



SERVICE STATION MANUAL

664962



Beverly Tourer 250 i.e.



SERVICE STATION MANUAL

Beverly Tourer 250 i.e.

The descriptions and illustrations given in this publication are not binding. While the basic specifications as described and illustrated in this manual remain unchanged, PIAGGIO-GILERA reserves the right, at any time and without being required to update this publication beforehand, to make any changes to components, parts or accessories, which it considers necessary to improve the product or which are required for manufacturing or construction reasons.

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

"© Copyright 2007 - PIAGGIO & C. S.p.A. Pontedera. All rights reserved. Reproduction of this publication in whole or in part is prohibited."

PIAGGIO & C. S.p.A. - After-Sales

V.le Rinaldo Piaggio, 23 - 56025 PONTEDERA (Pi)

SERVICE STATION MANUAL

Beverly Tourer 250 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, completely satisfactory work cannot be carried out without the necessary equipment and tools. It is therefore advisable to read the sections of this manual relating to appropriate tools, along with the appropriate tool catalogue

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

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

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



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



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



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



INDEX OF TOPICS

CHARACTERISTICS

CHAR

TOOLING

TOOL

MAINTENANCE

MAIN

TROUBLESHOOTING

TROUBL

ELECTRICAL SYSTEM

ELE SYS

ENGINE FROM VEHICLE

ENG VE

ENGINE

ENG

INJECTION

INJEC

SUSPENSIONS

SUSP

BRAKING SYSTEM

BRAK SYS

COOLING SYSTEM

COOL SYS

CHASSIS

CHAS

PRE-DELIVERY

PRE DE

TIME

TIME

INDEX OF TOPICS

CHARACTERISTICS

CHAR

This section describes the general specifications of the vehicle.

Rules

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

Safety rules

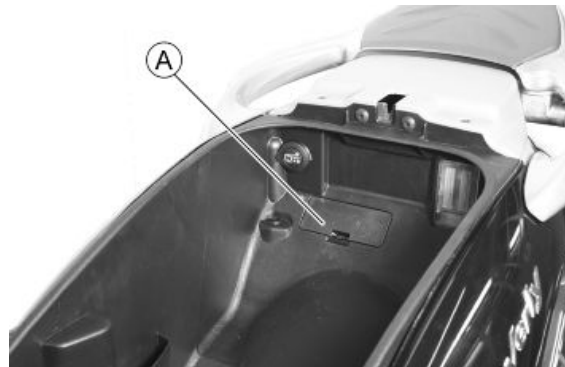
- If work can only be done on the vehicle with the engine running, make sure that the premises are well-ventilated, using special extractors if necessary; never let the engine run in an enclosed area. Exhaust fumes are toxic.
 - The battery electrolyte contains sulphuric acid. Protect your eyes, clothes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

Maintenance rules

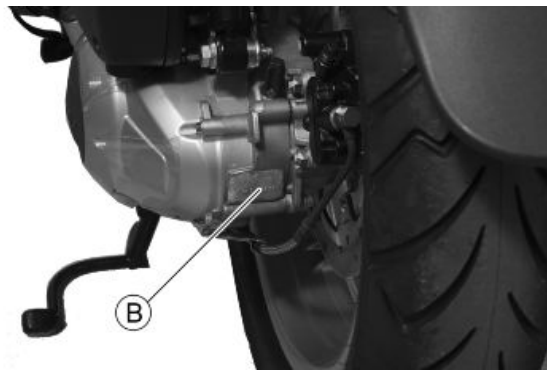
- Use original PIAGGIO spare parts and lubricants recommended by the Manufacturer. Non-original or non-conforming spares may damage the vehicle.
 - Use only the appropriate tools designed for this vehicle.
 - Always use new gaskets, sealing rings and split pins upon refitting.
 - After removal, clean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



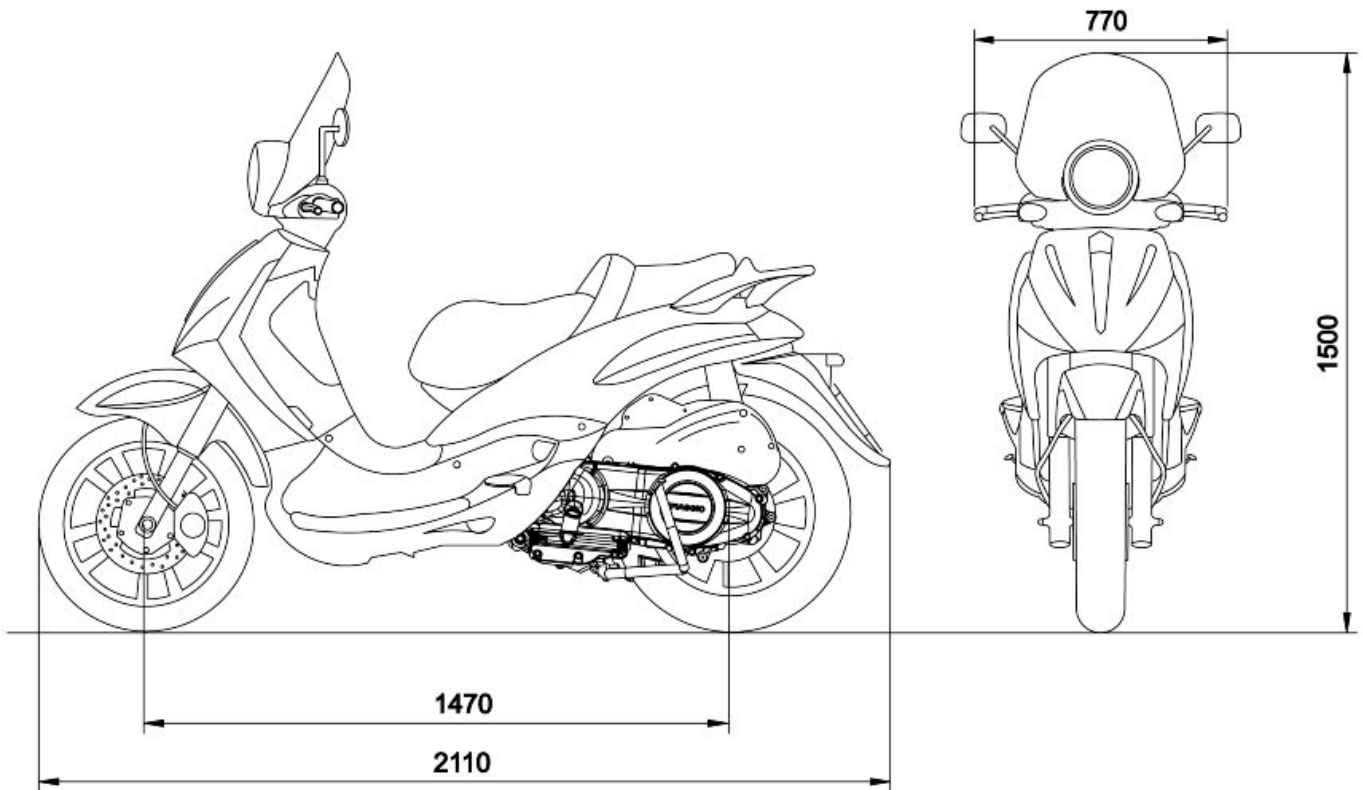
The engine prefix «B» is stamped near the rear left shock absorber lower support.



VEHICLE IDENTIFICATION

Specification	Desc./Quantity
Chassis prefix	M28801
Engine prefix	M288M

Dimensions and mass



VEHICLE EARTHING

Specification	Desc./Quantity
Kerb weight	163 kg ± 5 kg
Maximum weight allowed	350 kg

Engine

MOTORE

Specification	Desc./Quantity
Type	Single-cylinder, 4-stroke
Cubic capacity	244 cm ³
Bore x Stroke	72 x 60 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	Inlet: 0.10 mm Outlet: 0.15 mm
Max. power	16.5 KW at 8,000 rpm
MAX. torque	21 Nm at 6,250 rpm
Lubrication	Engine lubrication with lobe pump (inside crankcase) controlled by a chain 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-circulation coolant system.
Fuel	Unleaded petrol (95 RON)

Specification	Desc./Quantity
Exhaust muffler	Absorption-type exhaust muffler 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 reduction unit in oil bath.

Capacities

CAPACITÀ

Specification	Desc./Quantity
Engine oil	1.3 l
Transmission oil	250 cm ³
Cooling system fluid	1.75 l
Fuel tank (reserve)	~ 10 l (2 l)
Fork oil (quantity per stem)	133 cm ³

Electrical system

ELECTRICAL SYSTEM

Specification	Desc./Quantity
Start-up	Electric
Ignition	Electronic inductive discharge ignition, high efficiency, with separate HV coil.
Ignition advance	α/N three-dimensional map managed by control unit
Spark plug	CHAMPION RG 4 PHP
Alternative spark plug	-
Battery	12V-12Ah
Generator	Alternating current

Frame and suspensions

TELAIO E SOSPENSIONI

Specification	Desc./Quantity
Chassis type	Welded tubular steel chassis with stamped sheet reinforcements
Front suspension	Hydraulic telescopic fork with advanced wheel pin and Ø 35 mm stem
Front fork max. stroke	104 mm
Rear suspension	Two double-acting shock absorbers, adjustable to four positions at preloading.
Rear shock absorber max. travel	95.5 mm

Brakes

FRENI

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

Wheels and tyres

RUOTE E PNEUMATICI

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

N.B.

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

Tightening Torques

STEERING

Name	Torque in Nm
Upper steering ring nut	30 ÷ 36
Steering lower ring nut	10 ÷ 13 then loosen by 90°
Handlebar fixing screw (*)	45 ÷ 50
Fixing screws for handlebar control assembly U-bolts	7 ÷ 10

CHASSIS

Name	Torque in Nm
Centre stand bolt	25 ÷ 30
Side stand bolt (°)	35 ÷ 40
Engine arm bolt - frame arm	33 ÷ 41
Swinging arm buffer nut	64 - 72
Frame-swinging arm bolt	64 - 72
Engine-swinging arm bolt	64 - 72

FRONT SUSPENSION

Name	Torque in Nm
Fixing screw for pumping elements to lower fork plate	20 ÷ 25
Front wheel axle	45 ÷ 50
Fork leg screw	6 ÷ 7
front mudguard to plate fixing screw	4.5 ÷ 7
Fixing screw for mudguard plate to fork	9 ÷ 11

REAR SUSPENSION

Name	Torque in Nm
Upper shock absorber clamp	33 ÷ 41
Lower shock absorber clamp	33 ÷ 41
Shock absorber-crankcase attachment bracket	20 ÷ 25
Rear wheel axle	104 ÷ 126
Fixing screw for wheel rim to hub	34 ÷ 38

Name	Torque in Nm
Muffler arm clamping screws	27 ÷ 30

FRONT BRAKE

Name	Torque in Nm
Brake fluid pump-hose fitting	16 ÷ 20
Brake fluid pipe-calliper fitting	16 ÷ 20
Calliper to fork tightening screw	20 ÷ 25
Disc tightening screw (°)	5 - 6
Oil bleed screw	12 - 16
Pad fastening pin	19.6 ÷ 24.5

REAR BRAKE

Name	Torque in Nm
Rear brake disc screws(°)	5 ÷ 6.5
Rear brake calliper-pipe fitting	20 ÷ 25
Rigid / flexible pipe fitting	13 ÷ 18
Rear brake pump-pipe fitting	16 ÷ 20
Rear brake calliper fixing screws	20 ÷ 25

MUFFLER

Name	Torque in Nm
Muffler heat guard fixing screw	4 ÷ 5
Screw for fixing muffler to the support arm	20 ÷ 25
Lambda probe clamp on exhaust manifold	40 ÷ 50
Exhaust manifold-muffler joint clamp	12 ÷ 13
Nut fixing muffler to cylinder head	16 ÷ 18

LUBRICATION

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

CYLINDER HEAD

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

TRANSMISSION

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

Name	Torque in Nm
Rear hub cap screws	24 ÷ 27

FLYWHEEL

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

CRANKCASE AND CRANKSHAFT

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

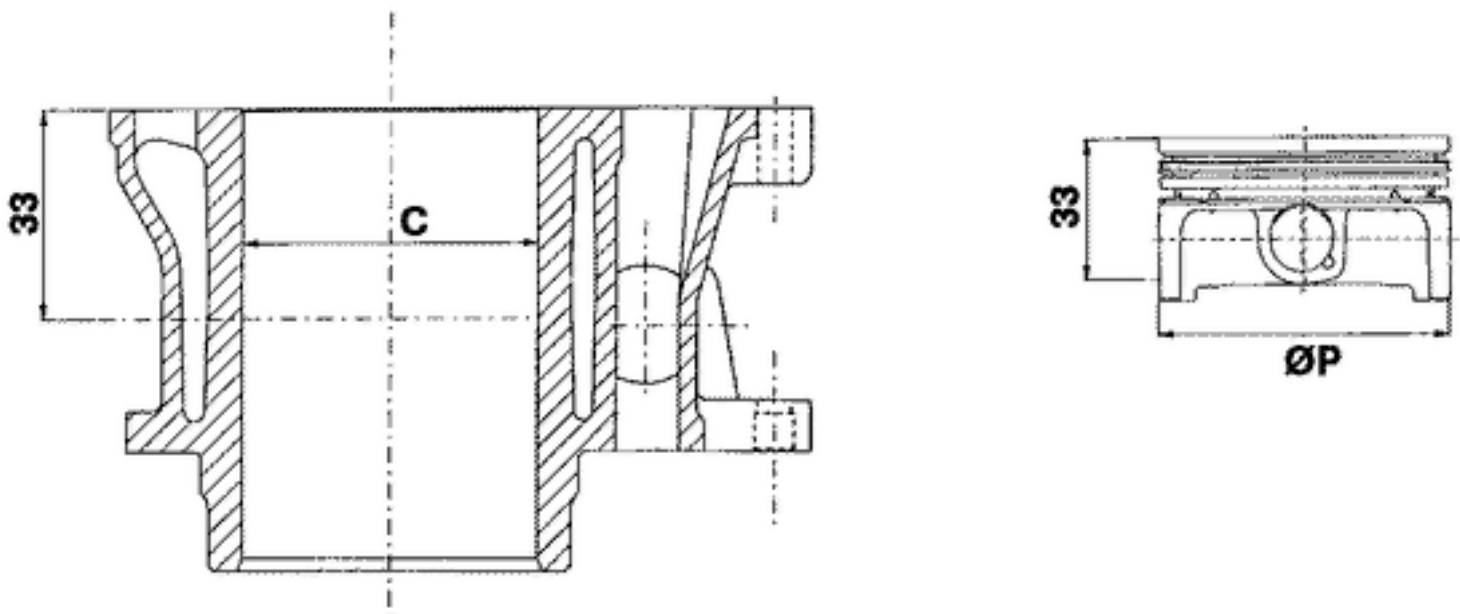
COOLING

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

Overhaul data

Assembly clearances

Cylinder - piston assy.

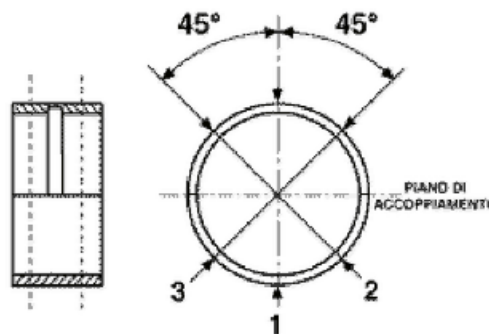


ENGINE COUPLING CATEGORY

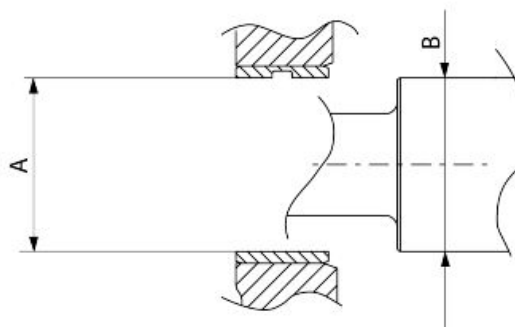
Name	Initials	Cylinder	Piston	Play on fitting
Cylinder	M	72.01 ÷ 72.017	71.953 ÷ 71.960	0.050 - 0.064
Cylinder	N	72.017 ÷ 72.024	71.960 ÷ 71.967	0.050 - 0.064
Piston	O	72.024 ÷ 72.031	71.967 ÷ 71.974	0.050 - 0.064
Piston	P	72.031 ÷ 72.038	71.974 ÷ 71.981	0.050 - 0.064

Crankcase - crankshaft - connecting rod

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



Characteristic
Diameter clearance
 0.023 ÷ 0.041 mm



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

CRANKSHAFT

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

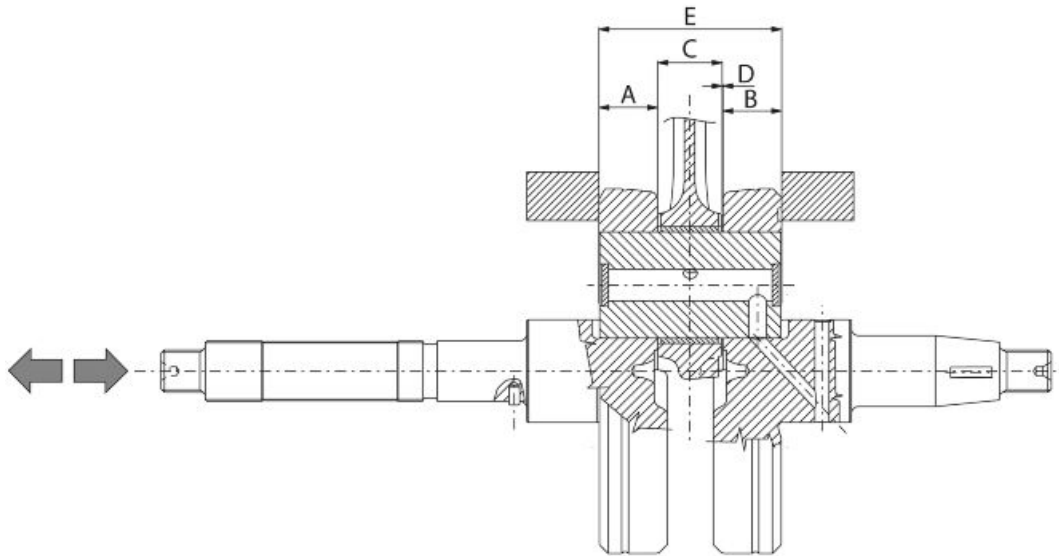
If the crankshaft is within the set limits, replace the crankshaft half-bearings mounting the crankcase so as to suit the specified couplings. The crankcase halves can be mounted with three types of crankshaft half-bearings identified by letters A (red), B (blue), C (yellow), E (green).

CRANKCASE

Specification	Desc./Quantity
Category 1	32.959 ÷ 32.965
Category 2	32.953 ÷ 32.959

CRANKCASE - CRANKSHAFT COUPLING / CRANKSHAFT HALF-BEARINGS

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



CRANKSHAFT/ CRANKCASE AXIAL CLEARANCE

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

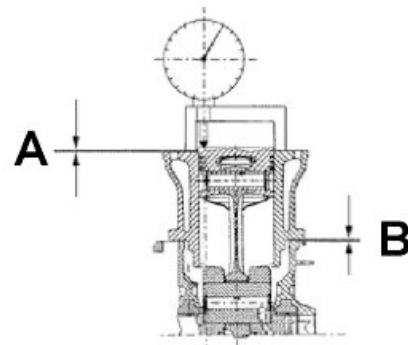
Slot packing system

The shimming system allows the compression ratio to be adjusted correctly.

Characteristic

Compression ratio

11 ± 0.5 : 1



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

N.B.

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

ENGINE 250 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

UNIT OF MEASUREMENT - CONVERSION - ENGLISH SYSTEM AND INTERNATIONAL SYSTEM (IS).

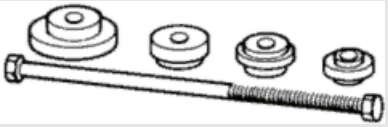

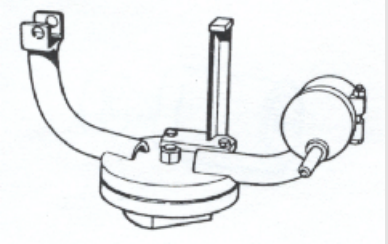

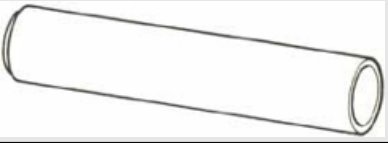


Specification	Desc./Quantity
1 Inch (in)	25.4 Millimetres (mm)
1 Foot (ft)	0.305 Meter (m)
1 Mile (mi)	1.609 Kilometre (km)
1 US Gallon (US gal)	3.785 Litre (l)
1 Pound (lb)	0.454 Kilogram (Kg)
1 Cubic inch (in ³)	16.4 Cubic centimetres (cm ³)
1 Foot pound (ft lb)	1.356 Newton meter (Nm)
1 Miles per hour (mi/h)	1.602 Kilometres per hour (km/h)
1 Pound per square inch (PSI)	0.069 (bar)
1 Fahrenheit (°F)	32+(9/5) Celsius (°C)

INDEX OF TOPICS

TOOLING

TOOL

APPROPRIATE TOOLS

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

Stores code	Description	
020074Y	Support base for checking crankshaft alignment	
020150Y	Air heater support	
020151Y	Air heater	
020193Y	Oil pressure gauge	
020262Y	Crankcase splitting strip	
020263Y	Sheath for driven pulley fitting	

Stores code

Description

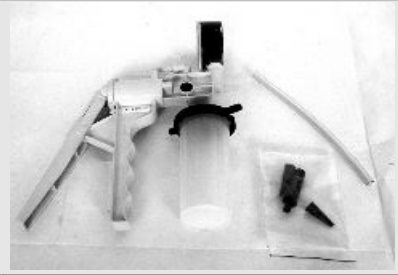
020306Y

Punch for assembling valve seal rings



020329Y

MityVac vacuum-operated pump



020330Y

Stroboscopic light to check timing



020331Y


Digital multimeter




020332Y

Digital rev counter




Stores code	Description	
020648Y	Single battery charger	







020335Y	Magnetic support for dial gauge	
---------	---------------------------------	---







020357Y	32 x 35 mm adaptor	
020359Y	42x47-mm adaptor	

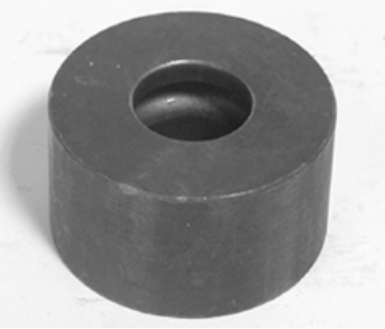


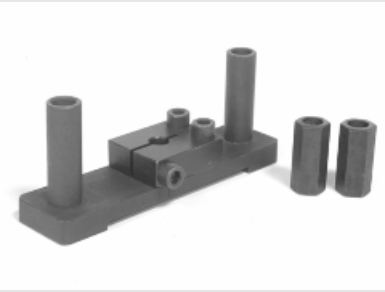









020360Y	Adaptor 52 x 55 mm	
---------	--------------------	---


020363Y	20 mm guide	
---------	-------------	---

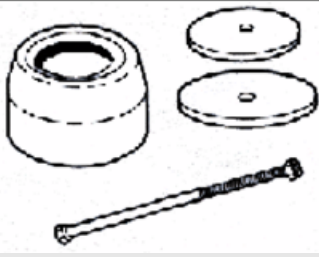




Stores code	Description	
020375Y	Adaptor 28 x 30 mm	
020376Y	Adaptor handle	
020382Y	Valve cotters equipped with part 012 removal tool	
020382Y011	adapter for valve removal tool	
020393Y	Piston fitting band	
020412Y	15 mm guide	

Stores code	Description	
020423Y	driven pulley lock wrench	
020424Y	Driven pulley roller casing fitting punch	
020426Y	Piston fitting fork	
020431Y	Valve oil seal extractor	
020434Y	Oil pressure control fitting	
020444Y	Tool for fitting/ removing the driven pulley clutch	

Stores code	Description	
020456Y	Ø 24 mm adaptor	
020477Y	Adaptor 37 mm	
020483Y	30 mm guide	
020489Y	Hub cover support stud bolt set	
020428Y	Piston position check support	
020460Y	Scooter diagnosis and tester	

Stores code	Description	
020621Y	HV cable extraction adaptor	
020481Y	Control unit interface wiring	
001467Y035	Belle for OD 47-mm bearings	
020626Y	Driving pulley lock wrench	
001467Y013	Pliers to extract ø 15-mm bearings	
020627Y	Flywheel lock wrench	

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

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

INDEX OF TOPICS

MAINTENANCE

MAIN

Maintenance chart

MAINTENANCE TABLE

- Replacement
- Check
- * Replace every 2 years

km x 1,000	1	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Driven pulley roller casing (greasing)			■		■		■		■		■		■		■		■
Safety locks	■		■				■				■				■		
Ignition spark plug					●				●				●				●
Centre stand (lubrication)		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Driving belt			■		●		■		●		■		●		■		●
Throttle control - (adjustment)	■		■		■		■		■		■		■		■		■
Air filter			■		■		■		■		■		■		■		■
Oil filter	●		●		●		●		●		●		●		●		●
Valve clearance					■				■				■				■
Electrical system and battery	■		■				■				■				■		
Coolant level *	■		■		■		■		■		■		■		■		■
Brake fluid level *	■		■		■		■		■		■		■		■		■
Engine oil	●	■	●	■	●	■	●	■	●	■	●	■	●	■	●	■	●
Hub oil	●		■		●		■		●		■		●		■		●
Brake pads	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Sliding blocks / variable speed rollers			●		●		●		●		●		●		●		●
Tyre pressure and wear	■		■		■		■		■		■		■		■		■
Vehicle road test	■		■		■		■		■		■		■		■		■
Suspensions	■		■		■		■		■		■		■		■		■
Steering	■		■		■		■		■		■		■		■		■

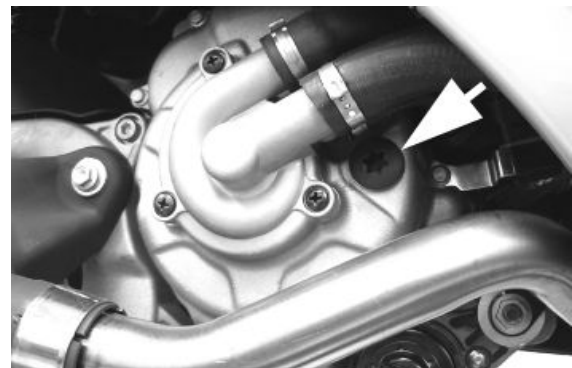
Checking the spark advance

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

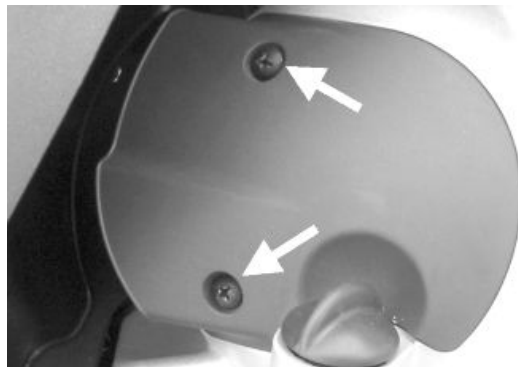
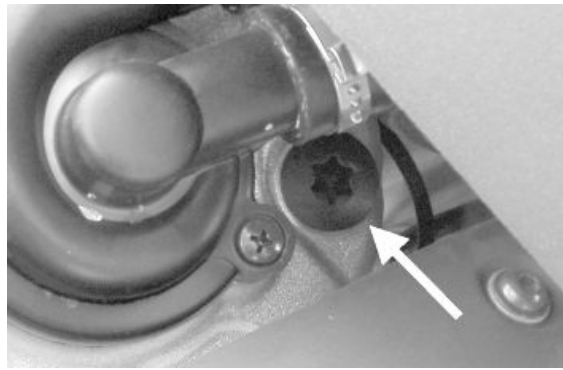
The ignition advance value is detectable at any time using the diagnostic tester. It is possible to check whether the ignition advance determined by the injection system matches the value actually activated on the engine, by means of the stroboscopic light.

Proceed as follows:

- Remove the spark plug.
- Remove the plastic cover on the flywheel cover shown in the photograph.
- Remove the transmission compartment air intake cover shown in the photograph.



