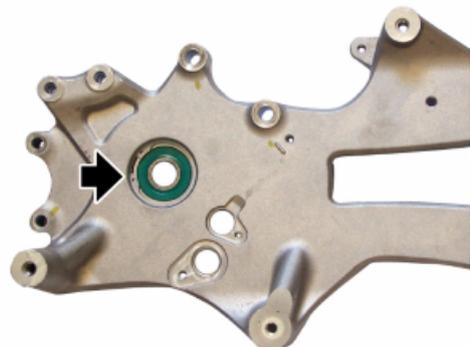
- Working on the outside, remove the snap ring.
- Adequately support the exhaust mounting bracket.
- By means of a specific punch, remove the bearing from the seat.

### Specific tooling

020359Y 42x47-mm Adaptor

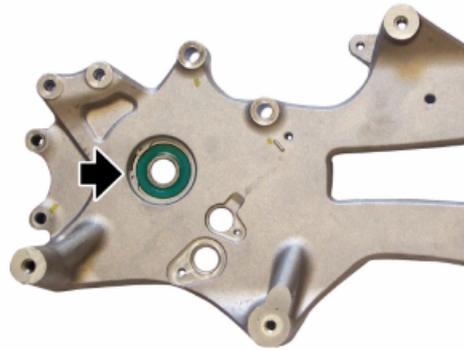
020376Y Adaptor handle

020439Y 17-mm guide



**Plate reassembly**

- By means of a heat gun, heat the bearing seat and, through specific punch, insert a new one into the seat.
- Working on the outside, insert the snap ring

**Specific tooling**

020151Y Air heater

**Refitting**

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

N.B.



THE SILENCER SUPPORT ARM MUST BE TIGHTENED AFTER TIGHTENING THE WHEEL.

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

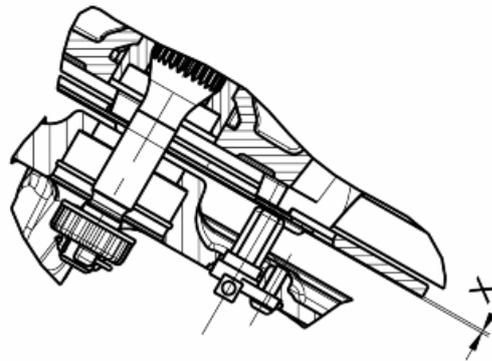
Silencer support bracket fixing screws 20 ÷ 25 Rear wheel nut 102 - 123

**PAY PARTICULAR ATTENTION TO THE FITTING OF THE SPEED SENSOR; PROCEED AS FOLLOWS:**

- install the speed sensor with its washer.
- Measure the height «X» with the aid of a feeler gauge and check that its value is correct.

**X = 0.25 to 1.85 mm**

- If the measurement «X» is too large, remove the washer and measure again.

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

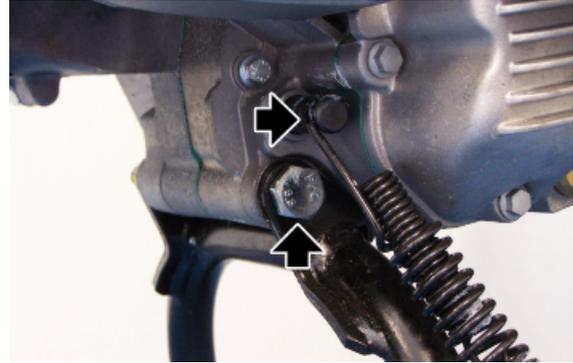
Rear wheel speed sensor tightening screw 6 - 8

## Centre-stand

- Unscrew the nut and the pin from the right side.
- Release the spring.
- Remove the centre stand.
- During refitting, tighten the nut to the specified torque.

### Locking torques (N\*m)

**Centre stand bolt 40 to 45**



## Side stand

- Position the vehicle on the centre stand.

### Removal of the side stand

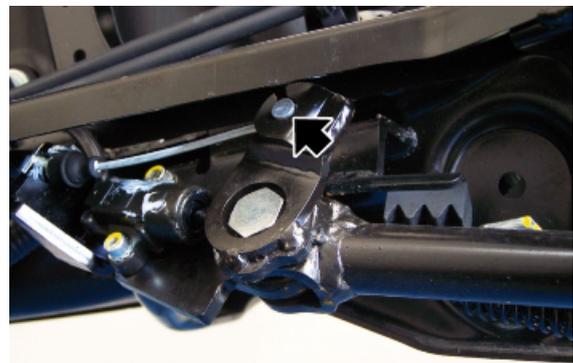
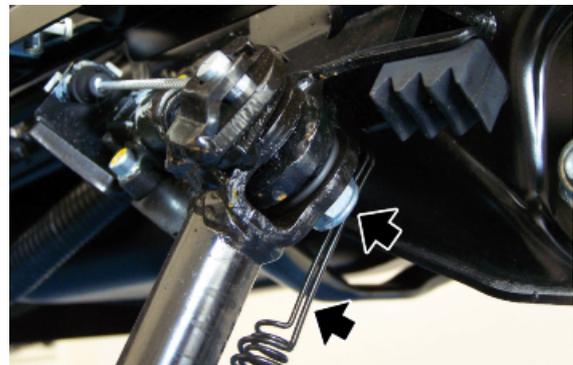
- Release the spring.
- Undo and remove the screw, then retrieve the nut.
- Remove the side stand, releasing it from the metallic cable.

### Fitting the side stand

- Perform the previous steps in reverse order.

### Locking torques (N\*m)

**Side stand fixing bolt 40 to 45**

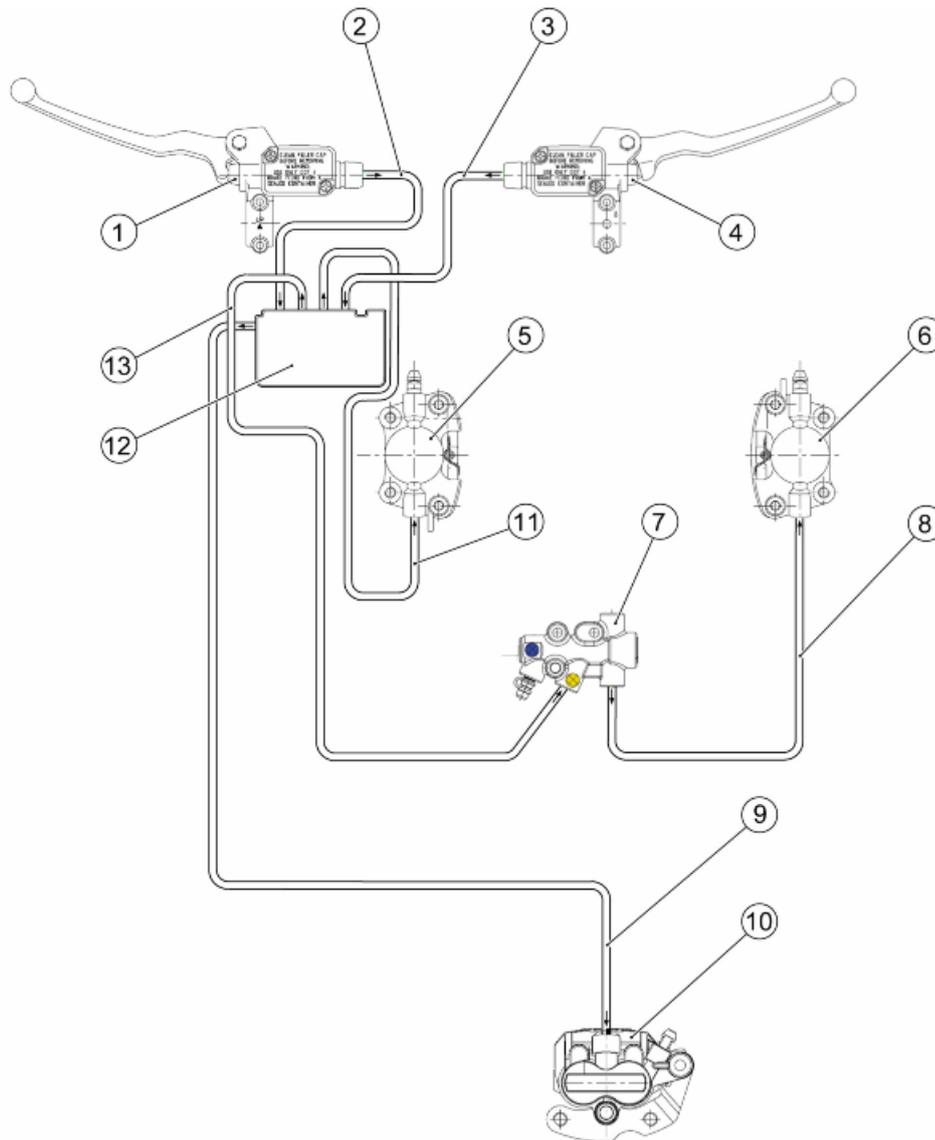


## INDEX OF TOPICS

**B**RAKING SYSTEM

**BRAK SYS**

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



#### **BRAKING SYSTEM DIAGRAM KEY VERSION WITH ABS**

1. Rear/front brake pump
2. Rear/front brake pump pipe - ABS control unit
3. Front brake pump pipe - ABS control unit
4. Front brake pump
5. Front left brake calliper
6. Front right brake calliper
7. Distribution valve
8. Distribution valve pipes - right front brake calliper
9. ABS control unit pipes - rear brake calliper
10. Rear brake calliper

11. ABS control unit pipes - left front brake calliper
12. ABS control unit
13. ABS control unit - distribution valve



**THE BLEEDING OPERATIONS OF THE BRAKING SYSTEM, EVEN FOR THE VERSION EQUIPPED WITH ABS SYSTEM, DO NOT ALLOW THE USE OF DIAGNOSTIC TESTER, AND ARE THEREFORE EQUAL TO THOSE DESCRIBED FOR THE STANDARD BRAKE SYSTEM.**



**THE CONTROL UNIT, SUPPLIED AS A SPARE, IS SEALED AND COMES WITH BRAKE FLUID. ANY LOSS OF FLUID DUE TO INSTALLATION OPERATIONS CAN BE RESET BY TOPPING UP THE SYSTEM.**

---

## Interventions rules

### WARNING

**BRAKING SYSTEM FLUID IS CORROSIVE: ALWAYS WEAR PROTECTIVE GLOVES. IN THE EVENT OF ACCIDENTAL CONTACT WITH YOUR EYES, RINSE THE CONTACT AREA WELL WITH ABUNDANT WATER.**

**THE BRAKE FLUID DRAINED FROM THE SYSTEM IS HARMFUL TO THE ENVIRONMENT. COLLECTION AND DISPOSAL MUST BE CARRIED OUT IN COMPLIANCE WITH THE REGULATIONS IN FORCE. UNDER NORMAL DRIVING AND CLIMATIC CONDITIONS YOU SHOULD CHANGE THE FLUID EVERY TWO YEARS. IF BRAKES ARE USED INTENSELY AND/OR IN HARSH CONDITIONS, CHANGE THE FLUID MORE FREQUENTLY.**

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

### N.B.

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

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

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

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

### N.B.

**ALWAYS USE FLUID FROM SEALED CONTAINERS.**

### N.B.

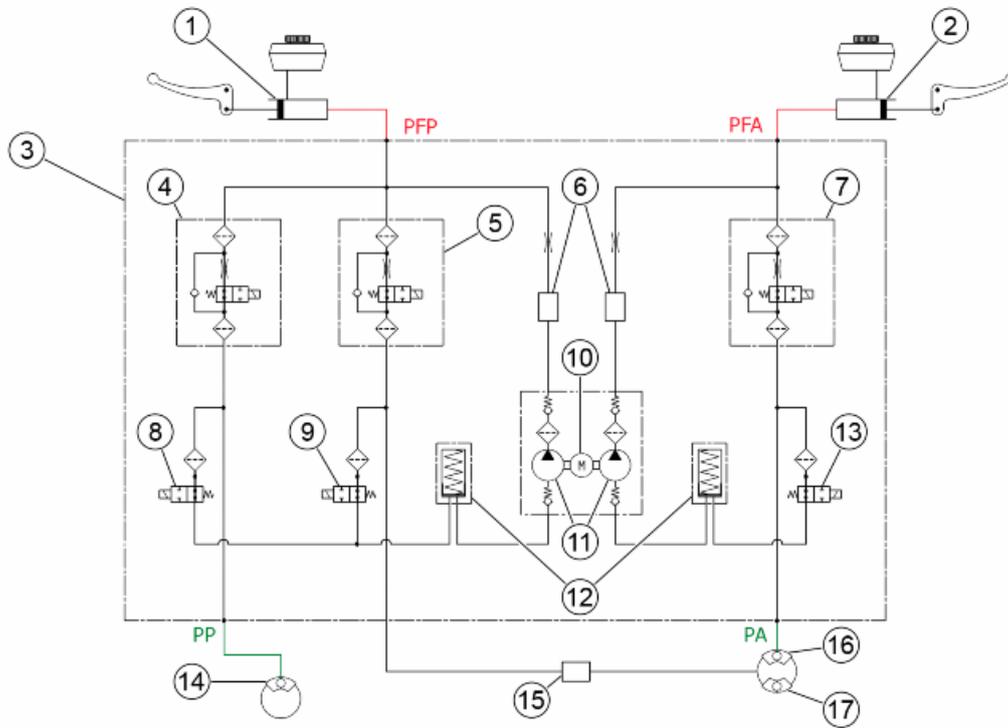
**RUBBER PARTS SHOULD NEVER BE LEFT IN ALCOHOL LONGER THAN 20 SECONDS. AFTER WASHING, THE PIECES MUST BE DRIED WITH A BLAST OF COMPRESSED AIR AND A CLEAN CLOTH.**

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

### WARNING

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

Operating diagram



KEY

- 1. Rear brake/integral braking (PFP)
- 2. Front brake (PFA)
- 3. ABS control unit
- 4. Rear brake circuit inlet solenoid valve
- 5. Front brake circuit «1» inlet solenoid valve
- 6. Damper chamber
- 7. Front brake circuit «2» inlet solenoid valve
- 8. Rear brake circuit outlet solenoid valve
- 9. Front brake circuit «1» outlet solenoid valve
- 10. Recirculation pump motor
- 11. Recirculation pumps
- 12. Low pressure accumulators
- 13. Front brake circuit «2» outlet solenoid valve
- 14. Rear brake caliper (PP)
- 15. Retarder valve
- 16. Front brake caliper «2» (PA)
- 17. Front brake caliper «1» (PA)

