



SERVICE STATION MANUAL

**xxxxxx (IT), xxxxxx (EN), xxxxxx (FR), xxxxxx (DE),
xxxxxx (ES), xxxxxx (PT), xxxxxx (NL), xxxxxx (EL)**



X7 EVO 300 i.e.



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Not all versions/models shown in this publication are available in all countries. The availability of each model should be checked at the official Piaggio sales network.

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

SERVICE STATION MANUAL

X7 EVO 300 i.e.

This service station manual has been drawn up by Piaggio & C. SpA to be used by the workshops of Piaggio-Gilera dealers. It is assumed that the user of this manual for maintaining and repairing Piaggio vehicles has a basic knowledge of mechanical principles and vehicle repair technique procedures. Any significant 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

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This section describes the general specifications of the vehicle.

Rules

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

Safety rules

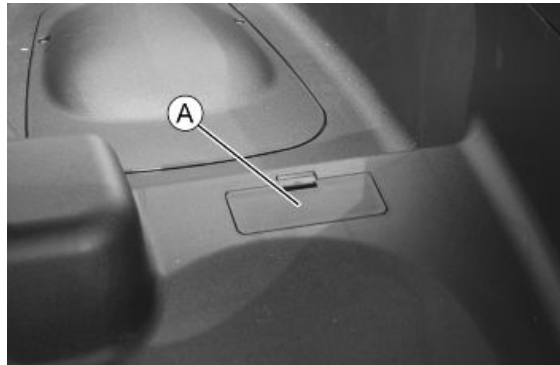
- If work can only be done on the vehicle with the engine running, make sure that the premises are well-ventilated, using special extractors if necessary; never let the engine run in an enclosed area. Exhaust fumes are toxic.
 - The battery electrolyte contains sulphuric acid. Protect your eyes, clothes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

Maintenance rules

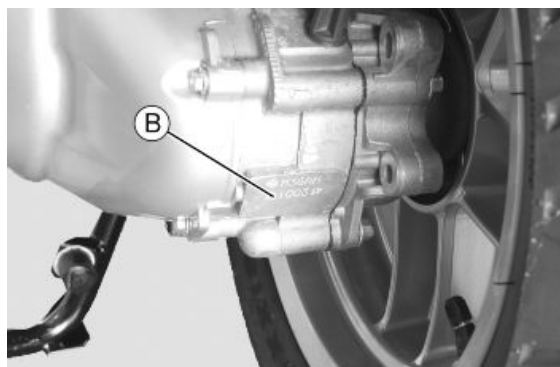
- Use original PIAGGIO spare parts and lubricants recommended by the Manufacturer. Non-original or non-conforming spare parts may damage the vehicle.
 - Use only the appropriate tools designed for this vehicle.
 - Always use new gaskets, sealing rings and split pins upon refitting.
 - After removal,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

Vehicle identification

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



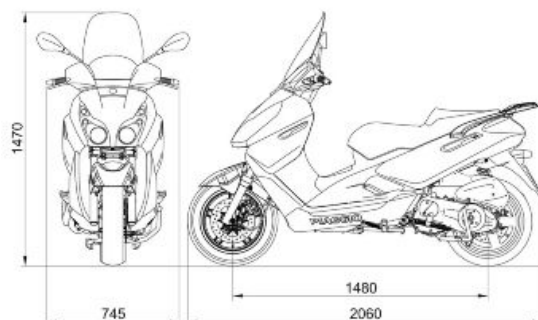
The engine prefix «B» is stamped near the rear left shock absorber lower support.



VEHICLE IDENTIFICATION

Specification	Desc./Quantity
Chassis prefix	M62201
Engine prefix	M624M

Dimensions and mass



VEHICLE EARTHING

Specification	Desc./Quantity
Kerb weight	161 ± 7 kg
Maximum weight allowed	360 kg

VEHICLE EARTHING

Engine

ENGINE

Specification	Desc./Quantity
Type	Single-cylinder, 4-stroke
Cubic capacity	278 cm ³
Bore x Stroke	75 X 63 mm
Compression ratio	11 ± 0.5 : 1
Engine idle speed	1,700 ± 100 rpm
Timing system	4 valves, single overhead camshaft, chain-driven.
Valve clearance	Intake: 0.10 mm Exhaust: 0.15 mm
Max. power	16 kW at 7500 rpm
MAX. torque	23.8 Nm at 5750 rpm
Lubrication	Engine lubrication with lobe pump (inside crankcase), chain-driven, with double filter: mesh and paper.
Lubrication pressure	4 bar
Minimum lubrication pressure (100° C)	0.8 bar
Fuel supply	Electronic injection with Ø 32-mm throttle body and electric fuel pump.
Cooling	Forced coolant circulation system.
Fuel	Unleaded petrol (95 RON)
Exhaust silencer	Absorption-type exhaust silencer with a 3-way catalytic converter and lambda probe.
Emission regulations	EURO 3

Transmission

TRANSMISSION

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

Capacities

CAPACITY

Specification	Desc./Quantity
Engine oil	1.3 l
Transmission oil	250 cm ³
Cooling system fluid	~ 2 l
Fuel tank (reserve)	~ 12 l (~ 2.5 l)
Fork oil (quantity per stem)	133 cm ³

Electrical system

ELECTRICAL SYSTEM

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

Frame and suspensions

CHASSIS AND SUSPENSION

Specification	Desc./Quantity
Chassis	Tubular and steel sheets.
Front suspension	Hydraulic telescopic fork with Ø 35-mm stem
Front suspension travel	94 mm
Rear suspension	Two double-acting shock absorbers, adjustable to four positions at preloading.
Rear suspension travel	89 mm

Brakes

BRAKES

Specification	Desc./Quantity
Front brake	Ø 260-mm disc brake with hydraulic control activated by handlebar right-side lever.
Rear brake	Ø 240-mm disc brake with hydraulic control operated by the handlebar left-side lever.

Wheels and tyres

WHEELS AND TYRES

Specification	Desc./Quantity
Wheel rim type	Light alloy wheel rims.
Front rim	14" x 3.50
Rear rim	13" x 3.50
Front tyre	Tubeless, 120/70-14" 55P
Rear tyre	Tubeless, 140/60 - 13" 63P
Front tyre pressure (with passenger)	2 bar (2 bar)
Rear tyre pressure (with passenger)	2.2 bar (2.5 bar)

Tightening Torques

STEERING

Name	Torque in Nm
Fixing screws for the handlebar control unit U-bolts	7 to 10
Steering tube upper ring nut	40 ÷ 45
Steering tube lower ring nut	14 ÷ 17
Handlebar fixing screw	43 ÷ 47

CHASSIS

Name	Torque in Nm
Stand fixing bolt	40 ÷ 45
Engine and vehicle side swinging arm junction bolt	33 to 41
Engine-swinging arm pin	64 ÷ 72
Body shell - Swinging arm pin	76 ÷ 83
Screw fixing the silent-block support plate to the body	42 ÷ 52

FRONT SUSPENSION

Name	Torque in Nm
Fork leg screw	6 ÷ 7
Front wheel axle	45 to 50
Fork plate screw	25 ÷ 34
Hydraulic rod fixing screw	25 ÷ 35* (apply LOCTITE 242 medium-strength threadlock)

Name	Torque in Nm
Stem support clamp tightening screws	20 to 25
Fork locking screws cap	15 ÷ 30

REAR SUSPENSION

Name	Torque in Nm
Upper shock absorber retainer	33 to 41
Shock absorber lower clamping	33 to 41
Shock absorber-crankcase attachment bracket	20 to 25
Rear wheel axle	104 to 126
Silencer arm clamping screws	27 - 30
Silencer - muffler supporting arm fixing screws	24 to 27
Lambda probe tightening on exhaust manifold	40 to 50
Manifold - silencer diaphragm tightening clamp	16 to 18

FRONT BRAKE

Name	Torque in Nm
Oil bleed screw	12 - 16
Brake disc screws	8 ÷ 10 (apply LOCTITE 243 medium-strength threadlock)
Brake fluid pipe-calliper fitting	20 to 25
Brake fluid pump-hose fitting	16 - 20
Screw tightening calliper to support	20 to 25
Tightening screw for calliper support to the fork	41 ÷ 51

REAR BRAKE

Name	Torque in Nm
Oil bleed screw	12 - 16
Brake disc screws	8 ÷ 10 (apply LOCTITE 243 medium-strength threadlock)
Rear brake calliper-pipe fitting	20 to 25
Rear brake pump-pipe fitting	16 - 20
Screw tightening calliper to support	42 ÷ 52

FLYWHEEL

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

LUBRICATION

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

CYLINDER HEAD

Name	Torque in Nm
Spark plug	12 to 14
Head cover screws	6 - 7
Nuts fixing head to cylinder	7±1 + 10±1 + 270°
Head fixing side screws	11 - 12
Starter ground screw	7 to 8.5

Name	Torque in Nm
Tappet adjustment check nut	6 - 8
Intake manifold screws	11 to 13
Timing chain tensioner slider screw	10 to 14
Start up counterweight support screw	11 to 15
Timing chain tensioner support screw	11 to 13
Timing chain tensioner central screw	5 to 6
Camshaft retention plate screw	4 to 6
Nut fixing muffler to cylinder head	16 ÷ 18

TRANSMISSION

Name	Torque in Nm
Belt support roller screw	11 to 13
Clutch unit nut on driven pulley	45 to 50
Drive pulley nut	75 to 83
Transmission cover screws	11 to 13
Driven pulley shaft nut	54 ÷ 60
Rear hub cap screws	24 to 27

CRANKCASE AND CRANKSHAFT

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

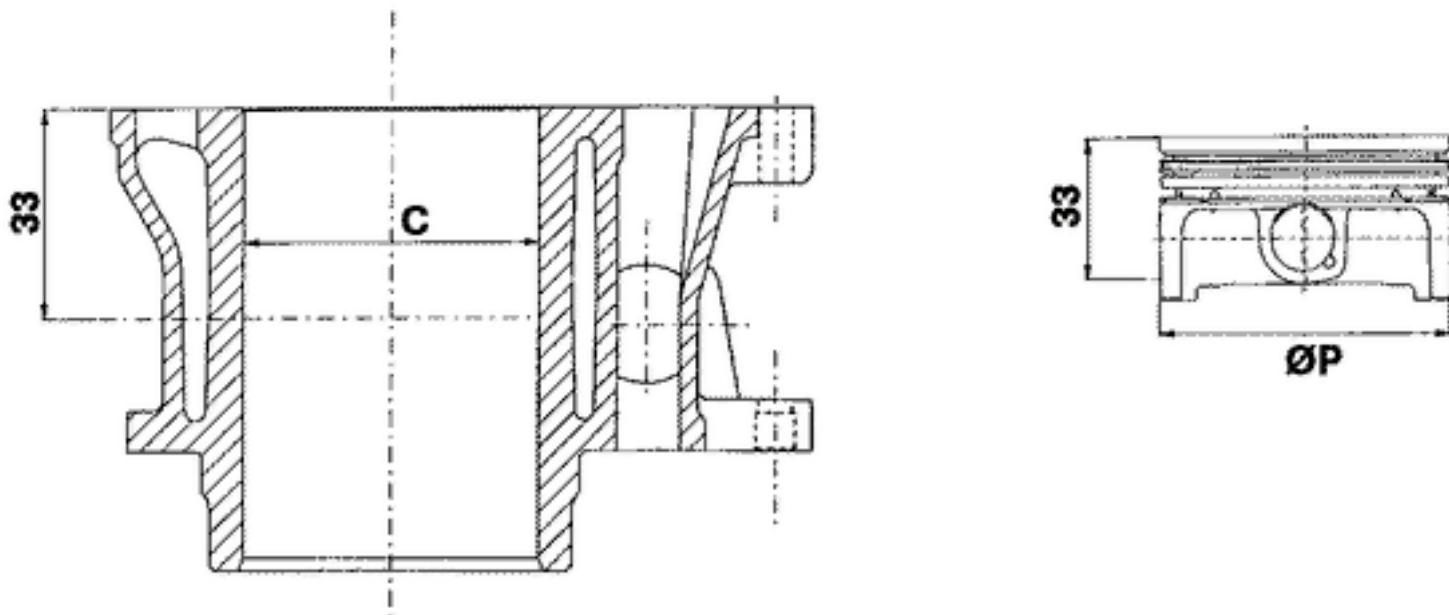
COOLING

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

Overhaul data

Assembly clearances

Cylinder - piston assy.



CYLINDER - PISTON

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

COUPLING CATEGORIES

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

N.B.

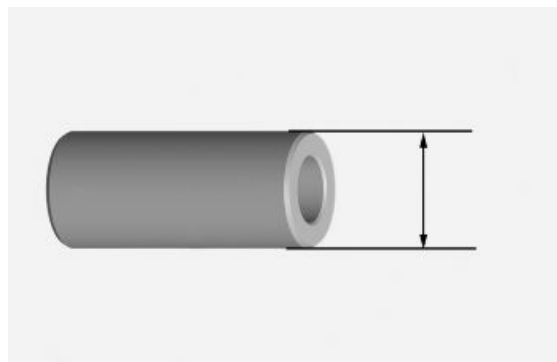
THE PISTON MUST BE INSTALLED WITH THE ARROW FACING TOWARDS THE EXHAUST SIDE, THE PISTON RINGS MUST BE INSTALLED WITH THE WORD «TOP» OR THE STAMPED MARK FACING UPWARDS.

- Measure the outer diameter of the gudgeon pin.

Characteristic

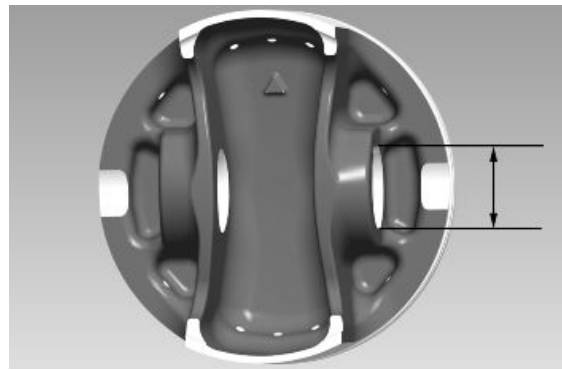
Pin outside diameter

16 +0 -0.004 mm



- Measure the diameter of the bearings on the piston.

Characteristic
Standard diameter
 16 +0.006 +0.001 mm

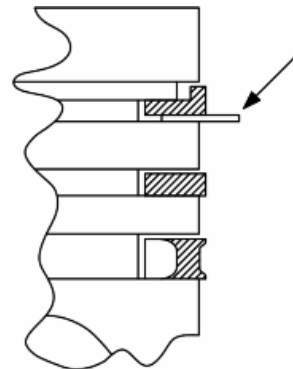


- Calculate the piston pin coupling clearance.

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

Characteristic
Standard clearance:
 0.001 - 0.010 mm

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



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

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

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



Characteristic

Maximum allowable run-out:

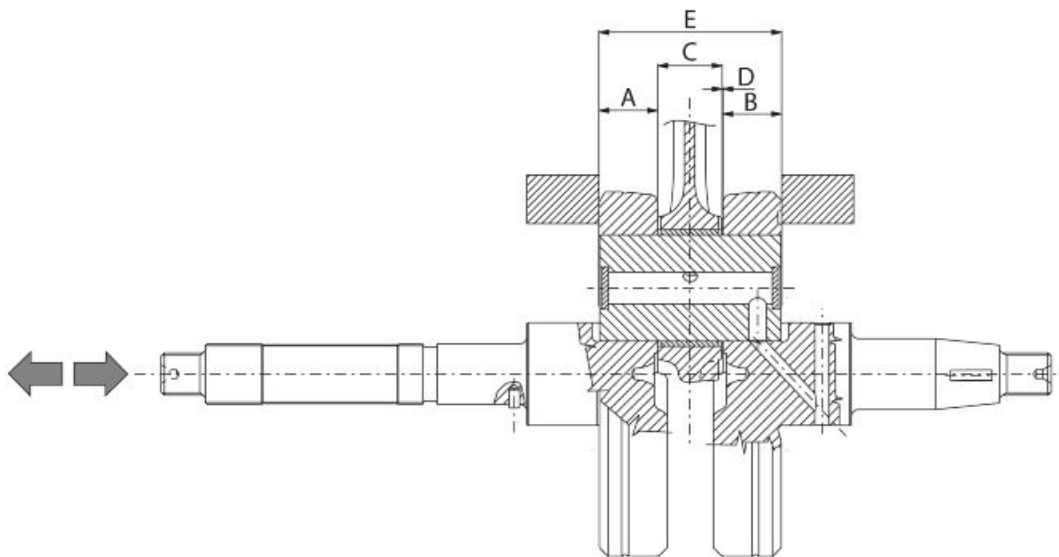
0.05 mm

Crankcase - crankshaft - connecting rod

CRANKSHAFT

Titolo	Durata/Valore	Testo Breve (< 4000 car.)	Indirizzo Immagine
Crankshaft		Crankshaft to connecting rod axial clearance	

Crankshaft to connecting rod axial clearance

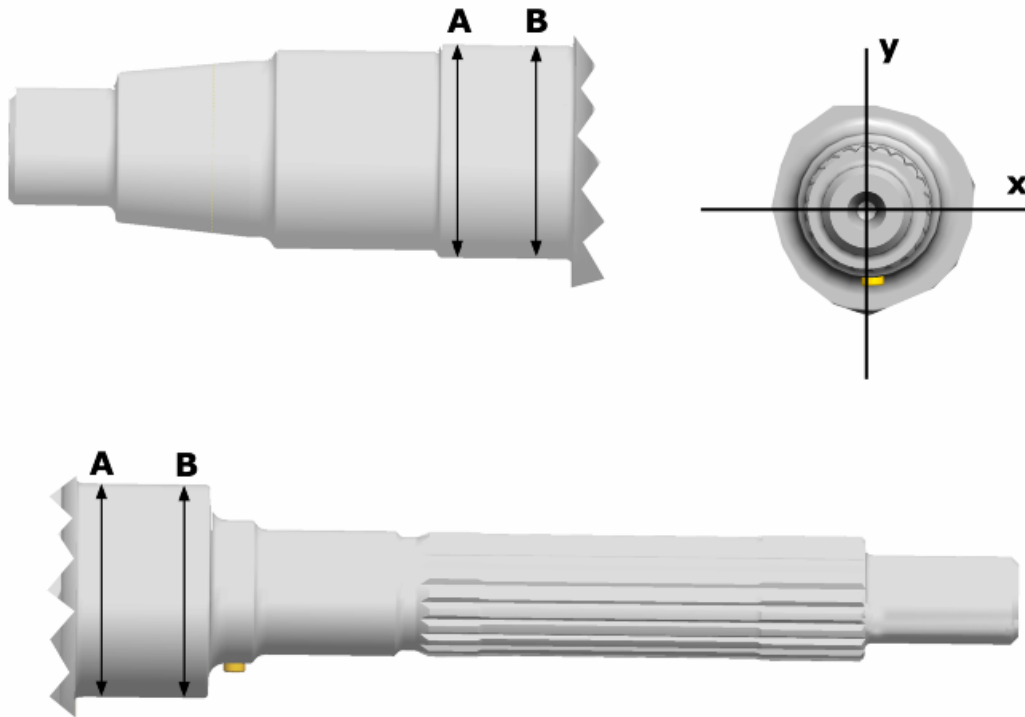


AXIAL CLEARANCE BETWEEN CRANKSHAFT AND CONNECTING ROD

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

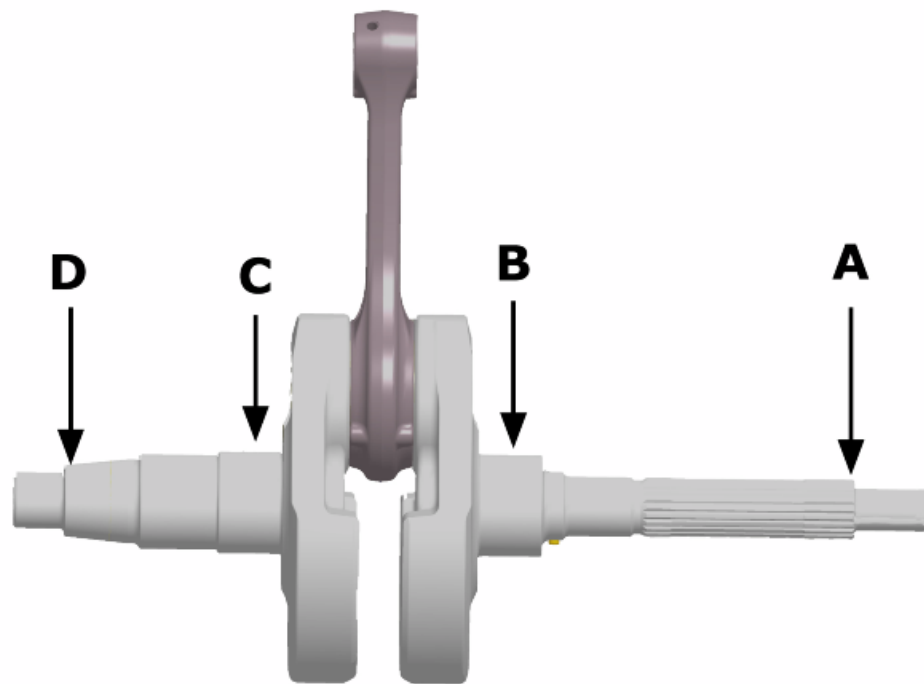
Diameter of crankshaft bearings.

Measure the bearings on both axes x-y.



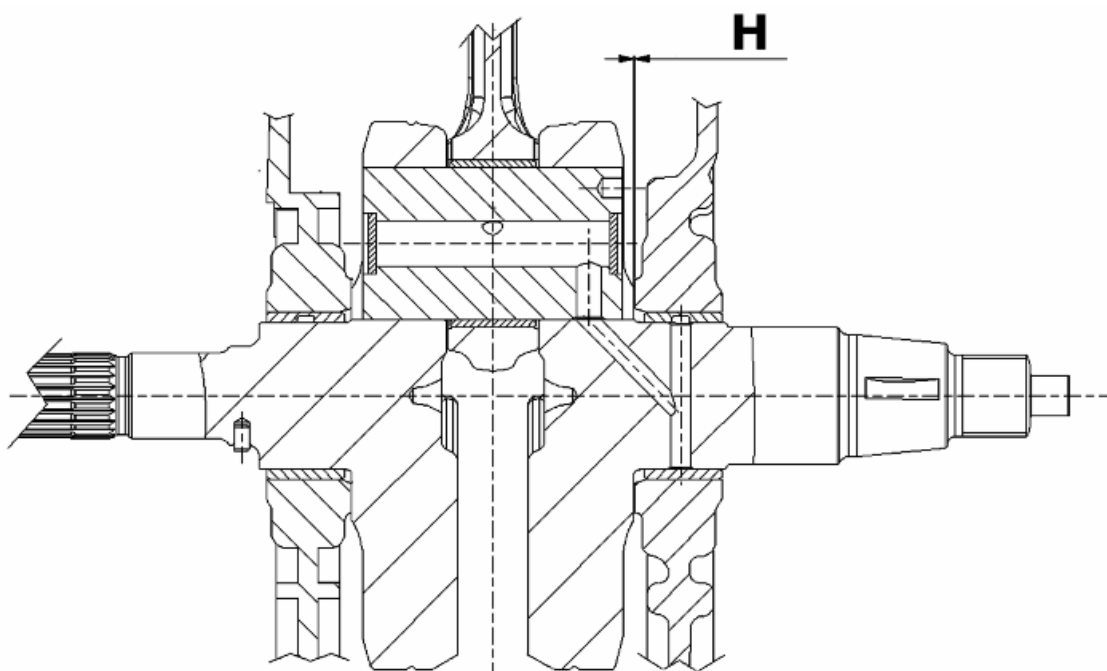
CRANKSHAFT

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



MAX. ADMISSIBLE DISPLACEMENT

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



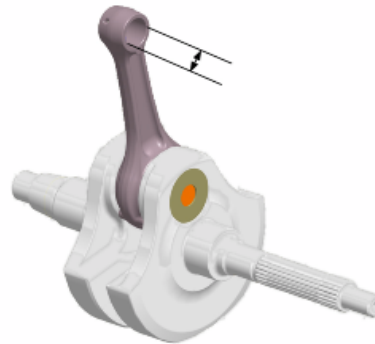
Characteristic

Crankshaft-crankcase axial clearance (H)

0.15 ÷ 0.43 mm

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

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



Characteristic

Standard diameter

16 +0.025 +0.015 mm

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

BUSHINGS

TYPE	IDENTIFICATION	CRANKSHAFT HALF-BEARING
B	BLUE	1.973 ÷ 1.976
C	YELLOW	1.976 ÷ 1.979

TYPE	IDENTIFICATION	CRANKSHAFT HALF-BEARING
E	GREEN	1.979 ÷ 1.982

COUPLINGS

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

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

CATEGORIES

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

N.B.

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

N.B.

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

Characteristic

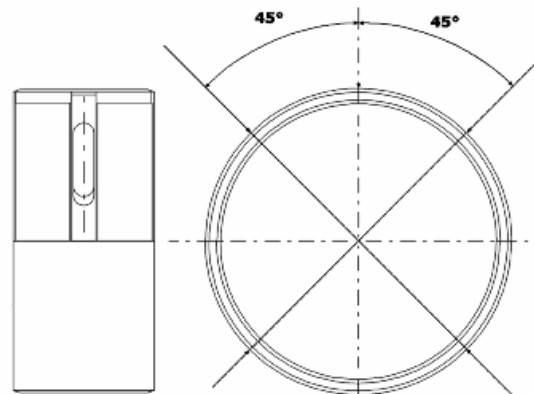
Crankshaft-bushing maximum clearance admitted:

0.08 mm

Diameter of crankcase without bushing

CAT. 1: 32.959 ÷ 32.965 mm

CAT. 2: 32.953 ÷ 32.959 mm

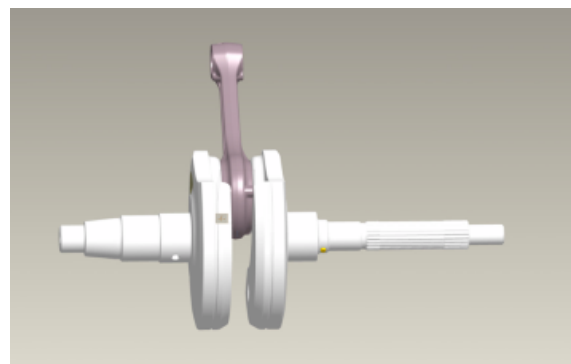


THE CRANKSHAFT is available in two **CATEGORIES**:

Characteristic

Crankshaft category:

CAT. 1 - CAT. 2



CRANKSHAFT CATEGORY IDENTIFICATION:

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

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

Cylinder Head

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

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

Characteristic

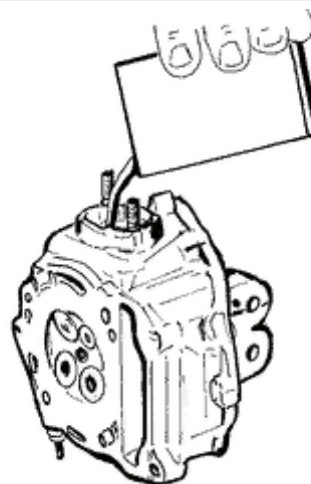
Maximum allowable run-out:

0.1 mm

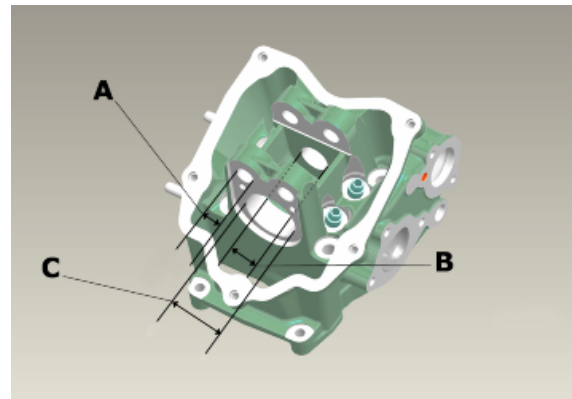


- In case of faults, replace the head.
- Check the sealing surfaces for the intake and exhaust manifold.
- Check that the camshaft and the rocking lever pin capacities exhibit no wear.
- Check that the head cover surface is not worn.
- Check that the coolant seal plug exhibits no oxidation.

- Insert the valves into the cylinder head.
- Alternatively check the intake and exhaust valves.
- The test is carried out by filling the manifold with petrol and checking that the head does not ooze through the valves when these are just pressed with the fingers.



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



HEAD BEARINGS

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

- Measure the unloaded valve spring length.

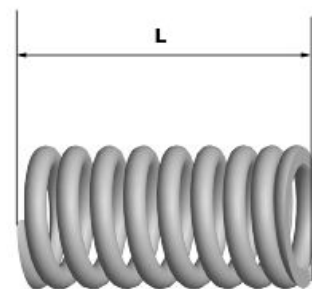
Characteristic

Standard length

40.2 mm

Allowable limit after use:

38.2 mm



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

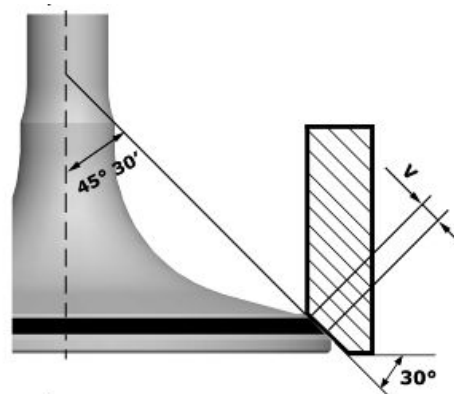
Characteristic

Standard value:

1 - 1.3 mm

Admissible limit:

1.6 mm



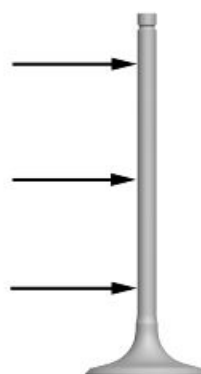
- If the impression width on the valve seat is larger than the prescribed limits, true the seats with a 45° mill and then grind.
- In case of excessive wear or damage, replace the head.

STANDARD VALVE LENGTH

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



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



STANDARD DIAMETER

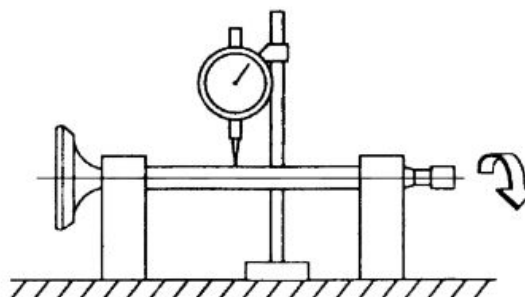
Specification	Desc./Quantity
Intake:	4.987 - 4.972 mm
Exhaust:	4.975 - 4.960 mm

MINIMUM ADMISSIBLE DIAMETER

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

- Calculate the clearance between valve and valve guide.

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

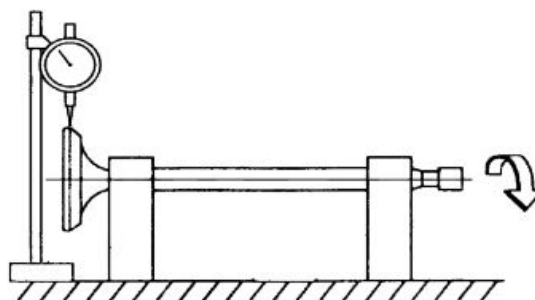


Characteristic

Limit values admitted:

0.1 mm

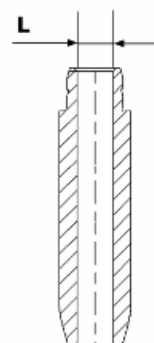
- Check the concentricity of the valve head by arranging a dial gauge at right angle relative to the valve head and rotate it on a "V" shaped abutment.



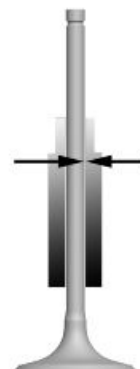
Characteristic
Admissible limit:
 0.03 mm

Measure the valve guide.

Characteristic
Valve guide:
 5 +0.012 mm



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



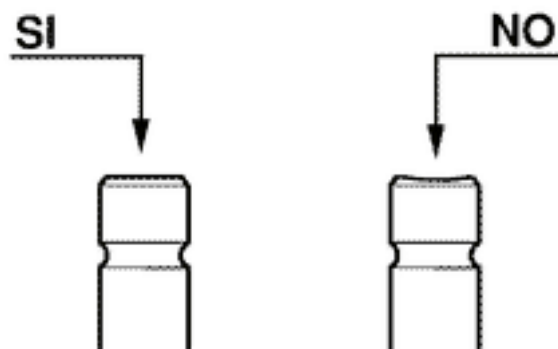
INTAKE

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

EXHAUST

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

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



- If no faults are found during the above checks, you can use the same valves. To obtain better sealing performance, grind the valve seats. Grind the valves gently with a fine-grained lapping compound. During the grinding, keep the cylinder head with the valve axes in a horizontal position. This will prevent the lapping compound residues from penetrating between the valve stem and the guide (see figure).



CAUTION

TO AVOID SCORING THE FAYING SURFACE, DO NOT KEEP ROTATING THE VALVE WHEN NO LAPPING COMPOUND IS LEFT. CAREFULLY WASH THE CYLINDER HEAD AND THE VALVES WITH A SUITABLE PRODUCT FOR THE TYPE OF LAPPING COMPOUND BEING USED.

CAUTION

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

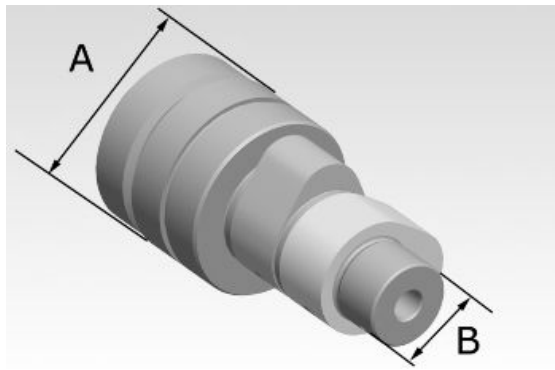
- Check that the camshaft bearings exhibit no scores or abnormal wear.
- Using a micrometer, measure the camshaft bearings.

STANDARD DIAMETER

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

MINIMUM DIAMETER PERMITTED

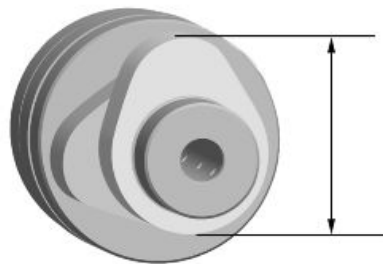
Specification	Desc./Quantity
Camshaft check: Minimum admissible diameter	Bearing A Ø: 36.94 mm
Camshaft check: Minimum admissible diameter	Bearing B diameter: 19.950 mm



-Using a gauge, measure the cam height.

STANDARD HEIGHT

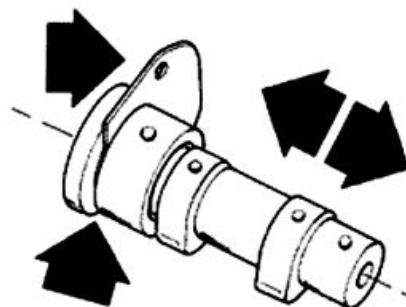
Specification	Desc./Quantity
Camshaft check: Standard height	Inlet: 30.285 mm
Camshaft check: Standard height	Exhaust: 29.209 mm



Check the axial clearance of the camshaft

CAMSHAFT AXIAL CLEARANCE

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



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

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

ROCKING LEVERS AND PIN DIAMETER:

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

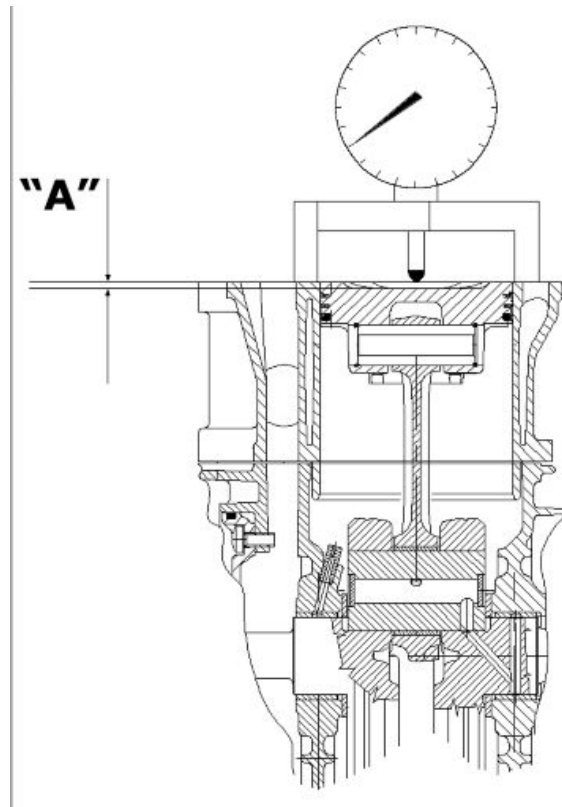


Slot packing system

Characteristic

Compression ratio

10.5 ÷ 11.5 : 1



Measurement "A" to be taken is a value of piston re-entry, it indicates by how much the plane formed by the piston crown falls below the plane formed by the top of the cylinder. The further the piston falls

inside the cylinder, the less the base gasket to be applied (to recover the compression ratio) and vice versa.

N.B.

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

ENGINE 300 SHIMMING

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

Products**RECOMMENDED PRODUCTS TABLE**

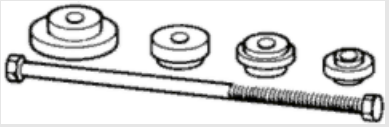

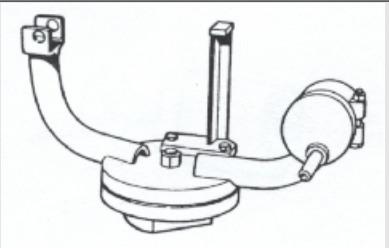

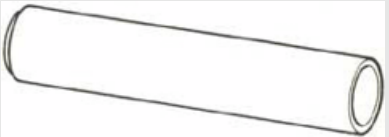


Product	Description	Specifications
AGIP ROTRA 80W-90	Rear hub oil	SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications
AGIP CITY HI TEC 4T	Oil to lubricate flexible transmissions (throttle control)	Oil for 4-stroke engines
AGIP FILTER OIL	Oil for air filter sponge	Mineral oil with specific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


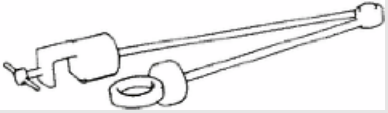





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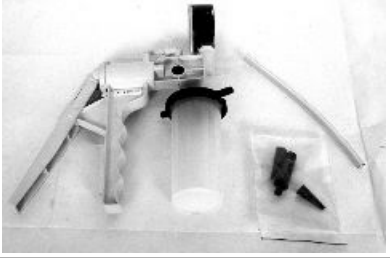



TOOLING

TOOL

SPECIFIC TOOLS

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

Stores code	Description	
020074Y	Support base for checking crankshaft alignment	
020150Y	Air heater mounting	
020151Y	Air heater	
020193Y	Oil pressure check gauge	
020201Y	Spacer bushing driving tube	
020262Y	Crankcase splitting plate	
020263Y	Driven pulley assembly sheath	

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

Stores code

Description

020648Y

Single battery charger



020335Y

Magnetic mounting for dial gauge



020357Y

32x35-mm Adaptor

020358Y

37x40-mm Adaptor

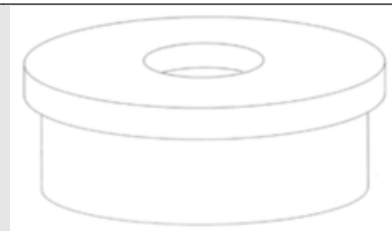
020359Y

42x47-mm Adaptor



020360Y

52x55-mm Adaptor



020363Y


20-mm guide



Stores code	Description	
020375Y	28 x 30 mm adaptor	


020376Y Adaptor handle



020382Y	Valve cotters equipped with part 012 removal tool	
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020382Y011 adapter for valve removal tool








020393Y	Piston assembly band	
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020412Y 15-mm guide



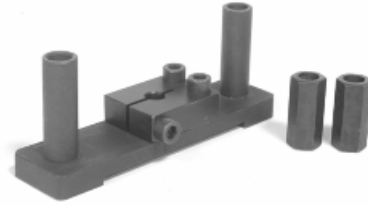
Stores code	Description	
020423Y	Driven pulley lock wrench	
020424Y	Driven pulley roller casing fitting punch	
020426Y	Piston fitting fork	
020431Y	Valve oil seal extractor	
020434Y	Oil pressure check fitting	

Stores code	Description	
020439Y	17-mm guide	
020444Y	Tool for fitting/ removing the driven pulley clutch	
020456Y	Ø 24 mm adaptor	
020477Y	37 mm adaptor	
020483Y	30-mm guide	
020489Y	Hub cover support stud bolt kit	

Stores code	Description
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020428Y

Piston position check mounting



020680Y

Diagnosis Tool



020621Y

HV cable extraction adaptor



020481Y

Control unit interface wiring



001467Y035







Bearing housing, outside \varnothing 47 mm



020626Y

Driving pulley lock wrench



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

Stores code	Description	
020244Y	15-mm diameter punch	
020115Y	Ø 18 punch	
020271Y	Tool for removing-fitting silent bloc	
020469Y	Reprogramming kit for vehicle diagnostic tester	
020487Y	Fork oil seal extractor	
020458Y	Puller for lower bearing on steering tube	

INDEX OF TOPICS

MAINTENANCE

MAIN

Maintenance chart

SCHEDULED MAINTENANCE TABLE

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

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

** Replace every 2 years*

Km x 1,000	1	5	10	15	20	25	30	35	40	45	50	55	60
Valve clearance					A				A				A
Driving belt				R			R			R			R
Sliding shoes / CVT rollers			R		R		R		R		R		R
Spark plug			R		R		R		R		R		R
Air filter			C		C		C		C		C		C
Belt compartment air filter			I		I		I		I		I		I
Engine oil	R	I	R	I	R	I	R	I	R	I	R	I	R
Oil filter	R		R		R		R		R		R		R
Oil filter (mesh)	C												
Hub oil	R		I		R		I		R		I		R
Coolant *	I		I		I		I		I		I		I
Radiator (external cleaning)				I			I			I			I
Brake fluid *	I		I		I		I		I		I		I
Brake pads	I	I	I	I	I	I	I	I	I	I	I	I	I
Brake levers	L		L		L		L		L		L		L
Throttle control	A		A		A		A		A		A		A
Electrical system and battery	I		I		I		I		I		I		I
Suspension			I		I		I		I		I		I
Steering	A		A		A		A		A		A		A
Headlight aiming adjustment				A			A			A			A
Transmission				L			L			L			L
Centre stand			L							L			
Safety fasteners	I		I				I				I		I
Tyre pressure and wear	I		I		I		I		I		I		I
Vehicle road test	I		I		I		I		I		I		I

Checking the spark advance

The ignition advance is determined electronically on the basis of parameters known by the control unit. For this reason it is not possible to interpret the reference values based on the engine rpm.

The ignition advance value is detectable at any time using the diagnostic tester. It is possible to check whether the ignition advance determined by the injection system matches the value actually activated on the engine, by means of the stroboscopic light.

Proceed as follows:

- Remove the spark plug.
- Remove the transmission crankcase.



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

If the values do not correspond, check:

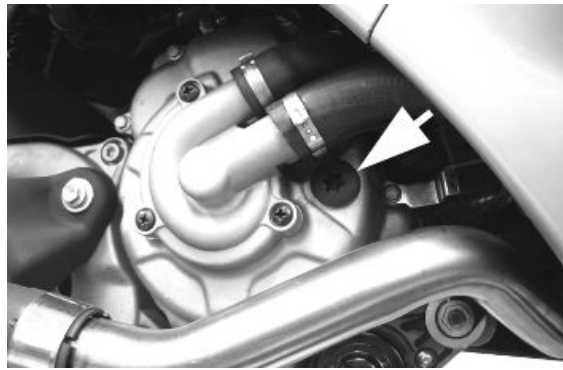
- distribution timing
- revolution timing sensor
- injection control unit

Specific tooling

020680Y Diagnosis Tool

020330Y Stroboscopic light to check timing

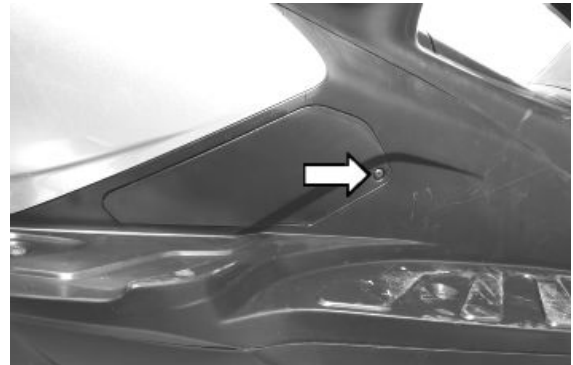
020621Y HV cable extraction adaptor



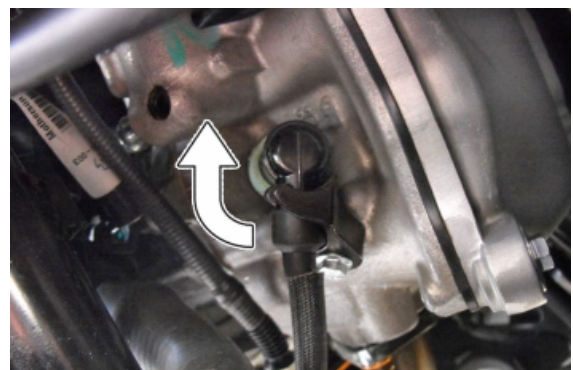
Spark plug

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

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



- Remove the spark plug cap by turning it clockwise until it is released from the head retainer.
- Remove the spark plug with the supplied wrench.
- Examine it carefully and replace it if the insulator is chipped or cracked.
- Measure electrode gap with a thickness gauge and, if necessary, adjust the gap by carefully bending the outer electrode forward or away.
- Make sure the sealing washer is in good conditions.
- Fit the spark plug, screw it manually and lock it to the prescribed torque with a spark plug spanner.
- Refit the spark plug inspection lid.



CAUTION

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

Characteristic

Spark plug

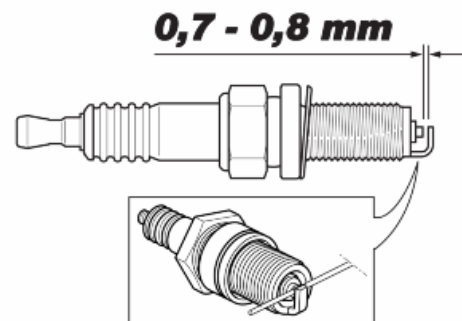
NGK CR8EKB

Electrode gap

0.7 to 0.8 mm

Locking torques (N*m)

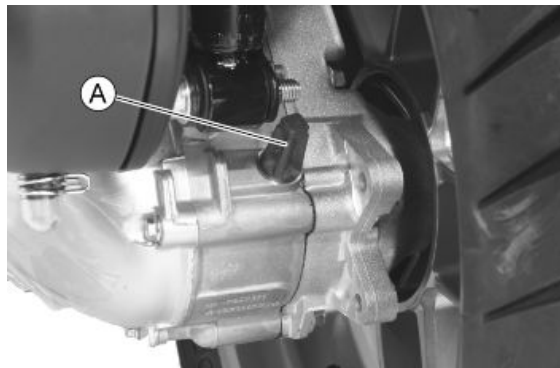
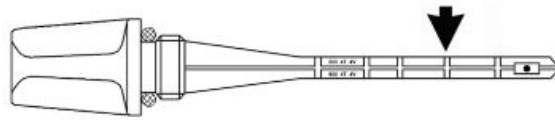
Spark plug 12 to 14



Hub oil

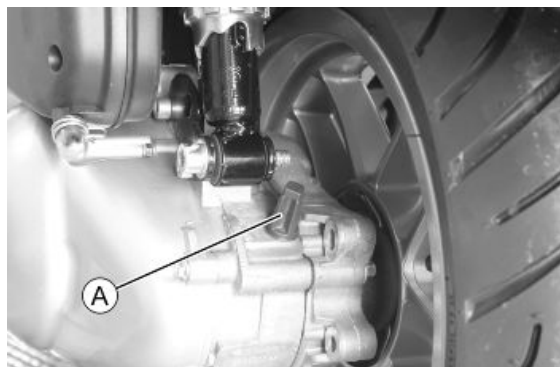
Check

- Park the vehicle on its centre stand on flat ground;
- Remove the oil dipstick «A», dry it with a clean cloth and put it back into its hole **tightening it completely**;
- Remove the dipstick and check that the oil level is slightly over the notch; if the level is below the notch indicated by the arrow, refill the hub with the right amount of oil.
- Screw up the oil dipstick again and make sure it is locked properly into place.



Replacement

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



Recommended products

AGIP ROTRA 80W-90 Rear hub oil

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

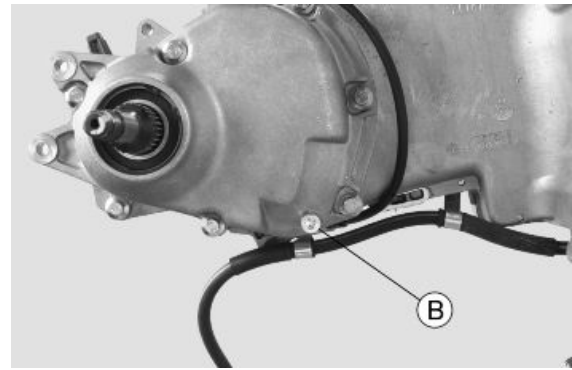
Characteristic

Transmission oil

250 cm³

Locking torques (N*m)

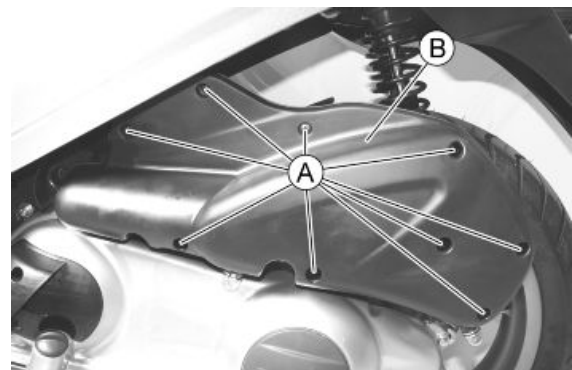
Hub oil drainage plug 15 to 17



Air filter

To reach the air filter:

- Undo the nine screws «**A**».
- Remove the air-box cover «**B**»



Cleaning:

- Wash the sponge with water and mild soap.
- Dry it with a clean cloth and short blasts of compressed air.
- Soak it in a mixture of 50% petrol and 50% specified oil.
- Gently squeeze the filtering element with your hands but do not wring it; allow it to drip dry and then refit.



CAUTION



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

Recommended products

AGIP FILTER OIL Oil for air filter sponge

Mineral oil with specific additives for increased adhesiveness

Engine oil

In 4T engines, the engine oil is used to lubricate the timing elements, the bench bearings and the thermal group. **An insufficient quantity of oil can cause serious damage to the engine.**

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

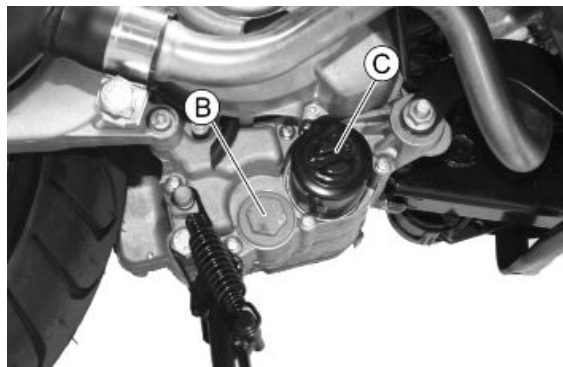
Replacement

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

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



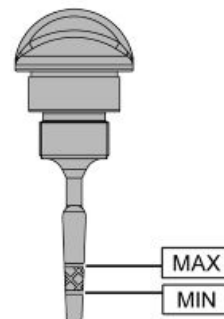
- Unscrew the mesh pre-filter drainage plug «B» on the flywheel side and let the oil drain off.
 - Once all the oil has drained through the drainage hole, unscrew and remove the oil cartridge filter «C».



Make sure the pre-filter and drainage plug O-rings are in good conditions. Lubricate them and refit the mesh filter and the oil drainage plug, screwing them up to the prescribed torque.

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

Add the recommended engine oil through plug «A». Then start up the vehicle, let it run for a few minutes and shut it off. After five minutes check the level and if necessary top up without exceeding the **MAX** level. The cartridge filter must be replaced every time the oil is changed.



N.B.

THE ENGINE MUST BE HOT WHEN THE OIL IS CHANGED.

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

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

Characteristic**Engine oil**

1.3 l

Check

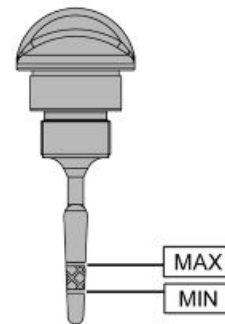
This operation **must be carried out with the engine cold** and following the procedure below:

- Place the vehicle on its centre stand and on flat ground.
- Make sure the adjustment of the rear suspension is set to the minimum preloading position.
- Unscrew the cap/dipstick «A», dry it with a clean cloth and reinsert it, **by screwing it in completely**.



- Remove the cap/dipstick «A» again and check that the level is between the **MAX** and **MIN** marks. top-up, if required.

If the check is carried out after the vehicle has been used, and therefore with a hot engine, the level line will be lower; in order to carry out a correct check, wait at least 10 minutes after the engine has been stopped so as to get the correct level.

**Oil top-up**

The oil should be topped up after having checked the level and in any case by adding oil without exceeding the **MAX** level indicated on the cap/ dipstick. Restoring the level from **MIN** to **MAX** requires approximately 400 cm³ of oil.

Engine oil filter

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

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

Recommended products

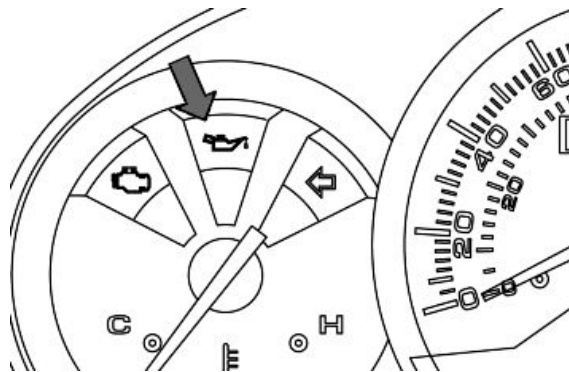
AGIP CITY HI TEC 4T Engine oil

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

Oil pressure warning light

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

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



Checking the ignition timing

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

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



Cooling system

If noise or liquid leaks through the drain bore of the water pump are detected, the pump must be replaced as described in the «Flywheel cover» Chapter.

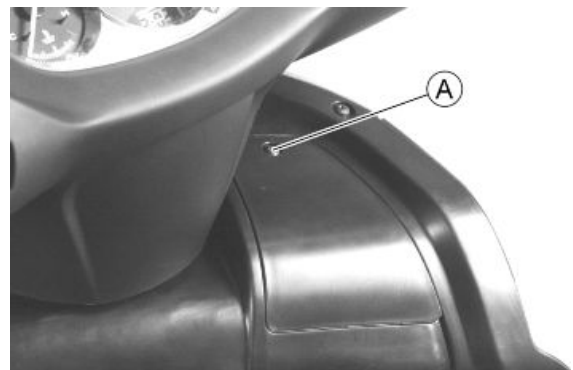
CAUTION

FOR CHANGING THE COOLANT AND BLEEDING THE SYSTEM, SEE CHAPTER "COOLING SYSTEM".

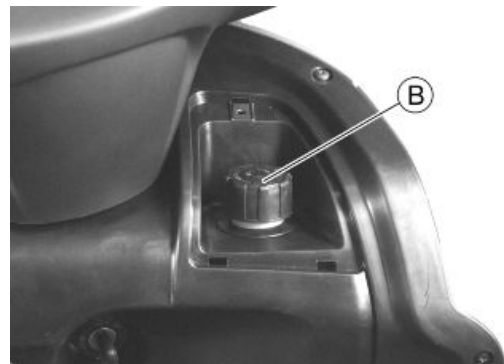
Level check

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

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

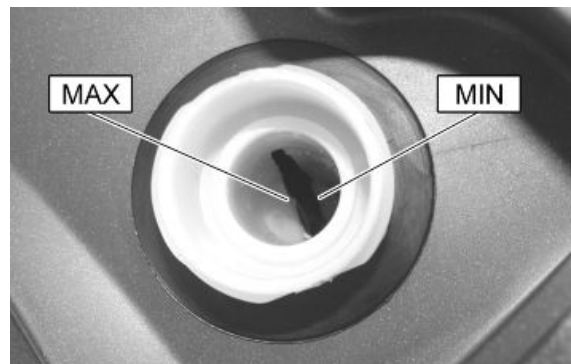


- Remove the expansion tank cover «B» by turning it anticlockwise.



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

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



WARNING



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

WARNING



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

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

Recommended products

AGIP PERMANENT SPEZIAL coolant

Monoethylene glycol-based antifreeze fluid, CU-NA NC 956-16

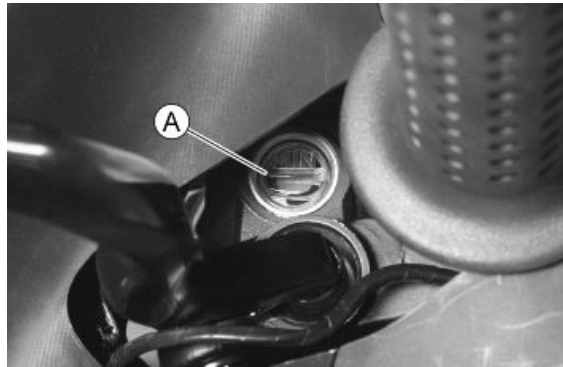
Braking system

Level check

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

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

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



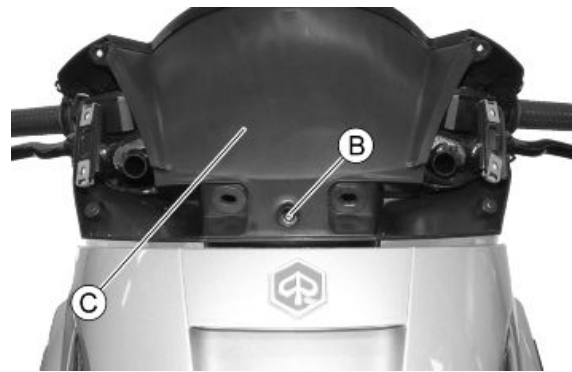
Top-up

Proceed as follows:

- Remove the rear-view mirrors.
- Working from both sides of the vehicle, undo the three screws «A» and remove the front frame.

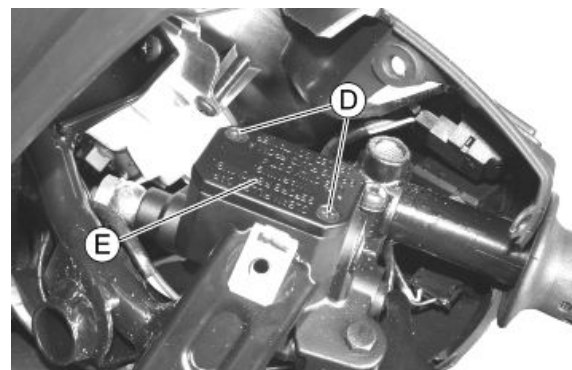


- Remove the windshield.
- Undo the screw «B» and remove the front handlebar cover «C» partially.



- Remove the cap «E» by loosening the two screws «D» and restore the fluid level by adding prescribed fluid type only, without exceeding the maximum level.

This operation applies to top up the rear brake pump. Follow the same procedure for the front one.



WARNING



ONLY USE DOT 4 CLASS BRAKE FLUIDS. BRAKING CIRCUIT FLUIDS ARE HIGHLY CORROSIVE. MAKE SURE THAT IT DOES NOT COME INTO CONTACT WITH THE PAINTWORK.

CAUTION



AVOID CONTACT OF BRAKE FLUID WITH EYES, SKIN, AND CLOTHING. IN CASE OF CONTACT, RINSE WITH WATER. THE BRAKING CIRCUIT FLUID IS HYGROSCOPIC, THAT IS, IT ABSORBS HUMIDITY FROM THE SURROUNDING AIR. IF THE HUMIDITY IN THE BRAKING FLUID EXCEEDS A CERTAIN VALUE, IT WILL LEAD TO INEFFICIENT BRAKING. NEVER USE BRAKING FLUID KEPT IN CONTAINERS THAT HAVE ALREADY BEEN OPENED, OR PARTIALLY USED.

Recommended products

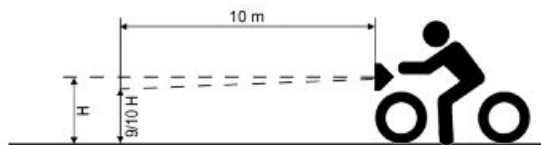
AGIP BRAKE 4 Brake fluid

FMVSS DOT 4 Synthetic fluid

Headlight adjustment

Proceed as follows:

- Position the unloaded vehicle, in running order and with the tyres inflated to the prescribed pressure, onto a flat surface, 10 m away from a half-lit white screen; make sure the vehicle axis is perpendicular to the screen.
- Turn on the headlight and check that the borderline of the projected light beam should be lower than $\frac{9}{10}$ of the distance from the ground to the centre of the vehicle's headlight, and higher than $\frac{7}{10}$.
- Otherwise, adjust the headlight.

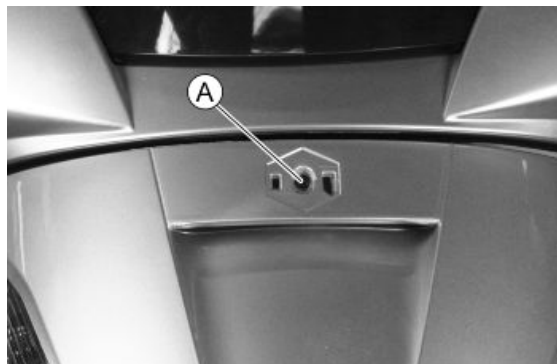


N.B.

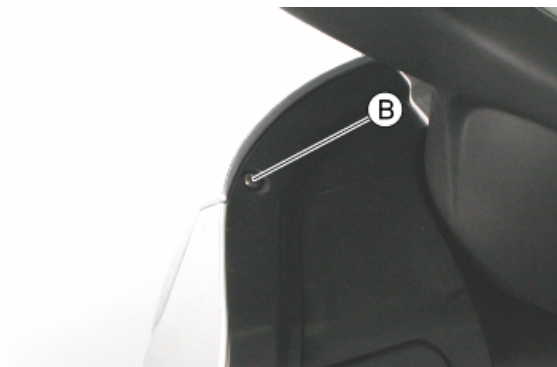
THE ABOVE PROCEDURE COMPLIES WITH THE EUROPEAN STANDARDS REGARDING MAXIMUM AND MINIMUM HEIGHT OF LIGHT BEAMS. REFER TO THE STATUTORY REGULATIONS IN FORCE IN EVERY COUNTRY WHERE THE VEHICLE IS USED.

In order to adjust the light beams:

- Remove the PIAGGIO clip-on badge and undo the screw «A».



- Working on both sides of the vehicle, undo the screw «B» and remove the front headlight cover.



- Act on the screws «**C**» in order to aim the light properly.



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

Poor performance

POOR PERFORMANCE

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

Starting difficulties

DIFFICULT STARTING

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

Excessive oil consumption/Exhaust smoke

EXCESSIVE CONSUMPTION

Possible Cause	Operation
Wrong valve adjustment	Adjust the valve clearance properly
Overheated valves	Remove the head and the valves, grind or replace the valves

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

Insufficient lubrication pressure

LOW LUBRICATION PRESSURE

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

Transmission and brakes

Clutch grabbing or performing inadequately

IRREGULAR CLUTCH PERFORMANCE OR SLIPPAGE

Possible Cause	Operation
Faulty clutch	Check that there is no grease on the masses. Check that the clutch mass faying surface with the bell is mainly in the centre with equivalent characteristics on the three masses. Check that the clutch casing is not scored or worn in an anomalous way

Insufficient braking

INEFFICIENT BRAKING SYSTEM

Possible Cause	Operation
Inefficient braking system	Check the pad wear (1.5 min). Check that the brake discs are not worn, scored or warped. Check the correct level of fluid in the pumps and 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	Replace the calliper.
Brake disc slack or distorted	Check the brake disc screws are locked; use a dial gauge and a wheel mounted on the vehicle to measure the axial deviation of the disc.
Clogged compensation holes on the pump	Clean carefully and blast with compressed air
Swollen or stuck rubber gaskets	Replace the calliper.

Electrical system

Battery

BATTERY

Possible Cause	Operation
Battery	This is the device in the system that requires the most frequent attention and the most thorough maintenance. If the vehicle is not used for some time (1 month or more) the battery needs to be recharged periodically. The battery runs down completely in the course of 3 months. If the battery is fitted on a motorcycle, be careful not to invert the connections, keeping in mind that the black ground wire is connected to the negative terminal while the red wire is connected to the terminal marked+.