- Rotate the driving pulley fan using a screwdriver 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 photograph.
- 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 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 «parameter» function in this menu.
- Select the stroboscopic light command in 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
- rpm-timing sensor
- injection control unit

Specific tooling

020460Y Scooter diagnosis and tester

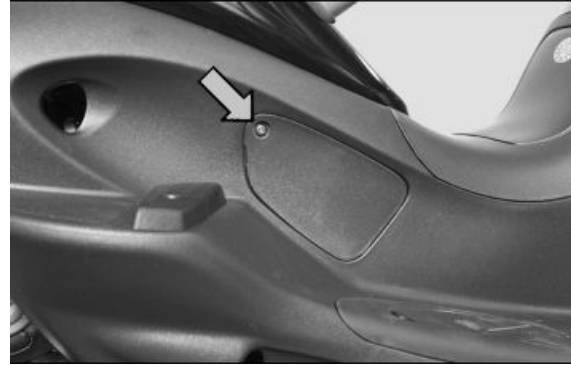
020330Y Stroboscopic light to check timing

020621Y HV cable extraction adaptor

Spark plug

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

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



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



CAUTION

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

Characteristic

Spark plug

CHAMPION RG 4 PHP

Electrode gap

0.7-0.8 mm

Locking torques (N*m)

Spark plug 12 ÷ 14

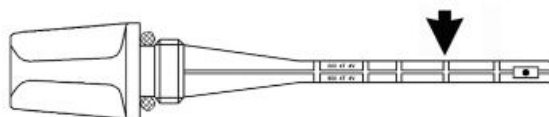
Hub oil

Check

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

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

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



Replacement

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

Recommended products

AGIP ROTRA 80W-90 Rear hub oil

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

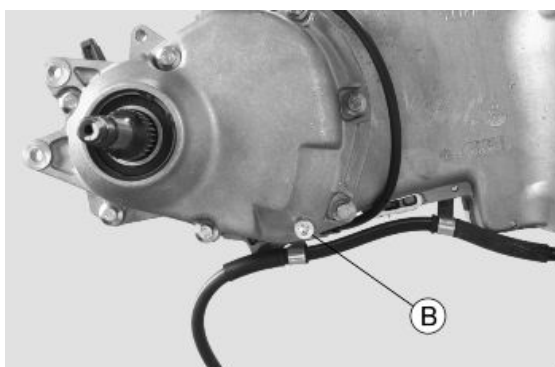
Characteristic

Rear hub oil

Capacity approximately 250 cc

Locking torques (N*m)

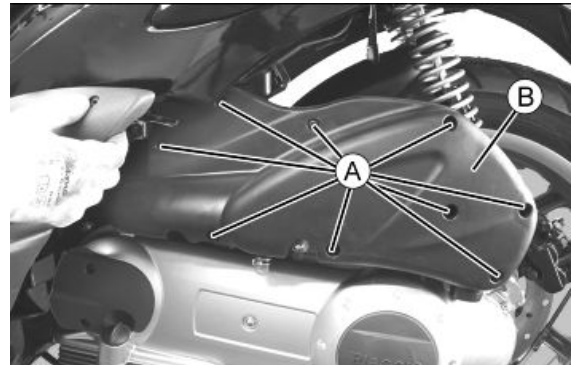
Hub oil drainage screw 15 ÷ 17 Nm



Air filter

To access 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

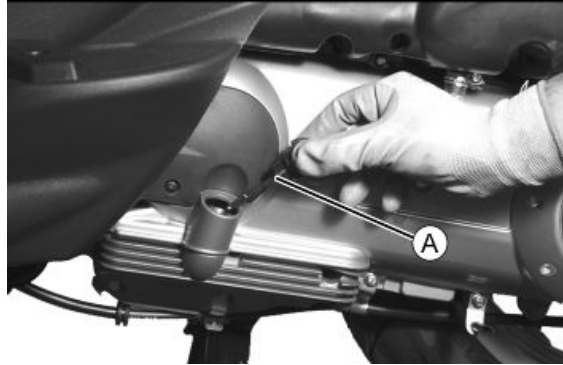
Mineral oil with specific additives for increased adhesiveness

Engine oil

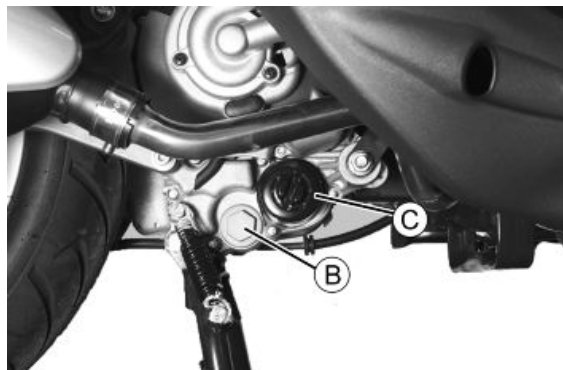
Replacement

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 oil drainage plug, screwing them up to the specified torque.

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

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.

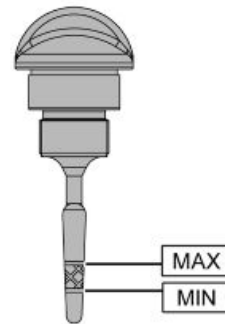
THE ENGINE MUST BE HOT WHEN THE OIL IS CHANGED.

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



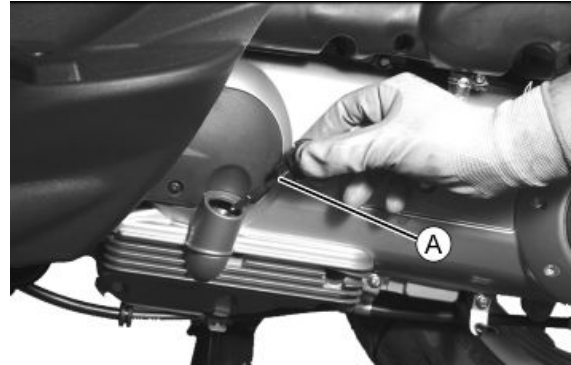
Engine oil

1.3 l

Check

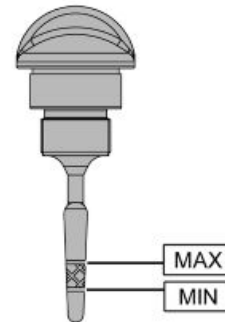
This operation **must be carried out with the engine cold** and following the procedure below:

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

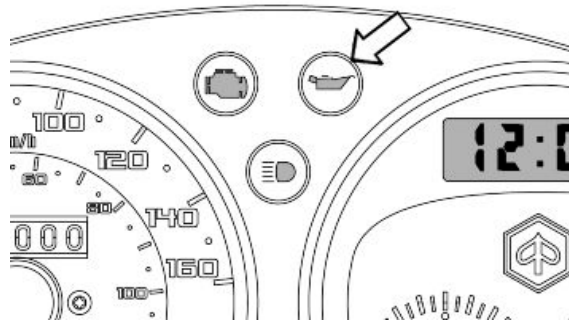
Recommended products**AGIP CITY HI TEC 4T Engine oil**

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.

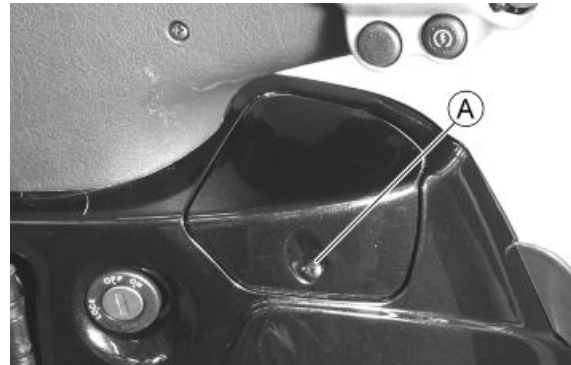


Cooling system

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».

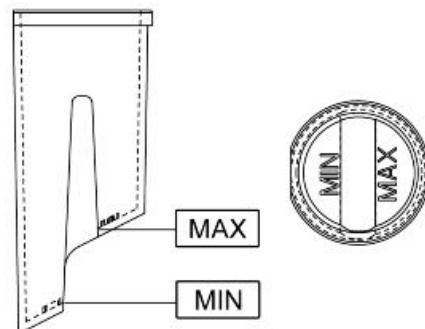


- Remove the expansion tank cover «B» by turning it anticlockwise.



- 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.

IN ORDER TO GUARANTEE THE PROPER FUNCTION OF THE ENGINE, IT IS NECESSARY TO KEEP THE RADIATOR GRILLE CLEAN.

Recommended products

AGIP PERMANENT SPEZIAL coolant

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

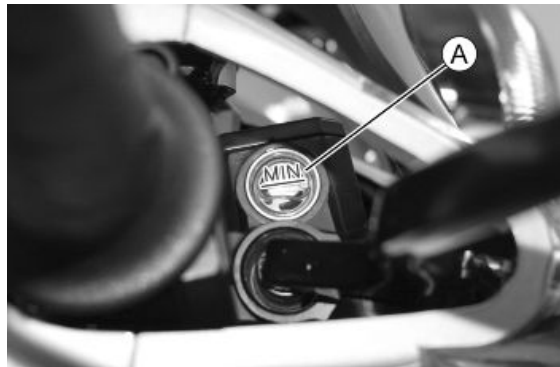
Braking system

Level check

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

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

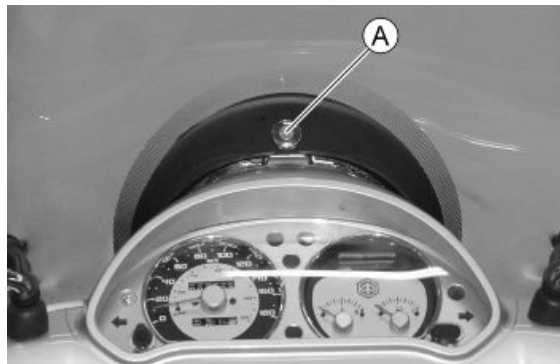
A certain lowering of the level is caused by wear on the pads.



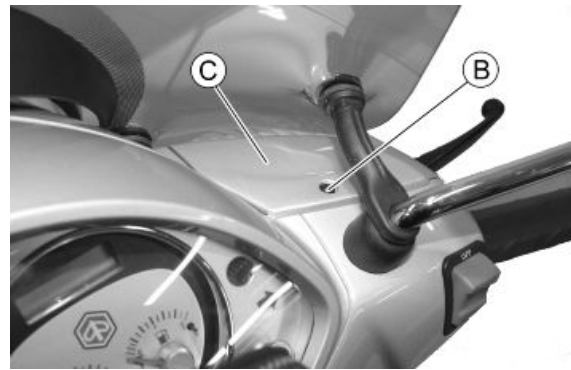
Top-up

Proceed as follows:

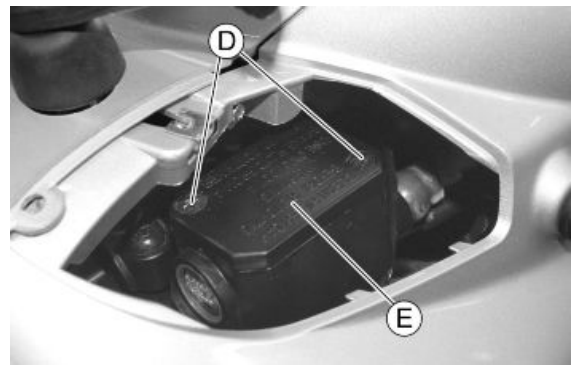
- Undo the five screws « A » and remove the wind-shield.



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



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



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

CAUTION

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

CAUTION

ONLY USE DOT 4-CLASSIFIED BRAKE FLUID.

WARNING

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

WARNING

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

Recommended products

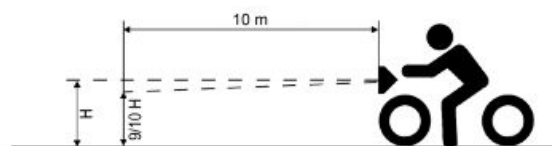
AGIP BRAKE 4 Brake fluid

FMVSS DOT 4 Synthetic fluid

Headlight adjustment

Proceed as follows:

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



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

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

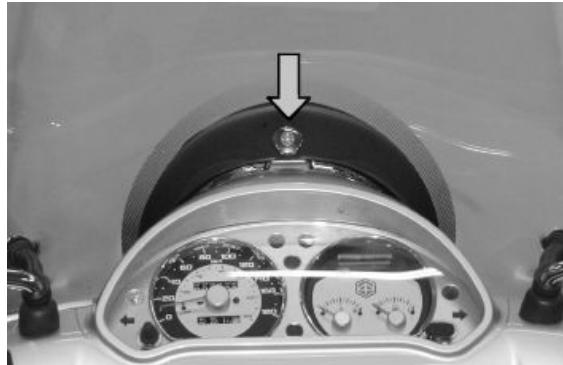
- Otherwise, adjust the headlight.

N.B.

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

To adjust light beams:

- Undo the five screws indicated and remove the windshield.



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



INDEX OF TOPICS

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 encrustations 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
Transmission 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 assembly

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 - Engine flooded.	Inspect the head and/or restore the correct clearance 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 motor 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 Battery flat	Replace the spark plug or check the ignition circuit components 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 assembly
Worn cylinder, Worn or broken piston rings	Replace the piston cylinder assembly or piston rings
Worn or broken piston rings or piston rings that have not been fitted properly	Replace the piston cylinder unit or just the piston rings
Oil leaks from the couplings or from the gaskets	Check and replace the gaskets or restore the coupling seal
Worn valve oil guard	Replace the valve oil guard
Worn valve guides	Check and replace the head unit if required

Insufficient lubrication pressure

POOR LUBRICATION PRESSURE

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

Transmission and brakes

Clutch grabbing or performing inadequately

IRREGULAR CLUTCH PERFORMANCE OR SLIPPAGE

Possible Cause	Operation
Faulty clutch	Check that there is no grease on the masses. Check that the clutch mass contact surface with the casing 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 scooter.

Brakes overheating

BRAKES OVERHEATING

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

Steering and suspensions

Heavy steering

STEERING HARDENING

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

Excessive steering play

EXCESSIVE STEERING CLEARANCE

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

Noisy suspension

NOISY SUSPENSION

Possible Cause	Operation
Malfunctions in the suspension system	If the front suspension is noisy, check: locking torques, head-stock components, inspect forks.

Suspension oil leakage

OIL LEAKAGE FROM SUSPENSION

Possible Cause	Operation
Seal fault or breakage	Replace the shock absorber

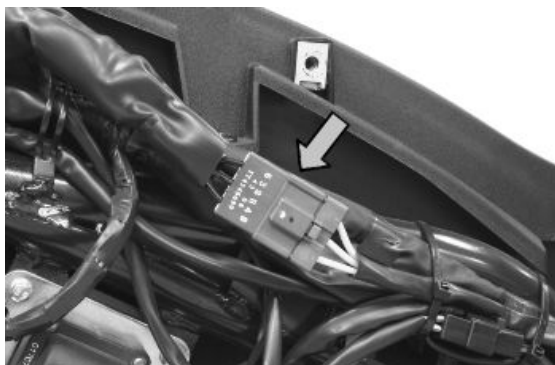
INDEX OF TOPICS

ELECTRICAL SYSTEM

ELE SYS

Components arrangement

1. Statore: per accedere al connettore rimuovere la fiancata laterale destra.



2. Batteria: per accedervi rimuovere il coperchio batteria situato nel vano sottosella.

**Characteristic
Battery**

12V-12Ah



3. Teleruttore di avviamento: per accedervi rimuovere la fiancata laterale destra.



4. Fusibili primari: per accedervi rimuovere la copertura laterale destra.



5. Bobina A.T. : per accedervi rimuovere la fiancata laterale destra.

Characteristic

HV coil resistance primary value:

~ 0.9 Ω

HV coil secondary resistance value:

~ 3.4 k Ω

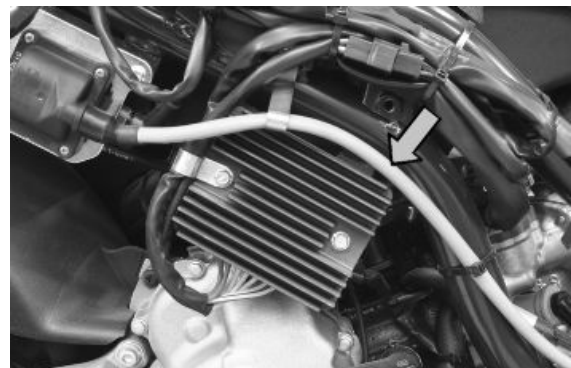


6. Regolatore di tensione: per accedervi rimuovere la fiancata laterale destra.

Electric characteristic

Control voltage

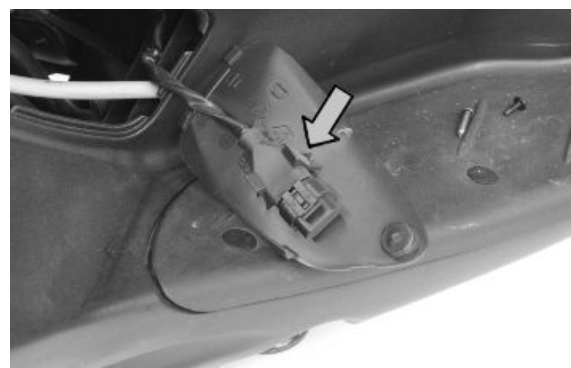
14÷15 V to 1500÷12000 rpm

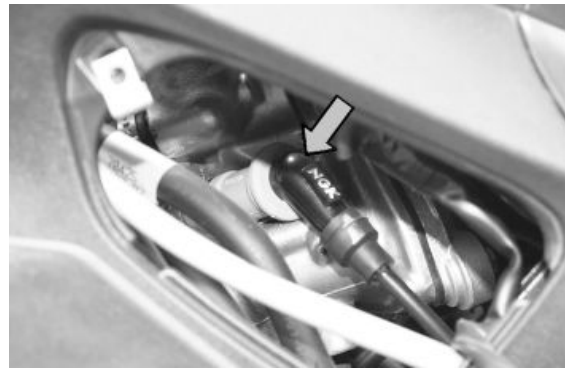


7. Sensore pressione olio: situato in basso nella parte posteriore del lato destro del veicolo.



8. Connettore per diagnostica: per accedervi rimuovere il coperchio sul lato destro del veicolo.





10. Clacson: per accedervi rimuovere il controscudo.



11. Antenna Immobilizer: per accedervi rimuovere lo scudo anteriore.



12. Commutatore a chiave: per accedervi rimuovere lo scudo anteriore.

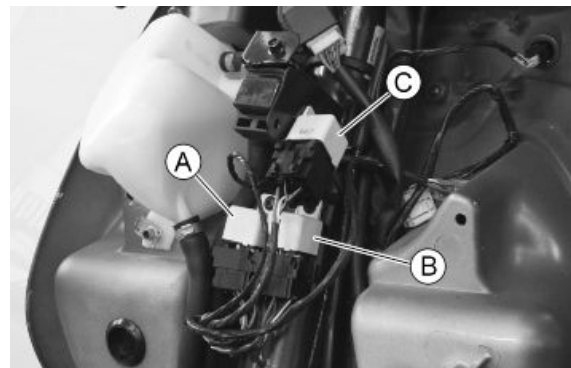


13. Dispositivo comando lampeggiatori: per accedervi rimuovere lo scudo anteriore.

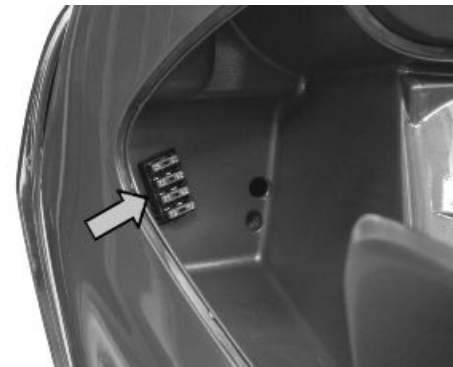


14. Teleruttori: per accedervi rimuovere lo scudo anteriore.

- A. Teleruttore luci
- B. Teleruttore elettroventola
- C. Teleruttore carichi iniezione



15. Fusibili secondari: situati nel vano portaoggetti anteriore.



16. Trasmettitore livello carburante: per accedervi rimuovere la copertura centrale.

Electric characteristic

Resistance value when the tank is full

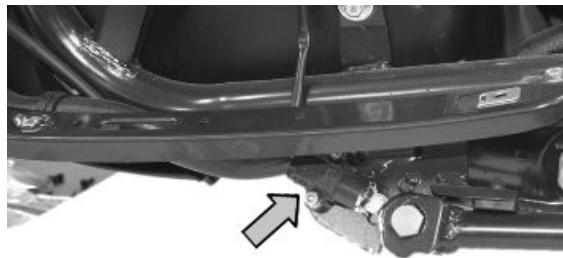
$\leq 7 \Omega$

Resistance value when the tank is empty

$90 + 13/-3 \Omega$



17. Interruttore cavalletto: per accedervi rimuovere la pedana poggiapiedi sinistra.



18. Attuatore apriporta: per accedervi rimuovere la fiancata laterale sinistra.

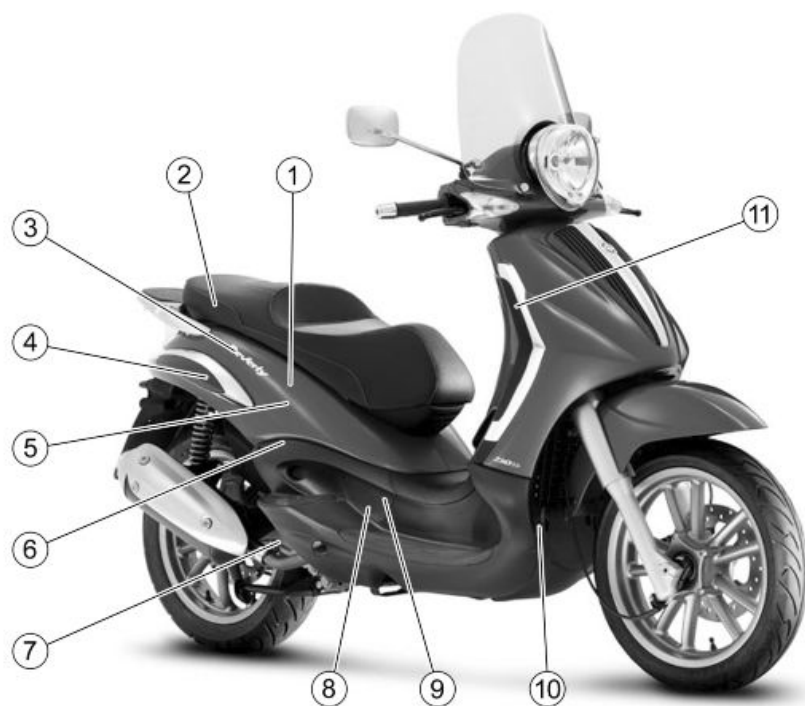


19. Centralina elettronica per iniezione: per accedervi rimuovere il coperchio di ispezione situato nel vano sottosella.

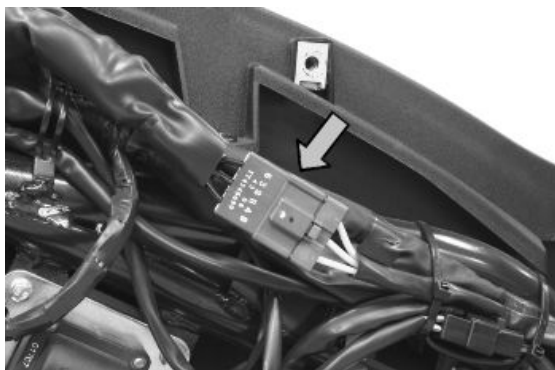


20. Presa di corrente: situata nel vano sottosella.





1. Statore: per accedere al connettore rimuovere la fiancata laterale destra.



2. Batteria: per accedervi rimuovere il coperchio batteria situato nel vano sottosella.

Characteristic

Battery

12V-12Ah



3. Teleruttore di avviamento: per accedervi rimuovere la fiancata laterale destra.



4. Fusibili primari: per accedervi rimuovere la copertura laterale destra.



5. Bobina A.T. : per accedervi rimuovere la fiancata laterale destra.

Characteristic

HV coil resistance primary value:

~ 0.9 Ω

HV coil secondary resistance value:

~ 3.4 k Ω

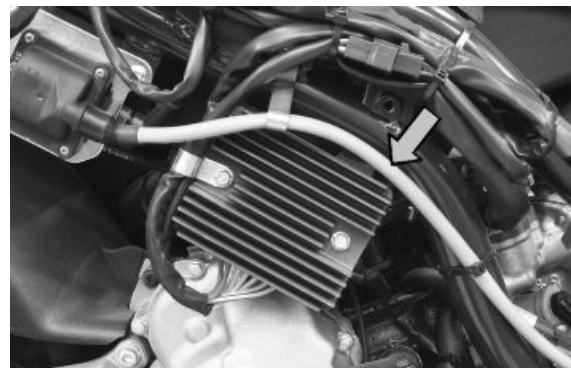


6. Regolatore di tensione: per accedervi rimuovere la fiancata laterale destra.

Electric characteristic

Control voltage

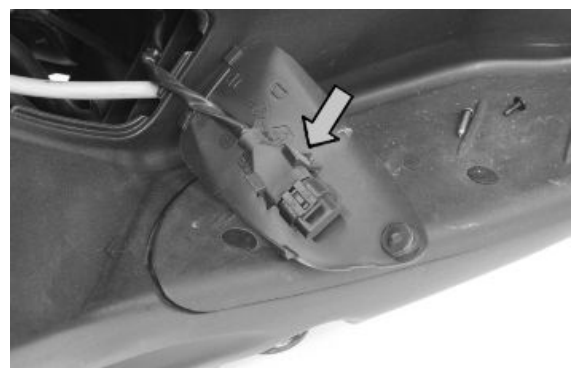
14÷15 V to 1500÷12000 rpm



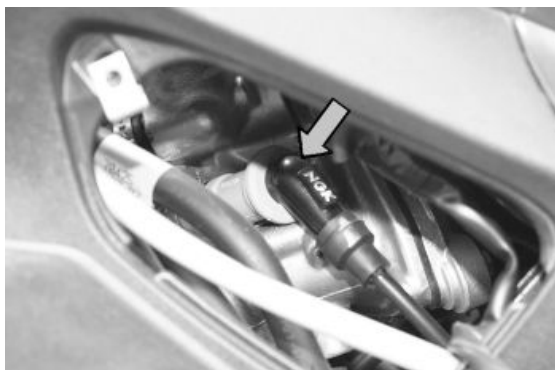
7. Sensore pressione olio: situato in basso nella parte posteriore del lato destro del veicolo.



8. Connettore per diagnostica: per accedervi rimuovere il coperchio sul lato destro del veicolo.



9. Candela: per accedervi rimuovere il coperchio sul lato destro del veicolo.



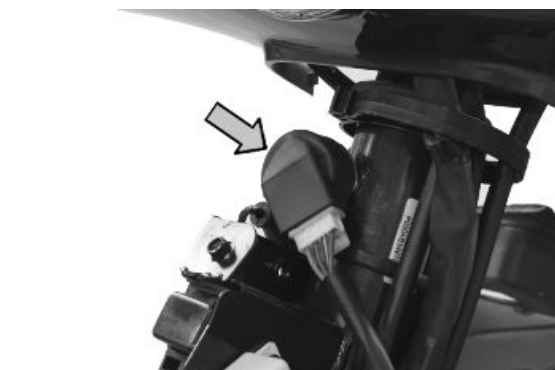
10. Clacson: per accedervi rimuovere il controscudo.