OPERATION OF THE ABS

**General considerations**

- The front circuit is the same as the rear one.
- The ABS inlet valve (4 - 5 - 7) is normally open and is only closed when the system is actively preventing wheel lock-up.
- The ABS outlet valve (8 - 9 - 13) is normally closed and is only opened when the system is actively preventing wheel lock-up.
- With the system in stand-by mode, the ABS processor controls the wheel speed instant by instant to assess any slippage of the wheels.
- While in stand-by, the system does not intervene in any way on the braking of the rider, the braking system is identical to the one without ABS.
- ABS Cycle phases (the following operations refer to the front circuit but they are also valid for the rear):

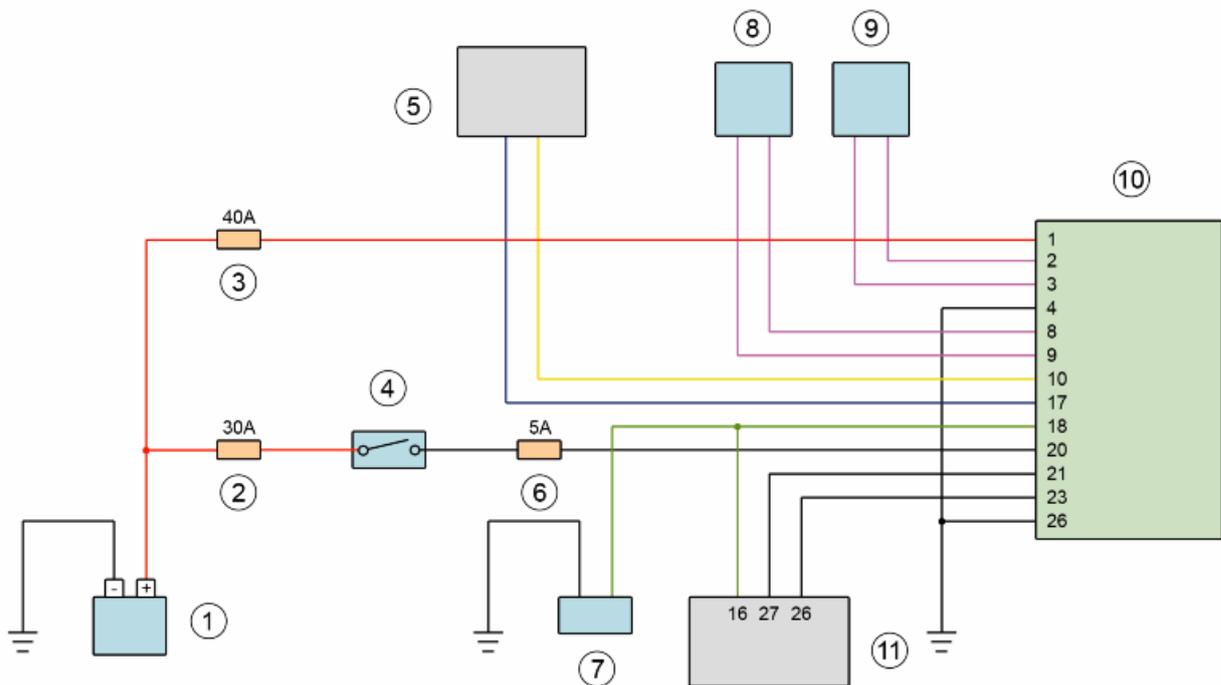
**A - Start braking:** The rider starts to brake like in normal braking.

**B - Pressure reduction:** coincides with the recognition of the dangerous situation (wheel slippage exceeds the threshold): The system closes the inlet valve (4 - 5 - 7) and temporarily opens the drain valve (8 - 9 - 13). In this state, the rider cannot increase caliper pressure (14 - 16 - 17) and the system partially reduces the pressure in the calipers. Excess fluid temporarily fills the reservoir until the ABS pump (11) automatically activates to direct the fluid to the brake master (1 - 2).

**C - Maintaining pressure:** the pressure in the calipers (14 - 16 - 17) remains low until the correct speed / wheel grip conditions are fully restored. The system returns the fluid taken from the caliper to the section of circuit between the brake master (1 - 2) and the ABS inlet valve (4 - 5 - 7).

**D - Pressure restoration:** by temporarily opening the inlet valve (4 - 5 - 7), the caliper pressure (14 - 16 - 17) is increased to obtain maximum deceleration, at which point the system restores full braking control to the rider.

**E -** In the event that the wheel does not regain full grip, the system continues to operate as before until it is restored or until the vehicle stops. An error may be shown in the event that the duration of the pressure reduction phase exceeds a predetermined time limit.

**KEY**

1. Battery
2. Fuse No. 9
3. Fuse No. 10
4. Ignition switch
5. Instrument panel
6. Fuse No. 7
7. Diagnostics socket
8. Front speed sensor
9. Rear speed sensor
10. ABS control unit
11. Injection ECU

**Guide to diagnosis**

**At each key ON, if at least one current or memorised system error is not identified:**

- the abs warning light flashes.

**When exceeding 5 km/h (3.11 mph):**

- If no errors are detected the ABS warning light turns off
- If at least one malfunction is detected, the ABS warning light turns on permanently.

**The ABS system is disabled!**

**The system is still fully functional like any other brake system without ABS.**

The detection of malfunctions may require more or less time depending on the type of fault.

Following the detection logic one or more conditions must persist within a certain time to detect errors.

If during this time one of the conditions is lost and then reappears, the timer is reset and the system is not able to detect the fault.

The ABS system continues to be inactive.

### **GUIDE TO ABS FAULT DIAGNOSIS**

1. ABS LAMP ON

2. CONNECT THE DIAGNOSTIC TOOL

**DOES THE DIAGNOSTIC TOOL COMMUNICATE? (NO, go to point 3; YES, go to point 4)**

3. PERFORM THESE CHECKS:

- A. PIN 26 Ground connection
- B. +12V at PIN 1
- C. +12V at PIN 20 with key-ON

**4. ARE THERE ANY ERRORS? YES, go to point 5; NO, go to point 6)**

5. CONSULT THE ERRORS DISPLAY TABLE

6. ABS WARNING LIGHT ACTIVATION

**IS IT ACTIVATED?(YES, go to point 7; NO, go to point 8)**

7. CONTACT TECHNICAL SERVICE

8. PERFORM THESE CHECKS:

- A. Continuity in cable between PIN 10 of ABS unit connector and PIN 16 of instrument cluster.
- B. Check connectors - see operations described in the chapter.

**If the above checks are OK, the causes can be:**

- C. ABS Control unit malfunction
- D. Instrument panel malfunction

---

## **Modulator**

### **MODULATOR REMOVAL**

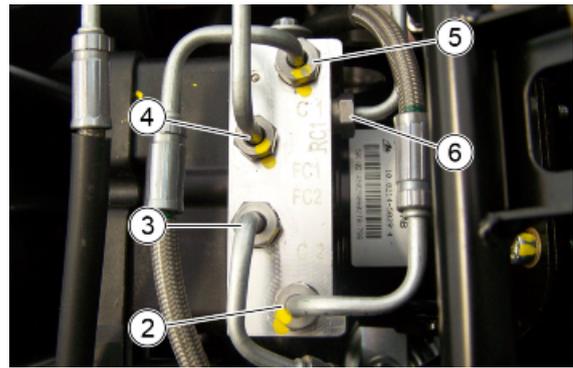
- Remove the legshield.
- Disconnect the ABS unit connector.



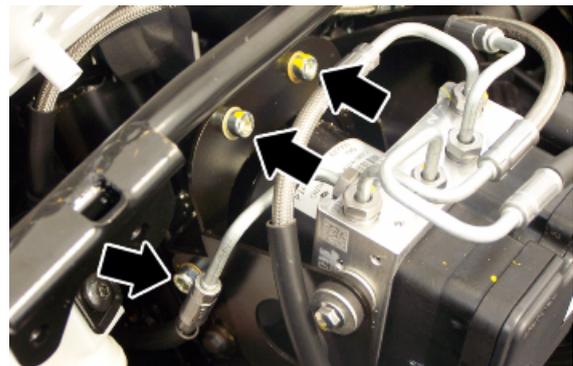
- Undo the nuts and remove and plug the fluid lines in the sequence (5) - (6) - (4) - (2) - (3).

**N.B.**

**PAY ATTENTION TO THE LOSS OF BRAKE FLUID DURING THE REMOVAL OF THE PIPING FROM THE MODULATOR. USE A SMALL CONTAINER AND A CLOTH.**



- Unscrew and remove the three screws, collecting the washers, and remove the abs modulator.



### MODULATOR INSTALLATION

When installing the abs modulator, repeat the operations described in the removal in reverse order, paying close attention when inserting the piping.

Before installing the front shield, bleed the brake system in order to restore the correct operation of the braking system.

### Locking torques (N\*m)

**ABS control unit supporting bracket fixing screw 10 to 11 Nm M6x16 screws fastening the ABS control unit to the support 10 to 12 Nm Pipe fittings - ABS control unit 13 - 18**

### See also

[Legshield](#)  
[Fill](#)

## ASR

## System ASR

### ASR SYSTEM

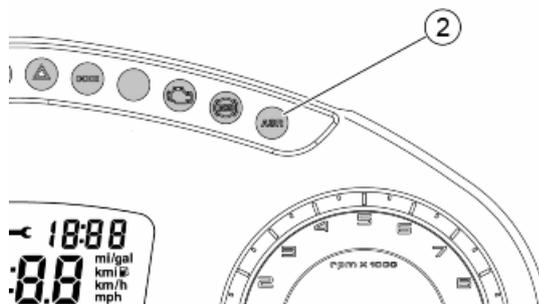
The ASR system is a device to help riding that helps the rider during acceleration manoeuvres, especially on slippery surfaces or in conditions that can cause sudden slippage of the rear wheel. The ASR in these situations automatically intervenes by reducing engine output within the limit imposed by the grip conditions, contributing significantly to the maintenance of stability the vehicle.



#### WARNING



THE ASR SYSTEM IS BASED ON THE RECOGNITION OF SPEED DIFFERENCES BETWEEN FRONT AND REAR WHEEL. IN ORDER FOR THE SYSTEM TO MAINTAIN MAXIMUM EFFICIENCY IN ALL CONDITIONS, THE CALIBRATION PROCEDURE **MUST** BE PERFORMED EVERY TIME, EVEN IN CASE OF REPLACEMENT OF JUST ONE TYRE. FOR THE CALIBRATION OF THE CONTROL UNIT PERFORM THE PROCEDURE BELOW.



- SWITCH «1»: on / off.
- WARNING LIGHT «2»: operating indication warning light.

#### Flashing mode:

- Off with the vehicle in gear: the system is working, but is not active (normal condition).
- Flashing quickly with moving vehicle: the system is up and running (conditions of low grip and intervention to reduce engine power); we recommend the utmost caution because the grip limit has been exceeded; restore the vehicle safety conditions by gently reducing the throttle opening.
- Lit with moving vehicle: the system is disabled and will not intervene in case of loss of grip.
  - If the deactivation was voluntary (by pressing the appropriate button «1» for 1 second) it is recommended to replace the system as soon as possible.
  - If the system was NOT deactivated voluntarily, this indicates an ASR system fault.

To ensure maximum safety of the vehicle it is advisable to keep the system active. Deactivation may be necessary only in case of starting with very low grip surfaces (mud, snow) on which the operation of the ASR could actually prevent the movement of the vehicle.

#### N.B.

**AT VEHICLE START-UP THE ASR WARNING LIGHT FLASHES AT THE SAME FREQUENCY AS THE ABS WARNING LIGHT, INDICATING A DIAGNOSTIC PHASE OF THE SYSTEM. IN THE ABSENCE OF ERRORS, BOTH WARNING LIGHTS TURN OFF AT THE SAME TIME WHEN EXCEEDING 5 KM/H.**

#### WARNING





THE ASR SYSTEM IS ACTIVATED AT EVERY «ON» POSITIONING OF THE IGNITION SWITCH. IF DISABLED BY THE USER, THE ASR SYSTEM KEEPS THE STATE OF INACTIVITY ONLY IF THE VEHICLE IS OFF, BY USING THE ENGINE STOP SWITCH; AT THE NEXT KEY ON THE ASR SYSTEM IS ENABLED AUTOMATICALLY.

CAUTION



IT IS EMPHASISED THAT THE RIDING AUXILIARY SYSTEM CAN NOT CHANGE THE PHYSICAL LIMITS OF GRIP AND IS NOT A SUBSTITUTE FOR PROPER MANAGEMENT OF POWER, BOTH ON STRAIGHT STRETCHES AND IN TURNS. THEREFORE, IT IS RECOMMENDED TO ALWAYS USE THE VEHICLE WITH THE UTMOST CARE AND IN ACCORDANCE WITH THE REGULATIONS IN FORCE.

CAUTION



AT LOW SPEED (LESS THAN 5 KM/H), THE ASR SYSTEM DOES NOT WORK. IT IS RECOMMENDED TO PAY PARTICULAR ATTENTION IN THE EVENT OF ACCELERATION FROM STANDSTILL IN CONDITIONS OF LOW GRIP, ESPECIALLY IN THE FIRST METRES.

N.B.

IN CASE OF A ROAD FULL OF HOLES THERE BRIEF ACTIVATIONS OF THE ASR SYSTEM MAY OCCUR. THIS OCCURRENCE IS PART OF THE NORMAL CONDITIONS OF OPERATION OF THE VEHICLE.

N.B.

THE DEVICE PREVENTS IMPRESSING ON THE REAR HIGH SPEED ROTATION WHEEL WITH THE VEHICLE ON THE CENTRE STAND. IT IS RECOMMENDED NOT TO INSIST WITH THE THROTTLE GRIP IN THIS PARTICULAR CONDITION.

CAUTION



A POOR STATE OF MAINTENANCE OF THE TYRES CAN RESULT IN ABNORMAL OPERATION OF THE ASR SYSTEM.

IN CASE OF REPEATED INTERVENTIONS OF THE ASR, EVEN ON ROAD SURFACES WITH GOOD GRIP OR SMALL THROTTLE OPENINGS, IT IS NECESSARY TO CHECK FOR WEAR AND/OR THE STATE OF INFLATION OF TYRES FIRST.

CAUTION



**IN THE EVENT OF MALFUNCTION OF THE BATTERY, THE ABS - ASR SYSTEM TURNS OFF ASR SYSTEM CALIBRATION PROCEDURE.**

In order to maintain the effectiveness of the ASR system following the replacement of one or both tyres a calibration procedure of the system must be performed as follows on a straight flat stretch of road.

- It is necessary that the diagnostic phase of the ASR systems and ABS is complete: for this purpose, after the key ON, ride a short distance above 5 km/h and wait for the flashing of the two warning lights to stop.

- Turn the ASR system off by pressing the button «1» on the handlebar and check that the ASR disabling warning light «2» is on.