Steering and suspensions

Heavy steering

STEERING HARDENING

Possible Cause	Operation
Steering hardening	Check the tightening of the top and bottom ring nuts. If irregularities continue in turning the steering even after making the above adjustments, check the rotation seats and the steering fifth wheels.

Excessive steering play

EXCESSIVE STEERING CLEARANCE

Possible Cause	Operation
Torque not conforming	Check the tightening of the top and bottom ring nuts. If irregularities continue in turning the steering even after making the above adjustments, check the rotation seats and the steering fifth wheels.

Noisy suspension

NOISY SUSPENSION

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

Suspension oil leakage

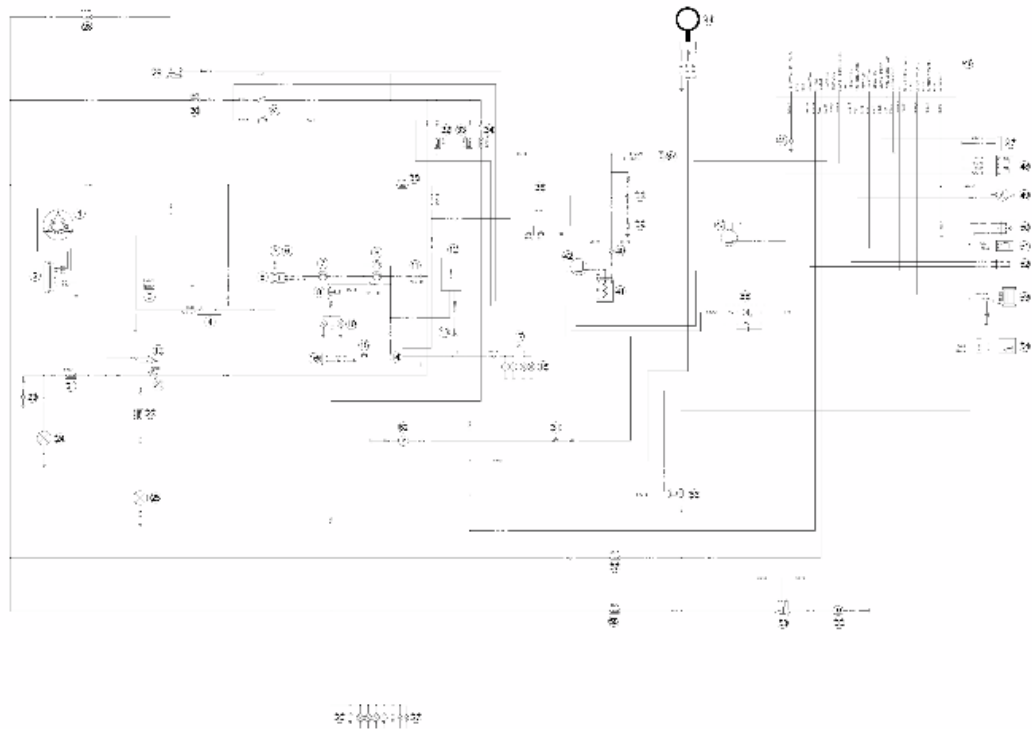
OIL LEAKAGE FROM SUSPENSION

Possible Cause	Operation
Faulty or broken seals	Replace the shock absorber

INDEX OF TOPICS

ELECTRICAL SYSTEM

ELE SYS

**Key:**

1. Magneto flywheel
2. Voltage regulator
3. Fuse F1 - 30A
4. Battery 12V-12Ah
5. Starter remote control switch
6. Starter motor
7. Starter button
8. Stop light remote control
9. Stop buttons
10. Stop light bulb (12V - 21/5W)
11. Fuse F10 - 7.5A
12. Turn indicator control device
13. Turn indicator switch
14. Pre-installation for anti-theft device
15. Horn button
16. Horn
17. Turn indicator warning light bulb (12V - 2W)
18. Turn indicator bulb (12V - 10W)
19. Light switch

-
20. High-beam light flashing switch
 21. Fuse F11 - 7.5A
 22. Fuse F12 - 7.5A
 23. High-beam warning light bulb (12V - 2W)
 24. High beam bulb (12V - 55W)
 25. Low beam bulb (12V - 55W)
 26. Front and rear daylight bulbs and license plate light (12V - 5W)
 27. Instrument panel lighting bulbs (12V - 1.2W)
 28. Fuse F3 - 15A
 29. Light solenoid
 30. Fuse F2 - 15A
 31. Key switch contacts
 32. Fuse F7 - 3A
 33. Fuse F8 - 7.5A
 34. Fuse F9 - 7.5A
 35. Fuse F6 - 3A
 36. Digital clock
 37. Preinstallation for satellite navigation system
 38. Oil pressure warning light bulb (12V - 2W)
 39. Oil pressure sensor
 40. Low fuel warning light bulb (12V - 2W)
 41. Fuel level transmitter
 42. Fuel gauge
 43. Water temperature gauge
 44. Immobilizer Aerial
 45. Engine control warning light
 46. Injection electronic control unit
 47. Diagnostics socket
 48. Coolant temperature sensor:
 49. Engine stop switch
 50. Fuel supply pump
 51. Fuel injector
 52. Lambda probe
 53. HV coil
 54. Engine rpm sensor
 55. Immobilizer LED
 56. Injection load remote control
 57. Fuse F5 - 15A

58.Fuse F4 - 15A

59. Electric fan remote control

60. Radiator electric fan

61. Fuel port opening switch

62. Fuel port actuator

Key

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

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

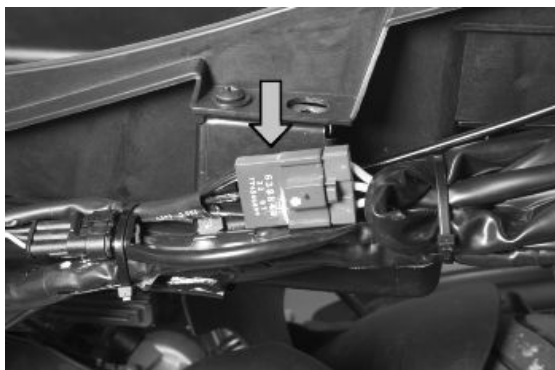
Components arrangement



1. Injection ECU: Remove the inspection flap placed in the helmet compartment to reach it.



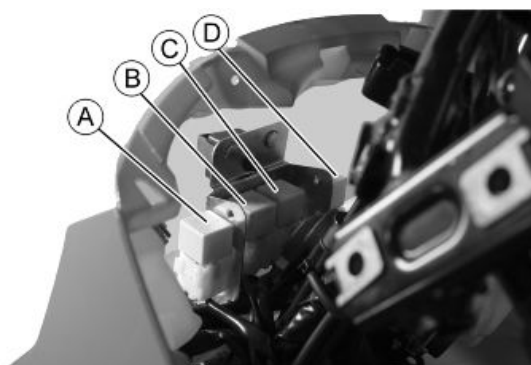
2. Stator: Remove the left side fairing to reach the connector.



3. Remote control switches: Remove the shield back plate to reach them.

KEY

- A. Injection load remote control switch
- B. Stop light remote control switch
- C. Remote control switch for electric fan
- D. Headlight remote control switch



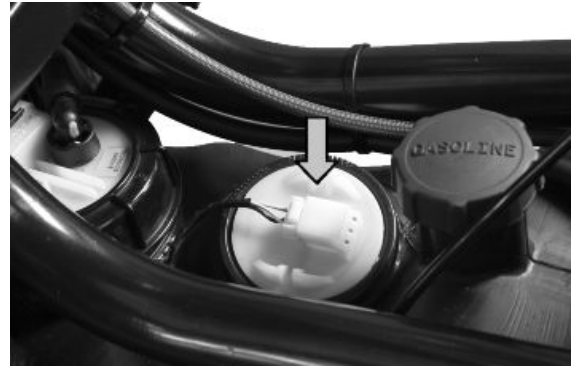
4. Turn indicators control device: Remove the leg-shield to reach it.



5. Horn: Remove the left footrest to reach it.



6. Fuel level transmitter: Remove the central cover to reach it.

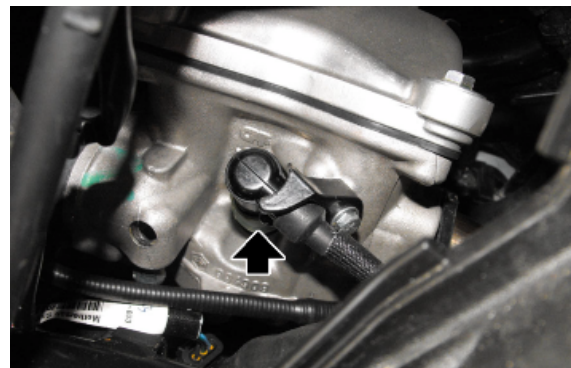


7. Spark plug: Remove the lid placed on the right side fairing to reach it.

Characteristic

Spark plug

CHAMPION RG 4 PHP



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

Characteristic

HV coil resistance primary value:

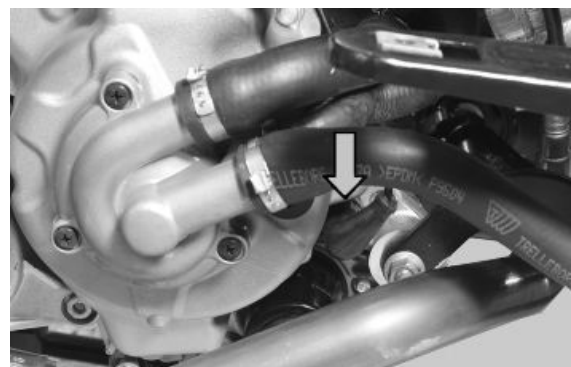
~ 0.9 Ω

HV coil secondary resistance value

~ 3.4 k Ω



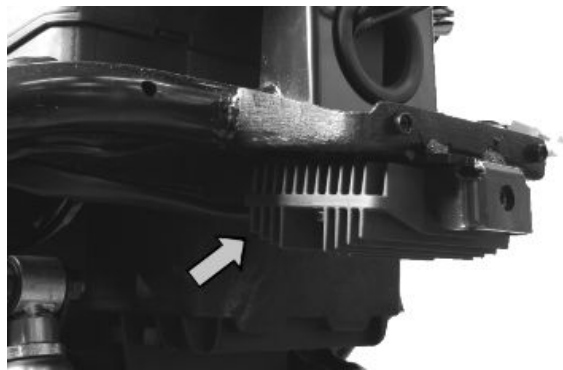
9. Oil pressure sensor: On the engine, on the low right-hand side.



10. Start-up remote control switch: Remove the right side fairing to reach it.



11. Voltage regulator: Remove the side fairings to reach it.

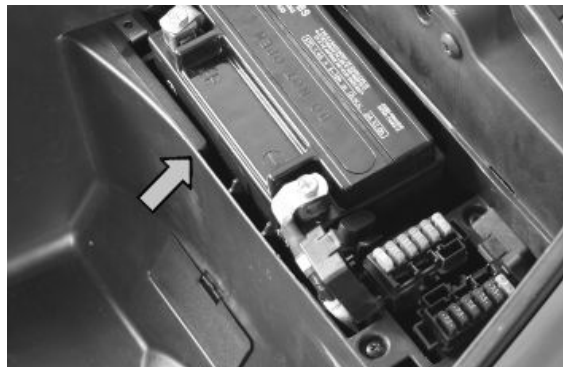


12. Battery: Remove the battery cover placed in the helmet compartment to reach it.

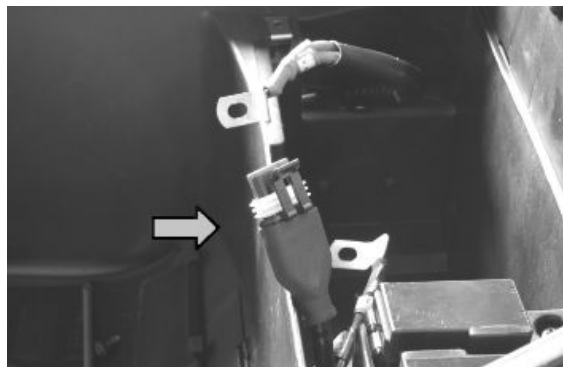
Electric characteristic

Battery

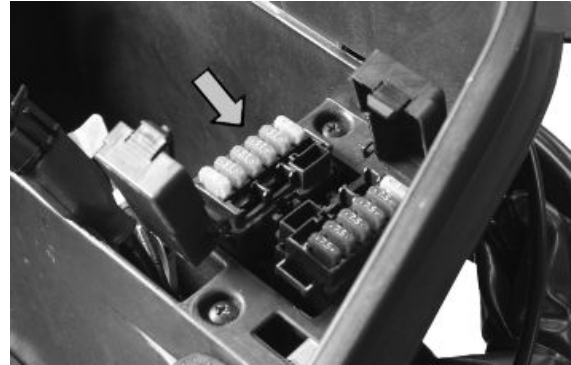
12V 12Ah



13. Diagnostics socket: Remove the battery cover placed in the helmet compartment to reach it.



14. Fuses: Remove the battery cover placed in the helmet compartment to reach them.



15. Fuel port actuator: Remove the left footrest to reach them.

16. Immobilizer Aerial: Remove the legshield to reach it. The aerial is placed on the key switch.



Ground points

There are three ground points in the electrical system:

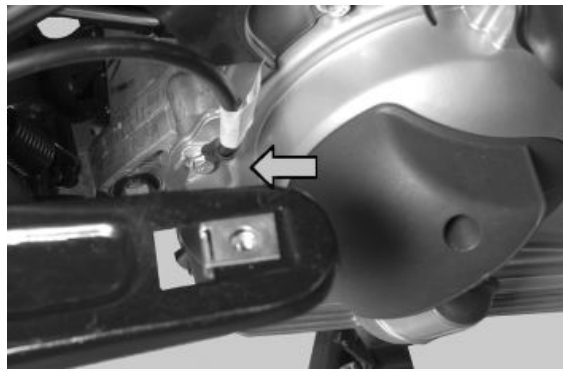
A. Ground point on the chassis. Remove the left footrest to reach it.



B. Ground point on the chassis. Remove the left footrest to reach it.

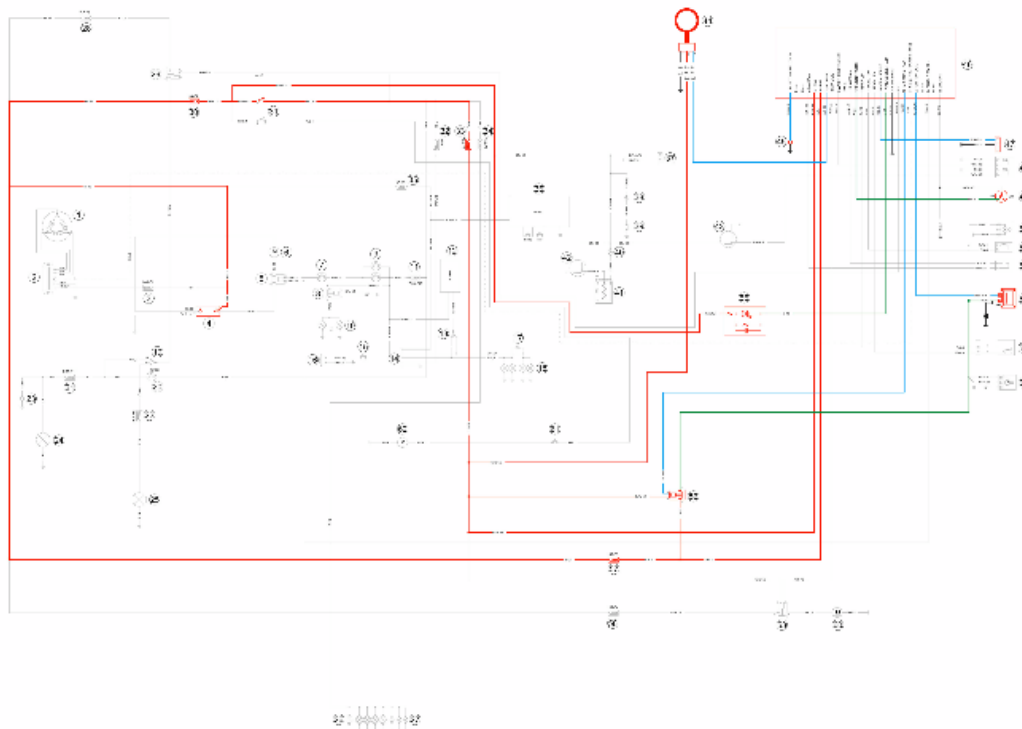


C. Ground point on the engine. Placed at the bottom at the back of the left side fairing.



Conceptual diagrams

Ignition



Key:

- 4. 12V-12Ah Battery
- 30. Fuse F2 - 15A
- 31. Key switch contacts
- 33. Fuse F8 - 7.5A
- 44. Immobilizer Aerial
- 45. Engine control warning light
- 46. Injection electronic control unit

47. Diagnostics socket

49. Engine stop switch

53. HV coil

55. Immobilizer LED

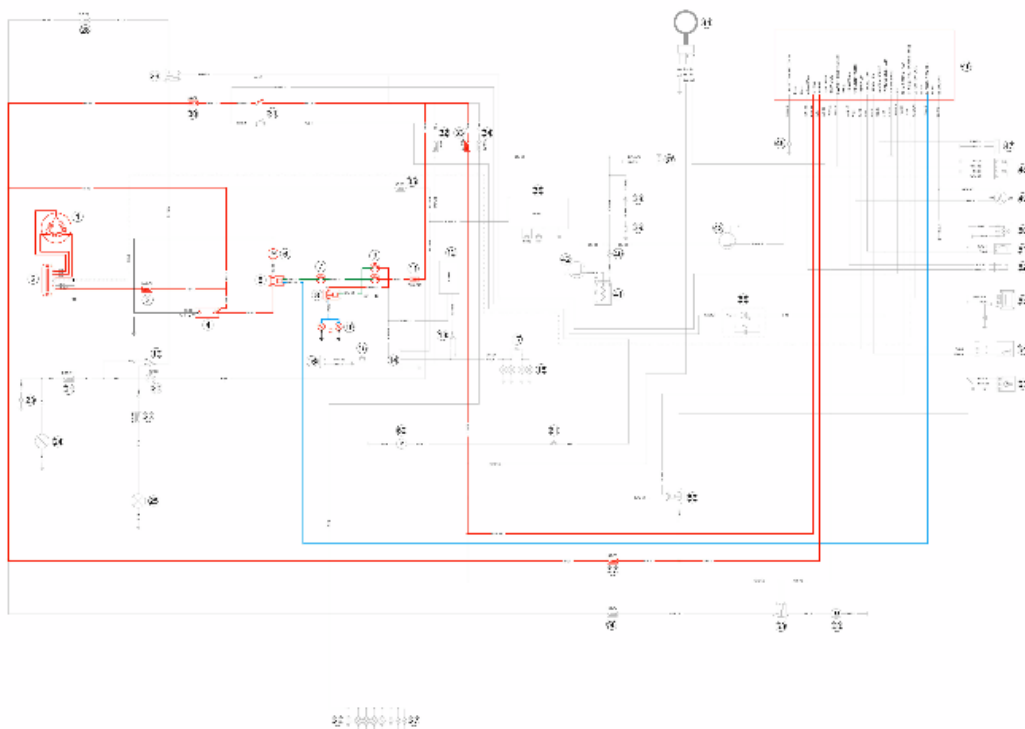
56. Injection load remote control

57. Fuse F5 - 15A

KEY

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

Battery recharge and starting



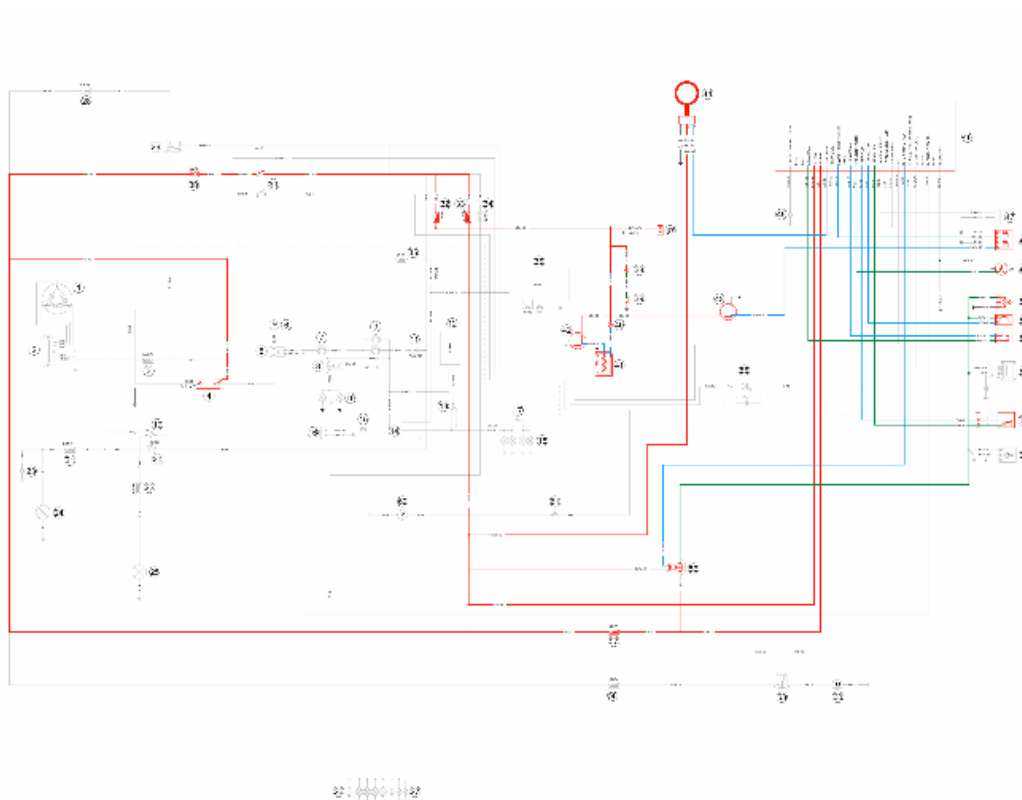
Key:

1. Magneto flywheel
2. Voltage regulator
3. Fuse F1 - 30A
4. 12V-12Ah Battery
5. Start-up remote control switch
6. Starter motor
7. Starter button
8. Stop light remote control

- 9. Stop buttons
- 10. Stop light bulb (12V - 21/5W)
- 11. Fuse F10 - 7.5A
- 30. Fuse F2 - 15A
- 31. Key switch contacts
- 33. Fuse F8 - 7.5A
- 46. Injection electronic control unit
- 57. Fuse F5 - 15A

KEY

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

Level indicators and enable signals section**Key:**

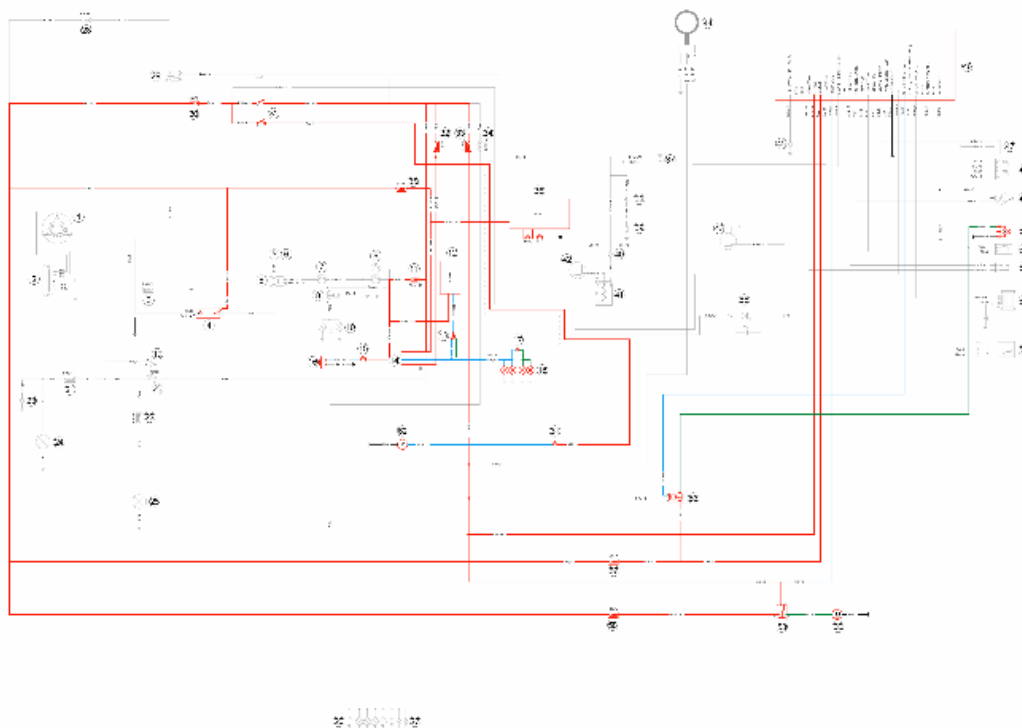
- 4. 12V-12Ah Battery
- 29. Light solenoid
- 30. Fuse F2 - 15A
- 31. Key switch contacts
- 32. Fuse F7 - 3A
- 33. Fuse F8 - 7.5A

- 37. Preinstallation for satellite navigation system
- 38. Oil pressure warning light bulb (12V - 2W)
- 39. Oil pressure sensor
- 40. Low fuel warning light bulb (12V - 2W)
- 41. Fuel level transmitter
- 42. Fuel gauge
- 43. Water temperature gauge
- 44. Immobilizer Aerial
- 46. Injection electronic control unit
- 48. Coolant temperature sensor:
- 49. Engine stop switch
- 50. Fuel supply pump
- 51. Fuel injector
- 52. Lambda probe
- 54. Engine speed sensor
- 56. Injection load remote control
- 57. Fuse F5 - 15A

KEY

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

Devices and accessories



Key:

- 11. Fuse F10 - 7.5A
- 12. Turn indicator control device
- 13. Turn indicator switch
- 14. Pre-installation for anti-theft device
- 15. Horn button
- 16. Horn
- 17. Turn indicator warning light bulb (12V - 2W)
- 18. Turn indicator bulb (12V - 10W)
- 30. Fuse F2 - 15A
- 31. Key switch contacts
- 32. Fuse F7 - 3A
- 33. Fuse F8 - 7.5A
- 35. Fuse F6 - 3A
- 36. Digital clock
- 46. Injection electronic control unit
- 50. Fuel supply pump
- 53. HV coil

56. Injection load remote control

57. Fuse F5 - 15A

58. Fuse F4 - 15A

60. Radiator electric fan

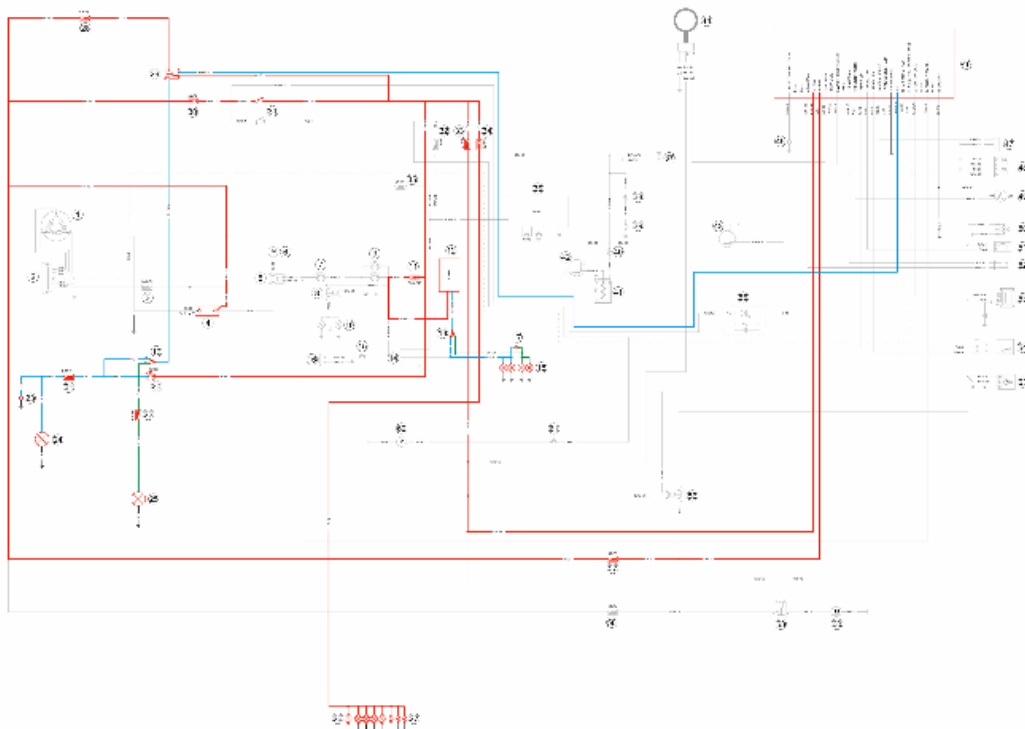
61. Fuel port opening switch

62. Fuel port actuator

KEY

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

Lights and turn indicators



Key:

4. 12V-12Ah Battery

11. Fuse F10 - 7.5A

12. Turn indicator control device

13. Turn indicator switch

17. Turn indicator warning light bulb (12V - 2W)

18. Turn indicator bulb (12V - 10W)

19. Light switch

20. High-beam light flashing switch

-
- 21. Fuse F11 - 7.5A
 - 22. Fuse F12 - 7.5A
 - 23. High-beam warning light bulb (12V - 2W)
 - 24. High beam bulb (12V - 55W)
 - 25. Low beam bulb (12V - 55W)
 - 26. Front and rear daylight bulbs and license plate light (12V - 5W)
 - 27. Instrument panel lighting bulbs (12V - 1.2W)
 - 28. Fuse F3 - 15A
 - 29. Light solenoid
 - 30. Fuse F2 - 15A
 - 31. Key switch contacts
 - 33. Fuse F8 - 7.5A
 - 34. Fuse F9 - 7.5A
 - 46. Injection electronic control unit
 - 57. Fuse F5 - 15A

KEY

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

Checks and inspections

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

Immobiliser

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

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

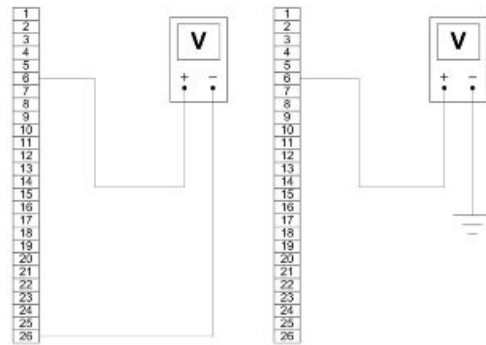
The diagnosis LED also works as a theft-deterrent blinker. This function is activated every time the key switch is set to «OFF» or the engine emergency cut-off switch is set to «OFF». It remains activated for 48 hours in order not to affect the battery charge. When the ignition switch is turned to «ON», the

detering blinker function is deactivated. Subsequently, a flash confirms the switching to « ON». The duration of the flash depends on the programming of the electronic control unit. If the LED is off regardless of the position of the ignition-key switch and/or the instrument panel is not initiated, check if:

- there is battery voltage
- fuses F2 and F8 efficiency
- there is power to the control unit as specified below:

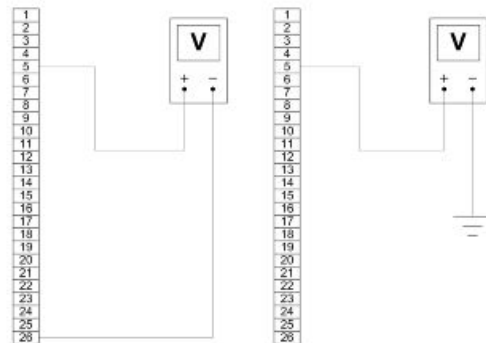
With the key switch set to OFF:

- if there is battery voltage between terminals 6-26 and terminal 6-chassis ground (fixed power supply). If there is no voltage, check that fuse F5 and its cable harness are in working order.

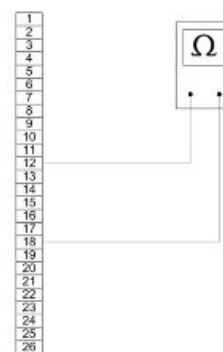


With the key switch in the OFF position:

- if there is battery voltage between terminals 5-26 and terminals 5-chassis ground (fixed power supply). If there is no voltage, check the key switch contacts, and that fuses F2 and F8 and their cable harnesses are in working order.



- There is continuity between terminals 12-18 with the emergency cut-off switch set to «RUN». If there is no continuity, check their contacts.



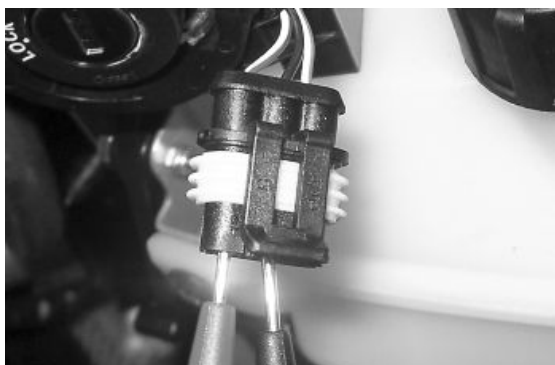
After removing the leg shield back plate, remove the electrical connection from the aerial as shown in the picture.



Remove the protective base from the connector.



With the ignition key switch set to ON, check there is battery voltage between the Red-Green and Black cables

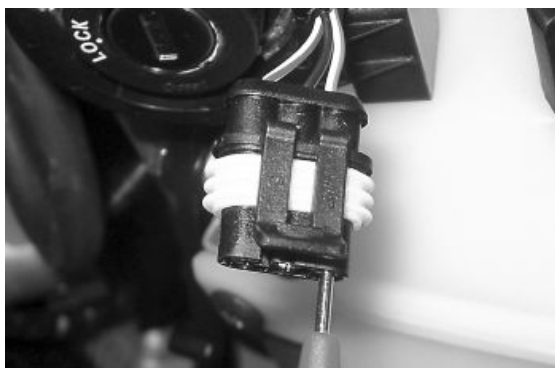


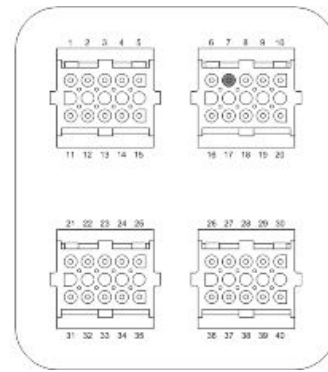
With MIU connector disconnected, check the continuity between the Orange-White cable and pin 7 of the interface wiring.

Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter





Virgin circuit

When the ignition system is not encrypted, any key will start the engine but limited to 2000 rpm. The keys can only be recognised if the control unit has been programmed properly. The data storage procedure for a previously not programmed control unit provides for the recognition of the Master as the first key to be stored to memory: this becomes particularly important because it is the only key that enables the control unit to be wiped clean and reprogrammed for the memorisation of the service keys. The Master and service keys must be used to code the system as follows:

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

The maximum time to change keys is 10 seconds.

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

It is essential to adhere to the times and the procedure. If you do not, start again from the beginning. Once the system has been programmed, the Master key transponder is strictly matched with the control unit. With this link established, it is now possible to encode new service keys, in the event of losses, replacements, etc. Each new programming deletes the previous one; to add or delete a key it is therefore necessary to repeat the procedure using all the keys that you intend to keep in use. If a service key becomes uncoded, the efficiency of the high voltage circuit shielding must be thoroughly inspected: In any case it is advisable to use resistive spark plugs.

Diagnostic codes

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

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

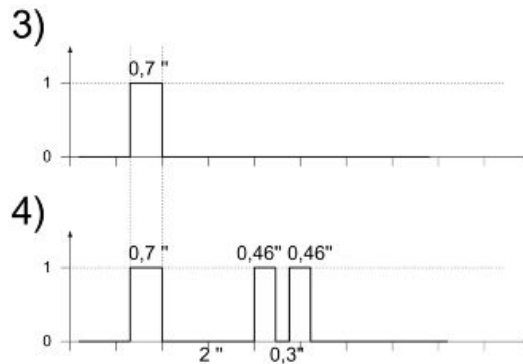
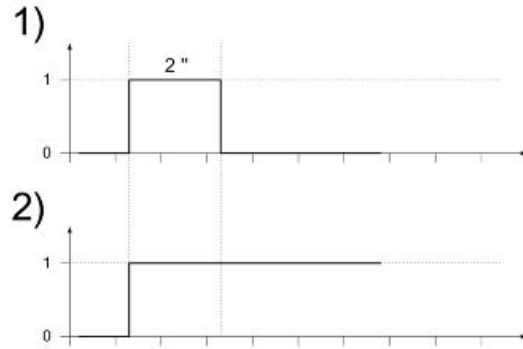
2. Previously unused control unit - transponder absent or cannot be used: The LED is permanently ON; in this condition, no operations are possible, including starting of the vehicle.

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

4. Programmed control unit - Master key 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 steadily. The engine cannot be started. The codes that can be transmitted are:

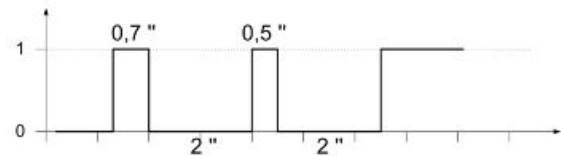
- 1-flash code
- 2-flash code



- 3-flash code

Diagnostic code - 1 flash

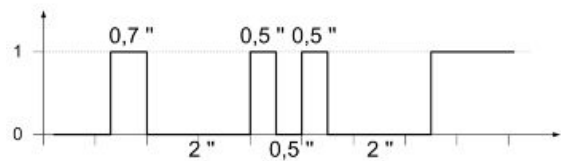
A one-flash code indicates a system where the serial line is not present or is not detected. Check the Immobilizer aerial wiring and change it if necessary.



Diagnostic code - 2 flashes

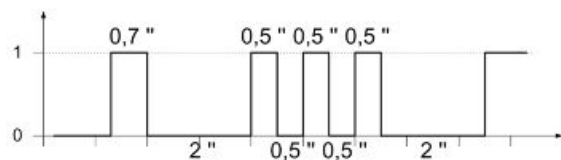
A two-flash code shows a system where the control unit does not show the transponder signal. This might depend on the inefficiency of the immobiliser aerial or the transponder.

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



Diagnostic code - 3 flashes

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



Ignition circuit

No spark plug

WARNING

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

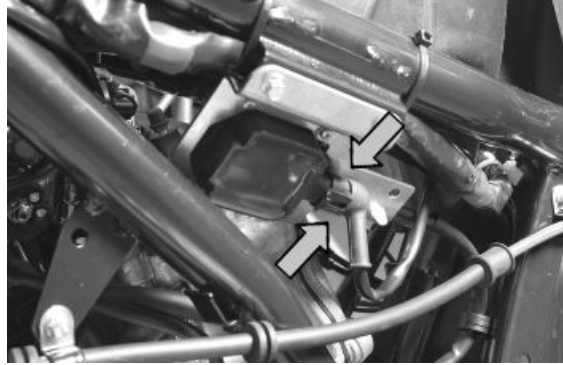
HV coil primary resistance value:

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

Characteristic

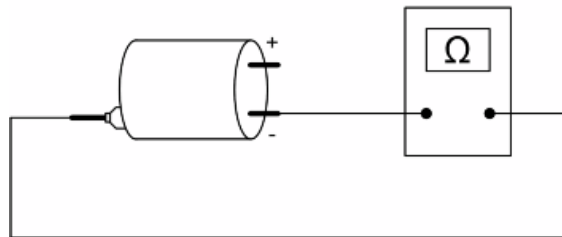
HV coil resistance primary value:

~ 0.9 Ω



HV coil secondary resistance value:

- 1) Disconnect the HV cable from the spark plug and measure the resistance between the spark plug cap and the HV coil negative terminal.
- 2) Disconnect the spark plug cap from the HV cable and measure the resistance between the HV cable end and the HV coil negative terminal (see figure).
- 3) Measure the resistance between the 2 ends of the spark plug cap.



Characteristic

HV coil secondary resistance value with spark plug cap

~ 8.4 k Ω

HV coil secondary resistance value:

~ 3.4 k Ω

Spark plug cap resistance value

~ 5 k Ω

Battery recharge circuit

The recharge circuit is provided with a three-phase generator with permanent magneto flywheel.

The generator is directly connected to the voltage regulator.

This, in its turn, is connected directly to the ground and the battery positive terminal passing through the 30A protection fuse F1.

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

Remote controls check

To check the operation of a solenoid:

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



Switches check

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

KEY

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

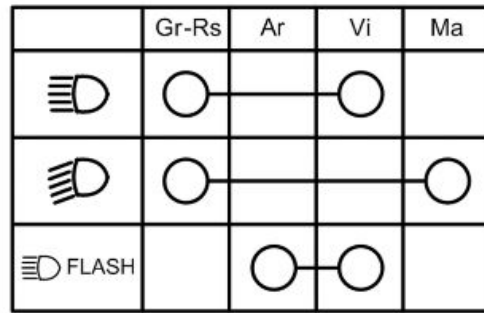
ENGINE STOP SWITCH

	Gr-Ve	Ar	

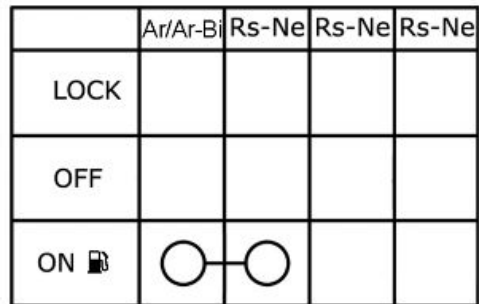
STARTER BUTTON

	Ar-Bi	Bi-Ne

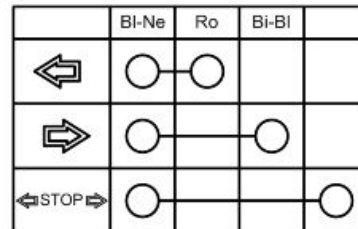
LIGHT SWITCH



KEY SWITCH

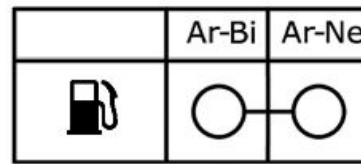


TURN INDICATOR SWITCH



HORN BUTTON

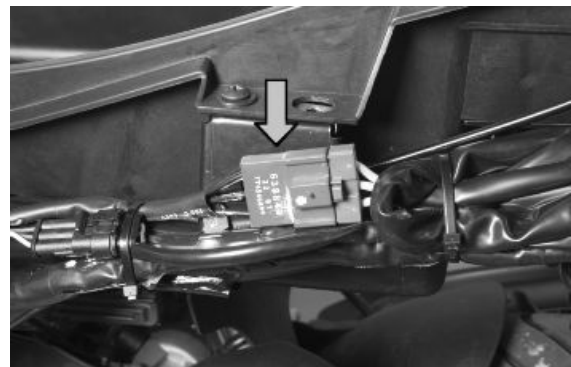


FUEL PORT OPENING SWITCH


Stator check
WARNING

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

- 1) Disconnect the connector between stator and regulator with the three yellow cables as shown in the photograph.
- 2) Measure the resistance between each of the yellow terminals and the other two.

**Characteristic****Stator phase resistance value**

~ 0.6 Ω

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

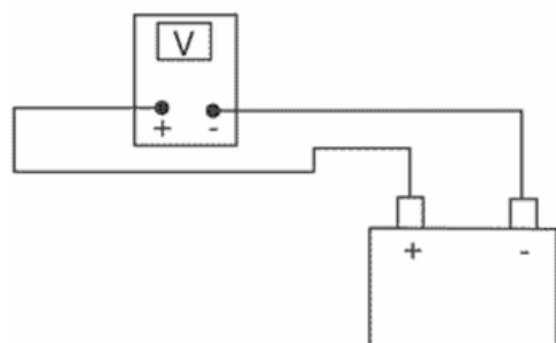
Voltage regulator check

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.

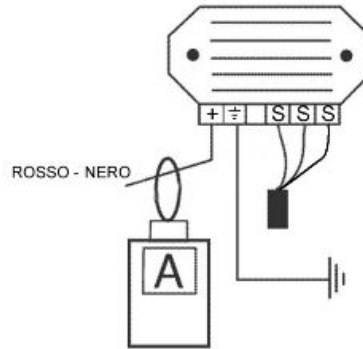
**Electric characteristic****Control voltage**

14÷15 V to 1500÷12000 rpm

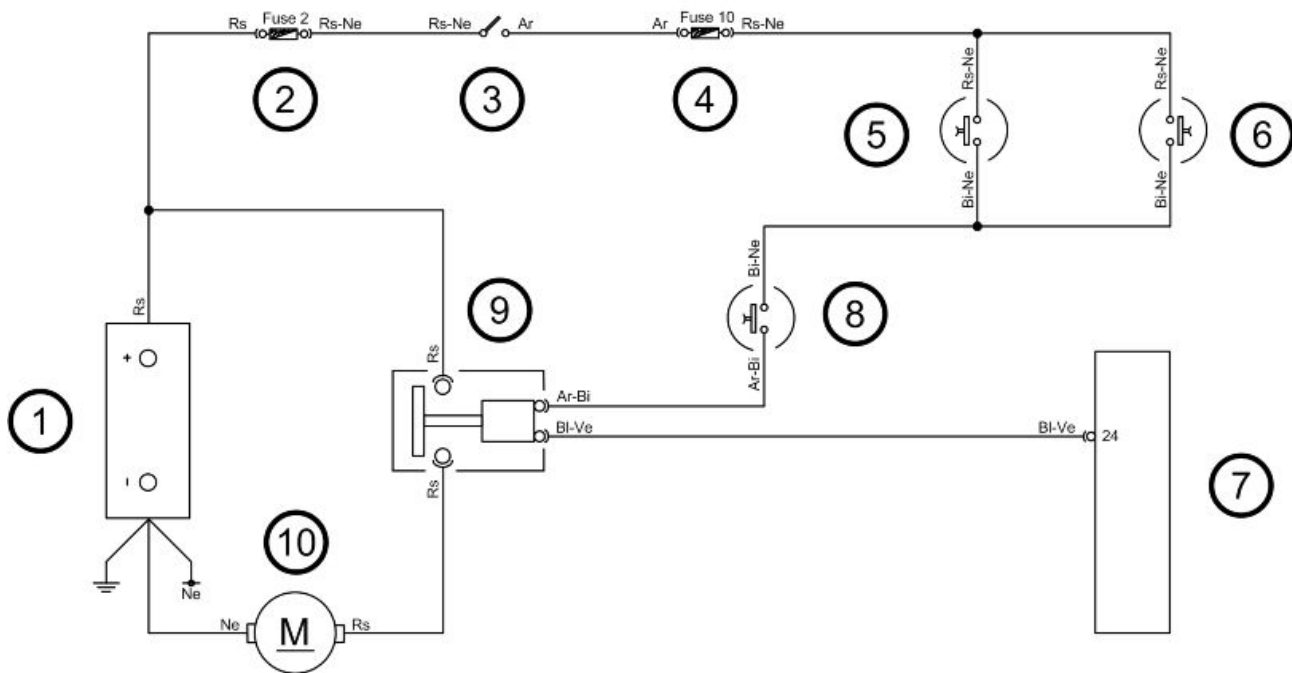
Recharge system voltage check

Connect the ammeter induction clamp to the voltage regulator positive terminal, measure the battery voltage and turning on the vehicle lights with the engine off, wait for the voltage to settle at about 12 Volt. Start the engine and measure the current generated by the system with the lights on and a high running engine.

In case the generated current value is lower than 10A, repeat the test using a new regulator and/ stator alternatively.



Starter motor



KEY

- 1. Battery
- 2. Fuse F2
- 3. Key switch contacts
- 4. Fuse F10
- 5. Stop button on rear brake
- 6. Stop button on front brake
- 7. Injection ECU

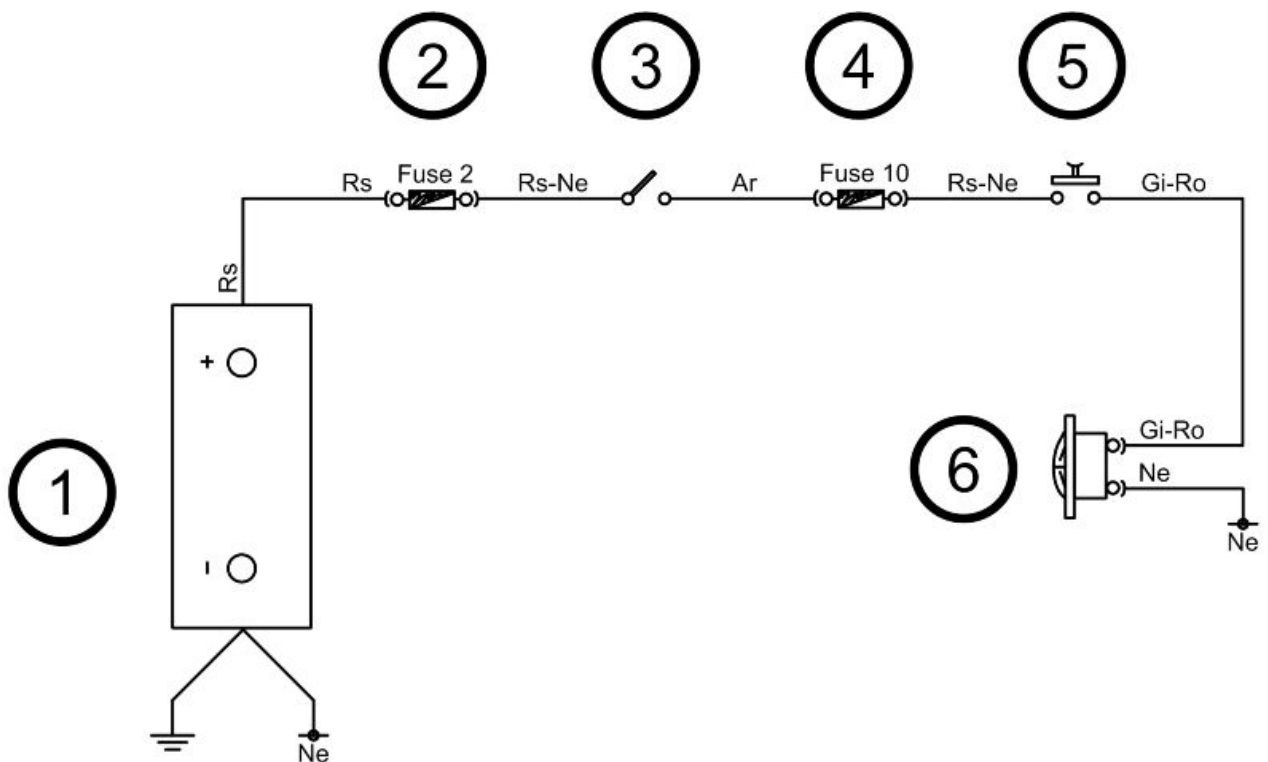
- 8. Starter button
- 9. Starter remote control switch
- 10. Starter motor

WARNING

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

If the starter motor does not operate correctly, proceed as follows:

- 1) Check the continuity of the Red cable between the battery and the start-up remote control switch. Also check continuity between the latter and the starter motor.
- 2) Check the starter motor ground connection.
- 3) Check fuses F2 and F10.
- 4) Check key switch contacts.
- 5) Check stop buttons and the starter button.
- 6) Check the start-up remote control switch.
- 7) Check wiring continuity.

Horn control**KEY**

1. Battery
2. Fuse F2
3. Key switch contacts
4. Fuse F10
5. Horn button

6. Horn

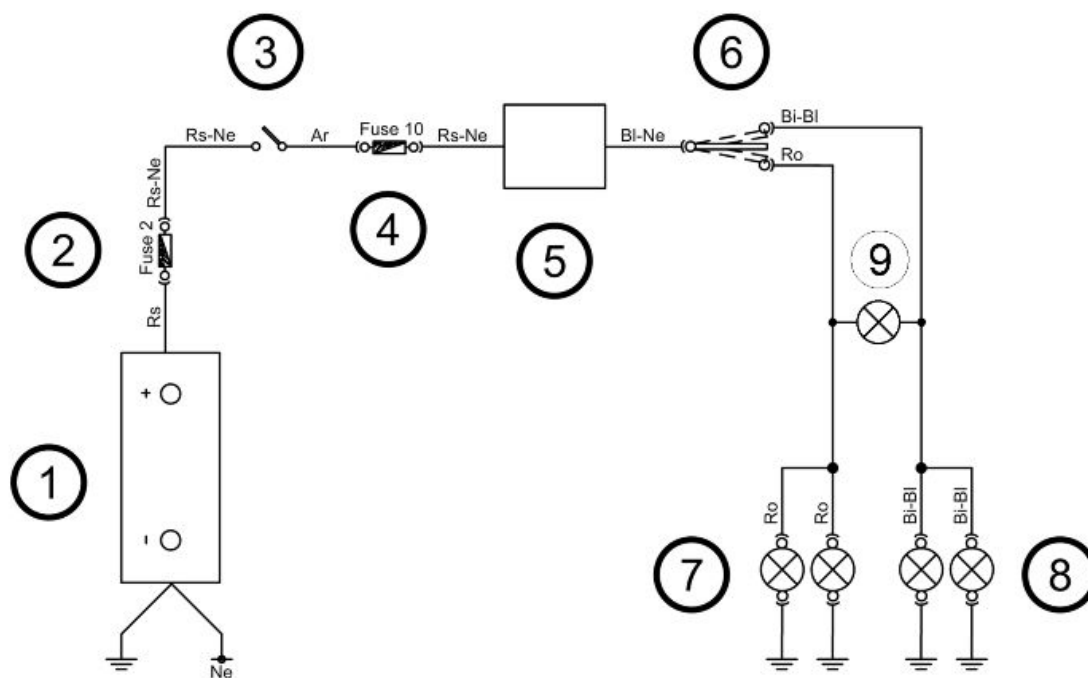
WARNING

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

In case the horn does not operate correctly, proceed as follows:

- 1) Check fuses F2 and F10.
- 2) Check key switch contacts and horn button.
- 3) Check wiring continuity.
- 4) Check the horn ground connection.

Turn signals system check

**KEY**

1. Battery
2. Fuse F2
3. Key switch contacts
4. Fuse F10
5. Turn indicators control device
6. Turn indicator switch
7. Left turn indicator bulbs
8. Right turn indicator bulbs
9. Turn indicator warning light bulb

WARNING

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

If the circuit does not work properly, proceed as follows:

- 1) Check that bulbs operate properly.
- 2) Check fuses F2 and F10.
- 3) Check key switch contacts.
- 4) With the key switch set to «ON», check if there is intermittent voltage between the output Blue-Black cable from the turn indicator control device and the ground lead.
- 5) If no voltage is detected, check cable harness continuity and, if necessary, restore it. If it is not damaged, replace the turn indicator control device.
- 6) Check the turn indicator switch.
- 7) Check turn indicator switch cable harness continuity.
- 8) Check the bulbs ground connection.

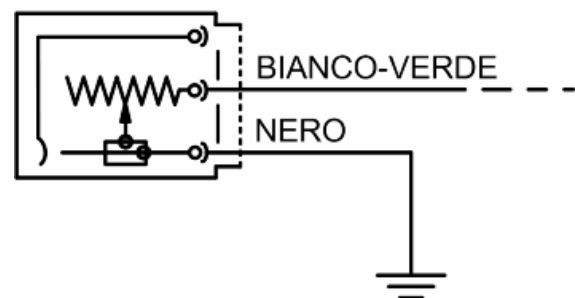
level indicators

WARNING

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

If faults are detected:

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



Electric characteristic

Resistance value when the tank is full

$\leq 7 \Omega$

Resistance value when the tank is empty

$90 +13/-3 \Omega$

Lights list

LIGHT BULBS TABLE

	Specification	Desc./Quantity
1	High-beam light bulb	Type: HALOGEN (H7) Power: 12V - 55W Quantity: 1
2	Low-beam bulb	Type: HALOGEN (H7) Power: 12V - 55W Quantity: 1
3	Front side light bulb	Type: Incandescent (W2.1x9.5d)

Specification		Desc./Quantity
		Power: 12V - 5W Quantity: 2
4	Front turn indicator light bulb	Type: Incandescent (BAU 15s) Power: 12V - 10W Quantity: 1 RHS + 1 LHS
5	Rear turn indicator light bulb	Type: Incandescent (BAU 15s) Power: 12V - 10W Quantity: 1 RHS + 1 LHS
6	Tail light and stop light bulb	Type: Incandescent (BAY 15d) Power: 12V - 5/21W Quantity: 2
7	License plate bulb	Type: Incandescent (W2.1x9.5 d) Quantity: 1 Power: 12V - 5W

Fuses

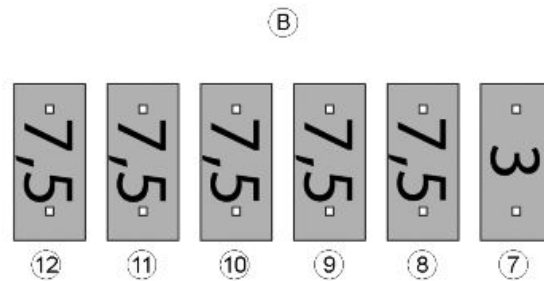
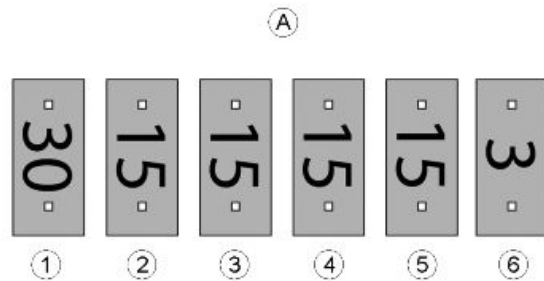
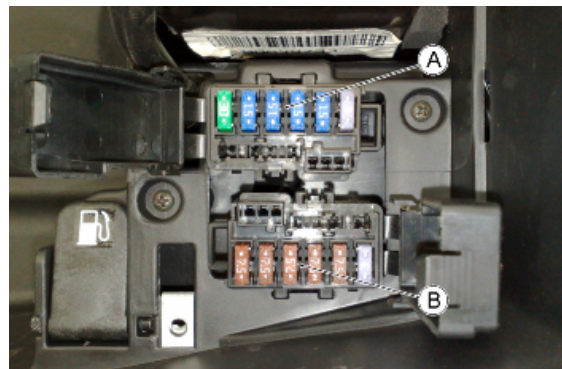
The electrical system is fitted with twelve fuses divided between two fuse boxes, located in the battery compartment, for the protection of the various circuits in the system.

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

CAUTION



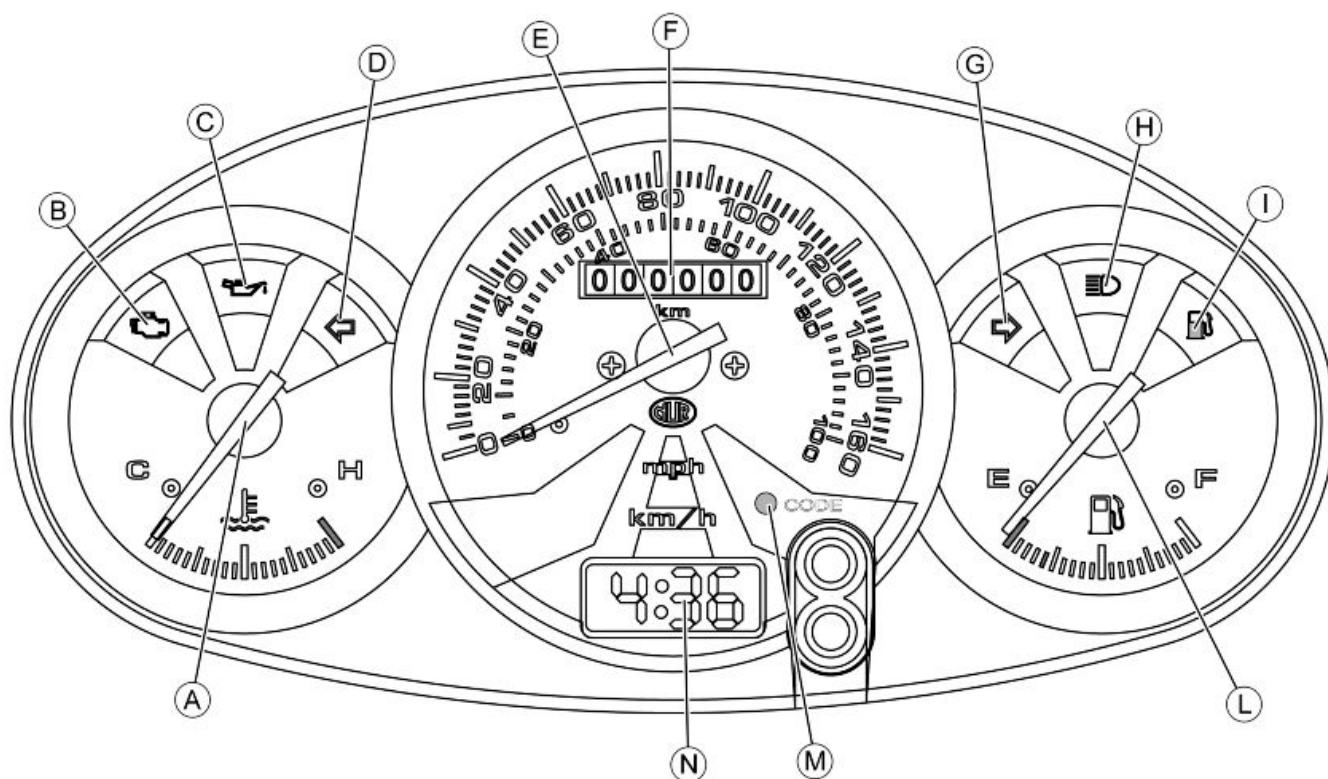
BEFORE REPLACING A BLOWN FUSE, FIND AND SOLVE THE FAILURE THAT CAUSED IT TO BLOW. NEVER TRY TO REPLACE THE FUSE WITH ANY OTHER MATERIAL (E.G., A PIECE OF ELECTRIC WIRE).



FUSES

	Specification	Desc./Quantity
1	Fuse F1	Capacity: 30 A Protected circuits: Battery recharge circuit.
2	Fuse F2	Capacity: 15A Protected circuits (live): Headlight remote control, fuses F 7-8-9-10-11 and fuel port actuator. Battery-powered immobilizer LED.
3	Fuse F3	Capacity: 15A Protected circuits: Light switch (via remote control)
4	Fuse F4	Capacity: 15A Protected circuits: Electric fan (via remote control)
5	Fuse F5	Capacity: 15A Protected circuits: Injection load (via remote control), injection ECU.
6	Fuse F6	Capacity: 3A Protected circuits: Clock, pre-installation for antitheft device.
7	Fuse F7	Capacity: 3A Protected circuits (live): Anti-theft device, satellite navigation system, warning lights and instrument panel indicators.
8	Fuse F8	Capacity: 7.5 A Protected circuits (live): Injection load remote control, injection ECU, electric fan remote control, immobilizer aerial.
9	Fuse F9	Capacity: 7.5 A Protected circuits (live): Position lights, license plate light, instrument panel lighting.
10	Fuse F10	Capacity: 7.5 A Protected circuits (live): Stop lights, start-up circuit, horn, turn indicators.
11	Fuse F11	Capacity: 7.5 A Protected circuits (live): High-beam light.
12	Fuse F12	Capacity: 7.5 A Protected circuits (live): Low-beam light.

Dashboard



- A** = Coolant temperature gauge
- B** = Engine control telltale light and injection system failure warning light
- F** = Low oil pressure warning light
- D** = Left turn indicator warning light
- E** = Speedometer with twin scale (km/h and mph)
- F** = Odometer
- G** = Right turn indicator warning light
- H** = High-beam warning light
- I** = Low fuel warning light
- L** = Fuel gauge
- M** = Immobilizer LED
- N** = Digital clock

Sealed battery

If the vehicle is provided with a sealed battery, the only maintenance required is checking its charge and recharging, when necessary.

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

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

INSTRUCTIONS FOR THE RENEWAL RECHARGE AFTER OPEN-CIRCUIT STORAGE

1) Voltage check up

Before installing the battery on the vehicle, check the open circuit voltage with a standard tester.

- If voltage exceeds 12.60 V, the battery can be installed without any renewal recharge.
- If voltage is below 12.60 V, a renewal recharge is required as explained in 2).

2) Constant voltage battery charge mode

- Constant voltage charge equal to 14.40 to 14.70V
- Initial charge voltage equal to 0.3 to 0.5 for Nominal capacity
- Charge time:

10 to 12 h recommended

Minimum 6 h

Maximum 24 h

3) Constant current battery charge mode

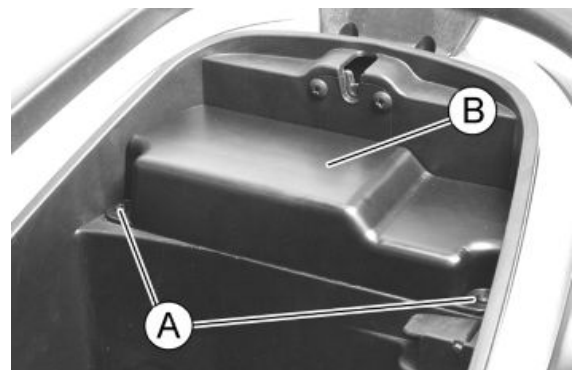
- Charge current equal to 1/10 of the battery rated capacity
- Charge time: Maximum 5 h

Battery installation

To access the battery, proceed as follows:

1. Place the scooter on its centre stand;
2. Open the saddle;
3. Remove the two fasteners «**A**» and the battery cover «**B**».