11. Antenna Immobilizer: per accedervi rimuovere lo scudo anteriore.



12. Commutatore a chiave: per accedervi rimuovere lo scudo anteriore.

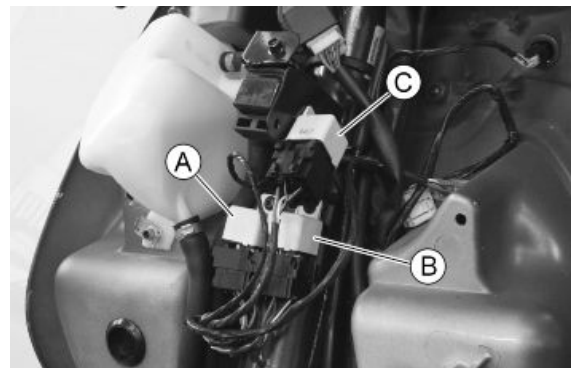


13. Dispositivo comando lampeggiatori: per accedervi rimuovere lo scudo anteriore.



14. Teleruttori: per accedervi rimuovere lo scudo anteriore.

- A. Teleruttore luci
- B. Teleruttore elettroventola
- C. Teleruttore carichi iniezione



15. Fusibili secondari: situati nel vano portaoggetti anteriore.



16. Trasmettitore livello carburante: per accedervi rimuovere la copertura centrale.

Electric characteristic

Resistance value when the tank is full

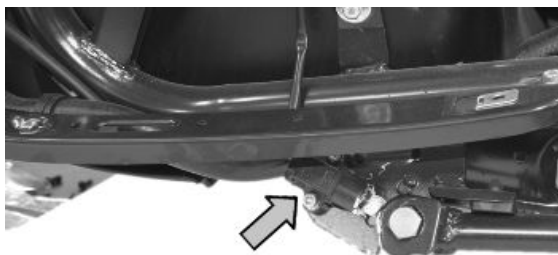
$\leq 7 \Omega$

Resistance value when the tank is empty

$90 + 13/-3 \Omega$



17. Interruttore cavalletto: per accedervi rimuovere la pedana poggiapiedi sinistra.



18. Attuatore apriporta: per accedervi rimuovere la fiancata laterale sinistra.



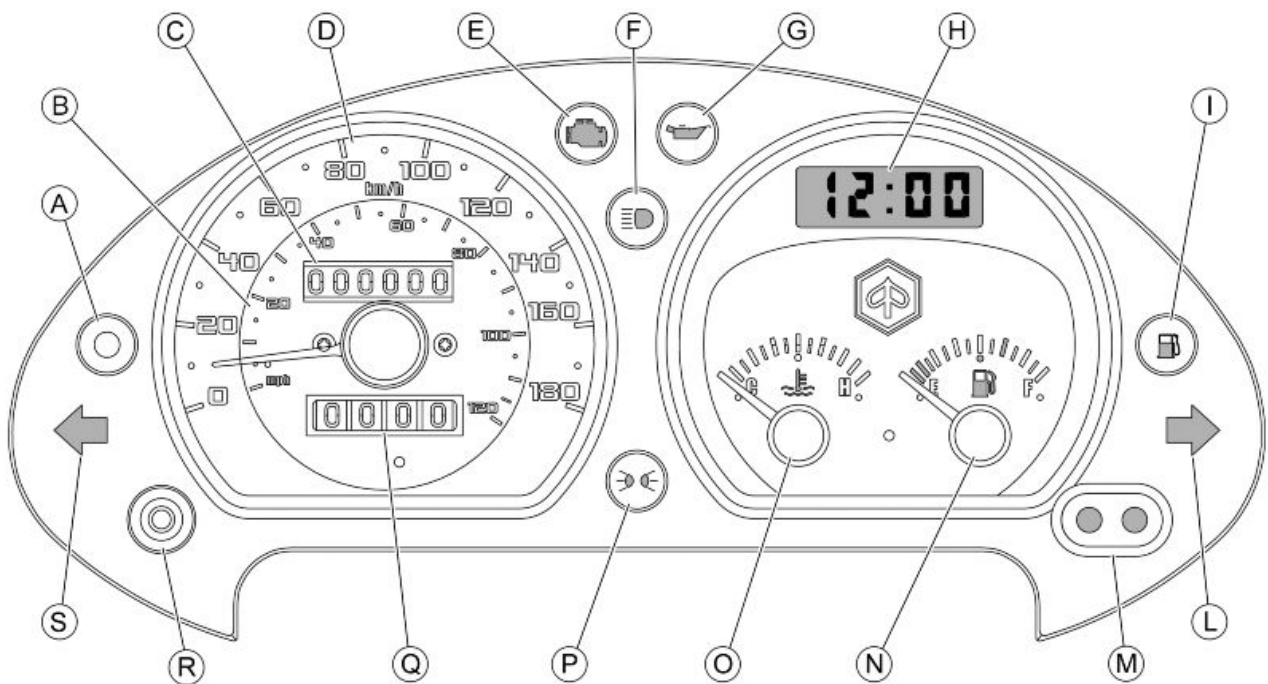
19. Centralina elettronica per iniezione: per accedervi rimuovere il coperchio di ispezione situato nel vano sottosella.



20. Presa di corrente: situata nel vano sottosella.



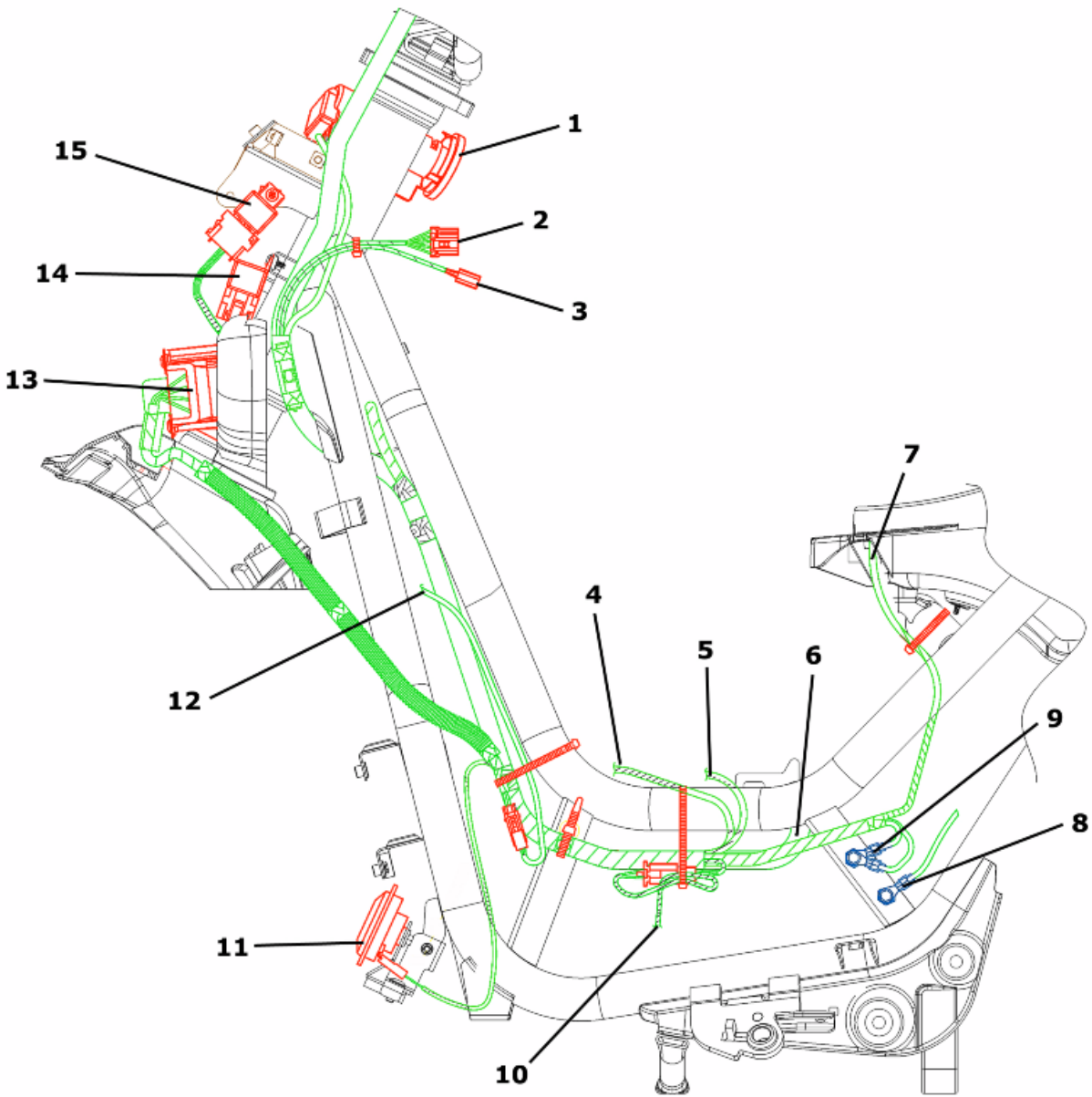
Instrument panel



- A** = Immobilizer LED
- B** = Speedometer (mph)
- C** = Total Odometer
- D** = Speedometer (km/h)
- E** = Injection telltale light
- F** = High-beam warning light
- G** = Oil pressure warning light
- H** = Digital clock
- I** = Low fuel warning light
- L** = Right turn indicator warning light
- M** = Clock controls
- N** = Fuel gauge
- O** = Water temperature gauge
- P** = Headlight warning light
- Q** = Trip odometer
- R** = Odometer reset button
- S** = Left turn indicator warning light

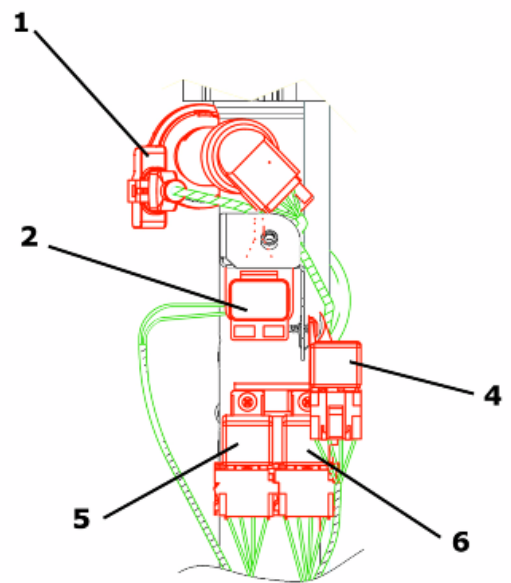
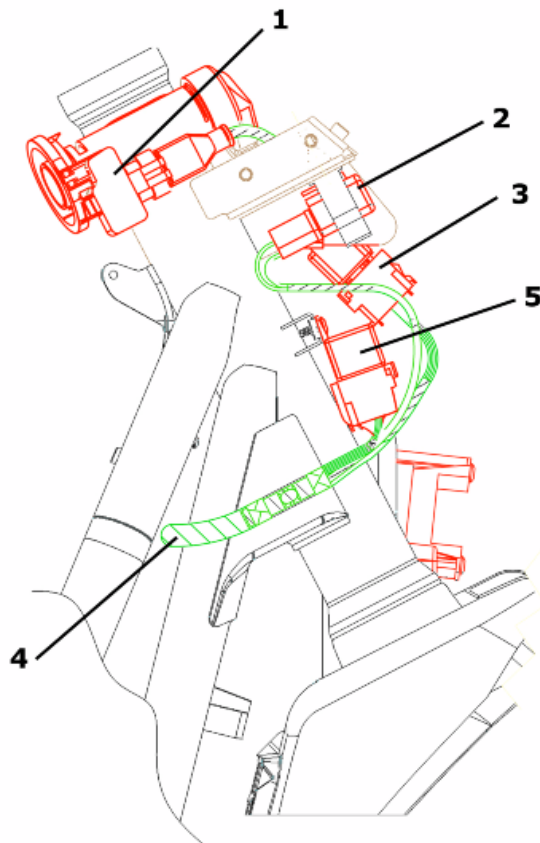
Electrical system installation

Front side

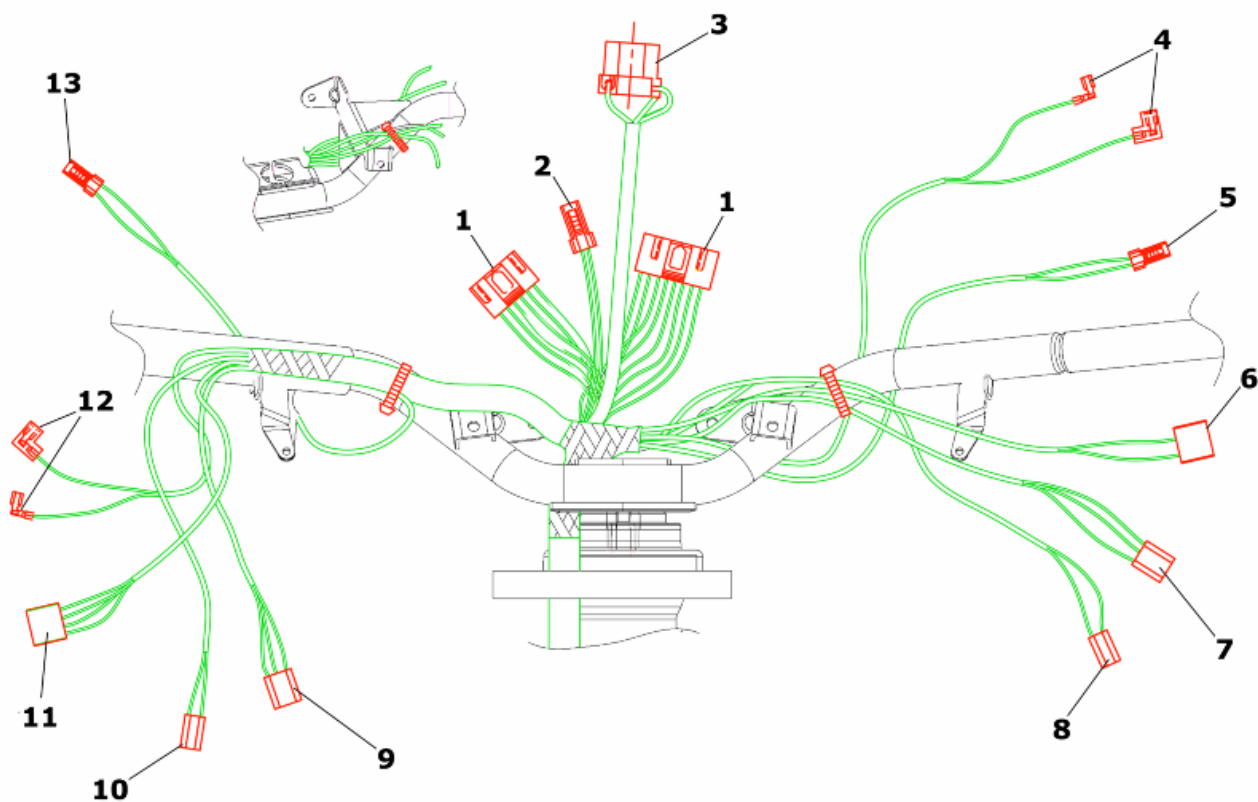


1. Immobilizer aerial
2. Pre-installation for antitheft ECU
3. Saddle opening switch
4. To fuel gauge
5. To fuel pump
6. Towards right fairing
7. To helmet compartment light switch
8. Engine ground lead
9. Ground lead clamping to chassis
10. To stand switch

- 11.Horn
- 12.To electric fan
- 13.Front fuse-box
- 14.Electric fan remote control
- 15.Injection load remote control

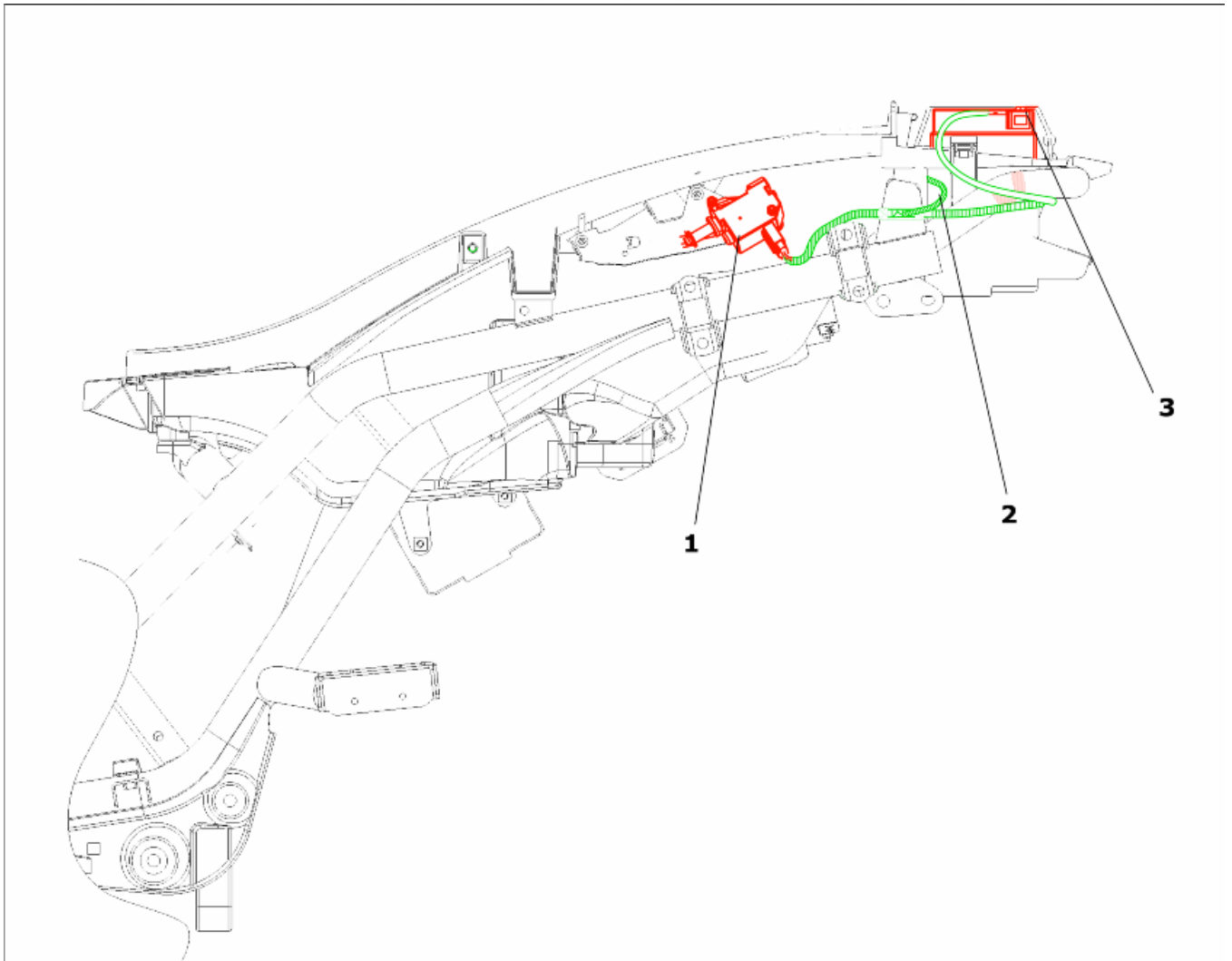


- 1. Immobilizer aerial
- 2. Turn indicator control device
- 3. Injection load remote control
- 4. On the left side
- 5. Light remote control
- 6. Electric fan remote control

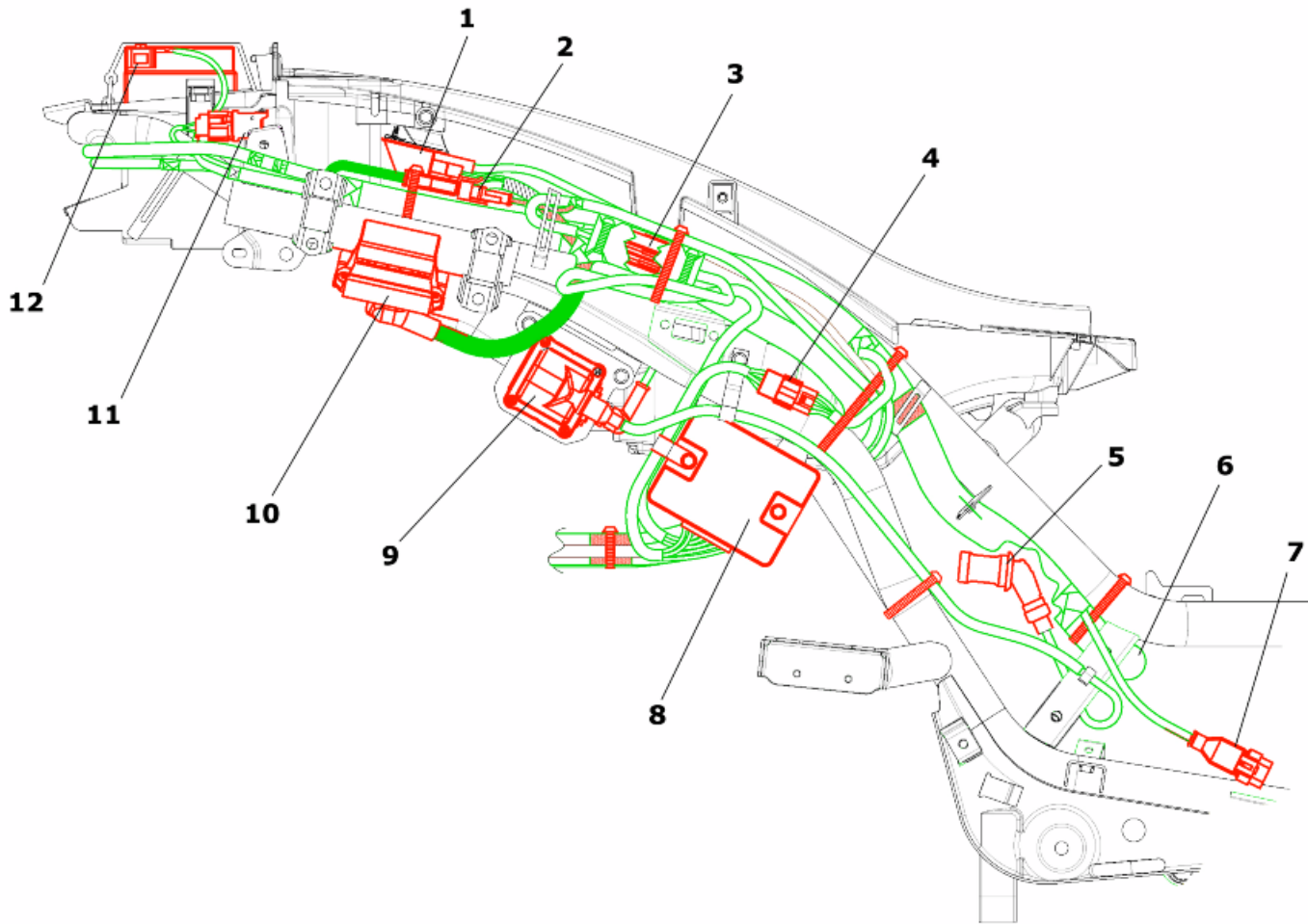


1. To instrument panel
2. To front position light
3. To headlight
4. To right turn indicator
5. To front brake stop button
6. To engine stop switch
7. To light switch
8. To starter button
9. To turn indicator switch
10. To horn button
11. To light switch
12. To left turn indicator
13. To front brake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

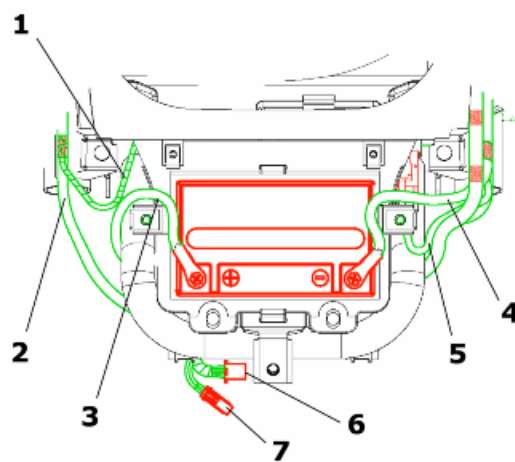
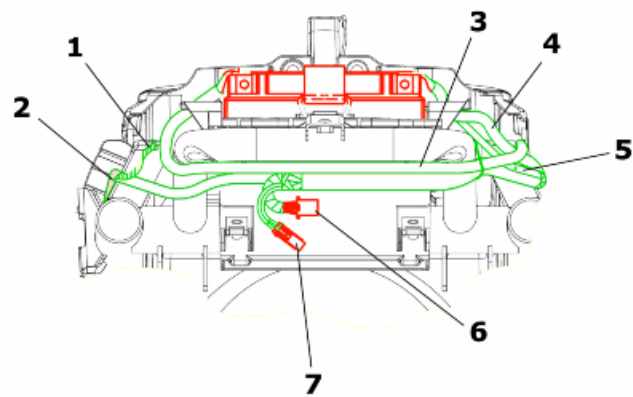
Back side



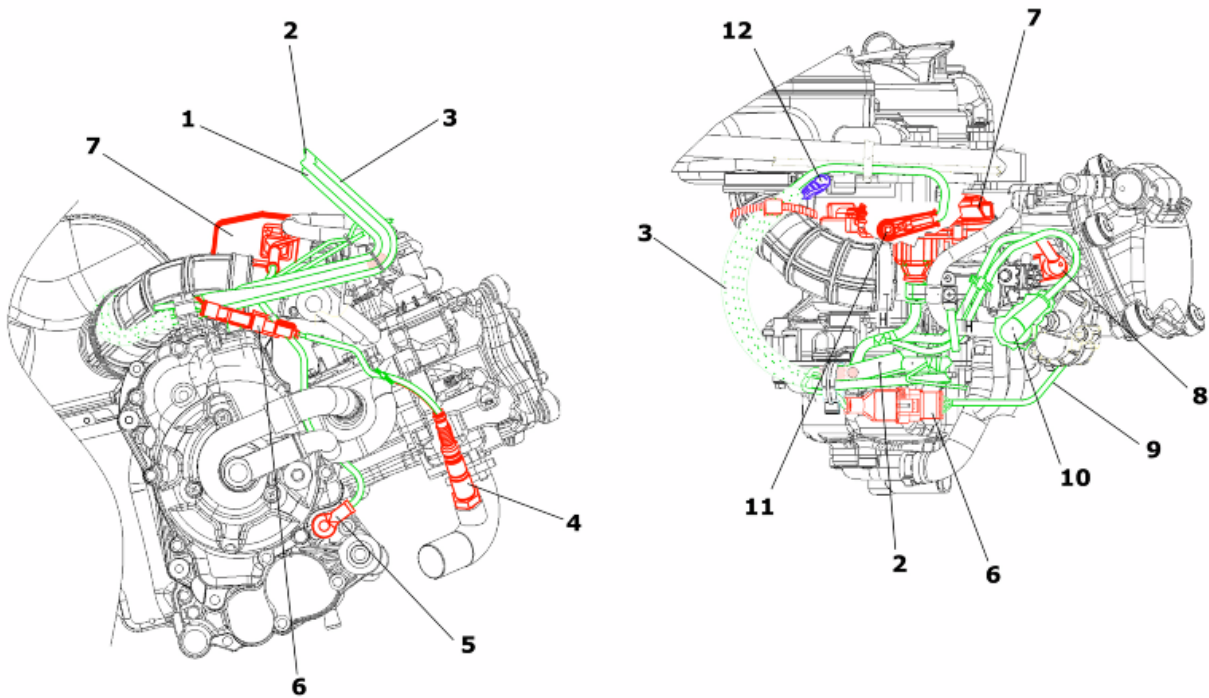
1. Saddle opening actuator
2. To internal light
3. Battery positive



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



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



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

Checks and inspections

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

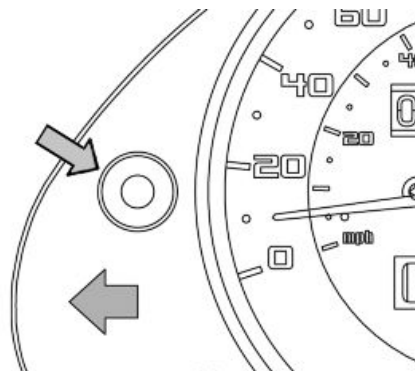
Immobiliser

L'impianto di accensione elettronica viene gestito dalla centralina nella quale è integrato il sistema Immobilizer. L'Immobilizer è un sistema antifurto che permette il funzionamento del veicolo solo se questo viene avviato mediante delle chiavi codificate e riconosciute dalla centralina. Il codice è integrato in un trasponder inserito nel corpo della chiave. Questo consente un funzionamento trasparente al conducente che non deve eseguire alcuna operazione aggiuntiva alla normale rotazione della chiave. L'impianto Immobilizer è composto dai seguenti componenti:

- centralina
- antenna immobilizer
- chiave master con trasponder incorporato
- chiave di servizio con trasponder incorporato
- bobina A.T.
- led diagnostico

Il led diagnostico svolge anche la funzione di lampo-eggio deterrente. Questa funzione si ottiene ogni volta che il commutatore a chiave viene posizionato in «OFF» o se l'interruttore di arresto di emergenza viene commutato in «OFF» e, al fine di non pregiudicare la carica della batteria, rimane attiva per 48 ore. Quando il commutatore a chiave viene posizionato in «ON» si interrompe la funzione di lampo deterrente e di seguito avviene un lampo di conferma del passaggio in «ON». La durata di questo lampo varia in funzione della programmazione della centralina. Nel caso in cui il led risulti spento indipendentemente dalla posizione del commutatore a chiave e/o non venga inizializzato il quadro strumenti, verificare:

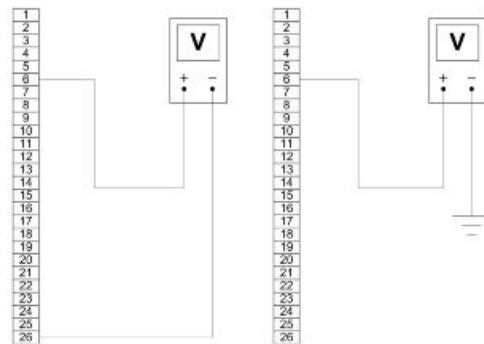
- presenza tensione batteria
- efficienza fusibili 1,2,6,9



- presenza delle alimentazioni alla centralina come di seguito specificato:

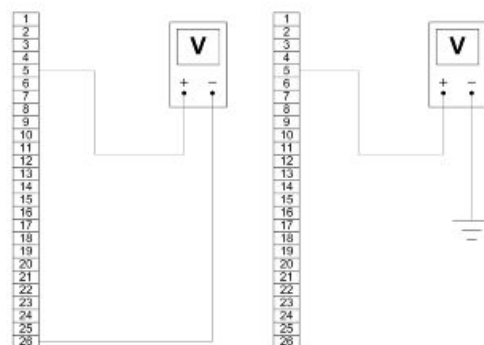
With the key switch set to OFF:

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

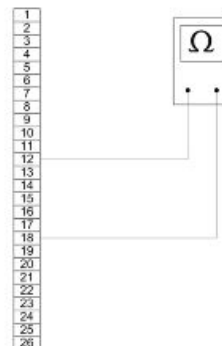


With the key switch in the OFF position:

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



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



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



Remove the protective base from the connector.