- Allow the engine to run in idle for at least 3 seconds.
- Press simultaneously the right brake lever, the engine start-up button and the ASR on/off button «1» for at least 2 seconds. The activation process will be confirmed by the ASR warning light «2» turning on with slow flashing.
- Accelerate to a constant speed of 30 to 40 km/h and maintain it for at least 7 to 8 seconds.
- The end of the procedure will be indicated by the flashing ASR warning light «2».
- Once the procedure is complete it is necessary to turn off the vehicle panel (key off) and wait 30 seconds before turning the panel on (key on).
- In case of failure to complete the procedure within 2 minutes the ASR warning light «2» will stay on steady and the ASR will remain off until the panel is turned off (key off).
- To restart the vehicle panel (key on) it is necessary to reactivate the ASR. It is however necessary to repeat the process until it succeeds.

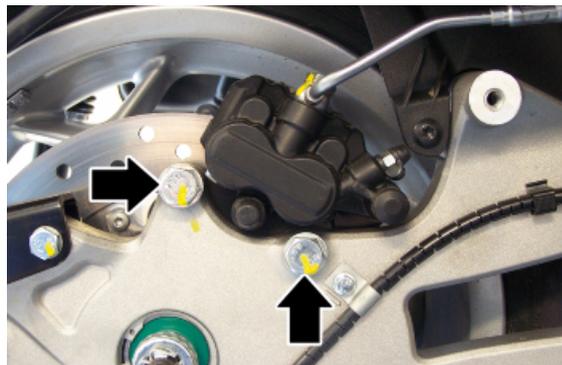
## Rear brake calliper

### Removal

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

**N.B.**

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



### SMONTAGGIO VALVOLA RIPARTIZIONE FRE- NATA

- Rimuovere i due fissaggi valvola ripartizione frenata al supporto e recuperare le rondelle.

**N.B.**

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

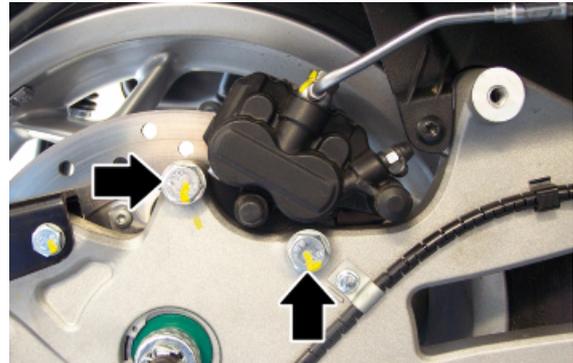


## Refitting

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

### Locking torques (N\*m)

Rear brake calliper fixing screws 41 - 51



If the calliper is replaced:

#### CAUTION

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

#### CAUTION

**ALWAYS USE NEW COPPER WASHERS.**

### Locking torques (N\*m)

Rear brake calliper-pipe fitting 20 ÷ 25

#### FITTING BRAKING DISTRIBUTION VALVE

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

#### CAUTION

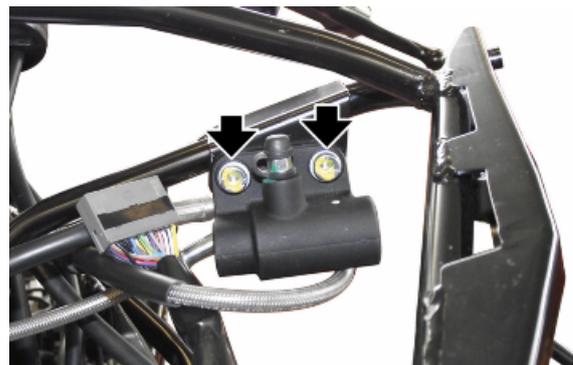
**ALWAYS USE NEW COPPER WASHERS.**

#### N.B.

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

### Locking torques (N\*m)

Screws fixing the distribution mechanism 10 to 11  
 Brake fluid pipe-calliper fitting 20 ÷ 25



#### See also

[Rear - combined](#)

## Front brake calliper

---

## Removal

- Remove the two front brake calliper devices fastening to the support and recover the four washers.

**N.B.**

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



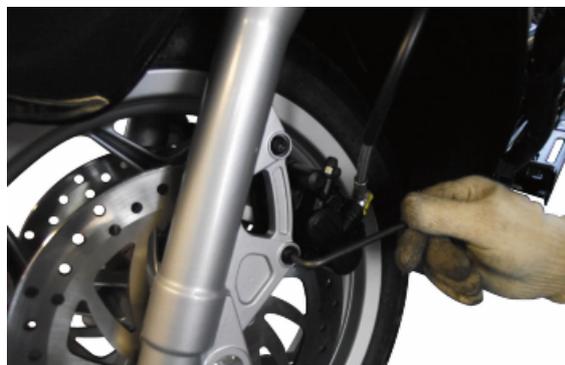
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## Refitting

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

### Locking torques (N\*m)

**Screw tightening calliper to support 24 ÷ 27**



If the calliper is replaced:

**CAUTION**

**ALWAYS USE NEW COPPER WASHERS.**

**CAUTION**

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

### Locking torques (N\*m)

**Brake fluid pipe-calliper fitting 20 ÷ 25**

**See also**

[Front](#)

---

## Rear brake disc

---

### Removal

**REAR WHEEL WITH INTEGRATED HUB**

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



## Refitting

### REAR WHEEL WITH INTEGRATED HUB

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

**N.B.**

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



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

### Recommended products

#### Loctite 243 Medium-strength threadlock

Medium Loctite 243 threadlock

### Locking torques (N\*m)

Brake disc screws 8 ÷ 10

## Disc Inspection

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

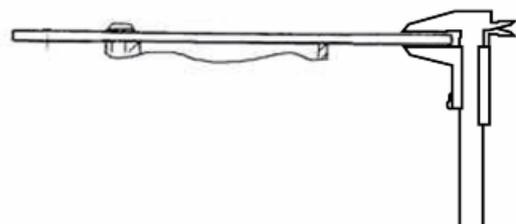
### Characteristic

#### New rear disc thickness

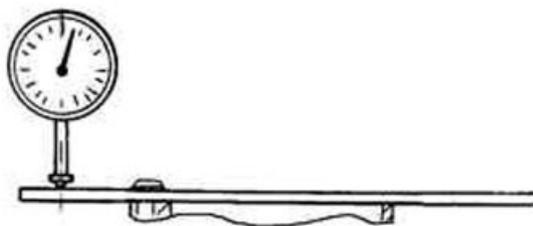
4.5 mm

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

4.0 mm



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



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

### Characteristic

#### Max. axial run-out

0.1 mm

## Front brake disc

### Removal

- Remove the front wheel.
- Unscrew the five fixing screws and remove them, together with their collars and washers.
- Thoroughly clean the seats on the front wheel hub and on the disc.



### Refitting

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

- Position the collars and washers.
- Do up the screws to the prescribed torque and apply the recommended product

**N.B.**

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

### Recommended products

#### Loctite 243 Medium-strength threadlock

Medium Loctite 243 threadlock

### Locking torques (N\*m)

**Brake disc screws 24 ÷ 27**



## Disc Inspection

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

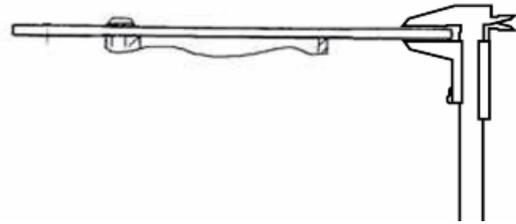
### Characteristic

#### Thickness of a new front disc

4.5 mm

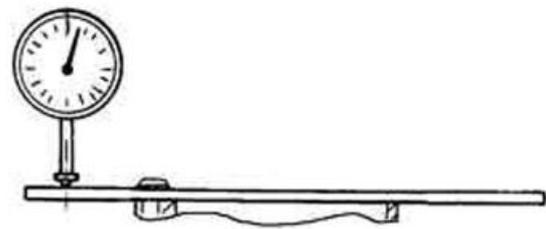
#### Disc thickness at wear limit (front)

4.0 mm



- Remove the wheel and check using the appropriate tools that the axial run-out of the brake surface is within the prescribed limits.

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



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

### Characteristic

#### Max. axial run-out

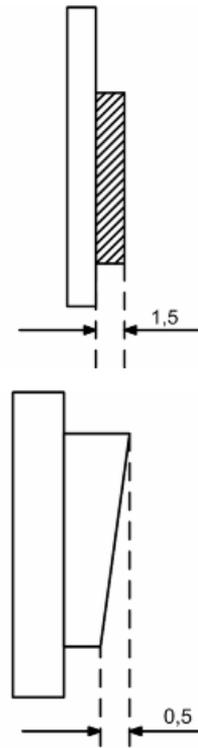
0.1 mm

## Front brake pads

### Removal

- Remove the front brake calliper.
- Loosen the two pins shown in the figure that lock the two pads; be careful with the pad spring clamp.
- Remove the brake pads and check there are no faults or warping. Replace it if such anomalies are present.
- Check the thickness of the friction material is more than 1.5 mm. If it is not, replace it
- The replacement must be made with greater residual thickness if the brake pad has not worn evenly. A 0.5 mm thickness difference in the residual friction material is permitted.





### See also

[Removal](#)

## Refitting

To fit, proceed as follows:

- Insert the two pads in the callipers.
- Make sure to properly position the retainer spring, tighten the locking pin of the pads to the correct torque, applying the recommended product.
- Fit the calliper on its support, tightening the two screws to the prescribed torque.

#### N.B.

IF IT IS NOT POSSIBLE TO CORRECTLY POSITION THE CALLIPER ON THE DISC DURING FITTING, GENTLY EXPAND THE PADS.

### Recommended products

#### Loctite 243 Medium-strength threadlock

Medium Loctite 243 threadlock

### Locking torques (N\*m)

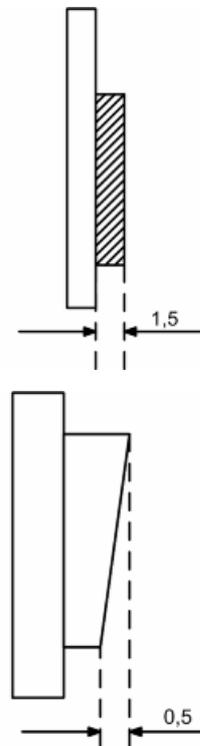
**Screw tightening calliper to support 24 ÷ 27 Pad fastening pin 19.6 to 24.5**



## Rear brake pads

### Removal

- Remove the rear brake calliper
- Loosen the two pins shown in the figure that lock the two pads; be careful with the pad spring clamp.
- Remove the brake pads and check there are no faults or warping. Replace it if such anomalies are present.
- Check the thickness of the friction material is more than 1.5 mm. If it is not, replace it
- The replacement must be made with greater residual thickness if the brake pad has not worn evenly. A 0.5 mm thickness difference in the residual friction material is permitted.



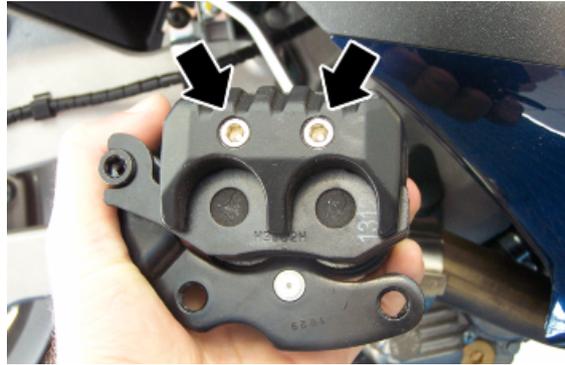
### See also

[Removal](#)

## Refitting

To fit, proceed as follows:

- Insert the two pads in the callipers.
- Screw the two pad lock pins to the correct torque, and apply the recommended product.
- Fit the calliper on its support, tightening the two screws to the prescribed torque.



### N.B.

IF IT IS NOT POSSIBLE TO CORRECTLY POSITION THE CALLIPER ON THE DISC DURING FITTING, GENTLY EXPAND THE PADS.

### Recommended products

#### Loctite 243 Medium-strength threadlock

Medium Loctite 243 threadlock

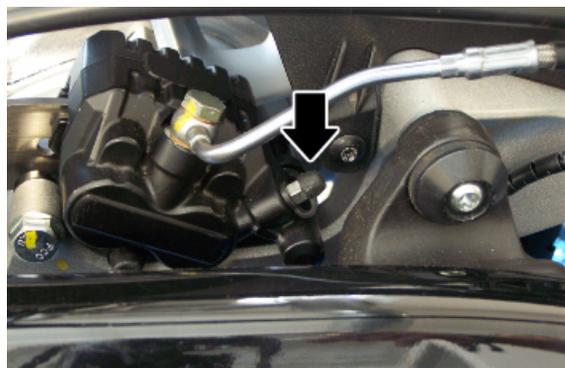
### Locking torques (N\*m)

Rear brake calliper fixing screws 41 - 51 Pad fastening pin 19.6 to 24.5

## Fill

### Rear - combined

- Remove the rubber cap from the bleed screw.
- Insert a rubber pipe in the bleed screw to permit the brake fluid to be recovered.
- With the brake lever, load the system and bring it up to the required pressure.
- Keeping the brake lever pulled, loosen the bleed screw to purge the air in the system. Then tighten the bleed screw



- Repeat the operation until only brake fluid comes out of the rubber pipe.
- Remove the fluid recovery pipe and refit the rubber cap over the bleed screw.
- Top up the brake fluid to the right level in the reservoir.

If necessary, bleeding can be done using a special vacuum pump



**THE BLEEDING OPERATIONS OF THE BRAKING SYSTEM, EVEN FOR THE VERSION EQUIPPED WITH ABS SYSTEM, DO NOT ALLOW THE USE OF DIAGNOSTIC TESTER, AND ARE THEREFORE EQUAL TO THOSE DESCRIBED FOR THE STANDARD BRAKE SYSTEM.**

### N.B.

**DURING THE BLEEDING OPERATIONS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE BODYWORK SO AS NOT TO DAMAGE IT. FURTHERMORE, DURING THE**

**BLEEDING OPERATIONS REGARDING THE BRAKE CALLIPERS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE DISC BRAKES AND WITH THE BRAKE PADS. FAILURE TO OBSERVE THIS PRECAUTION WILL ENDANGER THE PROPER WORKING AND EFFICIENCY OF THE BRAKING SYSTEM**

### Specific tooling

020329Y Mity-Vac vacuum-operated pump

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

System bleed calliper fitting: 12 ÷ 16 Nm

## Front

- Remove the rubber cap from the bleed screw.
- Insert a rubber pipe in the bleed screw to permit the brake fluid to be recovered.
- With the brake lever, load the system and bring it up to the required pressure.
- Keeping the brake lever pulled, loosen the bleed screw to purge the air in the system. Then tighten the bleed screw



- Repeat the operation until only brake fluid comes out of the rubber pipe.
- Remove the fluid recovery pipe and refit the rubber cap over the bleed screw.
- Top up the brake fluid to the right level in the reservoir.