The battery is the electrical device that requires the most frequent inspections and diligent maintenance. The most relevant maintenance rules to be observed are as follows:



Characteristic

Battery

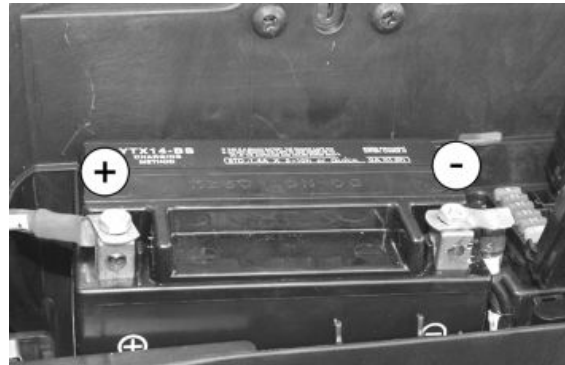
12V-12Ah

- Insert the battery in the appropriate compartment.
- Using the screwdriver, tighten up the battery terminal cables as far as they will go, placing the special Grover washer between the screw head and the cable terminal.

N.B.

DO NOT USE WRENCHES TO TIGHTEN UP THE SCREWS FOR FIXING THE TERMINALS TO THE BATTERY TERMINALS

- Refit the battery cover



Make sure that the terminals are connected correctly. When a new battery is installed, the correct time and date must be reset on the digital instrument panel.

CAUTION

DO NOT REVERSE THE POLARITY: RISK OF SHORT CIRCUIT AND DAMAGE TO THE ELECTRICAL SYSTEM.



NEVER DISCONNECT THE BATTERY CABLES WHILE THE ENGINE IS RUNNING; THIS CAN CAUSE PERMANENT DAMAGE TO THE VEHICLE ELECTRONIC CONTROL UNIT.

CAUTION

THE ELECTROLYTE IN THE BATTERY CONTAINS SULPHURIC ACID: AVOID CONTACT WITH EYES, SKIN AND CLOTHES. IN CASE OF ACCIDENTAL CONTACT, RINSE WITH ABUNDANT WATER AND CONSULT A DOCTOR.

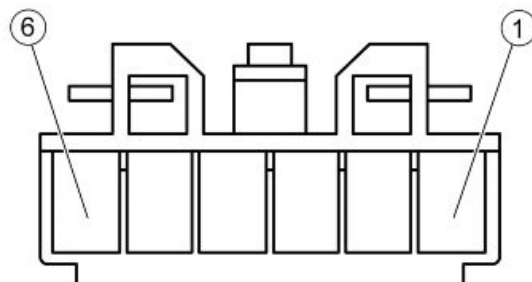
WARNING

USED BATTERIES ARE HARMFUL FOR THE ENVIRONMENT. COLLECTION AND DISPOSAL SHOULD BE CARRIED OUT IN COMPLIANCE WITH REGULATIONS IN FORCE.

Connectors

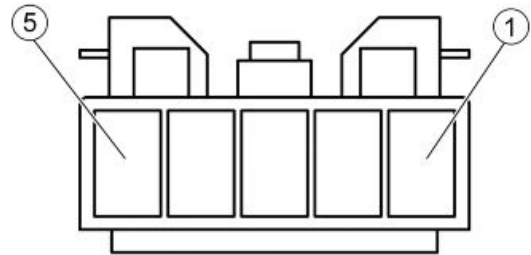
INSTRUMENT PANEL CONNECTOR «A»

1. Low fuel warning light (Yellow-Green)
2. Live supply (White-Red)
3. High-beam warning light (Purple)
4. Right turn indicator warning light (White-Blue)
5. Fuel level indicator (White-Green)
6. Instrument panel lighting (Yellow-Black)

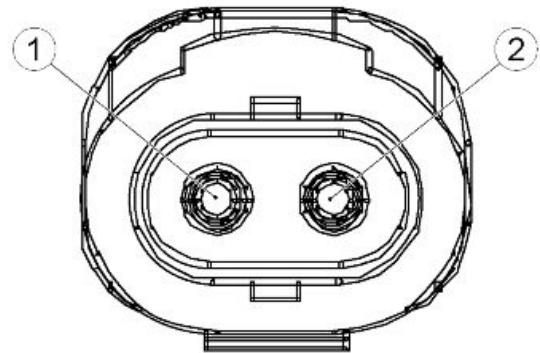


INSTRUMENT PANEL CONNECTOR «B»

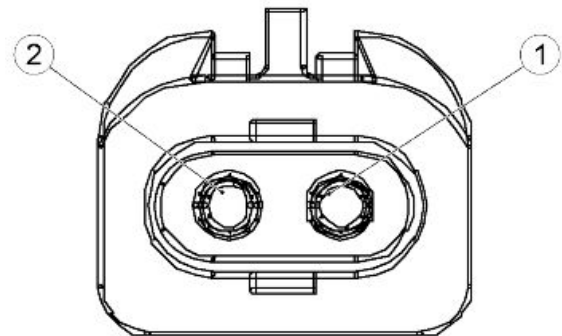
1. Ground (Black)
2. Left turn indicator warning light (Pink)
3. Coolant temperature signal (Blue-Black)
4. Live supply (White-Red)
5. Injection telltale light (Brown-Black)

**OIL WARNING LIGHT CONNECTOR**

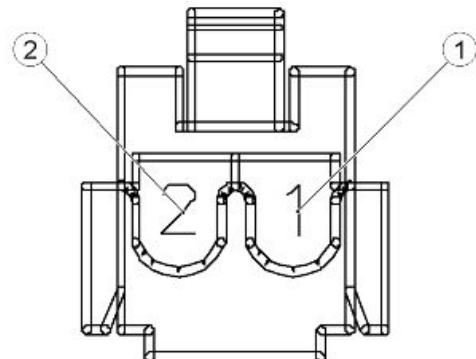
1. Minimum oil pressure signal (White-Pink)
2. Live supply (White-Red)

**CLOCK CONNECTOR**

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

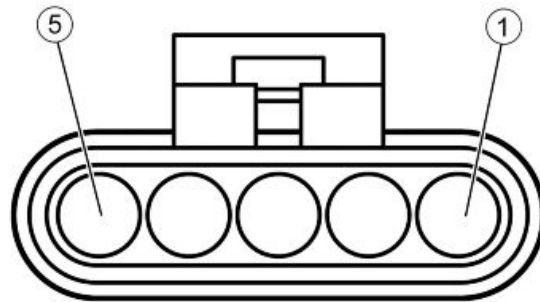
**IMMOBILIZER LED CONNECTOR**

1. Negative from control unit (Yellow)
2. Battery positive (Red-Black)

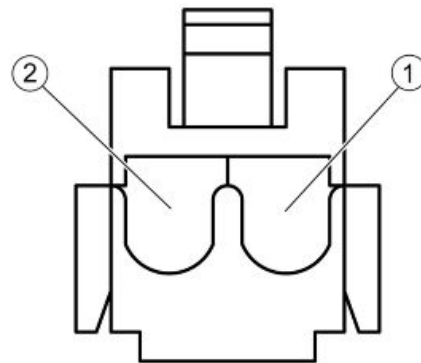


FUEL PUMP CONNECTOR

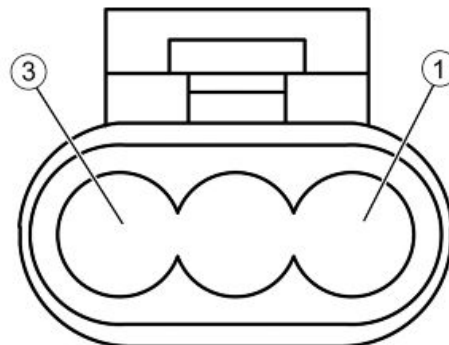
1. Not connected
2. Ground (Black)
3. Not connected
4. Not connected
5. power via remote control (Black-Green)

**ELECTRIC FAN CONNECTOR**

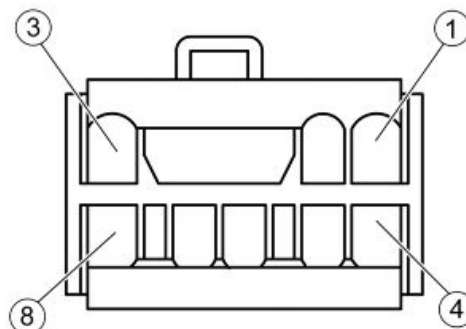
1. Power via remote control (Red)
2. Ground (Black)

**MAGNETO FLYWHEEL CONNECTOR**

1. Engine revolution sensor ECU positive (Red)
2. Engine revolution sensor ECU negative (Brown)
3. Oil pressure sensor (White-Pink)

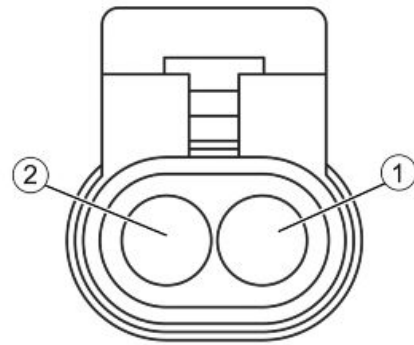
**ANTI-THEFT DEVICE PRE-INSTALLATION CONNECTOR**

1. LHS Turn indicator bulbs (Pink)
2. RHS Turn indicator bulbs (White-Blue)
3. Ground (Black)
4. Battery-powered (Blue-Red)
5. Live supply (White-Red)
6. Not connected
7. Not connected
8. Not connected

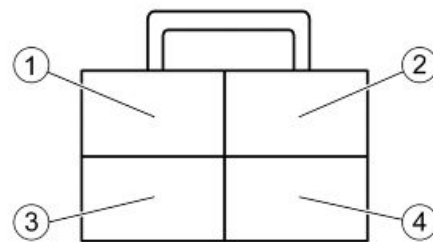


LAMBDA PROBE CONNECTOR

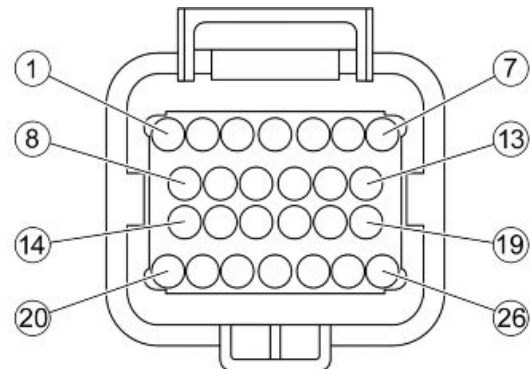
1. Lambda probe ECU positive (Sky blue-Yellow)
2. Lambda probe ECU negative (Sky blue-Black)

**VOLTAGE REGULATOR CONNECTOR**

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

**INJECTION ELECTRONIC CONTROL UNIT CONNECTOR**

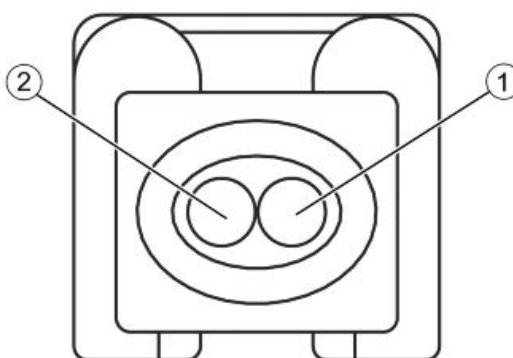
1. Injection telltale light (Brown-Black)
2. Not connected
3. Not connected
4. Lambda probe negative (Sky blue-Black)
3. Live supply (Red-Green)
6. Battery-powered (Orange-Blue)
7. Immobilizer Aerial (Orange-White)
8. Electric fan remote control (Green-White)
9. Coolant temperature sensor (Yellow-Pink)
10. Not connected
11. Lambda probe positive (Light blue-Yellow)
12. Engine stop switch (Orange)
13. Engine speed sensor positive (Red)
14. Injector negative (Yellow-Red)
15. Engine speed sensor negative (Brown)
16. Diagnostics socket (Orange-Black)
17. Immobilizer LED (Yellow)
18. Ground lead (Grey-Green)



- 19. Lights remote control (Black-Green)
- 20. Injection load remote control (Black-Purple)
- 21. Not connected
- 22. HV coil negative (Pink-Black)
- 23. Not connected
- 24. Start-up remote control switch (Blue-Green)
- 25. Not connected
- 26. Ground lead (Black)

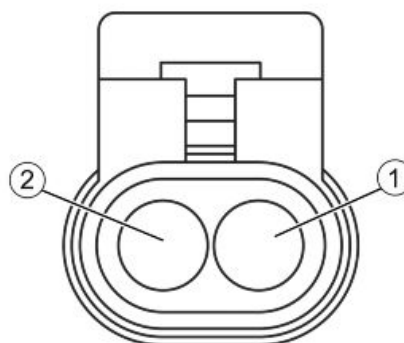
INJECTOR CONNECTOR

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



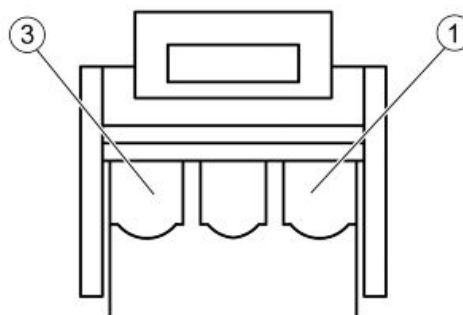
HV COIL CONNECTOR

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



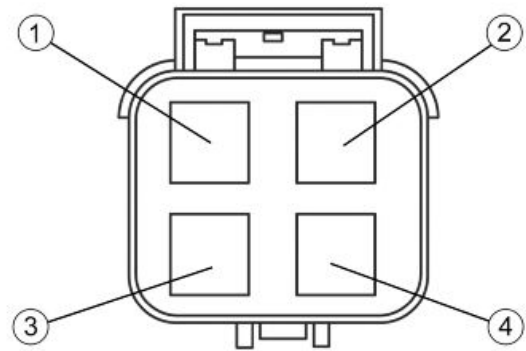
FUEL LEVEL TRANSMITTER CONNECTOR

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



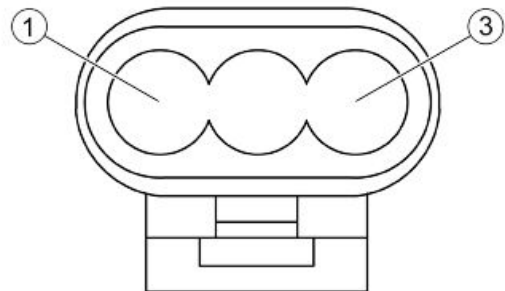
COOLANT TEMPERATURE SENSOR CONNECTOR

- 1. Ground (Grey-Green)
- 2. Ground (Black)
- 3. Injection ECU (Yellow-Pink)
- 4. Instrument panel (Sky blue-Black)



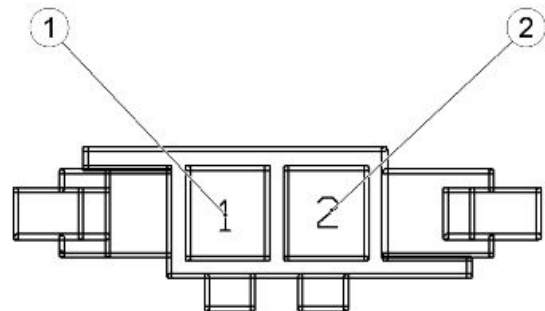
IMMOBILIZER AERIAL CONNECTOR

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



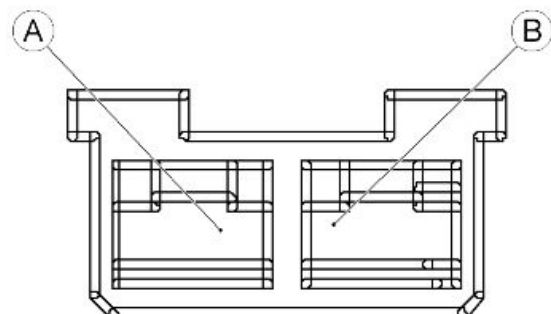
FUEL PORT ACTUATOR CONNECTOR

- 1. Ground lead (Black)
- 2. Switch signal (Orange-Black)



FUEL PORT OPENING SWITCH CONNECTOR

- A. Live power supply (Orange-White)
- B. Actuator (Orange-Black)



INDEX OF TOPICS

ENGINE FROM VEHICLE

ENG VE

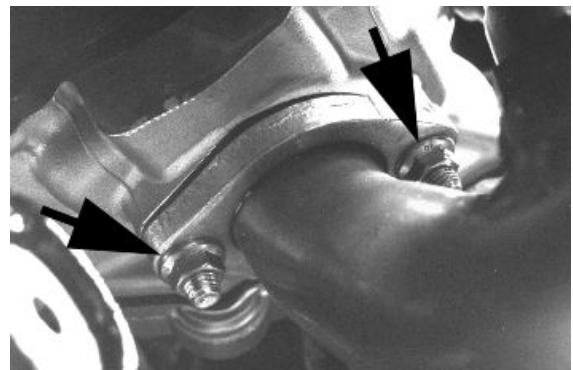
This section describes the operations to carry out when removing the engine from the vehicle.

Exhaust assy. Removal

- Remove the Lambda probe from its support and disconnect it.



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



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



Remove the lambda probe from the manifold.



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

Removal of the engine from the vehicle

Disconnect the battery.

- Remove the engine cover inside the helmet compartment
- Remove the side panels

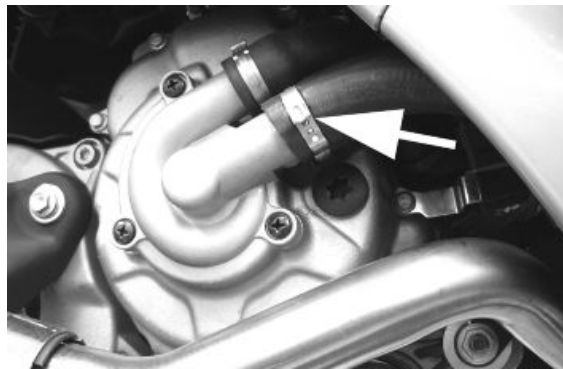
Remove the full muffler assembly.

CAUTION

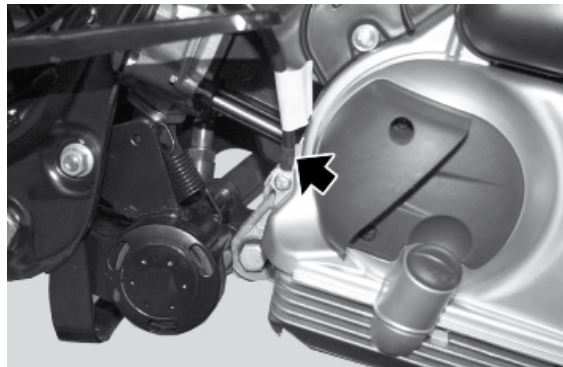


THIS OPERATION MUST BE CARRIED OUT WHEN THE ENGINE IS COLD.

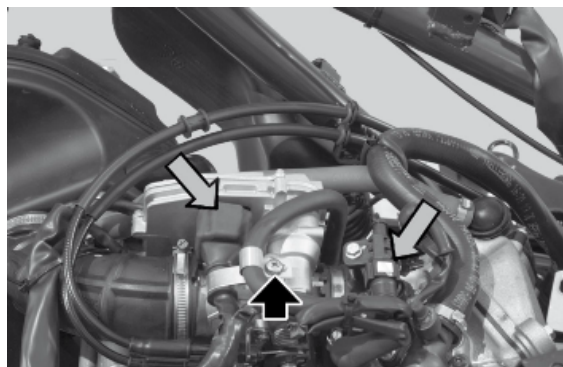
- Remove the pipe feeding coolant into the pump as shown in the photograph and then empty the system.



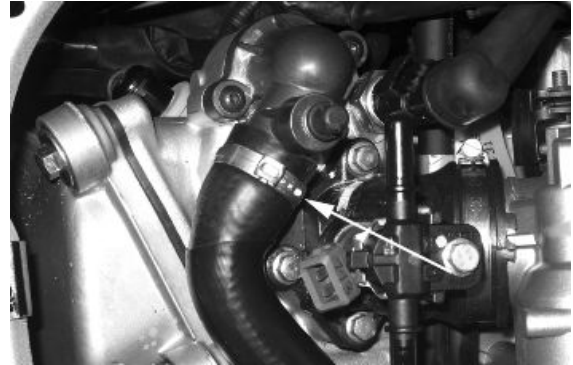
-
- Remove the engine-chassis ground lead.



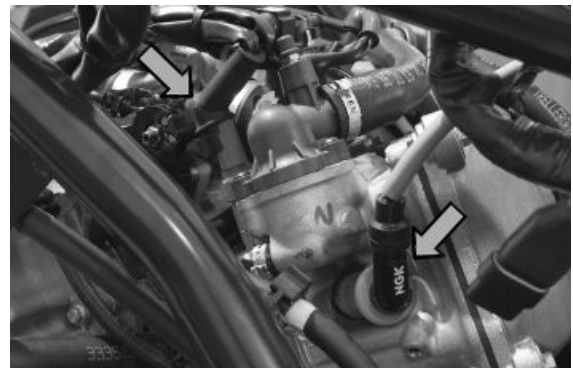
-
- Disconnect the fuel delivery and return pipes from the injector by removing the screw locking the retaining clamp.
 - Disconnect the injector wiring and the throttle body control unit wiring.



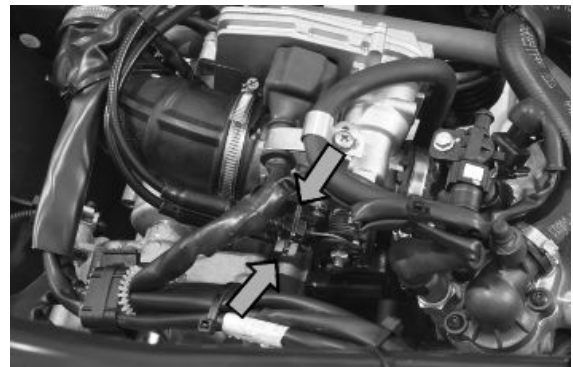
-
- Remove the coolant outlet pipe from the engine as indicated.



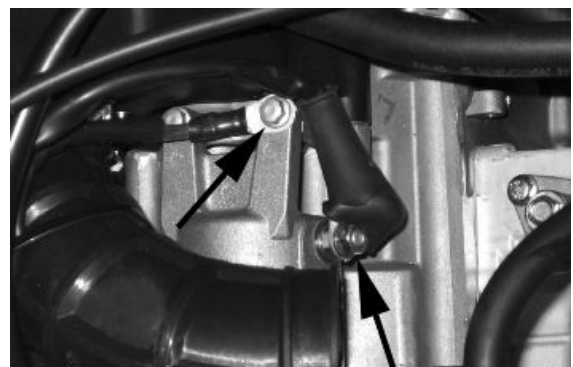
-
- Remove the spark plug cap.
 - Remove the coolant temperature sensor connector indicated in the picture.



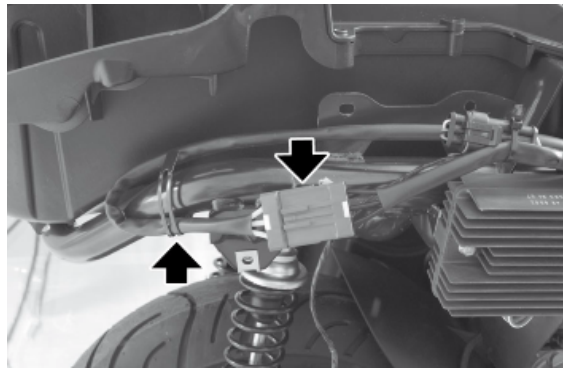
-
- Remove the throttle cables from the throttle body by undoing the nuts indicated in the picture.



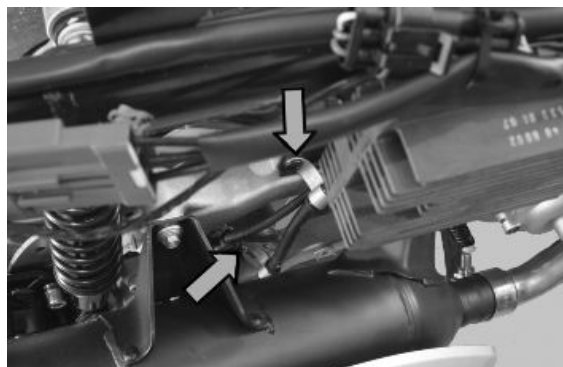
-
- Remove the positive and negative wiring from the starter motor as shown in the picture.



- Disconnect the connectors from the flywheel wiring as shown in the photo.
- Remove the cable from the retaining clip on the flywheel cover.

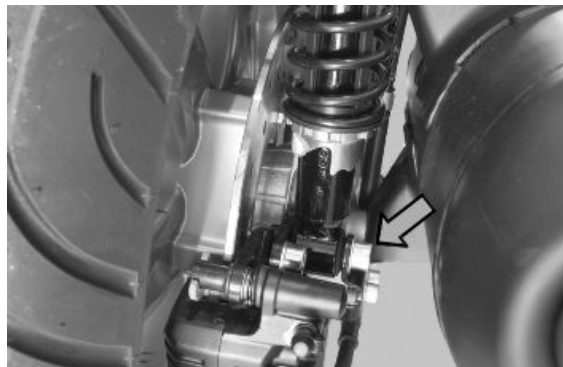


- Undo the fixing screw of the locking clamps of the brake pipe from the muffler supporting arm.



Muffler supporting arm removal

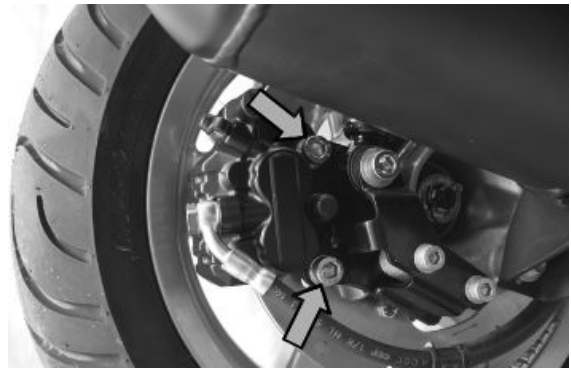
- Unscrew and remove the screw fixing the right-hand shock absorber to the supporting plate.



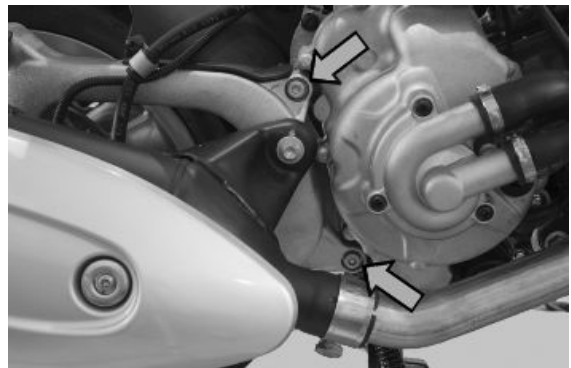
- Remove the cotter pin, the cap and unscrew the wheel axle nut. Operate the rear brake by pulling the left lever on the handlebar so that the axle does not turn.



-
- Undo the 2 screws fixing the rear brake calliper.
 - Remove the calliper and its pipes from the muffler supporting arm.

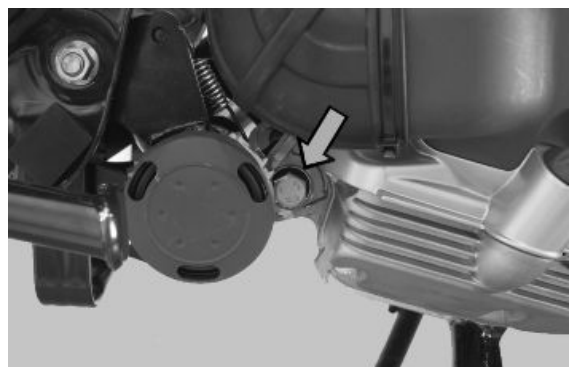


-
- Undo the 2 screws fixing the swinging arm to the engine.
 - Remove the muffler support arm



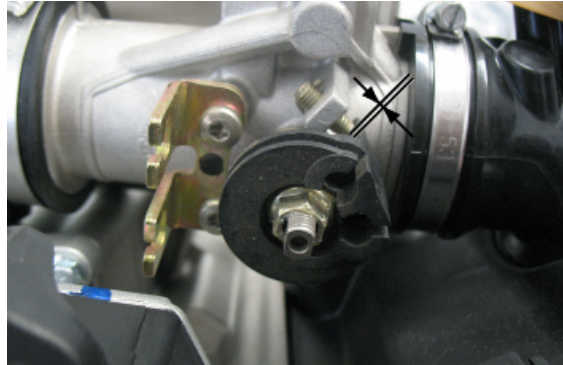
-
- Slide off the entire wheel with its disc from the wheel axle. Move the right shock absorber backwards to facilitate removing the wheel.

-
- Use a jack to support the vehicle properly. Remove the engine-swinging arm fixing pin by undoing the nut and the head of the pin as shown in the photograph.
 - The engine is now free.



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

**CAUTION**

PAY PARTICULAR ATTENTION TO POSITIONING THE THROTTLE CONTROL TRANSMISSION PROPERLY.

INDEX OF TOPICS

ENGINE

ENG

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

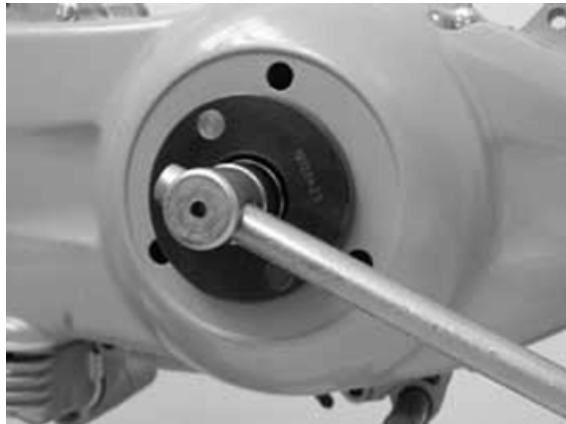
Automatic transmission

Transmission cover

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

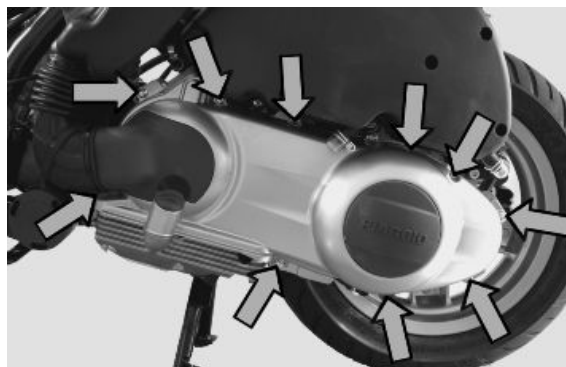
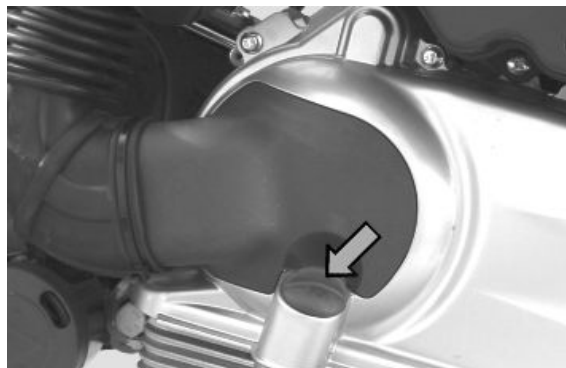
Specific tooling

020423Y Driven pulley lock wrench



- Remove the cap/dipstick from the engine oil filling hole.

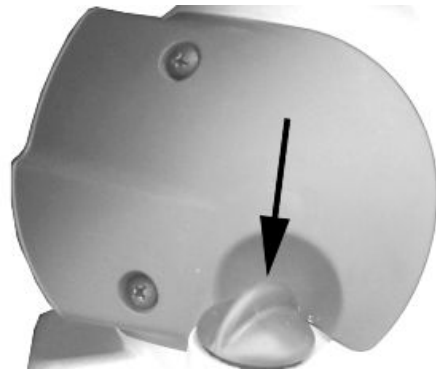
- Remove the ten screws.



- Remove the transmission cover.

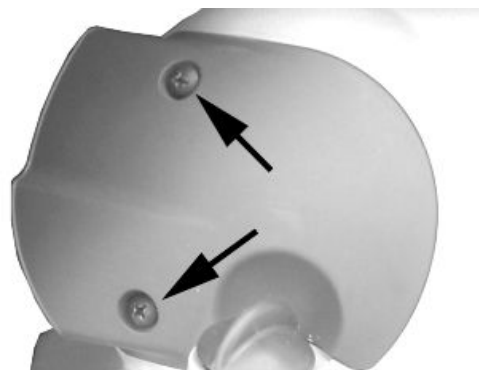
N.B.

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

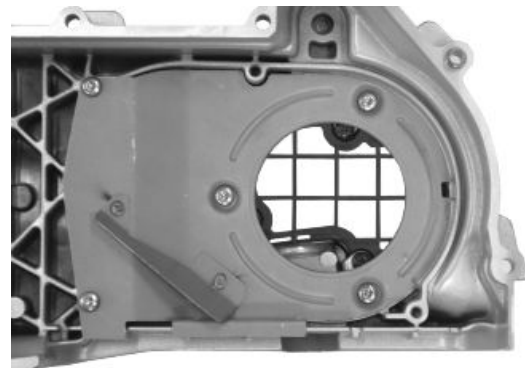


Air duct

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



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



Removing the driven pulley shaft bearing

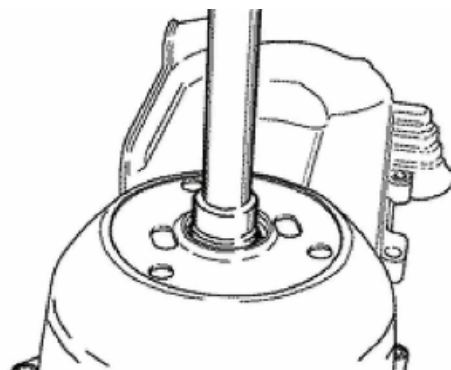
- Remove the clip from the inside of the cover.
- Remove the bearing from the crankcase by means of:

Specific tooling

020376Y Adaptor handle

020375Y 28 x 30 mm adaptor

020412Y 15-mm guide



Refitting the driven pulley shaft bearing

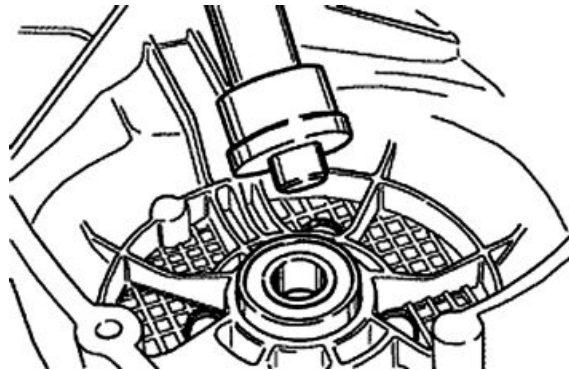
- Slightly heat the crankcase from the inside so as not to damage the painted surface.
- Insert the bearing in its seat.
- Refit the Seeger ring.

CAUTION

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

N.B.

ALWAYS REPLACE THE BEARING WITH A NEW ONE UPON REFITTING.



Specific tooling

020376Y Adaptor handle

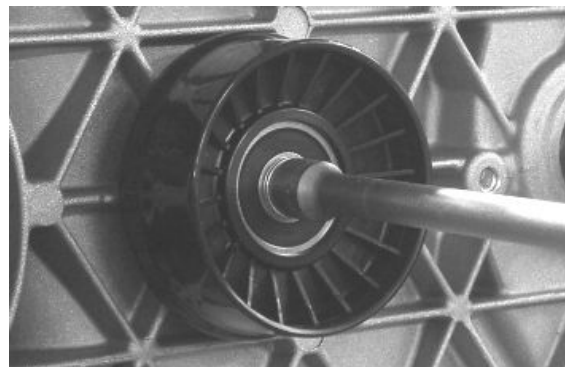
020357Y 32x35-mm Adaptor

020412Y 15-mm guide

Baffle roller

Plastic roller

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



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



Locking torques (N*m)

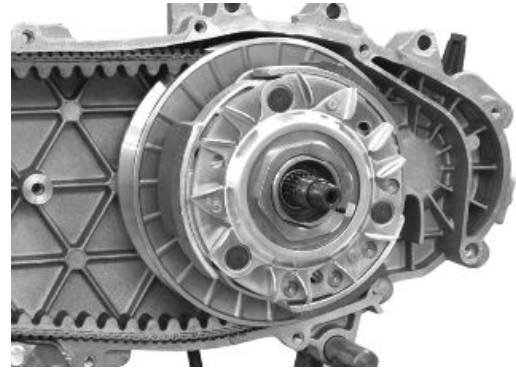
Anti-flapping roller 12 - 16

Removing the driven pulley

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

N.B.

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



Inspecting the clutch drum

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

Characteristic

Max. value clutch bell

Max. value: \varnothing 134.5 mm

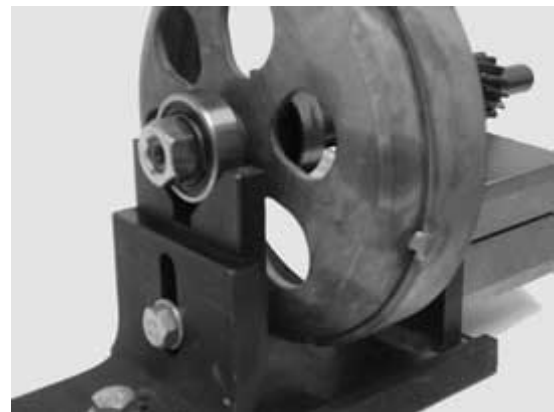
Clutch bell standard value

Standard value: \varnothing 134 - 134.2 mm



Checking the bell working surface eccentricity

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



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

Specific tooling

020074Y Support base for checking crankshaft alignment

020335Y Magnetic mounting for dial gauge

Characteristic

clutch bell inspection: Limit eccentricity.

Admissible limit eccentricity: 0.15 mm



Removing the clutch

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

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



CAUTION

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

Specific tooling

020444Y Tool for fitting/ removing the driven pulley clutch

020444Y011 adapter ring

020444Y009 wrench 46 x 55

Inspecting the clutch

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

N.B.

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

CAUTION

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

Characteristic**Check minimum thickness**

1 mm



Pin retaining collar

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

N.B.

USE TWO SCREWDRIVERS IF YOU HAVE ANY DIFFICULTY.

N.B.

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



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



Removing the driven half-pulley bearing

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



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

Specific tooling

001467Y035 Bearing housing, outside \varnothing 47 mm



- Remove the roller bearing using the modular punch.

Specific tooling

020376Y Adaptor handle

020456Y \varnothing 24 mm adaptor

020363Y 20-mm guide

Inspecting the driven fixed half-pulley

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

Characteristic

Half-pulley minimum diameter

Minimum admissible diameter: \varnothing 40.96 mm

Half-pulley standard diameter



Standard diameter: Ø 40.985 mm

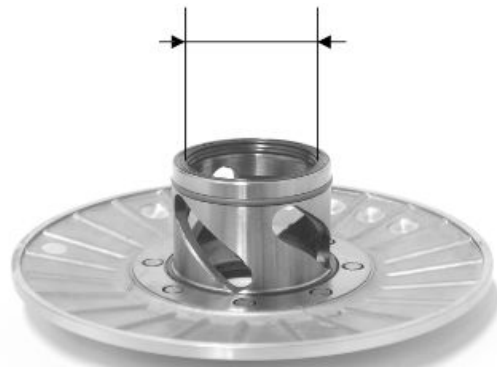
Wear limit

0.3 mm



Inspecting the driven sliding half-pulley

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



MOVABLE DRIVEN HALF-PULLEY DIMENSIONS

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

Refitting the driven half-pulley bearing

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

Fit the retainer ring

WARNING

N.B.

FIT THE BALL BEARING WITH THE VISIBLE SHIELDING

Specific tooling

020376Y Adaptor handle

020375Y 28 x 30 mm adaptor

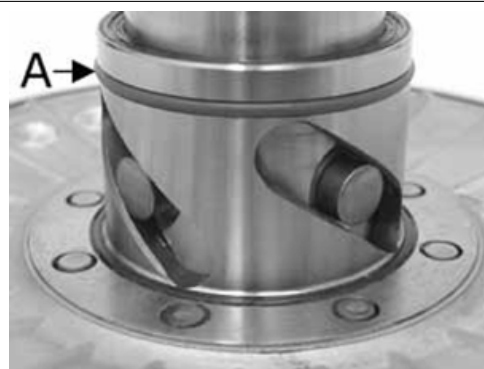
020424Y Driven pulley roller casing fitting punch



Refitting the driven pulley

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

N.B.



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

Specific tooling

020263Y Driven pulley assembly sheath

Recommended products

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

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



Inspecting the clutch spring

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

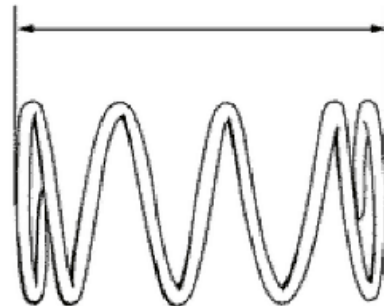
Characteristic

Standard length

123 mm

Acceptable limit after use:

118 mm



Refitting the clutch

- Support the driven pulley spring compressor specific tool with the control screw in vertical axis.
- Arrange the tool with the medium length pins screwed in position "C" on the inside.
- Introduce the adapter ring No. 11 with the chamfering facing upwards.
- Insert the clutch on the adapter ring.
- Lubricate the end of the spring that abuts against the torque server closing collar.
- Insert the spring with its plastic holder in contact with the clutch.
- Insert the driving belt into the pulley unit according to their direction of rotation.
- Insert the pulley unit with the belt into the tool.
- Slightly preload the spring.



- Make sure that the clutch is perfectly inserted into the adapter ring before proceeding to tighten the clutch nut.
- Place the tool in the clamp with the control screw on the horizontal axis.
- Fully preload the spring.
- Apply the clutch fixing nut and tighten it to the prescribed torque using the special 46x55 wrench.
- Loosen the tool clamp and insert the belt according to its direction of rotation.
- Lock the driven pulley again using the specific tool.
- Preload the clutch return spring with a traction/ rotation combined action and place the belt in the smaller diameter rolling position.
- Remove the driven pulley /belt unit from the tool.

**N.B.**

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

N.B.

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

Specific tooling

020444Y Tool for fitting/ removing the driven pulley clutch

020444Y011 adapter ring

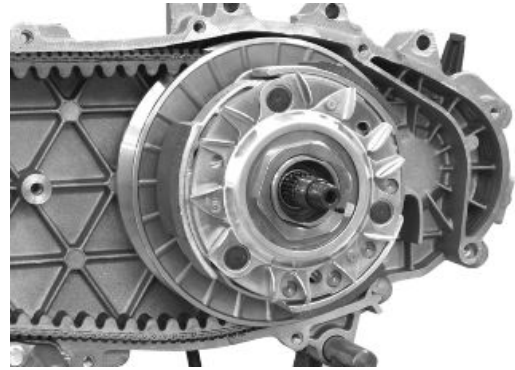
020444Y009 wrench 46 x 55

Locking torques (N*m)

Clutch unit nut on driven pulley 45 to 50

Refitting the driven pulley

- Refit the clutch bell.

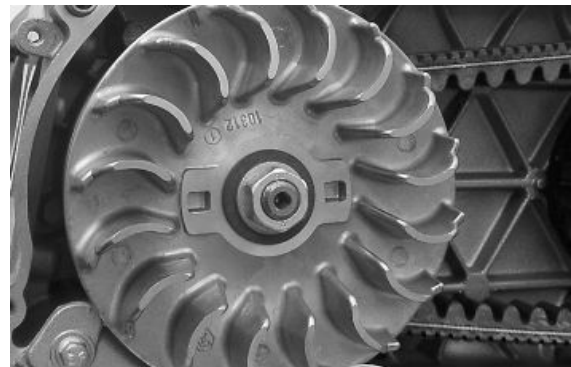


Drive-belt

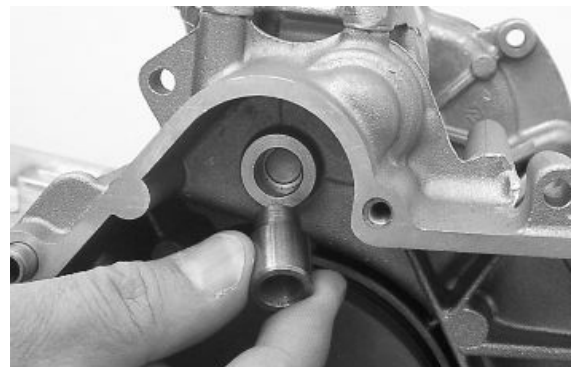
- Make sure the driving belt is not damaged and does not show abnormal wear.
- Replace as indicated in the scheduled maintenance table.

Removing the driving pulley

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



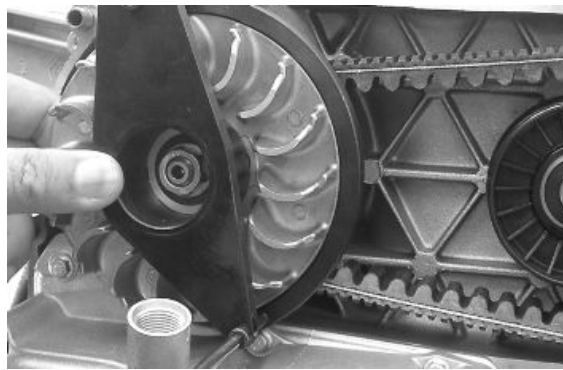
- Insert the adaptor sleeve of the appropriate tool in the hole shown in the picture



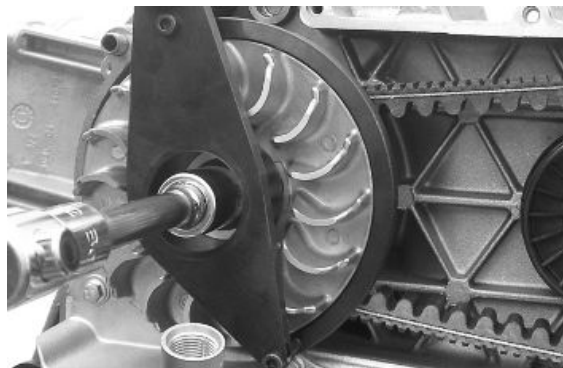
- Insert the tool in the hollows and apply the retention ring
- Bring in the ring's clamping screws while keeping the tool to support the pulley

Specific tooling

020626Y Driving pulley lock wrench



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



Inspecting the rollers case

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



CAUTION

DO NOT LUBRICATE OR CLEAN SINTERED BUSHINGS

Characteristic

movable driving half-pulley bushing: Standard Diameter

26.000 - 26.021 mm

movable driving half-pulley bushing: Maximum allowable diameter

Ø 26.12 mm

Sliding bushing: Standard Diameter

Ø 25.959 - 25.98 mm

Sliding bushing: Minimum admissible diameter

Ø 25.95 mm

Roller: Standard Diameter

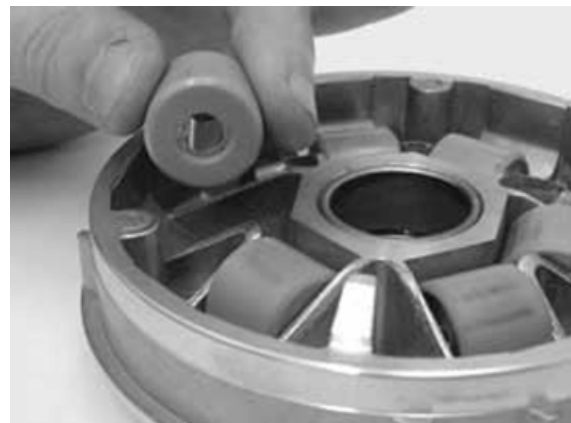
Diameter 20.5 - 20.7 mm

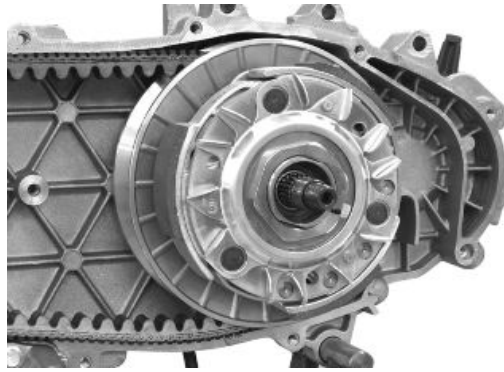
Roller: Minimum diameter allowed

Ø 20 mm

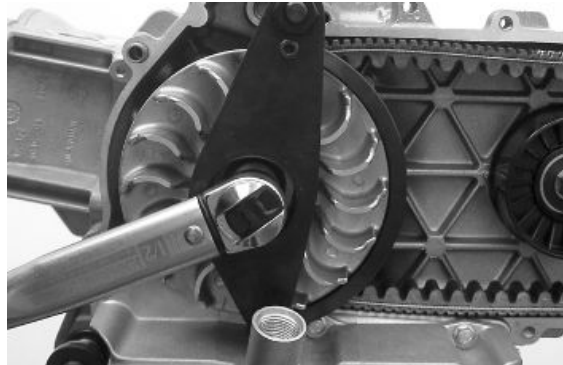
**Refitting the driving pulley**

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





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



Specific tooling

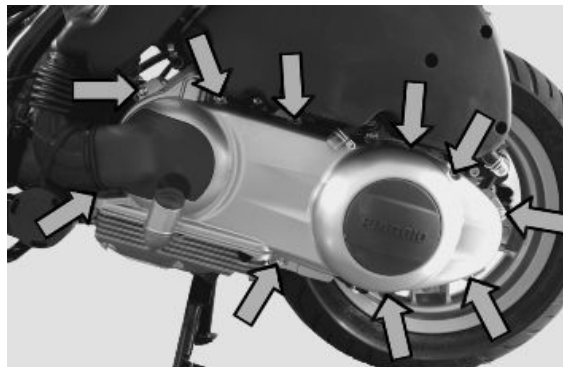
020626Y Driving pulley lock wrench

Locking torques (N*m)

Drive pulley nut 75 - 83

Refitting the transmission cover

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

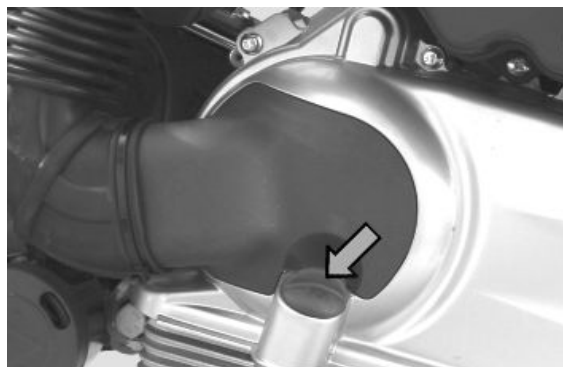


Specific tooling

020423Y Driven pulley lock wrench

Locking torques (N*m)

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

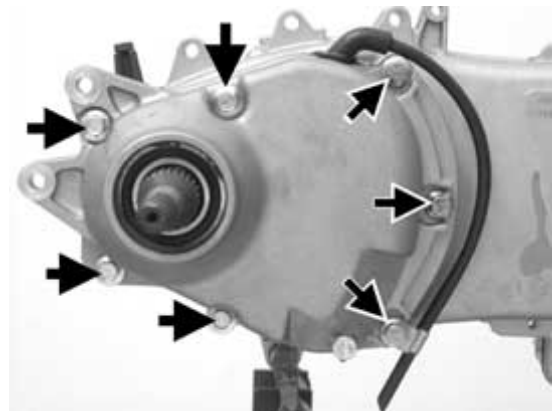




End gear

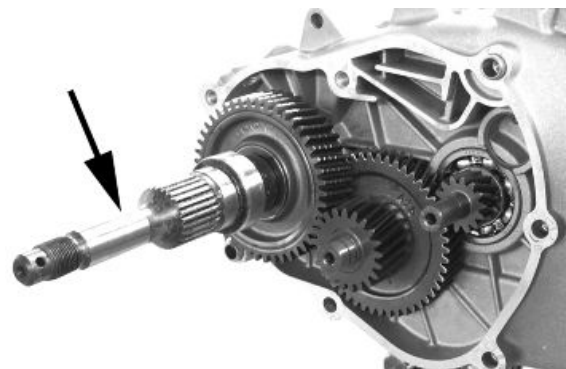
Removing the hub cover

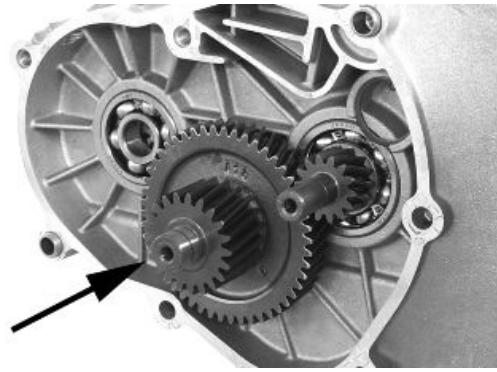
- Empty the rear hub through the oil drainage plug.
- Remove the 7 flanged screws indicated in the figure.
- Remove the hub cover and its gasket.



Removing the wheel axle

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





Removing the hub bearings

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

Specific tooling

001467Y013 Caliper to extract \varnothing 15-mm bearings



Removing the wheel axle bearings

- Take out the clip on the outside of the gearbox cover.
 - Support the hub cover and expel the bearing.
- By means of the appropriate tools, remove the oil seal as in the figure.

Specific tooling

020376Y Adaptor handle

020477Y 37 mm adaptor

020483Y 30-mm guide

020359Y 42x47-mm Adaptor

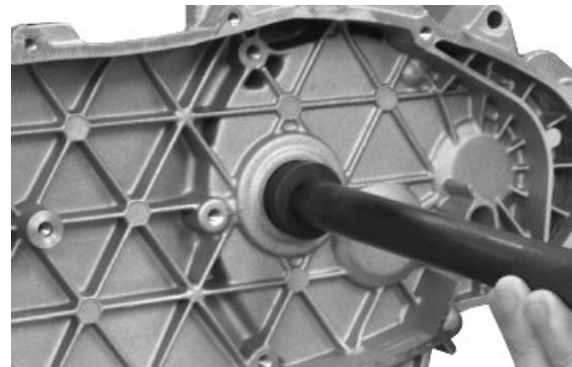
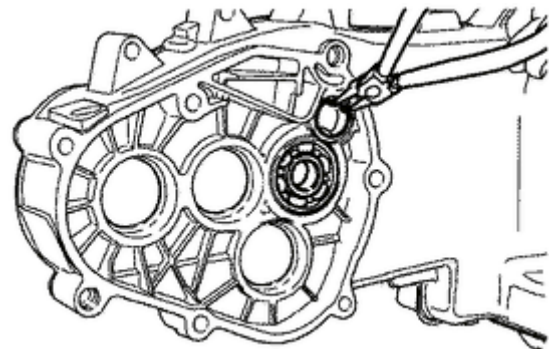
020489Y Hub cover support stud bolt kit





Removing the driven pulley shaft bearing

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



Specific tooling

020376Y Adaptor handle

020375Y 28 x 30 mm adaptor

020363Y 20-mm guide

Inspecting the hub shaft

- Check the three shafts for wear or distortion of the toothed surfaces, the bearing housings, and the oil seal housings.
- In case of anomalies, replace the damaged components.



Inspecting the hub cover

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

Refitting the wheel axle bearing

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

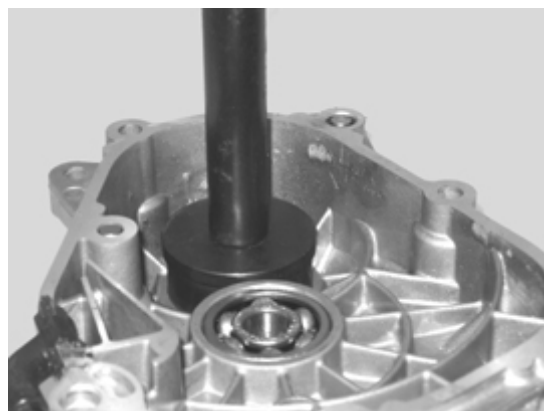
The 52-mm side of the adapter must be turned towards the bearing.

Specific tooling

020376Y Adaptor handle

020360Y 52x55-mm Adaptor

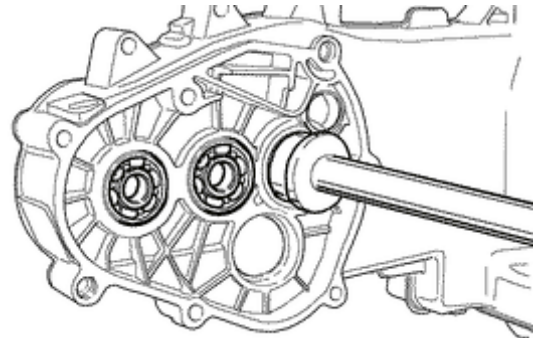
020483Y 30-mm guide



Refitting the hub cover bearings

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

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



Specific tooling

020150Y Air heater mounting

020151Y Air heater

020376Y Adaptor handle

020359Y 42x47-mm Adaptor

020412Y 15-mm guide



N.B.

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

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

N.B.

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

Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm Adaptor

020363Y 20-mm guide



N.B.

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

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

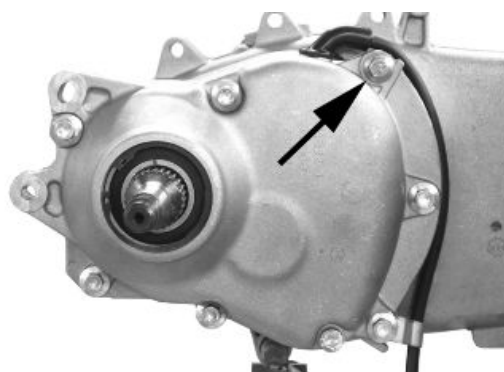
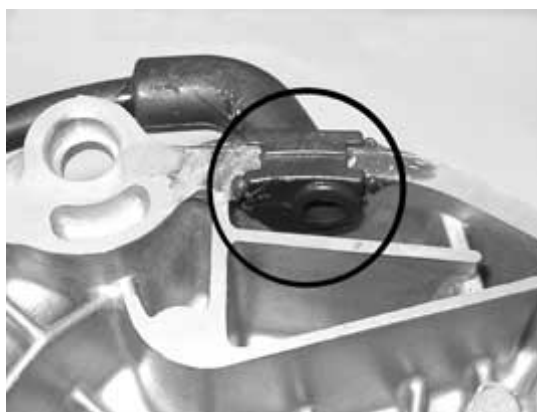
Refitting the hub bearings

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



Refitting the ub cover

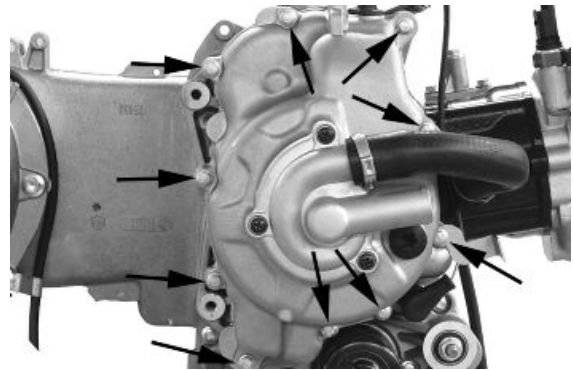
- Fit a new gasket together with the centring dowels.
- Seal the gasket of the breather pipe using black silicone sealant.
- Fit the gearbox cover, making sure the breather pipe is in the correct position.
- Position the shorter screw that can also be recognised from the different colour as shown in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



Flywheel cover

Removing the hub cover

- Remove the clamp fixing the sleeve to the cylinder and detach the sleeve.
- Remove the 10 clamps
- Remove the flywheel cover.



Removing the stator

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



Refitting the stator

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

Locking torques (N*m)

Stator assembly screws (°) 3 to 4

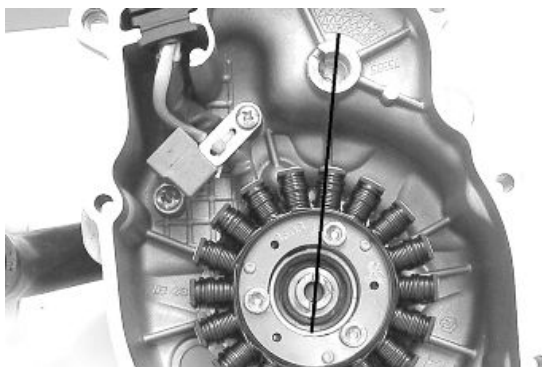


Refitting the flywheel cover

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



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



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

CAUTION

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

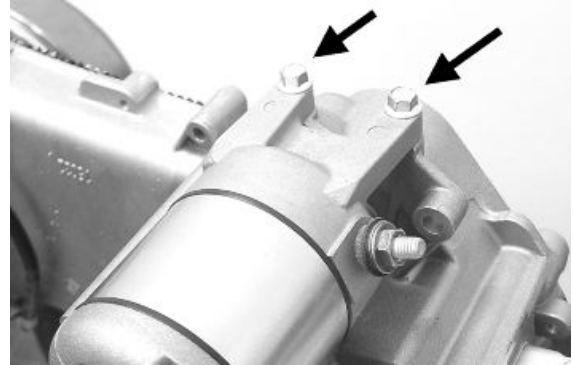
Locking torques (N*m)

Flywheel cover screws 11 - 13

Flywheel and starting

Removing the starter motor

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

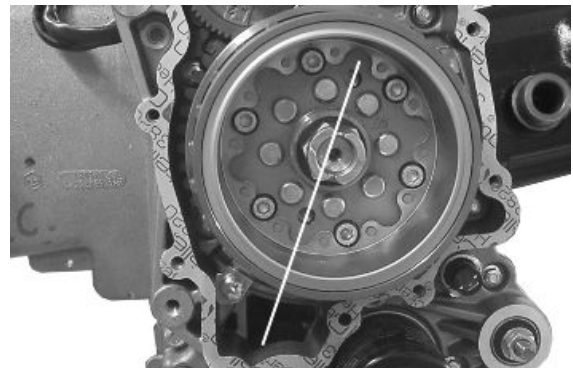


Removing the flywheel magneto

- Remove the water pump shaft and crankshaft spline clip



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



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



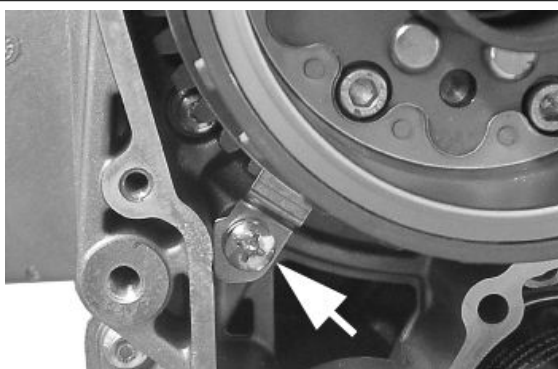
- Insert the special flywheel stop tool on the flywheel as shown in the picture

Specific tooling

020627Y Flywheel lock wrench



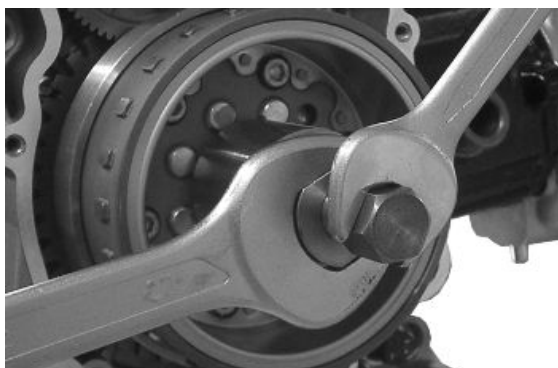
- Remove the plate indicated in the picture.



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

Specific tooling

020467Y Flywheel extractor



Inspecting the flywheel components

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

Refitting the free wheel

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

Recommended products

Loctite 243 Medium strength threadlock

Medium Loctite 243 threadlock

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

Locking torques (N*m)

Screw fixing freewheel to flywheel 13 - 15



- Oil the free wheel "rollers".



Refitting the flywheel magneto

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



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

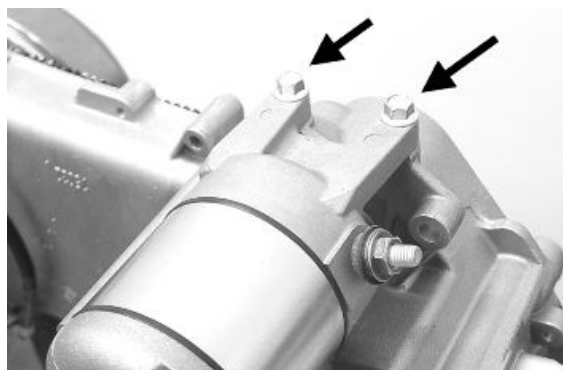


-
- Using the special flywheel lock wrench, tighten up the flywheel fixing nut to the prescribed torque
 - Refit the retention plate

Specific tooling**020627Y Flywheel lock wrench****Locking torques (N*m)****Flywheel nut 94 - 102**

Refitting the starter motor

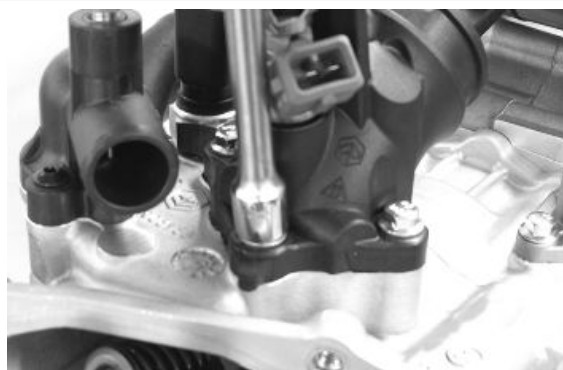
- Fit a new O-ring on the starter motor and lubricate it.
- Fit the starter on the crankcase and lock the 2 screws to the prescribed torque.