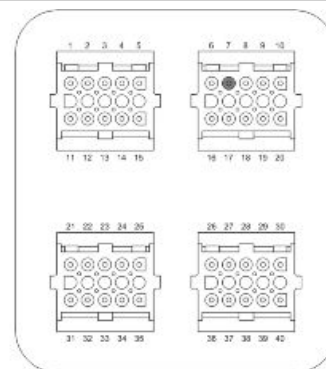
With the ignition key switch at «ON» check if there is battery voltage between the Red-White and Black cables

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

Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter



Virgin circuit

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

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

The maximum time to change keys is 10 seconds.

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

It is essential to adhere to the times and the procedure. If you do not, start again from the beginning. Once the system has been programmed, the master key transponder is strictly matched with the control unit. With this link established, it is now possible to encode new service keys, in the event of losses, replacements, etc. Each new programming deletes the previous one so, in order to add or eliminate keys, you must repeat the procedure using all the keys you intend to keep using. If a service key should

become un-coded, the efficiency of the high voltage circuit shielding must be thoroughly inspected: In any case it is advisable to use resistive spark plugs.

Diagnostic codes

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

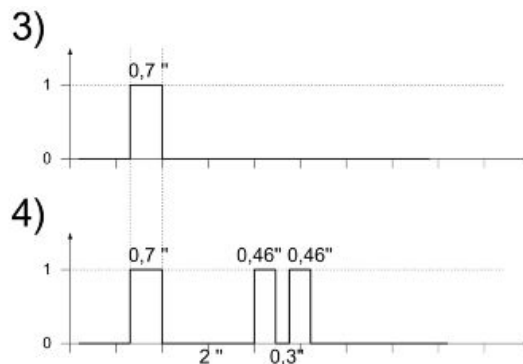
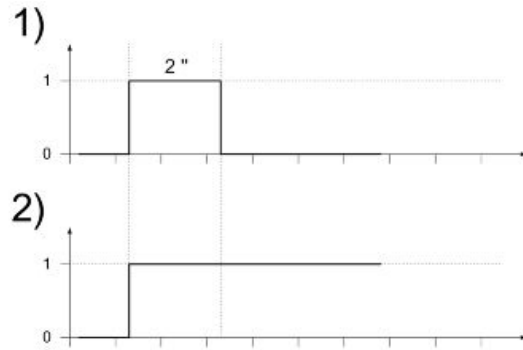
1. Previously unused control unit - key inserted: a single 2 second flash is displayed, after which the LED remains off permanently. The keys can be stored to memory, the vehicle can be started but with a limitation imposed on the number of revs.

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

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

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

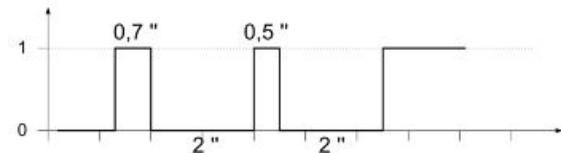
5. Programmed control unit - fault detected: a light code is displayed according to the fault detected, after which the LED remains on permanently. The engine cannot be started. The codes that can be transmitted are:



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

Diagnostic code - 1 flash

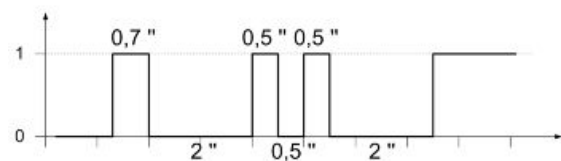
The one-flash code indicates a system where the serial line is not present or is not detected. Check the Immobilizer aerial wiring and change it if necessary.



Diagnostic code - 2 flashes

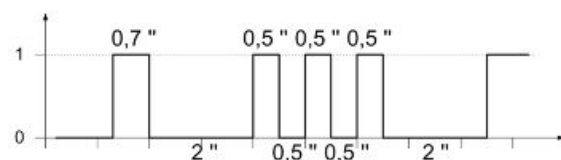
A two-flash code shows a system where the control unit does not show the transponder signal. This might depend on the inefficiency of the immobiliser aerial or the transponder.

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, perform a reprogramming.



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

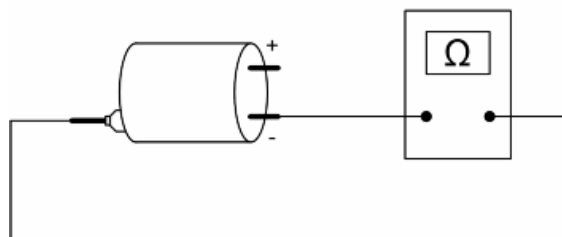
HV coil resistance primary value:

~ 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 system is provided with a three phase alternator with permanent flywheel.

The alternator is directly connected to the voltage regulator.

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

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

Stator check

Stator winding check-up

WARNING

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

- 1) Rimuovere la fiancata laterale destra.
- 2) Scollegare il connettore tra statore e regolatore con i tre cavetti gialli come indicato in foto.
- 3) Misurare la resistenza tra ciascuno dei terminali gialli e gli altri due.
- 4) Verificare che vi sia isolamento tra ciascun cavetto giallo e la massa.



Electric characteristic

Resistance:

0.2 - 1 Ω

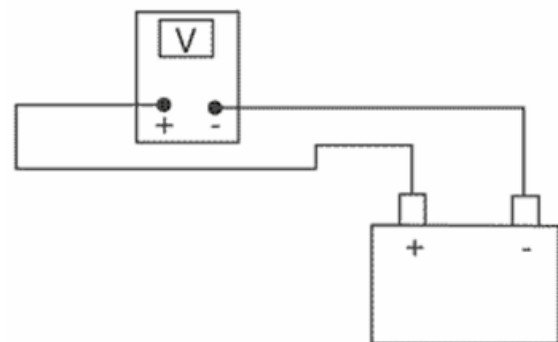
Voltage regulator check

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

Voltage should not exceed 15 Volt.

In case higher voltages are detected, replace the regulator.

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



Electric characteristic

Control voltage

14÷15 V to 1500÷12000 rpm

Recharge system voltage check

Look for any leakage

- 1) Access the battery by removing its cover under the saddle.
- 2) Check that the battery does not show signs of losing fluid before checking the output voltage.
- 3) Turn the ignition key to «OFF», connect the multimeter leads between the battery negative pole (-) and the Black cable. Only then disconnect the Black cable from the battery negative pole (-).

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

Check the charging current

WARNING

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

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

Electric characteristic

Voltage ranging between 14.0 and 15.0V at 5000 rpm.

Maximum current output check.

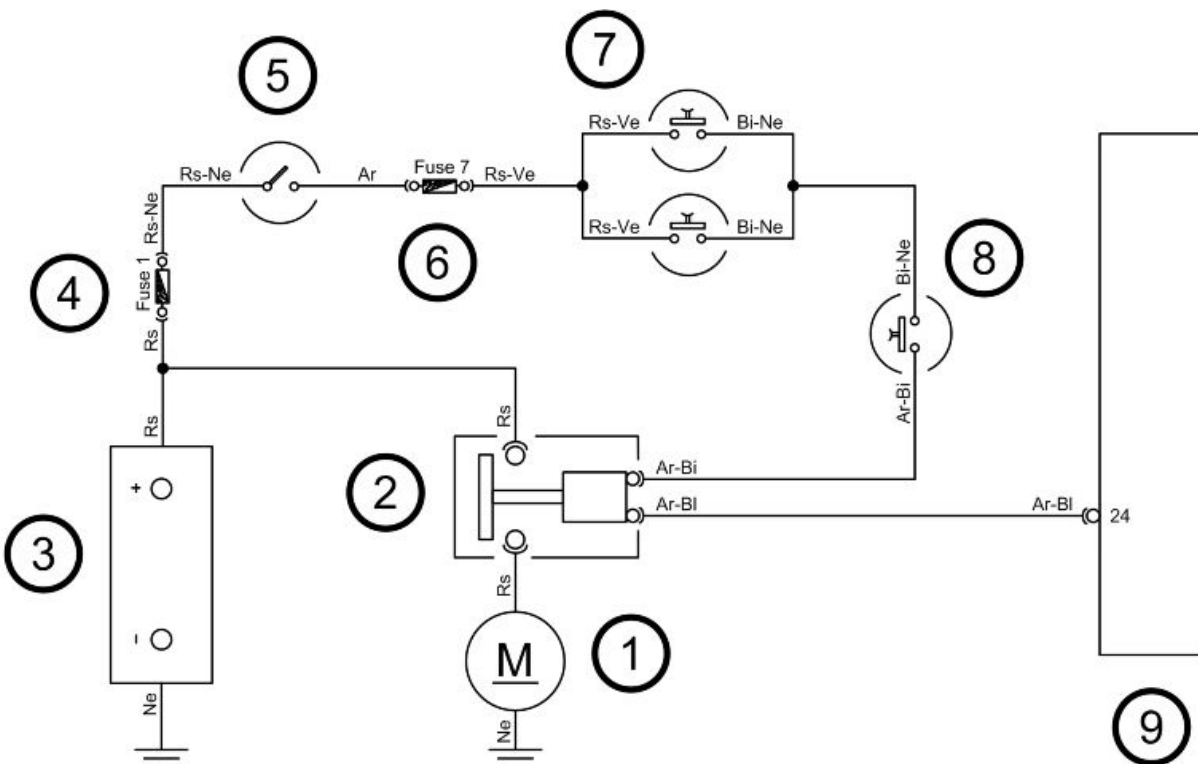
- With the engine off and the panel at «ON» with the lights on, allow the battery voltage to stop at 12V.
- Connect ammeter pliers to the 2 recharge positive poles in output from the regulator.
- Start the engine and rev it up to a high engine speed while reading the value on the pincer.

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

VOLTAGE REGULATOR/RECTIFIER

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

Starter motor



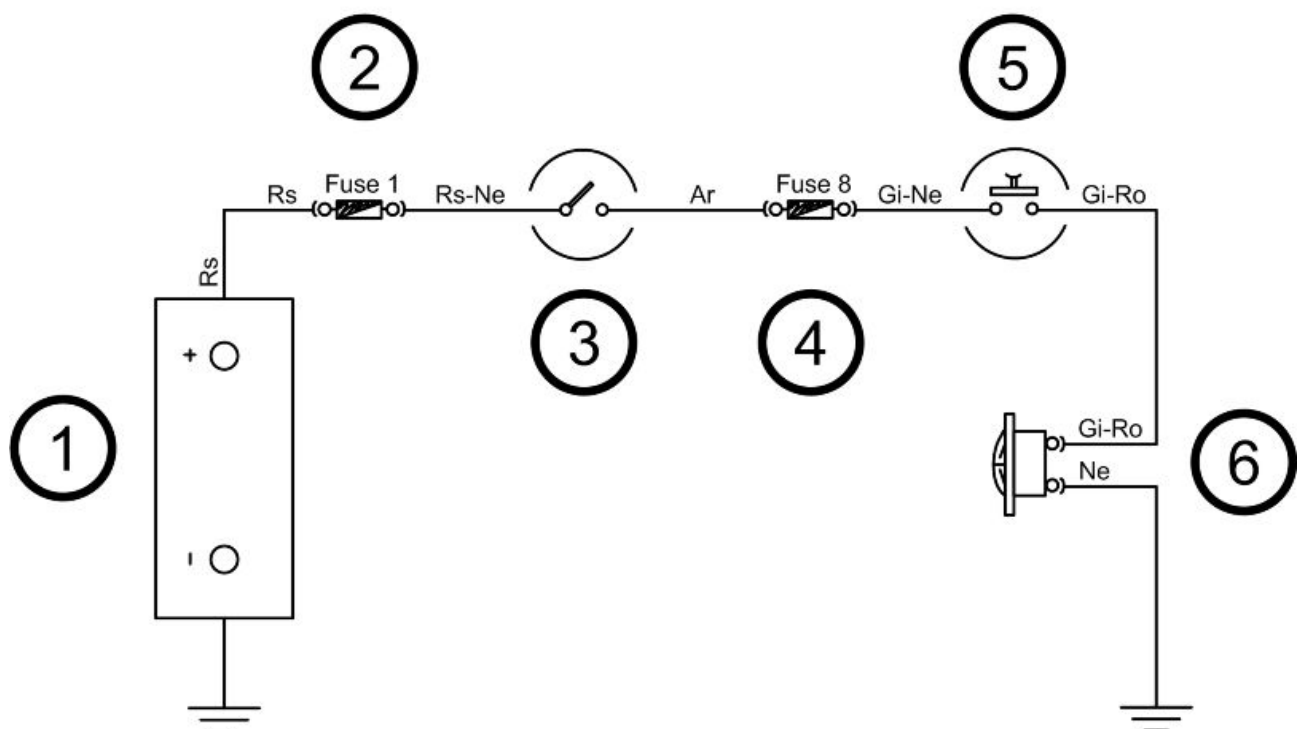
LEGENDA

1. Motorino d'avviamento
2. Teleruttore d'avviamento
3. Batteria
4. Fusibile n°1
5. Contatti del commutatore a chiave
6. Fusibile n°7
7. Pulsanti stop
8. Pulsante d'avviamento
9. Centralina elettronica per iniezione

WARNING

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

- 1) Controllare la continuità del cavo Rosso tra batteria, teleruttore d'avviamento e motorino.
- 2) Controllare i fusibili n°1 e 7, i contatti del commutatore a chiave, i pulsanti di stop e il pulsante d'avviamento.
- 3) Controllare il teleruttore d'avviamento.
- 4) Se i componenti risultano integri verificare la continuità dei cablaggi che li collegano.
- 5) Verificare la continuità del cavo Arancio-Blu tra teleruttore d'avviamento e connettore della centralina.

Horn control**KEY**

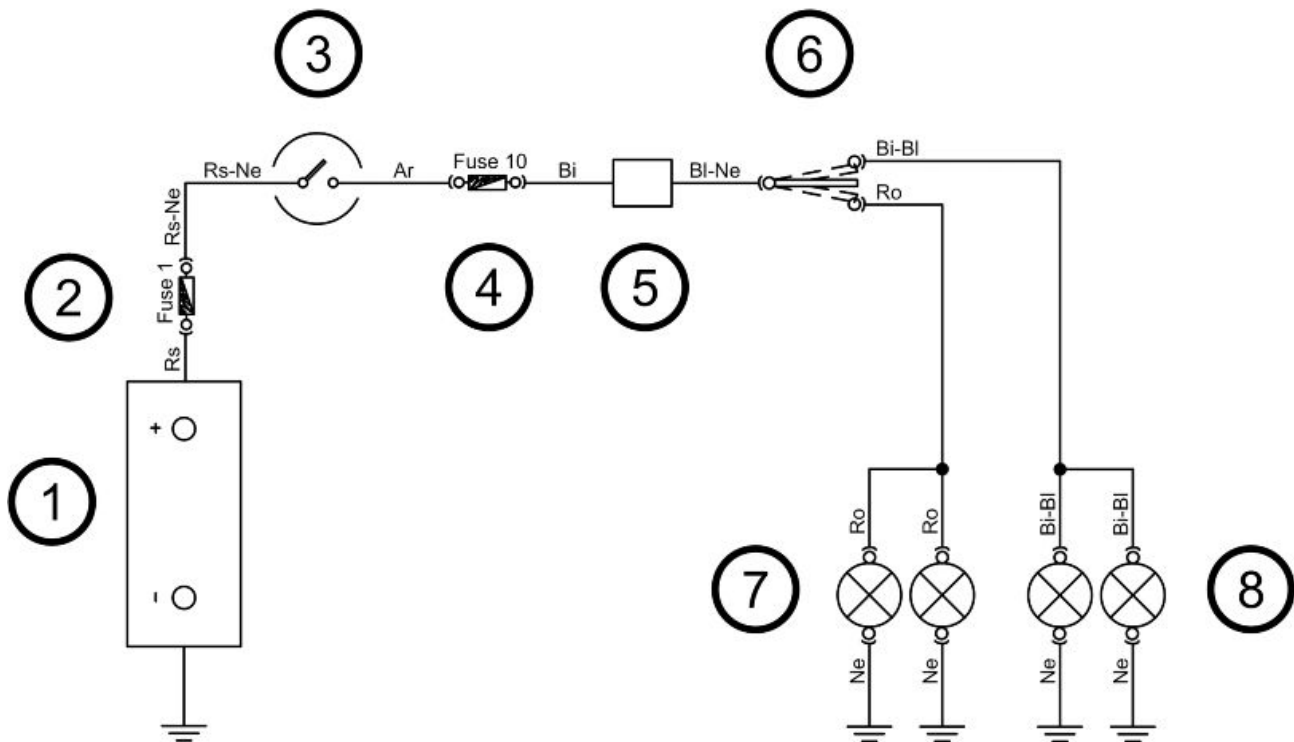
1. Battery

2. Fuse No. 1
3. Key switch contacts
4. Fuse No. 8
5. Horn button
6. Horn

WARNING

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

- 1) Check fuses No. 1 and 8, key switch contacts and the horn button.
- 2) If the components are not damaged, check wiring for continuity.
- 3) Check that the Yellow-Pink cable between the horn and horn button is not interrupted.
- 4) Check that the Black cable of the horn is earthed.

Turn signals system check
**KEY**

1. Battery
2. Fuse No. 1
3. Key switch contacts
4. Fuse No. 10
5. Turn indicator control device
6. Turn indicator switch
7. Left turn indicators
8. Right turn indicators

WARNING

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

- 1) Check the working order of bulbs.
- 2) Check fuses No. 1 and 10 and the key switch contacts.
- 3) Check if there is intermittent voltage between the Blue-Black cable of the turn indicator control device and the ground connection.
- 4) If there is no voltage, check that the cable harness is not interrupted.
- 5) Check the turn indicator switch.
- 6) Check that the Blue-Black cable between the turn indicator control device and the turn indicator switch is not interrupted.
- 7) Check that the Pink and White-Blue cables connecting the bulbs and the turn indicator switches are not interrupted.
- 8) Check the bulbs ground connection.

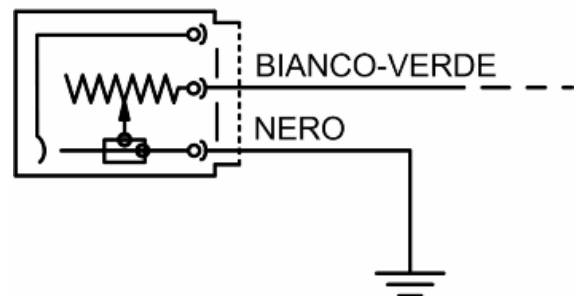
level indicators

WARNING

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

If faults are detected:

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



Electric characteristic

Resistance value when the tank is full

$\leq 7 \Omega$

Resistance value when the tank is empty

$90 +13/-3 \Omega$

Lights list

LIST OF BULBS

	Specification	Desc./Quantity
1	High-/low-beam bulb	Type: Halogen (H4) Quantity: 1 Power: 12V - 55/60W

	Specification	Desc./Quantity
2	Front tail light bulb	Type: All glass Quantity: 1 Power: 12V - 5W
3	Turn indicator bulbs	Type: Spherical Quantity: 4 Power: 12V - 10W
4	Rear tail light bulb	Type: All glass Quantity: 2 Power: 12V - 3W
5	Stop light bulb	Type: Spherical Quantity: 1 Power: 12V - 10W
6	Instrument panel light bulbs	Type: All glass Quantity: 5 Power: 12V - 1.2W
7	Helmet compartment light bulb	Type: Cylindrical Quantity: 1 Power: 12V - 5W
8	License plate light bulb	Type: All glass Quantity: 1 Power: 12V - 5W

Linea luci di posizione e illuminazione strumento

In caso di non funzionamento controllare:

- Efficienza delle lampade
- Fusibili n°1 e 8
- Contatti del commutatore a chiave
- Continuità dei cablaggi

Linea luce abbagliante/anabbagliante

In caso di non funzionamento controllare:

- Efficienza delle lampade
- Deviatore luci
- Teleruttore proiettore
- Fusibili n°1, 5 e 7
- Contatti del commutatore a chiave
- Continuità dei cablaggi

Fuses

The electrical system is equipped with:

1. Six protective fuses «**A**» located inside the side panel on the right-hand side;
2. Four protective fuses «**B**» located inside the compartment on the upper left-hand side.

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

CAUTION



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

CAUTION



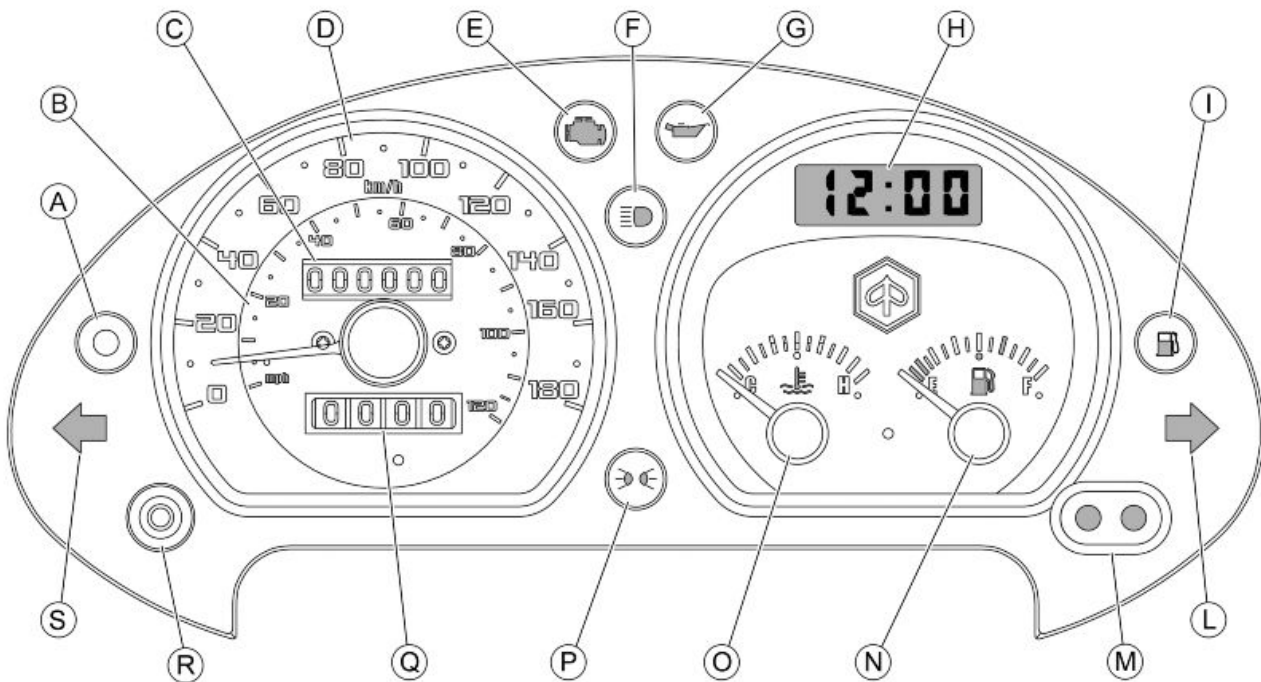
MODIFICATIONS OR REPAIRS TO THE ELECTRICAL SYSTEM, PERFORMED INCORRECTLY OR WITHOUT STRICT ATTENTION TO THE TECHNICAL SPECIFICATIONS OF THE SYSTEM, CAN CAUSE ERRORS IN FUNCTIONING AND RISK OF FIRE.



FUSES

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

Dashboard



- A** = Immobilizer LED
- B** = Speedometer (mph)
- C** = Total Odometer
- D** = Speedometer (km/h)
- E** = Injection telltale light
- F** = High-beam warning light
- G** = Oil pressure warning light
- H** = Digital clock
- I** = Low fuel warning light
- L** = Right turn indicator warning light
- M** = Clock controls
- N** = Fuel gauge
- O** = Water temperature gauge
- P** = Headlight warning light
- Q** = Trip odometer
- R** = Odometer reset button
- S** = Left turn indicator warning light

Sealed battery

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

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

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

INSTRUCTIONS FOR THE RENEWAL RECHARGE AFTER OPEN-CIRCUIT STORAGE

1) Voltage check up

Before installing the battery on the vehicle, check the open circuit voltage with a regular 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 ÷ 14.70V
- Initial charge voltage equal to 0.3 ÷ 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

Dry-charge battery

COMMISSIONING A NEW DRY-CHARGED BATTERY

- Remove the battery air pipe stop cap and each single cell cap.
- Fill the battery with electrolyte of 1.270+/-0.01 kg/l density (corresponding to 31+/-1 Bé) with an ambient temperature not below 15°C, until it reaches the upper level indicated on the block.
- Tilt the battery slightly to remove any air bubbles formed during filling.
- Place the caps on each single cell filling hole without screwing them and leave the battery to rest.

During this stage, the battery is subjected to a gasification phenomenon and temperature increases.

- Let it rest until it reaches ambient temperature (this stage can take up to 60 minutes).
- Tilt the battery slightly to facilitate the elimination of any gas bubbles present inside; restore the level using the same filling electrolyte

Note: This is the last time that electrolyte can be added. Future top-ups should be done only with distilled water;

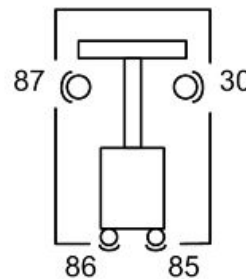
- Before 24 hours elapse, recharge the battery following these steps:
- Connect the battery charger terminals observing the correct polarity;

- With the battery charger drw. 020333Y and/or drw. 020334Y operate the battery charger control by selecting the position corresponding to that capacity;
 - Otherwise, charge the battery with direct current equal to 1/10 of rated capacity (e.g. for a battery with a 9Ah rated capacity, the charging current should be 0.9-1.0A) for approximately a 4-6 hour charge.
Note: Batteries that have been stored for a long time may take a longer charging time. The battery chargers drw. 020333Y and drw. 020334Y have an automatic protection which interrupts the recharge after 12 hours to avoid battery harmful heating. In this case, a green LED turns on to indicate the activation of the safety system and not the end of the charge.
 - Let the open circuit battery rest for approximately 4-6 hours; then check the off-load voltage using a standard tester.
 - If the open-circuit voltage is higher or equal to **12.6V**, the battery is charged adequately. Slightly shake or tilt the battery to eliminate any air bubbles formed during recharging.
 - Check the electrolyte levels again, fill them with distilled water up to the upper level line if necessary, clean battery properly, close each single cell cap tightly and install it on the vehicle.
 - If the voltage indicated is low, charge the battery another 4-6 hours in the way described above.
- Note:** With the battery charger drw. 020334Y, it is possible to check the battery charge level with the **Check** function. The value indicated on the display must be higher than the value indicated on the chart; otherwise, recharge the battery again in the same way indicated above.

Remote controls check

To check the operation of a remote control:

- 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 remote control.
- 3) With the remote control fed, check that there is continuity between terminals 87 and 30.
- 4) If these conditions are not met, the remote control is surely damaged and, therefore, it should be replaced.