If necessary, bleeding can be done using a special vacuum pump



**THE BLEEDING OPERATIONS OF THE BRAKING SYSTEM, EVEN FOR THE VERSION EQUIPPED WITH ABS SYSTEM, DO NOT ALLOW THE USE OF DIAGNOSTIC TESTER, AND ARE THEREFORE EQUAL TO THOSE DESCRIBED FOR THE STANDARD BRAKE SYSTEM.**

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### Specific tooling

020329Y Mity-Vac vacuum-operated pump

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

System bleed calliper fitting: 12 ÷ 16 Nm

## Brake fluid level check

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

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

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



## Front brake pump

### Removal

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



### Refitting

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

**N.B.**

**WHILE REFITTING, REPLACE THE COPPER GASKETS ON THEIR FITTINGS.**

**WARNING**

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

**CAUTION**

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

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

Oil bleed screw 12 - 16 Brake fluid pump-hose fitting 13 to 18 Nm Fixing screws for the handlebar control unit U-bolts 7 ÷ 10

**See also**

[Front](#)

**Rear brake pump - combined****Removal**

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

**Refitting**

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

**N.B.**

**WHILE REFITTING, REPLACE THE COPPER GASKETS ON THEIR FITTINGS.**

**WARNING**

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**CAUTION**

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

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

Oil bleed screw 12 - 16 Brake fluid pump-hose fitting 13 to 18 Nm Fixing screws for the handlebar control unit U-bolts 7 ÷ 10

**See also**

[Rear - combined](#)

## Brake pipes

### FRONT BRAKE PIPES REMOVAL

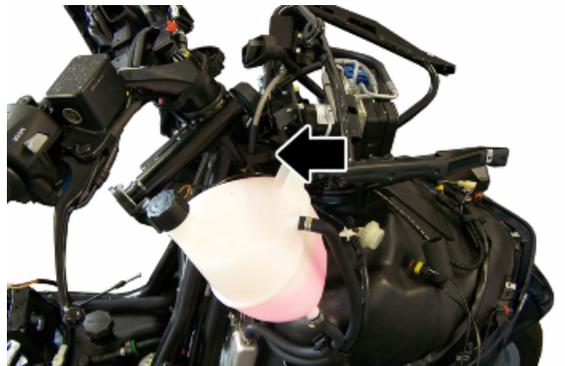
- Remove all the front plastics of the bodywork, including the handlebar.
- Disconnect the brake pipes from the left front caliper and drain the system collecting the fluid.



- Remove the metal clamp placed inside the front wheel housing.

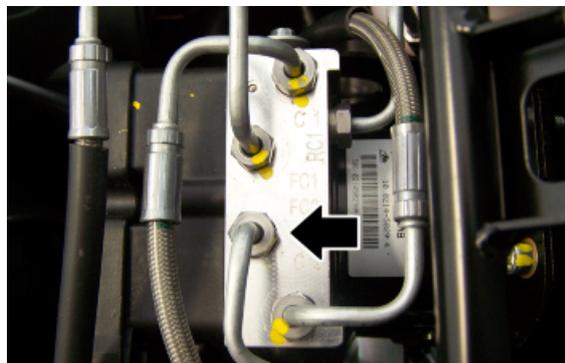


- Release the pipes from the spring.

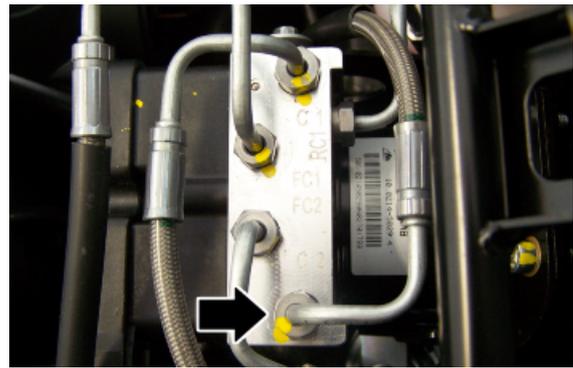


- Disconnect the front left brake caliper line from the ABS unit.

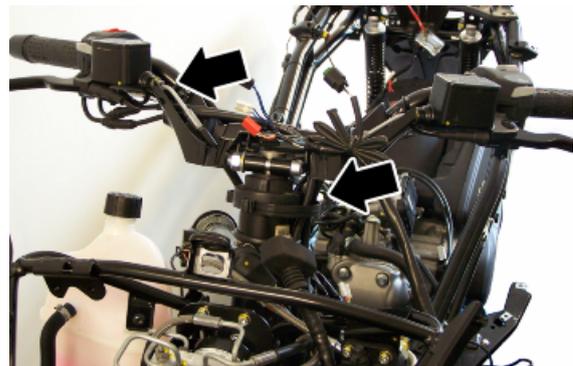
The first section of the line is now free.



- Disconnect the right hand brake master line from the ABS unit.



- Release the pipes from the collar.
- Disconnect the pipes from the right brake pump.



#### INTEGRAL REAR BRAKE PIPES REMOVAL

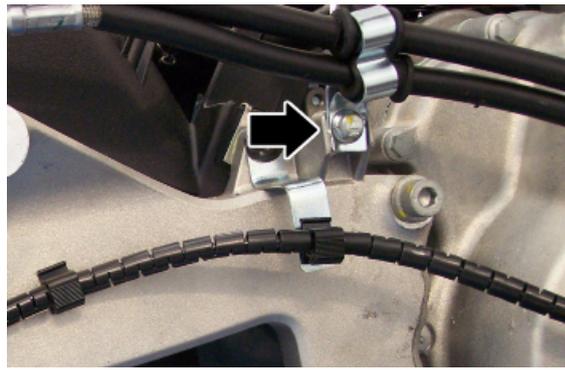
- Remove all the plastics of the bodywork, including the handlebar.
- Disconnect the brake pipes from the rear calliper and drain the system collecting the fluid.



- Disconnect the brake pipes from the right front calliper and drain the system collecting the fluid.



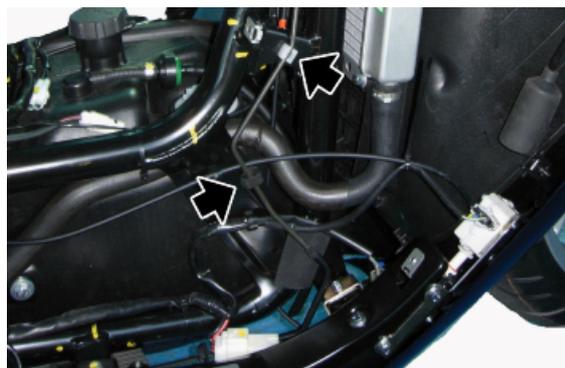
- Remove the metal clamp.



- Remove the metal clamp and release the pipes from the spring.



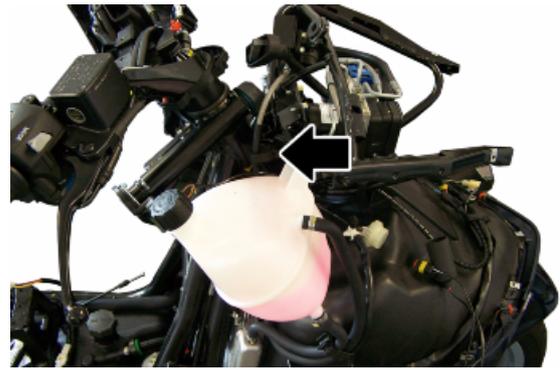
- Release the pipes from the springs.



- Remove the clamp.

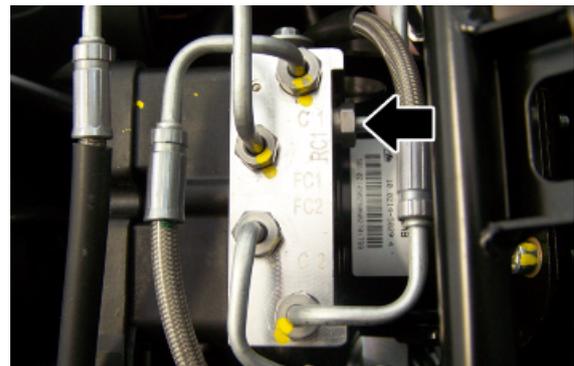


- Release the pipes from the spring.



- Disconnect the rear hand brake caliper line from the ABS unit.

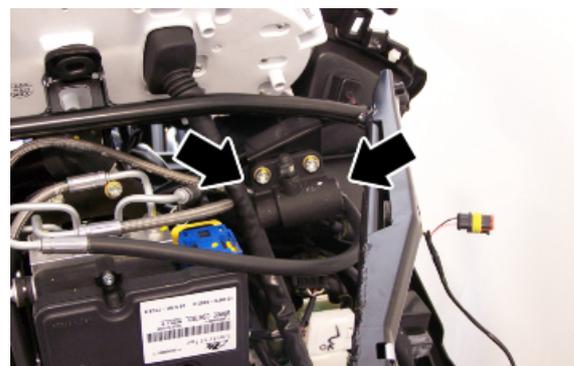
The first section of the line is now free.



- Remove the metal clamp placed inside the front wheel housing.

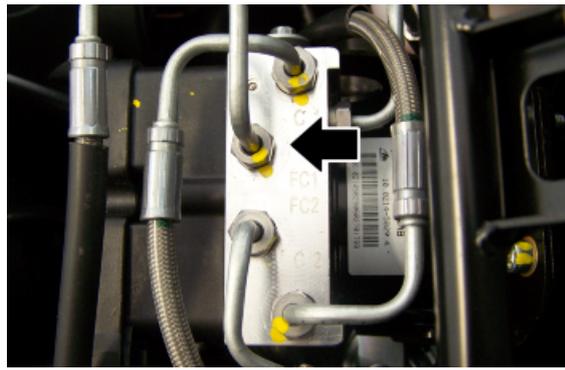


- Disconnect the pipes from the distribution valve.

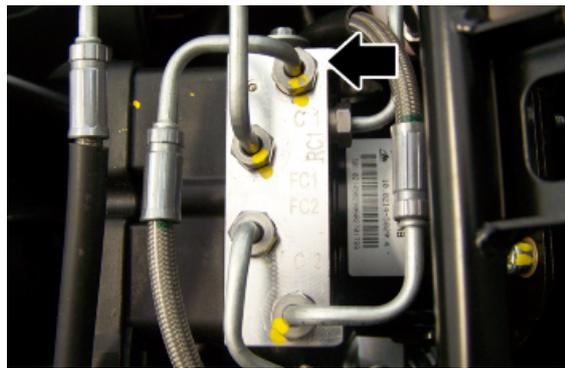


- Disconnect the front right brake caliper line from the ABS unit.

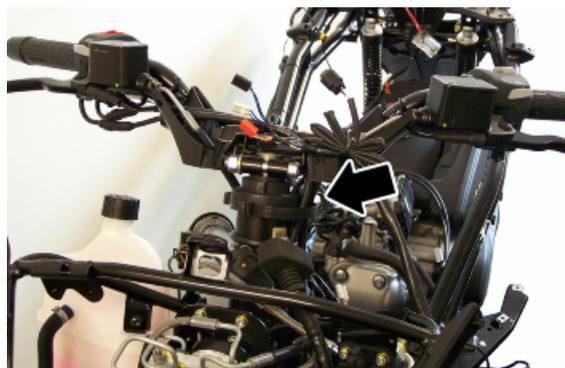
The second section of the line is now free.



- Disconnect the left hand brake master line from the ABS unit.



- Release the pipes from the collar.



- Disconnect the pipes from the left brake pump.



## BRAKE PIPING INSTALLATION

- To refit, carry out the removal operations but in reverse order.



THE CONTROL UNIT, SUPPLIED AS A SPARE, IS SEALED AND COMES WITH BRAKE FLUID. ANY LOSS OF FLUID DUE TO INSTALLATION OPERATIONS CAN BE RESET BY TOPPING UP THE SYSTEM.

**CAUTION**

ONCE REFITTING IS FINISHED, BLEED THE SYSTEM.

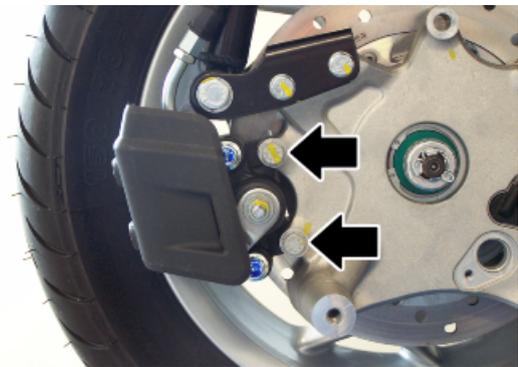
**Locking torques (N\*m)**

Brake fluid pump-hose fitting 13 to 18 Nm Brake fluid pipe-calliper fitting 20 ÷ 25 Front calliper pipe tightening - distribution mechanism 20 ÷ 25 Brake pipes fixing screw at the distribution mechanism 20 ÷ 25 Pump pipe grommet screw - clamp 6 - 10 Pipe fittings - ABS control unit 13 - 18

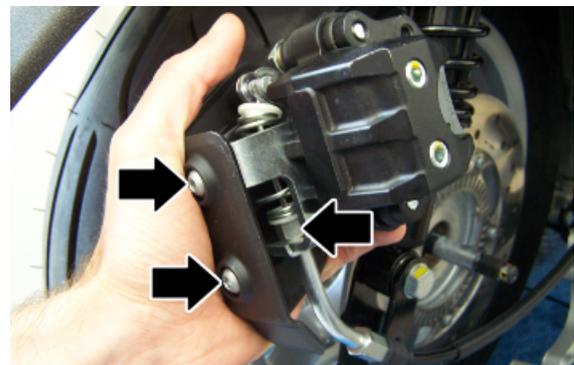
## Parking brake

### PARKING BRAKE CALLIPER REMOVAL

- Undo the two screws indicated and remove the calliper from the silencer support bracket.



- Unscrew the two screws indicated to remove the protection, then loosen the indicated nut to remove the transmission.