Locking torques (N*m)**Starter screws 11 to 13**

Cylinder assy. and timing system

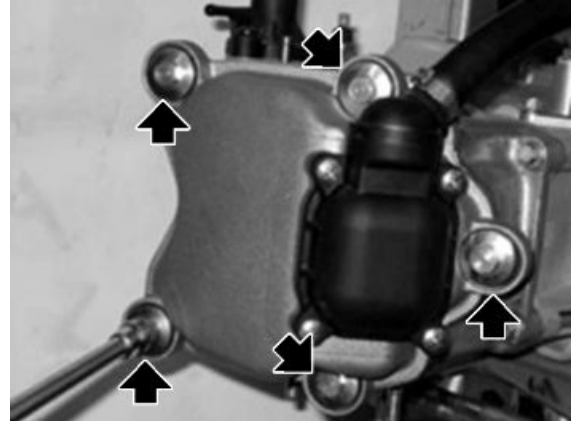
Removing the intake manifold

- Loosen the 3 screws and remove the air intake manifold.
- Upon refitting, secure to the specified torque.



Removing the rocker-arms cover

- Remove the 5 screws indicated in the figure



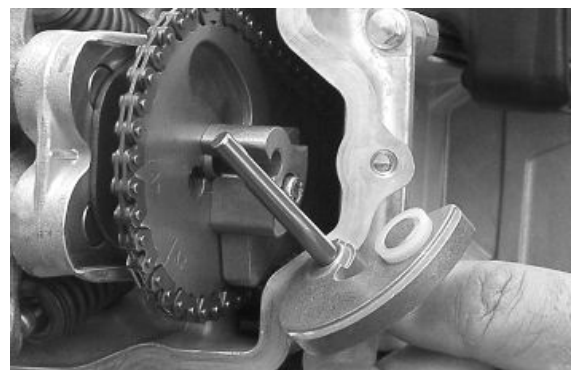
Removing the timing system drive

- First remove the parts listed below: transmission cover, drive pulley with belt, oil sump with spring and by-pass piston, oil pump pulley cover, O-ring on the crankshaft and the sprocket wheel separation washer.

- Remove the tappet cover.
- Remove the central screw fastener and the automatic valve-lifter retaining cover, as shown in the figure.



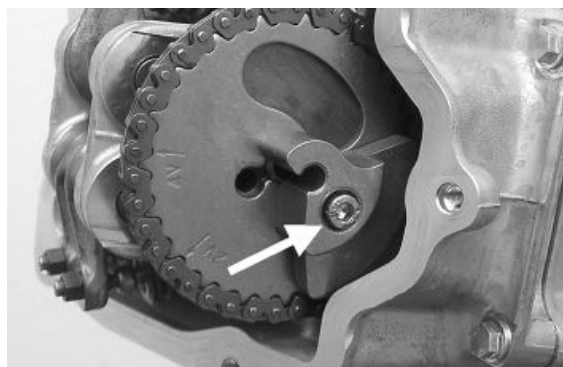
- Remove the return spring of the automatic valve lifter unit and the automatic valve lifter unit and its end of stroke washer.



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



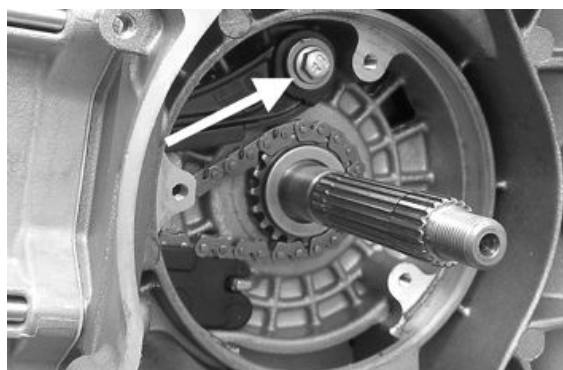
- Remove the internal hex screw and the counterweight shown in the figure.



- Remove the camshaft control pulley with its washer.



- Remove the command sprocket wheel and the timing chain.
 - Remove the screws indicated in the figure, the spacer bar and the tensioner slider.
- The chain tensioner slider must be removed from the transmission side. As regards the lower chain guide slider, it may only be removed after the head has been removed.



N.B.

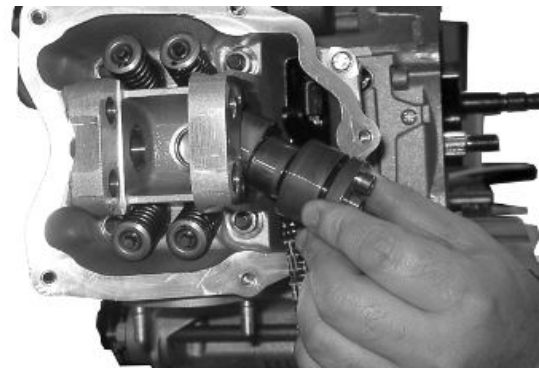
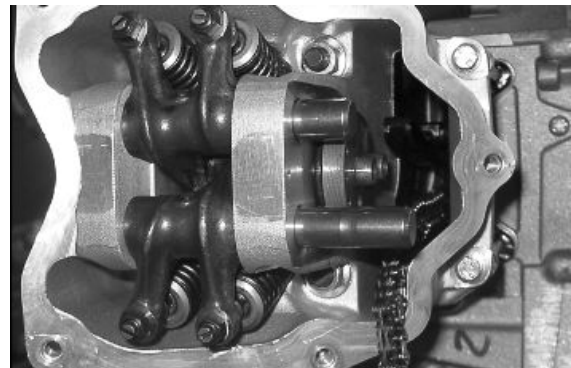
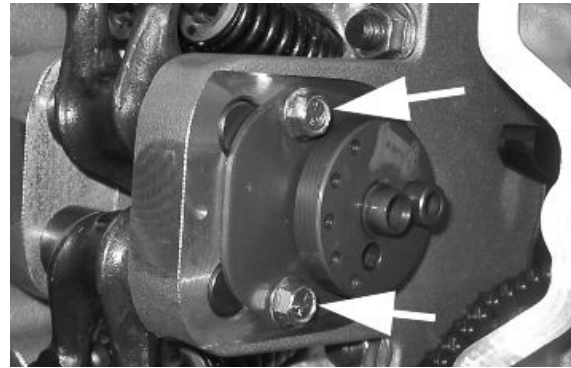
IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.

Removing the cam shaft

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

N.B.

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

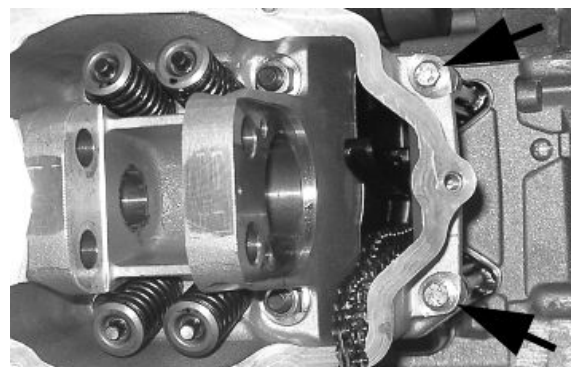


Removing the cylinder head

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

N.B.

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



Removing the valves

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

CAUTION

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

Specific tooling

020382Y011 adapter for valve removal tool

020382Y Valve cotters equipped with part 012 removal tool

020431Y Valve oil seal extractor



Removing the cylinder - piston assy.

Removing cylinder and piston

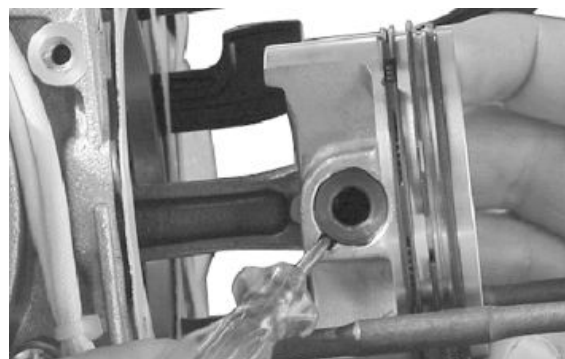
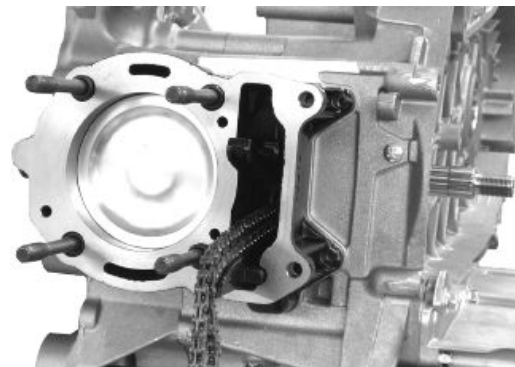
- Remove the chain guide slider.
- Remove the 4 O-rings on the stud bolts.
- Pull out the cylinder.
- Remove the cylinder base gasket.
- Remove the two stop rings, the wrist pin and the piston.
- Remove the piston seals.

CAUTION

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

N.B.

BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.



Inspecting the small end

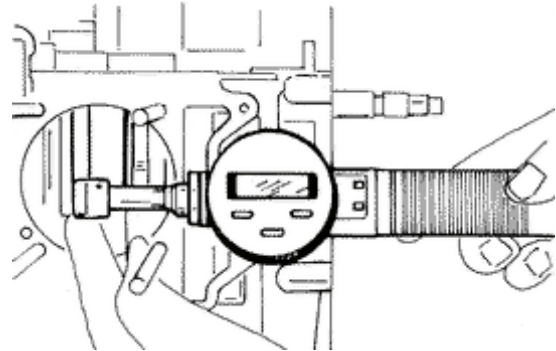
- Measure the internal diameter of the small end using an internal micrometer.

N.B.

REPLACE THE CRANKSHAFT IF THE DIAMETER OF THE ROD SMALL END EXCEEDS THE STANDARD DIAMETER OR IT SHOWS SIGNS OF WEAR OR OVERHEATING.

N.B.

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



See also

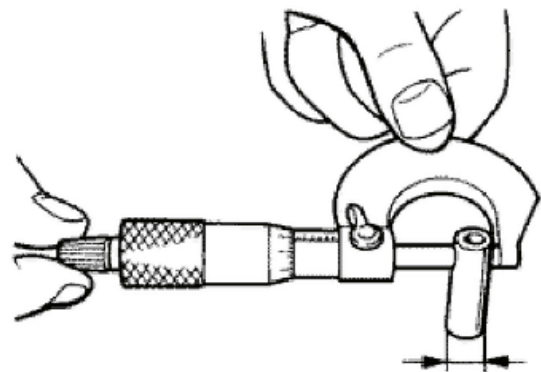
[Crankcase - crankshaft - connecting rod](#)

Inspecting the wrist pin

- Measure the outer diameter of the gudgeon pin.
- Calculate the coupling clearance between pin and connecting rod end.

N.B.

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

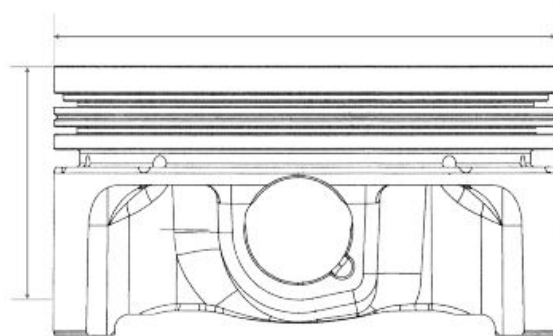
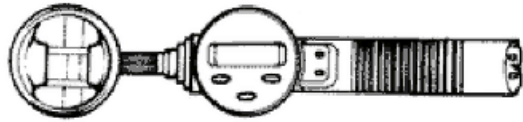


See also

[Cylinder - piston assy.](#)

Inspecting the piston

- Measure the diameter of the wrist pin seat on the piston.
- Calculate the piston pin coupling clearance.
- Measure the outside diameter of the piston, perpendicular to the gudgeon pin axis.
- Take the measurement at 5 mm from the base in the position shown in the figure.
- Carefully clean the seal housings.
- Measure the coupling clearance between the sealing rings and the grooves using suitable sensors, as shown in the diagram.
- If the clearance is greater than that indicated in the table, replace the piston.



N.B.

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

N.B.

THE PIN HOUSINGS HAVE 2 LUBRICATION CHANNELS. FOR THIS REASON MEASUREMENT OF THE DIAMETER MUST BE CARRIED OUT ACCORDING TO THE AXIS OF THE PISTON.

N.B.

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



See also

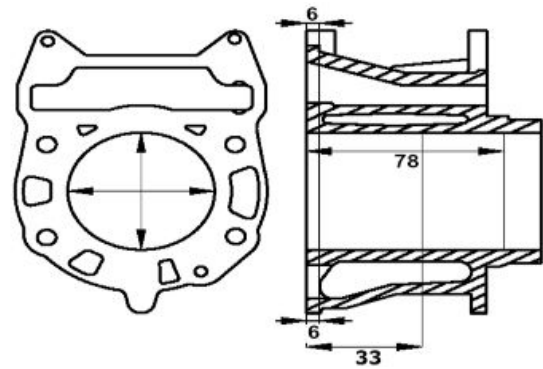
[Cylinder - piston assy.](#)

Inspecting the cylinder

- Using a bore meter, measure the inner cylinder diameter at three different points according to the directions shown in the figure.
- 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).

N.B.

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

**See also**

[Cylinder - piston assy.](#)

Inspecting the piston rings

sealing rings

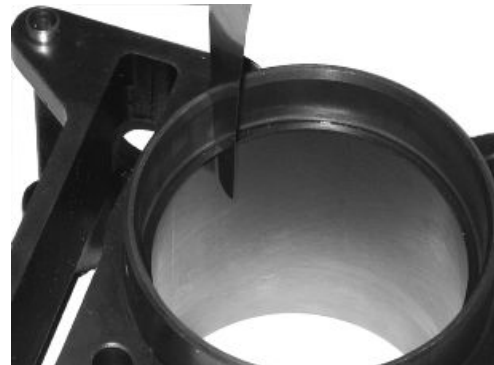
- Alternately insert the three sealing rings into the cylinder, in the area where it retains its original diameter. Using the piston, insert the rings perpendicularly to the cylinder axis.
- Measure the opening (see figure) of the sealing rings using a feeler gauge.
- If any measurements are greater than specified, replace the piston rings.

N.B.

BEFORE REPLACING ONLY THE PISTON RINGS, ENSURE THAT THE CLEARANCE BETWEEN THE PISTON RINGS AND THE PISTON RING GROOVES, AND BETWEEN THE PISTON AND THE CYLINDER, IS AS SPECIFIED. IN ANY CASE, NEW PISTON RINGS USED IN COMBINATION WITH A USED CYLINDER MAY HAVE DIFFERENT BEDDING CONDITIONS THAN THE STANDARD.

N.B.

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



Removing the piston

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



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

CAUTION
USING A HAMMER MIGHT DAMAGE THE STOPS' HOUSING.

Specific tooling

020454Y Tool for fitting piston pin stops (200 - 250)

Choosing the gasket

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

Specific tooling

020428Y Piston position check mounting

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



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

N.B.

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

See also

[Slot packing system](#)

Refitting the piston rings

- Place the oil scraper spring on the piston.
- Refit the oil scraper ring with the join of spring ends on the opposite side from the ring gap and the word 'TOP' towards the crown of the piston. The chamfered side of the oil scraper ring should always be facing the piston crown.
- Fit the middle piston ring with the identification letter facing the crown of the piston. In any case, the step must be facing opposite the piston top.
- Fit the top piston ring with the word 'TOP' or the reference mark facing the crown of the piston.
- It is advisable to use a fitter to facilitate the installation of the linings.

N.B.

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

- Offset the piston ring gaps on the three rings by 120° to each other as shown in the figure.
- Lubricate the components with engine oil.
- The top piston ring on the engine has an L-shaped cross-section.



Refitting the cylinder

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

N.B.

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

Specific tooling

020426Y Piston fitting fork

020393Y Piston assembly band



Inspecting the cylinder head

N.B.

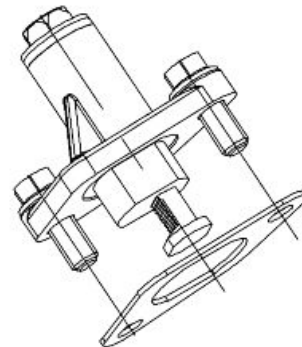
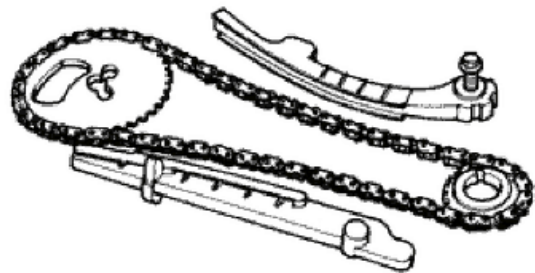
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

[Cylinder Head](#)

Inspecting the timing system components

- Check that the guide slider and the tensioner slider are not worn out.
- Ensure that the camshaft control pulley chain assembly and the sprocket wheel are not worn.
- If you detect wear, replace the parts or, if the chain, sprocket wheel and pulley are worn, replace the whole unit.
- Remove the centre screw with the washer and the tensioner spring. Check that the one-way mechanism is not worn.
- Check the condition of the tensioner spring.
- If examples of wear are found, replace the whole unit.



Inspecting the valve sealings

N.B.

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

See also

[Cylinder Head](#)

Inspecting the valves

N.B.

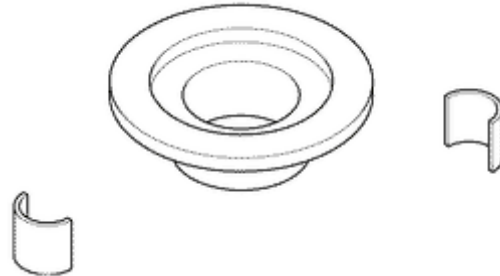
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

[Cylinder Head](#)

Inspecting the springs and half-cones

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



- Measure the unloaded spring length.

N.B.

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

See also

[Cylinder Head](#)

Refitting the valves

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

N.B.

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

Specific tooling

020306Y Punch for assembling valve seal rings

020382Y Valve cotters equipped with part 012 removal tool

020382Y011 adapter for valve removal tool



Inspecting the cam shaft

N.B.

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

See also[Cylinder Head](#)**Refitting the head and timing system components**

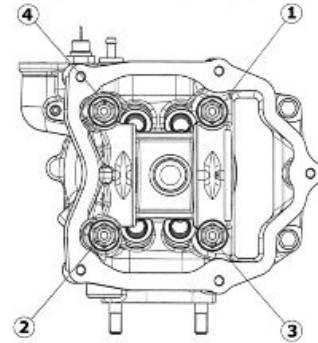
- Fit the timing chain guide slider.
- Insert the centring dowel between the cylinder head to the cylinder, fit the cylinder head gasket and the cylinder head.
- Lubricate the stud bolt threading.
- Tighten up the nuts to an initial pre-torque of 7 ± 1 N·m
- Tighten up the nuts to a second pre-torque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

N.B.

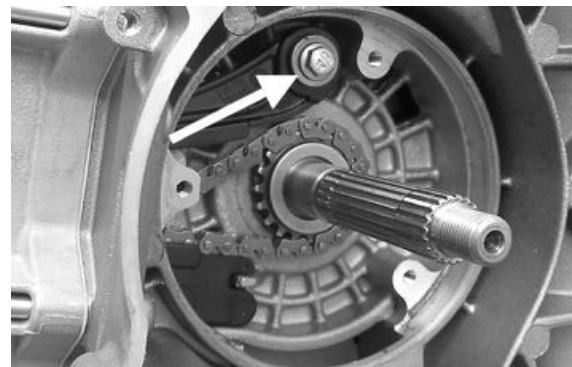
BEFORE INSTALLING THE HEAD, MAKE SURE THAT THE LUBRICATION CHANNEL IS CLEAN USING A COMPRESSED AIR JET.

Locking torques (N*m)

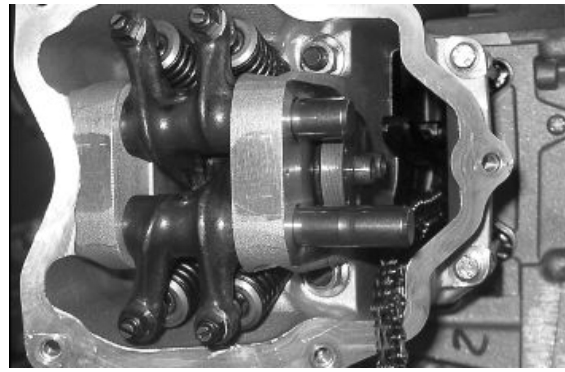
Timing chain tensioner support screw 11 to 13



- Refit the lower timing chain sprocket wheel on the crankshaft, with the chamfer facing the insertion side.
- Loop the timing chain around the sprocket on the crankshaft.
- Fit the chain tensioner slider from the cylinder head side.
- Fit the spacer and the screw fastener.
- Tighten the screws to the prescribed torque.



- Fit the pins and rocking levers.
- Lubricate the two rocking levers through the holes at the top.
- Lubricate the 2 bearings and insert the camshaft in the cylinder head with the cams corresponding to the rocking levers.
- Insert the retention plate and tighten the two screws shown in the figure to the prescribed torque.
- Refit the spacer on the camshaft.
- Rotate the engine so that the piston is at top dead centre, using the reference marks on the flywheel and the crankcase.
- Holding this position insert the chain on the camshaft control pulley.
- Insert the pulley on the camshaft while keeping the reference **4V** in correspondence with the reference mark on the head.
- Fit the counterweight and tighten the clamping screw to the prescribed torque.
- Fit the end-stop ring on the automatic valve-lifter cam and fit the automatic valve-lifter cam to the camshaft.
- Fit the automatic valve-lifter return spring.
- During this operation the spring must be loaded by approximately 180°.
- Fit the automatic valve-lifter retaining dish, using the counterweight screw fastener as a reference.
- Tighten the clamping screw to the prescribed torque.
- Set the tensioner cursor in the rest position.
- Fit the chain tensioner on the cylinder, using a new gasket, and tight the two screws to the prescribed torque.
- Insert the chain tensioning screw, together with the spring and washer, tightening it to the prescribed torque.
- Adjust the valve clearance.



- Fit the spark plug.

Electrode distance 0.8 mm

N.B.

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

Locking torques (N*m)

Timing chain tensioner support screw 11 to 13

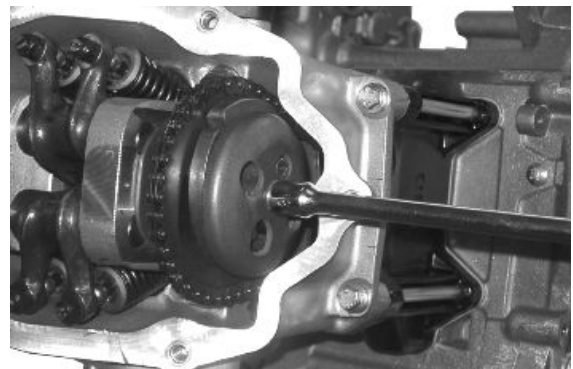
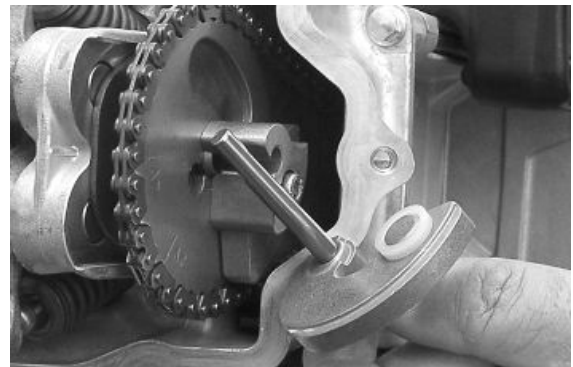
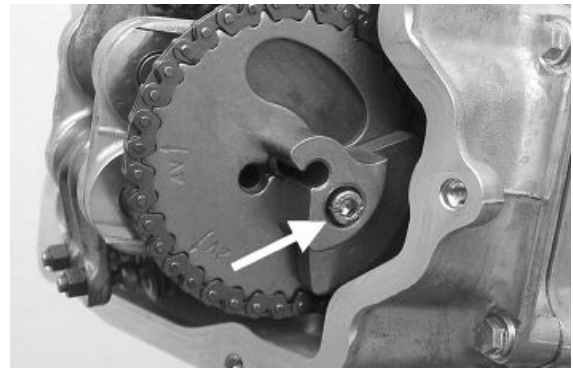
Spark plug 12 to 14 Starter ground screw 7 to 8.5

Timing chain tensioner slider screw 10 to 14

Start up counterweight support screw 11 to 15

Timing chain tensioner central screw 5 to 6

Camshaft retention plate screw 4 to 6

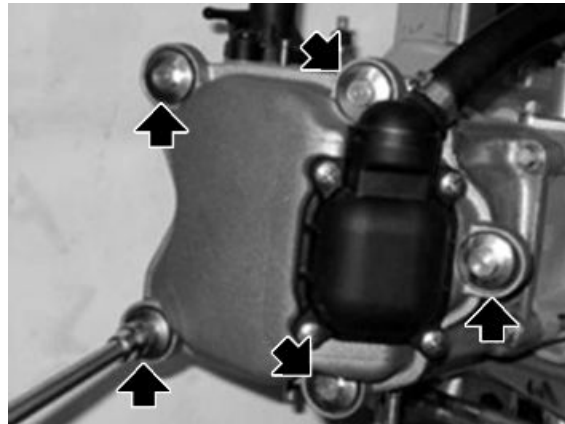


Refitting the rocker-arms cover

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

Locking torques (N*m)

Tappet cover screws 6 - 7 Nm

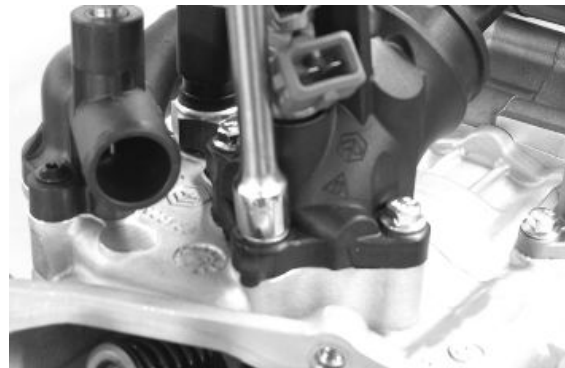


Refitting the intake manifold

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

Locking torques (N*m)

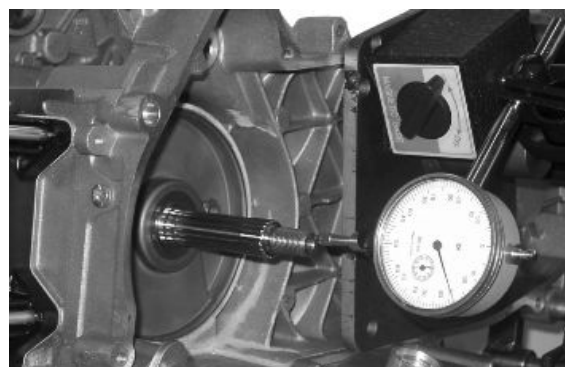
Intake manifold screws 11 to 13



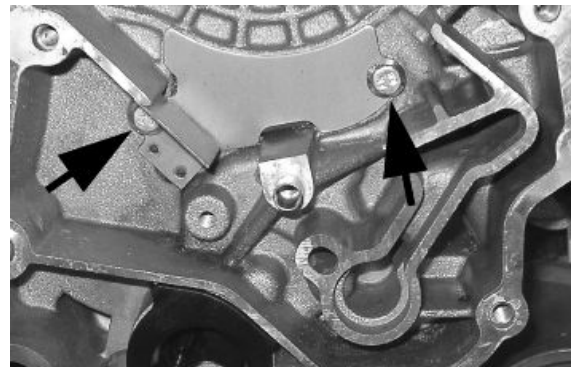
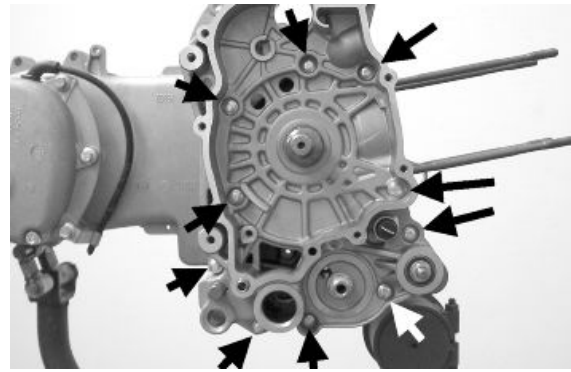
Crankcase - crankshaft

Splitting the crankcase halves

- Before opening the crankcase, it is advisable to check the axial clearance of the crankshaft. To do this, use a plate and a support with appropriate tool dial gauge.
- Upper clearances are an indication of wear on the surfaces of the crankshaft casing support.
- Remove the 10 crankshaft coupling screws.
- Separate the crankcase while keeping the crankshaft in one of the two halves of the crankcase.
- Remove the crankshaft.
- Remove the half crankcase coupling gasket.



- Remove the two screws and the internal cover shown in the diagram.
- Remove the oil guard on the flywheel side.
- Remove the oil filter fitting shown in the diagram.
- Check the axial clearance on the connecting rod.
- Check the radial clearance on the connecting rod.
- Check the surfaces that limit the axial free-play are not scored and measure the width of the crankshaft between these surfaces, as shown in the diagram.
- If the axial clearance between crankshaft and crankcase is exceeding and the crankshaft does not have any defect, the problem must be due to either excessive wear or wrong machining on the crankcase.
- Check the diameters of both the bearings of the crankshaft in accordance with the axes and surfaces shown in the figure. The half-shafts are classified in two categories Cat. 1 and Cat. 2 as shown the chart below.

**CAUTION**

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

CAUTION

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

CAUTION

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

N.B.

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

Specific tooling

020262Y Crankcase splitting plate

020335Y Magnetic mounting for dial gauge

N.B.

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

**See also**

[Crankcase - crankshaft - connecting rod](#)

Inspecting the crankshaft alignment

N.B.

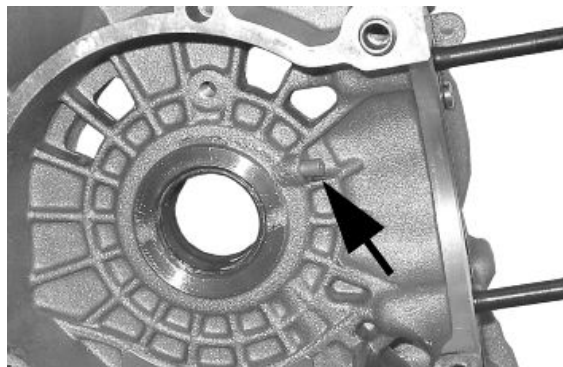
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

[Crankcase - crankshaft - connecting rod](#)

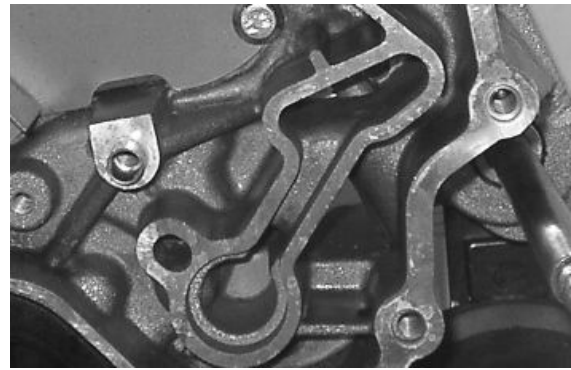
Inspecting the crankcase halves

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



ular 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

8

- 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

Lubrication pressure

3.5 to 4 bar

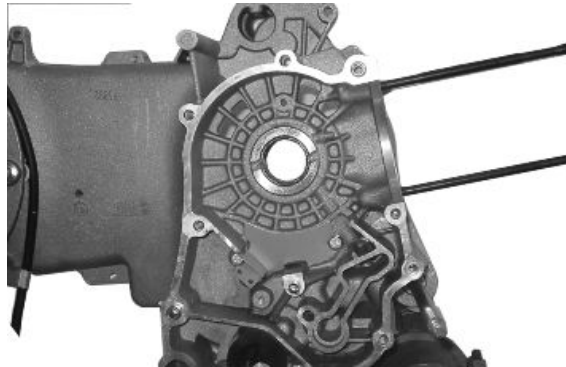
- The solid half-bearing is intended to stand the thrusts caused by combustion, and for this reason it is arranged opposite the cylinder.

- To prevent shutters in the oil feeding channels, the matching surface of the two half-bearings must be perfectly orthogonal to the cylinder axis, as shown in the figure.

- The oil feeding channel section is also affected by the bushings driving depth compared with the crankshaft axial clearance of the limiting surface.

N.B.

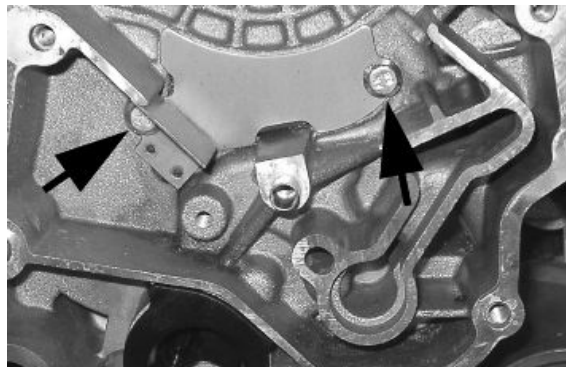
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

**See also**

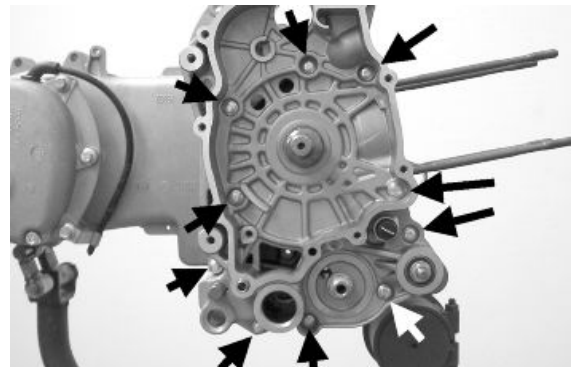
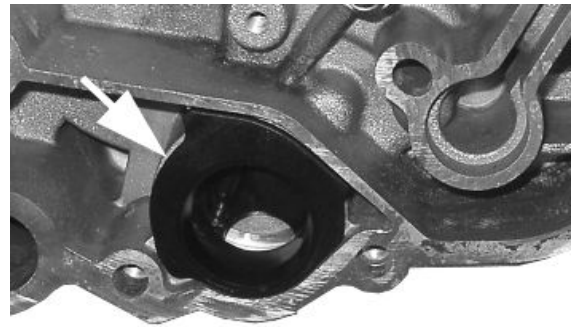
[Crankcase - crankshaft - connecting rod](#)

Refitting the crankcase halves

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

**Locking torques (N*m)**

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



Studs

Check that the stud bolts have not worked loose from their seat in the crankcase.

Check the depth of stud bolt driving with a gauge, as indicated in the picture. If it varies significantly from the driving depth indicated, it means that the stud bolt has yielded.

In this case, replace it.



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

Clean the threaded seat on the carter thoroughly. Refit a new stud bolt and apply the special product on the threading crankcase side.

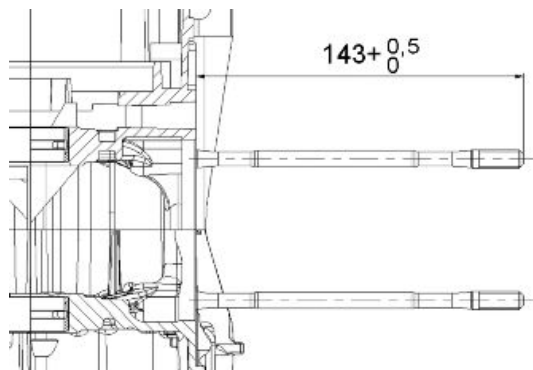
Tighten up to the depth of the driving indicated.



Recommended products

Loctite Quick Set Loctite 270 high strength threadlock

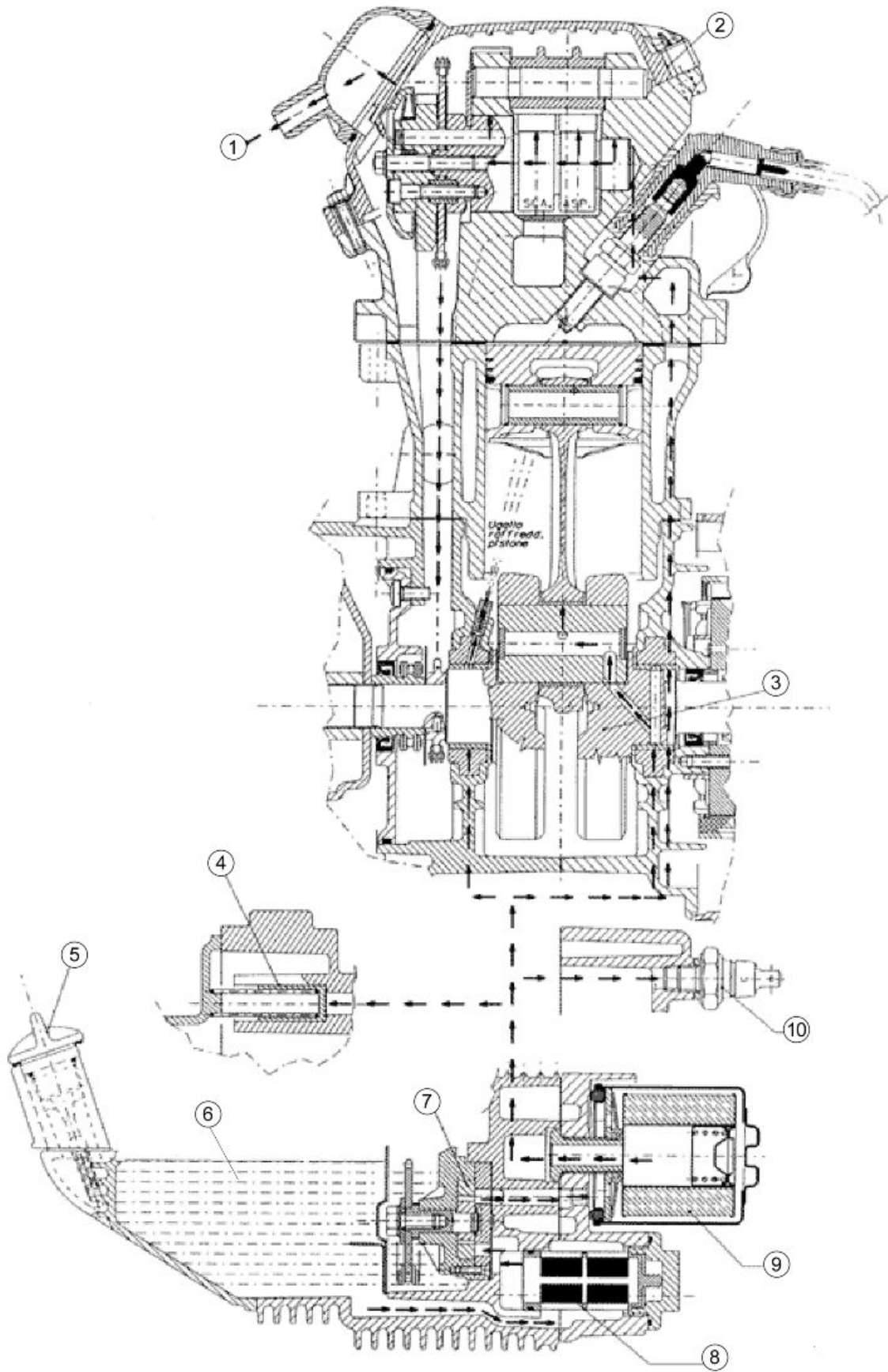
Loctite 270 high strength threadlock



Lubrication

Conceptual diagrams

LUBRICATION CIRCUIT



1. Engine throttle recovery
2. Tappet cover
3. Crankshaft
4. By-pass valve
5. Oil load
6. Oil level in the sump
7. oil pump
8. Mesh pre-filter
9. Cartridge filter
10. Minimum pressure switch

Oil pressure check

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



N.B.

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

Specific tooling

020193Y Oil pressure check gauge

Characteristic**Oil pressure**

Minimum pressure admitted at 6000 rpm: 3.2 atm.

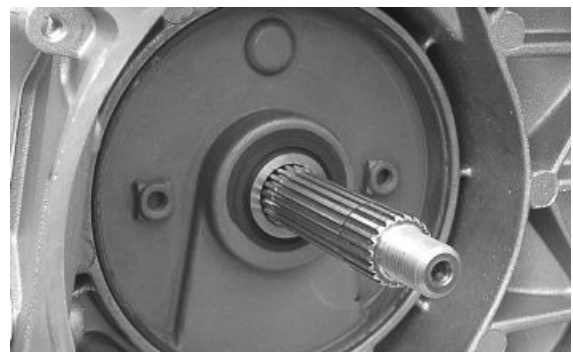
Locking torques (N*m)

Minimum oil pressure sensor 12 to 14

Crankshaft oil seals

Removal

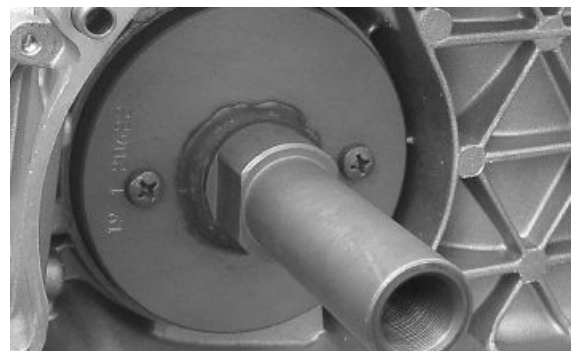
- Remove the transmission cover and the complete drive pulley beforehand



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

Specific tooling

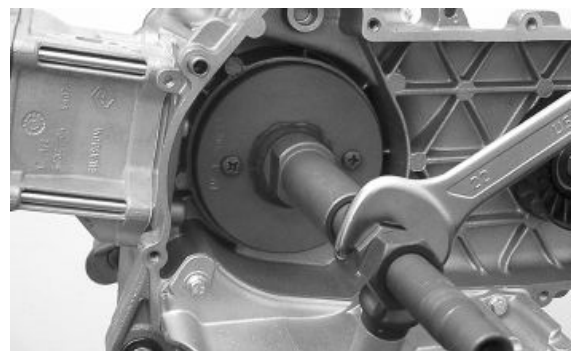
020622Y Transmission-side oil seal punch



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

Specific tooling

020622Y Transmission-side oil seal punch



Refitting

- Always use a new oil seal upon refitting
- Prepare the new oil seal by lubricating the sealing lip.
- Preassemble the oil seal with the appropriate tool by positioning the screws.
- Insert the sheath over the crankshaft.
- Insert the tool with the oil seal on the crankshaft until it comes into contact with the crankcase.
- Insert the adaptor bushing of the tool in the hole on the crankcase.
- Orientate the oil seal by inserting the bracket which is part of the appropriate tool
- Tighten the threaded bar onto the crankshaft as far as it will go.
- Use the nut to move the base of the tool until you can see the end of the oil seal driving stroke
- Remove all the tool components following the procedure but in reverse order

CAUTION

DO NOT LUBRICATE THE KEYING SURFACE ONTO THE ENGINE CRANKCASE.

CAUTION

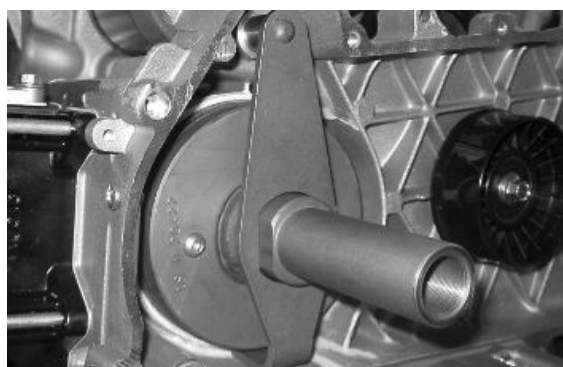
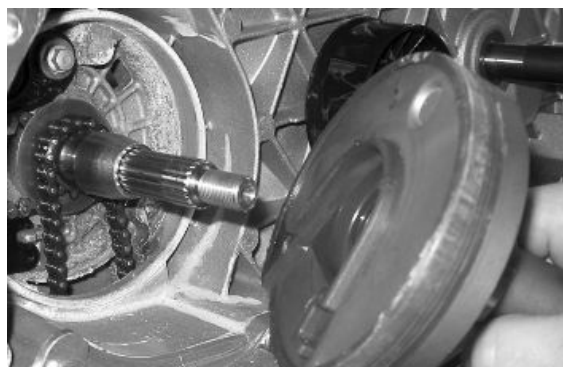
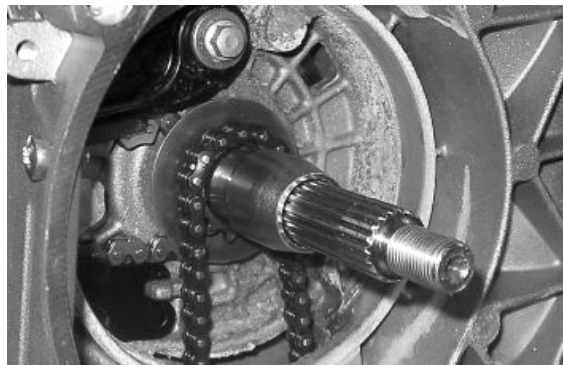
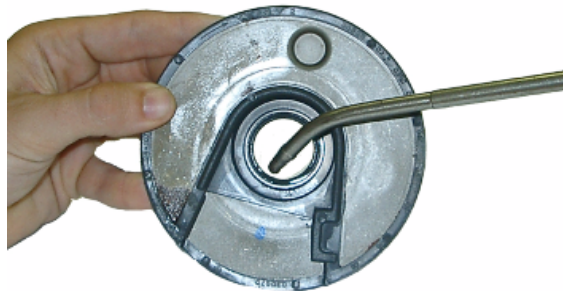
ORIENT THE OIL SEAL BY POSITIONING THE CHAIN HOUSING CHANNEL FACING DOWNWARDS. WHEN THE POSITION IS REACHED, DO NOT RETRACT THE OIL SEAL. FAILURE TO COMPLY WITH THIS RULE CAN CAUSE A WRONG POSITIONING OF THE OIL SEAL SHEATH.

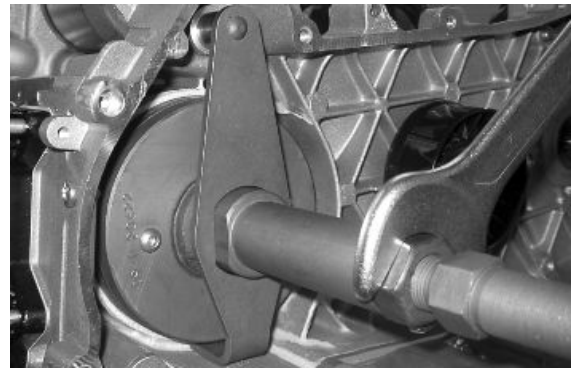
CAUTION

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

Specific tooling

020622Y Transmission-side oil seal punch

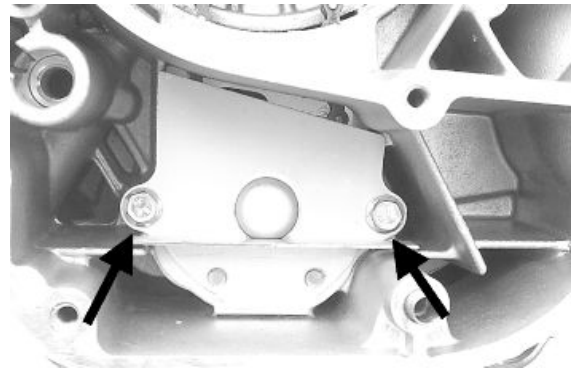




Oil pump

Removal

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



- Block the rotation of the oil pump control pulley with a screwdriver inserted through one of its two holes.

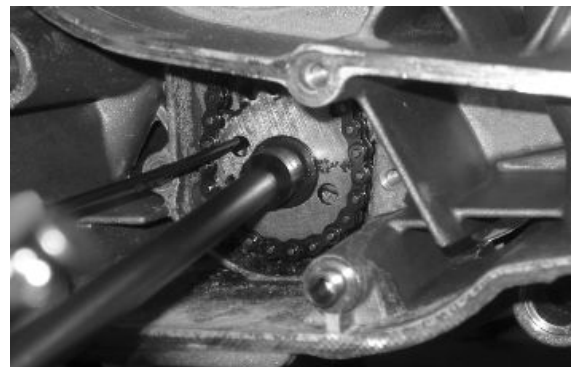
- Remove the central screw with Belleville washer, as shown in the diagram.

- Remove the chain with the sprocket.

- Remove the control sprocket wheel with relative O-ring.

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

- Remove the oil pump seal.



N.B.

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

Inspection

- Remove the two screws and the oil pump cover.
- Remove the circlip retaining the innermost rotor.
- Remove and wash the rotors thoroughly with petrol and compressed air.

- Reassemble the rotors in the pump body, keeping the two reference marks visible. Replace the retainer ring.

- Check the clearance between the rotors in the position shown in the diagram using a feeler gauge.

Measure the distance between the outer rotor and the pump body (see figure).

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

Characteristic

Axial rotor clearance

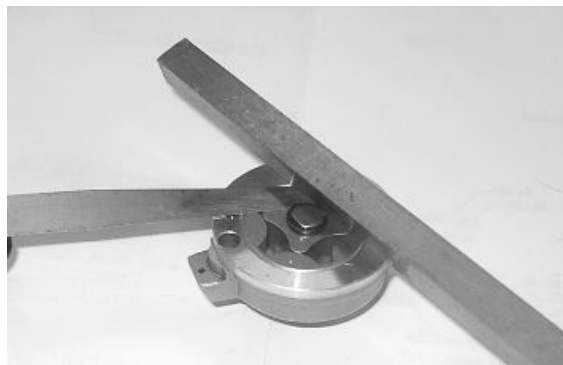
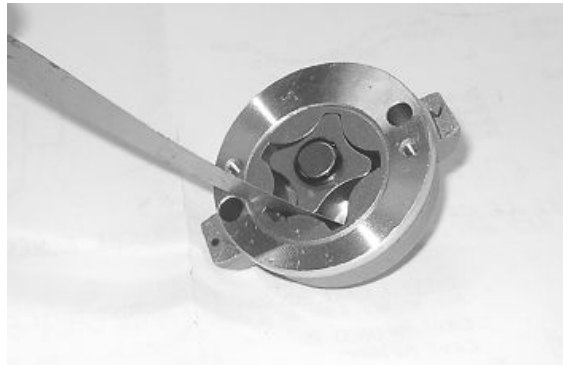
Limit values admitted: 0.09 mm

Distance between the outer rotor and the pump body

Admissible limit clearance: 0.20 mm

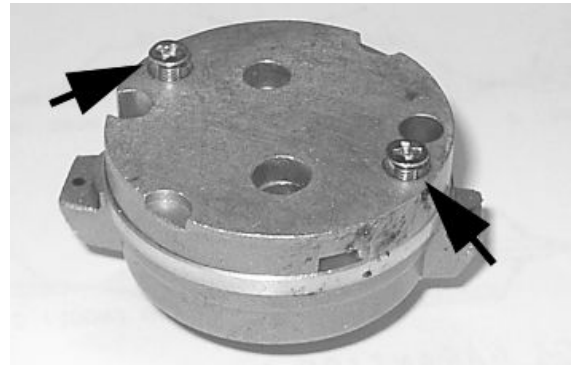
Distance between the rotors

Admissible limit clearance: 0.12 mm



Refitting

- Check there are no signs of wear on the oil pump shaft or body.
- Check there are no signs of scoring or wear on the oil pump cover.
- If you detect non-conforming measurements or scoring, replace the faulty parts or the unit.
- Fit the pump cover in the position that permits the crankcase clamping screws to be aligned.
- Make sure the gasket is positioned properly and refit the pump on the engine crankcase. The pump can only be fitted in one position.
- Tighten the screws to the prescribed torque.
- Fit the sprocket wheel with a new O-ring.
- Fit the chain.
- Fit the central screw and the belleville washer. Tighten to the prescribed torque.
- Fit the oil pump cover, by tightening the two screws to the prescribed torque.



N.B.

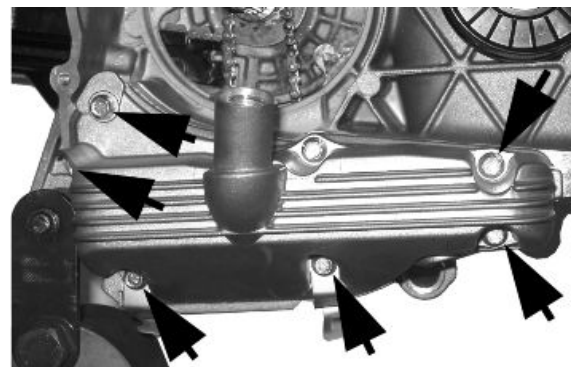
FIT THE BELLEVILLE WASHER SO THAT ITS OUTER RIM TOUCHES THE PULLEY. MAKE SURE THAT THE PUMP TURNS FREELY.

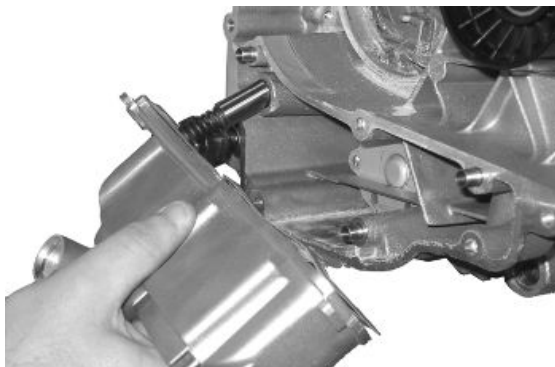
Locking torques (N*m)

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

Removing the oil sump

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





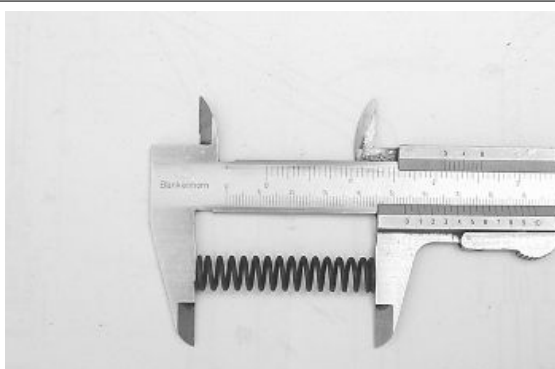
Inspecting the by-pass valve

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

Characteristic

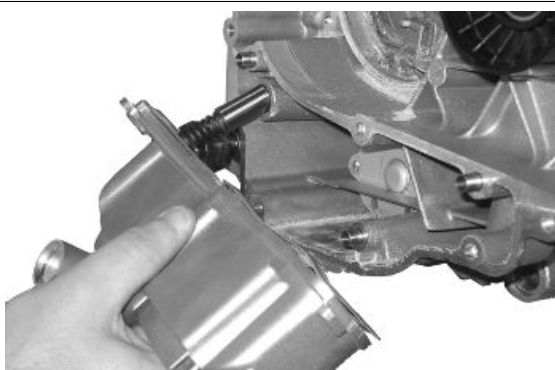
By-pass check up: Standard length

54.2 mm



Refitting the oil sump

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



N.B.

WHEN CHECKING THE LUBRICATION SYSTEM, REFER TO THE «CRANKCASE AND CRANKSHAFT» CHAPTER

**ON LUBRICATING THE CRANKSHAFT AND CONNECTING
ROD.**

Locking torques (N*m)

Oil sump screws 10 to 14

INDEX OF TOPICS

INJECTION

INJEC



INJECTION COMPONENTS

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

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 strength

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

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

The **fuel system circuit** consists of:

- Fuel pump
- Fuel filter
- Injector
- Pressure regulator

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

The injector is connected by a delivery pipe.

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

The **ignition circuit** consists of:

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

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

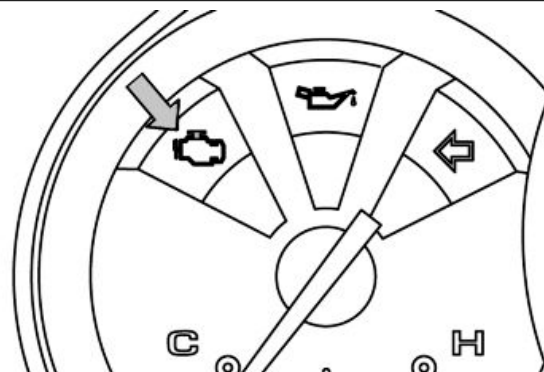
The MIU injection-ignition system controls engine functions by means of a pre-set program.

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

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

- Fuel pump
- HV coil
- Injector

The control unit is provided with a self-diagnosis system connected to an indicator light in the instrument panel.



Failures are detected and restored by the diagnostic tester.

In any case, when the fault is no longer present, the data storage is automatically cleared after 16 cycles of use (cold start, running at regular engine temperature, stop).

The diagnostic tester is also required to adjust the idle mixture.



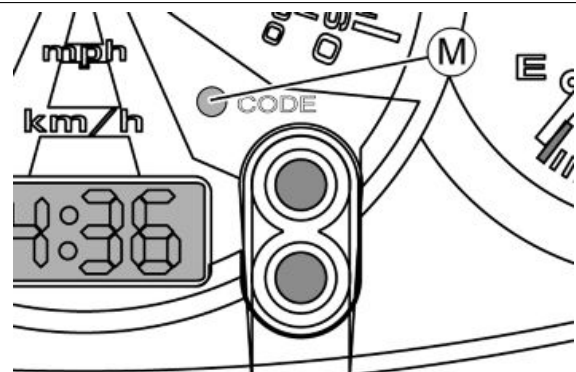
Specific tooling

020680Y Diagnosis Tool

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

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

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



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

Precautions

Troubleshooting hints

1 - A failure of the EMS system is more likely to be due to the connections than to the components. Before troubleshooting the MIU system, carry out the following checks:

A: Electrical power supply

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

B: Chassis earthing

C: Fuel supply

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

D: Ignition system

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

E: Intake circuit

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

F: Other

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

2 - MIU system faults may be caused by loose connectors. Make sure that all connections are properly implemented.

Check the connectors taking into consideration the following point:

- check that the terminals are not bent.
- check that the connectors have been connected up properly.
- check whether the failure changes making the connector vibrate slightly.

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

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

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

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

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

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

5. Before trying to start the vehicle, check to make sure there is at least two litres of fuel in the tank. Failure to respect this norm will damage the fuel pump.

6. If the vehicle is expected to remain unused for a long time, refill the tank up to a little over half the level. This will ensure the pump will be covered by fuel.

7. When washing the vehicle, be careful with the electric components and wiring.

8. When an ignition problem is detected, start the checks from the battery and the injection system connections.

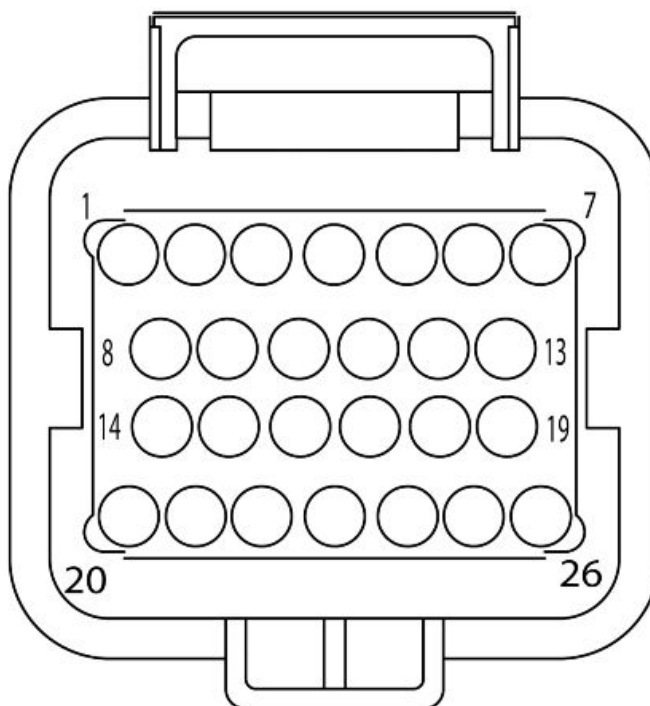
9. Before disconnecting the MIU ECU connector, perform the following steps in the order shown:

- Set the switch to «OFF»
- Disconnect the battery

Failure to respect this norm may damage the control unit.

- 10. Do not invert the poles when fitting the battery.
- 11. To avoid causing any damage, disconnect and reconnect the MIU system connectors only if required. Before reconnecting, check that the connectors are dry.
- 12. When carrying out electric inspections, do not force the tester probes into the connectors. Do not take measurements not specifically foreseen by the manual.
- 13. At the end of every check performed with the diagnostic tester, remember to protect the system connector with its cap. Failure to observe this precaution may damage the MIU control unit.
- 14. Before reconnecting the quick couplers of the power supply system, check that the terminals are perfectly clean.

Terminals setup

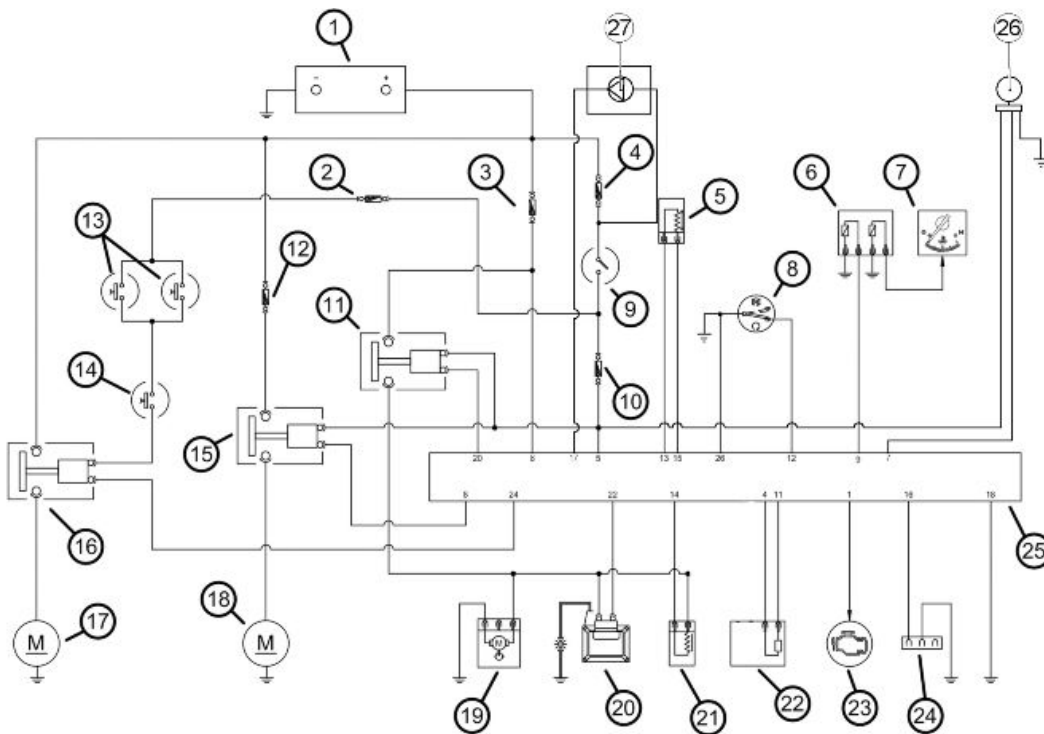


TERMINAL LAYOUT

	Specification	Desc./Quantity
1	Injection telltale light	
2	-	
3	-	
4	Lambda probe negative	
5	Live supply	
6	Battery-powered	
7	Immobilizer aerial	
8	Electric fan solenoid	
9	Water temperature sensor	
10	-	
11	Lambda probe positive	
12	Engine stop switch	
13	Engine speed sensor (+)	
14	Fuel injector	
15	Engine speed sensor (-)	

	Specification	Desc./Quantity
16	Diagnostics socket output	
17	Immobilizer LED	
18	Ground lead	
19	Headlight remote control	
20	Injection load solenoid	
21	-	
22	HV coil	
23	-	
24	Start up enabling	
25	-	
26	Ground lead	Engine stop switch connected.