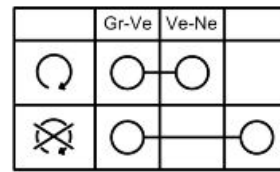
Switches check

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

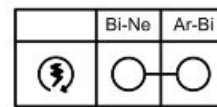
KEY

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

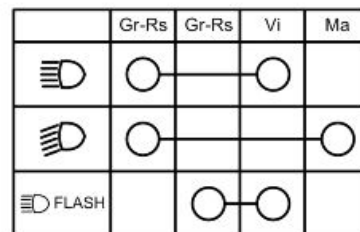
ENGINE STOP SWITCH



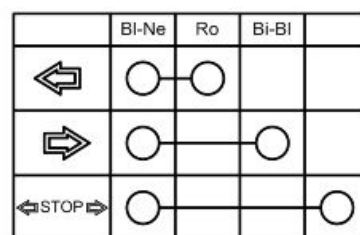
STARTER BUTTON

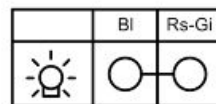
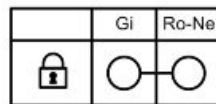


LIGHT SWITCH

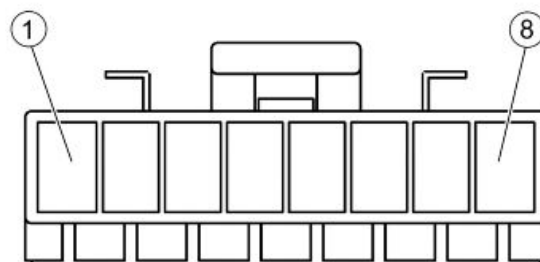


TURN INDICATOR SWITCH



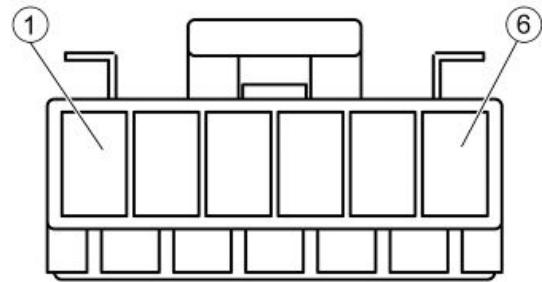
HORN BUTTON**HELMET COMPARTMENT LIGHT SWITCH****SADDLE OPENING SWITCH****Connectors****CONNETTORE GRUPPO STRUMENTI «A»**

1. Spia lampeggiatori SX (Rosa)
2. Immobilizer (Rosso-Verde)
3. Alimentazione da batteria (Rosso-Nero)
4. Sensore temperatura liquido di raffreddamento (Verde-Giallo)
5. Non collegato
6. Trasmettore livello carburante (Bianco-Verde)
7. Spia lampeggiatori DX (Bianco-Blu)
8. Spia riserva carburante (Grigio-Nero)



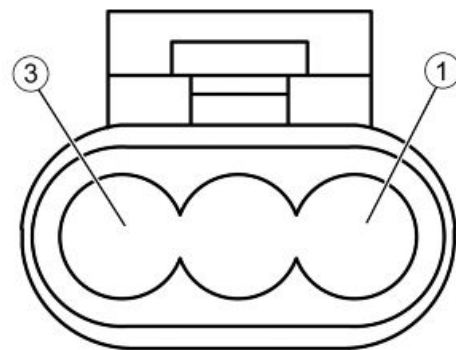
CONNETTORE GRUPPO STRUMENTI «B»

1. Spia luci abbaglianti (Viola)
2. Massa (Nero)
3. Spia iniezione (Marrone-Nero)
4. Sensore pressione olio (Rosa-Bianco)
5. Alimentazione sotto chiave (Bianco)
6. Illuminazione strumento (Giallo-Nero)



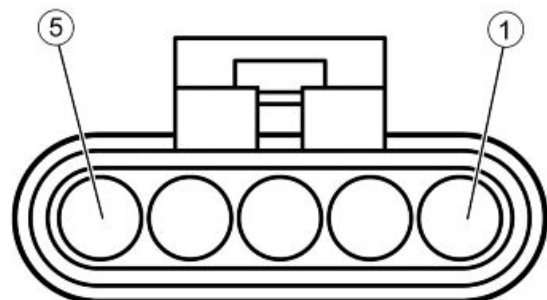
IMMOBILIZER AERIAL CONNECTOR

1. Live supply (Red-White)
2. Ground (Black)
3. Injection ECU (Orange-White)



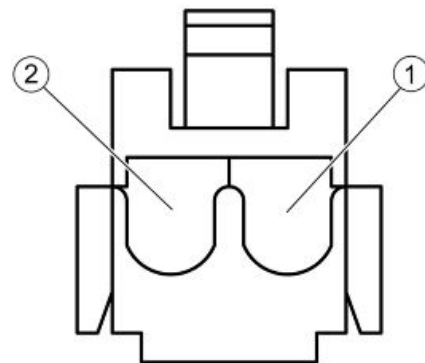
FUEL PUMP CONNECTOR

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



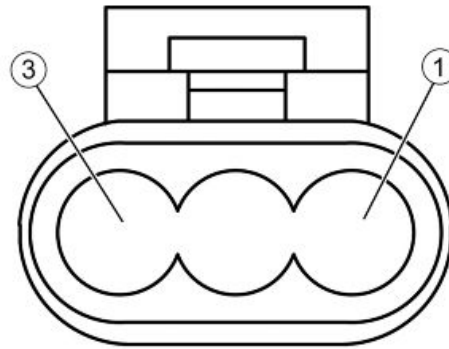
ELECTRIC FAN CONNECTOR

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

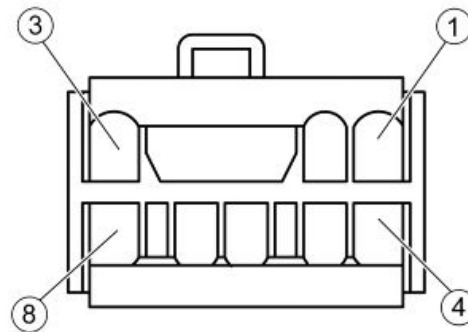


CONNETTORE PICK-UP

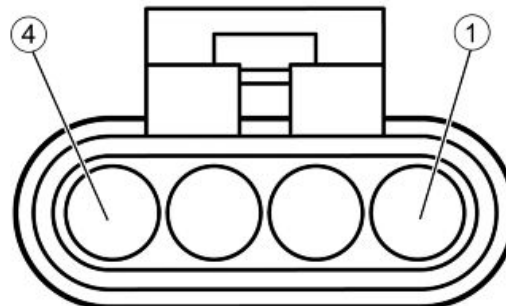
1. Positivo da centralina sensore giri motore (Rosso)
2. Negativo da centralina sensore giri motore (Marrone)
3. Sensore pressione olio (Bianco-Rosa)


**ANTITHEFT DEVICE PRE-INSTALLATION
CONNECTOR**

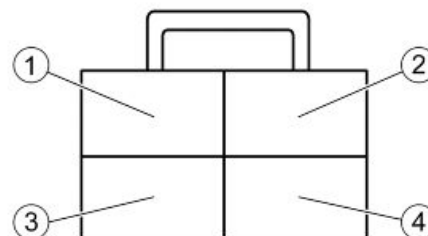
1. LHS Turn indicator bulbs (Pink)
2. RHS Turn indicator bulbs (White-Blue)
3. Ground (Black)
4. Battery-powered (Blue)
5. Power permanent supply (White)
6. Helmet compartment light bulb (Red-Yellow)
7. Not connected
8. Not connected

**CONNETTORE SONDA LAMBDA**

1. Positivo da centralina sonda lambda (Azzurro-Nero)
2. Negativo da centralina sonda lambda (Bianco-Verde)
3. Negativo da centralina riscaldatore (Verde-Giallo)
4. Alimentazione riscaldatore tramite teleruttore (Nero-Verde)

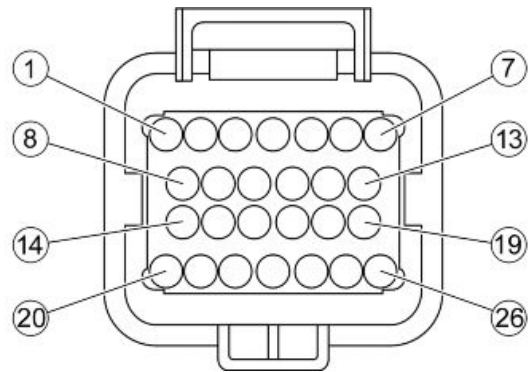
**VOLTAGE REGULATOR CONNECTOR**

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



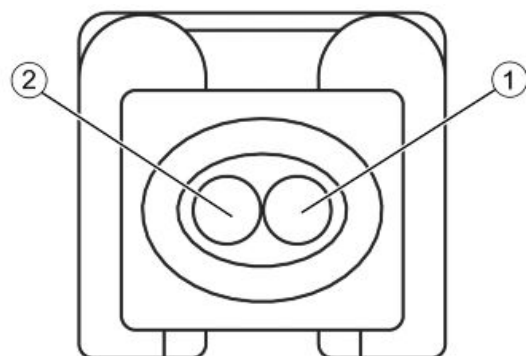
CONNETTORE CENTRALINA ELETTRONICA PER INIEZIONE

1. Spia iniezione (Marrone-Nero)
2. Non collegato
3. Non collegato
4. Negativo sonda lambda (Bianco-Verde)
5. Alimentazione sotto chiave (Rosso-Bianco)
6. Alimentazione da batteria (Arancio-Nero)
7. Antenna Immobilizer (Arancio-Bianco)
8. Teleruttore elettroventola (Blu-Giallo)
9. Sensore temperatura liquido di raffreddamento (Azzurro-Verde)
10. Non collegato
11. Positivo sonda lambda (Azzurro-Nero)
12. Deviatore arresto motore (Verde-Nero)
13. Positivo sensore giri motore (Rosso)
14. Negativo iniettore (Giallo-Rosso)
15. Negativo sensore giri motore (Marrone)
16. Presa diagnostica (Viola-Bianco)
17. Led Immobilizer (Rosso-Verde)
18. Cavalletto laterale (Azzurro)
19. Non collegato
20. Teleruttore carichi iniezione (Nero-Viola)
21. Negativo riscaldatore lambda (Verde-Giallo)
22. Negativo Bobina A.T. (Rosa-Nero)
23. Non collegato
24. Teleruttore di avviamento (Arancio-Blu)
25. Non collegato
26. Massa (Nero)



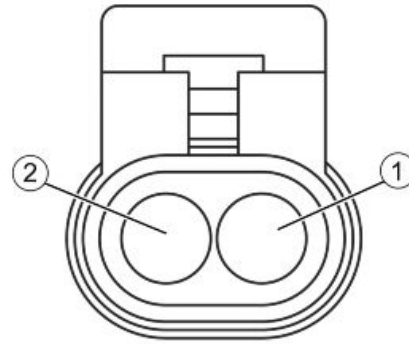
INJECTOR CONNECTOR

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

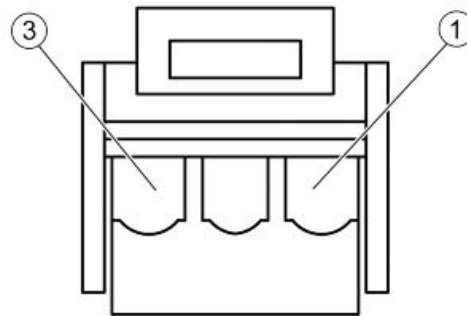


HV COIL CONNECTOR

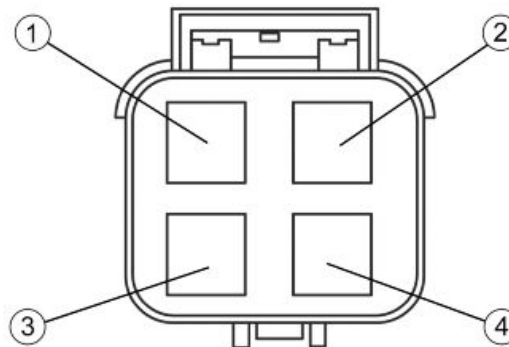
1. Control unit negative (Pink-Black)
2. Power via remote control (Black-Green)

**CONNETTORE TRASMETTITORE LIVELLO
CARBURANTE**

1. Spia riserva carburante (Grigio-Nero)
2. Massa (Nero)
3. Segnale livello carburante (Bianco-Verde)

**CONNETTORE SENSORE TEMPERATURA
LIQUIDO DI RAFFREDDAMENTO**

1. Massa (Grigio-Verde)
2. Gruppo strumenti (Verde-Giallo)
3. Centralina elettronica per iniezione (Azzurro-Verde)
4. Massa (Nero)



INDEX OF TOPICS

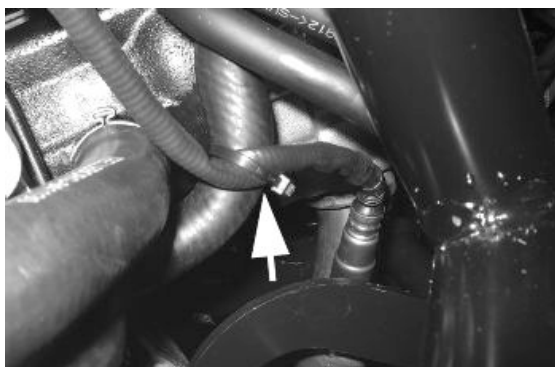
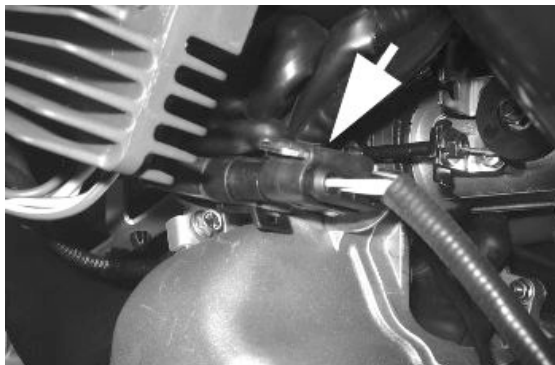
ENGINE FROM VEHICLE

ENG VE

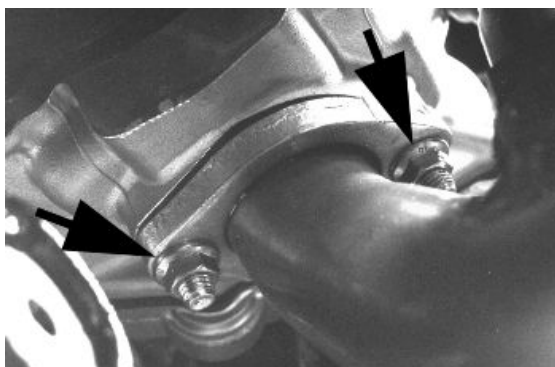
Questa sezione descrive le operazioni da effettuare per lo smontaggio del motore dal veicolo.

Exhaust assy. Removal

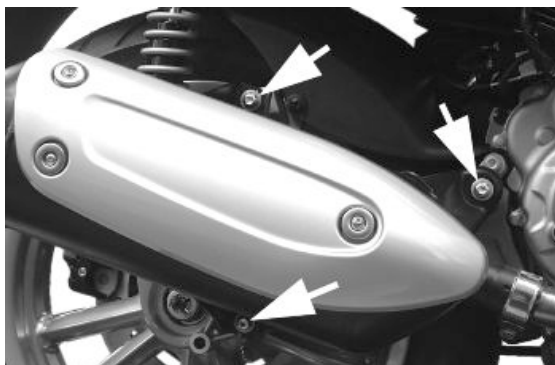
- Remove the RHS footrest.
- Remove the Lambda probe from its support and disconnect it.
- Cut the fastening clamp on the lambda probe cable.



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



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



Remove the lambda probe from the manifold.



Removal of the engine from the vehicle

- Disconnect the battery
- Remove the engine cover inside the helmet compartment.
- Remove the side fairings and the footrests.

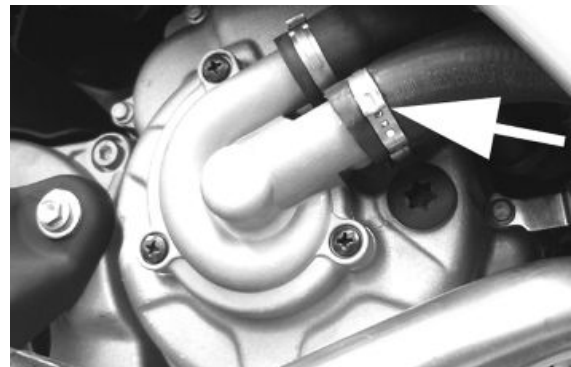
Remove the full muffler assembly.

CAUTION

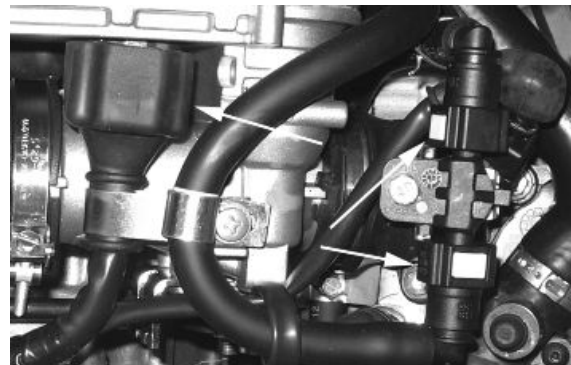


THIS OPERATION MUST BE CARRIED OUT WHEN THE ENGINE IS COLD.

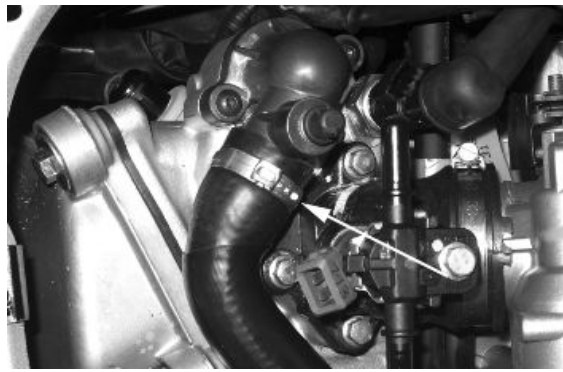
- Remove the rear wheel.
- Remove the pipe that feeds coolant into the pump as shown in the photograph and then empty the system.
- Remove the engine coolant outlet pipe as indicated.



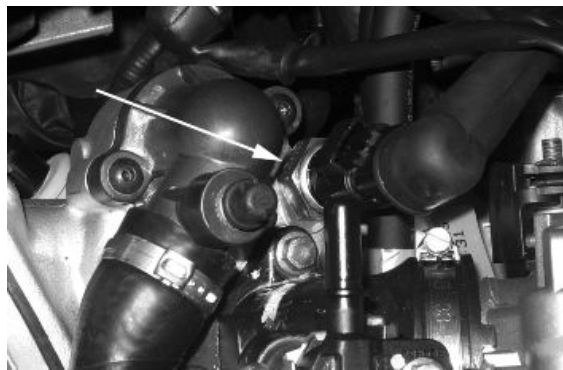
- Disconnect the fuel delivery and return pipes from the injector by removing the screw locking the retaining clip.
- Disconnect the injector wiring and the throttle body control unit wiring.



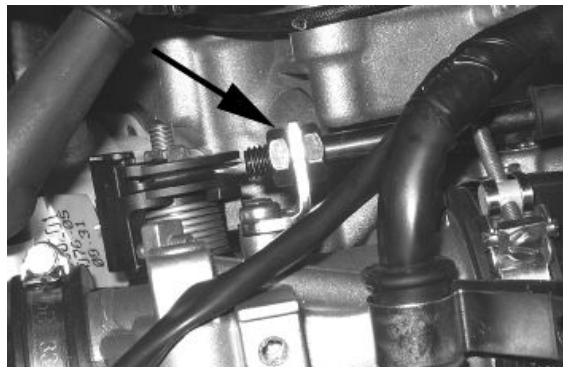
- Remove the coolant outlet pipe from the motor as indicated.



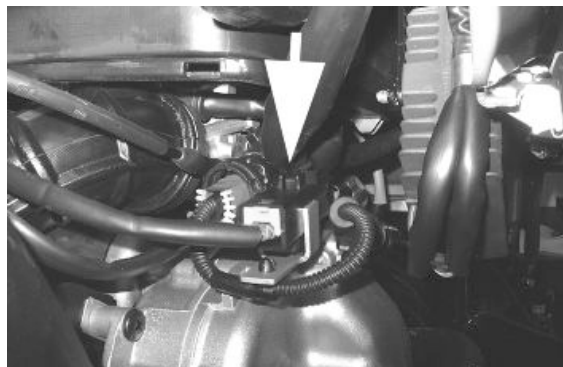
- Remove the spark plug caps.
- Remove the coolant temperature sensor connector indicated in the photo.

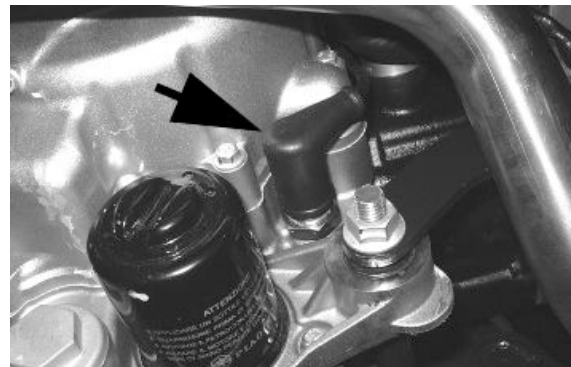


- Remove the throttle cable from the throttle body by undoing the nut shown in the photo.

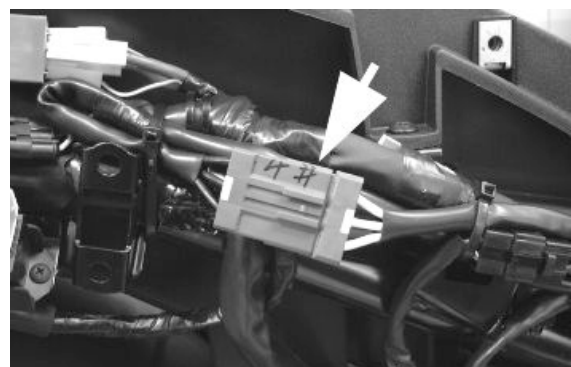


- Disconnect the positive and negative connectors from the starter motor as shown in the photo.

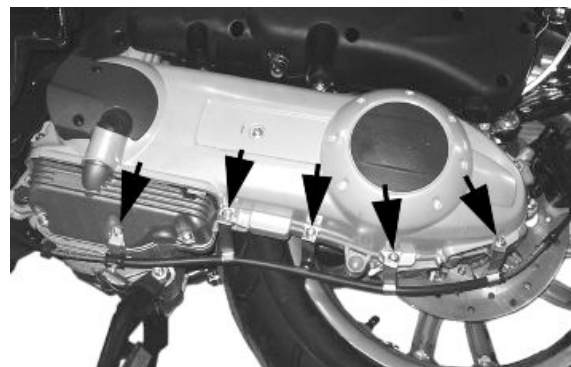




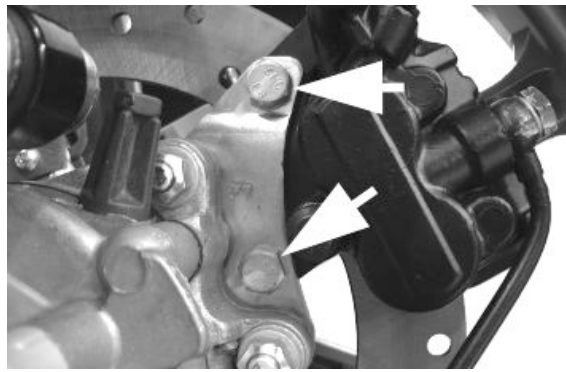
- Disconnect the connectors from the flywheel wiring harness.
- Disconnect the relevant cable from the retaining clamps.



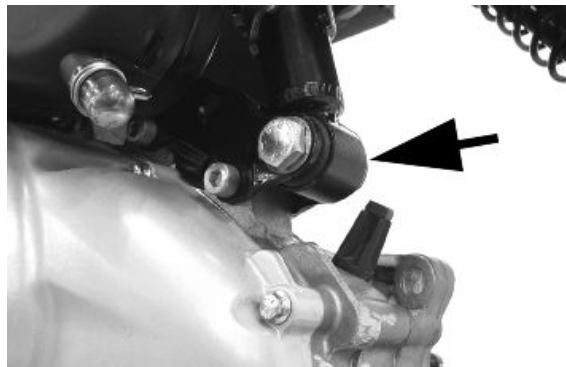
- Remove the screws indicated in the figure.



Remove the retaining bolts of the rear brake caliper.

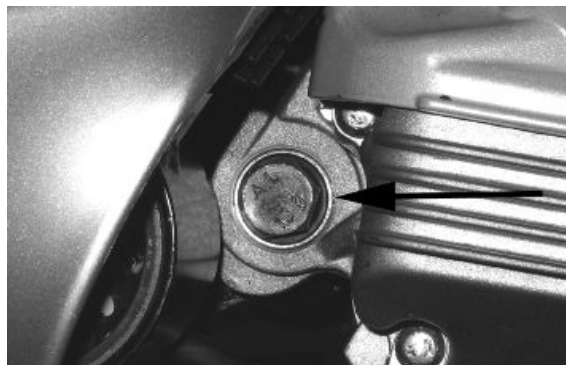
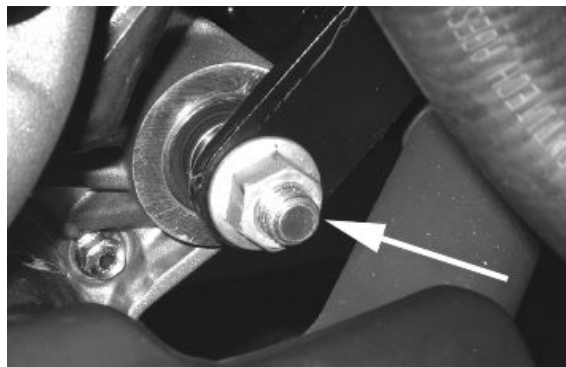


Remove the lower screw of the left-hand shock absorber.



- 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 scooter, carry out the removal operations but in reverse order and respect the tightening torques shown in the Specifications Chapter.

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

CAUTION

PAY PARTICULAR ATTENTION TO POSITIONING THE THROTTLE CONTROL TRANSMISSION PROPERLY.

INDEX OF TOPICS

ENGINE

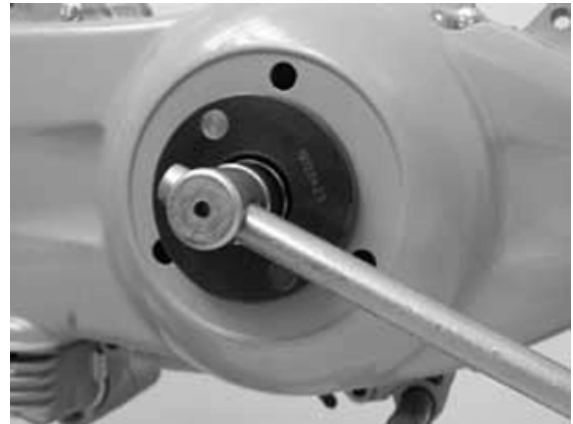
ENG

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.



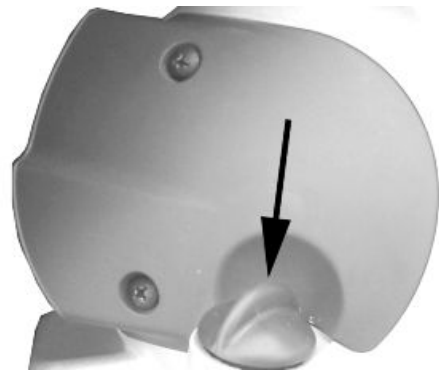
Specific tooling

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.

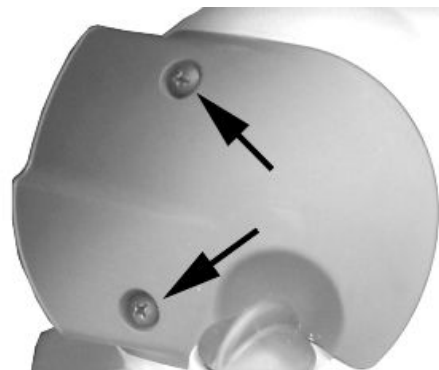
WHEN YOU ARE REMOVING THE TRANSMISSION COVER YOU MUST BE CAREFUL NOT TO DROP THE CLUTCH BELL.



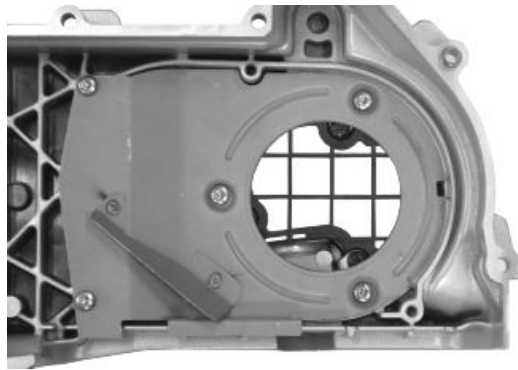
Air duct

Versione 250

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



- Remove the five screws on two different levels as well as the small casing.



Removing the driven pulley shaft bearing

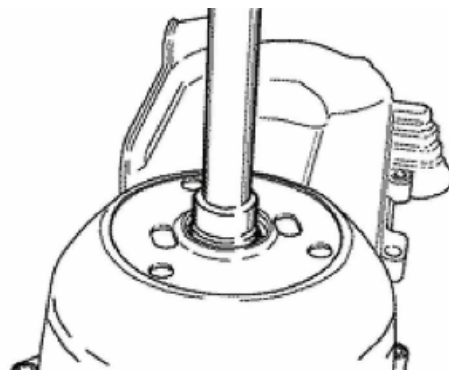
- Remove the clip from the inside of the cover.
- Remove the bearing from the crankcase by means of:

Specific tooling

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm

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.

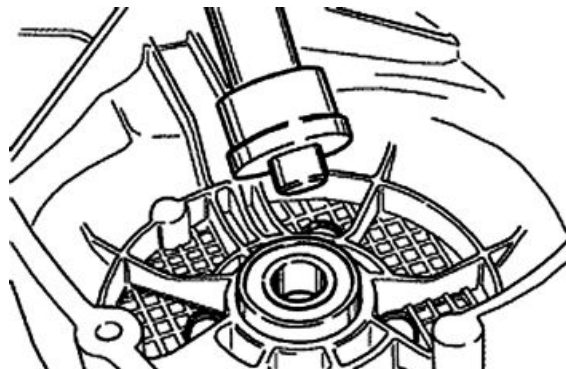
ALWAYS REPLACE THE BEARING WITH A NEW ONE UPON REFITTING.