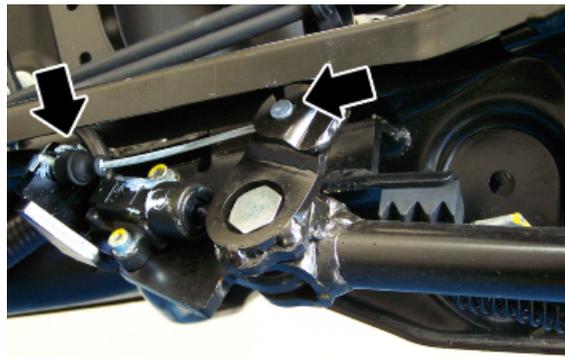
- To refit, carry out the previous operations but in reverse order. After adjustment, tighten the nut indicated to the prescribed torque.

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

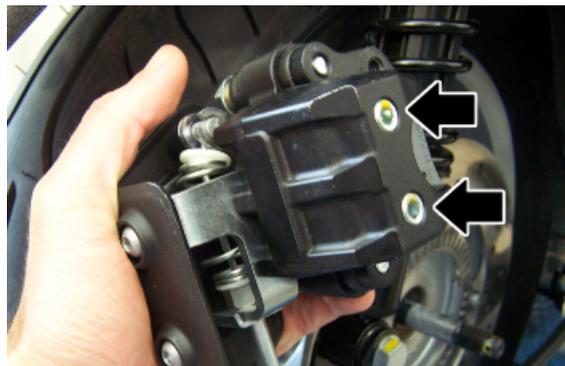
Screw fixing parking brake calliper to supporting plate 24 to 27 Parking brake adjusting nut 10

**PARKING BRAKE CONTROL REMOVAL**

- Remove the left footrest.
- Disconnect the transmission cable and release the pipe from the indicated retainer.

**BRAKE PAD REPLACEMENT**

- Remove the brake calliper.
- Unscrew the two retaining pins and slide off the pads.
- To refit, carry out the previous operations but in reverse order.

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

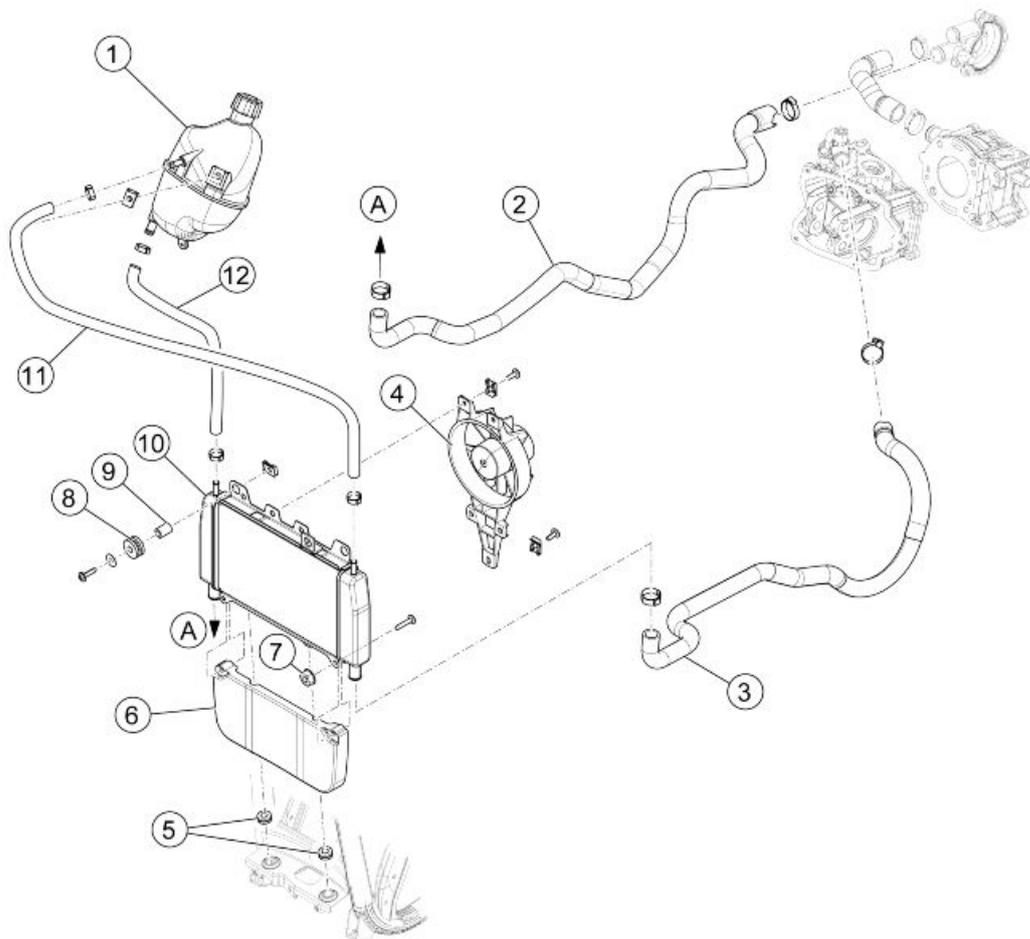
**Pin fixing parking brake pads 15 to 20**

## INDEX OF TOPICS

COOLING SYSTEM

COOL SYS

---

**Circuit diagram****Key**

1. Cooling liquid reservoir
2. Pump-radiator connecting pipe
3. Head-radiator connecting pipe
4. Electric fan
5. Radiator grille closing
6. Radiator grille closing
7. M6 self-locking nut
8. Upper retainer rubber
9. Spacer
10. Water radiator
11. Radiator return pipe

12. Radiator filling pipe

**DATI CARATTERISTICI**

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

**THERMOSTAT**

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

**ELECTRIC VENTILATION**

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

**WATER PUMP**

Specification	Desc./Quantity
Type	Centrifugal
Control	Coaxial to crankshaft

**RADIATOR**

Specification	Desc./Quantity
Type	Aluminium, with horizontal circulation

**EXPANSION TANK**

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

**Electric fan check**

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

**Characteristic**

**Battery voltage**

12V

- Check that the electric ventilation relay is working properly.

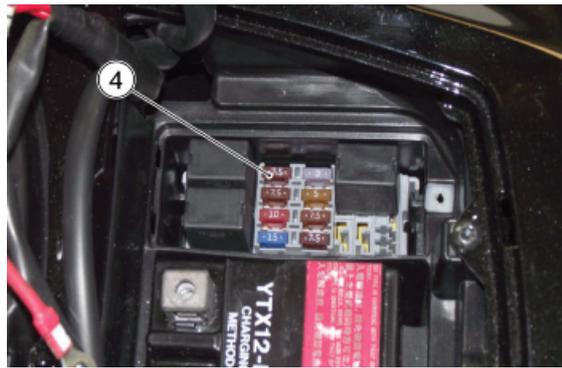


**WARNING**

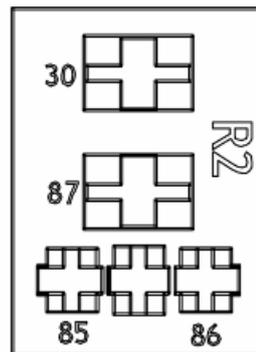
**TO INDICATE THE RELAY OF THE DESIRED FUNCTION, REFER TO THE PIN-CABLE COLOUR RELATIONSHIP WITH THE ATTACHED ELECTRIC SYSTEM DIAGRAM.**

Verificare lo stato del fusibile «4» dell'elettroventola:

- se il fusibile è compromesso, sostituirlo con uno dello stesso tipo, da 7,5 A;
- se il fusibile è integro, procedere con i controlli successivi.



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



- In order to check the coolant temperature sensor, see the «Electrical system-diagnostics instrument» chapter

### See also

[Strumento di diagnosi](#)

## Coolant replacement

First remove the front headlight assembly, the left and right side fairings, the lower cover, the right footrest.

First drain off the system.

### DRAINING THE COOLING SYSTEM

- Loosen the clamp and after taking out the delivery tube to the water pump, drain the fluid into a container of suitable capacity previously placed under the vehicle.



- To complete the draining of the liquid, also open the cap of the expansion tank, located in the right dashboard door.

### Recommended products

**AGIP PERMANENT SPEZIAL Ethylene glycol-based antifreeze fluid with organic inhibition additives. Red, ready to use.**

ASTM D 3306 - ASTM D 4656 - ASTM D 4985 -  
CUNA NC 956-16

### Characteristic

#### Cooling system fluid

1.75 l

### REPLACEMENT OF COOLING SYSTEM

- Reposition the delivery pipe to the water pump and position a new clamp.
- Through the entrance of the expansion tank, fill the cooling system with the suggested liquid, until reaching the maximum level and bleed the system.
- Tighten the expansion tank cap.
- Fit the removed components: the right footrest, the lower cover, the left and right side fairings, front headlight assembly, top fairing.

### See also

[Footrest](#)  
[Radiator fan](#)  
[Flyscreen](#)  
[Side fairings](#)

[Headlight assy.](#)

## System bleed

- Drain the cooling system.
- After removing the saddle, unscrew and remove the four screws and remove the helmet compartment door.



- Start up the engine until the operating temperature is reached.
- Remove the bleed valve rubber cap.
- Use a rubber hose of suitable length to connect the valve to the expansion tank.
- Place one end of the hose on the bleed valve and the other in the expansion tank.



- Loosen the screw by **two** turns until the communication hole is revealed with the head as shown in the picture.
- Wait until only coolant comes out of the rubber pipe so as to eliminate any air bubbles inside the circuit.
- Tighten the bleed valve respecting the prescribed torque.
- Refill with coolant up to the correct level inside the expansion tank.

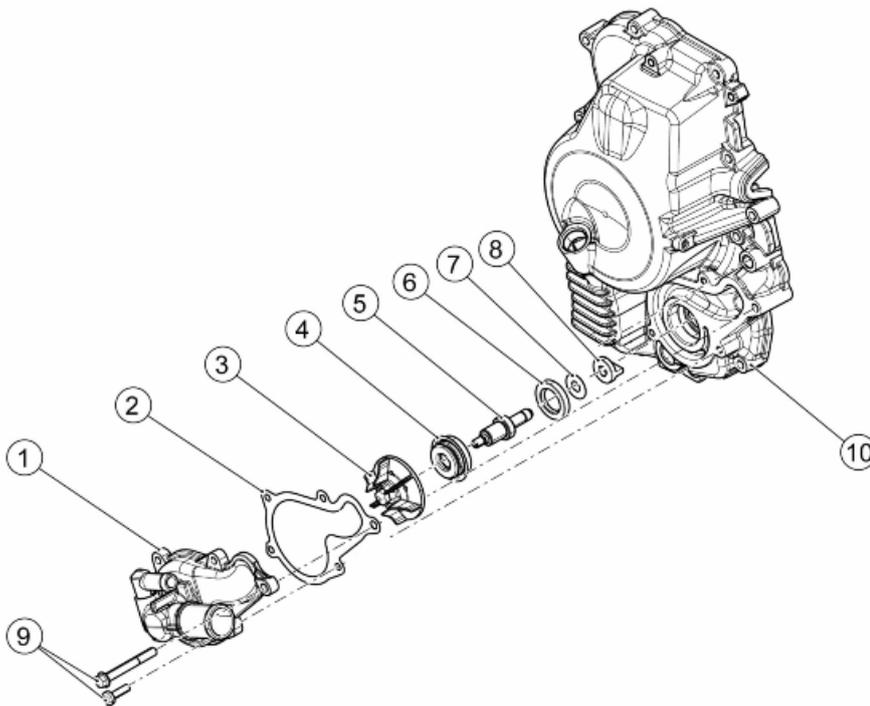


### Locking torques (N\*m)

Bleed screw 3

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## Water pump



**key:**

1. Pump cover
2. Pump cover gasket
3. Pump rotor
4. Sealing ring
5. Pump shaft
6. Sealing ring
7. Flat washer

8. Driving joint
9. Pump cover screws
10. Flywheel cover.

**See also**

[Removing the hub cover](#)  
[Removal](#)  
[Fitting](#)

---

**Thermostat**

---

**Removal**

---

- Drain the cooling system.
- After removing the saddle, unscrew and remove the four screws and remove the helmet compartment door.



- Unscrew and remove the two screws, remove the cover and remove the thermostat.

**See also**

[Coolant replacement](#)

---

## Check

1) Visually inspect that the thermostat is not damaged.

2) Fill a metal container with approx. 1 litre of water.

Immerse the thermostat, and keep it in the centre of the container.

Immerse the multimeter temperature probe, and keep it close to the thermostat.

Heat up the container using the thermal gun.

Check the temperature at which the thermostat starts to open:

Heat up until the thermostat is completely open.

3) Replace the thermostat if it is not working properly.



### CAUTION

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

## Specific tooling

020331Y Digital multimeter

020151Y Air heater

## THERMOSTAT

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

## Refitting

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

### Locking torques (N\*m)

#### Thermostat cover screws 3 ÷ 4

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

### See also

[System bleed](#)

Coolant replacement

## INDEX OF TOPICS

**CHASSIS**

**CHAS**

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

## Seat

- If it is not possible to open the saddle with the button on the dashboard, with key inserted and in «OFF» position, push and open the front case.



- Operate on the left lever to open the saddle.



- Unscrew and remove the fixing screw to the bracket of the saddle lifting small piston.



- 
- While supporting the saddle, loosen and remove the two central fixing screws of the saddle to the helmet compartment and remove the saddle.

### Locking torques (N\*m)

**Saddle fixing screws 8 ÷ 10 Fixing screws pneumatic spring - saddle 15 to 20 Fixing screws pneumatic spring - frame 15 to 20**



---

## Driving mirrors

- Lift the rubber cover.
- Loosen the indicated nut, keeping the lower spacer blocked.
- Undo the mirror from the lower spacer.
- Remove the lower spacer, if necessary.

**N.B.**

**THE RIGHT MIRROR SHOULD BE UNSCREWED CLOCKWISE.**

### Locking torques (N\*m)

**Mirrors fastening long nut 24 - 26**



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## Rear handlebar cover

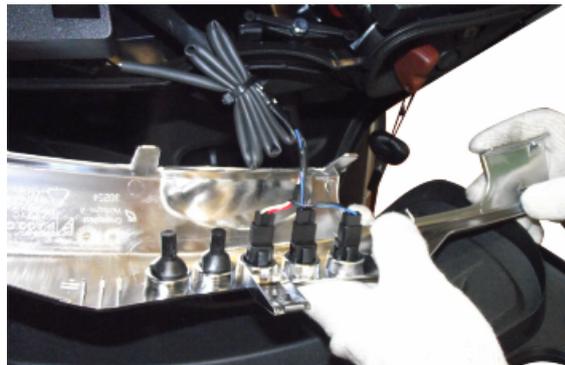
- To remove the instrument panel, first remove the handlebar cover.
- Then undo the central screw.



- Operating from both sides, unscrew the two screws inside the glove-box of the instrument panel.



- Remove the moulding switches and disconnect the connectors.



- Unscrew and remove the two side screws.



- 
- Unscrew and remove the two central screws.