EMS circuit diagram



SYSTEM DIAGRAM

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse F10	7.5 A
3	Fuse F5	15 A
4	Fuse F2	15 A
5	Speed sensor	
6	Water temperature sensor	
7	Water temperature gauge	
8	Engine stop switch	
9	ignition key contacts	
10	Fuse F8	7.5 A
11	Injection load solenoid	
12	Fuse F4	15 A
13	Stop button	
14	Starter button	
15	Electric fan solenoid	
16	Start-up remote control switch	
17	Starter motor	
18	Electric fan	
19	Fuel pump	
20	HV coil	

	Specification	Desc./Quantity
21	Fuel injector	
22	Lambda probe	
23	Engine control warning light	
24	Diagnostics socket connector	
25	Injection ECU	
26	Immobilizer aerial	
27	Immobilizer LED	

Troubleshooting procedure

Engine does not start

ENGINE DOES NOT START IF ONLY PULLED

Possible Cause	Operation
Immobiliser enabling signal	System not encoded System not efficient, repair according to the indications of the self-diagnosis
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor
Fuel system	Fuel in the tank Fuel pump activation Fuel pressure (low) Injector capacity (low)
Power to the spark plug	Shielded spark plug cap HV coil (secondary insulation)
Parameter reliability	Coolant temperature Distribution timing - injection ignition Intake air temperature
End of compression pressure	End of compression pressure

Starting difficulties

ENGINE START-UP PROBLEMS

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature
Start-up speed	Starter motor and remote control Battery Ground connections Stepper
End of compression pressure	End of compression pressure
Power to the spark plug	Spark plug Shielded cap HV coil Speed-timing sensor Ignition advance
Fuel system	Fuel in the tank 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 the throttle valve, air filter efficiency

Engine stops at idle

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

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

Engine does not rev down

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

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

Exhaust backfires in deceleration

EXHAUST BACKFIRES WHEN DECELERATING

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

Possible Cause	Operation
Correctness of the parameters	Coolant temperature Lambda probe
	Throttle valve position sensor Stepper Coolant temperature sensor Intake air temperature sensor
Intake system sealing (infiltrations)	Intake manifold - head Throttle body - manifold Air cleaner joint Filter box
Fuel system (low pressure)	Fuel pump Pressure regulator Fuel filter Injector capacity
Exhaust 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 Stepper
Intake system sealing	Air cleaner joint 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) Air cleaner joint (sealing)
Parameter reliability	Throttle valve position signal Coolant temperature indicator

Possible Cause	Operation
	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)

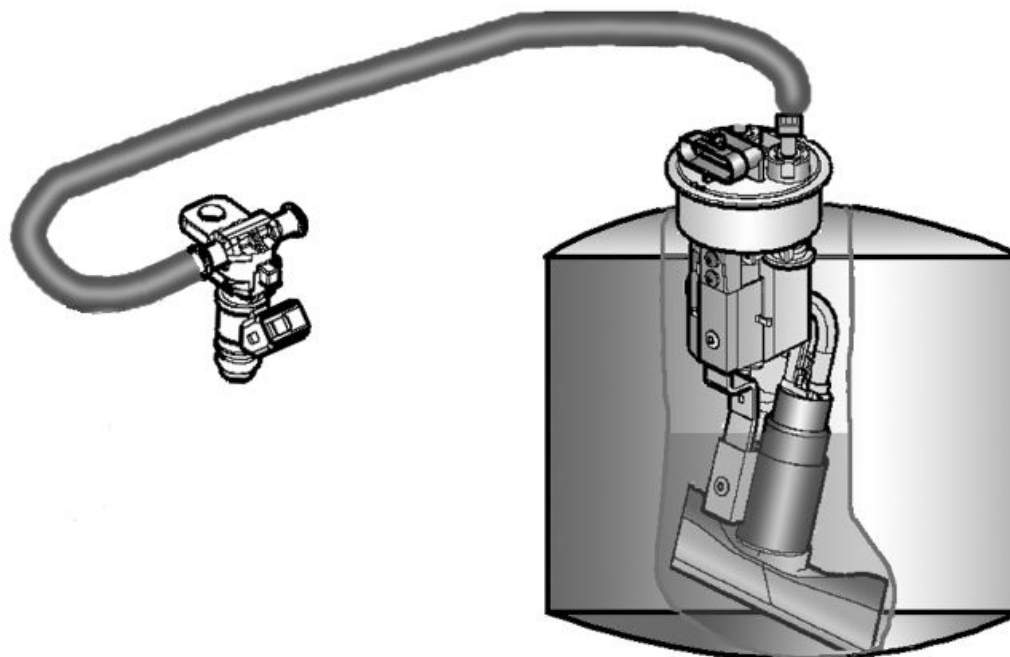
Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature Lambda probe
Ignition efficiency Parameter reliability	Spark plug Throttle valve position signal Coolant temperature indicator Intake air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

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

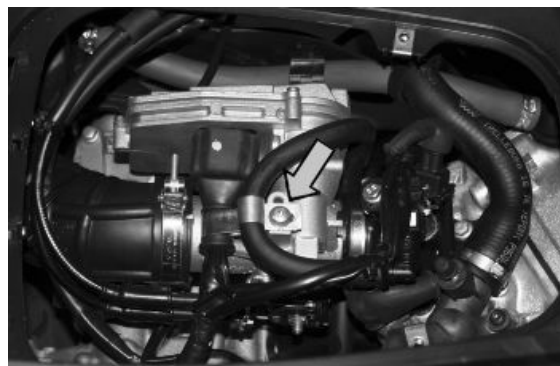
The pressure is controlled by the pressure regulator situated in the pump assembly in the tank.



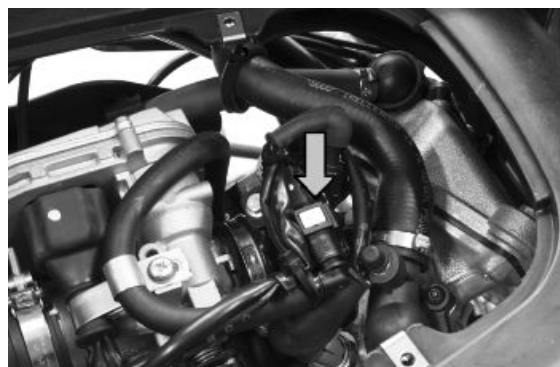
Removing the butterfly valve

Remove the helmet compartment cover.

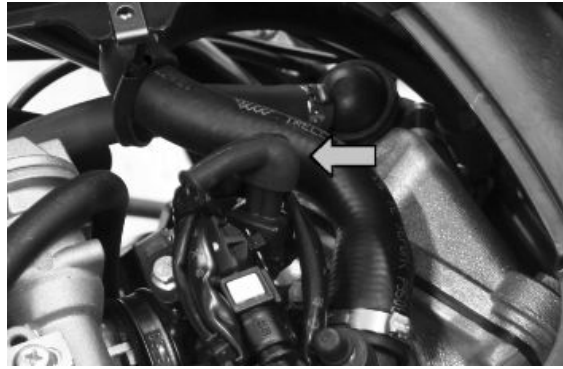
Remove the fuel piping clamping screw indicated in the figure.



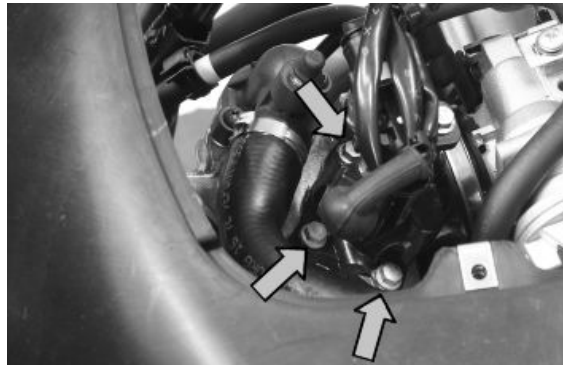
Remove the fast-release fitting from the injector support



Remove the injector connector.



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



Remove the MIU ECU connector.



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

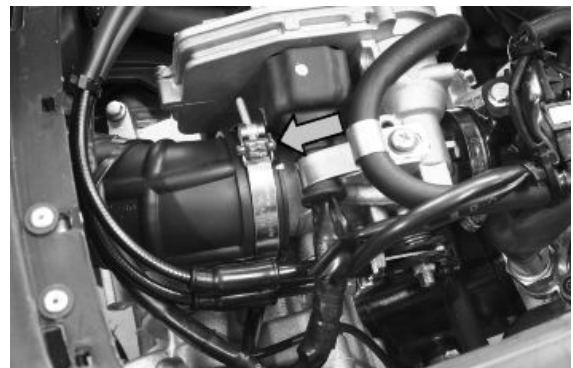


Remove the gas control retainers as indicated in the photograph

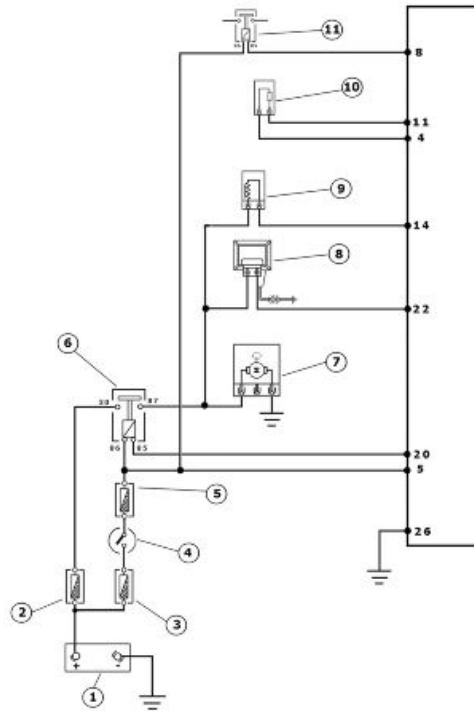


Refitting the butterfly valve

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



Pump supply circuit



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse F5	15 A
3	Fuse F2	15 A
4	ignition key contacts	
5	Fuse F8	7.5 A
6	Injection load solenoid	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Lambda probe	
11	Electric fan solenoid	

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

ELECTRICAL DATA

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

Check efficiency of the fuse F2 of 15 A (battery-powered key switch and immobilizer LED).

Check the efficiency of 15A fuse F5 (injection load).

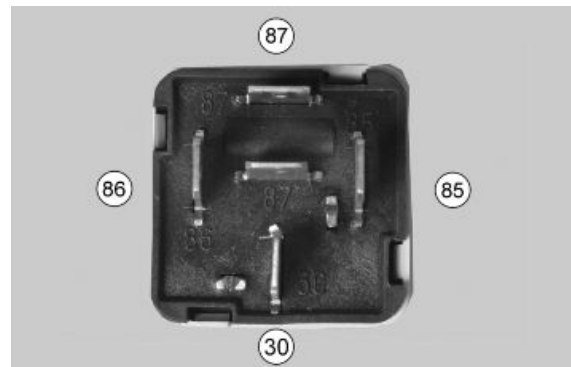
Check the efficiency of 7.5A fuse F8 (live ECU power).

Check the efficiency of the injection load remote control: measure the resistance of the drive coil between pins 86 and 85.

Characteristic

Drive coil resistance

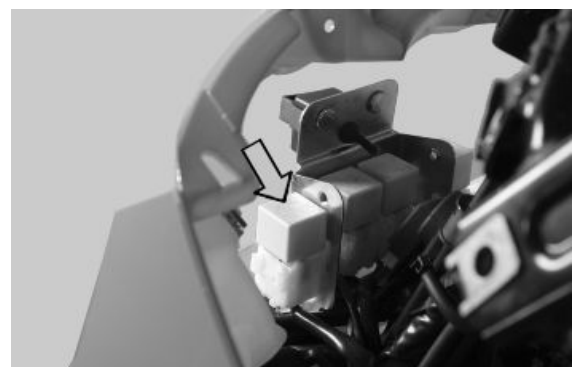
40 ÷ 80 Ω



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

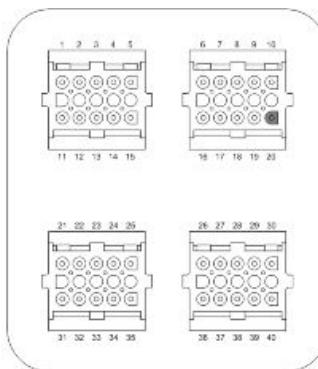


Check the power supply line of the injection load remote control energising coil: after switching to «ON », make sure there is battery voltage, for 2 seconds, between the Red-Green cable and the Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-Green cable between the fuse box (fuse F8) and the remote control base and of the Black-Purple cable between pin 20 of the ECU and the remote control base.



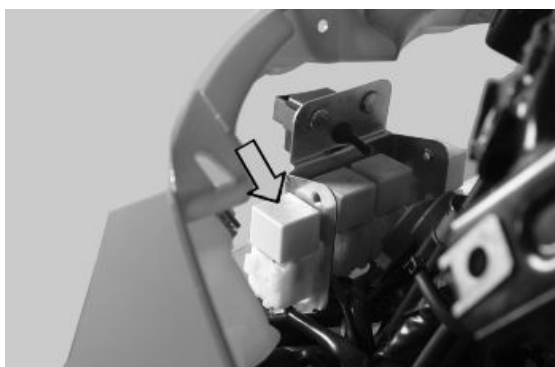
N.B.

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



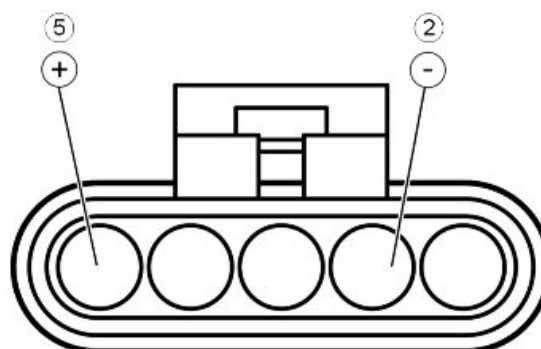
Check if there is steady voltage between the Orange-Blue cable of the remote control base and the ground lead. If there is not, check the continuity of the Orange-Blue cable between the fuse box (15A fuse F5) and the remote control base.

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

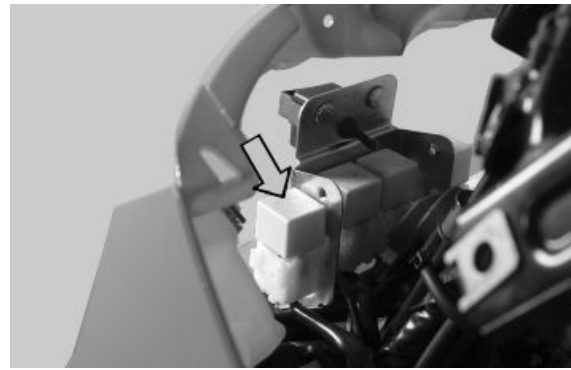


After switching to «ON», check that there is battery voltage, for about 2 seconds, between the Black-Green cable of the pump connector and the ground lead with the pump connector disconnected. Otherwise, check the continuity of the Black-Green cable (5, positive) between the pump connector and the remote control base.

Check the efficiency of the ground line of the fuel pump by measuring the continuity between the pump connector Black cable (2, negative), system side, and the ground lead.



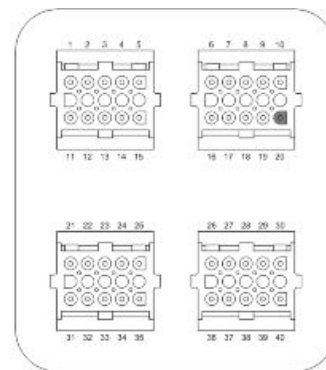
If, when switching to «ON», the pump continues to turn after 2 seconds of activation, check, with the control unit disconnected and the injection load remote control disconnected, that the Black-Purple cable (pin 20 on the interface wiring) is insulated from the ground.



Specific tooling

020331Y Digital multimeter

020481Y Control unit interface wiring



Circuit leak test

Install the appropriate tool for fuel pressure control with the pipe fitted with the pressure gauge on the delivery pipe..



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



With the battery voltage > 12 V, check the pump flow rate by disconnecting from the injector the pipe equipped with the pressure gauge of the appropriate tool. Prepare a graded burette with flow rate of approximately 1 L. Rotate the pump by using the active diagnosis of the palmtop. Using a pair of long

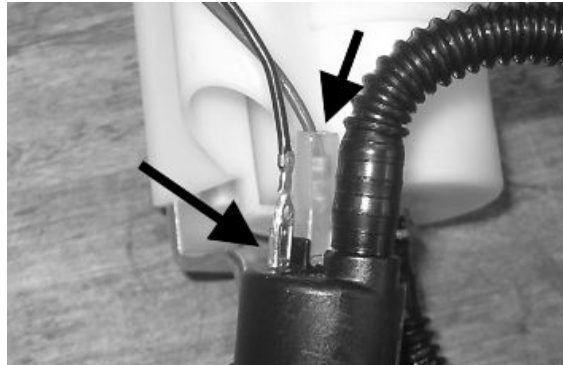
flat needle-nose pliers, choke the fuel pipe making the pressure stabilise at approx. 2.5 BAR. Check that within 15 seconds the pump has a flow rate of approx. 110 cm³.

Specific tooling

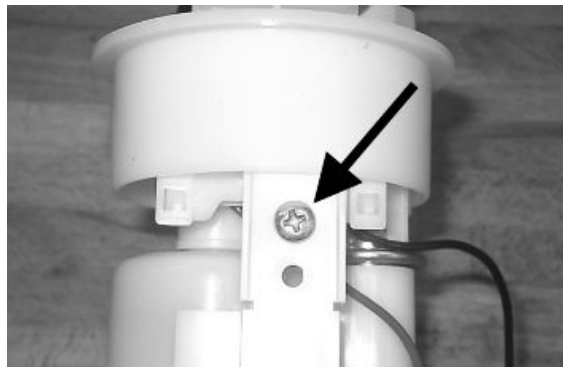
020480Y Petrol pressure check kit

Fuel filter check

Disconnect the terminals from the electric pump



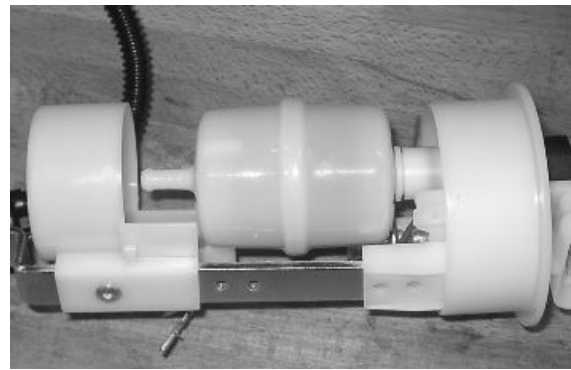
Remove the screw shown in the picture



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



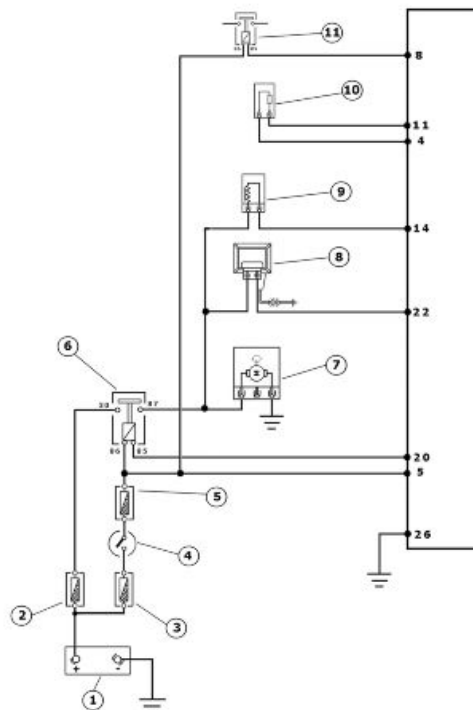
Separate the lower part of the pump mounting as shown in the picture.



Remove the filter from the pump mounting



Inspecting the injector circuit



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse F5	15 A
3	Fuse F2	15 A

	Specification	Desc./Quantity
4	ignition key contacts	
5	Fuse F8	7.5 A
6	Injection load solenoid	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Lambda probe	
11	Electric fan solenoid	

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

Check efficiency of the fuse F2 of 15 A (battery-powered key switch and immobilizer LED).

Check the efficiency of 15A fuse F5 (injection load).

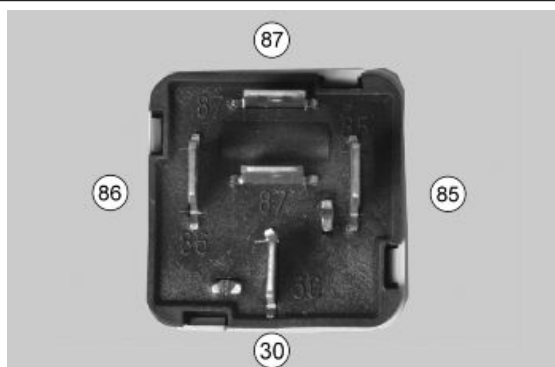
Check the efficiency of 7.5A fuse F8 (live ECU power).

Check the efficiency of the injection load remote control: measure the resistance of the drive coil between pins 86 and 85.

Characteristic

Drive coil resistance

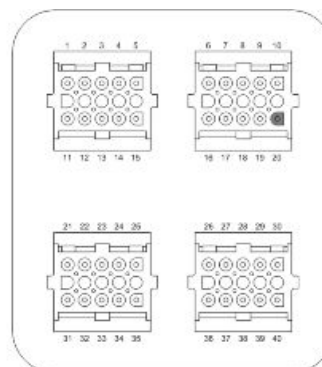
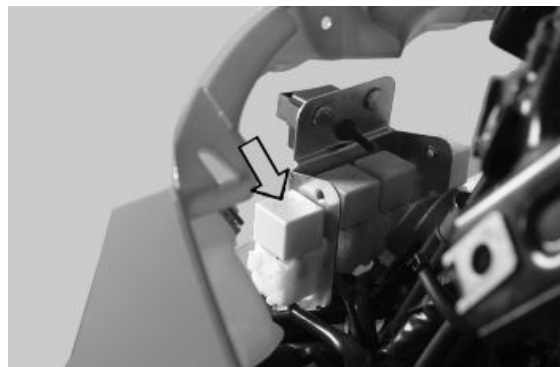
$40 \div 80 \Omega$



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



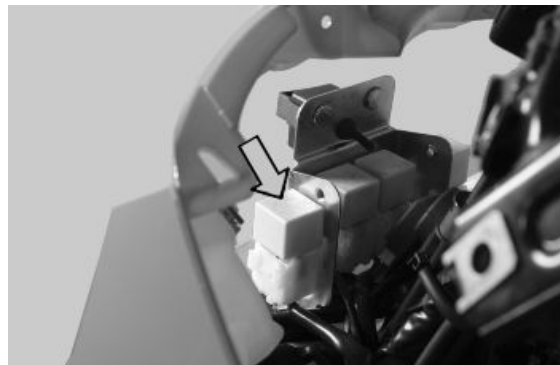
Check the power supply line of the injection load remote control energising coil: after switching to «ON », make sure there is battery voltage, for 2 seconds, between the Red-Green cable and the Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-Green cable between the fuse box (fuse F8) and the remote control base and of the Black-Purple cable between pin 20 of the ECU and the remote control base.



N.B.

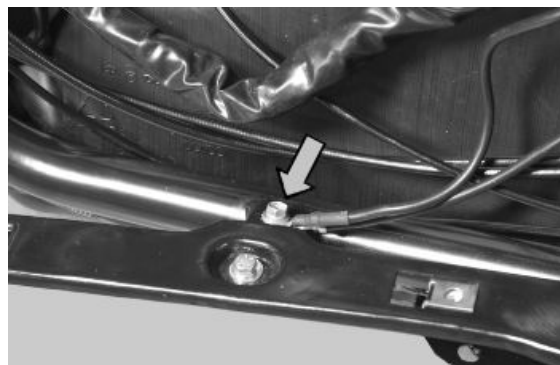
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (SOLENOIDS, CONTROL UNIT, FUSES, ETC.).

Check if there is steady voltage between the Orange-Blue cable of the remote control base and the ground lead. If there is not, check the continuity of the Orange-Blue cable between the fuse box (15A fuse F5) and the remote control base.

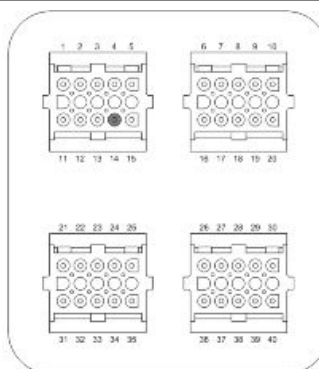


N.B.

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



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



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

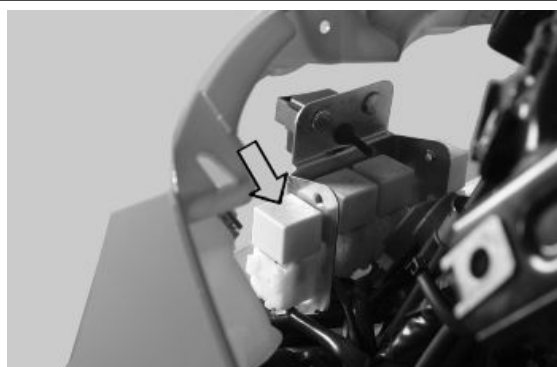


With injector disconnected and the injector load remote control disconnected, check the continuity of the Black-Green cable between the injector connector and remote control base.

Specific tooling

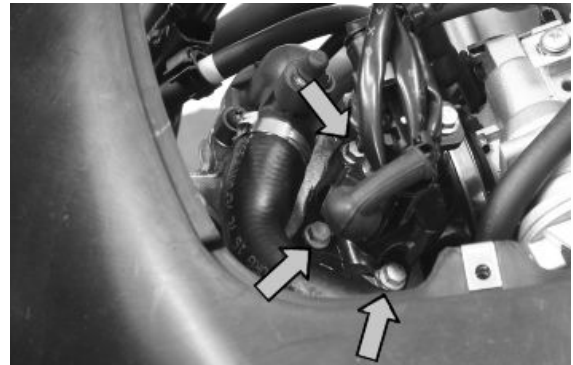
020331Y Digital multimeter

020481Y Control unit interface wiring



Inspecting the injector hydraulics

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



Install the appropriate tool for checking fuel pressure and position the manifold over a container graduated by at least 100 cm³. Connect the injector with the cable making up part of the supply for the injection tester. Connect the clamps of the cable to an auxiliary battery. Activate the fuel pump with the active diagnosis. Check that, within fifteen seconds, approximately 40 cm³ of fuel is dispensed with an adjustment pressure of approximately 2.5 BAR.



Specific tooling

020480Y Petrol pressure check kit

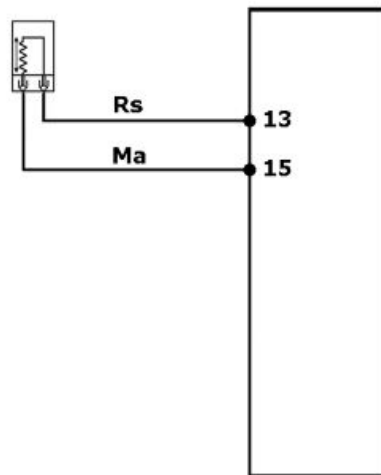
Proceed with the injector seal test.

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

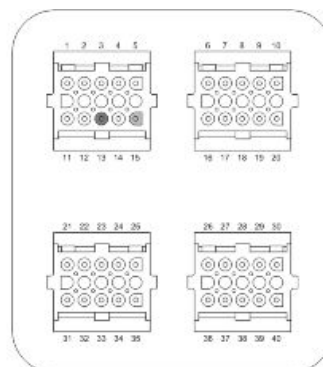
Value limit = 1 drop per minute



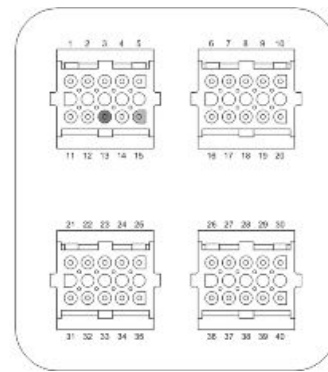
Tachometer



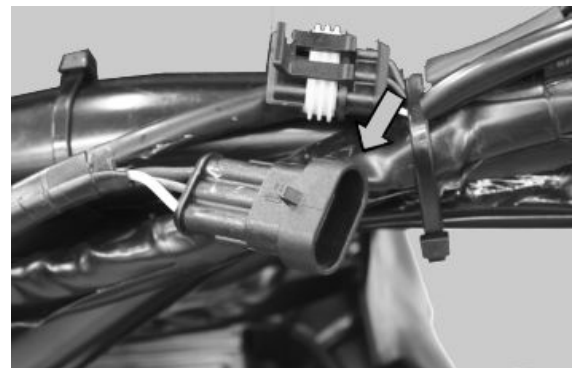
With wiring disconnected from the control unit and connected to the system, check that the sensor resistance between pins 13 - 15 is between 100 and 150 Ohm at an engine temperature of approximately 20°



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



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

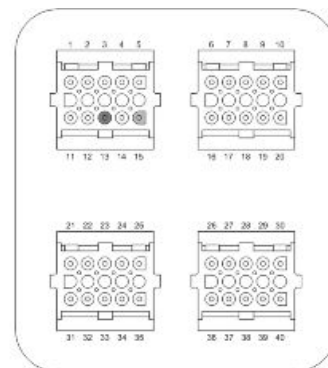


With the interface wiring and rpm sensor connector disconnected from the control unit, check that the Red and Brown cables (pin 13 - 15) are isolated from each other and insulated from the ground.

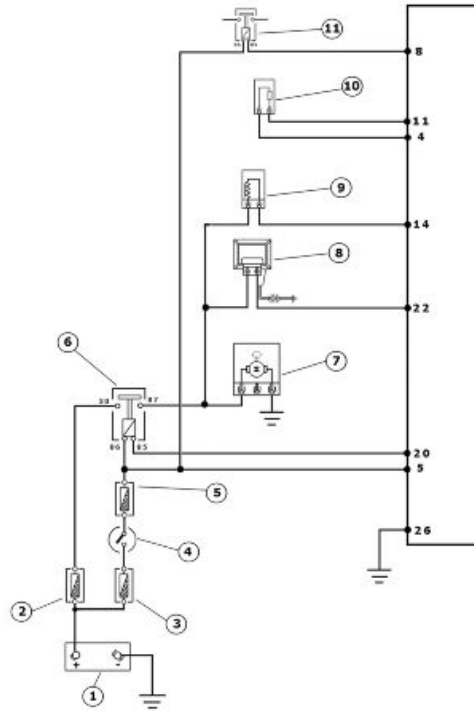
Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter



HT coil



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse F5	15 A
3	Fuse F2	15 A
4	ignition key contacts	
5	Fuse F8	7.5 A
6	Injection load solenoid	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Lambda probe	
11	Electric fan solenoid	

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

The control unit manages two important parameters:

- Ignition advance

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

With the engine at idle, the ignition advance is optimised to stabilise the speed at 1700 ± 100 rpm.

- Magnetisation time

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

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

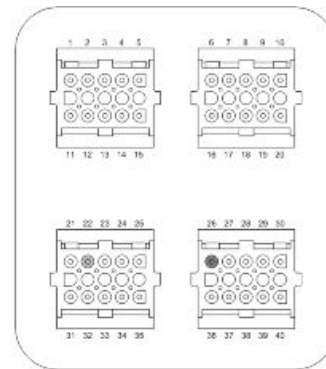
Specific tooling

020331Y Digital multimeter

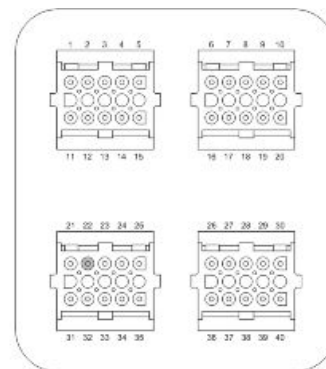
020481Y Control unit interface wiring

Check efficiency of the fuse F2 of 15 A (battery-powered key switch and immobilizer LED).
 Check the efficiency of 15A fuse F5 (injection load).
 Check the efficiency of 7.5A fuse F8 (live ECU power).

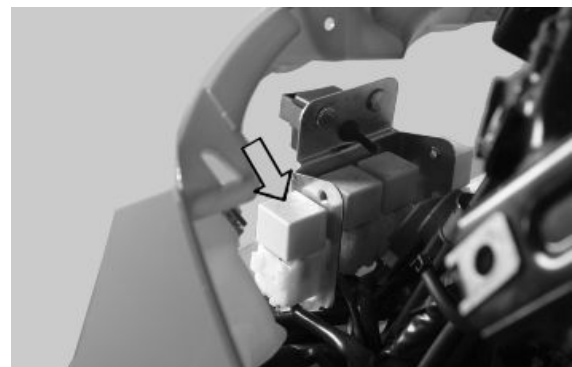
Check there is voltage between pins 22 and 26 of the interface wiring for around two seconds when switching to «ON».



Check the resistance of the primary coil between pin 22 of the interface wiring and the Black-Green cable of the injection load remote control base, with the control unit disconnected and the remote control disconnected.

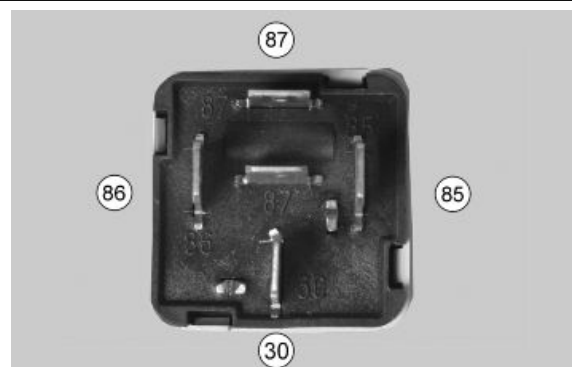


Characteristic
HV coil resistance primary value:
 ~ 0.9 Ω



Check the efficiency of the injection load remote control: measure the resistance of the drive coil between pins 86 and 85.

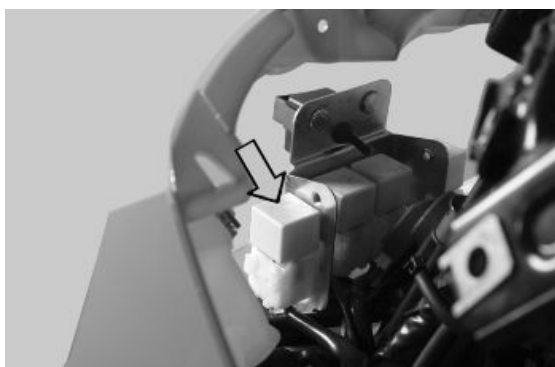
Characteristic
Drive coil resistance
 40 ÷ 80 Ω



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

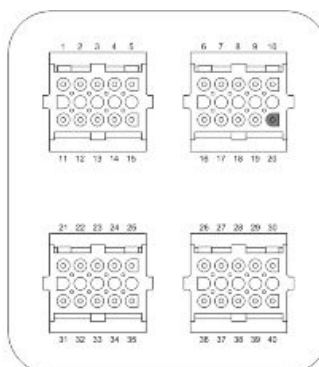


Check the power supply line of the injection load remote control energising coil: after switching to «ON », make sure there is battery voltage, for 2 seconds, between the Red-Green cable and the Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-Green cable between the fuse box (fuse F8) and the remote control base and of the Black-Purple cable between pin 20 of the ECU and the remote control base.



N.B.

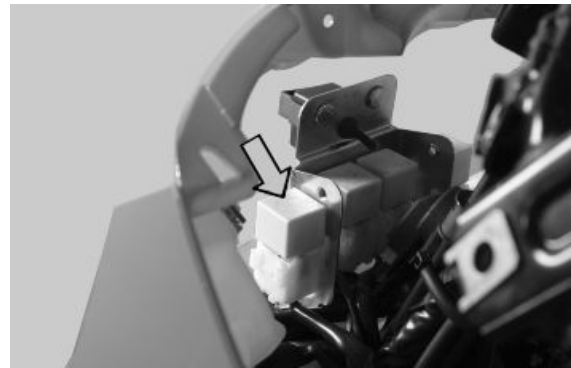
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (SOLENOIDS, CONTROL UNIT, FUSES, ETC.).



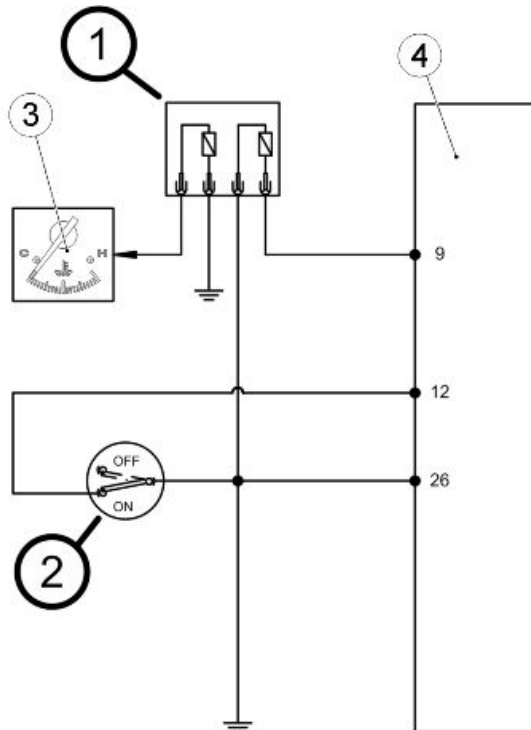
Check if there is steady voltage between the Orange-Blue cable of the remote control base and the ground lead. If there is not, check the continuity of the Orange-Blue cable between the fuse box (15A fuse F5) and the remote control base.

N.B.

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



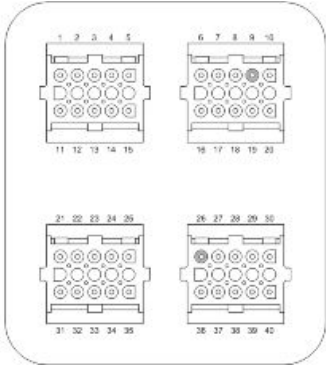
Coolant temperature sensor



TEMPERATURE SENSOR 1

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

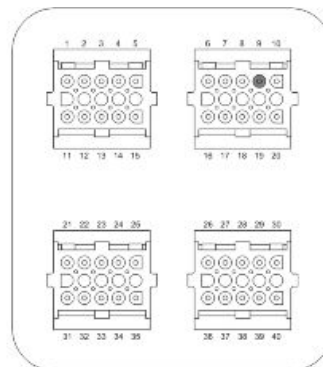
	Specification	Desc./Quantity
--	---------------	----------------

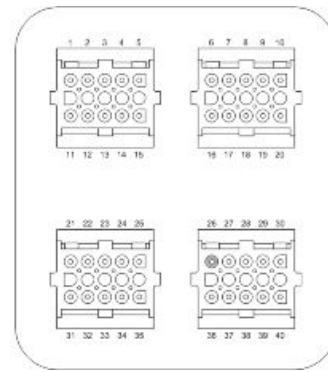
4	<p>Injection ECU</p> <p>With the connector on the control unit side disconnected and the coolant temperature sensor connector connected, check that the resistance values between pins 9 and 26 correspond to the engine temperature.</p> <p>20° = 2500 ± 100 Ω</p> <p>80° = 308 ± 6 Ω</p> <p>With the connector on the control unit side disconnected and the coolant temperature sensor connector disconnected, check the insulation between the two Grey-Green and Yellow-Pink cables.</p>	
---	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------

With the connector on the control unit side disconnected and the coolant temperature sensor connector disconnected, check the continuity between pin 9 of the interface wiring and the Yellow-Pink cable of the connector, and between pin 26 of the interface wiring and the Grey-Green cable of the connector.



- Specific tooling**
- 020481Y Control unit interface wiring**
 - 020331Y Digital multimeter**





Zeroing the throttle

Resetting the throttle valve position signal (TPS reset)

The MIU control unit is supplied with a throttle valve position sensor that is pre-calibrated.

Pre-calibration entails regulating the minimum opening of the throttle valve to obtain a certain flow of air under pre-set reference conditions.

Pre-calibration ensures optimal air flow to control idling.

This regulation must not be tampered with in any way whatsoever.

The injection system will complete the management of the idling through the Stepper motor and the variation of the ignition advance.

The throttle body after the pre-calibration has an opened valve with an angle that can vary depending on the tolerances of the machining of the pipe and the valve itself.

The valve position sensor can also assume various fitting positions. For these reasons the mV of the sensor with the valve at idle can vary from one throttle body to another.

To obtain the optimum fuel mixture, especially at small openings of the throttle valve, it is essential to match the throttle body with the control unit following the procedure known as TPS resetting.

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

To reset, proceed as follows.

Connect the diagnostic tester.

Switch to «ON».

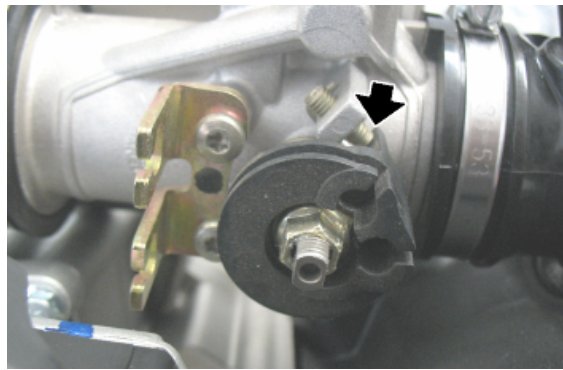
Select the functions of the diagnostic tester on «TPS RESET».

Specific tooling

020680Y Diagnosis Tool



Make sure that the throttle valve with the control is supporting the stop screw.



Guaranteeing that this position will be kept, send a confirmation for the TPS reset procedure.



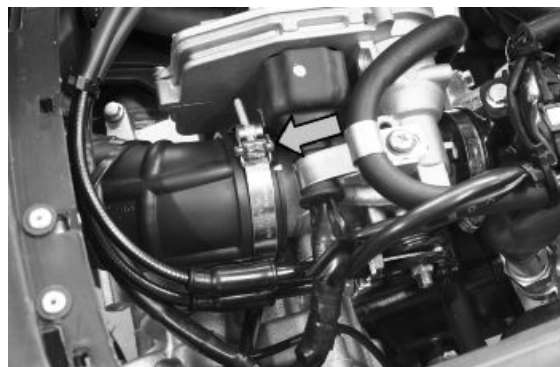
Reset should be performed in the following cases:

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

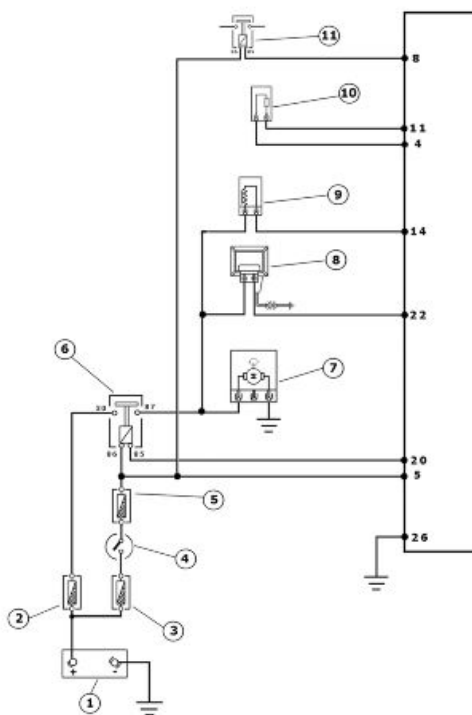
N.B.

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

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



Lambda probe



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse F5	15 A
3	Fuse F2	15 A
4	ignition key contacts	
5	Fuse F8	7.5 A
6	Injection load solenoid	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Lambda probe	
11	Electric fan solenoid	

The Lambda probe or oxygen sensor is a sensor which provides indications concerning the oxygen content in the exhaust gas. The signal generated is not of the proportional type but of the ON/OFF type,

i.e. there is oxygen or there is not. The sensor is positioned on the exhaust manifold before the catalytic converter in an area where the gas temperature is always high. The temperature at which the sensor works is at least 350°C at 600°C and it has a reaction time of just 50 milliseconds. The signal generated passes from a high value to a low value with a mixture with $\lambda = 1$.

Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter

Check efficiency of the fuse F2 of 15 A (battery-powered key switch and immobilizer LED).

Check the efficiency of 15A fuse F5 (injection load).

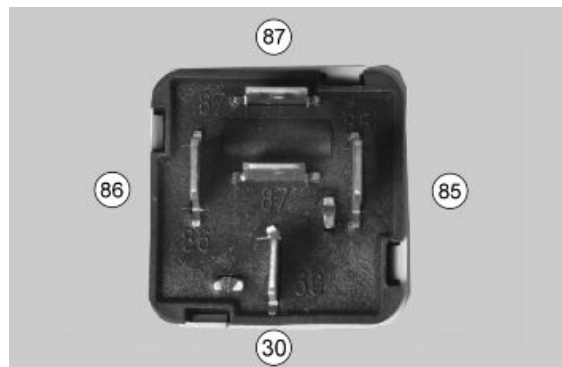
Check the efficiency of 7.5A fuse F8 (live ECU power).

Check the efficiency of the injection load remote control: measure the resistance of the drive coil between pins 86 and 85.

Characteristic

Drive coil resistance

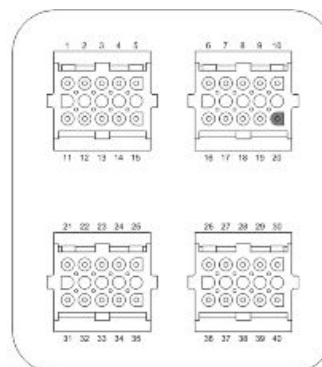
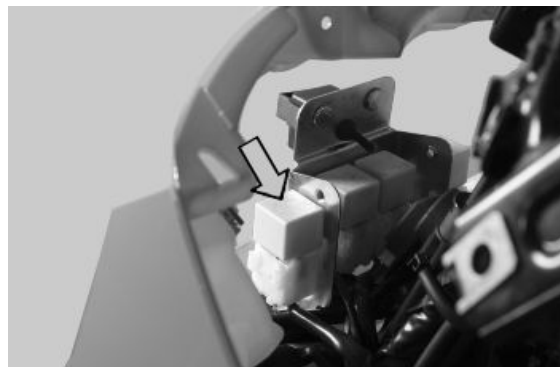
40 ÷ 80 Ω



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



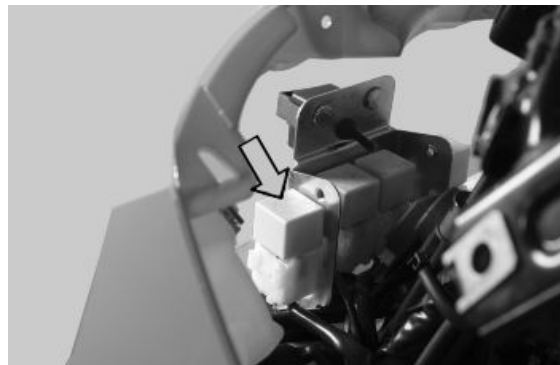
Check the power supply line of the injection load remote control energising coil: after switching to «ON », make sure there is battery voltage, for 2 seconds, between the Red-Green cable and the Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-Green cable between the fuse box (fuse F8) and the remote control base and of the Black-Purple cable between pin 20 of the ECU and the remote control base.



N.B.

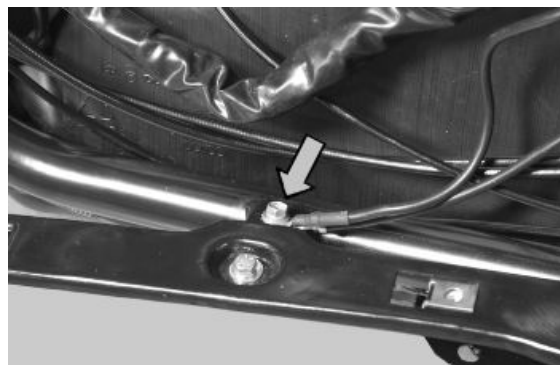
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (SOLENOIDS, CONTROL UNIT, FUSES, ETC.).

Check if there is steady voltage between the Orange-Blue cable of the remote control base and the ground lead. If there is not, check the continuity of the Orange-Blue cable between the fuse box (15A fuse F5) and the remote control base.



N.B.

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

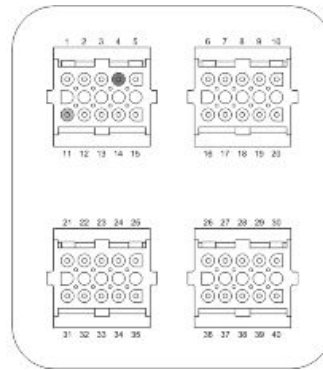


SIGNAL CONTROL

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

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

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



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

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

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

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



Specific tooling

020331Y Digital multimeter

020481Y Control unit interface wiring

INDEX OF TOPICS

SUSPENSIONS

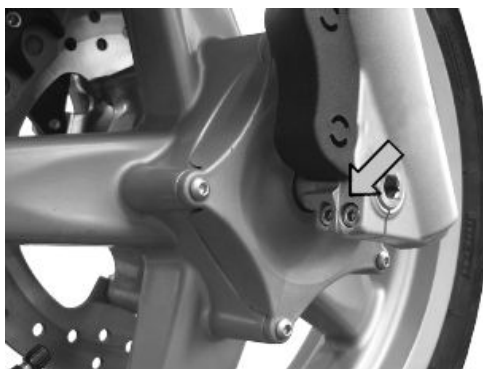
SUSP

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

Front

Removing the front wheel

- Remove the fixing nut from the wheel axle on the left side of the vehicle.
- Loosen the two screws fixing the wheel axle clamp and remove the clamp.



Front wheel hub overhaul

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

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

- Remove the two bearings on the brake disc side using pliers 14 and the special bell 9.
- Remove the internal spacer.





- Support the front wheel with two wooden shims that make it possible to avoid scratching in the case of contact with the rim.
- Insert the punch (consisting of adaptor handle, 24 mm adaptor and 15 mm guide) from the brake disc side to permit the removal of the opposite side bearing and the spacer bushing.



Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020412Y 15-mm guide

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



- Insert the bearing using the punch consisting of adaptor handle, 40x37 mm adaptor and 15 mm guide, and take it to the stop.



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

Specific tooling**020376Y Adaptor handle****020359Y 42x47-mm Adaptor****020412Y 15-mm guide****020201Y Spacer bushing driving tube**

-
- Refit the cap and tighten the five fixing screws.



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



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



- 2 - Insert the two bearings one at a time using the punch consisting of adaptor handle, 32x35 mm adaptor and 15 mm guide, and take it to the stop.

Specific tooling

020376Y Adaptor handle

020357Y 32x35-mm Adaptor

020412Y 15-mm guide

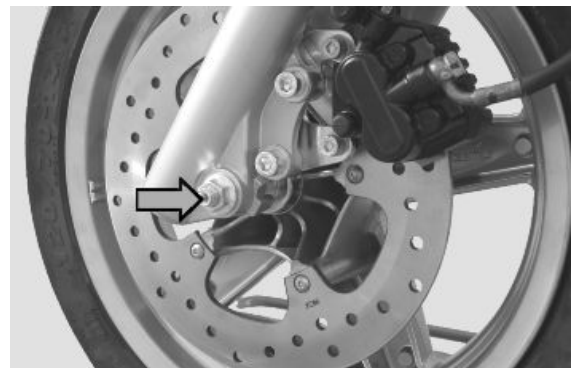


Refitting the front wheel

- Carry out the operations described in the «removal» section but in reverse order.

Locking torques (N*m)

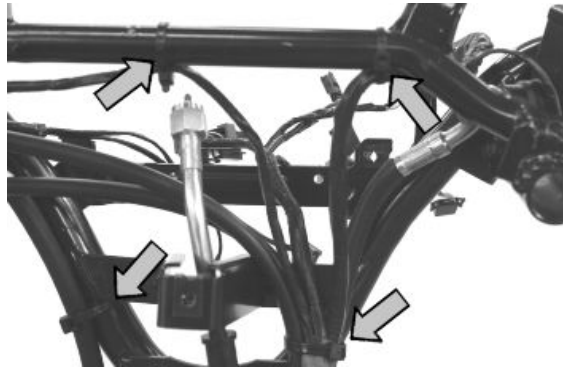
Wheel axle nut 45 to 50 Wheel axle clamp screws 6 - 7 Nm



Handlebar

Removal

- Remove the handlebar covers as explained in the «Bodywork» Chapter.
- Remove the handlebar wiring retaining straps and disconnect the electric connectors from the brake levers.



- Unscrew the clamps of the U-bolts and release the brake pumps.
- Remove the flexible transmissions of the throttle grip and remove the throttle control.
- Loosen the clamp fixing the handlebar to the steering tube and remove the handlebar by pulling it upwards.



N.B.

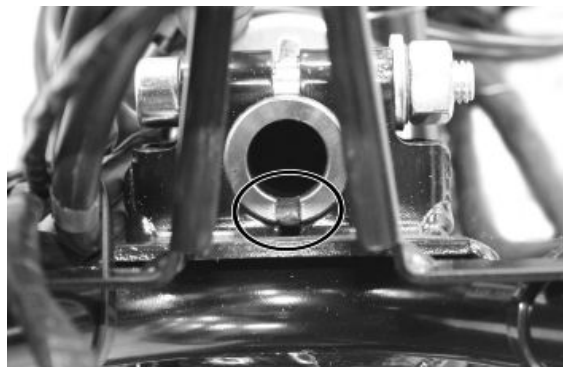
IF THE HANDLEBAR IS BEING REMOVED TO REMOVE THE STEERING, IT IS ONLY NECESSARY TO TILT THE HANDLEBAR FORWARD ONTO THE FRONT PART OF THE VEHICLE WITHOUT REMOVING THE PARTS FITTED SO AS TO AVOID DAMAGING THE SHAFTS.

Refitting

Carry out the above operations by following the removal steps but in reverse order, respecting the handlebar-steering tube alignment as shown in the figure.

Locking torques (N*m)

Handlebar fixing screw (*) 43 ÷ 47



Front fork

Removal

See also

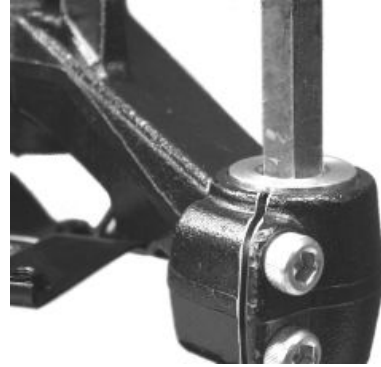
[Removal](#)

Overhaul

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

CAUTION

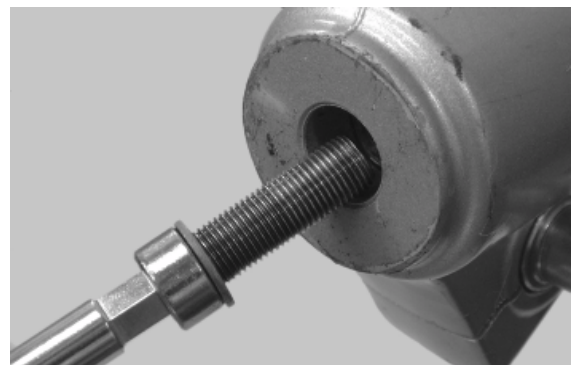
THE STEM CLOSING CAP KEEPS THE MAIN SPRING PRE-LOADED. KEEP THE CAP PROPERLY FITTED DURING THE REMOVAL FINAL STAGE TO AVOID ACCIDENTS.



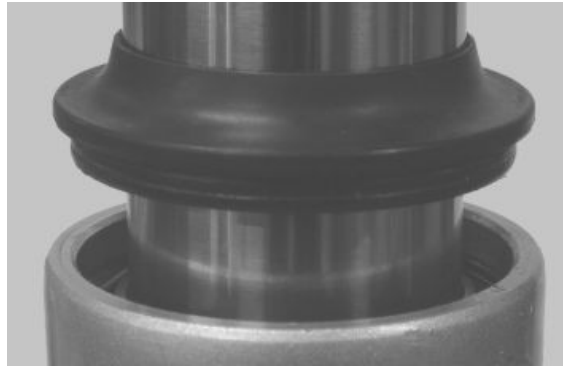
- Support the fork leg properly, remove the main spring and drain off the fork leg oil.



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



-
- Remove the stem dust guard with a screwdriver.



-
- Remove the circlip retaining the oil seal.



-
- Take out the stem.



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

Characteristic**Maximum fork leg diameter**

35.10 mm

Minimum stem diameter

34.90 mm

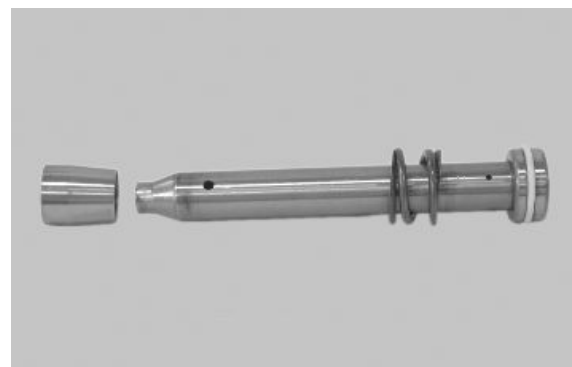
- Take out the oil seal using the appropriate tools.
- Fit the tie rod into the oil seal.
- Insert in sequence the two half-rings per \varnothing 35-mm stems.

Specific tooling**020487Y Fork oil seal extractor**

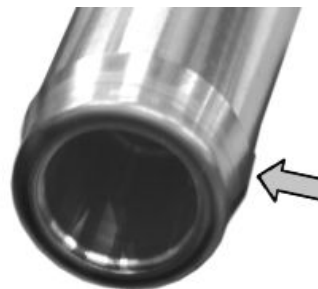
- Hold the tie rod manually so that it does not fall into the fork leg and/or that both half-rings are not in their position.
- Fit the bell.
- Tighten the nut until it stops.
- Act on the tool until the oil seal is completely removed.

Specific tooling**020487Y Fork oil seal extractor**

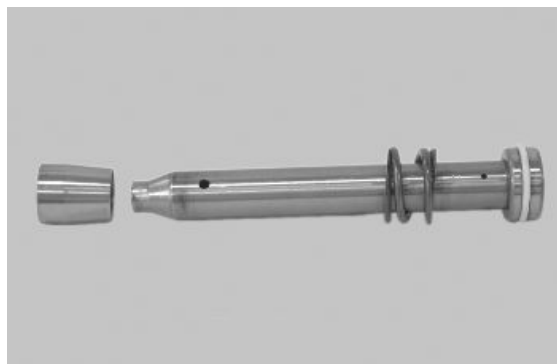
- Remove the hydraulic rod with the corresponding sealing gasket, the spring and the stop bushing.

**COMPONENT CHECK****CAUTION****CLEAN ALL THE COMPONENTS THOROUGHLY.**

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



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



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



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



Refitting

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

Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm Adaptor

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



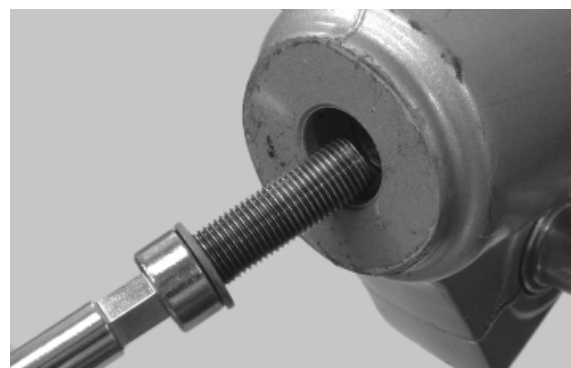
- Fit the hydraulic rod fixing screw with the copper sealing washer and tighten to the prescribed torque using the recommended product.

CAUTION

ALWAYS USE NEW COPPER WASHER.

Locking torques (N*m)

Hydraulic rod fixing screw 25 ÷ 35*



(°) Apply LOCTITE 243 threadlock

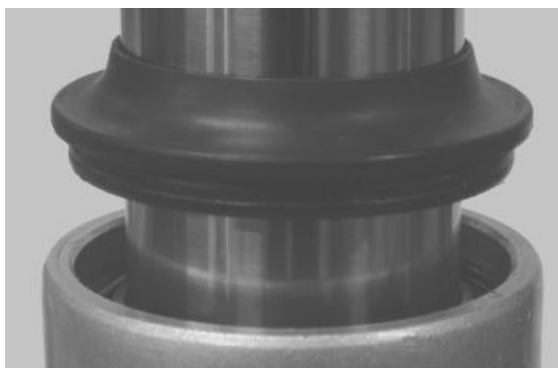
-
- Lock hydraulic rod rotation using a 19-mm hexagonal spanner.



-
- Fit the oil seal retaining circlip.



-
- Grease and fit a new dust guard.



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

Locking torques (N*m)

Stem support clamp tightening screws 20 to 25



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

Recommended products

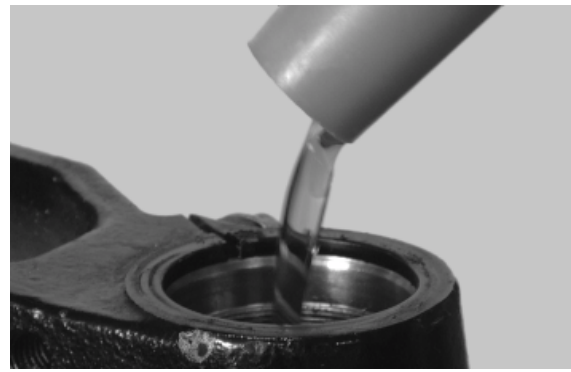
AGIP FORK 7.5 W Oil for front fork

Hydraulic fluid SAE 7.5 W

Characteristic

Oil quantity per stem

133 ± 3 cm³



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



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

Locking torques (N*m)

Fork locking screws cap 15 ÷ 30



- Repeat the procedure for the other fork leg.

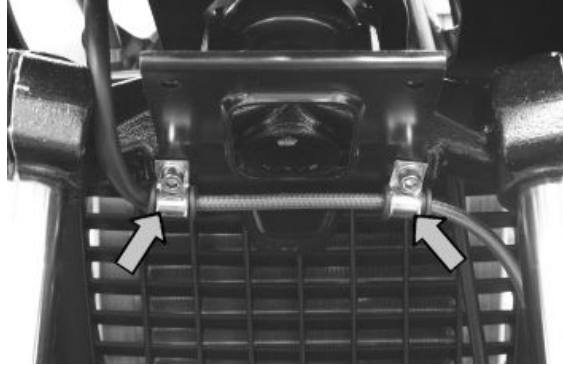
N.B.

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

Steering column

Removal

- Remove the front wheel.
- Remove the handlebar and tip it onto the shield back plate being careful not to damage the plate.
- Release the front brake pipe from the fork by undoing the screws indicated.



- Using the appropriate tool, loosen and remove the upper ring nut, the space washer, the counter ring nut and the spacer 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

[Removing the front wheel Removal](#)



Refitting

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

N.B.

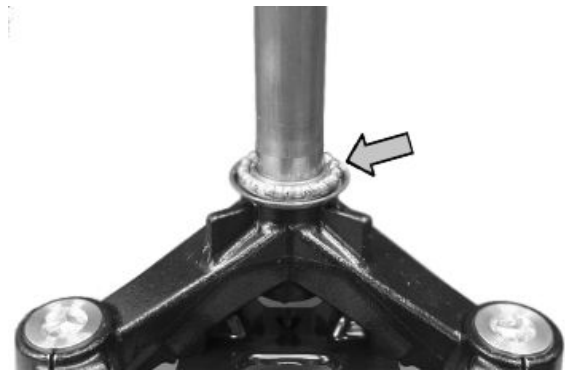
LUBRICATE THE STEERING FIFTH WHEEL TRACKS WITH RECOMMENDED GREASE BEFORE USE.

Recommended products

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

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





- Fit the upper steering fifth wheel.

CAUTION

INSERT THE UPPER FIFTH WHEEL WITH THE CAGE FACING UPWARDS.



- Fit the steering fifth wheel upper seat.



- Fit the cover plate.



-
- Insert the spacer.



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

Specific tooling

020055Y Wrench for steering tube ring nut

Locking torques (N*m)

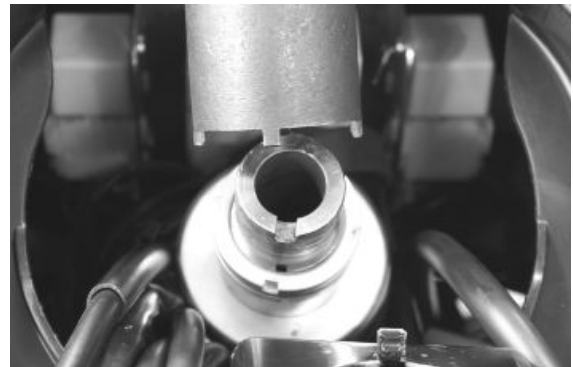
Steering tube lower ring nut 14 ÷ 17



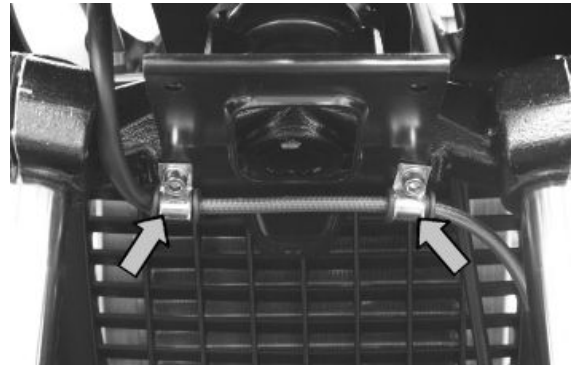
-
- Fit the spacer between the two ring nuts on the steering tube in the position indicated.



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

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

- Fasten the two retainer clamps of the front brake pipe to the fork plate.

Locking torques (N*m)**Screw fixing the front brake pipe to the fork plate 5 ÷ 7**

- Fit the front wheel.

Steering bearing

Removal

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



- Check the lower steering fifth wheel for wear.