Specific tooling

020376Y Adaptor handle

020357Y 32 x 35 mm adaptor

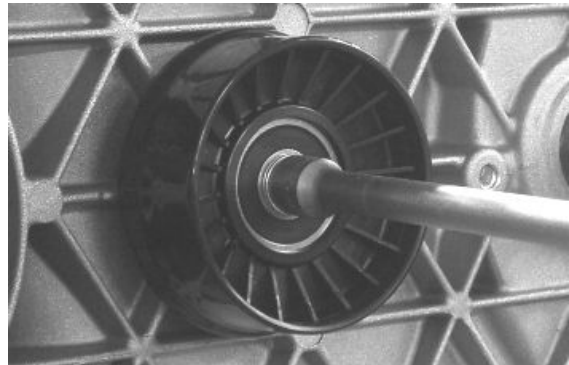
020412Y 15 mm guide



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 photograph



- Check the outside 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)

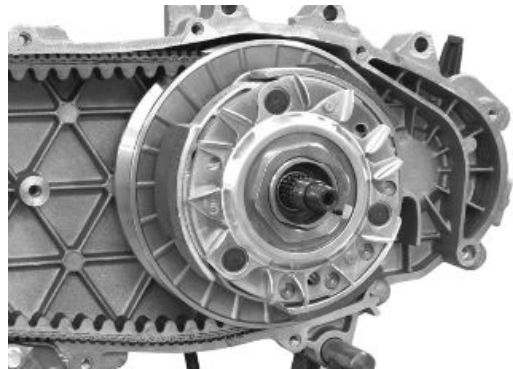
Anti-flapping roller 12 - 16

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 (inner diameter 15 and 17 mm).
- Lock with the original spacer and nut.
- Place the bell/shaft assembly on the support to check the crankshaft alignment.



- Using a feeler pin 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 support 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 No. 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 No. 9 to remove the nut fixing the clutch in place.

- Dismantle the driven pulley components (Clutch and spring with its plastic holder)



CAUTION

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

Specific tooling

020444Y011 adapter ring

020444Y009 46x55 Wrench

020444Y Tool for fitting/ removing the driven pulley clutch

Inspecting the clutch

- Check the thickness of the clutch mass friction material.

- The masses must not show traces of lubricants; otherwise, check the driven pulley unit seals.

N.B.

UPON RUNNING-IN, THE MASSES MUST EXHIBIT A CENTRAL CONTACT 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

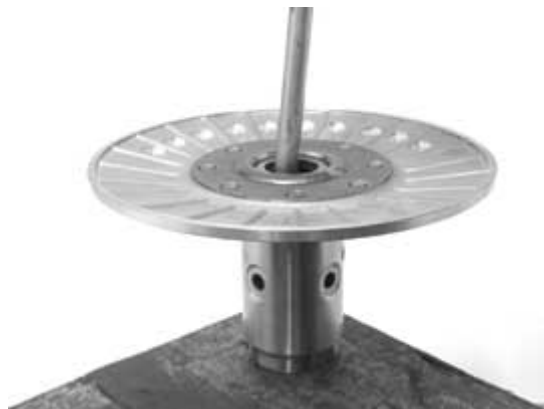
- Simultaneously turn and pull the collar manually to remove it.

N.B.**USE TWO SCREWDRIVERS IF YOU HAVE DIFFICULTY.****N.B.****BE CAREFUL NOT TO PUSH THE SCREW DRIVERS IN TOO FAR TO AVOID DAMAGE THAT COULD ENDANGER THE O-RING SEAL.**

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

**Removing the driven half-pulley bearing**

- Check there are no signs of wear and/or noisiness; - Replace with a new one if there are.
- Remove the retaining 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 Belle for OD 47-mm bearings



- Remove the roller bearing using the modular punch.

Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020363Y 20 mm guide

Inspecting the driven fixed half-pulley

Version 250

- Measure the outside diameter of the pulley bushing.
- Check the contact 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 Ø 40.96 mm

Half-pulley standard diameter

Standard diameter: Ø 40.985 mm

Wear limit

0.3 mm



Inspecting the driven sliding half-pulley

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



MOVABLE DRIVEN HALF-PULLEY DIMENSIONS

Specification	Desc./Quantity
Wear limit	0.3 mm
standard diameter	Diameter 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 sleeve as in the figure.
- For the fitting of the new ball bearing, follow the example in the figure using a modular punch.

Fit the snap ring

WARNING

N.B.

FIT THE BALL BEARING WITH THE VISIBLE SHIELD

Specific tooling

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm

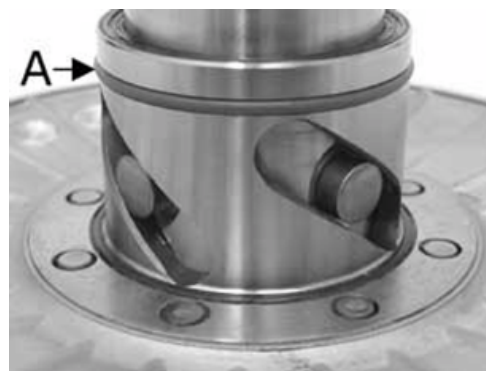
020424Y Driven pulley roller casing fitting punch





Refitting the driven pulley

- Insert the new oil guards 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 gr. of grease. Apply the 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 Sheath for driven pulley fitting

Recommended products

AGIP GREASE SM 2 Grease for the tone wheel revolving ring

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

Inspecting the clutch spring

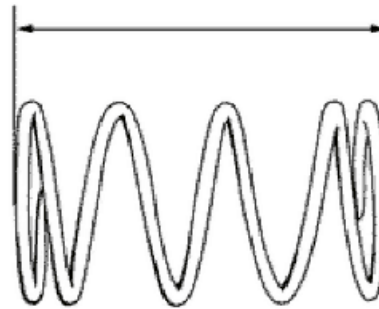
- Measure the length of the spring, while it is relaxed.

**Characteristic
Standard length**

123 mm

acceptable limit after use:

118 mm



Refitting the clutch

- Support the driven pulley spring compressor appropriate 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 servo-system 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

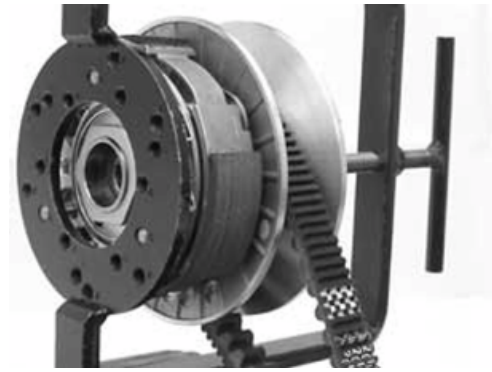
020444Y Tool for fitting/ removing the driven pulley clutch

020444Y011 adapter ring

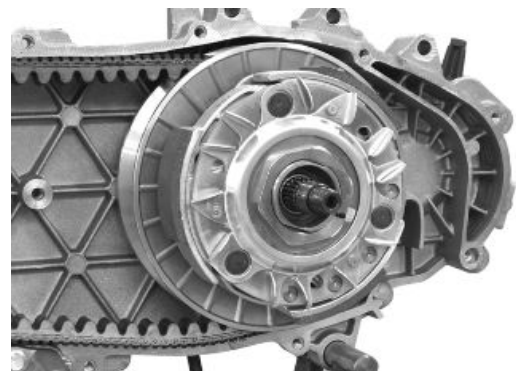
020444Y009 46x55 Wrench

Locking torques (N*m)

Clutch unit nut on driven pulley 45 ÷ 50

**Refitting the driven pulley**

- Refit the clutch bell.



Drive-belt

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

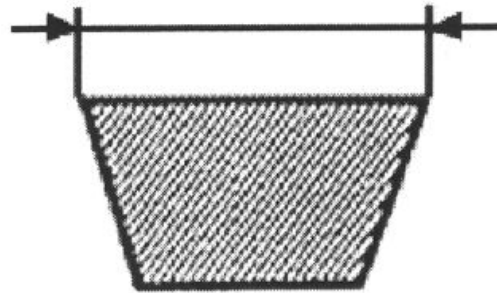
Characteristic

250 4T Transmission belt/minimum width

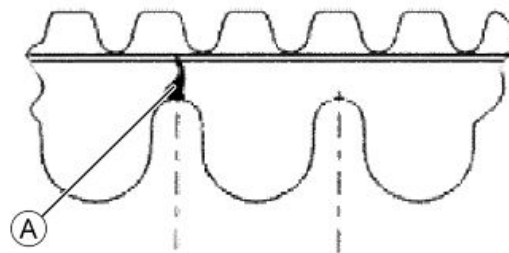
19.5 mm

250 4T Transmission belt/standard width

21.3 ± 0.2 mm



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

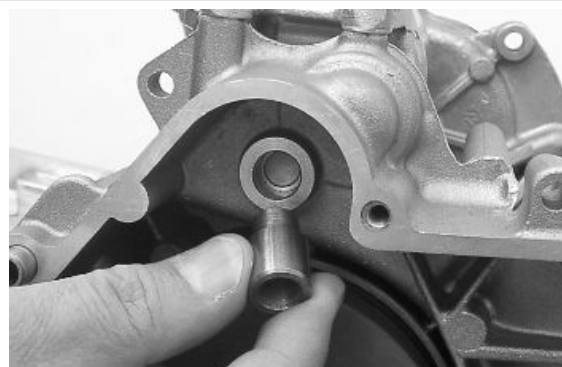


Removing the driving pulley

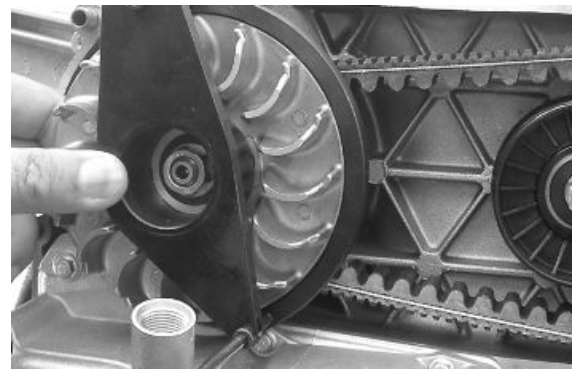
- Turn the crankshaft until the ropes of the pulley are on a horizontal axis



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



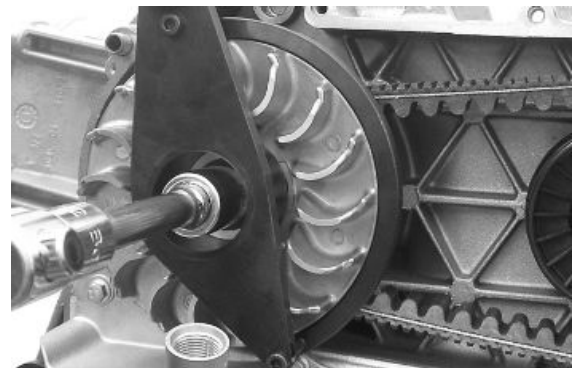
- Insert the tool in the hollows and apply the retention ring
- Bring in the ring's clamping screws while keeping the tool to support the pulley



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 its inside diameter.
- Measure outside 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 contact 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

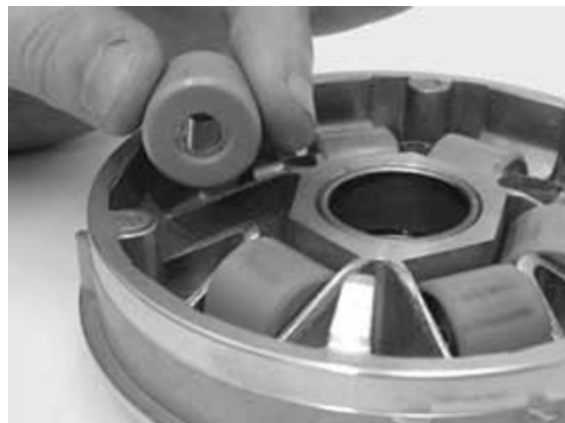
Roller: Minimum diameter permitted

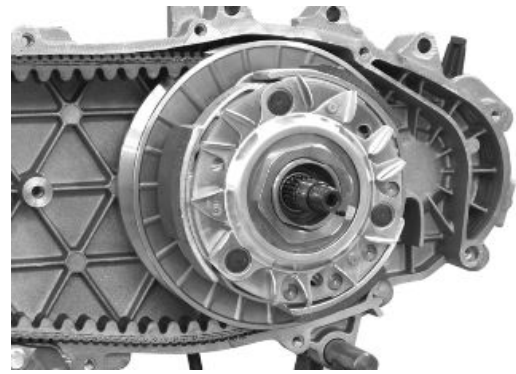
Ø 20 mm



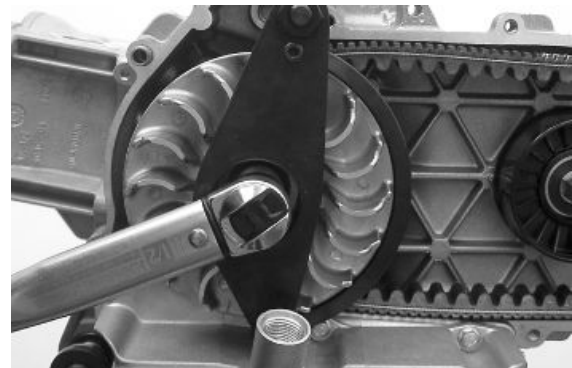
Refitting the driving pulley

- 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 driving shaft.
- 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

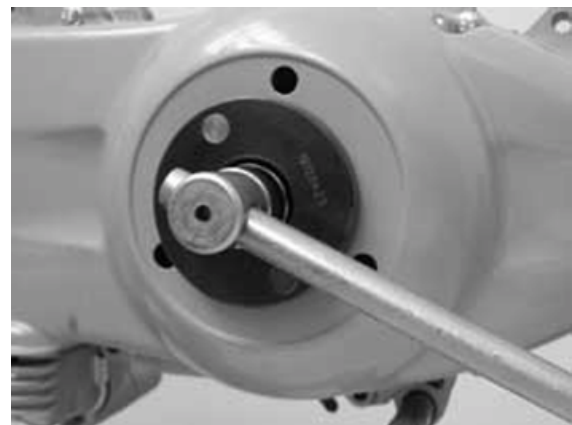
020626Y Driving pulley lock wrench

Locking torques (N*m)

Drive pulley nut 75 ÷ 83

Refitting the transmission cover

- Check the presence of the 2 centring dowels and the correct installation of the sealing gasket for the oil sump on the transmission cover.
- Replace the cover tightening the 10 screws at 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.
- Replace the plastic cover.



Specific tooling

020423Y driven pulley lock wrench

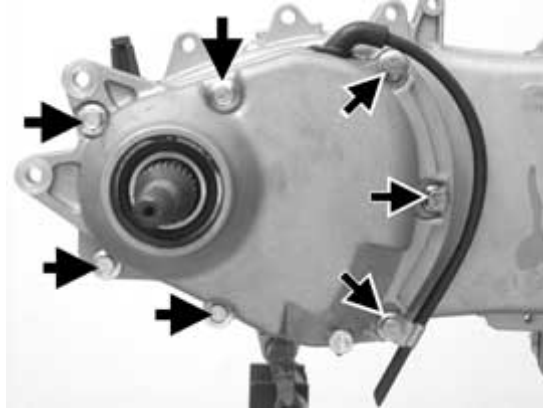
Locking torques (N*m)

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

End gear

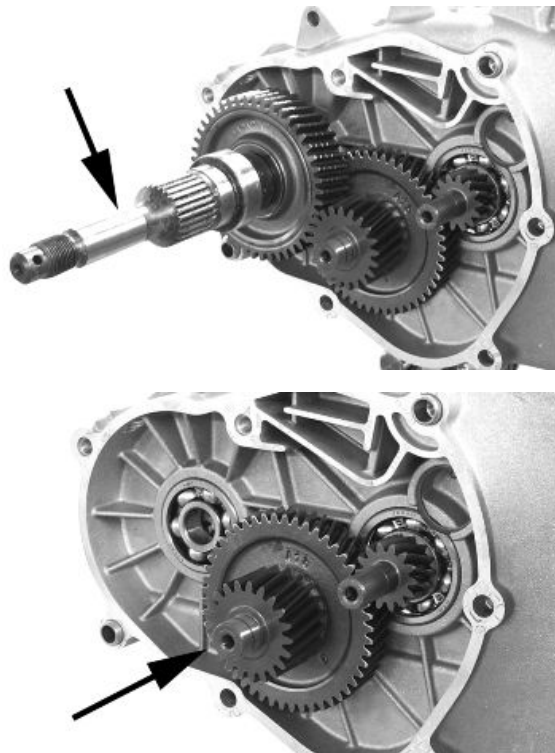
Removing the hub cover

- 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 Pliers 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 guard as in the figure.

Specific tooling

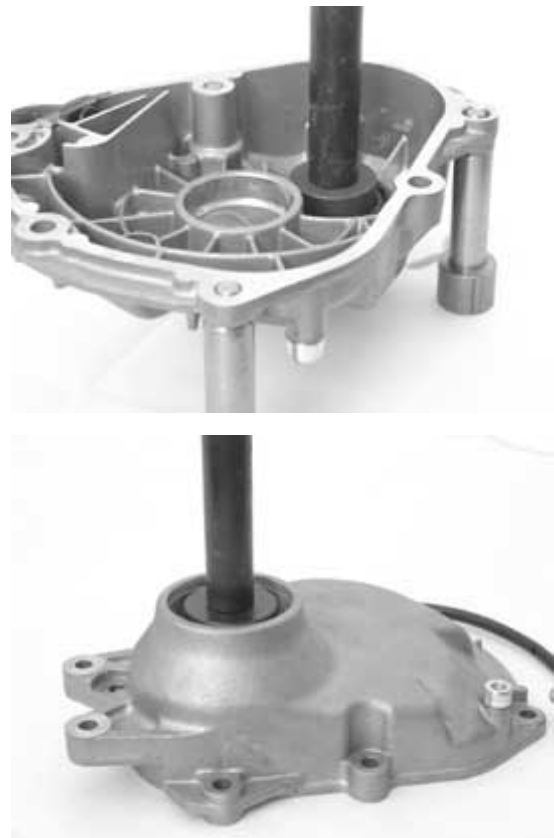
020376Y Adaptor handle

020477Y Adaptor 37 mm

020483Y 30 mm guide

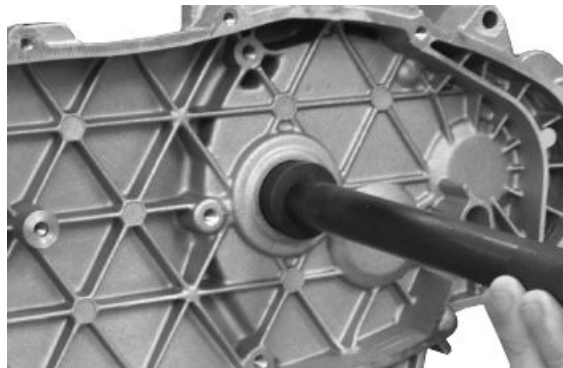
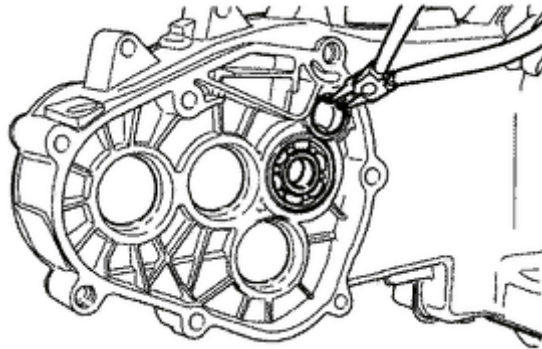
020359Y 42x47-mm adaptor

020489Y Hub cover support stud bolt set



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 Adaptor 28 x 30 mm

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 anomalies, 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 guard 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.

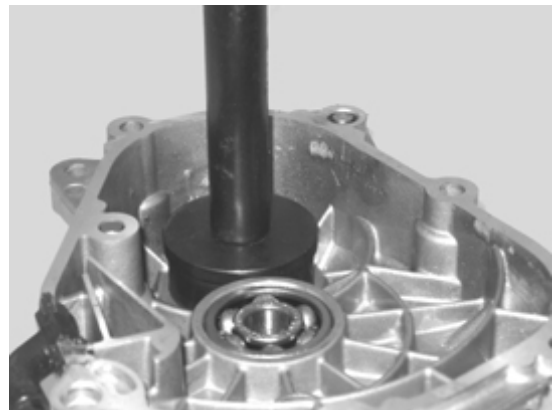
The 52 mm side of the adapter must be turned towards the bearing.

Specific tooling

020376Y Adaptor handle

020360Y Adaptor 52 x 55 mm

020483Y 30 mm guide



Refitting the hub cover bearings

For the fitting of 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

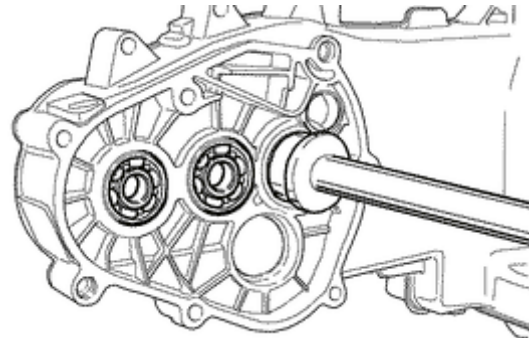
020150Y Air heater support

020151Y Air heater

020376Y Adaptor handle

020359Y 42x47-mm adaptor

020412Y 15 mm guide



N.B.

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

- 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 guard flush with the crankcase from the pulley side.

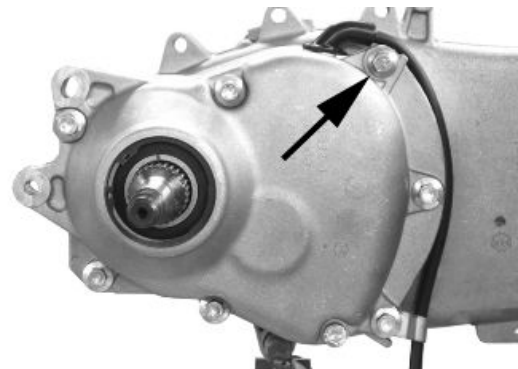
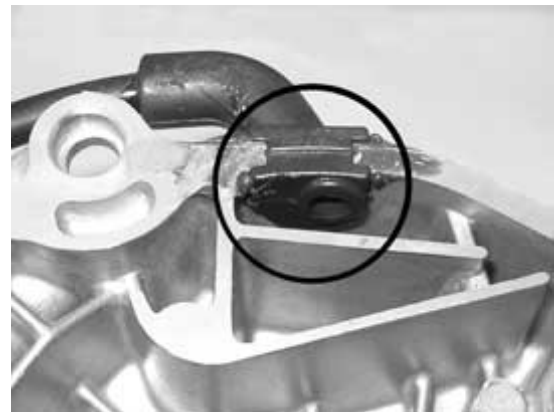
Refitting the hub bearings

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



Refitting the ub cover

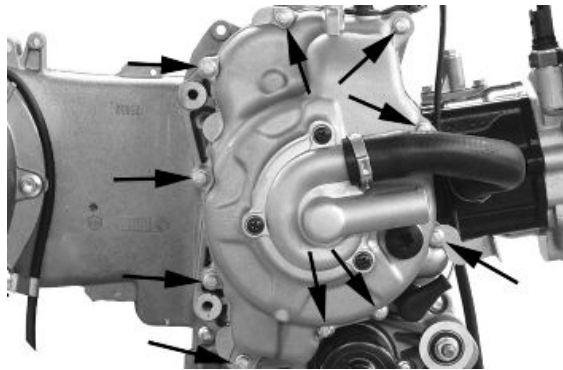
- Fit a new gasket together with the centring dowels.
- Seal the gasket of the breather pipe using black silicone sealant.
- Fit the gearbox cover, making sure the breather pipe is in the correct position.
- Position the shorter screw that can also be recognised from the different colour as shown in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



Flywheel cover

Removing the hub cover

- Remove the clip fixing the hose to the cylinder.
- Remove the 10 fixings
- 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 ÷ 4

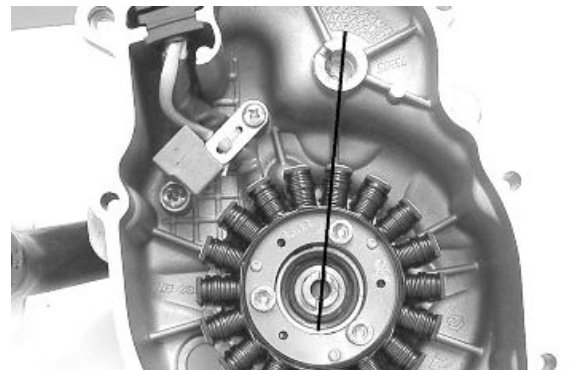


Refitting the flywheel cover

- 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 photo.



- Refit the cover over the engine and tighten the screws to the prescribed torque.
- Carry out the steps in the reverse order from the dismantling procedure.

CAUTION

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

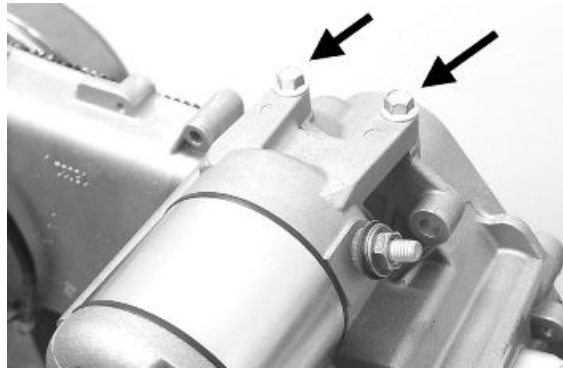
Locking torques (N*m)

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

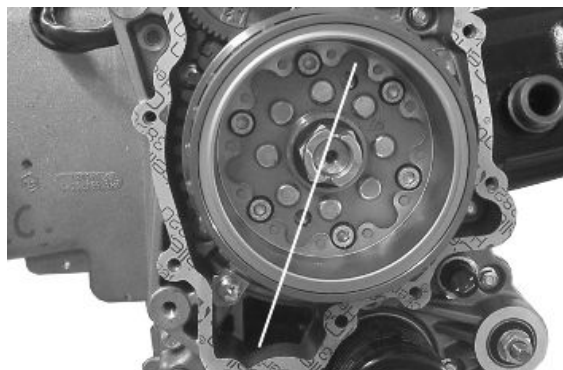


Removing the flywheel magneto

- Remove the water pump shaft and crankshaft spline clip



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



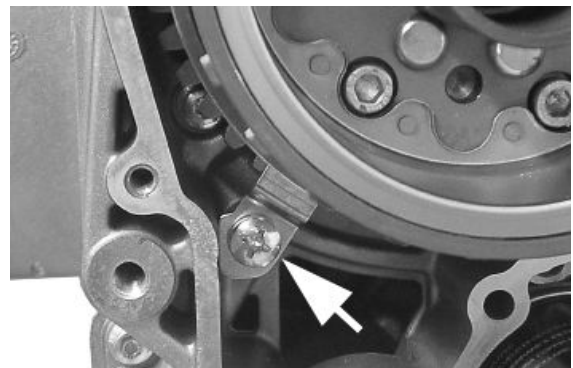
- Screw in the guide bushing that is part of the special flywheel stop tool on the flywheel as shown in the photo.



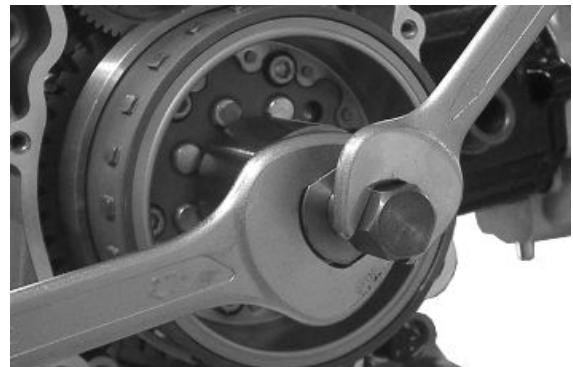
-
- Insert the special flywheel stop tool on the flywheel as shown in the photo

Specific tooling**020627Y Flywheel lock wrench**

-
- Remove the plate indicated in the photo.



-
- 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 photograph

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**

Loctite 243 medium-strength 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

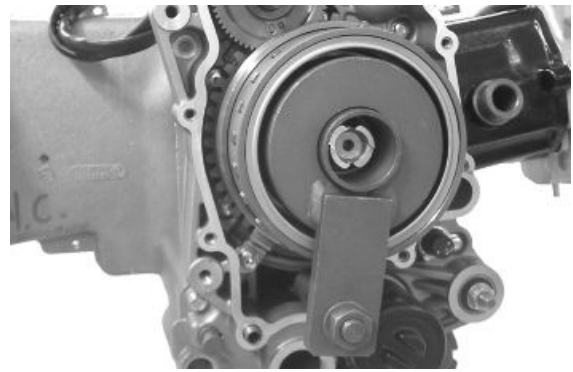
- Remove the freewheel retaining plate indicated in the photograph
- Remove the transmission gear and the freewheel



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



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



Specific tooling

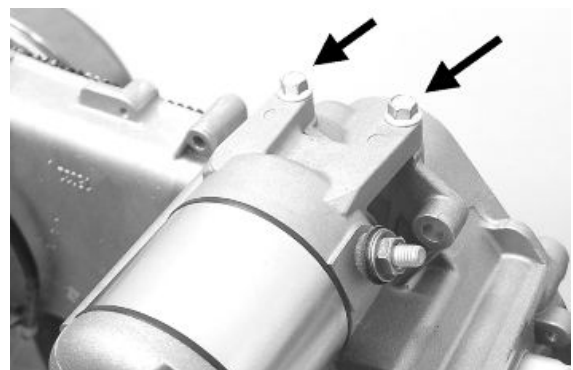
020627Y Flywheel lock wrench

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, locking the two screws to the prescribed torque.