- 
- Remove the central cover.



- 
- Remove the expansion tank cap by unscrewing it and temporarily close it with a clean cloth so that no dust or other impurities get into the coolant.



- 
- Remove the internal cover of the instrument panel glove-box.
  - Working inside the left compartment, disconnect the USB socket connector.



- Disconnect the instrument panel connector.
- Remove the instrument panel.
- Remove the cloth and insert the cap in the expansion tank.

**See also**

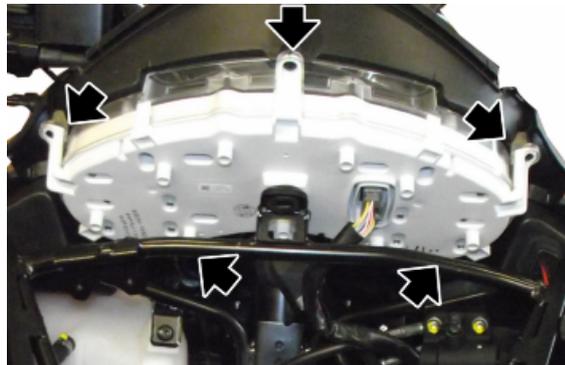
[Front handlebar cover](#)

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**Instrument panel**

To remove the instrument panel, first remove the rear handlebar cover.

- Unscrew and remove the five fixing screws and remove the instrument panel from the rear cover.

**See also**

[Rear handlebar cover](#)

---

**Front handlebar cover**

- To remove the handlebar cover, first remove the rear-view mirrors.
- Using a small screwdriver and paying attention to the paintwork of the vehicle, remove the Piaggio clip-on badge.



- 
- Undo and remove the central screw.



- 
- Remove the central cover.



- 
- Unscrew and remove the four screws and remove the handlebar cover.

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

Central cover fixing screws - handlebar 9  
Handlebar upper cover fixing screws 5 - 8



#### See also

[Driving mirrors](#)

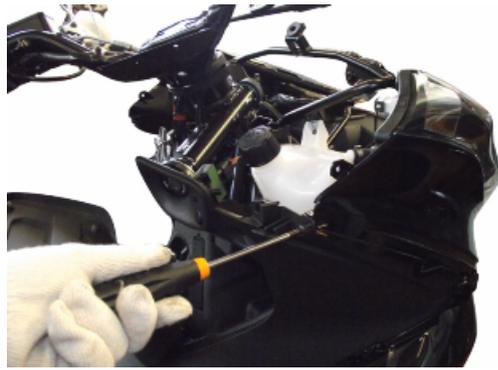
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### Headlight assy.

- First remove the windshield unit, handlebar cover, instrument panel and side mouldings.
- Operating from both sides of the front frame, unscrew and remove the two screws.



Operating from both sides of the vehicle, unscrew and remove the fixing screw.



- Operating from both sides, unscrew and remove the four fixing screws to the lower shield.

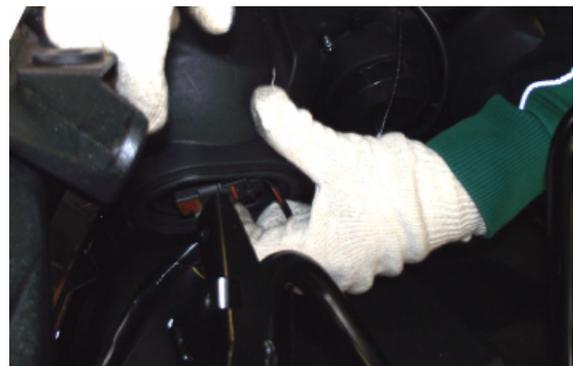




- Disconnect the connectors of the two front turn indicators.



- Disconnect the connectors of the two low beam bulbs.



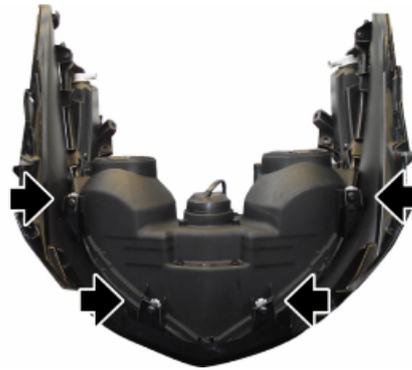
- Disconnect the connector of the high beam bulbs.



- If necessary, by unscrewing the four screws indicated, it is possible to disassemble the front headlight.

### Locking torques (N\*m)

Front headlight assembly fixing screws - shield 4.5 to 7  
Shield upper cover fixing screws - front headlight assembly 4.5 to 7



### See also

[Rear handlebar cover](#)  
[Front handlebar cover](#)  
[Flyscreen](#)

## Legshield

Using a screwdriver and paying attention to the bodywork, remove the Piaggio clip-on badge «A».



Unscrew and remove the front screw «B».



Turn the handlebars to the side opposite to the one on which you are operating and, after lifting the door of the respective dashboard glove-box, unscrew the screw «**C**», first operating on the left side and then on the right side of the vehicle.



Remove the plastic cover from both sides.



Operating from both sides of the vehicle, unscrew and remove the screw «**D**».



Remove the front cover from the front.



## Removing the ignition key-switch when on \*off\*

To remove the lock when it is in «OFF» position first remove the lower top fairing and the case.

- Disconnect the connector and remove the immobilizer antenna, disengaging it from the lock body.



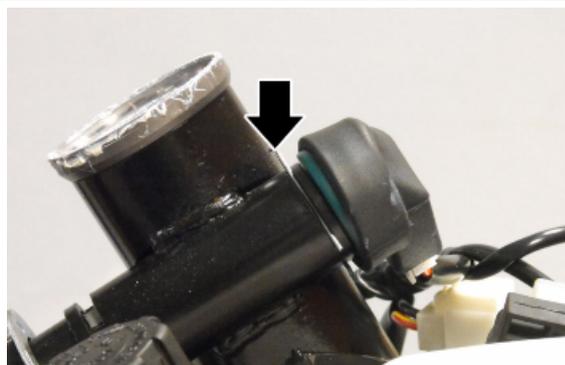
### See also

[Front](#)  
[Flyscreen](#)

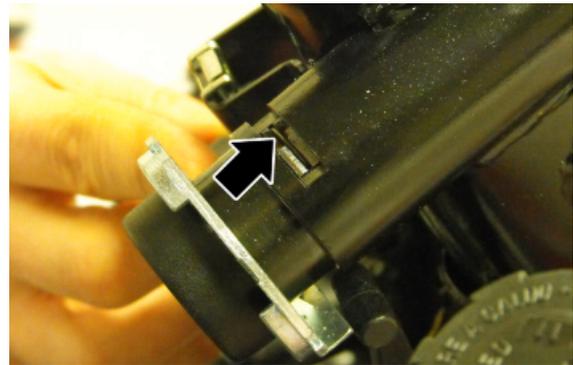
- Disconnect the lock key connector.



- Release the indicated clip and remove the ignition key;



- Press the lock body and remove the cylinder clip as indicated;
- Release the lock body and remove the cylinder.



- If necessary, remove the connector key lock from the cylinder.

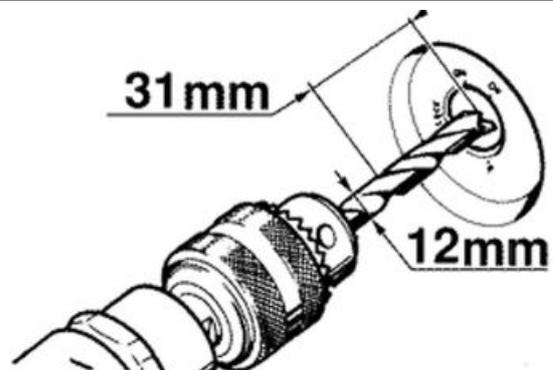


### Removing the ignition key-switch when on \*lock\*

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

**N.B.**

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



### See also

[Removing the ignition key-switch when on \\*off\\*](#)

## Front wheel housing

### REMOVAL OF FRONT WHEEL HOUSING

To remove the front lower shield, you must first remove the front cover and side fairings.

- Operating on both sides of the vehicle, unscrew and remove the three screws.



- Remove the front lower shield from below and, lifting the front wheel with the aid of a hoist suitably fixed to the vehicle, remove it by passing it through the front wheel from below.



### REMOVAL OF WHEEL HOUSING - LOWER SHIELD

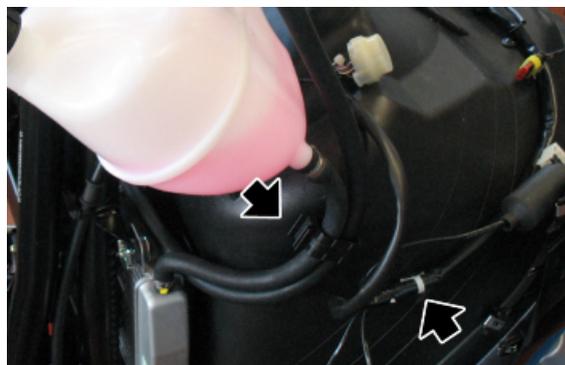
Position the vehicle on the central stand, first supporting it with a hoist.

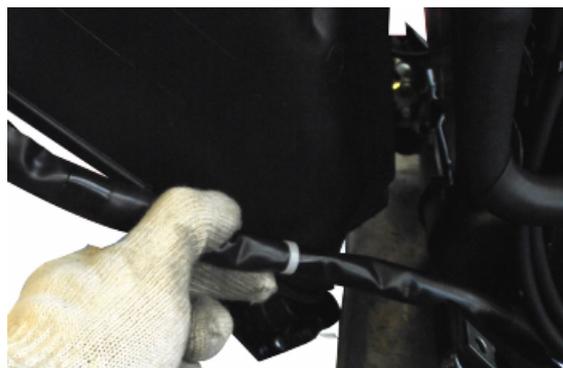
First remove the cover of the wheel housing, as previously described, and the steering-forks-front wheel assembly.

- Unscrew and remove the fixing screw to the instrument panel support frame.



- Release the coolant pipes from pipe grommet.
- Release three cable grommets arranged around the perimeter of the shield.
- Release the electric cable harness from the front central cable grommet.





- Release the electric cable harness from the central cable grommets.



- Disconnect the external air temperature sensor connector.



- Release the radiator piping from the pipe grommet.
- Release the wheel housing from below.

### Locking torques (N\*m)

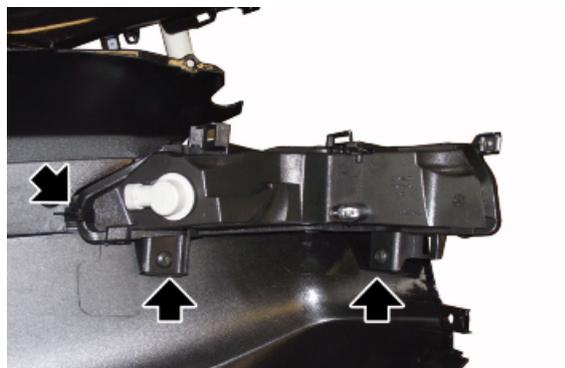
**Wheel housing fixing screws - chassis 4.5 to 7**  
**Wheel housing fixing screws - front frame 4.5 to 7**



## Taillight assy.

First remove the rear central cover and the semi-tail fairing on the side concerned.

- Working on the rear and inner side of the semi-tail fairing, unscrew and remove the two lower screws and remove the relative rear headlight assembly, sliding it off from the left fastening tab.



### See also

[Tail guard](#)  
[Lower cover](#)

## Footrest

The following removal operations refer to one footrest but apply to both.

First remove the lower cover.

- Release and remove the front and rear mats.



**REMOVAL OF REAR FOOTREST**

- Undo and remove the two screws and collect the respective washers.



- Unscrew and remove the rear screw.



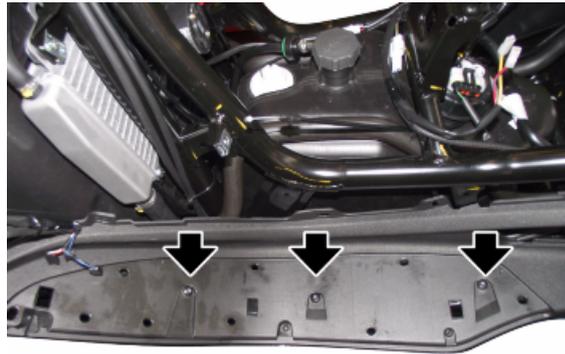
- Remove the rear footrest, paying attention to the fitting tab.



- Unscrew and remove the front screw.



- Undo and remove the three screws.



#### FRONT FOOTREST

- Undo and remove the two screws and collect the respective washers.



- Unscrew the footrest.



- 
- Remove the lower cover of the footrest, being careful not to damage it.

### Locking torques (N\*m)

**Footrests central fixing screws 4.5 to 7 Footrests rear fixing screws 4.5 to 7 Passenger footrest fixing screws 4.5 to 7 Passenger footrest rubber fixing screws 4.5 to 7**



### See also

[Lower cover](#)

---

## Side fairings

### FRONT MOULDING REMOVAL

- Remove the moulding switches as described in the instrument panel removal.

- Remove the front mat by lifting it.



- Undo and remove the screw.



- Remove the side moulding by sliding it off the fittings.



### CENTRAL MOULDINGS

- The right and left central mouldings are removed in the same way, by extracting them with caution from the six fittings that secure to the parts of the bodywork.



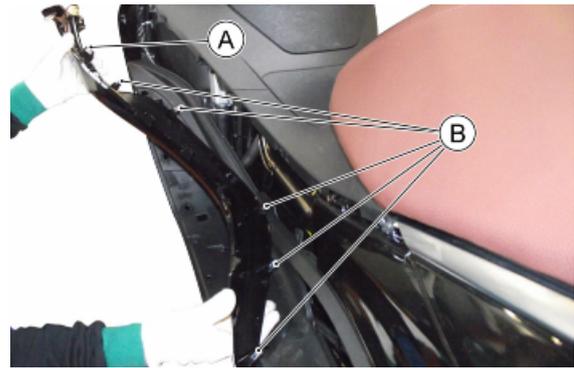
### SIDE FAIRING REMOVAL

- Remove the front moulding and the central one. Unscrew and remove the 4 screws.



- Remove the side paying close attention and pulling it out from the five side retainers and from the front one.

The operations for the removal of the side are described for one but apply to both.



### See also

[Rear handlebar cover](#)

## License plate holder

- To remove the license plate, it is necessary to first remove the semi-tail fairing.

- Unscrew and remove the four screws.



- Disconnect the license plate light connector and remove the license plate support.