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

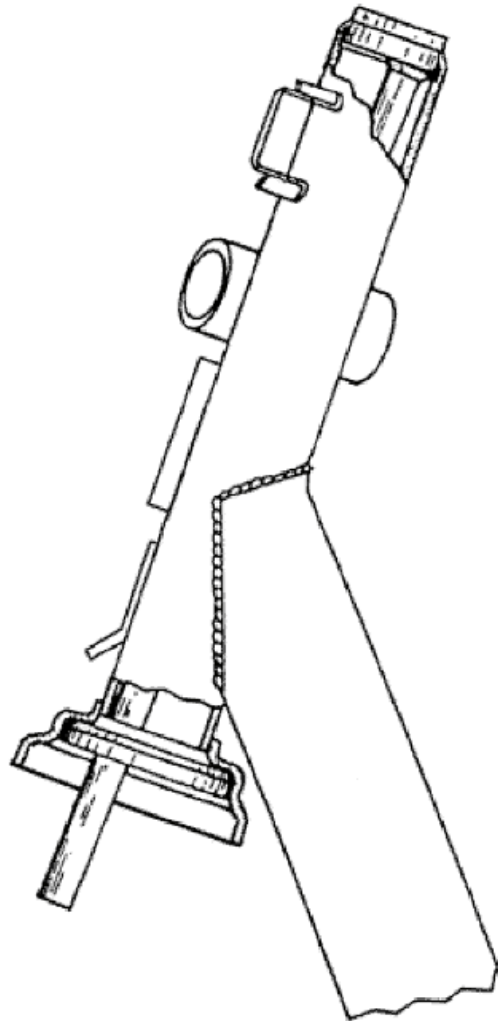
STEERING FIFTH WHEEL TRACK REMOVAL

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



Specific tooling

020004Y Punch for removing steering bearings from headstock



- Repeat the procedure for the lower steering fifth wheel track by using the appropriate tool.

Specific tooling

020458Y Puller for lower bearing on steering tube

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

Specific tooling

020004Y Punch for removing steering bearings from headstock



Refitting

STEERING FIFTH WHEEL TRACK FITTING

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

N.B.

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

Specific tooling

001330Y Tool for fitting steering seats

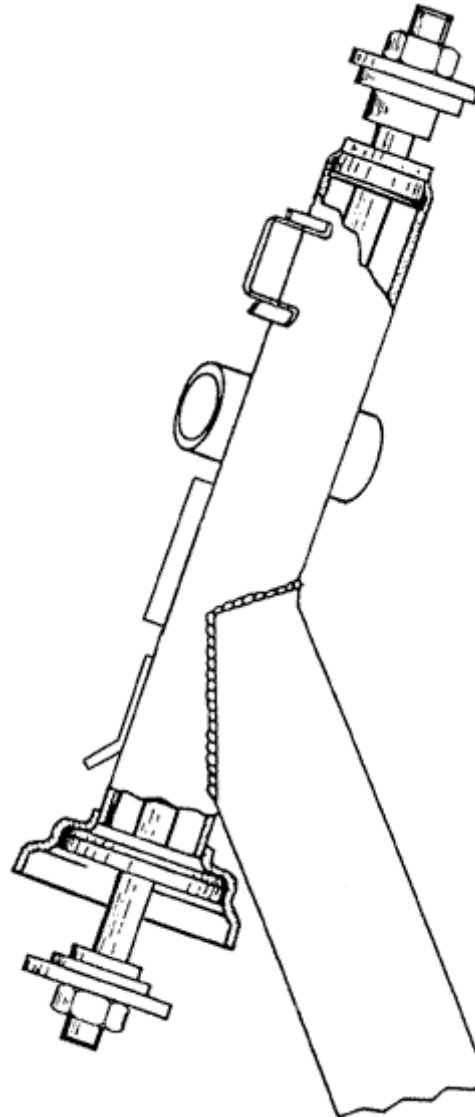
001330Y014 Tool for fitting steering seats

001330Y015 Tool for fitting steering seats

Recommended products

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

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



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

N.B.

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

Recommended products

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



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

Rear

Removing the rear wheel

- Remove the muffler supporting bracket.
- Remove the rear mudguard.
- Remove the tapered spacer.



- Remove the rear wheel.

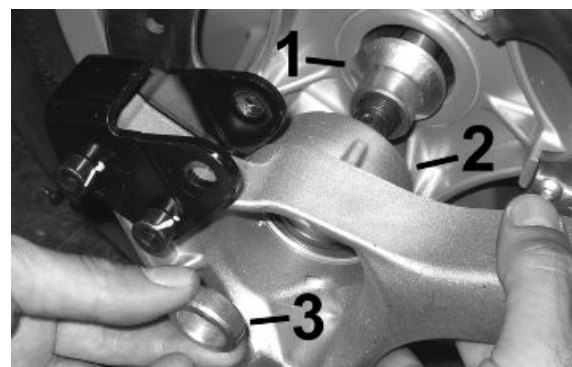


Refitting the rear wheel

To fit, follow the removal steps but in the reverse sequence, being careful to fit the spacers on the wheel axle as shown in the picture.

Locking torques (N*m)

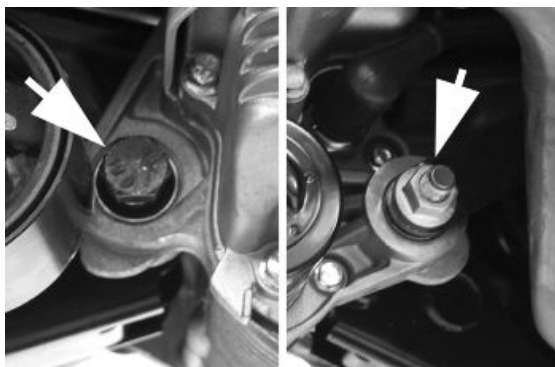
Silencer arm clamping screws 27 - 30 **Rear wheel axle nut** 104 to 126 **Shock absorber-crankcase attachment bracket** 20 to 25 **Lower shock absorber clamping screw** 33 - 41 Nm **Rear brake calliper fixing screws** 25 - 30 Nm



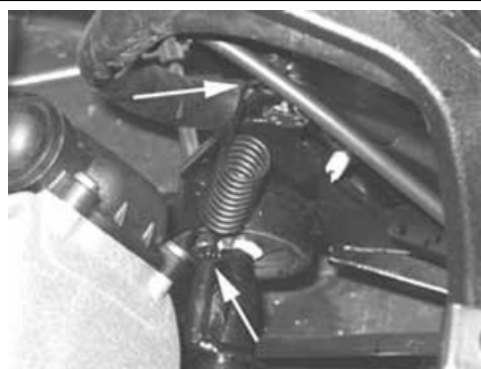
Swing-arm

Removal

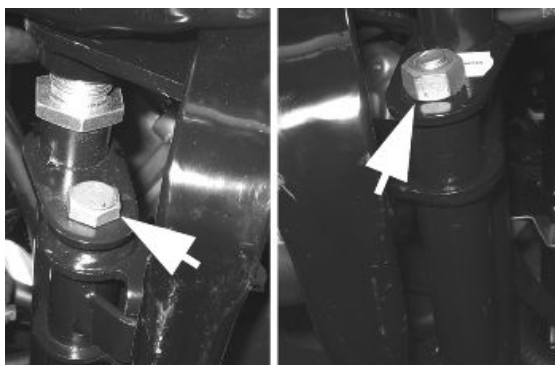
- Place the vehicle on its centre stand;
- Remove the swinging arm/engine fitting shown in the picture
- Move the engine back



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



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



- Undo the nut on the LHS shown in the figure and remove the corresponding bolt from the opposite side.
- Remove the swinging arm.



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



Overhaul

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



Characteristic

Standard clearance

0.40 - 0.60 mm

Allowable limit after use:

1.5 mm

- 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 12-mm inside diameter for pins, minimum 30-mm outside diameter and 4-mm thick at least.



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

Characteristic

Standard clearance

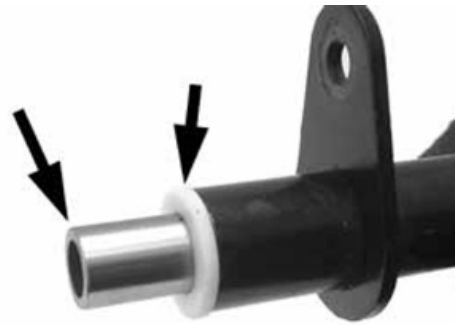
0.40 - 0.60 mm

Allowable limit after use:

1.5 mm



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



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



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

Specific tooling

020244Y 15-mm diameter punch

020115Y Ø 18 punch

Characteristic

Length of the swinging arm tube on the engine side:

175.3 ± 0.3 mm

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

183 ± 0.3 mm

Engine side swinging arm plastic bushing shim:

3.5 ± 0.05 mm

Chassis side swinging arm plastic bushing shim:

3.5 ± 0.05 mm

Length of the internal swinging arm spacer on the chassis side:

290 ± 0.1 mm



Length of the swinging arm tube on the chassis side:

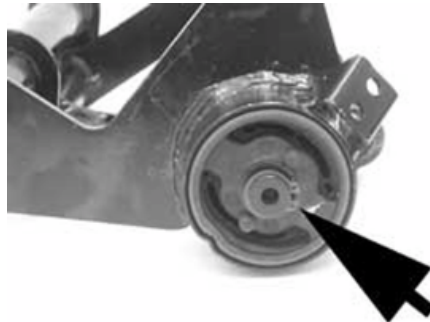
283 ± 0.1 mm

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

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

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

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



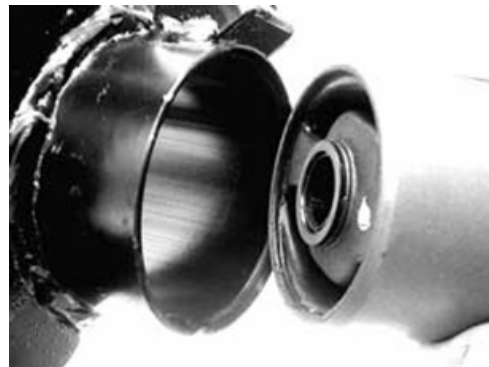
- Remove the full silent bloc bracket
- Undo the silent bloc ring shown in the picture



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



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



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



Refitting

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

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

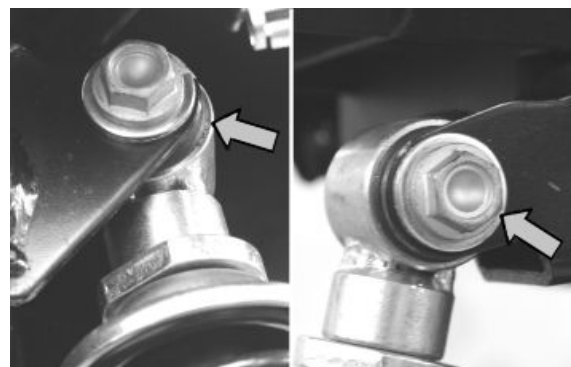
Locking torques (N*m)

Engine and vehicle side swinging arm junction bolt 33 ÷ 41 Nm Swinging arm pin - Engine 64 ÷ 72 Nm Body shell - Swinging arm pin 76 ÷ 83 Nm Screw fixing the silent-block support plate to the body 42 ÷ 52 Nm

Shock absorbers

Removal

- Rest the scooter on its centre stand.
- Slightly lift the engine using a jack to free both shock absorbers.
- Remove the silencer.
- Unscrew the shock absorber spring unit fixing screw from the support fixed to the engine on one side, and from that fixed to the muffler support on the other.
- Undo the two upper nuts (one on each side) fixing the shock absorber spring unit to the chassis and remove the shock absorbers themselves.



Refitting

Carry out the previous operations but in reverse order.

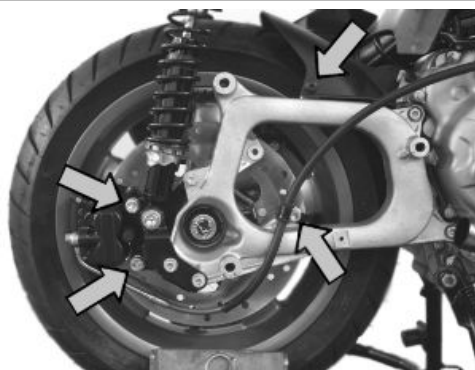
Locking torques (N*m)

Shock absorber lower clamping 33 to 41 Upper shock absorber retainer 33 to 41

Exhaust bracket

Removal

- Remove the exhaust silencer.
- Remove the rear brake calliper, release the rear brake pipes from the retainer clamp and undo the screw fixing the rear mudguard.



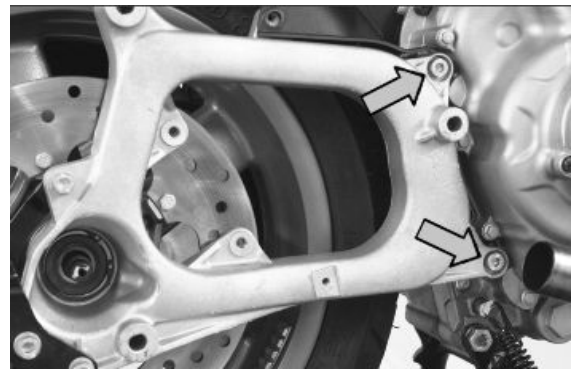
- Release the cotter pin and remove the cap.



- Unscrew the rear wheel fixing nut and remove the spacer.



-
- Undo the two fixing screws to the engine crank-case.



-
- Remove the muffler supporting bracket.



Overhaul

-
- Remove the Seeger ring.



-
- With the appropriate tools, remove the bearing from the inside.

Specific tooling

020376Y Adaptor handle

020439Y 17-mm guide

020358Y 37x40-mm Adaptor



-
- Check that the bearing seat is not abnormally worn.
 - Heat the bearing seat with the appropriate tool.

Specific tooling**020151Y Air heater**

-
- Drive a new bearing as far as it will go using the appropriate tool.

Specific tooling**020376Y Adaptor handle****020439Y 17-mm guide****020359Y 42x47-mm Adaptor**

-
- Fit the Seeger ring.



Refitting

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

Recommended products**AGIP GREASE PV2 Grease for steering bearings and spindle seats**

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

Locking torques (N*m)**Silencer arm clamping screws 27 - 30 Rear wheel axle 104 to 126****See also**[Refitting](#)[Refitting the rear wheel](#)[Refitting](#)

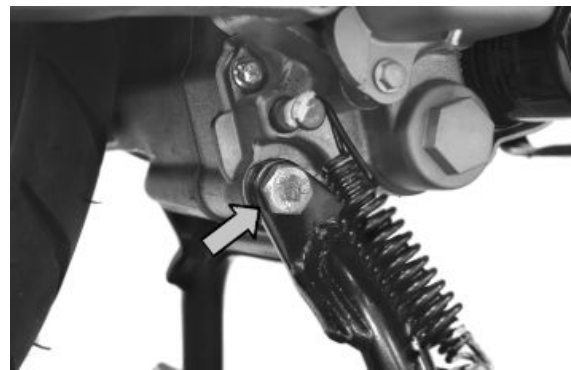
Centre-stand

REMOVAL

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



- Remove the bolt from the right side.
- Remove the centre stand.



FITTING

- Install the sealing rings on the support tube of the stand;
- Carry out the operations described above in reverse order, then insert the sealing rings into their seats.

CAUTION

LUBRICATE THE FOLLOWING PARTS WITH GREASE:
SPRING COUPLING PINS, BUSHINGS ON STAND FIXING BRACKETS.

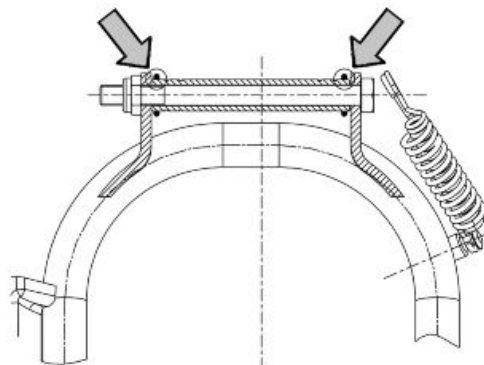
Recommended products

AGIP GREASE PV2 Grease for control levers on the engine

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

Locking torques (N*m)

Stand fixing bolt 40 ÷ 45



INDEX OF TOPICS

BRAKING SYSTEM

BRAK SYS

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

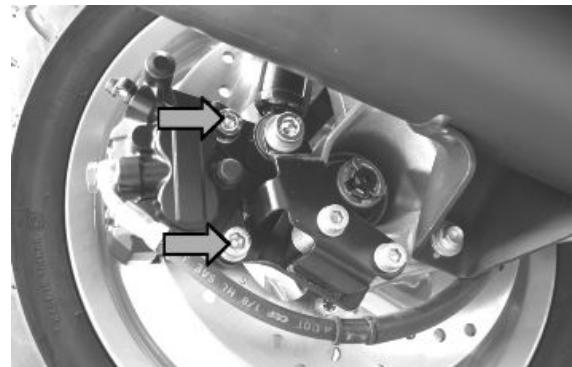
Rear brake calliper

Removal

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

N.B.

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



Refitting

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

Recommended products

Loctite 243 Medium strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

Screw tightening calliper to support 42 ÷ 52

If the calliper is replaced:

CAUTION

ONCE REFITTING IS FINISHED, BLEED THE SYSTEM.

CAUTION

ALWAYS USE NEW COPPER WASHERS.

Locking torques (N*m)

Rear brake calliper-pipe fitting 20 to 25

See also

[Rear - combined](#)

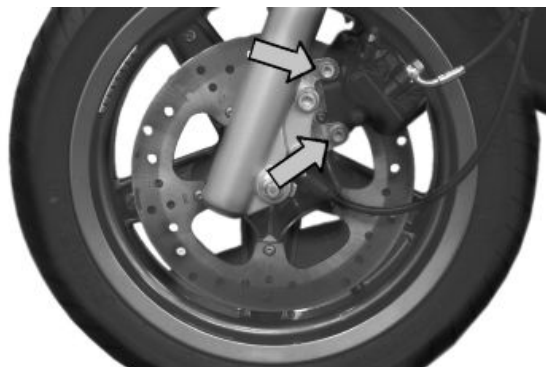
Front brake calliper

Removal

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

N.B.

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



Refitting

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

Locking torques (N*m)

Screw tightening calliper to support 24 to 27

If the calliper is replaced:

CAUTION

ALWAYS USE NEW COPPER WASHERS.

CAUTION

ONCE REFITTING IS FINISHED, BLEED THE SYSTEM.

Locking torques (N*m)

Brake fluid pipe-calliper fitting 20 to 25

See also

[Front](#)

Rear brake disc

Removal

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



Refitting

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

N.B.

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



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

Recommended products

Loctite 243 Medium strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

Brake disc screws 8 to 10



Disc Inspection

- Remove the rear brake calliper
- Check disc thickness with a micrometer, repeat the measurement at no fewer than six points on the disc.

Characteristic

Standard thickness:

5 ± 0.2 mm

Disc thickness at wear limit

4.5 mm

- Check the brake disc rotates regularly using the appropriate tool fixed onto the brake calliper support.



- In order to be able to anchor the specific tool properly use a metal plate with an M8 threaded hole and fix it to one of the two rear brake calliper attachment points.

N.B.

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

Specific tooling

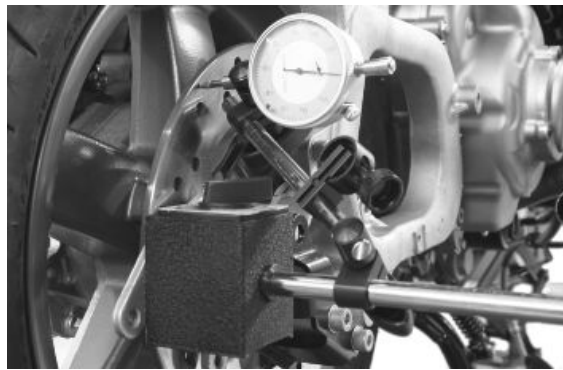
020335Y Magnetic mounting for dial gauge

Characteristic

Max. deviation allowed:

0.1 mm

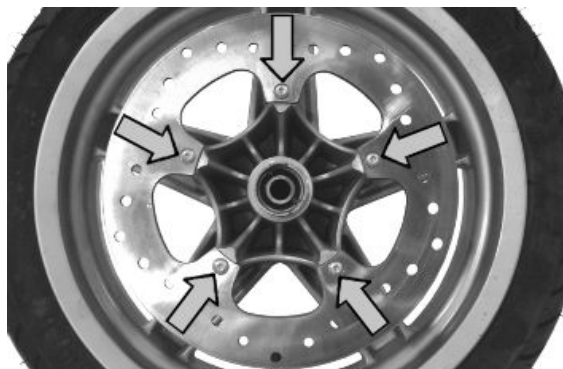
- If you detect incorrect values, replace the disc.
- If the fault continues, repeat the test.
- If the problem persists, replace the wheel.



Front brake disc

Removal

- Remove the front wheel.
- Undo the five clamping screws shown in the photograph



Refitting

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

N.B.

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



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

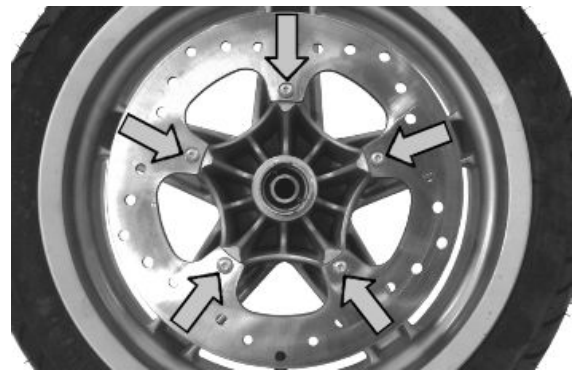
Recommended products

Loctite 243 Medium strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

Brake disc screws 8 to 10



Disc Inspection

- Remove the front brake calliper.
- Check disc thickness with a micrometer, repeat the measurement at no fewer than six points on the disc.

Characteristic

Standard thickness:

5 ± 0.2 mm

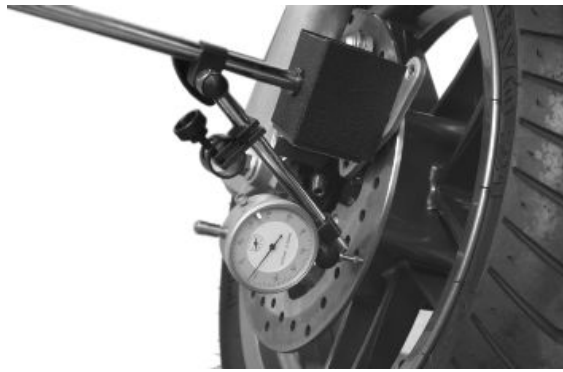
Disc thickness at wear limit

4.5 mm

- Check the brake disc rotates regularly using the appropriate tool fixed onto the brake calliper support.



- In order to secure the specific tool adequately use a metal plate with an M8 threaded hole and fix it to one of the two front brake calliper attachment points.



Specific tooling

020335Y Magnetic mounting for dial gauge

Characteristic

Max. deviation allowed:

0.1 mm

- If you detect incorrect values, replace the disc.
- If the fault continues, repeat the test.
- If the problem persists, replace the wheel.

Front brake pads

Removal

Proceed as follows:

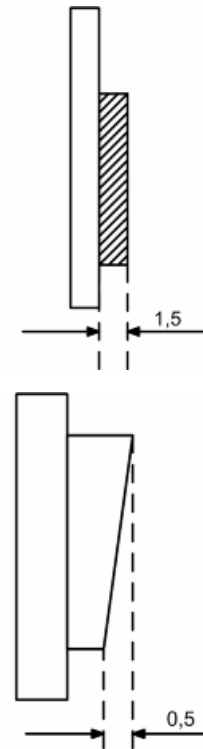
- Remove the front brake calliper.
- Loosen the two pins shown in the figure that lock the two pads.
- Remove the pads, being careful with the pad spring clamp.
- Check the thickness of the friction material of the pads.
- Replace the pads if the thickness is below the minimum value.
- The replacement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



Characteristic

Minimum value

1.5 mm



See also

[Front](#)
brake calliper

Refitting

To fit, proceed as follows:

- Insert the two pads in the callipers.
- Screw the two pad lock pins to the correct torque, and apply the recommended product.
- Fit the calliper on its support, tightening the two screws to the prescribed torque.

N.B.

IF IT IS NOT POSSIBLE TO CORRECTLY POSITION THE CALLIPER ON THE DISC DURING FITTING, GENTLY EXPAND THE PADS.

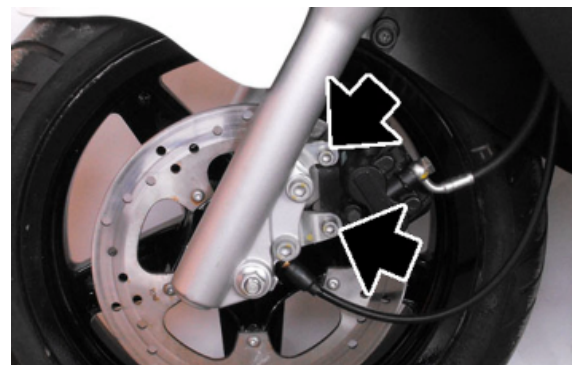
Recommended products

Loctite 243 Medium strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

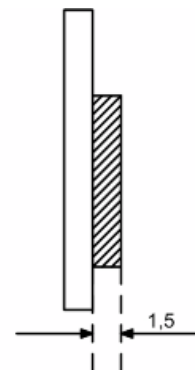
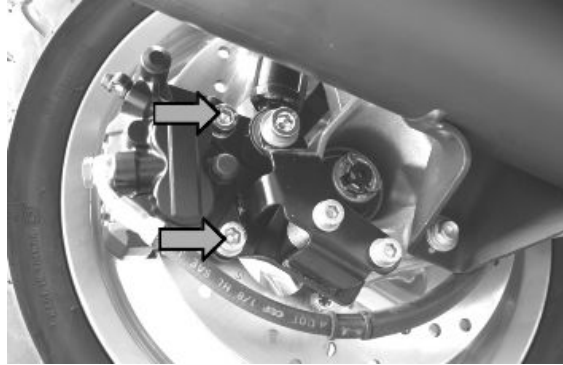
Screw tightening calliper to support 24 to 27 Pad fixing pin 19.6 ÷ 24.5



Rear brake pads

Removal

- Remove the rear brake calliper
- Loosen the two pins shown in the figure that lock the two pads; be careful with the pad spring clamp.
- Remove the brake pad and check there are no faults or warping. Replace it if such anomalies are present.
- Check the thickness of the friction material is more than 1.5 mm. If it is not, replace it
- The replacement must be made with greater residual thickness if the pad has not worn evenly. A 0.5 mm thickness difference in the residual friction material is permitted.



See also

[Rear](#)

brake calliper

Refitting

To fit, proceed as follows:

- Insert the two pads in the callipers.
- Screw the two pad lock pins to the correct torque, and apply the recommended product.
- Fit the calliper on its support, tightening the two screws to the prescribed torque.

N.B.

IF IT IS NOT POSSIBLE TO CORRECTLY POSITION THE CALLIPER ON THE DISC DURING FITTING, GENTLY EXPAND THE PADS.

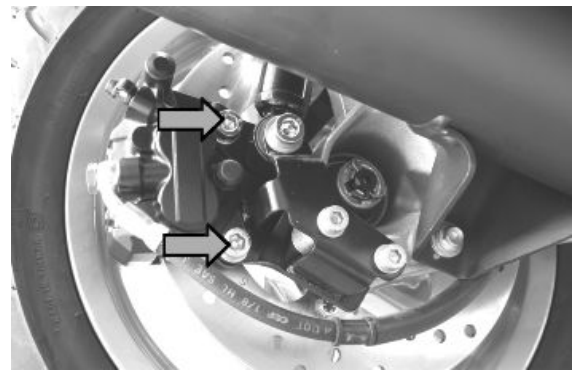
Recommended products

Loctite 243 Medium strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

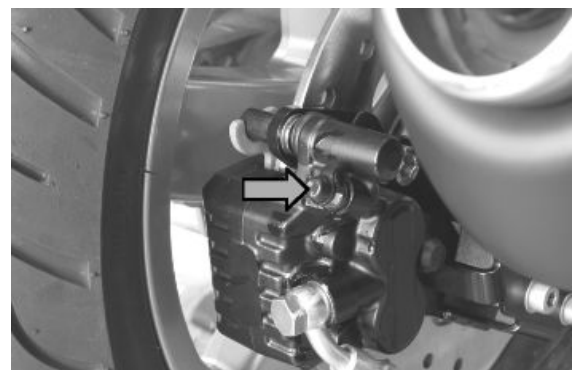
Screw tightening calliper to support 24 to 27 Pad fixing pin 19.6 ÷ 24.5



Fill

Rear - combined

- Remove the rubber cap from the bleed screw.
- Insert a rubber pipe in the bleed screw to permit the brake fluid to be recovered.
- With the brake lever, load the system and bring it up to the required pressure.
- Keeping the brake lever pulled, loosen the bleed screw to purge the air in the system. Then tighten the bleed screw



- Repeat the operation until only brake fluid comes out of the rubber pipe.
- Remove the fluid recovery pipe and refit the rubber cap over the bleed screw.
- Top up the brake fluid to the right level in the reservoir.

If necessary, bleeding can be done using a special vacuum pump

N.B.

DURING THE BLEEDING OPERATIONS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE BODYWORK SO AS NOT TO DAMAGE IT. FURTHERMORE, DURING THE BLEEDING OPERATIONS REGARDING THE BRAKE CALLIPERS, MAKE SURE THE BRAKE

FLUID DOES NOT COME INTO CONTACT WITH THE DISC BRAKES AND WITH THE BRAKE PADS. FAILURE TO OBSERVE THIS PRECAUTION WILL ENDANGER THE PROPER WORKING AND EFFICIENCY OF THE BRAKING SYSTEM

Specific tooling

020329Y Mity-Vac vacuum-operated pump

Locking torques (N*m)

System bleed calliper fitting: 12 ÷ 16 Nm

Front

- Remove the rubber cap from the bleed screw.
- Insert a rubber pipe in the bleed screw to permit the brake fluid to be recovered.
- With the brake lever, load the system and bring it up to the required pressure.
- Keeping the brake lever pulled, loosen the bleed screw to purge the air in the system. Then tighten the bleed screw



- Repeat the operation until only brake fluid comes out of the rubber pipe.
- Remove the fluid recovery pipe and refit the rubber cap over the bleed screw.
- Top up the brake fluid to the right level in the reservoir.

If necessary, bleeding can be done using a special vacuum pump

N.B.

DURING THE BLEEDING OPERATIONS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE BODYWORK SO AS NOT TO DAMAGE IT. FURTHERMORE, DURING THE BLEEDING OPERATIONS REGARDING THE BRAKE CALLIPERS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE DISC BRAKES AND WITH THE BRAKE PADS. FAILURE TO OBSERVE THIS PRECAUTION WILL ENDANGER THE PROPER WORKING AND EFFICIENCY OF THE BRAKING SYSTEM

Specific tooling

020329Y Mity-Vac vacuum-operated pump

Locking torques (N*m)

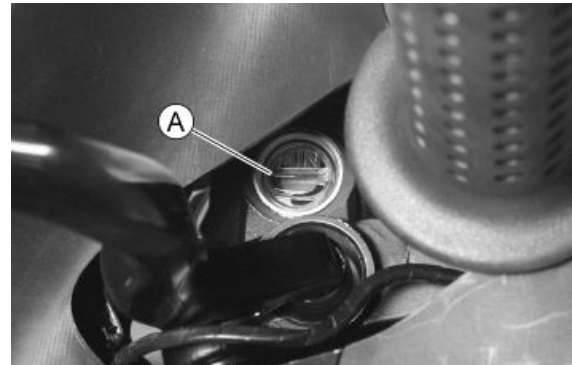
System bleed calliper fitting: 12 ÷ 16 Nm

Brake fluid level check

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

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

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



Front brake pump

Removal

- Remove the front and rear handlebar cover.
- Place a suitable container to collect the oil, disconnect the oil pipe from the calliper and operate the brake lever until no more oil comes out.



- Disconnect the oil pipe from the pump.



- Unscrew the two clamps of the U-bolt and remove the pump.



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.

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.

CAUTION

ALWAYS USE NEW COPPER WASHERS.

Locking torques (N*m)

Oil bleed screw 12 - 16 Rear brake calliper-pipe fitting 20 to 25 Rear brake pump-pipe fitting 16
- 20 Fixing screws for the handlebar control unit U-bolts 7 to 10

See also

[Front](#)

Rear brake pump - combined

Removal

- Remove the front and rear handlebar cover.
- Place a suitable container to collect the oil, disconnect the oil pipe from the calliper and operate the brake lever until no more oil comes out.



- Disconnect the oil pipe from the pump.



- Unscrew the two clamps of the U-bolt and remove the pump.



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.

WARNING

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

CAUTION

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

CAUTION

ALWAYS USE NEW COPPER WASHERS.

Locking torques (N*m)

Oil bleed screw 12 - 16 Rear brake calliper-pipe fitting 20 to 25 Rear brake pump-pipe fitting 16
- 20 Fixing screws for the handlebar control unit U-bolts 7 to 10

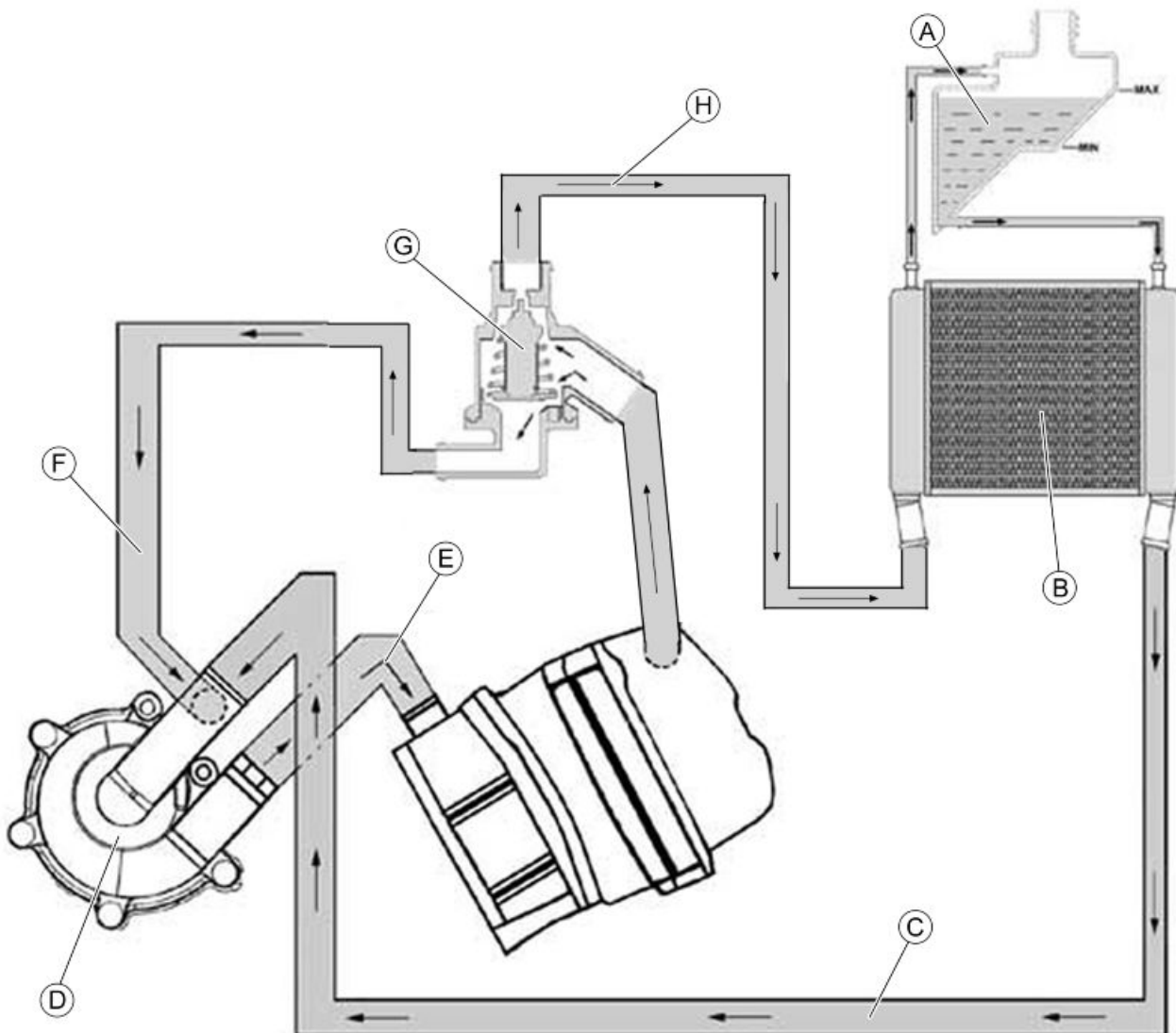
See also

[Rear - combined](#)

INDEX OF TOPICS

COOLING SYSTEM

COOL SYS

Circuit diagram
**KEY**

- A** = Expansion tank
- B** = Radiator
- C** = Radiator intake pipe
- D** = Water pump
- E** = Delivery pipe to cylinder
- F** = By-Pass pipe
- G** = Thermostat
- H** = Radiator delivery pipe

TECHNICAL SPECIFICATIONS

Specification	Desc./Quantity
Cooling system capacity:	~ 2l
Recommended fluid	AGIP PERMANENT SPEZIAL (ready for use)
Sealing pressure	Cap calibrated at 0.9 bar

THERMOSTAT

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

ELECTRIC VENTILATION

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

WATER PUMP

Specification	Desc./Quantity
Type	Centrifugal
Control	Coaxial to crankshaft

RADIATOR

Specification	Desc./Quantity
Type	Aluminium, with horizontal circulation

EXPANSION TANK

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

Electric fan check

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

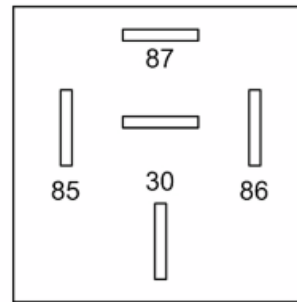
Characteristic**Battery voltage**

12V

- Check that the electric ventilation relay is working properly.



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



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

See also

[Remote controls check](#)

System bleed

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



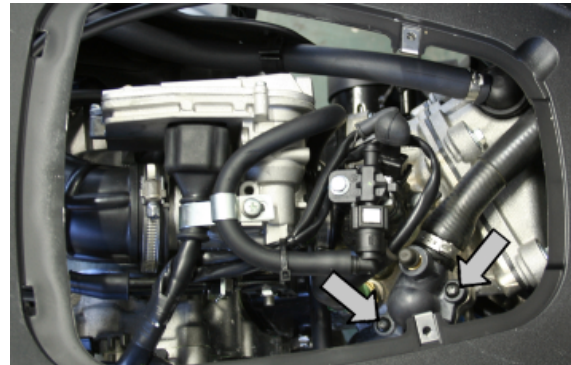
Locking torques (N*m)

Bleed screw 3

Thermostat

Removal

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



Check

- Visually check that the thermostat is not damaged.
- Prepare a metal container with approx. 1 litre of water.
- Immerse the thermostat, keeping it in the centre of the container.
- Immerse the multimeter temperature probe, near the thermostat.
- Warm up the container using the heat gun.
- Check the temperature when the thermostat starts to open:
- Warm up until the thermostat opens completely.
- Replace the thermostat if it does not work 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

Characteristic

Thermostat check: Opening start temperature

85 ÷ 1.5°C

Refitting

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

Locking torques (N*m)

Thermostat cover screws 3 to 4

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

INDEX OF TOPICS

CHASSIS

CHAS

Seat

- Lift the saddle and undo the three screws indicated.



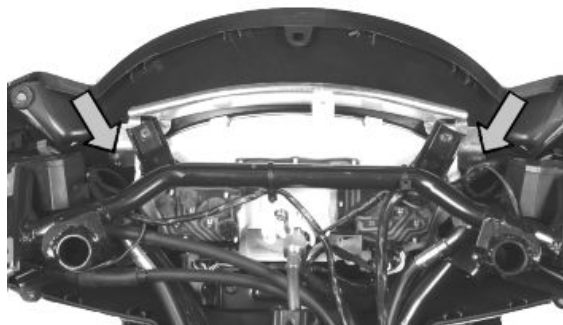
Driving mirrors

- Unscrew the lock-nut and slide off the rear-view mirror stem.

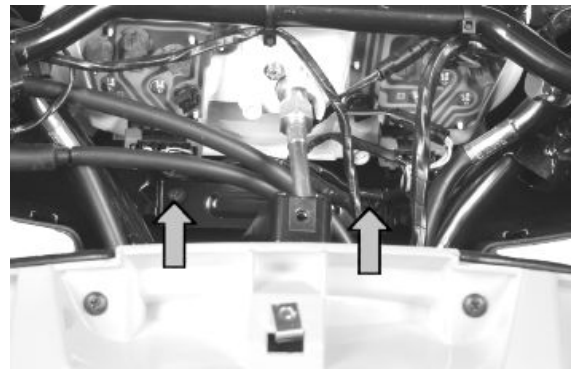


Rear handlebar cover

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

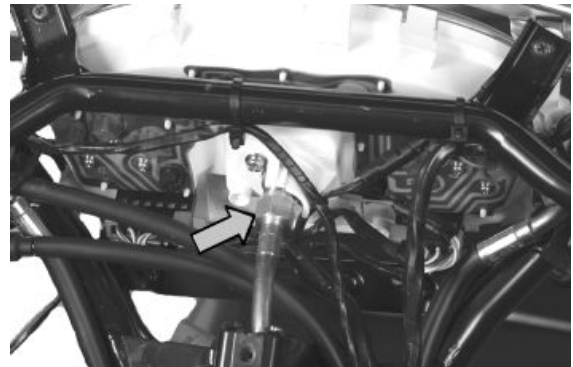


-
- Undo the two screws and disconnect the connections of the electrical controls.

**See also**[Front handlebar cover](#)

Instrument panel

- Remove the rear handlebar cover.
- Disconnect the odometer transmission cable.



-
- Undo the two screws indicated.



-
- Undo the two screws indicated and disconnect the connectors.

**See also**

[Rear handlebar cover](#)

Front handlebar cover

- Remove the windshield and the front central cover.
- Undo the screw indicated from both sides of the vehicle.



- Undo the screw indicated and remove the front handlebar cover.

**See also**

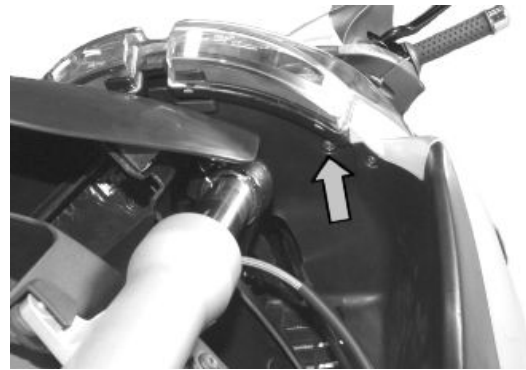
[Front central cover](#)
[Flyscreen](#)

Headlight assy.

- Remove the front central cover.
- Undo the three screws indicated.



- Undo the screw indicated in the front wheel housing on both sides.
- Disconnect the connectors from the low-beam, high-beam and turn indicators bulbs.
- Slide off the tail light rubber bulb holders.

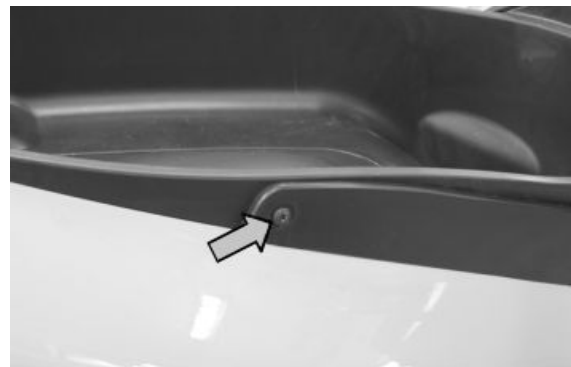


See also

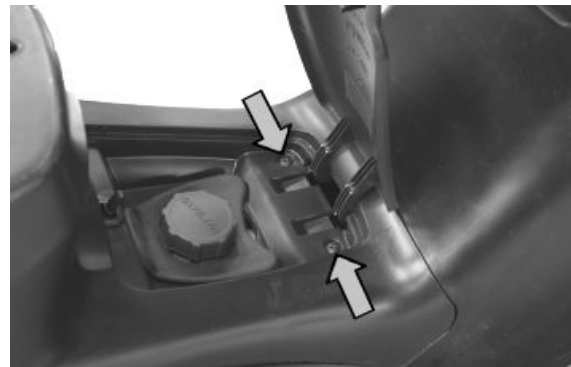
[Front central cover](#)

Frame central cover

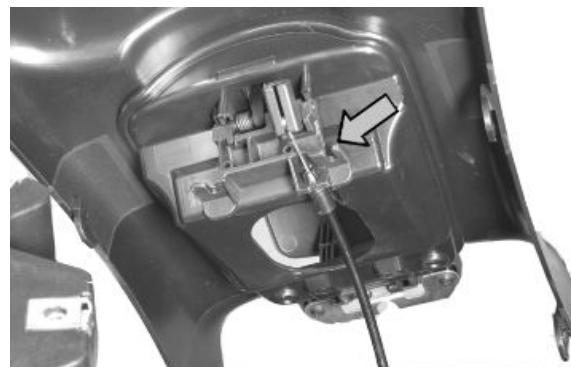
- Remove the saddle.
- Undo and remove the screw indicated from both sides of the vehicle and free the retainers.



- Unscrew the fuel tank cap.
- Undo the two screws indicated.



- Free the central cover from its retainers.
- Disconnect the fuel tank cap opening transmission.

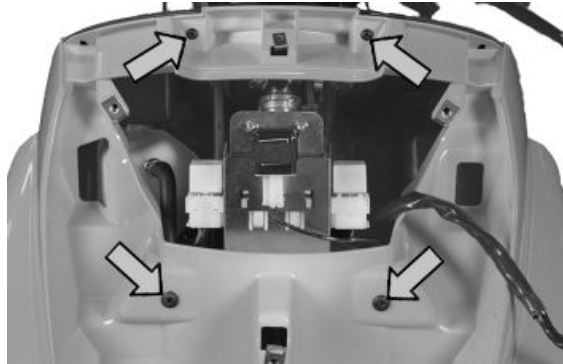


See also

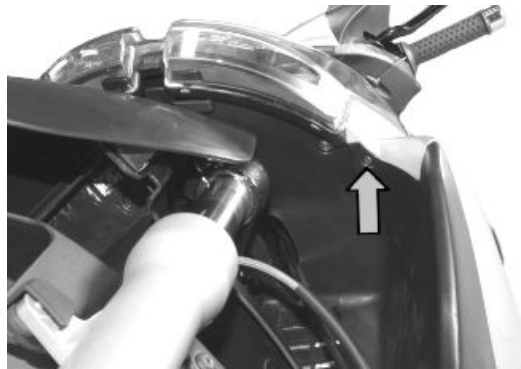
[Seat](#)

Legshield

- Remove the shield back plate.
- Remove the headlight assembly.
- Undo the four screws indicated.



- Undo the screw indicated in the front wheel housing on both sides.

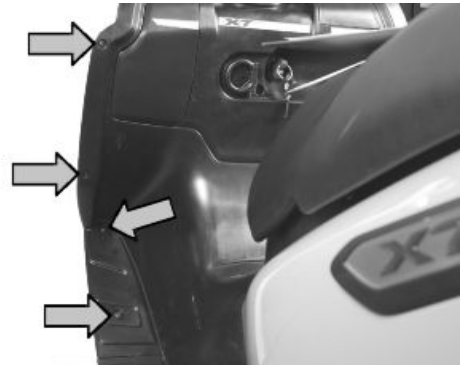


- Undo the two screws indicated on both sides of the vehicle.

**See also**[Knee-guard](#)[Headlight assy.](#)

Knee-guard

- Remove the footrest.
- Undo the four screws on both sides.



- Undo the upper screw on both sides of the vehicle.



See also

[Footrest](#)

- Undo the screw indicated.
- Remove the lid and unscrew the expansion tank cap.



- Undo the screw indicated.



See also

Footrest

- Undo the screw indicated on both sides of the vehicle.

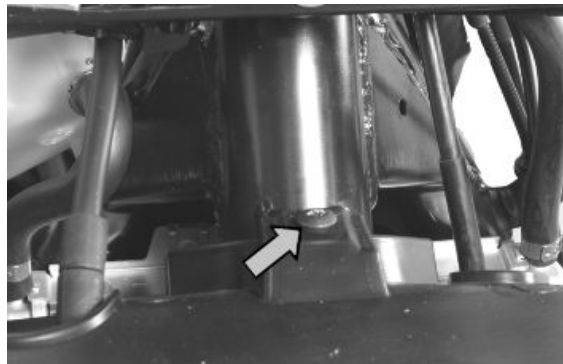


See also

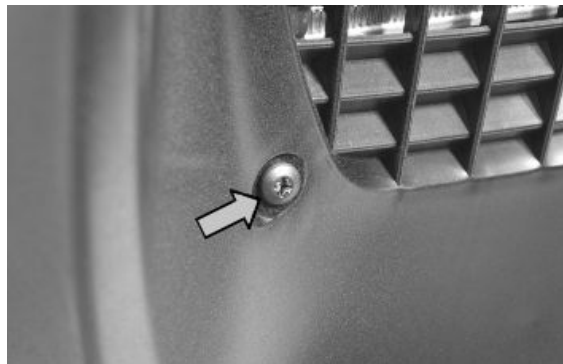
[Footrest](#)

Front wheel housing

- Remove the legshield.
- Remove the fork
- Undo the screw indicated.



- Undo the screw indicated from both sides of the vehicle.

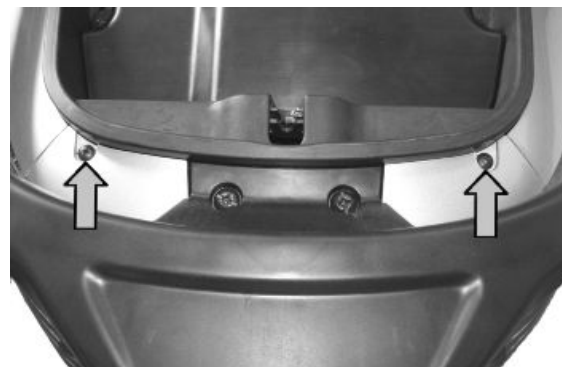


See also

[Legshield](#)

Taillight assy.

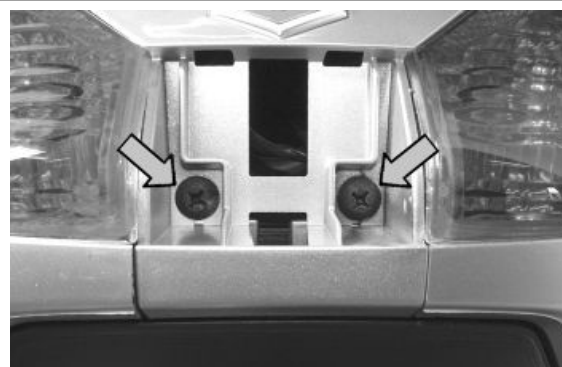
- Undo the two screws indicated.



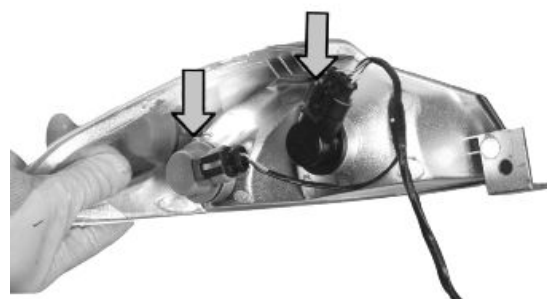
- With the aid of a flat screwdriver, remove the cover indicated.



- Undo the two screws indicated.



- Extract the light units and disconnect the bulb connectors.



License plate light

- Undo the screw indicated and slide off the rubber bulb holder.



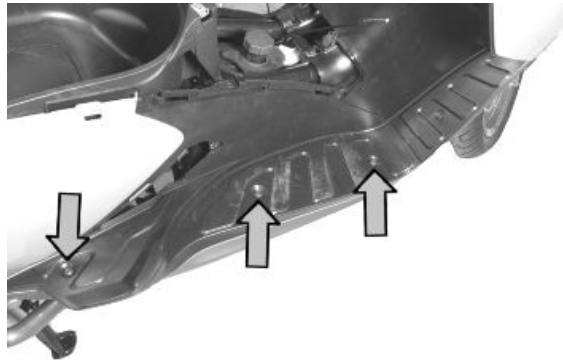
- Remove the rear light unit and disconnect the electrical connection indicated.

See also

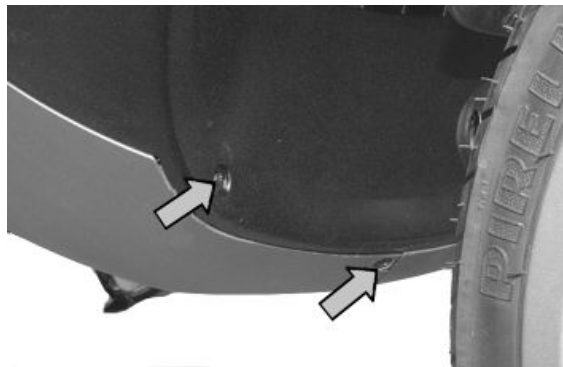
[Taillight assy.](#)

Footrest

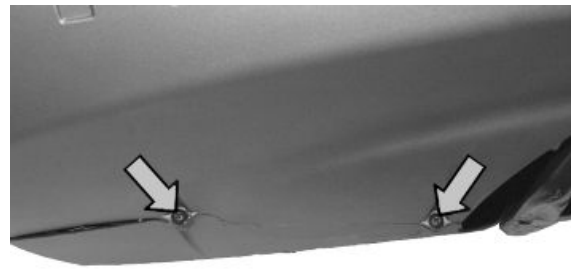
- Remove the side fairing.
- Undo the three screws indicated.



- Remove the two screws indicated in the front wheel housing.



-
- Undo the two screws indicated.

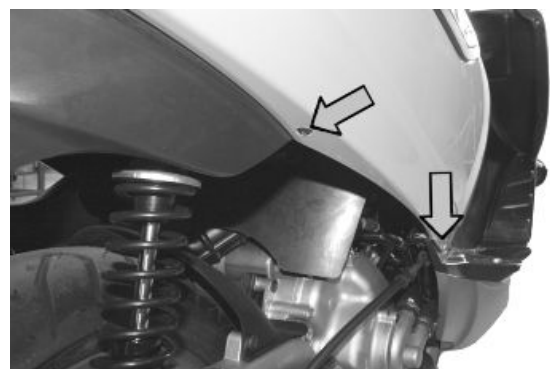
**See also**[Side fairings](#)

Side fairings

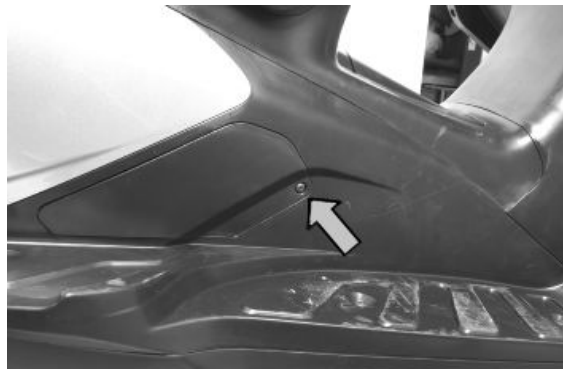
- Remove the chassis central cover.
 - Remove the rear light assembly.
 - Undo the screw indicated.
-
- Undo the four screws indicated and remove the passenger grab handles.



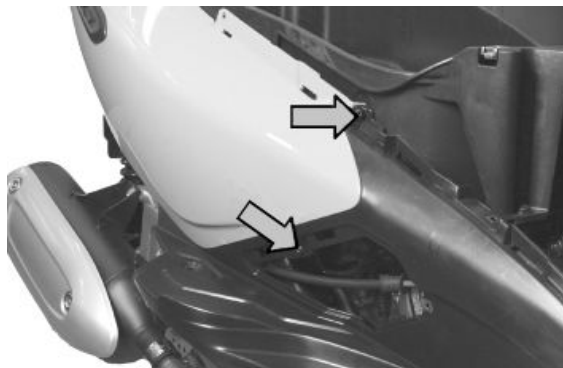
-
- Undo the two screws indicated.



-
- Undo the screw indicated and remove the inspection door.



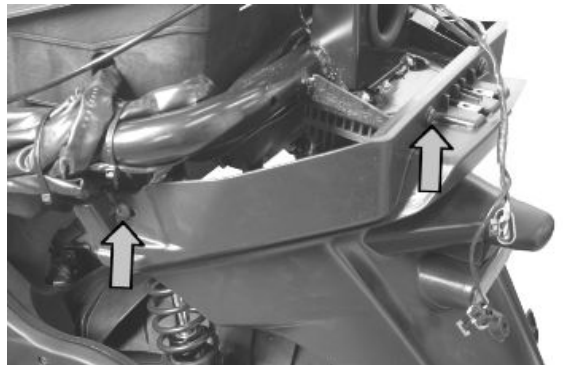
-
- Undo the two screws indicated.

**See also**

[Frame central cover](#)
[Taillight assy.](#)

License plate holder

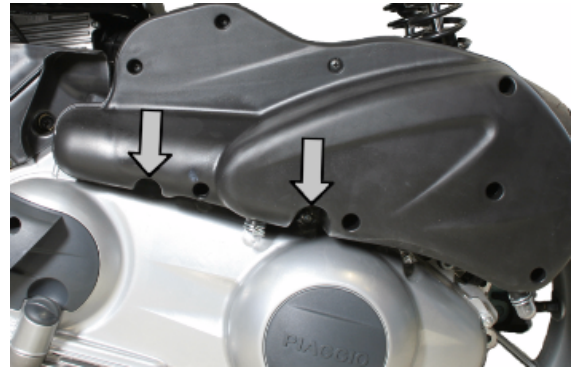
-
- Remove the side fairings.
 - Undo the two screws indicated on both sides of the vehicle.
 - Disconnect the license plate light connection.

**See also**

[Side fairings](#)

Air filter

- Undo the two screws indicated.

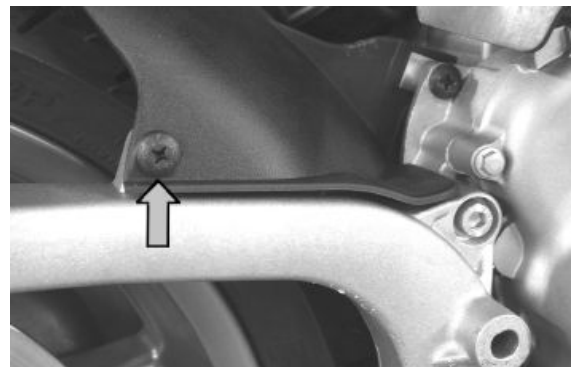


- Loosen the tightening screw of the throttle body sleeve to the filter.

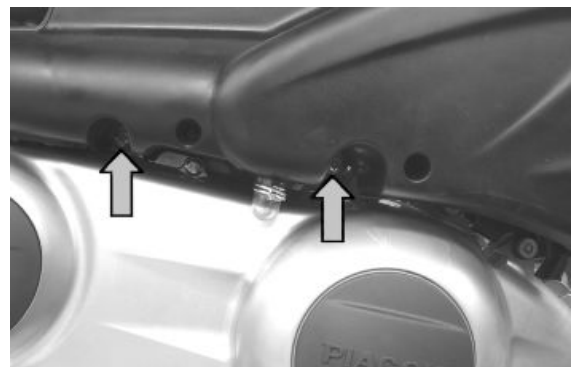


Rear mudguard

- From the right side of the vehicle, undo the screw indicated.



- Undo the two screws indicated from the right side and collect the washers.
- Remove the rear mudguard.



Helmet bay

- Remove the chassis central cover.
- Remove the side fairings.
- Remove the battery and disconnect the fuses box from the helmet compartment.
- Disconnect the fuel port opening cable from the lever on the helmet compartment.
- Undo the three screws indicated on both sides of the vehicle.
- Release the wiring from the helmet compartment.



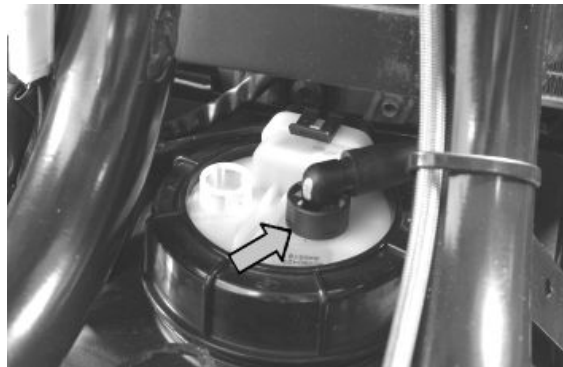
See also

[Side fairings](#)

[Frame central cover](#)

Fuel tank

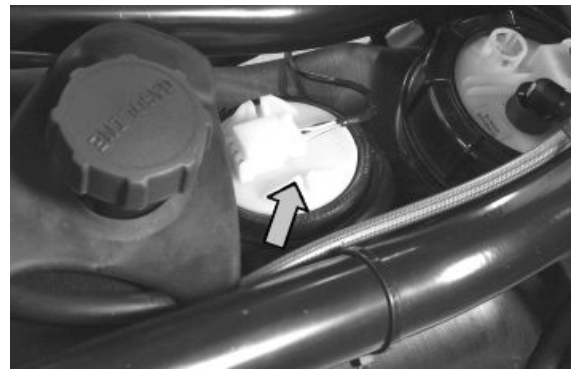
- Remove the footrests.
- Disconnect the fuel delivery pipe.



- Disconnect the power connector from the fuel pump.



- Disconnect the connector of the probe checking fuel level.



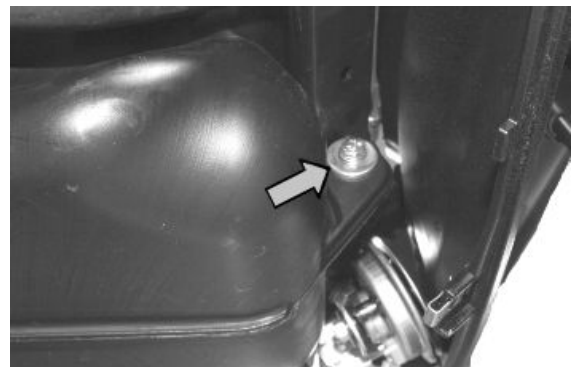
- Undo the screw indicated.



- Undo the screw indicated, placed under the vehicle at the back of the tank.



- Undo the screw indicated, placed under the vehicle at the front of the tank.



See also

[Footrest](#)

Front mudguard

- Undo the rear and front screws by working inside the mudguard.
- Slide up the entire mudguard.



Radiator fan

- Remove the wheel housing.
- Disconnect the connector of the electric fan.
- Get a container of suitable capacity and disconnect the feeding and return cooling circuit pipes.



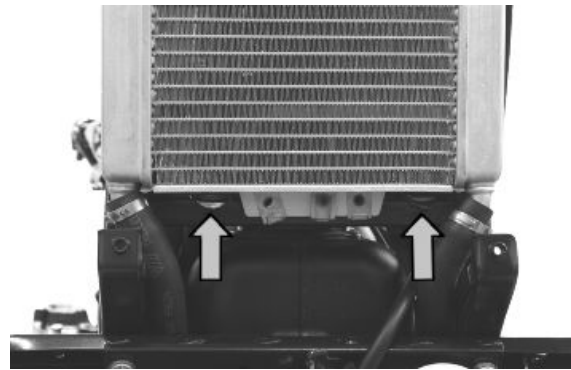
- Disconnect the feeding and return pipes from the expansion tank.



- Undo the fixing screw to the chassis.



- Disconnect the radiator together with the electric fan from the chassis retainers.
- Once the radiator is removed, undo the three fixing screws to remove the electric fan.

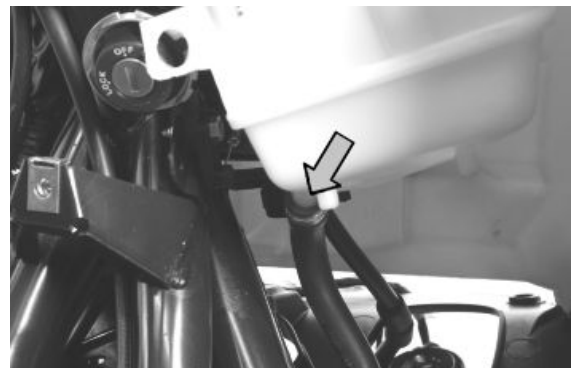


Expansion tank

- Remove the shield back plate.
- Disconnect the circuit de-aeration pipe.



- Disconnect the circuit refill pipe.



See also

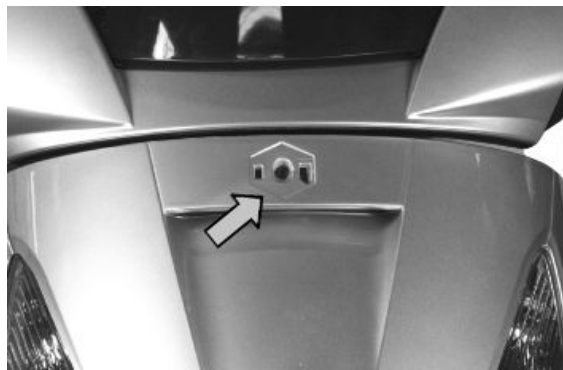
[Knee-guard](#)

Front central cover

- Undo the screw indicated from both sides of the vehicle.



- Remove the PIAGGIO clip-on badge and undo the screw indicated.



Flyscreen

- Remove both rear-view mirrors.
- Undo both rear-view mirrors supports.