Locking torques (N*m)

Starter motor screws 11 ÷ 13

Cylinder assy. and timing system

Removing the intake manifold



Loosen the three screws and remove the air intake manifold.

- When refitting, secure to the specified torque.

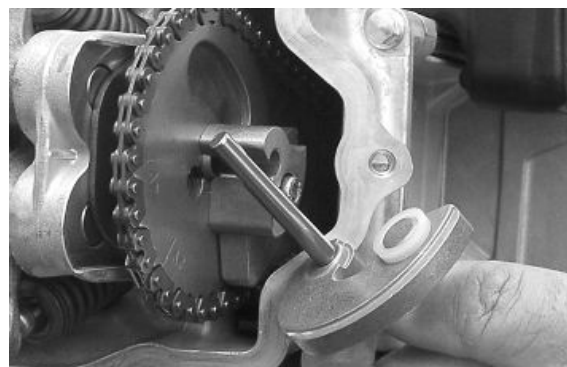
Removing the rocker-arms cover

- Remove the 5 screws indicated in the figure



Removing the timing system drive

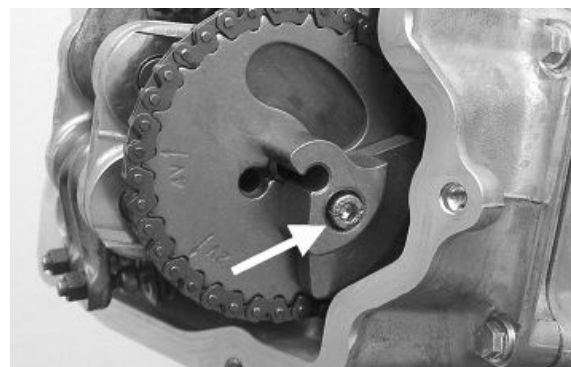
- Remove the parts listed below first: transmission cover, drive pulley with belt, oil sump with spring and by-pass piston, oil pump pulley cover, O-ring on the crankshaft and the sprocket wheel separation washer.
- Remove the tappet cover.
- Remove the central screw fastener and the automatic valve-lifter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



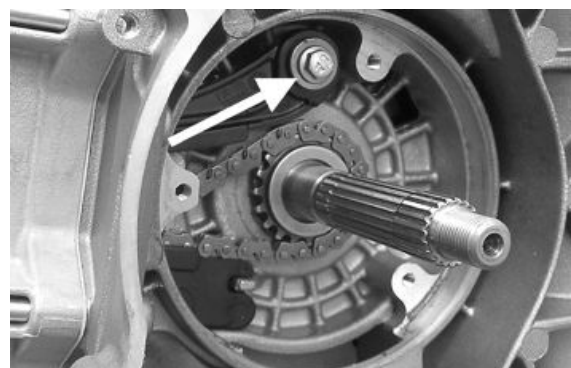
- Remove the internal hex screw and the counterweight shown in the figure.



- 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 tensioning pad must be removed from the transmission side. As regards the lower chain guide pad, it may only be removed after the head has been removed.



N.B.

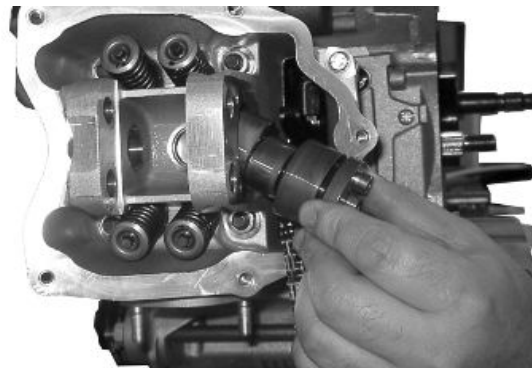
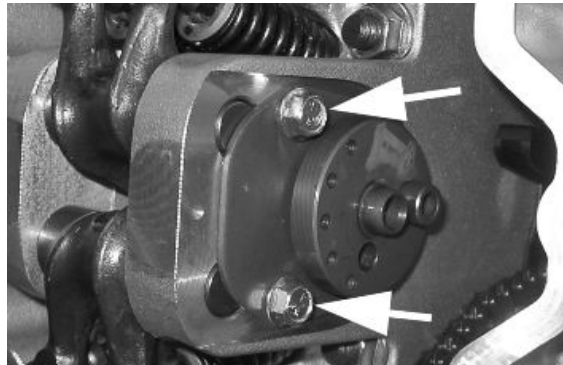
IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.

Removing the cam shaft

- Remove the two screws and the cam shaft re-tainer shown in the diagram.
- Remove the cam shaft.
- Remove the pins and the rocker arms from the flywheel side holes.

N.B.

IN CASE OF NEED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, PINS, ROCKING LEVERS AND FIXING BRACKET. THE HEAD CAN ALSO BE REMOVED WITHOUT REMOVING THE CHAIN AND THE DRIVING SHAFT CHAIN TIGHTENER.

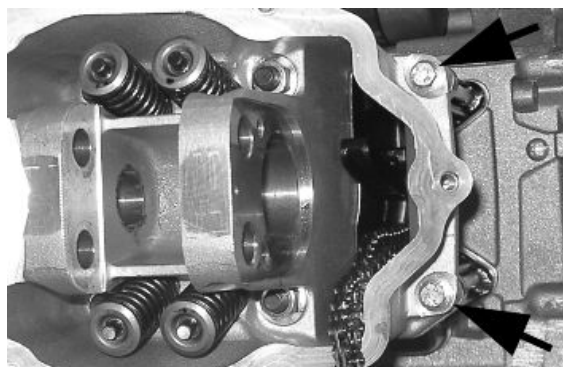


Removing the cylinder head

- 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.

IN CASE OF NEED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, PINS, ROCKING LEVERS AND FIXING BRACKET. THE HEAD CAN ALSO BE REMOVED WITHOUT REMOVING THE CHAIN AND THE DRIVING SHAFT CHAIN TIGHTENER.



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 adaptor 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

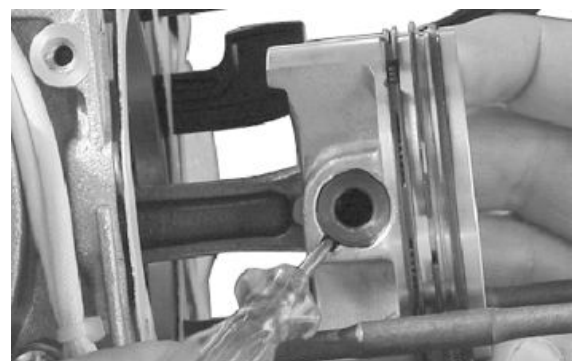
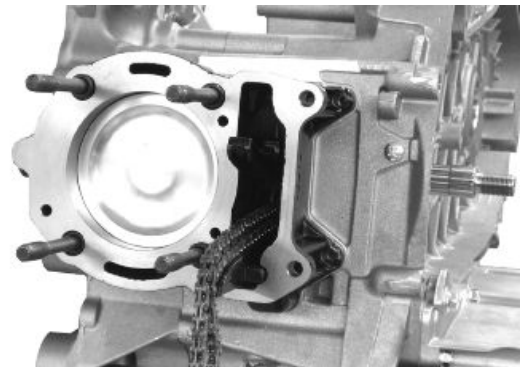
- Remove the chain guide pad.
- Remove the 4 O-rings on the stud bolts.
- Pull out the cylinder.
- Remove the cylinder base gasket.
- Remove the two stop rings, the wrist pin and the piston.
- Remove the piston seals.

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.

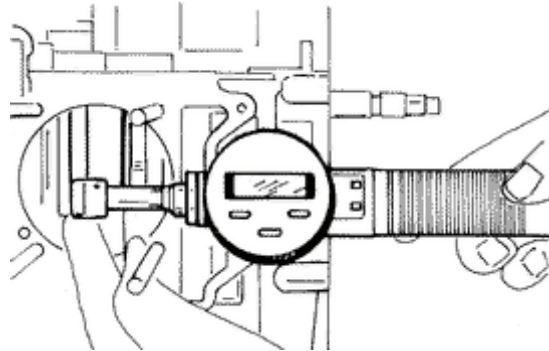
Characteristic

Rod small end check-up: Maximum diameter

15.030 mm

Rod small end check-up: Standard diameter

15 +0.015+0.025 mm



Inspecting the wrist pin

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

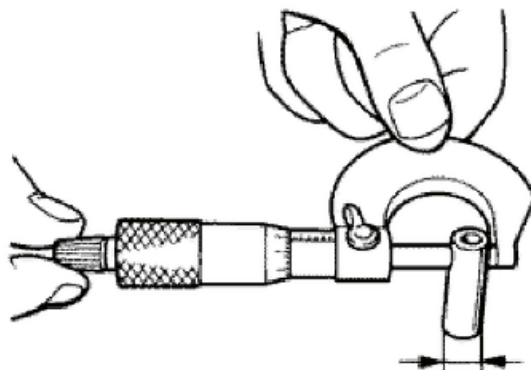
Characteristic

Pin diameter: Standard clearance

0.015 ÷ 0.029 mm

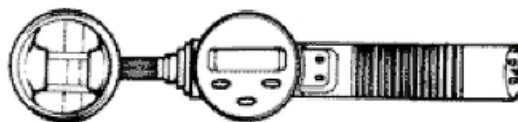
Pin diameter Standard diameter

14.996 - 15.000 mm



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.



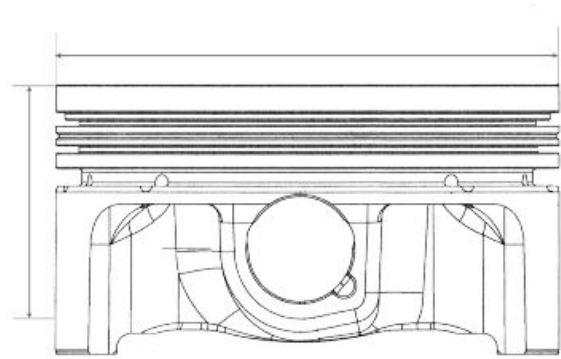
- If the clearance is greater than that indicated in the table, replace the piston.

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.



Characteristic

Wrist pin seat on the piston: Standard diameter

15.001 ÷ 15.006 mm

Diameter of the wrist pin seat on the piston: Standard clearance

0.001 ÷ 0.010 mm

piston diameter

71.953 - 71.981 mm

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

oil scraper ring - maximum clearance allowed after use 0.07 mm

oil scraper ring - maximum clearance allowed after use 0.07 mm

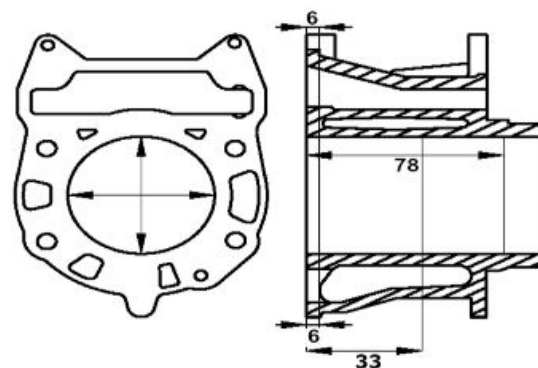


Inspecting the cylinder

- 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 diameter. The coupling must be made with those of the same type (M-M, N-N, O-O, P-P).



Characteristic

cylinder: standard diameter

71.990 - 72.018 mm (at 33 mm)

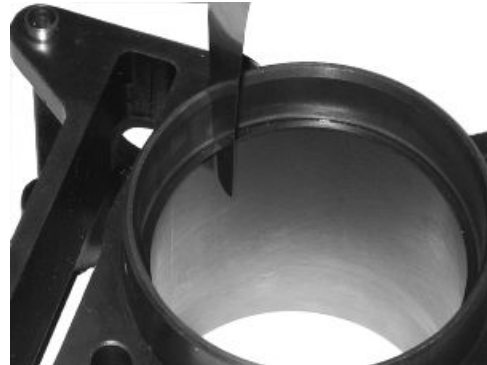
Maximum allowable run-out:

0.05 mm

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.

Characteristic

Top piston ring

Standard opening: 0.15 ÷ 0.30 mm

Middle piston ring

Standard opening: 0.20 ÷ 0.40 mm

scraper ring

Standard opening: 0.20 ÷ 0.40 mm

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.

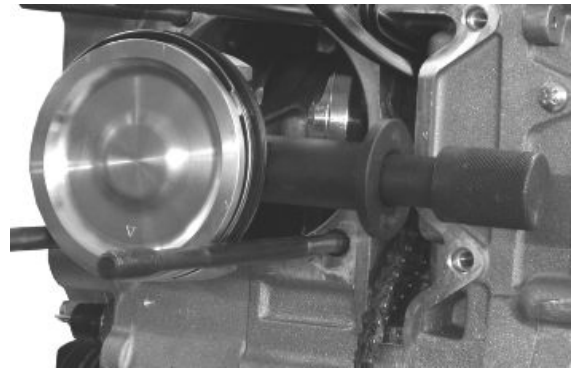
THE TOOL FOR INSTALLING THE STOP RINGS MUST BE USED MANUALLY.

CAUTION

USING A HAMMER MIGHT DAMAGE THE STOPS' HOUSING.

Specific tooling

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



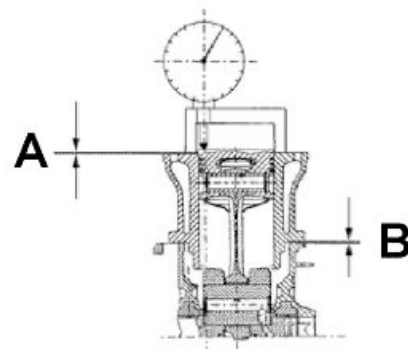
Choosing the gasket

The shimming system allows the compression ratio to be adjusted correctly.

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 travels inside the cylinder, the thinner the washer "B" of the base gasket to be applied (to obtain the required 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 250 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

Refitting the piston rings

Fitting the sealing 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.
- 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 250 engine has an L cross section.

N.B.

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



Refitting the cylinder

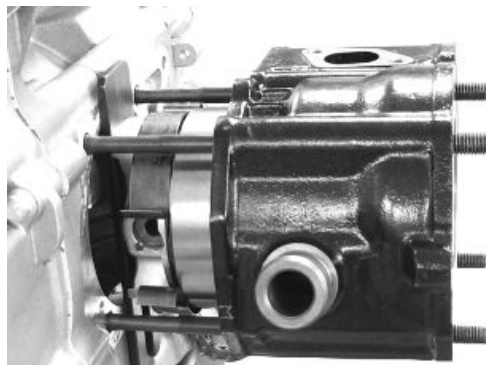
- Insert the cylinder base gasket with the thickness determined above.
- Using the fork support and the piston ring retaining band, refit the cylinder as shown in the figure.

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 fitting band**Inspecting the cylinder head**

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

Maximum allowable run-out: 0.05 mm

- Check that the camshaft and the rocker pin capacities exhibit no wear.

- Check that the cylinder head cover surface, the intake manifold and the exhaust manifold are not worn.

**Characteristic****bearing «A»**

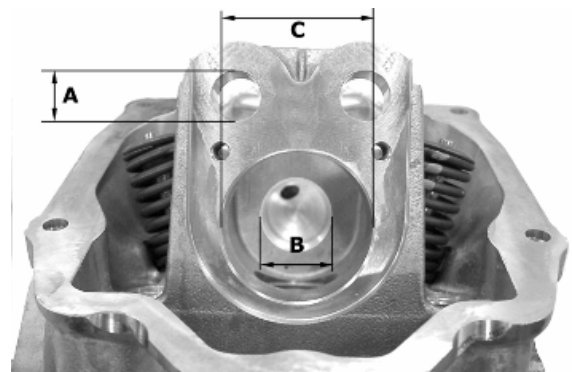
Ø 12.000 - 12.018 mm

bearing «B»

Ø 20.000 ÷ 20.021 mm

bearing «C»

Ø 37.000 - 37.025 mm

**Inspecting the timing system components**

- Check that the guide shoe and the tensioner shoe are not worn out.

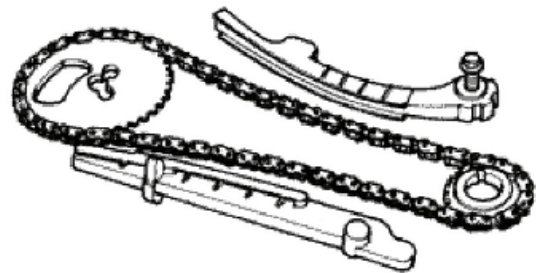
- Ensure that the camshaft control pulley chain assembly and the sprocket wheel are not worn.

- If you encounter wear, replace the parts or, if the chain, sprocket wheel and pulley are worn replace the whole assembly.

- Remove the centre screw with the washer and the tensioner spring. Check that the one-way mechanism is not worn.

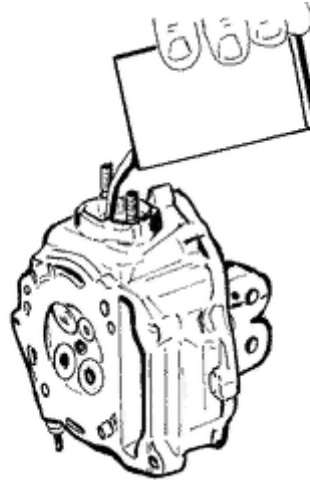
- Check the condition of the tensioner spring.

- If examples of wear are found, replace the whole assembly.



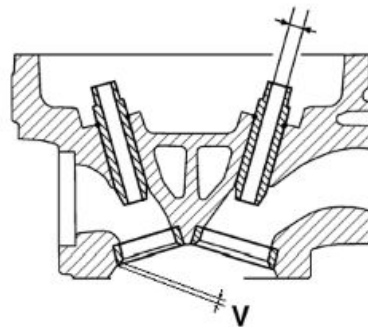
Inspecting the valve sealings

- 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.



Inspecting the valve housings

- Check the width of the imprint on the valve seat «V» wear limit max. 1.6 mm.
- Remove any carbon formation from the valve guides.
- Measure the inside diameter of each valve guide.
- Take the measurement at three different heights in the rocker arm push direction.
- If the width of the impression on the valve seat or the diameter of the valve guide exceed the specified limits, replace the cylinder head.



Characteristic

Valve seat wear Intake guide

limit accepted: 5.022

Valve seat wear Intake guide

Standard diameter: 5.000 ÷ 5.012 mm

Valve seat wear Exhaust guide

Accepted limit 5.022

Valve seat wear Exhaust guide

Standard diameter: 5.000 ÷ 5.012 mm

Inspecting the valves

- Measure the width of the sealing surface on the valve seats and on the valves.

Sealing surface width: After use: Intake and exhaust: 1.6 mm



- If any of the sealing surfaces on the valves is wider than the specified limit or is damaged in one or more points, or curved, replace the valve with a new one.

CAUTION

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

Characteristic

Valve wear check Standard: Intake and exhaust:

0.99 - 1.27 mm

- Measure the diameter of the valve stems in the three positions indicated in the diagram.
- Calculate the clearance between valve and valve guide.
- Check that there are no signs of wear on the surface of contact with the articulated register terminal.
- If the checks above give no failures, you can use the same valves. For best sealing results, it is advisable to grind the valves. 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.

N.B.

DO NOT CHANGE THE POSITIONS THE VALVES ARE FITTED IN

Characteristic

Valve check standard length

Outlet: 94.4 mm

Valve check standard length

Inlet: 94.6 mm

Valve check Maximum admissible clearance

Outlet: 0.072 mm

Valve check Maximum admissible clearance

Inlet: 0.062 mm

Valve check standard clearance

Outlet: 0.025 ÷ 0.052 mm

Valve check standard clearance

Inlet: 0.013 ÷ 0.040 mm

Valve check Minimum admissible diameter

Outlet: 4.95 mm

Valve check Minimum admissible diameter

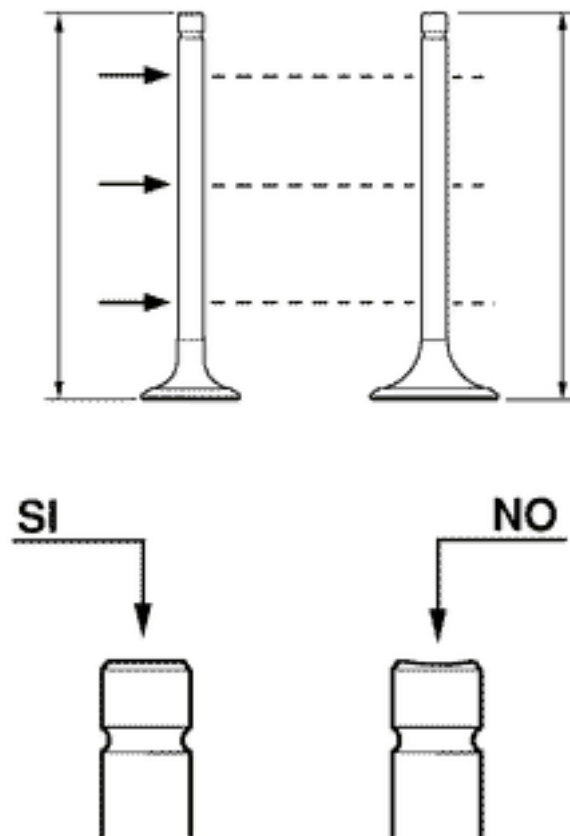
Inlet: 4.96 mm

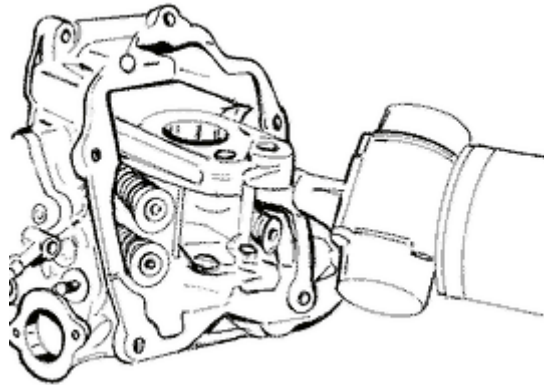
Valve check Standard diameter:

Inlet: 4.972 ÷ 4.987 mm

Valve check Standard diameter:

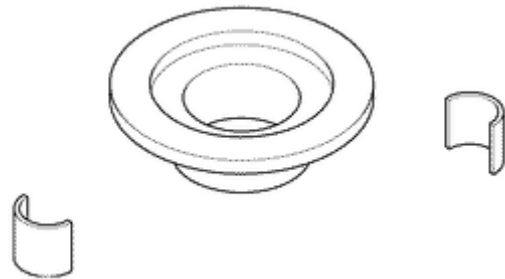
Outlet: 4.96 ÷ 4.975 mm





Inspecting the springs and half-cones

- Check that the upper spring caps and the cotter halves show no signs of abnormal wear.



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 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

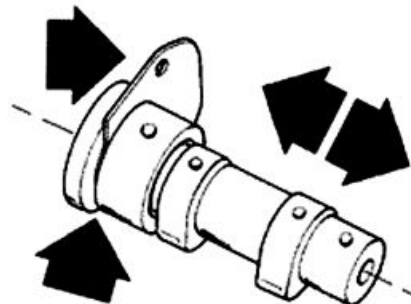
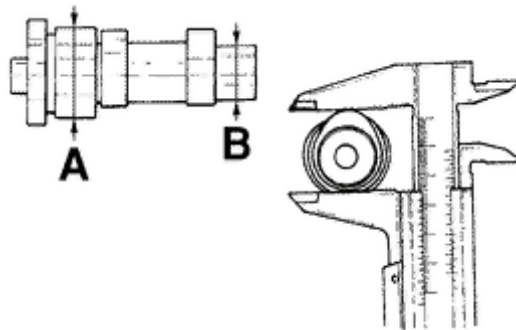
020382Y011 adapter for valve removal tool





Inspecting the cam shaft

- Inspect the cam shaft for signs of abnormal wear on the cams.
 - Check the cam height.
 - Check there is no wear on the cam shaft retaining plate and its associated groove on the cam shaft.
 - If any of the above dimensions are outside the specified limits, or there are signs of excessive wear, replace the defective components with new ones.
 - Check there are no signs of wear on the automatic valve-lifter cam, or the end-of stroke roller, or the rubber buffer on the automatic valve-lifter retaining cover.
 - Check that the valve lifting spring has not yielded.
 - Replace any defective or worn components.
 - Check the rocker pins do not show signs of wear or scoring.
 - Measure the internal diameter of each rocker arm.
- Check there are no signs of wear on the pad from contact with the cam and on the jointed adjustment plate.



Characteristic

Internal rocker arm diameter: Standard diameter

Diameter 12.000 - 12.011 mm

Rocking lever pin diameter: Standard diameter

Diameter 11.977 - 11.985 mm

Cam shaft check: Maximum admissible axial clearance

0.42 mm

Cam shaft check: Standard axial clearance:

0.11 - 0.41 mm

Cam shaft check: Standard height

Outlet: 29.209 mm

Cam shaft check: Standard height

Inlet: 30.285 mm

Cam shaft check: Minimum admissible diameter

Bearing B diameter: 19.950 mm

Cam shaft check: Minimum admissible diameter

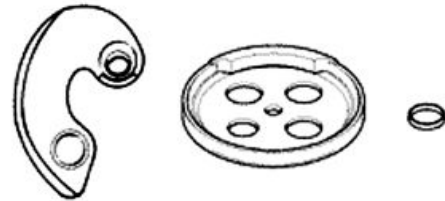
Bearing A Ø: 36.94 mm

Cam shaft check: Standard diameter

Bearing B diameter: 19.959 ÷ 19.98 mm

Cam shaft check: Standard diameter

Bearing A Ø: 36.95 ÷ 36.975 mm

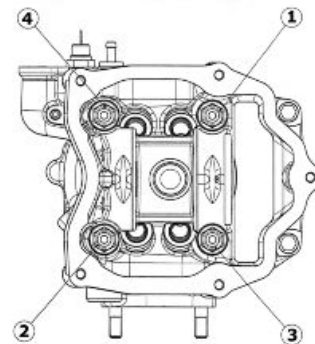


Refitting the head and timing system components

- Fit the timing chain guide pad.
- 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.

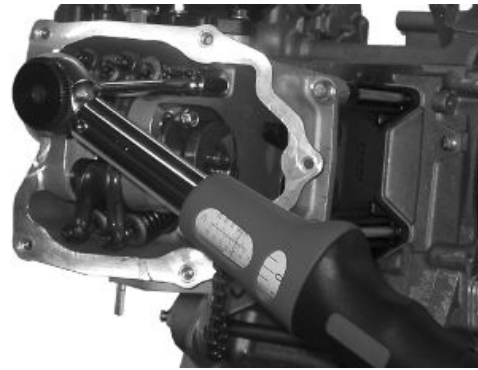
N.B.

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

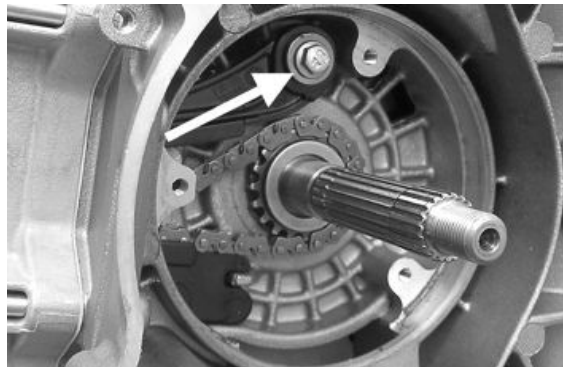


Locking torques (N*m)

Timing chain tensioner support screw 11 ± 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 rocker arms.
- Lubricate the two rocking levers through the holes at the top.
- Lubricate the 2 bearings and insert the cam shaft in the cylinder head with the cams corresponding to the rockers.
- Insert the retention plate and tighten the two screws shown in the figure to the prescribed torque.
- Refit the spacer on the cam shaft.
- 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 cam shaft while keeping the reference **4V** in correspondence with the reference mark on the head.
- Fit the counterweight and tighten the fixing 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 cam shaft.
- 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.