### Locking torques (N\*m)

Splash guard fixing screws 4.5 to 7



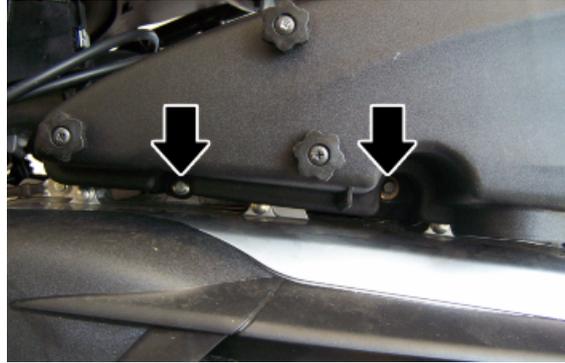
### See also

[Tail guard](#)

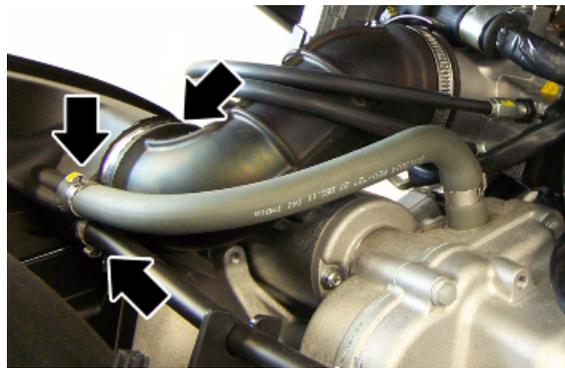
## Air filter

To remove the filter box it is first necessary to remove the semi half fairing.

- Unscrew and remove the two filter box fixing screws.



- Loosen three clamps and remove the pipes.
- Remove the filter box.



### See also

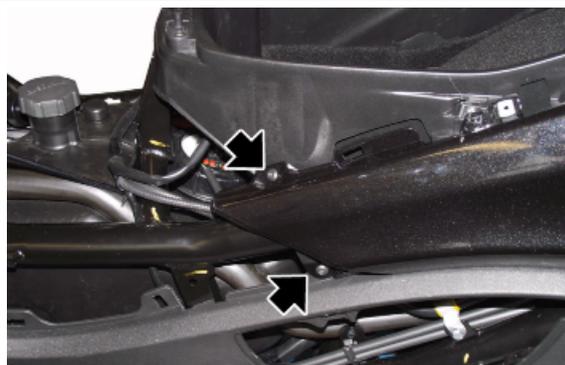
[Tail guard](#)

## Tail guard

The operations of removing the semi-tail fairing are the same for both sides of the vehicle even if it is described for one side only.

First remove the saddle, the handgrips, the side mouldings and the battery rear cover.

- Undo and remove the two front screws fixing the tail fairing.



- 
- Undo and remove the two side fixing screws of the tail fairing.



- 
- Unscrew and remove the lower screw.



- 
- Unscrew and remove the battery bracket fixing screw.
  - Remove the bracket from the fitting and remove the inner cover of the battery.



- 
- Unscrew and remove the two rear screws and retrieve the rear moulding.



- 
- Remove the internal rear cover by pulling it off the fittings.



- 
- Remove the grab handles.
  - Unscrew and remove the two rear screws and remove the cover.



- 
- Unscrew and remove the fixing screw to the license plate holder.



- Unscrew and remove the upper fixing screw of the rear semi-taillight.



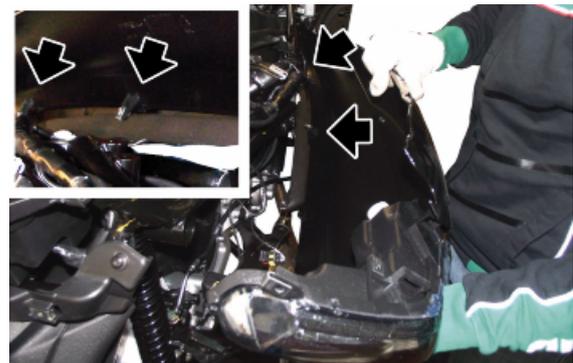
- Disconnect the semi-light connector



- Remove the semi half fairing, releasing it from the two internal fittings and the lower tabs.



WHEN REMOVING THE TAIL FAIRING, BE VERY CAREFUL NOT TO DAMAGE THE LOWER TABS OF THE FITTING.



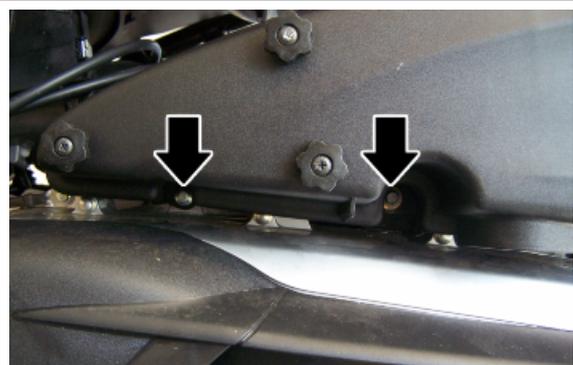
### See also

[Handles and top side fairings](#)

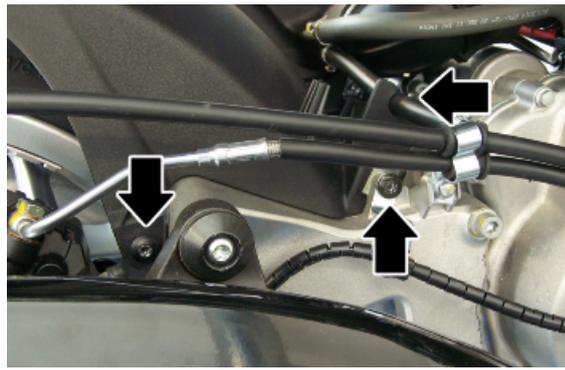
[Rear central cover](#)

## Rear mudguard

- Working on the left side of the vehicle, undo and remove the two screws fixing the filter box and the rear mudguard.



- Undo and remove the two fixing screws on the right side of the vehicle and release the vapour bleeding pipe of the filter box from the pipe grommet.
- Remove the rear mudguard.



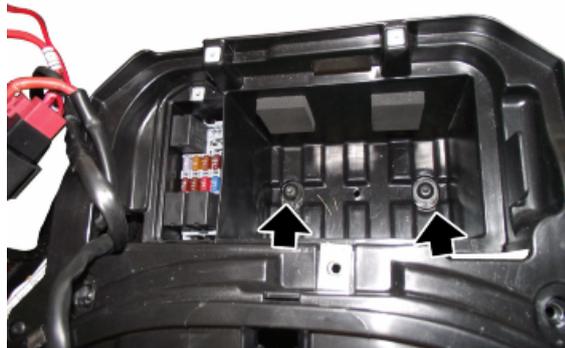
## Helmet bay

First remove the saddle, the battery, the tail fairing and the rear central cover.

- Unscrew and remove the screw and remove the fuse-box cover.



- Undo and remove the two screws from the battery compartment.



- Working from both sides, unscrew and remove the upper fixing screws.



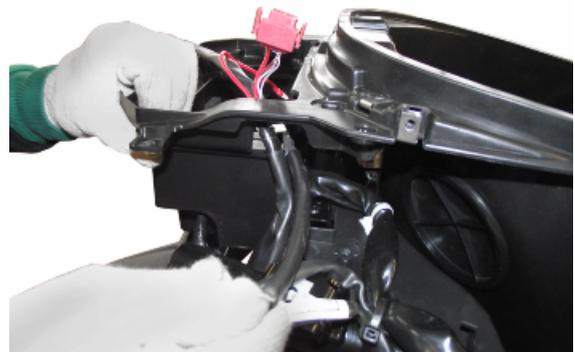
- Remove the main fuse cover.



- Undoing the screw, disconnect the positive from the cable.



- Release the cabling from the helmet compartment, moving the cables from below, through the opening.



- Undo and remove the two screws from inside the helmet compartment and release the saddle lock.



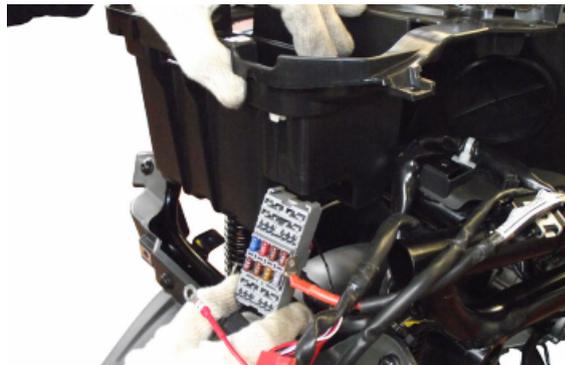
- Disconnect the two connectors of the helmet compartment light bulb switch.



- Remove the Seeger ring and, retrieving the washer, remove the saddle lifting piston from the linkage.



- Remove the three relays and remove the fuse box from below.



- 
- Remove the helmet compartment paying attention to the saddle linkage.
  - Unscrew the clamp if necessary.

**Locking torques (N\*m)****Helmet compartment fixing screws 4.5 to 7****See also**[Seat](#)[Tail guard](#)[Rear central cover](#)

---

**Fuel tank**

To remove the fuel tank it is necessary to remove most of the front covers.

- Preventively remove:
  - the front headlight assembly,
  - the top fairing,
  - the legshield,
  - the right and left side fairings,
  - the case,
  - the lower cover.



- Disconnect the quick coupling and release the fuel pipe from the pipe grommet.

- Slide off the breather pipe.



- Disconnect the fuel pipe connector.



- Operating from both sides of the vehicle, unscrew and remove the central screw fixing the tank to the chassis and retrieve the two washers.



- Working on both sides of the vehicle, unscrew and remove the two fixing screws of the tank support.
- Slide off the tank support from the bottom.



- 
- Slide off the tank from the bottom.

**FITTING**

For the fitting of the tank, follow the instructions in reverse order, paying attention to the insertion of the pin in the centring of the tank support.

**See also**

Headlight assy.

[Flyscreen](#)

[Legshield](#)

[Side fairings](#)

[Front](#)

[Lower cover](#)

---

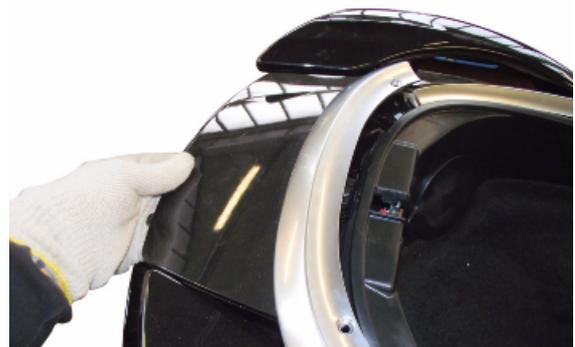
**Rear central cover**

- 
- Lift the saddle.
  - Unscrew and remove the two screws.

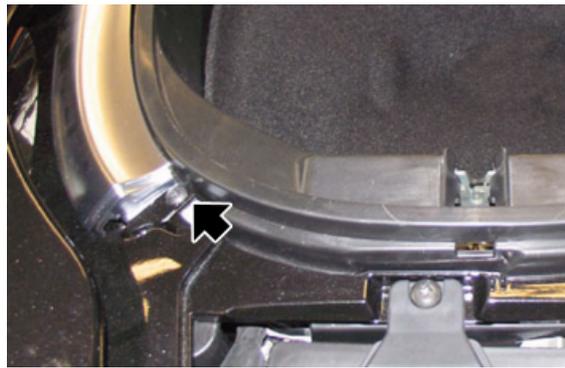


- 
- Remove the rear case cover.

From here it is possible to access the fuses, the battery, the diagnostic socket.



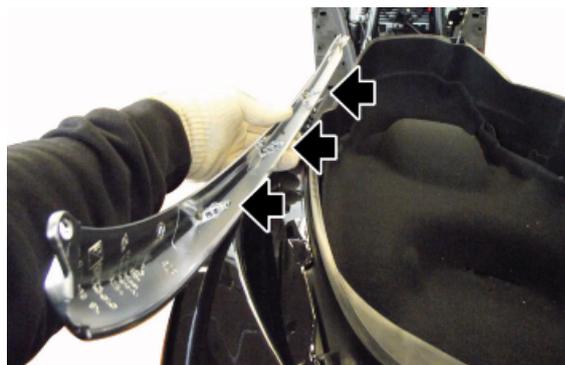
- To remove the side mouldings, work in the same way on both sides of the vehicle.
- Unscrew and remove the rear side screw.



- Unscrew and remove the front side screw.



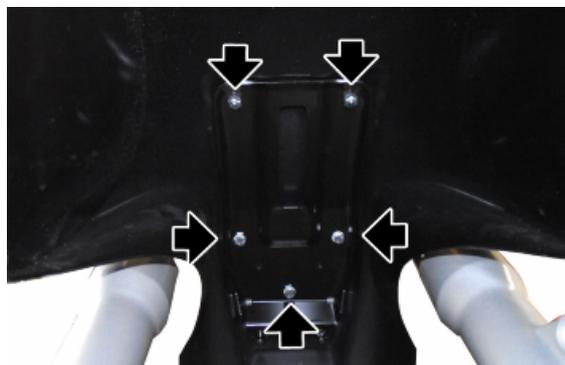
- Release the rear side moulding from the three fittings, being careful not to damage the component.



## Front mudguard

To remove the front mudguard it is necessary to first remove the front wheel.

- Undo and remove the three screws and two nuts and remove the front mudguard.



### FITTING

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

### Locking torques (N\*m)

front mudguard to plate fixing screw 4.5 to 7 Fixing screw for mudguard plate to fork 9 - 11

### See also

[Removing the front wheel](#)

---

## Radiator fan

First remove the front headlight assembly, the left and right side fairings, the lower cover, the right footrest.

First drain off the system.

### DRAINING THE COOLING SYSTEM

- Loosen the clamp and after taking out the delivery tube to the water pump, drain the fluid into a container of suitable capacity previously placed under the vehicle.

- To complete the draining of the liquid, also open the cap of the expansion tank, located in the right dashboard door.