- Undo the screws indicated on both sides of the handlebar and remove the front frame.



- Undo the four screws indicated and remove the windshield.



See also

[Driving mirrors](#)

INDEX OF TOPICS

PRE-DELIVERY

PRE DE

Carry out the listed tests before delivering the vehicle.

Warning - Handle fuel with care.

Aesthetic inspection

Appearance check:

- Paintwork
 - Fitting of plastics
 - Scratches
 - Dirt
-

Tightening torques inspection

- Check visually that the following clamps are marked in yellow:

FRONT SUSPENSION

- Front wheel pin nut
- Screw fixing wheel pin on right fork leg

FRONT BRAKE

- Screws fixing front brake callipers to forks
- Brake pipes to front brake callipers couplings

REAR SUSPENSION

- Shock absorbers lower fixing screw
- Shock absorbers upper fixing screw

REAR BRAKE

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

SWINGING ARM

- Swinging arm to engine pin locknut

STAND

- Central stand bolt nuts
 - Screw fixing muffler to muffler supporting arm
-

Electrical system

- Battery
 - Main switch
 - Lights: high-beam lights, low-beam lights, taillights (front and rear) and relevant warning lights
 - Headlight adjustment according to the regulations currently in force
-

- Front and rear stop light buttons and bulb
- Turn indicators and their warning lights
- Instrument lighting
- instruments: fuel and temperature indicator
- Instrument panel lights
- Horn
- Electrical start up
- Engine stopping with emergency stop switch

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.

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

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

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

THE BATTERIES PRODUCE EXPLOSIVE GAS; KEEP THEM AWAY FROM NAKED FLAMES, SPARKS AND CIGARETTES. VENTILATE THE AREA WHEN RECHARGING INDOORS.

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

CAUTION

NEVER USE FUSES WITH A CAPACITY HIGHER THAN THAT RECOMMENDED. USING A FUSE OF UNSUITABLE RATING MAY SERIOUSLY DAMAGE THE VEHICLE OR EVEN CAUSE A FIRE.

Levels check

Level check:

- Hydraulic brake system liquid level.
- Rear hub oil level
- Engine coolant level
- Engine oil level

Road test

Test ride

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

- Abnormal noise

Static test

Static control after the test ride:

- Hot engine restart
- Minimum seal (turning the handlebar)
- Uniform steering rotation
- Possible losses
- electric radiator fan operation

CAUTION

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

CAUTION

NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES OR TYRES MAY BURST.

Functional inspection

Functional Checks:

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

INDEX OF TOPICS

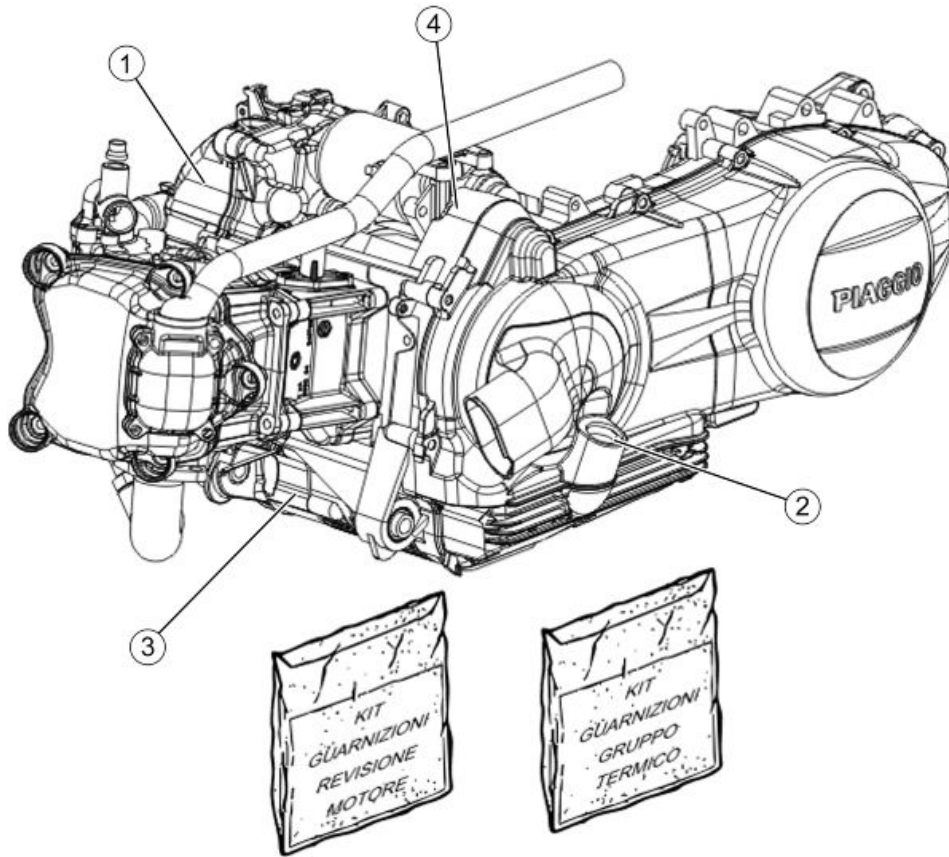
TIME

TIME

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

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

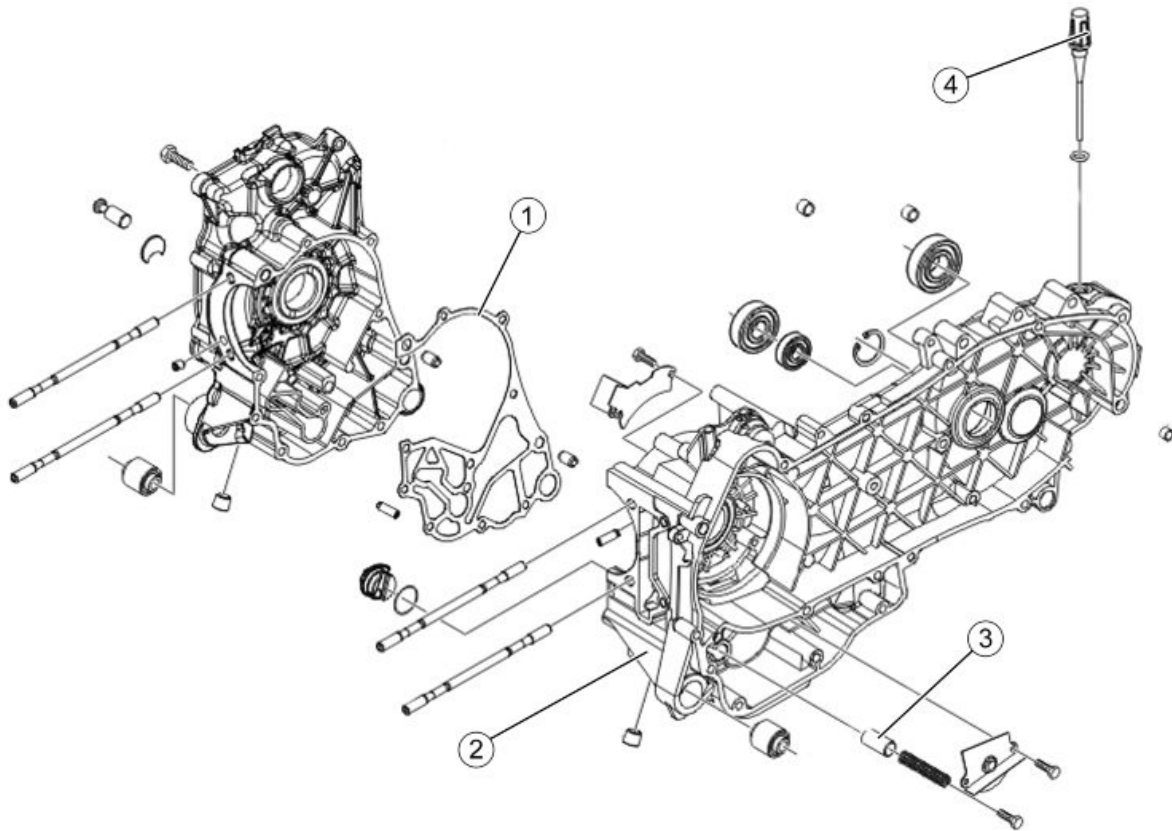
Engine



ENGINE

	Code	Action	Duration
1	001001	Engine from chassis - Removal and refit.	
2	003064	Engine oil - change	
3	001127	Engine - Complete service	
4	003057	Engine retainer - Tighten nuts	

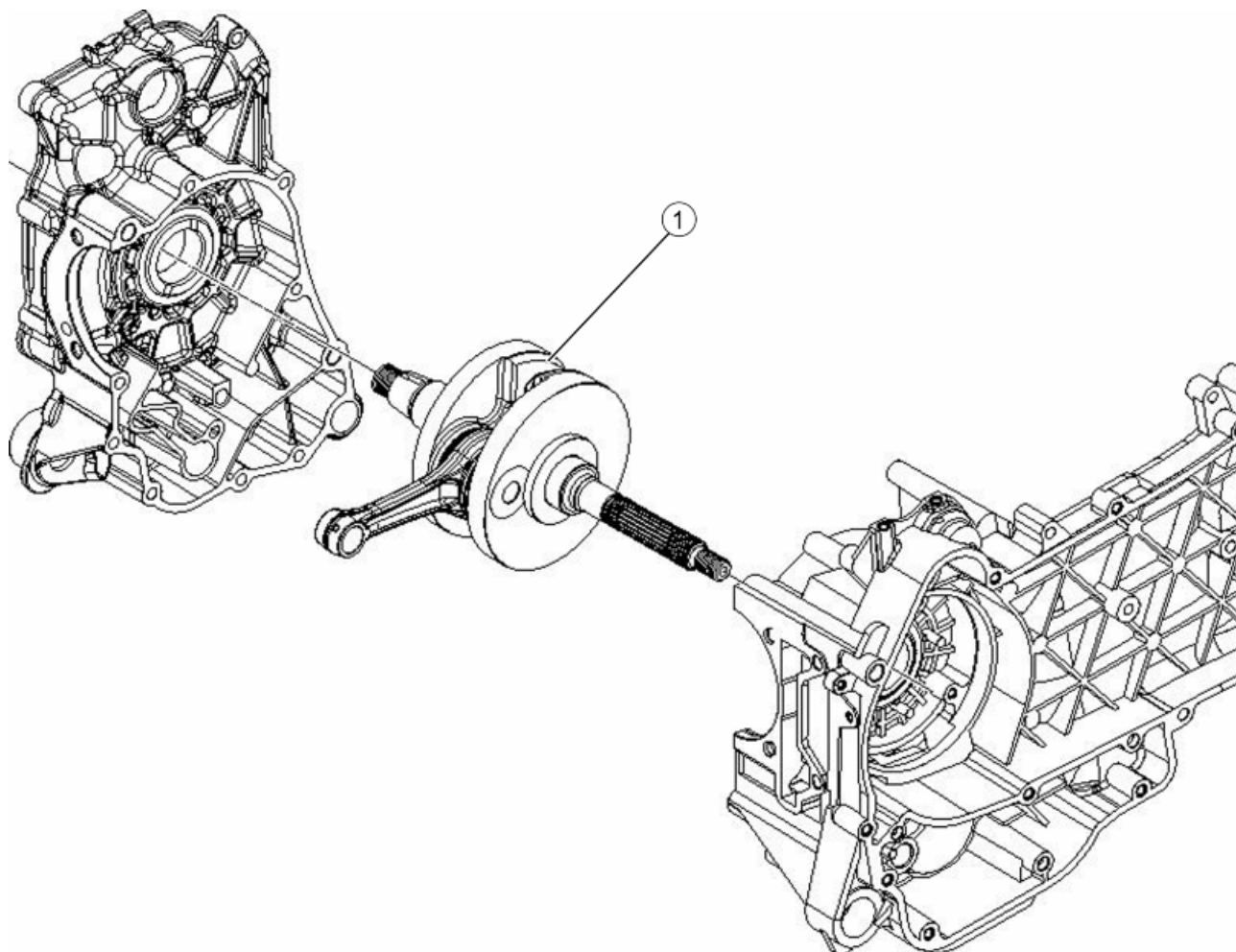
Crankcase



CRANKCASE

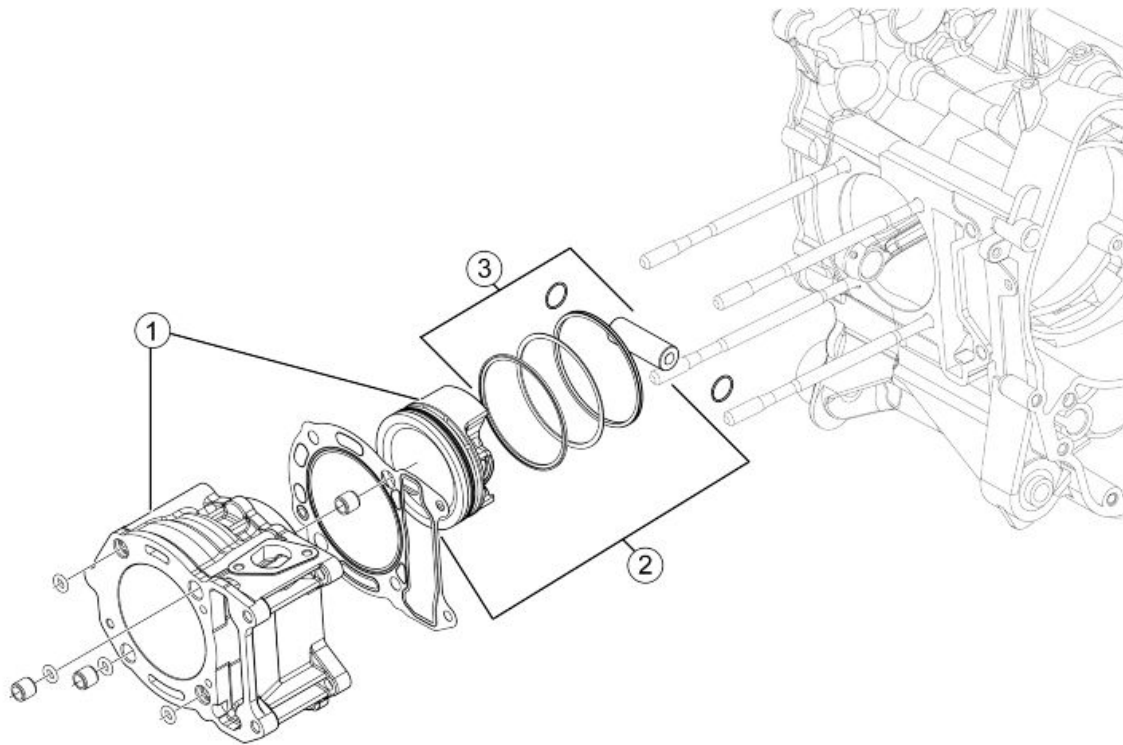
	Code	Action	Duration
1	001153	Crankcase halves gasket - Replacement	
2	001133	Engine crankcase - Replacement	
3	001124	Lubrication by pass - Replacement	
4	002028	Rear wheel hub - Replacement	

Crankshaft



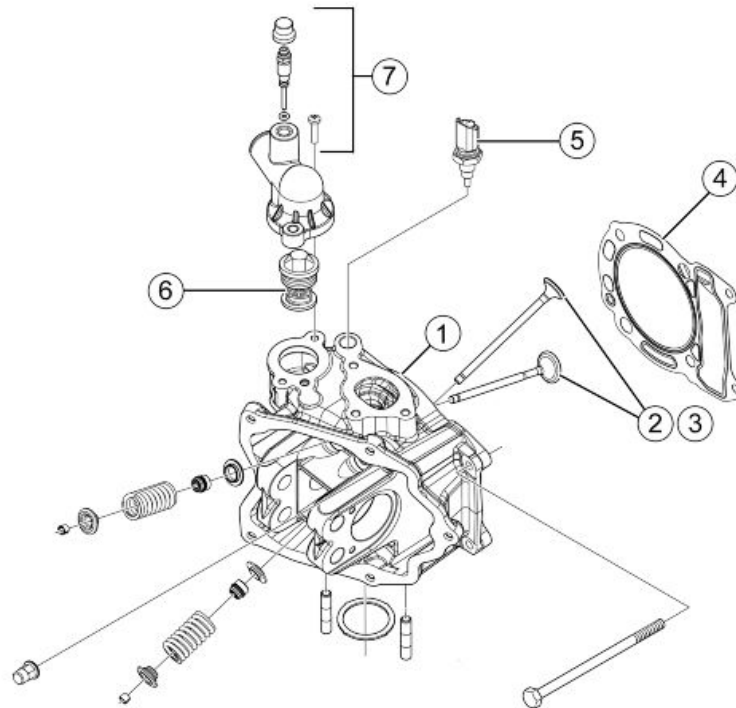
CRANKSHAFT

	Code	Action	Duration
1	001117	Crankshaft - Replacement	

Cylinder assy.**CYLINDER - PISTON**

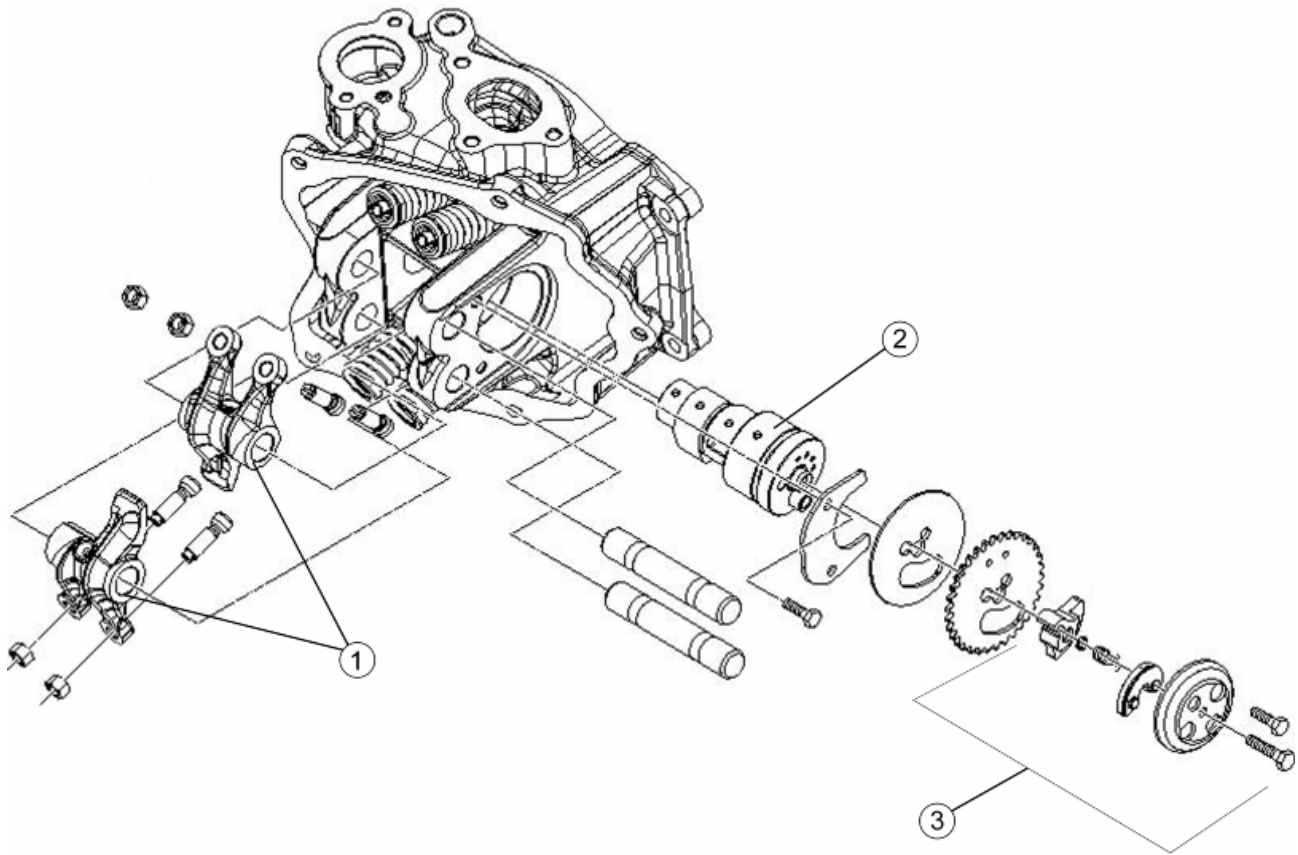
	Code	Action	Duration
1	001002	Cylinder / Piston - Replacement	
2	001154	Pistonsrings-pin assembly - Service	
3	001176	Rings / Pin - Replacement	

Cylinder head assy.

**VALVE HEAD**

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

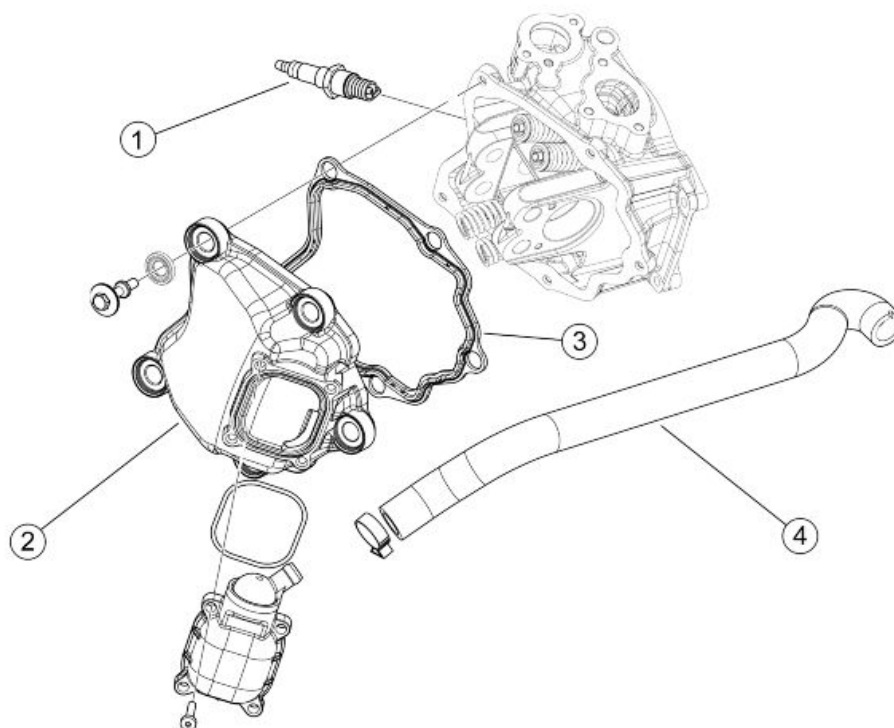
Rocker arms support assy.



CAMSHAFT

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

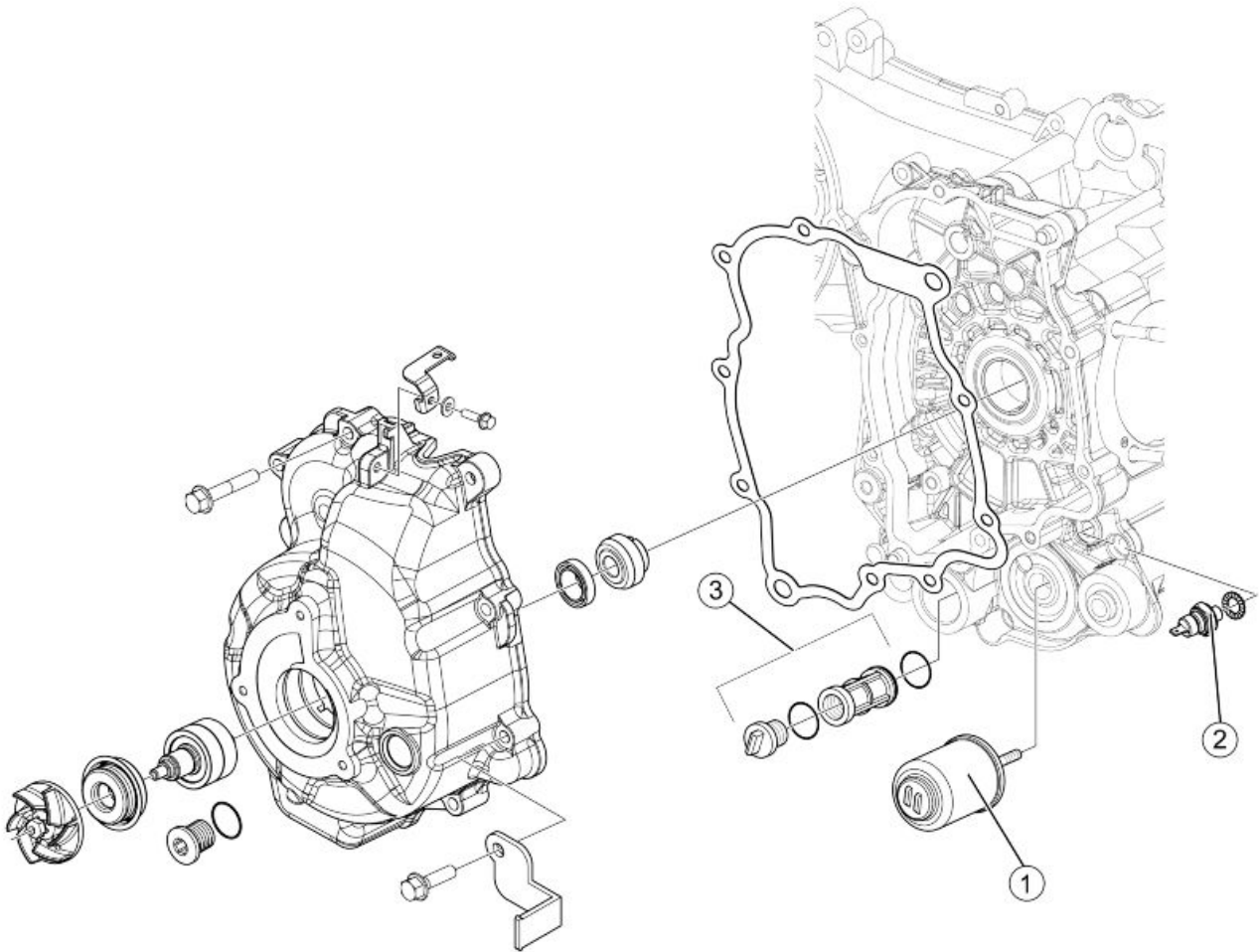
Cylinder head cover



HEAD COVER

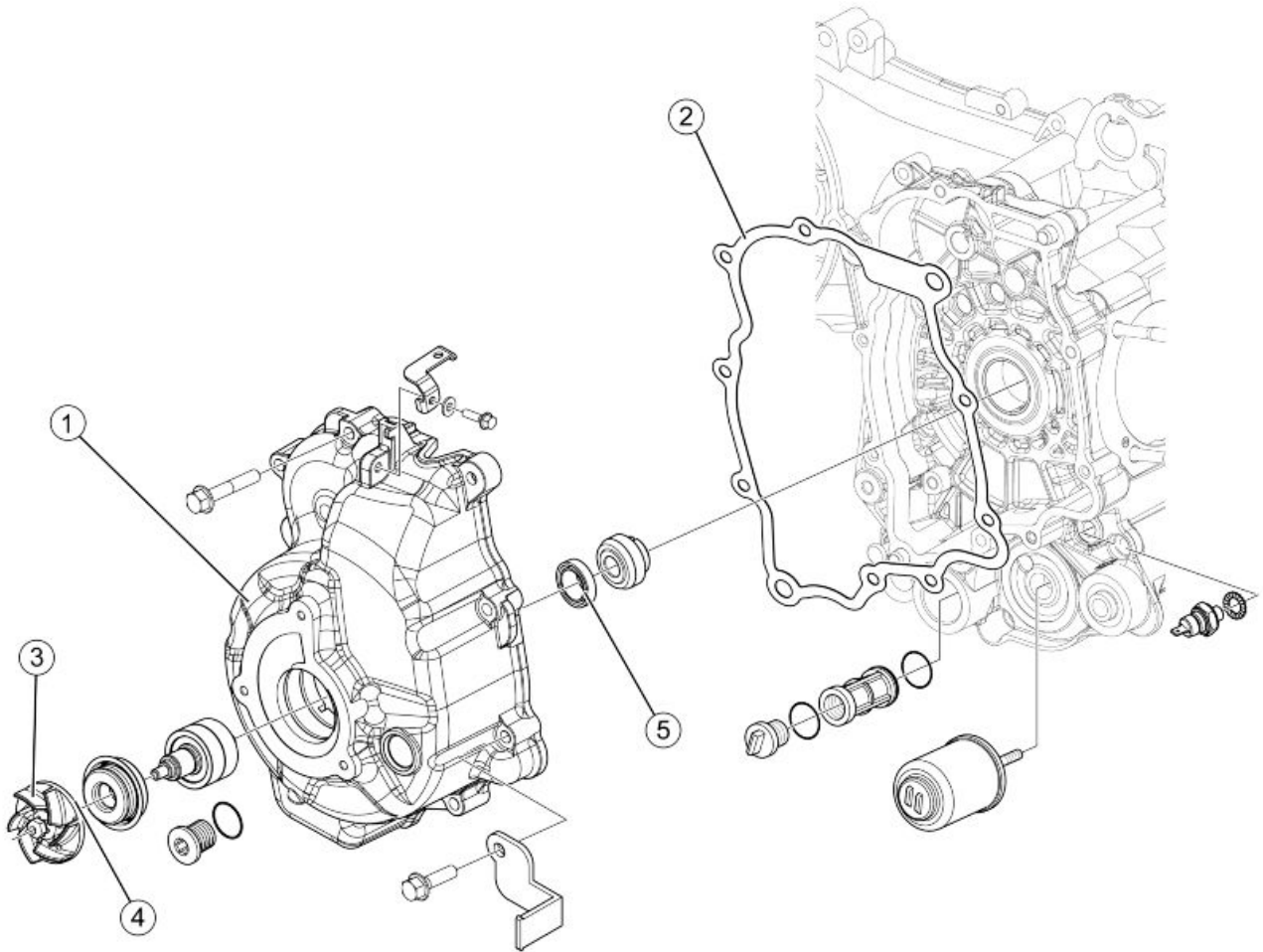
	Code	Action	Duration
1	001093	Spark plug - Replacement	
2	001089	Head cover - Replacement	
3	001088	Head cover gasket - Replacement	
4	001074	Oil vapour recovery pipe - Replacement	

Oil filter

**OIL FILTER**

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

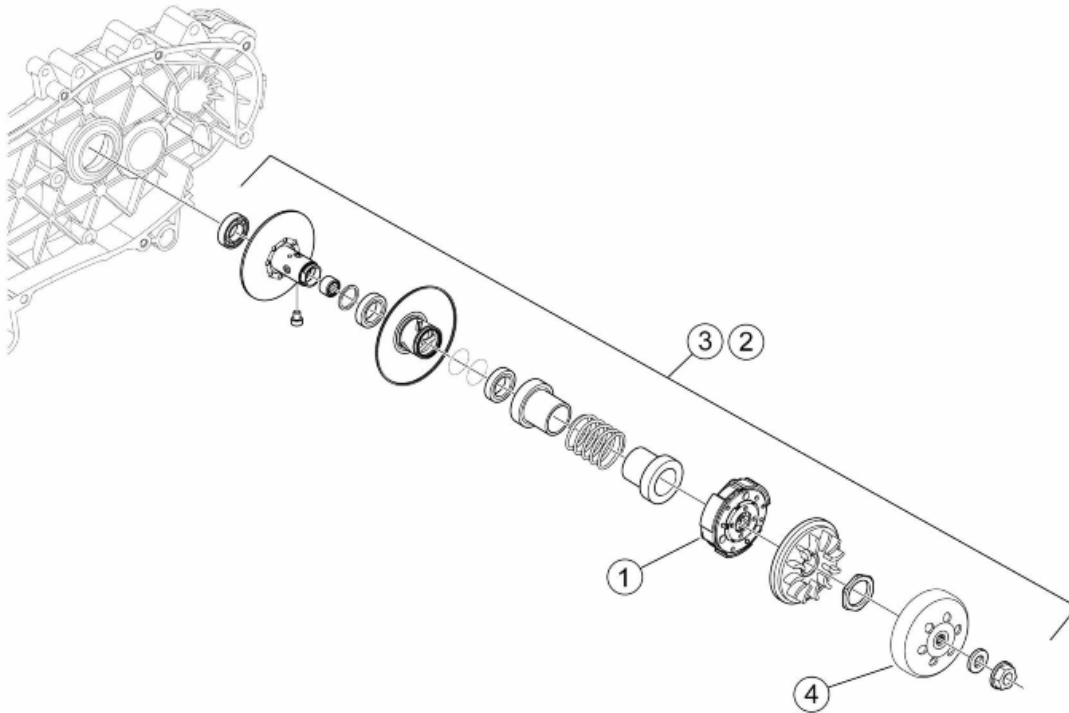
Flywheel cover



FLYWHEEL COVER

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

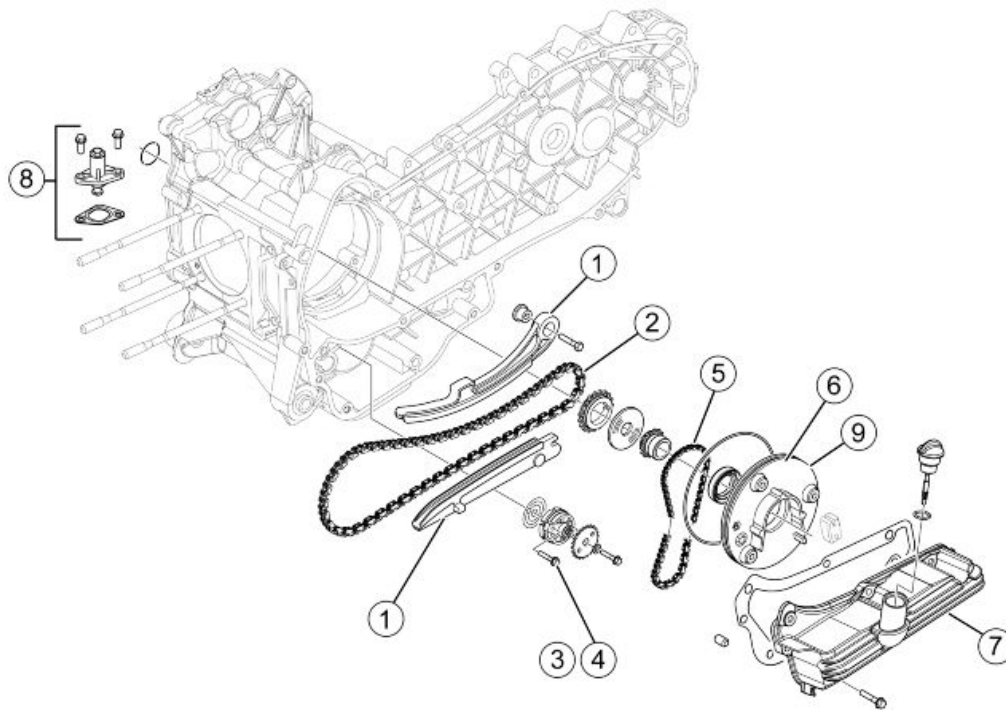
Driven pulley



DRIVEN PULLEY

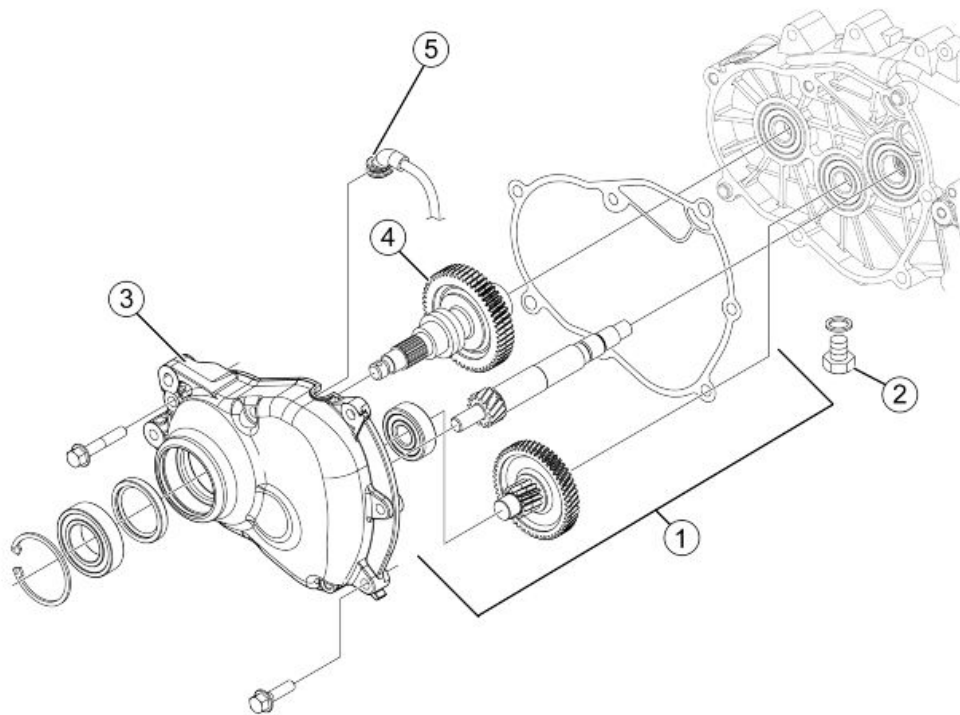
	Code	Action	Duration
1	001022	Clutch - Replacement	
2	001012	Driven pulley - overhaul	
3	001110	Driven pulley- Replacement	
4	001155	Clutch bell - Replacement	

Oil pump



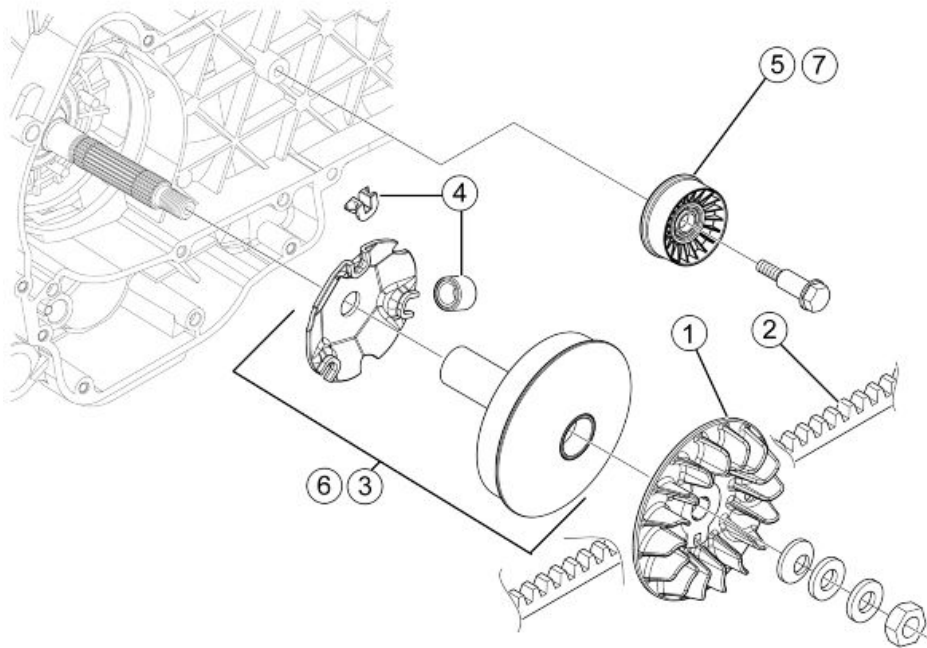
OIL PUMP

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

Final gear assy.**FINAL REDUCTION GEAR**

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

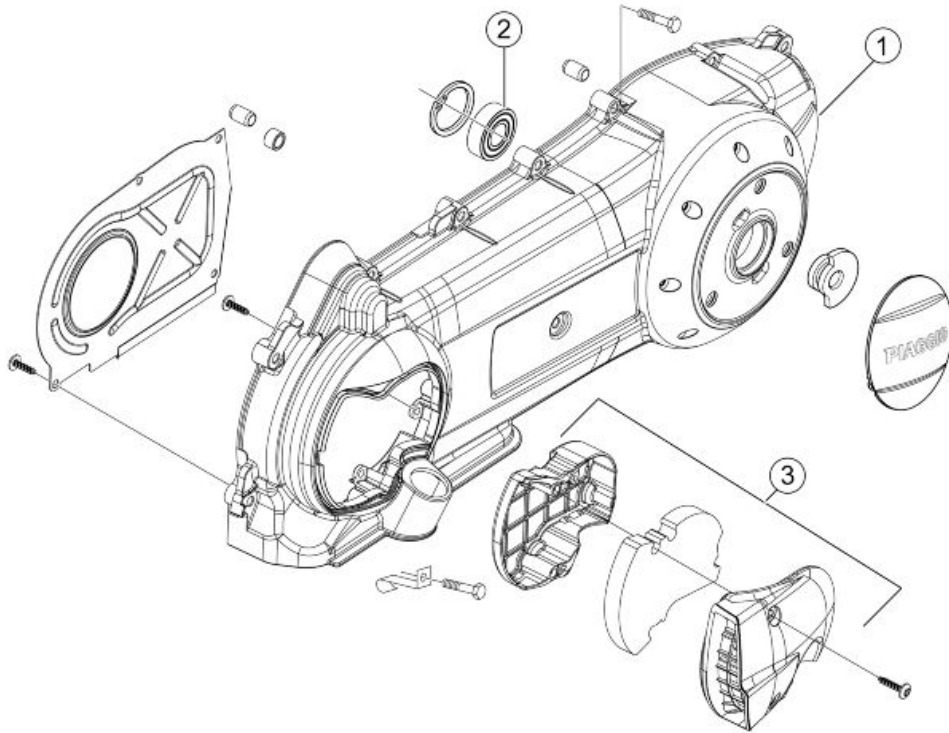
Driving pulley



DRIVING PULLEY

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

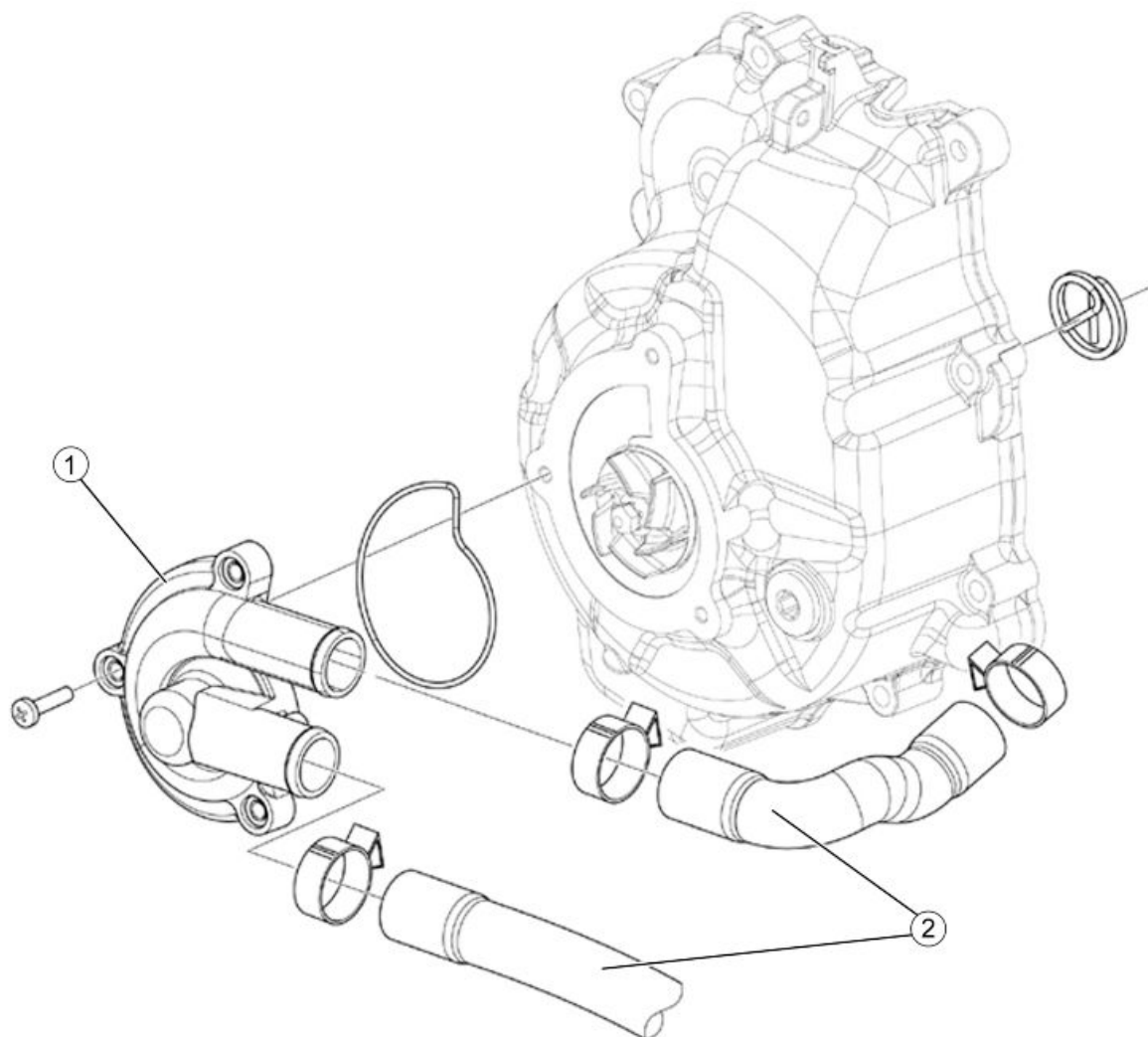
Transmission cover



TRANSMISSION COVER

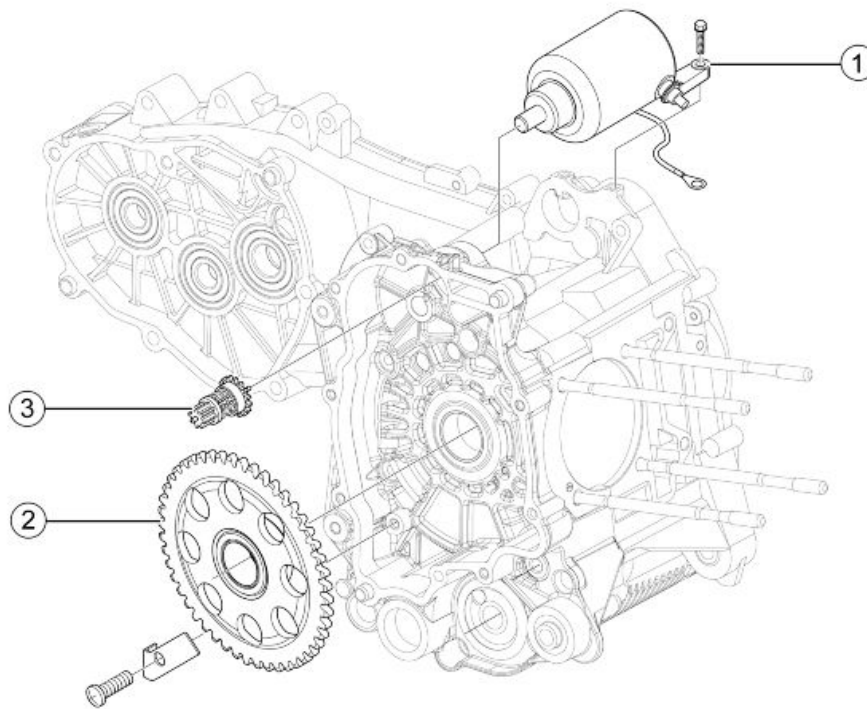
	Code	Action	Duration
1	001096	Transmission crankcase cover - Replacement	
2	001135	Transmission cover bearing - Replacement	
3	001170	Air deflector - Replacement	

Water pump



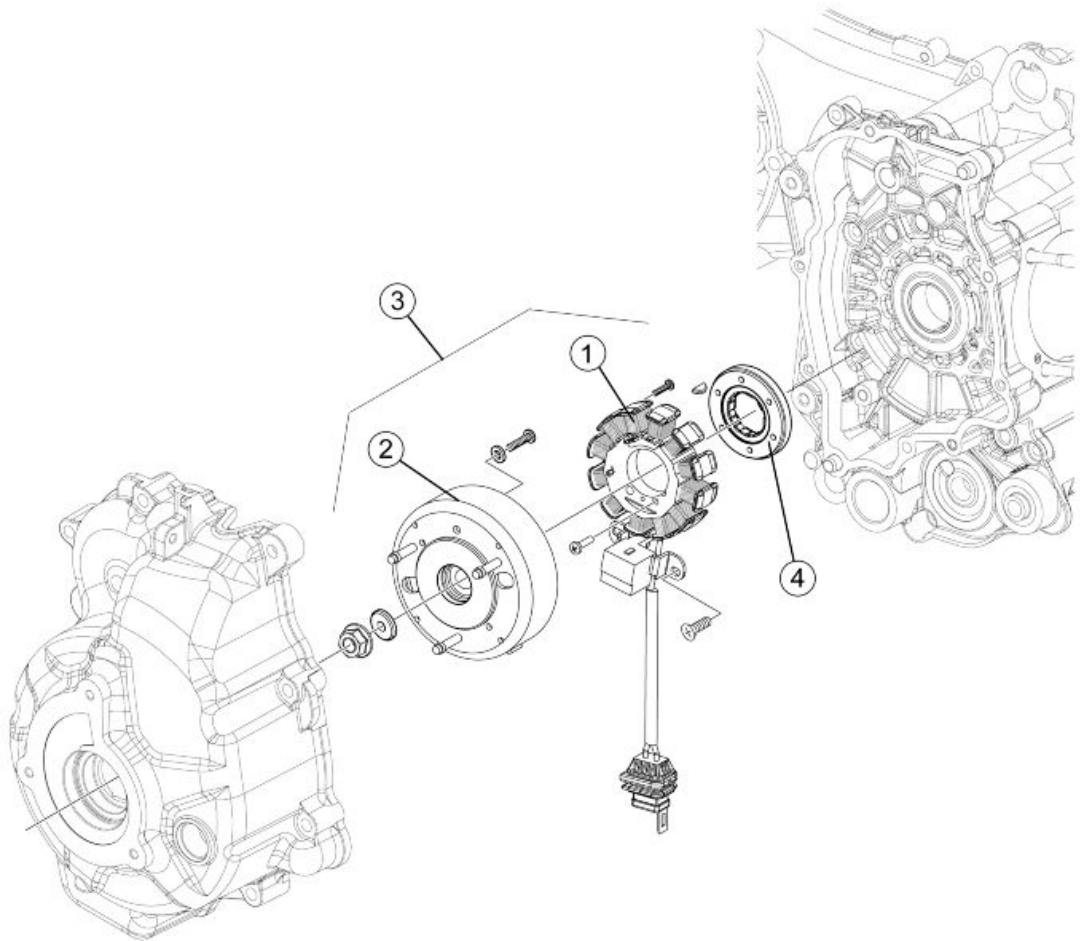
WATER PUMP

	Code	Action	Duration
1	007017	Water pump cover - Replacement	
2	007003	Coolant delivery and return pipe - change	

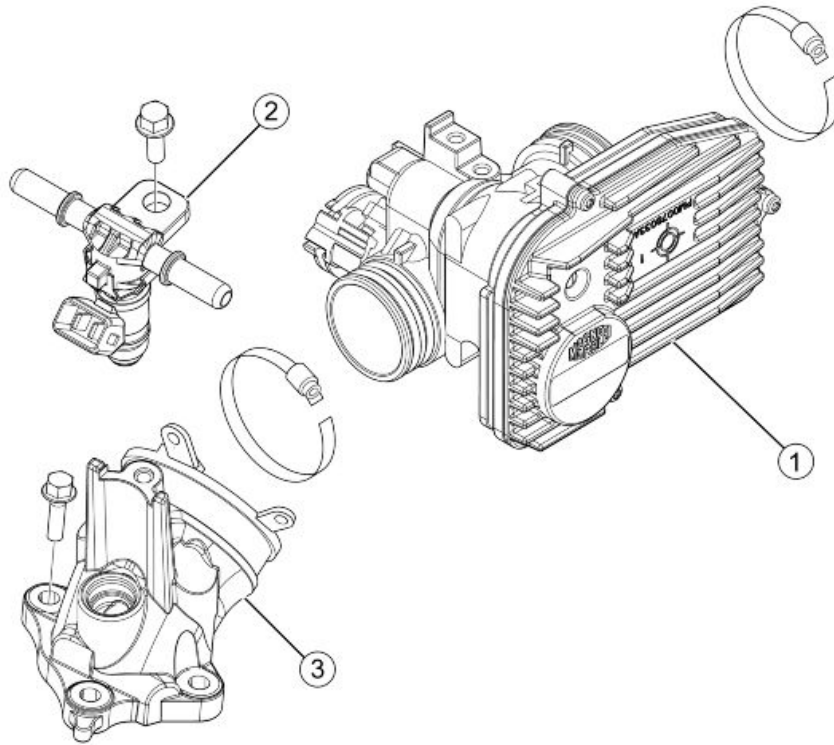
Starter motor**ELECTRICAL START-UP**

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

Flywheel magneto

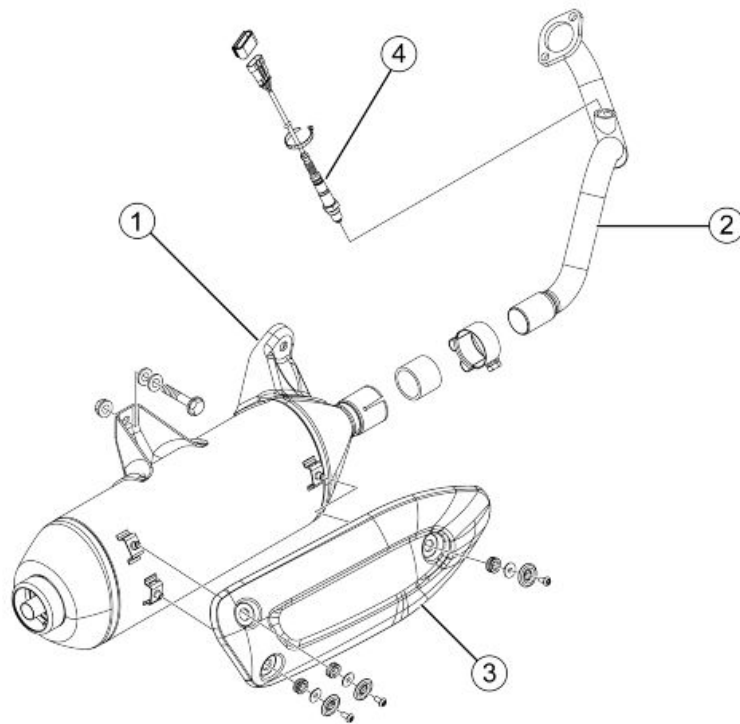
**MAGNETO FLYWHEEL**

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

Butterfly valve**THROTTLE BODY**

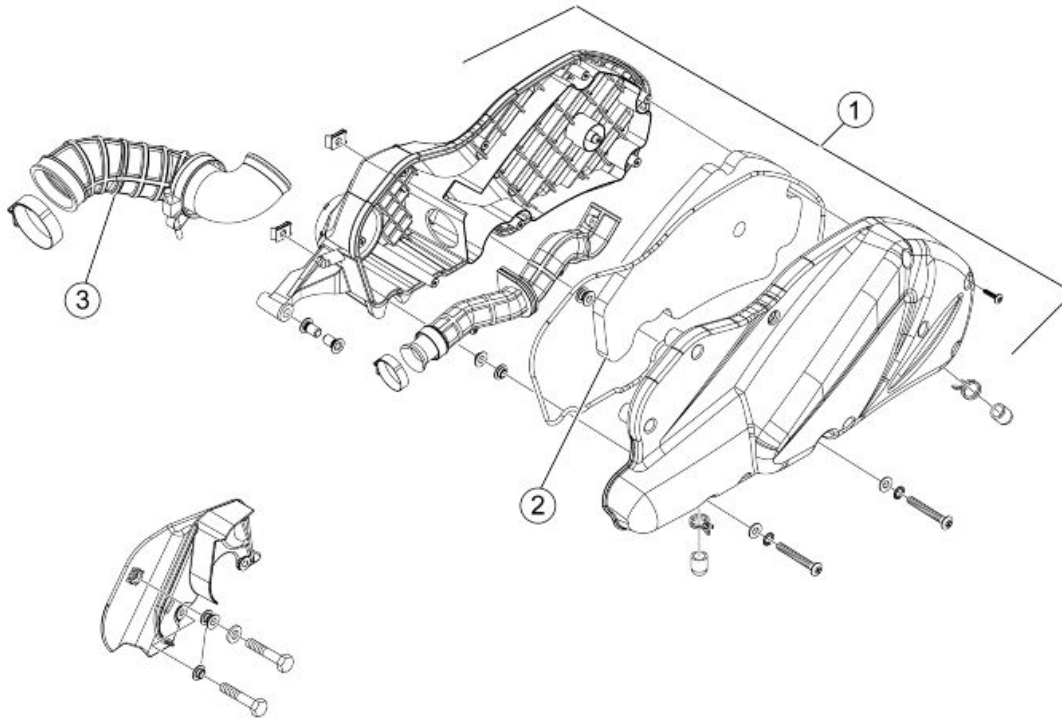
	Code	Action	Duration
1	001166	Throttle body - Replacement	
2	001047	Injector - Replacement	
3	001013	Intake manifold - change	

Exhaust pipe

**MUFFLER**

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

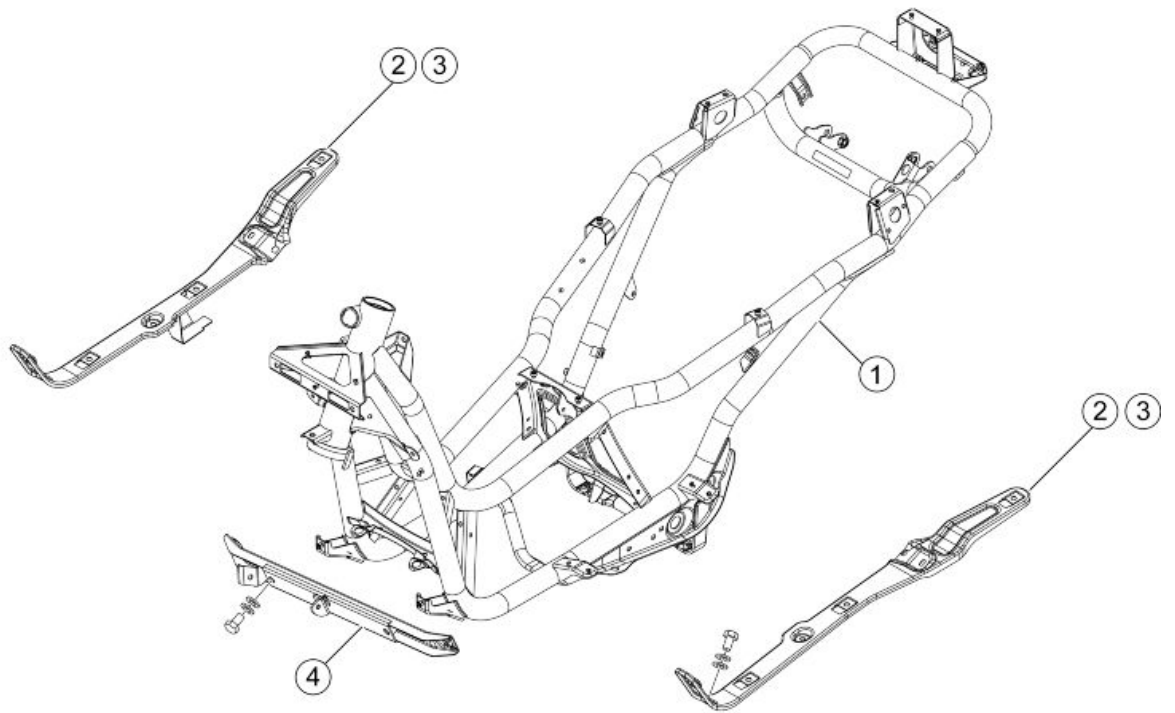
Air cleaner



AIR CLEANER

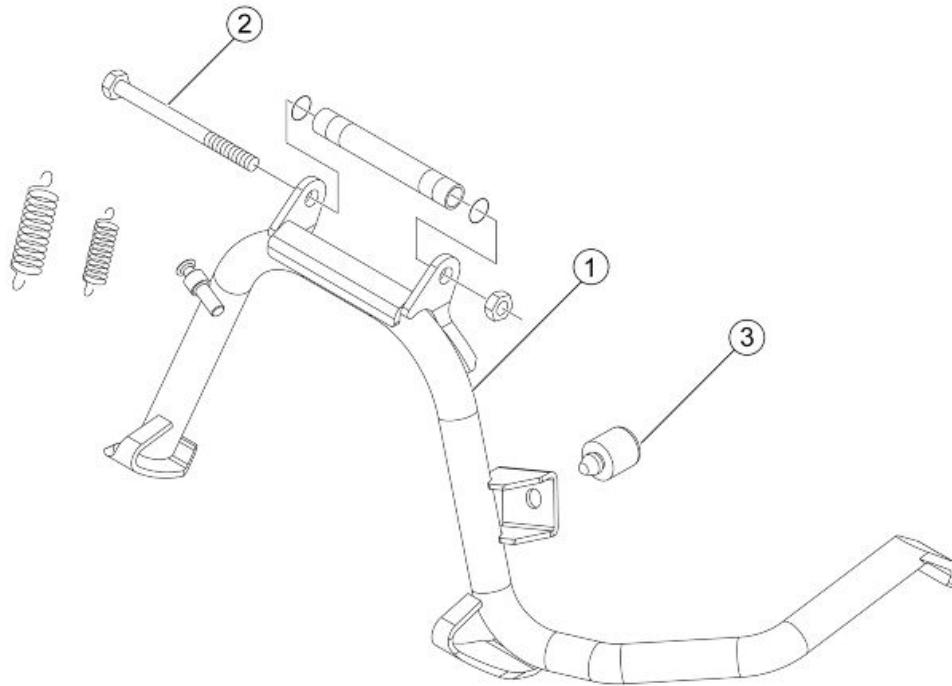
	Code	Action	Duration
1	001015	Air filter box - Replacement	
2	001014	Air filter - Replacement / cleaning	
3	004122	Air cleaner/ carburettor union - Replacement	

Frame



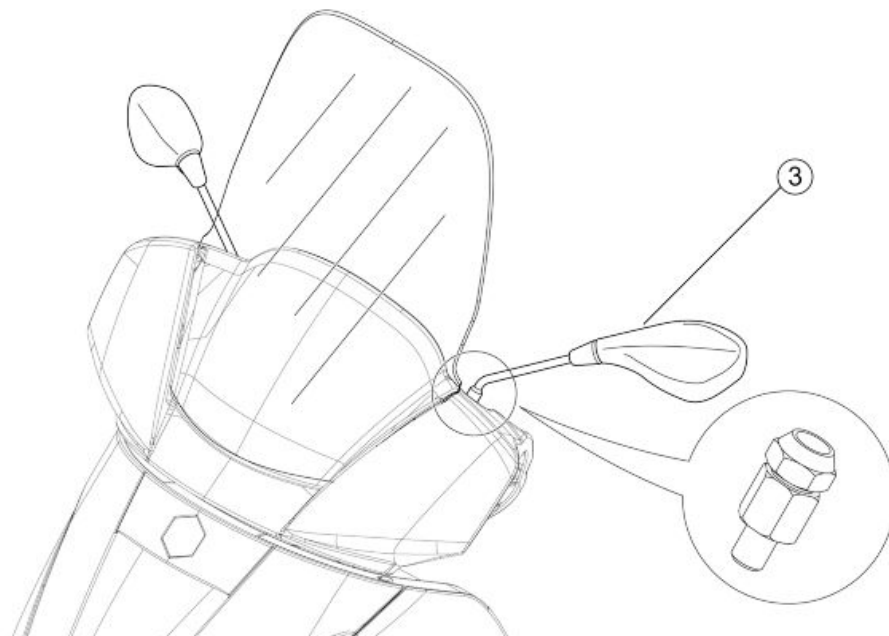
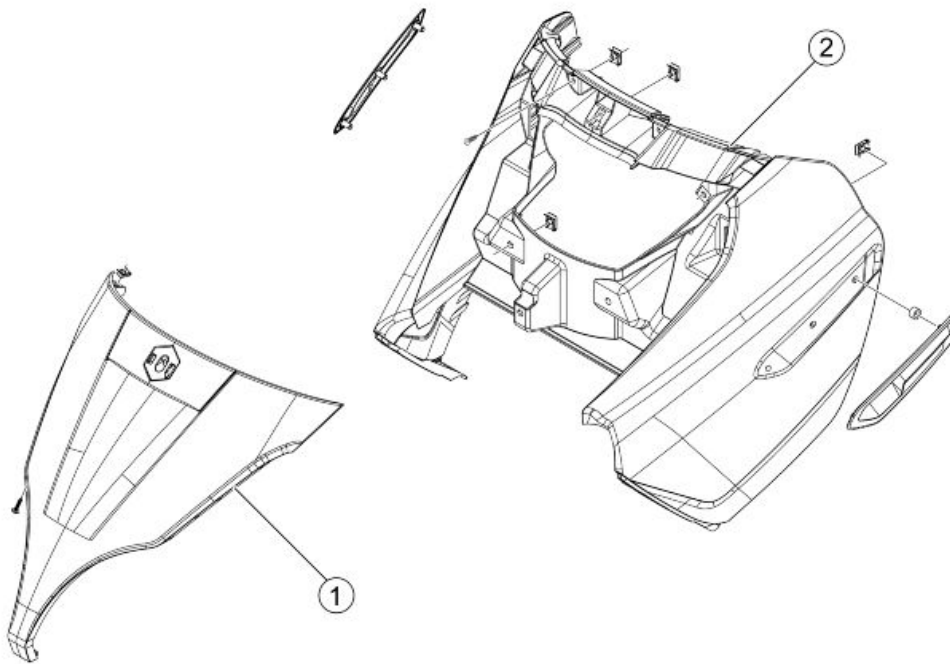
CHASSIS

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

Centre-stand**STAND**

	Code	Action	Duration
1	004004	Stand - Replacement	
2	001053	Stand pin - Replacement	
3	004179	Stand bumper - Replacement	

Legshield spoiler

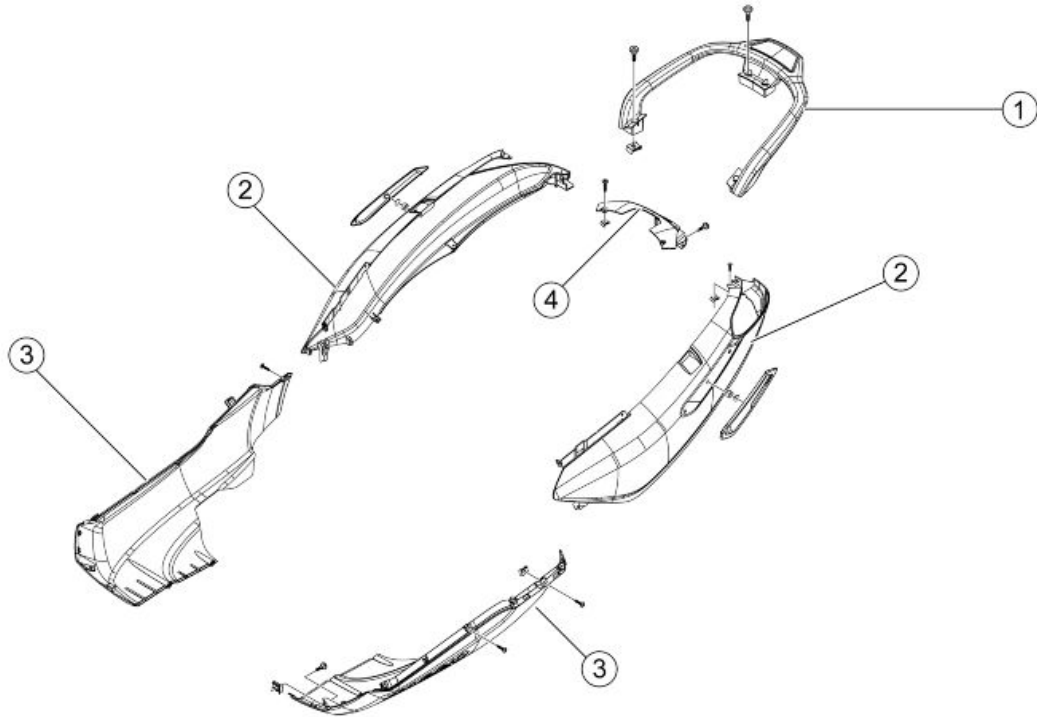


LEGSHIELD

	Code	Action	Duration
1	004020	Headlight frame - Replacement	
2	004064	Legshield, front section - Replacement	

	Code	Action	Duration
3	004066	Driving mirror - Replacement	

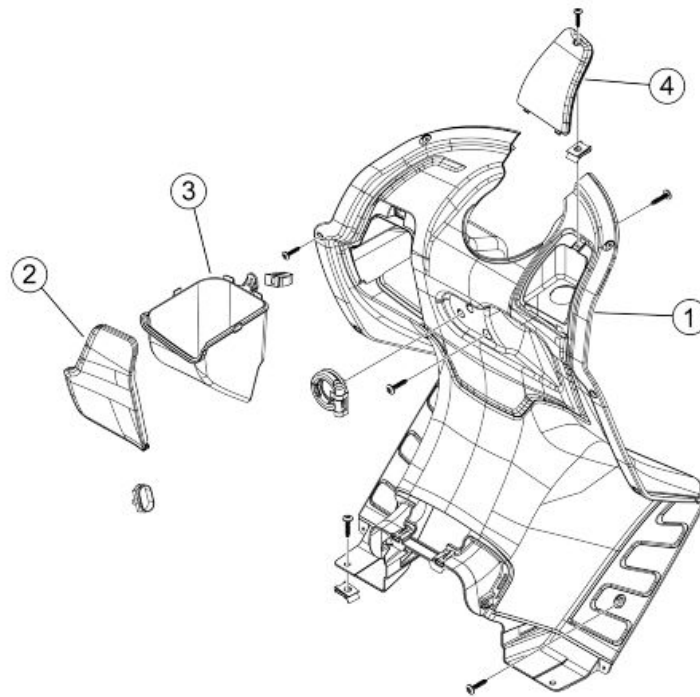
Side fairings



SIDE COVERS

	Code	Action	Duration
1	004068	Passenger handgrip - Replacement	
2	004085	Fairing (1) - Replacement	
3	004053	Spoiler - Replacement	
4	004036	Chassis cover - Replacement	

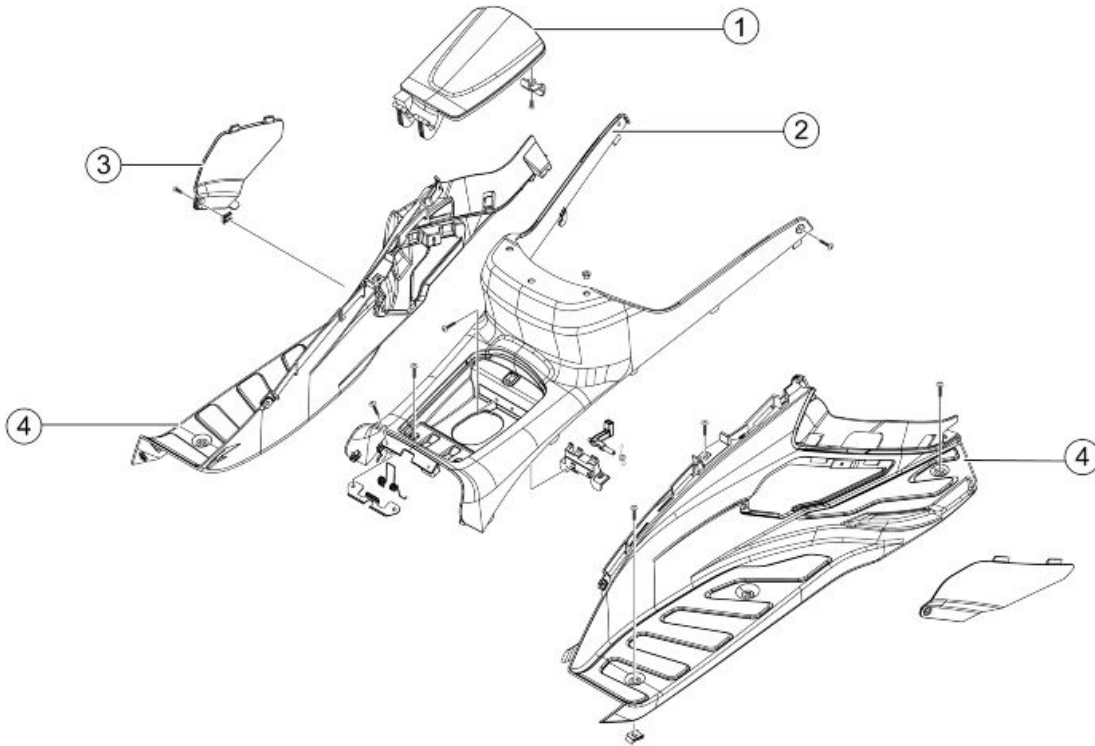
Rear cover



SHIELD BACK PLATE

	Code	Action	Duration
1	004065	Shield back plate - Replacement	
2	004156	Glove box flap and/or support - Replacement	
3	004145	Glove box - Replacement	
4	007024	Expansion tank cap - Replacement	

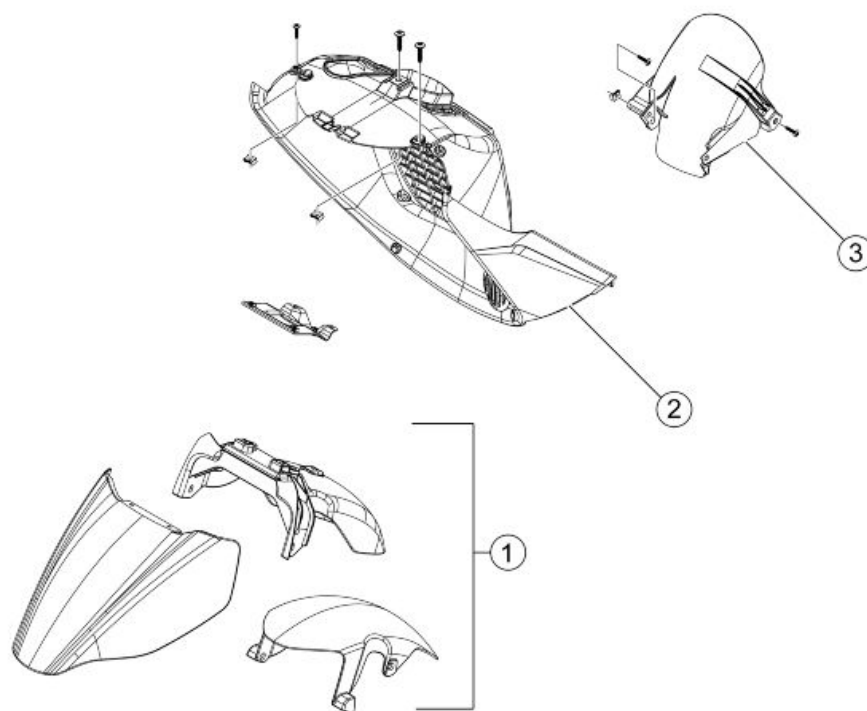
Central cover



CENTRAL COVER

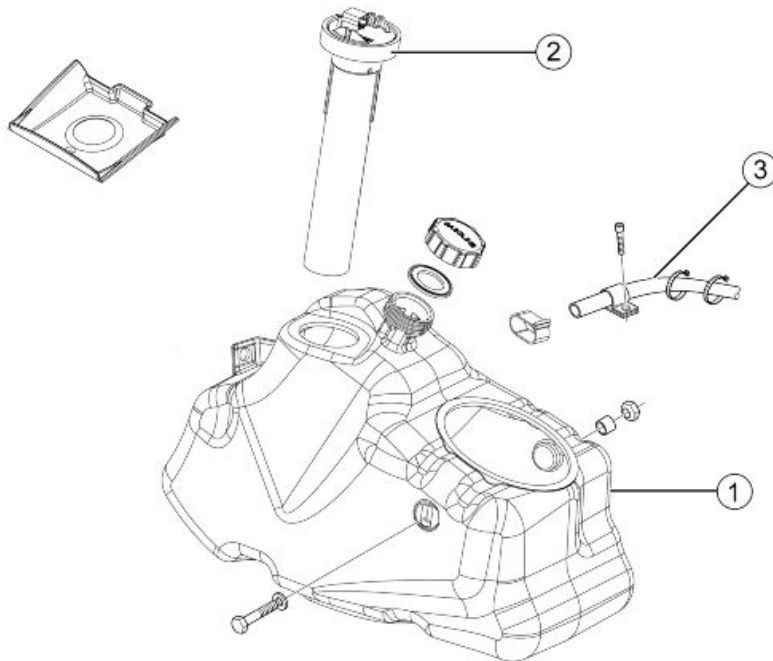
	Code	Action	Duration
1	004135	Fuel tank port - Replacement	
2	004011	Central chassis cover - Replacement	
3	004059	Spark plug inspection flap - Replacement	
4	004015	Footrest - Replacement	

Mudguard



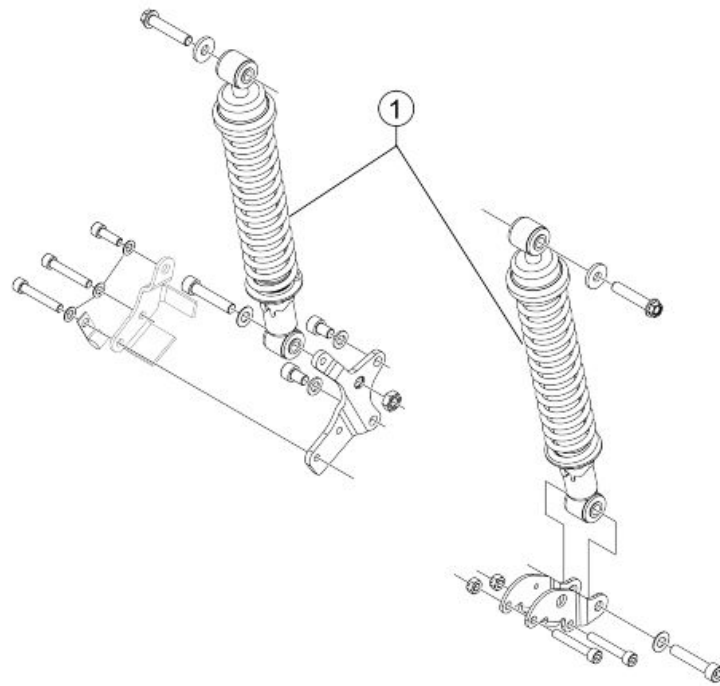
MUDGUARDS

	Code	Action	Duration
1	004002	Front mudguard - change	
2	004167	Grille / radiator cover - Replacement	
3	004009	Rear mudguard - Replacement	

Fuel tank**FUEL TANK**

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

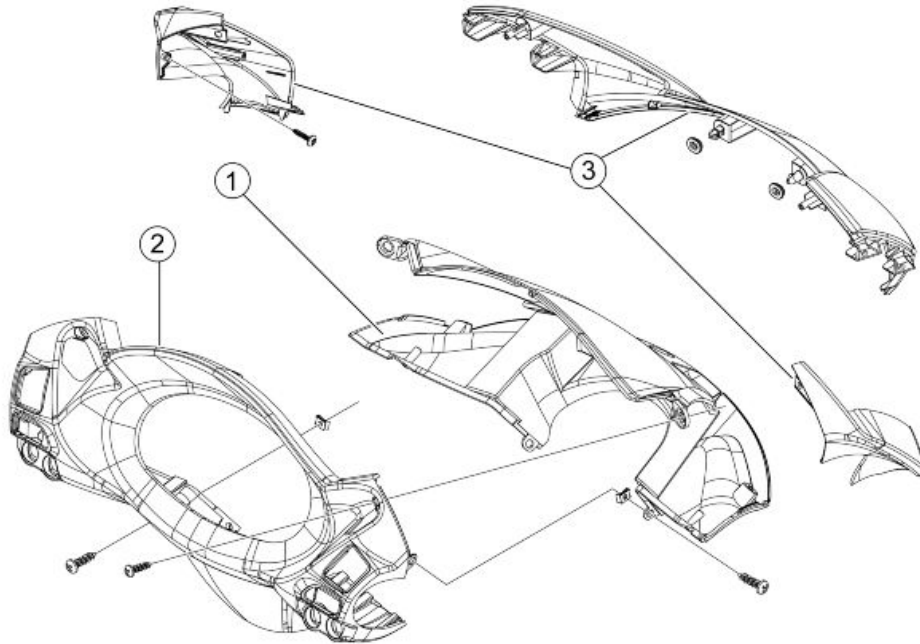
Rear shock-absorber



REAR SHOCK ABSORBER

	Code	Action	Duration
1	003007	Rear shock absorber - Replacement	

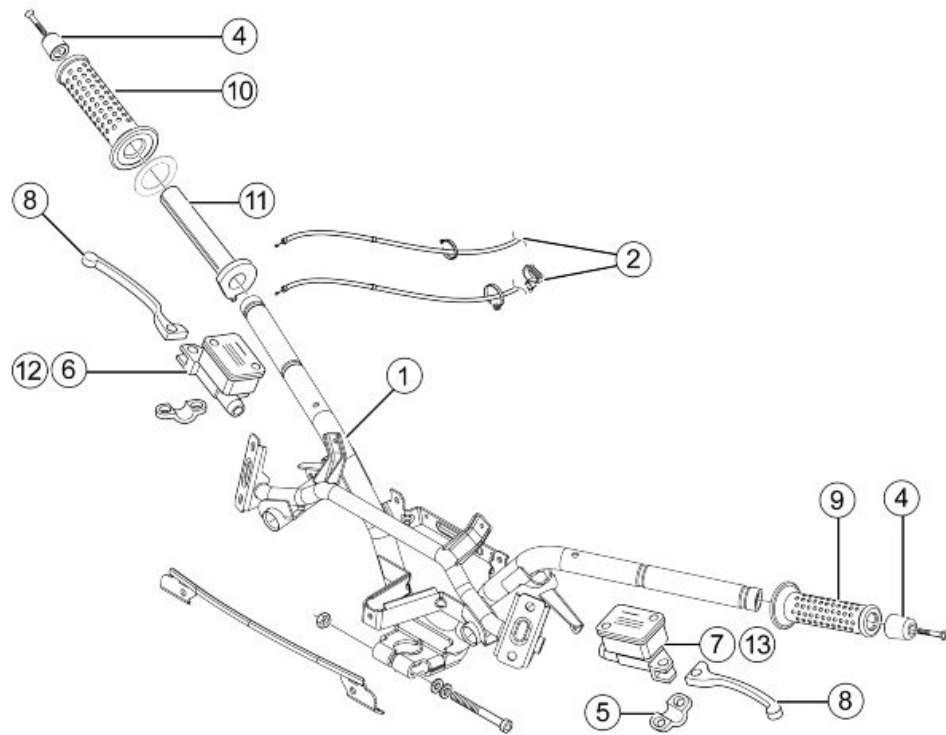
Handlebar covers



HANDLEBAR COVERS

	Code	Action	Duration
1	004018	Front handlebar covers - Replacement	
2	004019	Rear handlebar covers - Replacement	
3	004101	Windscreen - Replacement	

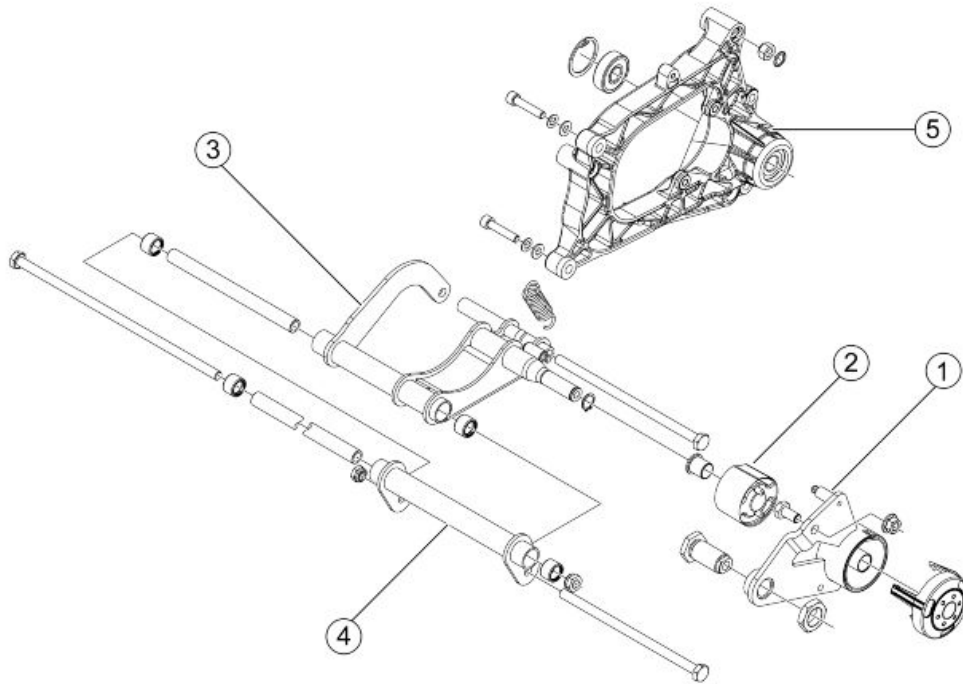
Handlebar components



HANDLEBAR COMPONENTS

	Code	Action	Duration
1	003001	Handlebar - Replacement	
2	002063	Complete throttle transmission - Replacement	
3	003061	Accelerator transmission - adjust	
4	003059	Counterweight - Replacement	
5	004162	Mirror mounting and/or brake pump fitting U-bolt - Replacement	
6	002024	Front brake pump - Replacement	
7	002067	Rear brake pump - Replacement	
8	002037	Brake lever - Replacement	
9	002071	Left knob - Replacement	
10	002059	Right-hand knob - Replacement	
11	002060	Complete throttle control - Replacement	
12	002047	Front brake fluid and air bleed system - Replacement	
13	002080	Rear brake oil bleed system - Change	

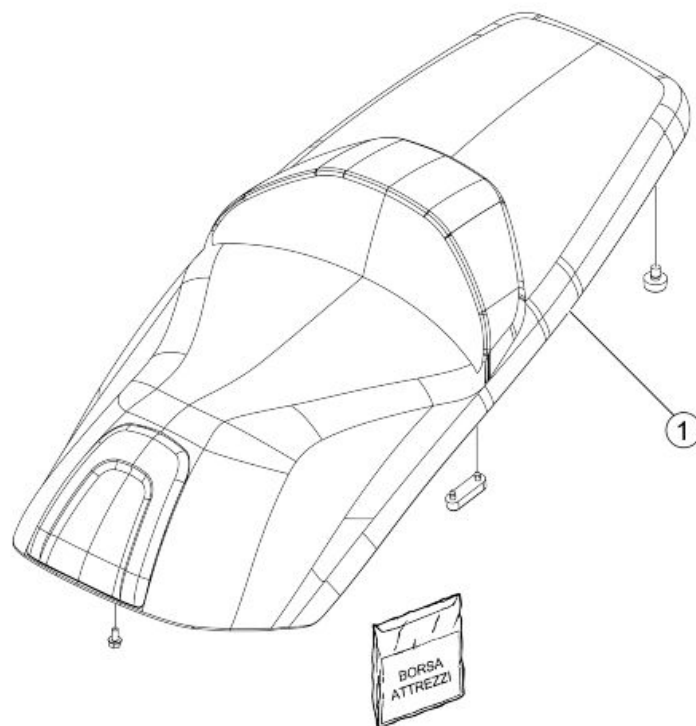
Swing-arm



SWINGING ARM

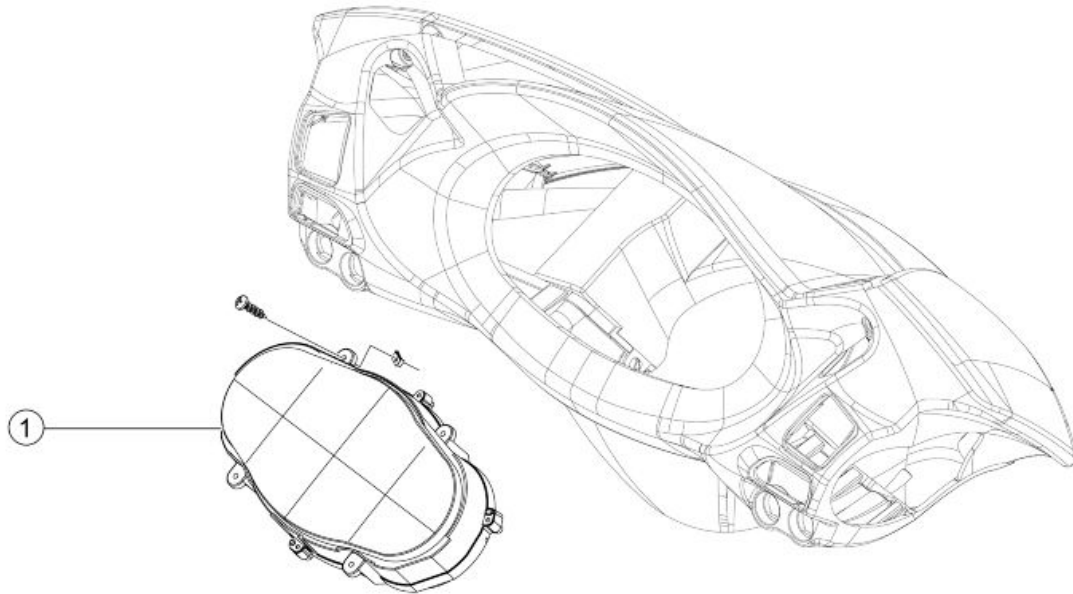
	Code	Action	Duration
1	003081	Swinging arm support flange - Replacement	
2	004058	Silent block - Replacement	
3	001072	Engine/chassis swinging arm attachment - Replacement	
4	003080	Swinging arm on chassis - Replacement	
5	003077	Muffer supporting arm/ rear shock absorber - Replacement	

Seat



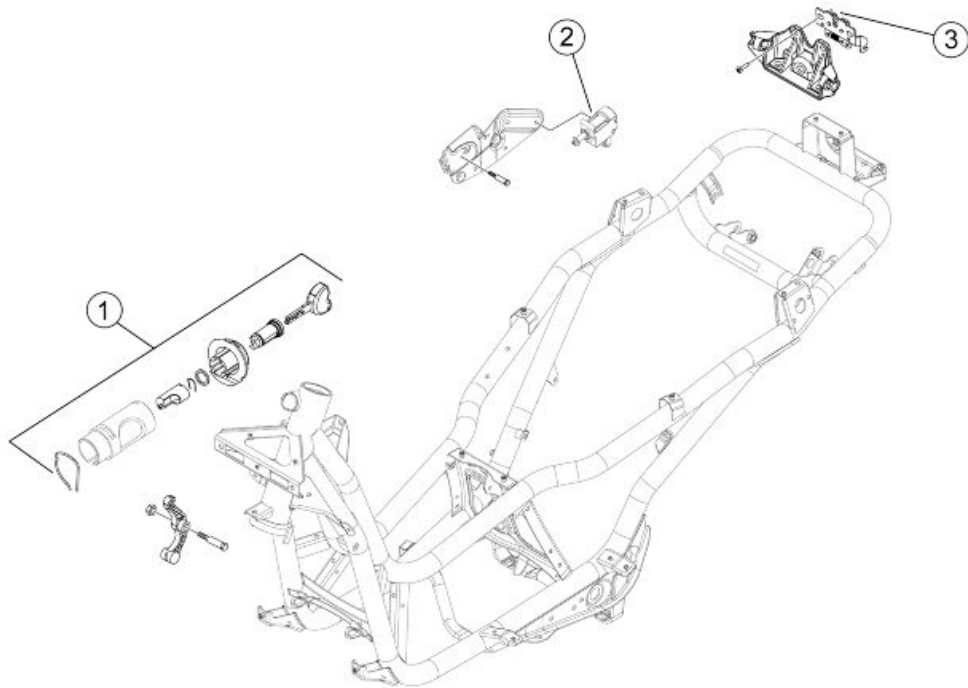
SADDLE

	Code	Action	Duration
1	004003	Saddle - Replacement	

Instrument panel**INSTRUMENT PANEL**

	Code	Action	Duration
1	005014	Odometer - Replacement	

Locks

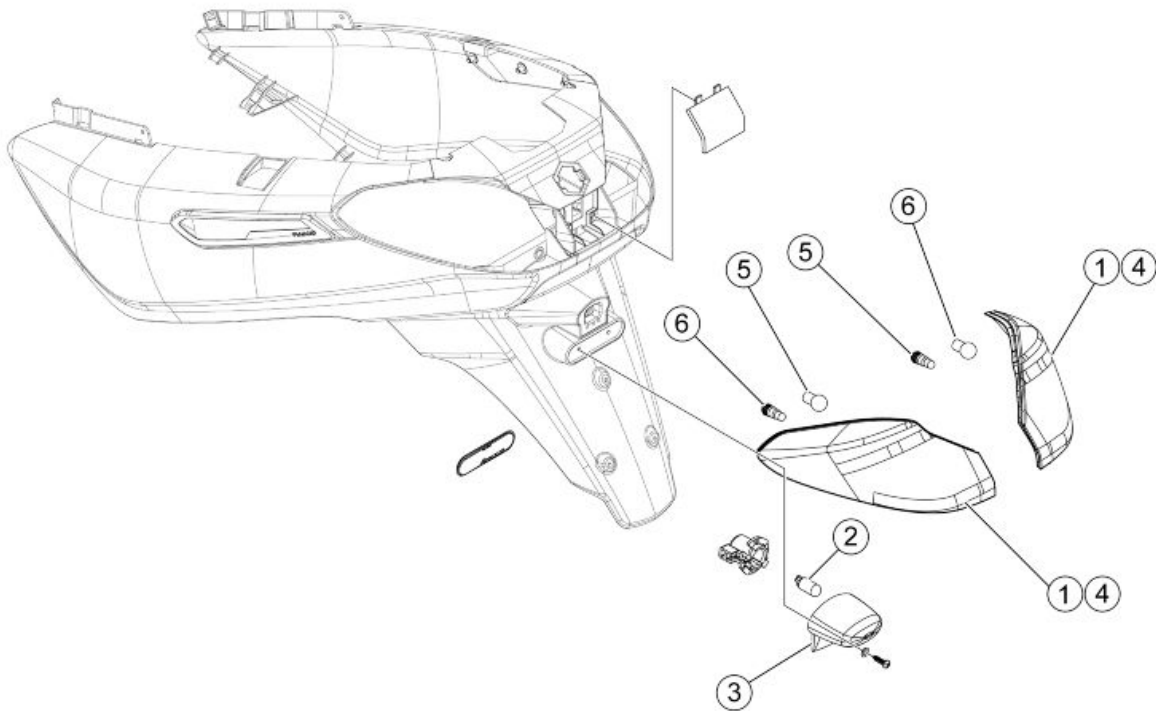


LOCKS

	Code	Action	Duration
1	004010	Anti-theft lock - Replacement	
2	005099	Electric saddle opening device - Replacement	
3	004054	Saddle lock catch - Replacement	

Turn signal lights

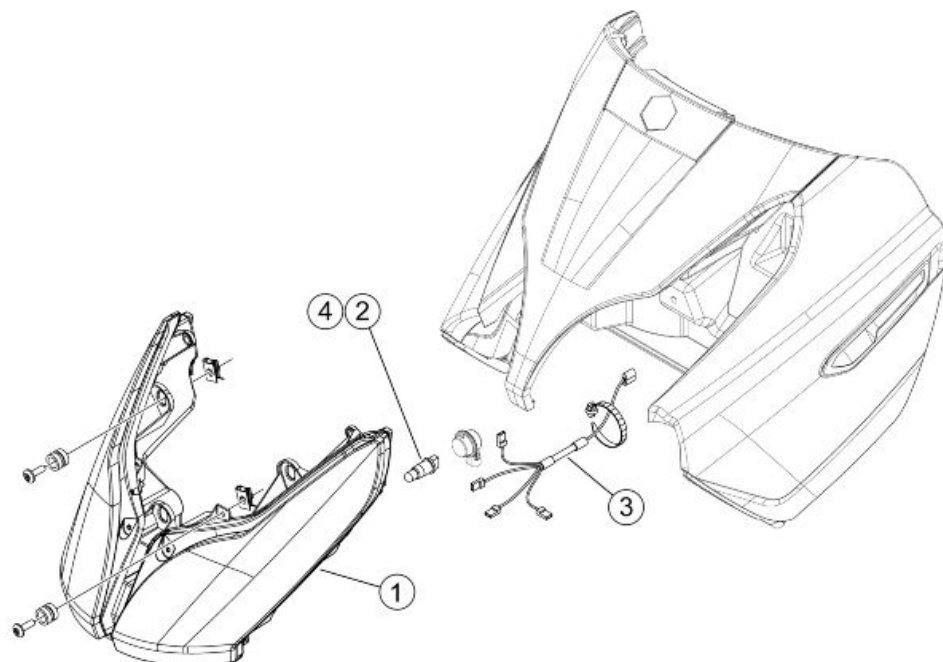
Rear lights



REAR LIGHTS

	Code	Action	Duration
1	005005	Taillight - change	
2	005031	number plate light bulb - Replacement	
3	005032	number plate light glass - Replacement	
4	005022	Rear turning indicators - Replacement	
5	005066	Rear light bulbs - Replacement	
6	005068	Rear turning indicator bulb - Replacement	

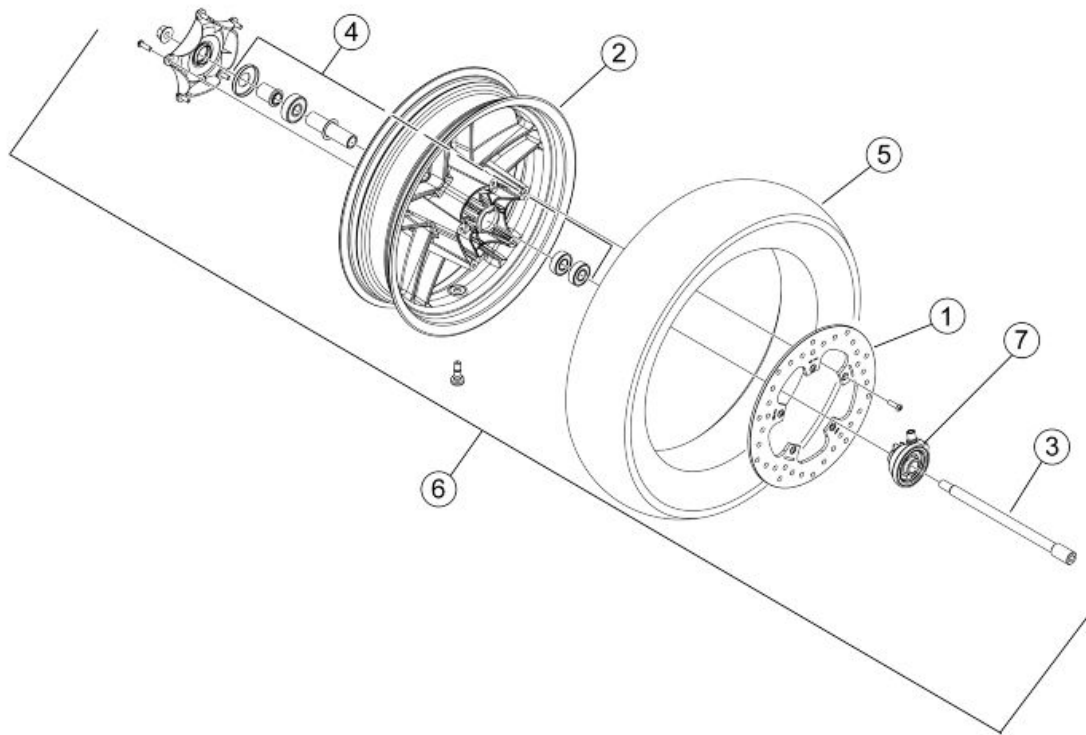
Front lights



INDICATOR LIGHTS

	Code	Action	Duration
1	005002	Front light - replacement	
2	005008	Headlight bulbs - Replacement	
3	005044	Front lights cable unit - replace	
4	005067	Front turning indicator bulb - replacement	

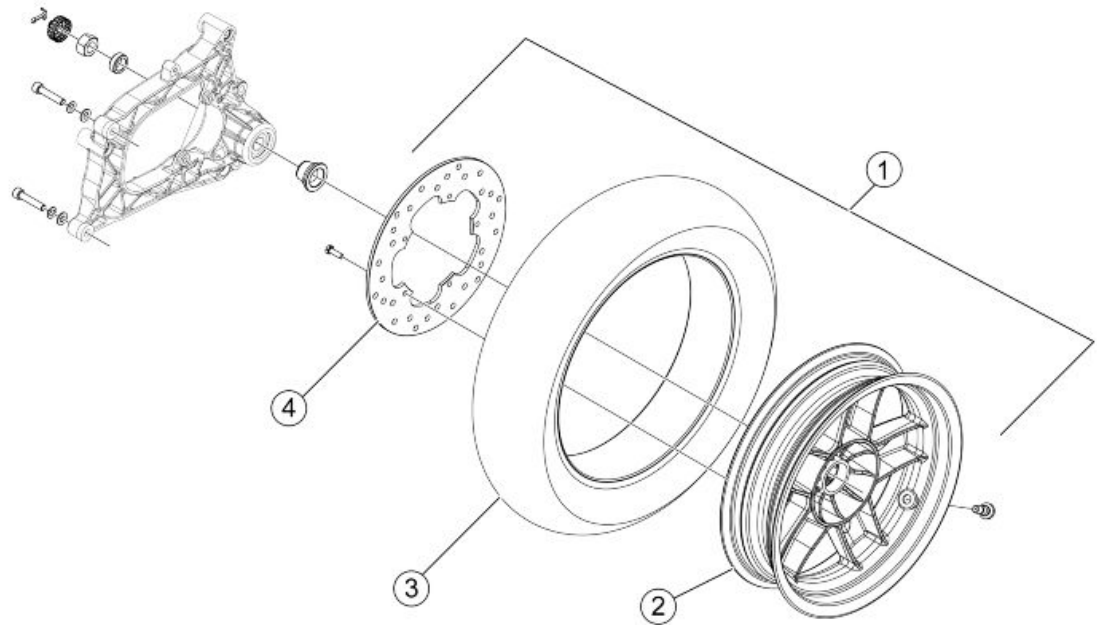
Front wheel



FRONT WHEEL

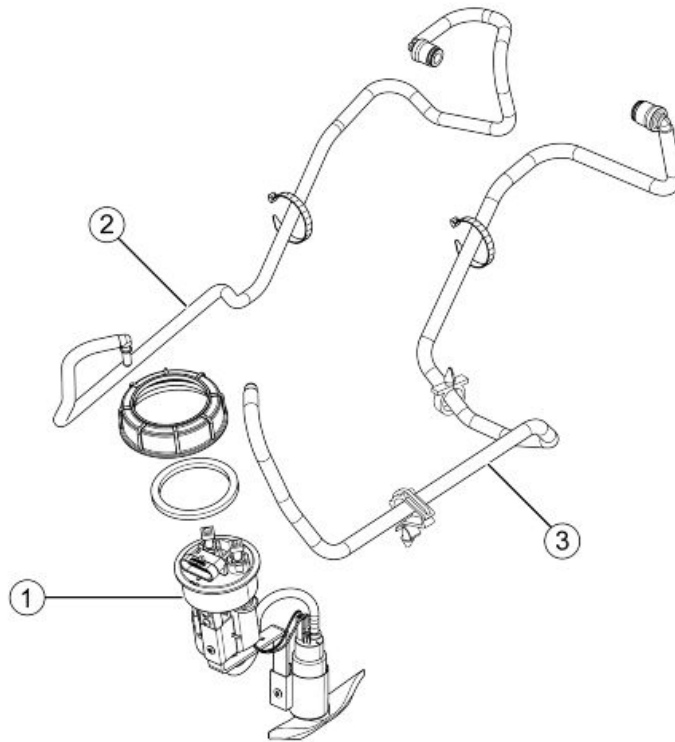
	Code	Action	Duration
1	002041	Front brake disc - Replacement	
2	003037	Front wheel rim - Replacement	
3	003038	Front wheel axle - Replacement	
4	003040	Front wheel bearings - Replacement	
5	003047	Front tyre - Replacement	
6	004123	Front wheel - Replacement	
7	002011	Odometer drive - Replacement	

Rear wheel



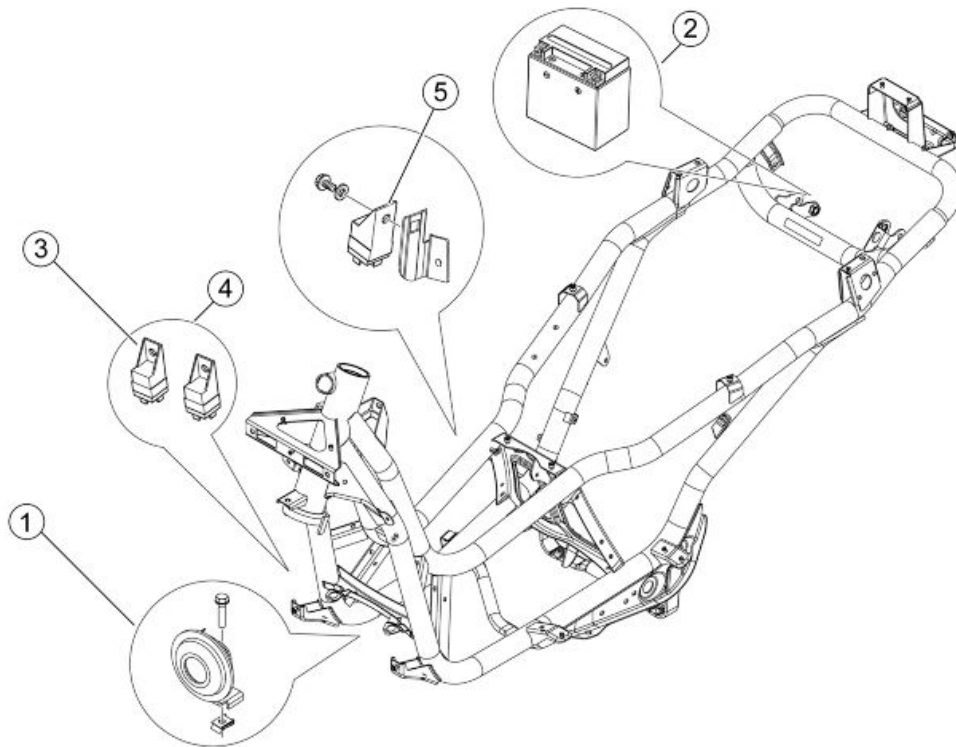
REAR WHEEL

	Code	Action	Duration
1	001016	Rear wheel - Replacement	
2	001071	Rear wheel rim - Replacement	
3	004126	Rear wheel tyre - Replacement	
4	002070	Rear brake disc - Replacement	

Fuel pump**FUEL PUMP**

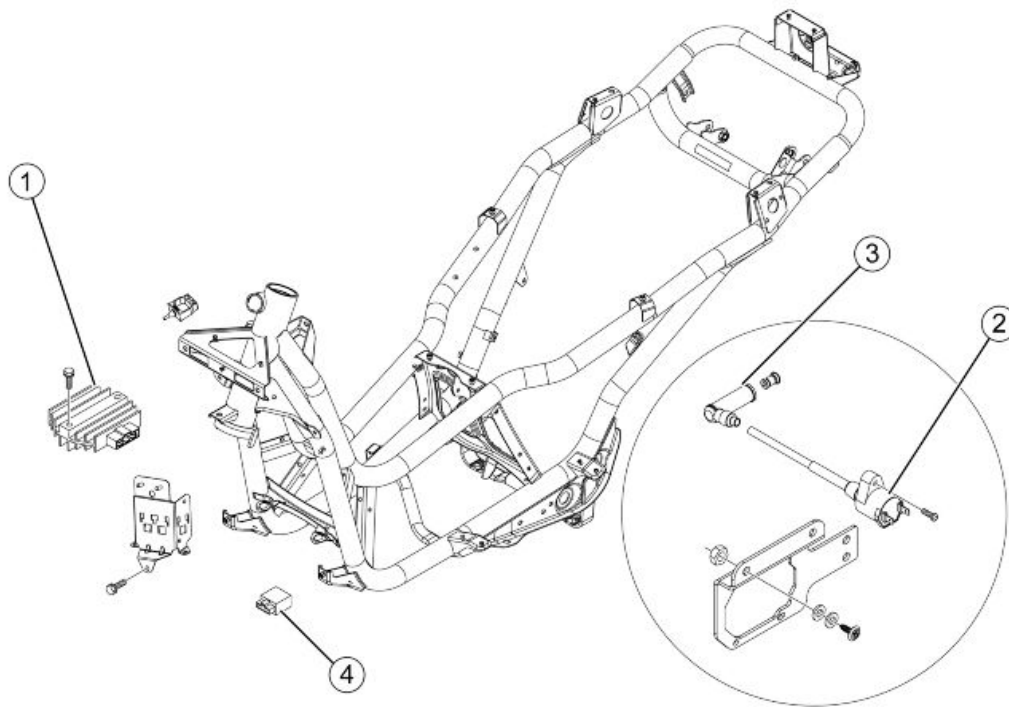
	Code	Action	Duration
1	004073	Fuel pump - Replacement	
2	004137	Pump/ injector pipe - Replacement	

Electric devices



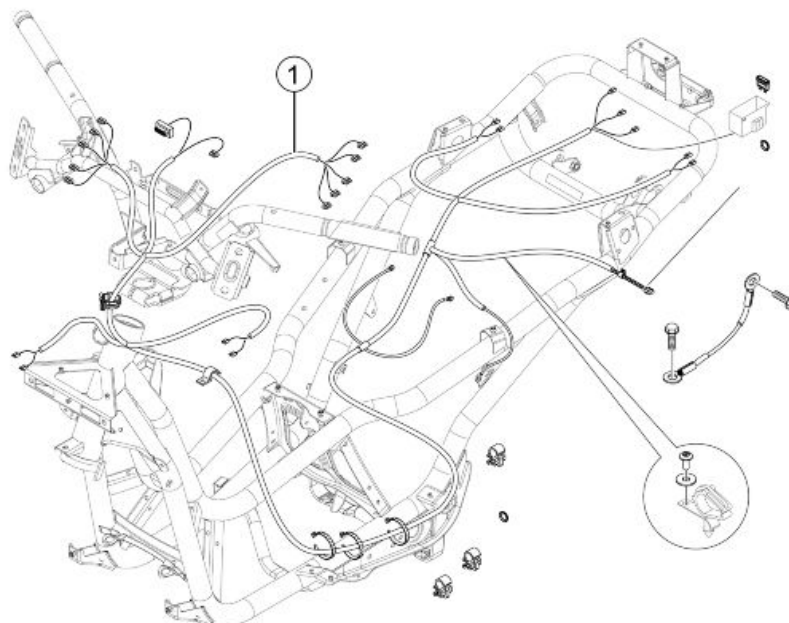
REMOTE CONTROLS

	Code	Action	Duration
1	005003	Horn - Replacement	
2	005007	Battery - change	
3	005075	Stop solenoid - Replacement	
4	005035	Headlight solenoid - Replacement	
5	005011	Starter relay - Replacement	



VOLTAGE REGULATOR

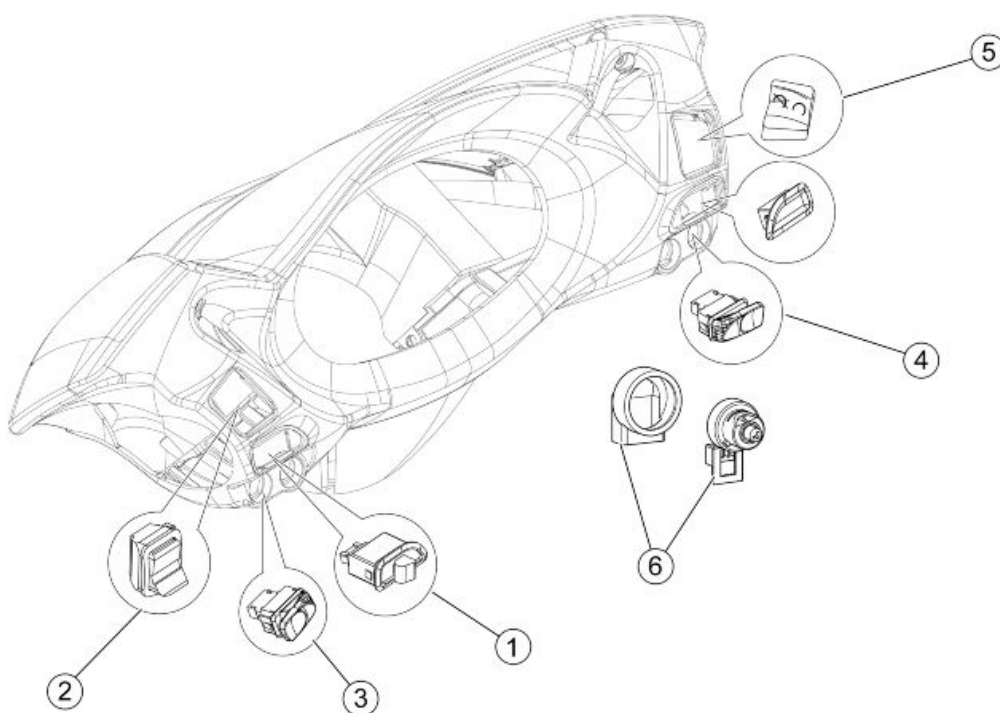
	Code	Action	Duration
1	005009	Voltage regulator - Replacement	
2	001069	HV coil - Replacement	
3	001094	Spark plug cap - Replacement	
4	005119	Fuel pump remote control - Replacement	



WIRE UNIT

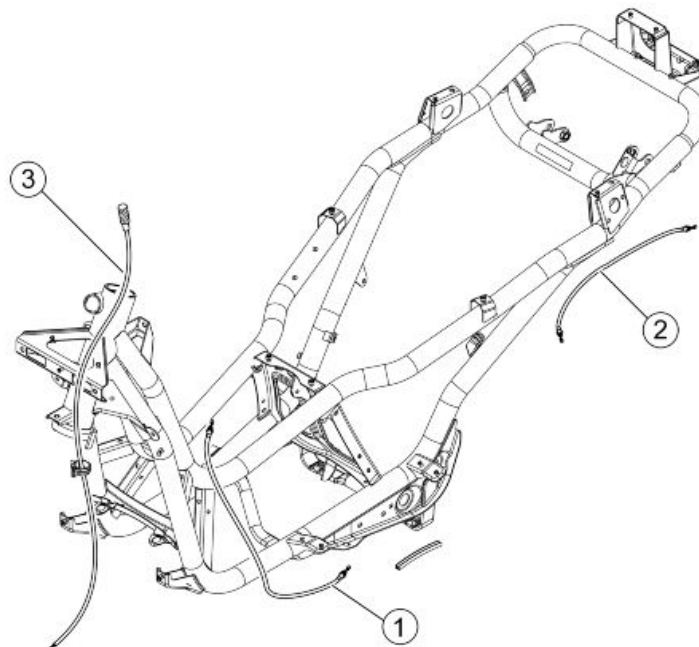
	Code	Action	Duration
1	005001	Electrical system - Replacement	

Electronic controls



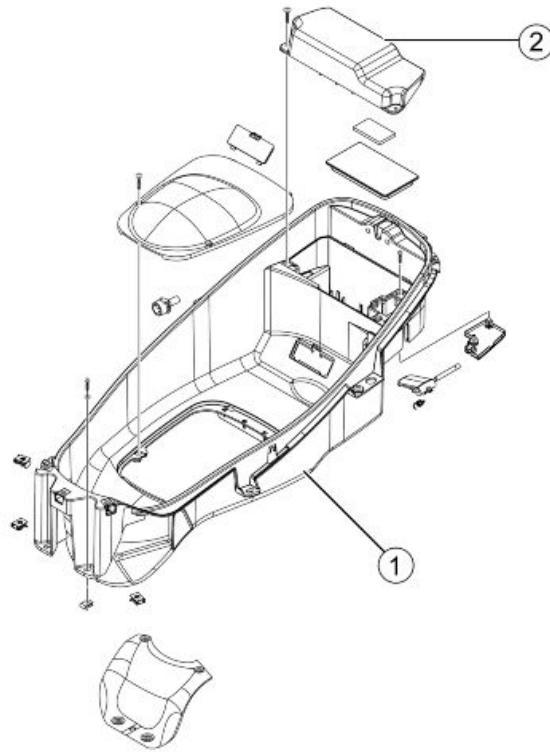
ELECTRIC CONTROLS

	Code	Action	Duration
1	005006	Light or turning indicator switch - Replacement	
2	005039	Lights switch - Replacement	
3	005040	Horn button - Replacement	
4	005041	Starter button - Replacement	
5	005077	Emergency stop switch - Replacement	
6	005016	Key switch - Replacement	

Transmissions**TRANSMISSIONS**

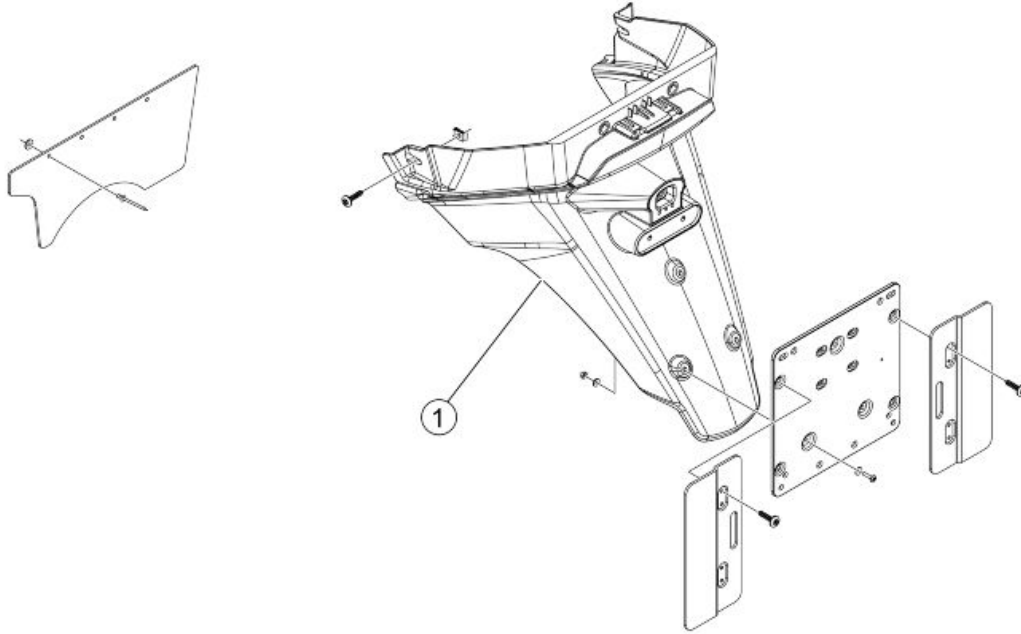
	Code	Action	Duration
1	002082	Fuel tank door opening drive - Replacement	
2	002083	Saddle opening transmission - Replacement	
3	002049	Odometer cable - Replacement	

Helmet bay



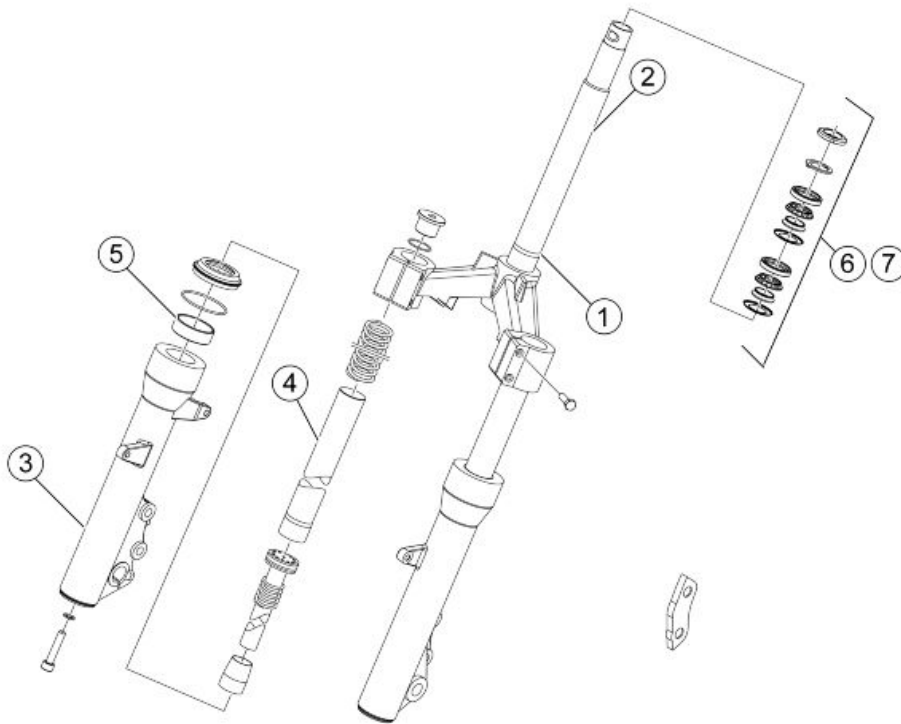
HELMET COMPARTMENT

	Code	Action	Duration
1	004016	Helmet compartment - Replacement	
2	005046	Battery cover - change	

Rear side fairings**REAR COVERS**

	Code	Action	Duration
1	005048	number plate holder - Replacement	

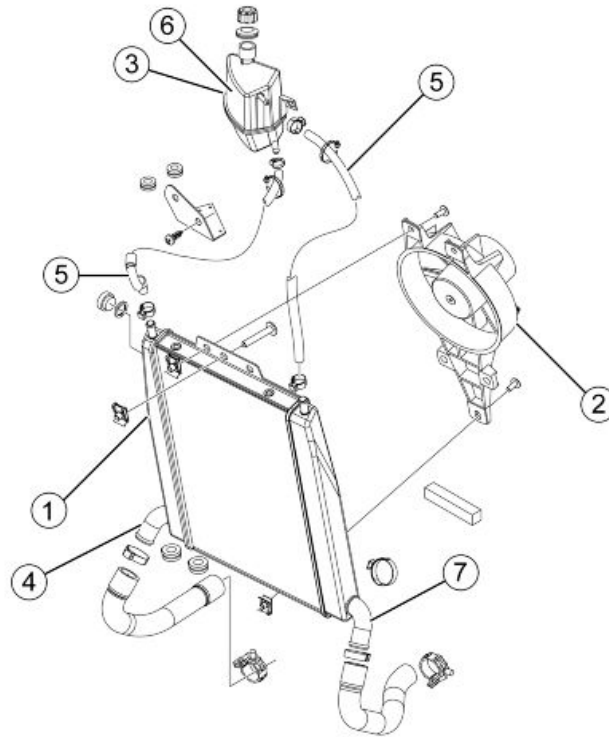
Front suspension



FRONT SUSPENSION

	Code	Action	Duration
1	003051	Complete fork - Replacement	
2	003010	Front suspension - Service	
3	003076	Fork sheath - Replacement	
4	003079	Fork stem - Replacement	
5	003048	Fork oil seal - Replacement	
6	003002	Steering fifth wheels - Replacement	
7	003073	Steering clearance - Adjustment	

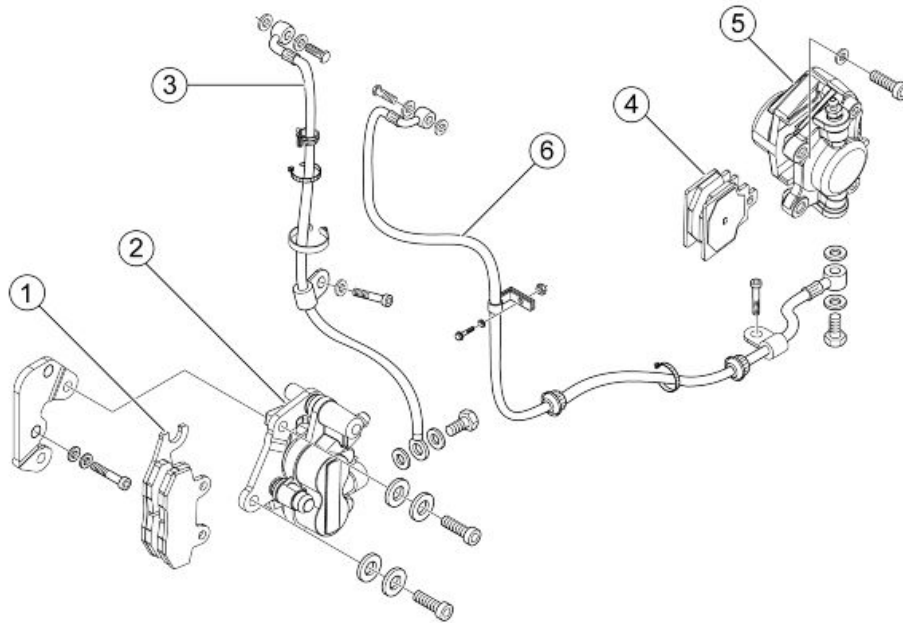
Cooling system



COOLING SYSTEM

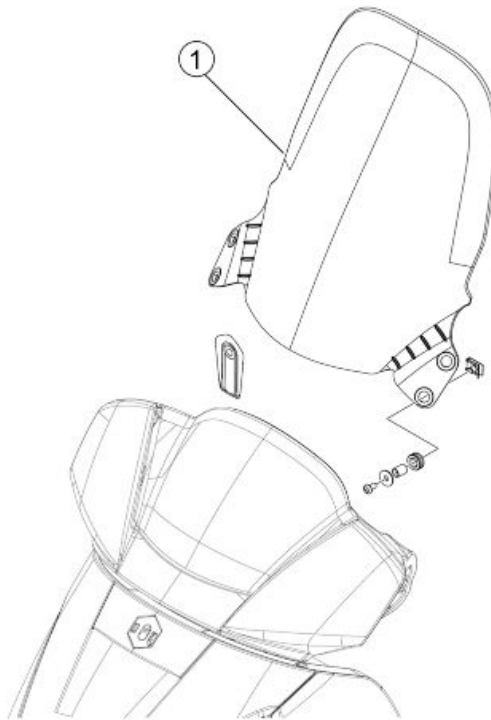
	Code	Action	Duration
1	007002	Water radiator - replacement	
2	007016	Fan with support - Replacement	
3	007001	Expansion tank - Replacement	
4	007022	Coolant delivery pipe - Replacement	
5	007013	Radiator expansion tank connection pipe - change	
6	001052	Coolant and air bleed - Replacement	
7	007019	Connection water pump pipe / return pipe - Replacement	

Braking system



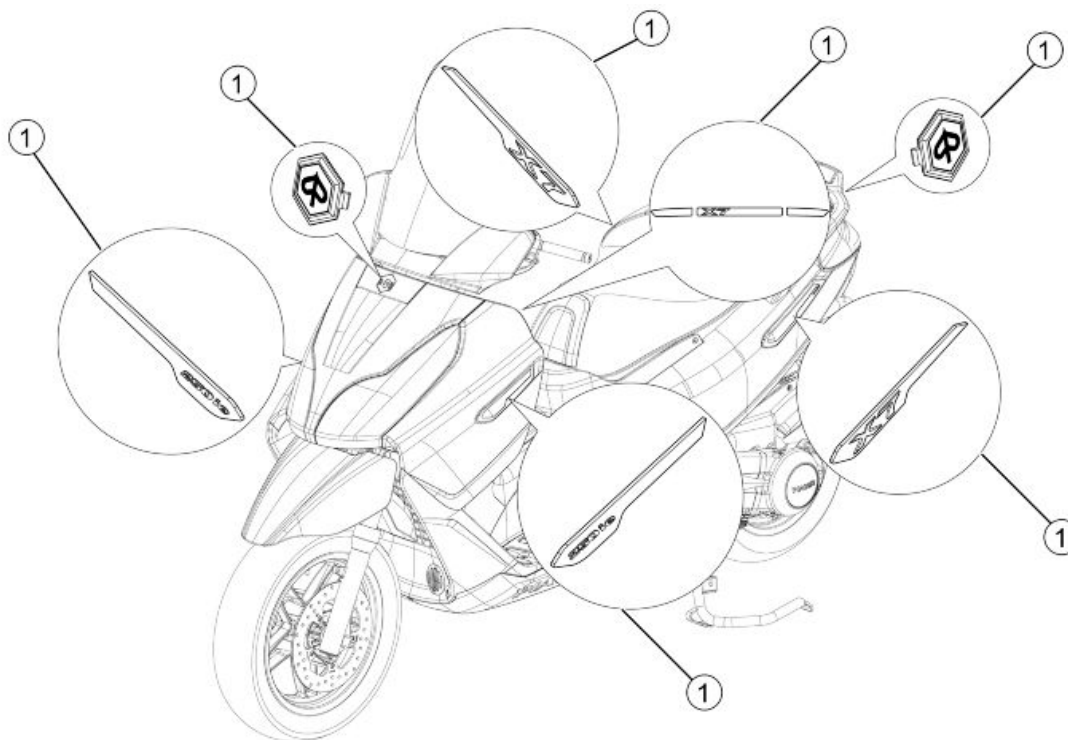
BRAKING SYSTEM

	Code	Action	Duration
1	002007	Front brake pads - Replacement	
2	002039	Front brake calliper - Replacement	
3	002021	Front brake piping - Replacement	
4	002002	Rear brake pads - Replacement	
5	002048	Rear brake calliper - Replacement	
6	002020	Rear brake disc piping - Replacement	

Windscreen**WINDSCREEN**

	Code	Action	Duration
1	004101	Windscreen - Replacement	

Stickers



TRANSFERS

	Code	Action	Duration
1	004159	Plates / Stickers - Replacement	

A

Air filter: 45, 263

B

Battery: 57, 67, 78, 88, 89

Brake: 231, 232, 234, 236–239, 241, 242

Brake fluid: 241

Bulbs:

C

Checks: 72

Coolant: 191

E

Electric: 247, 315

Engine oil: 46

F

Fuel: 172, 180, 264, 302, 314

Fuses: 86

H

Headlight: 52, 254, 256

Horn: 83

Hub oil: 43

I

Identification: 8

Instrument panel: 253, 308

M

Maintenance: 7, 41

Mirrors: 252, 269

O

Oil filter: 47, 282

R

Recommended products:

S

Saddle:

Shock absorbers: 225

Spark plug: 43, 78

Stand:

Start-up:

Suspension: 57, 321

T

Tank: 264, 267, 302

Transmission: 9, 56, 104, 118, 288

Turn indicators: 71

Tyres: 10

V

Vehicle: 8, 97, 98