### Recommended products

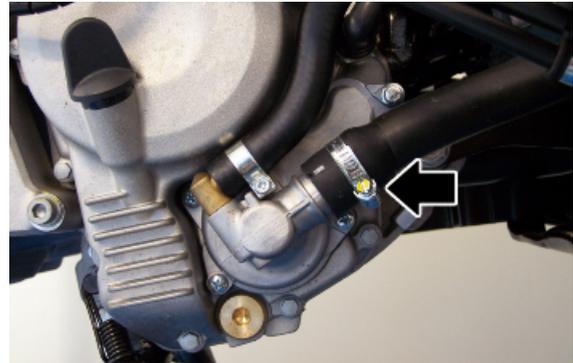
**AGIP PERMANENT SPEZIAL Ethylene glycol-based antifreeze fluid with organic inhibition additives. Red, ready to use.**

ASTM D 3306 - ASTM D 4656 - ASTM D 4985 -  
CUNA NC 956-16

### Characteristic

**Cooling system fluid**

1.75 l



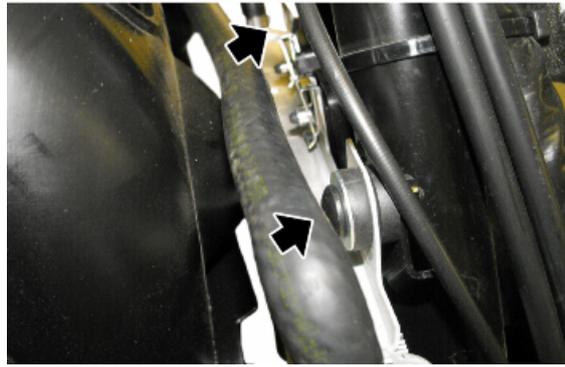
---

### RADIATOR REMOVAL

- Undo the central screw and pull the wheel housing.



- 
- Unscrew and remove the two fixing screws and collect their washers.



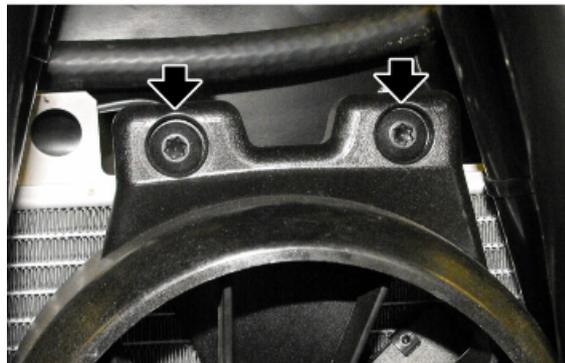
- 
- Remove the pipe from the pipe grommet.



- 
- Unscrew and remove the lower screws.



- 
- Remove the fan cover by unscrewing and removing the two fixing screws.



- 
- working from the right side, unhook the two clamps.



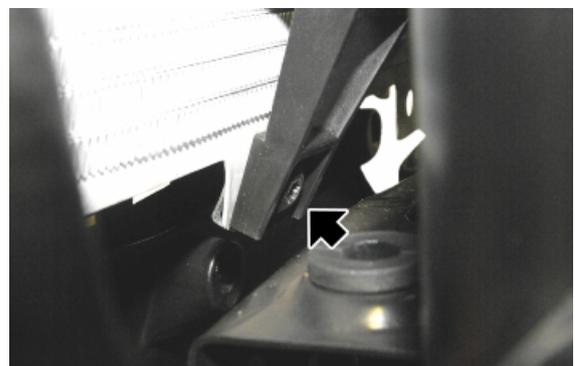
- 
- working from the left side, unhook the two clamps.



- 
- Remove the clamp and release the electric fan connector.



- 
- Remove the radiator from its lower fittings.
  - If it is necessary to remove the electric fan unscrew and remove the fixing screw.



### See also

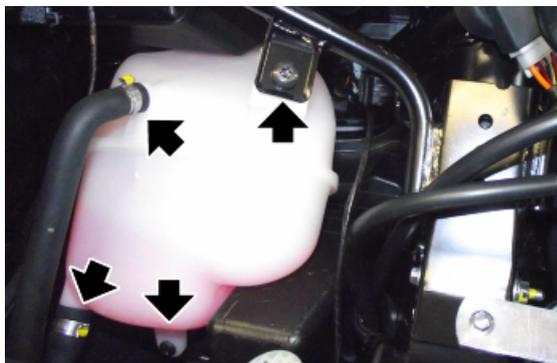
Headlight assy.  
[Side fairings](#)  
[Footrest](#)

---

## Expansion tank

Rimuovere preventivamente il gruppo ottico anteriore e svuotare l'impianto di raffreddamento.

- Rimuovere le due fascette e scollegare le tubazioni del vaso d'espansione.
- Svitare e togliere le due viti e rimuovere il vaso d'espansione.



### See also

Headlight assy.  
[Radiator fan](#)

---

## Top-case

### Front

First remove the rear handlebar cover, the side fairings, the lower cover and release the whole front wheel housing.

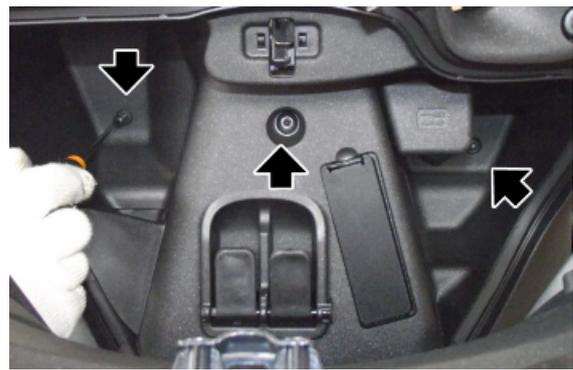
- Release the expansion tank from the two fixing screws.



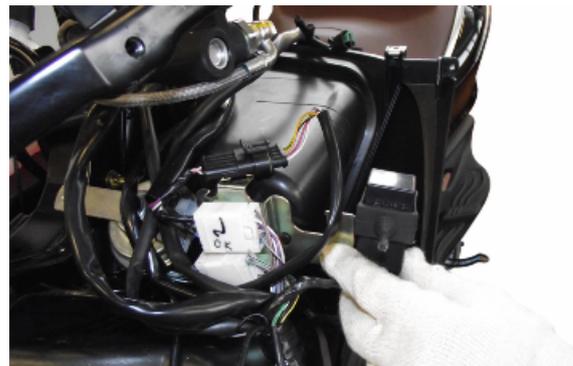
- Slide off the rubber protection and disconnect the plug socket connector.



- Open the front case.
- Undo and remove the three screws.



Remove relays and the three connectors from the plate.



- 
- Release the cable grommet.



- 
- Unscrew and remove the lower screws.



- 
- Remove the central cover, taking care to remove the tank door opening cable.

**See also**

[Side fairings](#)  
[Flyscreen](#)  
[Lower cover](#)  
[Front wheel housing](#)  
[Rear handlebar cover](#)

Headlight assy.

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---

## Handles and top side fairings

---

The following operations only refer to one handle, but they apply to both.

- Remove the cover of the handle and remove it.



- 
- Remove the handle.



- 
- Undo and remove the two screws and collect the respective washers.

### Locking torques (N\*m)

Handgrips fixing screws 15 to 20



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## Digital panel support

---

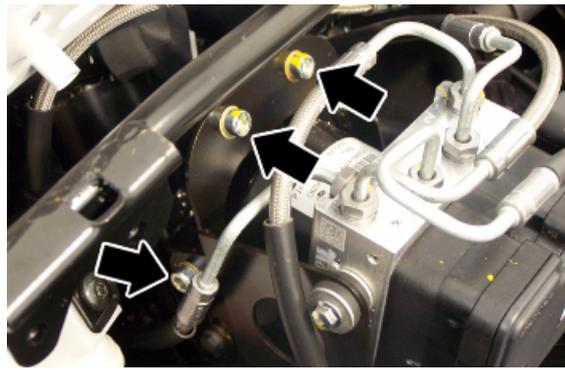
Il gruppo strumenti è vincolato al coprimanubrio posteriore e appoggiato al telaietto anteriore che funge da supporto.

Per accedervi è necessario rimuovere preventivamente il cupolino completo e il gruppo ottico anteriore.

- Svitare la vite inferiore di fissaggio.



- Unscrew and remove the three screws, collecting the washers, and remove the abs modulator.



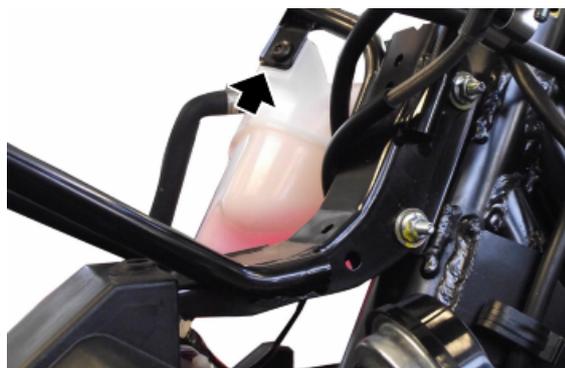
- Svitare e togliere le due viti di fissaggio del ripartitore di frenata al telaietto.



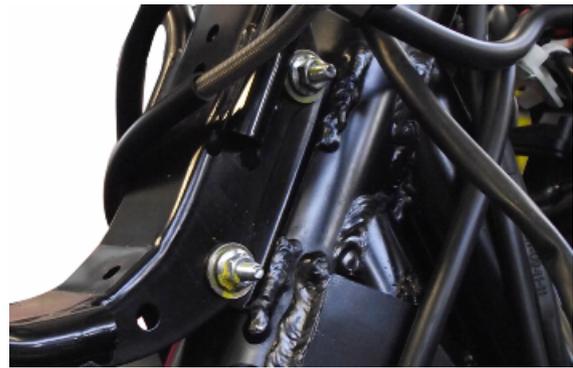
- Svitare e togliere la vite di fissaggio claxon e liberarlo.



- Svitare e togliere la vite superiore di fissaggio del vaso di espansione.



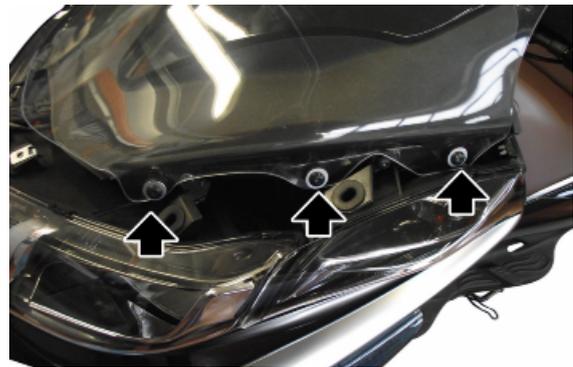
- Operando sul lato destro del veicolo, svitare e togliere le due viti di fissaggio telaietto al canotto di sterzo.
- Recuperare i relativi dadi sul lato sinistro del veicolo e le due rondelle su entrambi i lati.

**See also**[Flyscreen](#)

Headlight assy.

**Flyscreen**

- Remove the legshield.
- Operating from both sides, unscrew and remove the three screws and, recovering the corresponding washers, pull out the windshield.



- Operating from both sides, unscrew and remove the two screws and remove the top fairing.

**Locking torques (N\*m)****Windshield fixing screws - front frame 4.5 to 7****See also**[Legshield](#)

## Lower cover

First remove the side fairings.

- Working on both sides, remove the front screw.



- Working from both sides, unscrew and remove the upper screw.



- Lift the saddle.
- Unscrew and remove the screw and first retrieve the disassembled saddle.



- After opening the front case, by operating on the right lever, open the fuel door.
- Close the front case and undo and remove the two screws inside the tank compartment.



- 
- Unscrew and remove the two central fixing screws of the saddle bracket.



- 
- Undo the fuel tank cap and temporarily close the filler nozzle with a clean cloth.
  - Remove the footrest of the tank compartment.
  - Remove the cloth that has been used to protect the nozzle and tighten the fuel tank cap.



- 
- From above, remove the lower cover and remove the tank door opening cable.
  - Remove the lower cover.

**See also**[Legshield](#)

## INDEX OF TOPICS

**P**RE-DELIVERY

**PRE DE**

---

**Aesthetic inspection****Appearance check:**

- Paintwork
  - Fitting of plastics
  - Scratches
  - Dirt
- 

**Tightening torques inspection****Safety locks check**

- Safety fasteners
- Fixing screws

**Safety fasteners**

- Rear shock absorber upper fixing
  - Rear shock absorber lower fixing
  - Front shock absorber lower fixing
  - Brake calliper fixing
  - Nuts fixing the brake pipes to the tank
  - Front wheel fixing pin
  - Front wheel axle nut
  - Rear wheel axle nut
  - Chassis swinging arm fixings - engine
  - Engine fixing - chassis
  - Handlebar lock-nut
  - Side stand fixing nut
  - Side stand sensor fixing screws
  - Exhaust support bracket fixing screws
- 

**Electrical system**

- Battery
  - Main switch
  - Headlamps: high beam lights, low beam lights, taillights (front and rear) and relevant warning lights
  - Adjusting the headlights according to the regulations currently in force
  - Front and rear stop light buttons and bulb
  - Turn indicators and their warning lights
  - Instrument panel lights
  - Instrument panel: fuel and temperature indicator
-

- Instrument panel warning lights
- Horn
- Electric starter
- Engine stop with emergency stop switch
- Engine stop with side stand
- Saddle electrical opening with remote control

**CAUTION**

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

**CAUTION**

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

**WARNING**

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

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

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

**BATTERIES PRODUCE EXPLOSIVE GASES; KEEP THEM AWAY FROM NAKED FLAMES, SPARKS AND CIGARETTES. IF THE BATTERY IS CHARGED IN A CLOSED PLACE, TAKE CARE TO ENSURE ADEQUATE VENTILATION. ALWAYS PROTECT YOUR EYES WHEN WORKING CLOSE TO BATTERIES.**

**KEEP OUT OF THE REACH OF CHILDREN**

**CAUTION**

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

---

## Levels check

**Level check:**

- Hydraulic brake system liquid level.
- Rear hub oil level
- Engine coolant level
- Engine oil level

---

## Road test

**Test ride**

- Cold start
- Instrument operations
- Response to the gas command
- Stability on acceleration and braking
- Rear and front brake efficiency
- Front and rear suspension efficiency

- 
- Abnormal noise
- 

## Static test

### Static control after the test ride:

- Restarting when warmed up
- Idle holding
- Uniform turning of the steering
- Possible leaks
- Operation of the radiator electric fan

#### CAUTION

**CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.**

#### CAUTION

**NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES OR TYRES MAY BURST.**

---

## Functional inspection

Functional Checks:

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

## Specific operations for the vehicle

### MULTIMEDIA SUPPORT

The vehicle is equipped with support for navigation systems and smartphones to be installed on the handlebar and is located inside the helmet compartment.



Inside the pack are:

- A. Screw kit for installation
- B. Fitting instructions
- C. Mounting brackets
- D. Rubber cover



N.B.



**FOR THE INSTALLATION OF THE SUPPORT FOLLOW THE INDICATIONS CONTAINED IN THE FITTING INSTRUCTIONS.**

## **A**

ABS:

Air filter: 48, 133, 346

## **B**

Battery: 83, 95, 108

Brake: 132, 298–300, 302, 303, 305, 308–310, 315

Brake fluid: 308

Bulbs:

## **C**

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