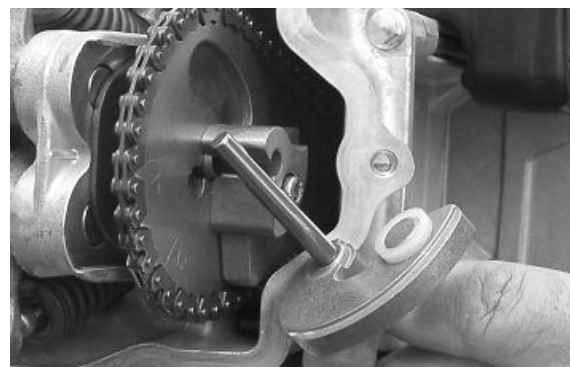
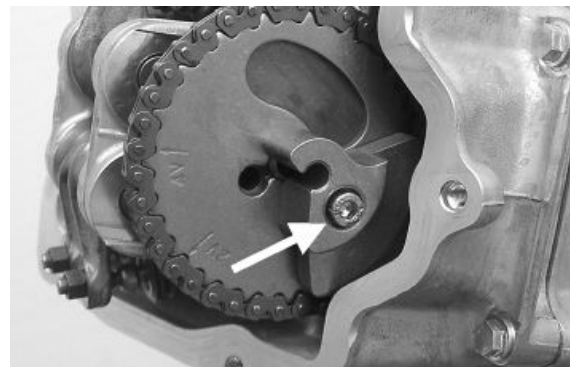
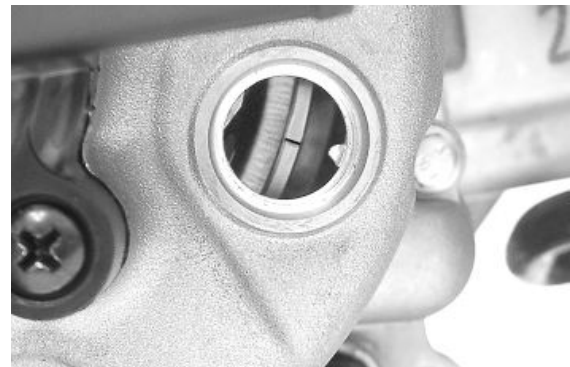
Electrode distance 0.8 mm

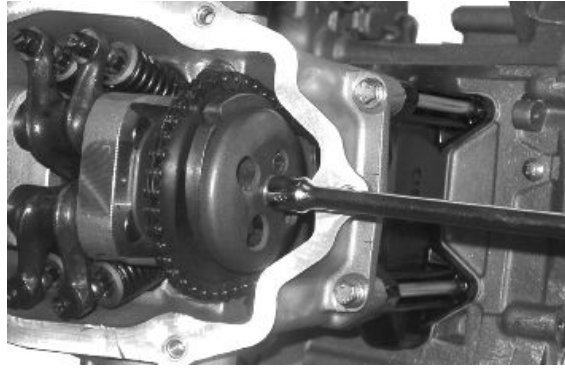
N.B.

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





Refitting the rocker-arms cover

- Refit the cylinder head cover, tightening 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)

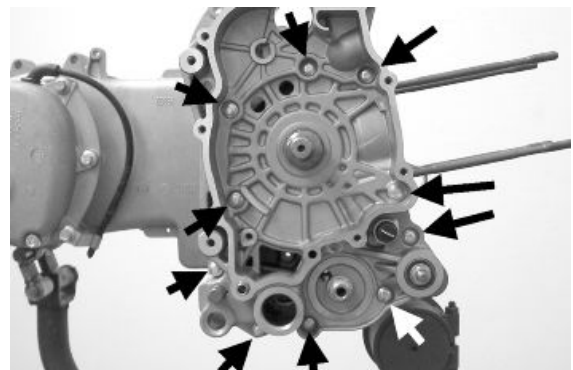
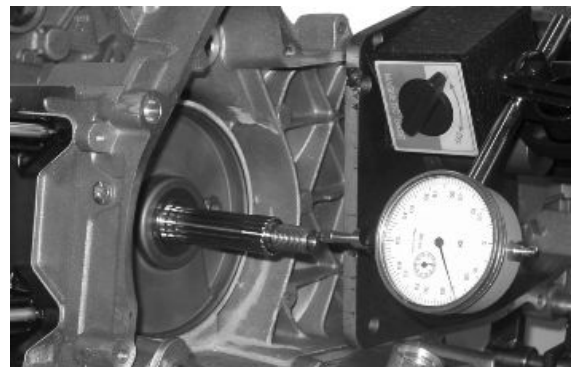
Inlet manifold screws 11 ÷ 13



Crankcase - crankshaft

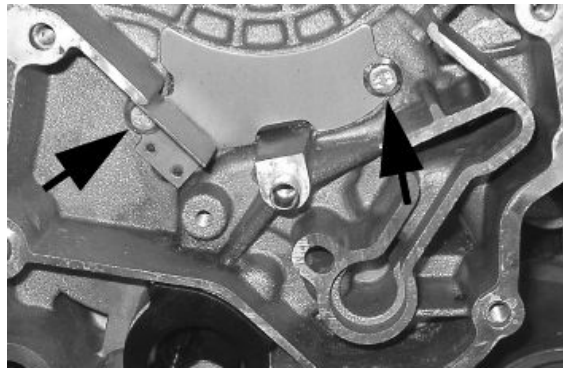
Splitting the crankcase halves

- 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 DRIVING SHAFT, 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 strip

020335Y Magnetic support for dial gauge

Characteristic

Axial crankshaft/crankcase clearance: Standard clearance

0.15 - 0.40 mm (when cold)

Axial connecting rod - crankshaft clearance Standard clearance

0.20 ÷ 0.50 mm

Radial connecting rod - crankshaft clearance Standard clearance

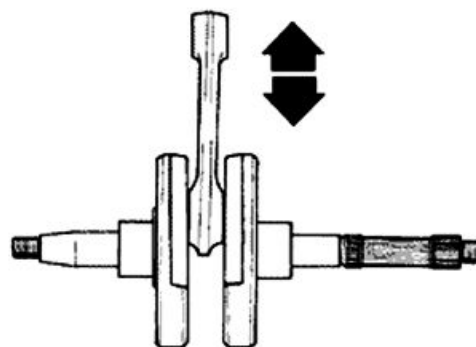
0.036 ÷ 0.054 mm

Width of crankshaft with integral washers: standard measurements

55.67 ÷ 55.85 mm

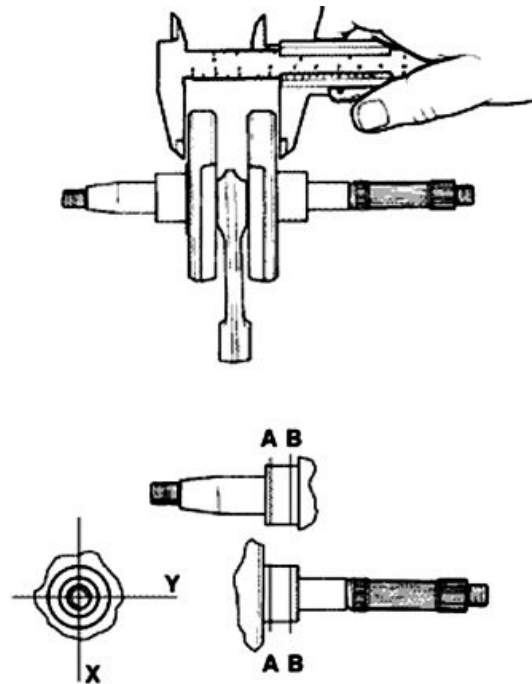
Crankshaft bearings: Standard diameter: Cat. 1

28.994 ÷ 29.000



Crankshaft bearings: Standard diameter: Cat. 2

29.000 ÷ 29.006

**Inspecting the crankshaft alignment**

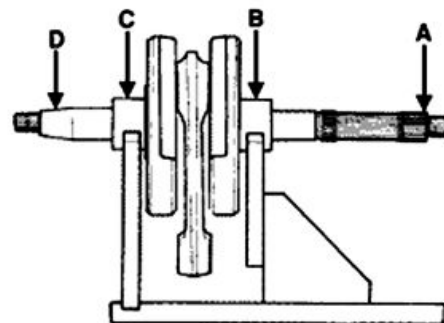
To install the drive shaft on the support and to measure the misalignment in the 4 points indicated in figure.

- Check that the driving shaft cone, the tab seat, the oil seal capacity, the toothed gear and the threaded tangs are in good working order.
- In case of failures, replace the crankshaft.

The connecting rod head bushings cannot be replaced. For the same reason, the connecting rod may not be replaced and, when cleaning the crankshaft, be very careful that no impurities get in through the shaft's lubrication holes.

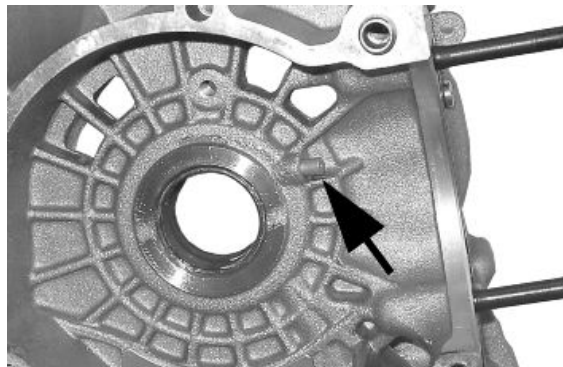
In order to prevent damaging the connecting rod bushings, do not attempt cleaning the lubrication duct with compressed air.

- Make sure that the 2 caps on the crankpin are properly fitted.
- A wrong installation of a cap can seriously affect the bushing lubrication pressure.



N.B.**THE MAIN BEARINGS ARE NOT GRINDABLE****Specific tooling****020074Y Support base for checking crankshaft alignment****Characteristic****Off-line maximum admitted****A = 0.15 mm****B = 0.01 mm****C = 0.01 mm****D = 0.10 mm****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 valve, which regulates the oil pressure.
- On the flywheel side crankcase half, take particular care cleaning the oil ducts for the main bushings, the oil duct for the jet that lubricates the cylinder head and the oil drainage duct at the flywheel side oil seal.
- Inspect the coupling surfaces on the crankcase halves for scratches or deformation, taking particular care with the cylinder/crankcase surfaces and the crankcase halves surfaces.
- Defects in the crankcase coupling gasket between the crankcase halves or the mating surfaces shown in the diagram, could cause a drop in the oil pressure lubricating the main bearings and connection 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 THE PISTON TOP COOLING. CLOGGING HAS EFFECTS THAT ARE DIFFICULT TO DETECT (PISTON TEMPERATURE INCREASE). FAILURE OR LEAK CAN CONSIDERABLY DECREASE THE MAIN BUSHING AND CONNECTING ROD LUBRICATION PRESSURE.

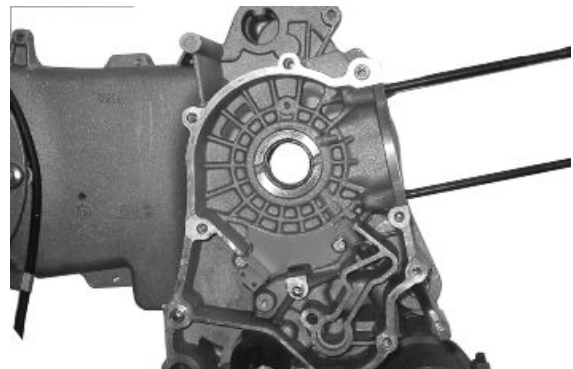
N.B.

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

Inspecting the crankshaft plain bearings

- To obtain a good bushing lubrication it is necessary to have both an optimal lubricating pressure (3.2 bar) and a good oil flow rate; the bushings must be correctly positioned so as not to obstruct the oil supply channels.

- The main bushings are comprised of two half-bearings, one with holes and channels for lubrication whereas the other is solid.



- 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 obstructions in the oil feeding channels, the matching surface of the two half-bearings must be perfectly perpendicular 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 KEEP THE BUSHINGS ON THE CRANKCASE IN SUCH POSITION, DRIVING IS FORCED ON CAST-IRON RINGS INSERTED IN THE CASTING OF BOTH CRANKCASE HALVES.

N.B.

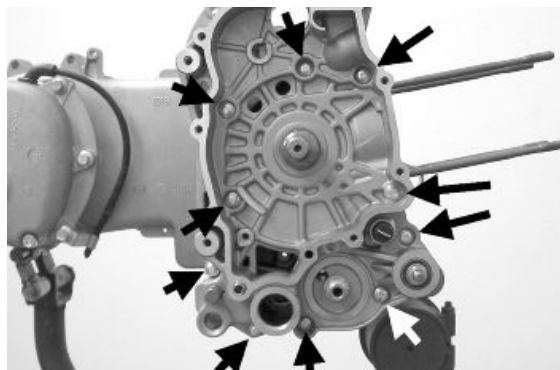
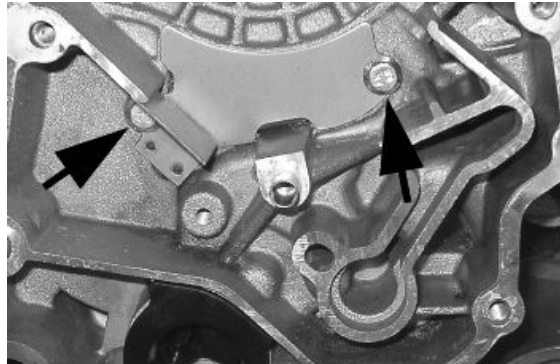
TO MEASURE WEAR LIMITS AND COUPLING CLEARANCES, SEE THE SPECIFICATIONS CHAPTER.

See also

Crankcase - crankshaft - connecting rod

Refitting the crankcase halves

- Fit the internal bulkhead by locking the two screws to the prescribed torque.
- Fit the oil filter fitting and tighten it to the specified torque.
- Position the oil pre-filter element as shown in the photograph.
- Place a new gasket on one of the crankcase halves, preferably on the transmission side, together with the locating dowels.
- Lubricate the main bushings and insert the crankshaft in the transmission side crankcase half.
- Reassemble the two crankcase halves.
- Fit the 10 screws and tighten them to the prescribed 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 ÷ 6 Engine-crankcase coupling screws 11 ÷ 13 Oil filter on crankcase fitting 27 ÷ 33 Engine oil drainage plug/mesh filter 24 ÷ 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 photograph. 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 photograph, 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.

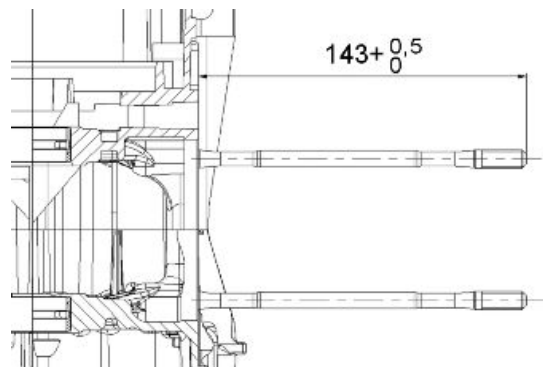
Tighten up to the depth of the driving indicated.



Recommended products

Loctite 'Quick Set' Strong 270 threadlock

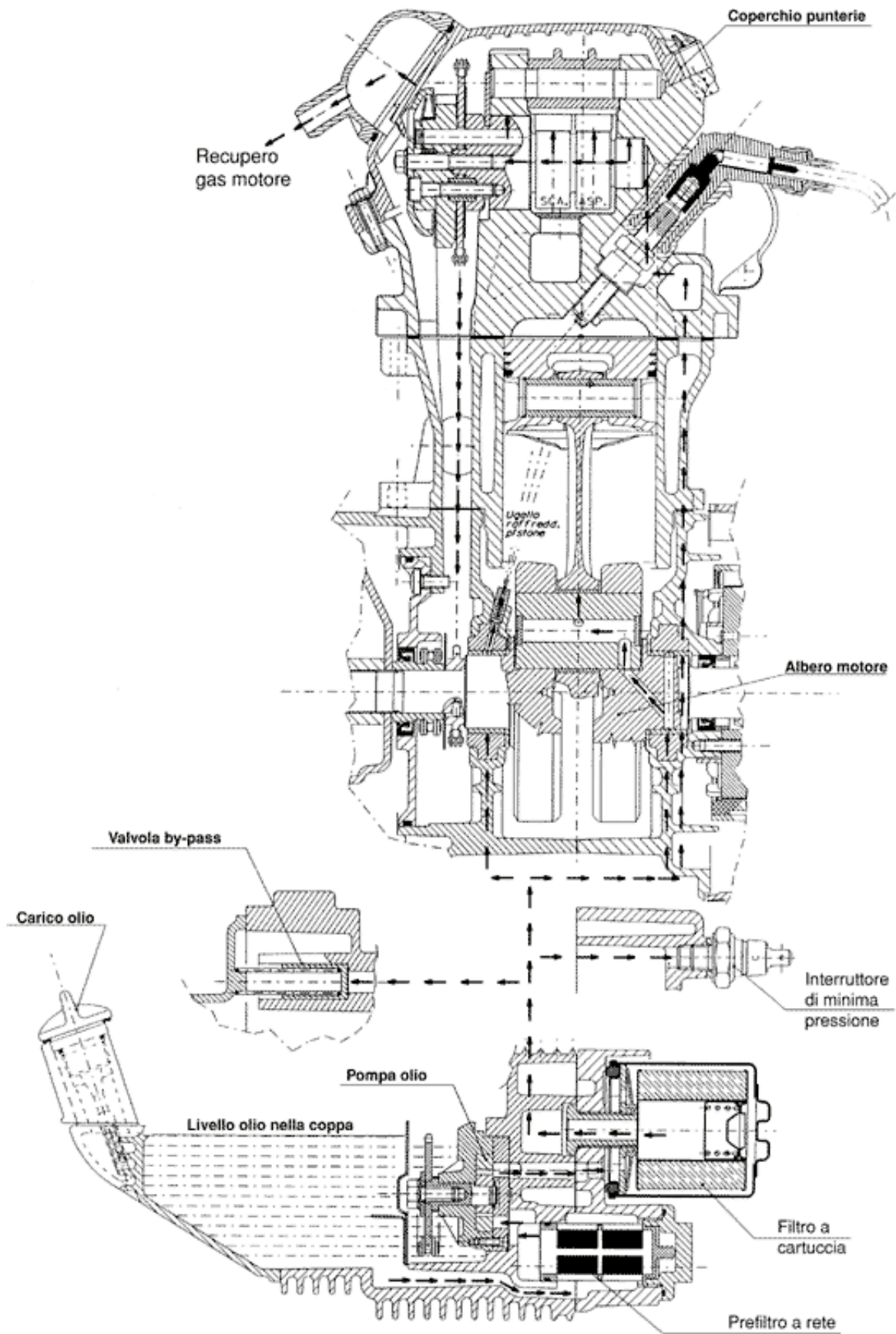
Strong 270 threadlock



Lubrication

Conceptual diagrams

LUBRICATION CIRCUIT



Oil pressure check

- Disconnect the electrical minimum oil pressure connection and remove the switch.
- Check 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 the oil pressure is between 3.2 and 4.2 atm with the engine running at a speed 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 GOOD CONDITION.

Characteristic**Oil pressure**

Minimum pressure admitted at 6000 rpm: 3.2 atm.

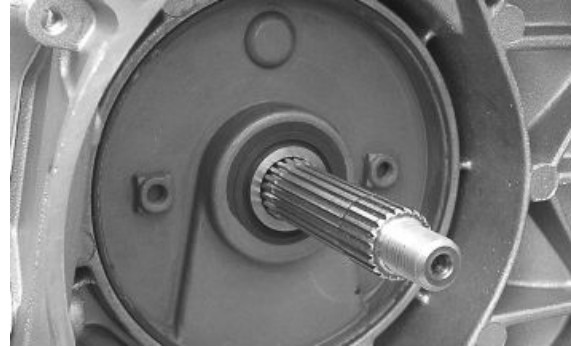
Locking torques (N*m)

Minimum oil pressure sensor 12 ÷ 14

Crankshaft oil seals

Removal

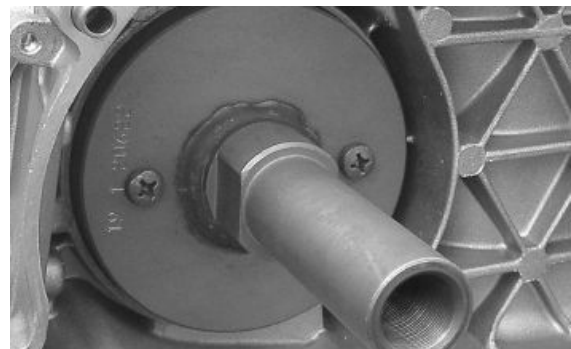
- First remove the transmission cover and the complete driving pulley



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

Specific tooling

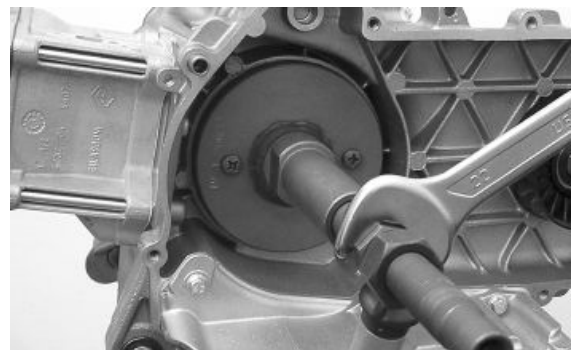
020622Y Transmission-side oil guard punch



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

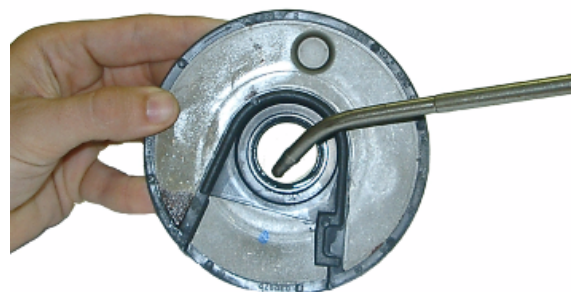
Specific tooling

020622Y Transmission-side oil guard punch



Refitting

- Use a new oil guard for the refitting
- Prepare the new oil guard, lubricating the sealing lip.
- Preassemble the oil seal with the specific tool, positioning the screws.
- Insert the sheath over the crankshaft.
- Insert the tool with the oil seal on the crankshaft until it comes into contact with the crankcase.
- Insert the adaptor bushing of the tool in the hole on the crankcase.



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

CAUTION

DO NOT LUBRICATE THE SURFACE FOR KEYING ONTO THE ENGINE CRANKCASE.

CAUTION

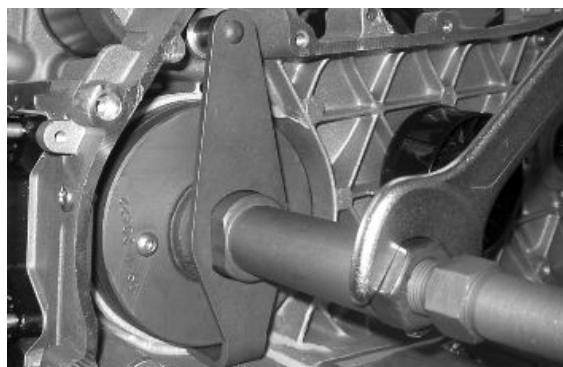
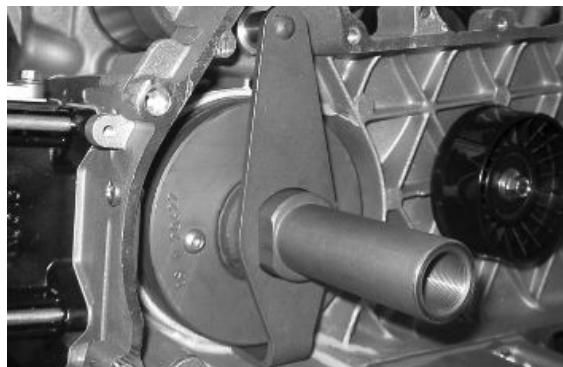
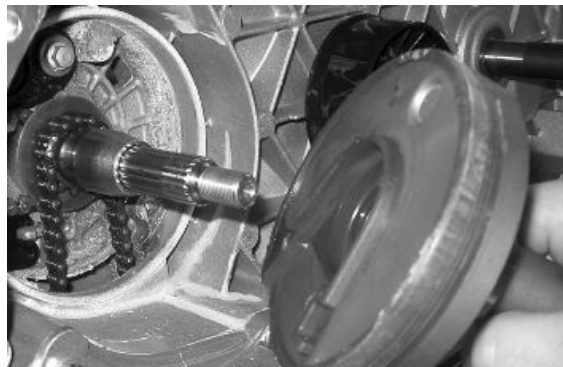
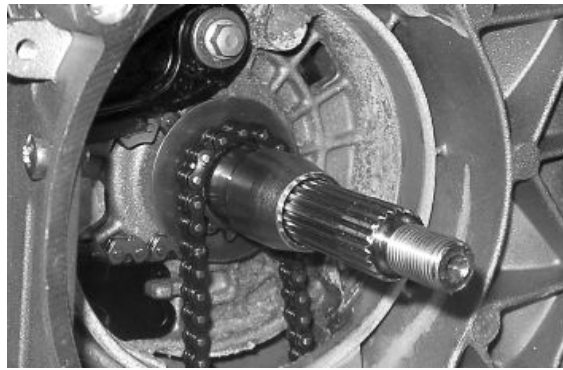
ORIENT THE OIL GUARD BY POSITIONING THE CHAIN HOUSING CHANNEL FACING DOWNWARDS. WHEN THE POSITION IS REACHED, DO NOT RETRACT THE OIL GUARD. FAILURE TO COMPLY WITH THIS RULE CAN CAUSE A WRONG POSITIONING OF THE OIL GUARD SHEATH.

CAUTION

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

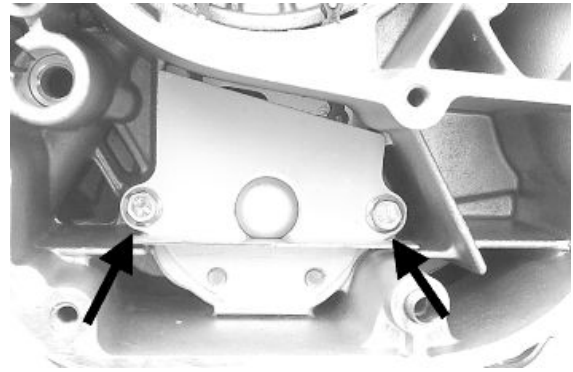
Specific tooling

020622Y Transmission-side oil guard punch

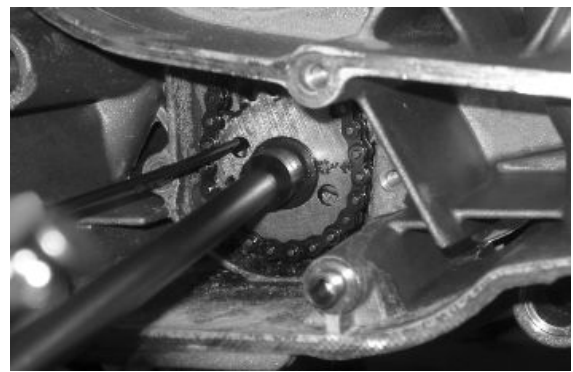
**Oil pump**

Removal

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



- 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 crown.
- Remove the control sprocket with relative O-ring.
- Remove the oil pump by undoing the two screws in the figure.
- Remove the oil pump seal.

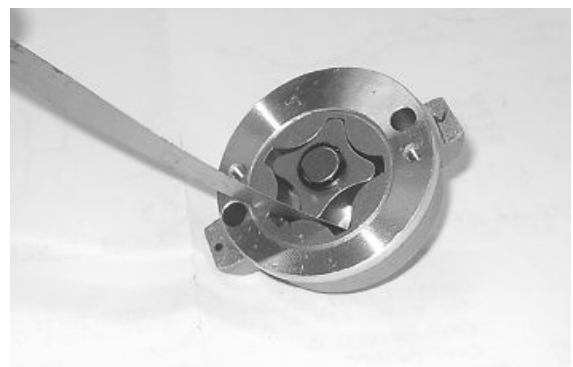


N.B.

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 clip 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 snap ring.



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

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

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



Characteristic

Axial rotor clearance

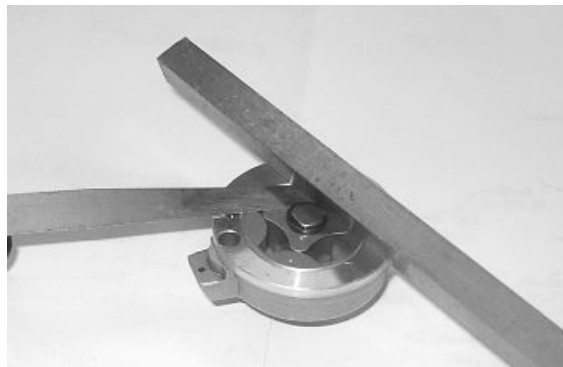
Limit values admitted: 0.09 mm

Distance between the outer rotor and the pump body

Admissible limit clearance: 0.20 mm

Distance between the rotors

Admissible limit clearance: 0.12 mm



Refitting

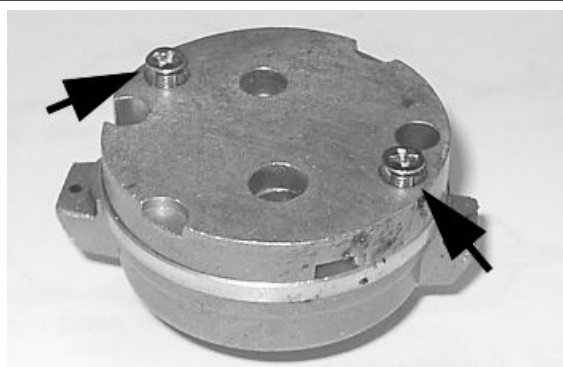
- Check there are no signs of wear on the oil pump shaft or body.

- Check there are no signs of scoring or wear on the oil pump cover.

- If you detect non-conforming measurements or scoring, replace the faulty parts or the unit.

- Fit the pump cover in the position that permits the crankcase fixing 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.

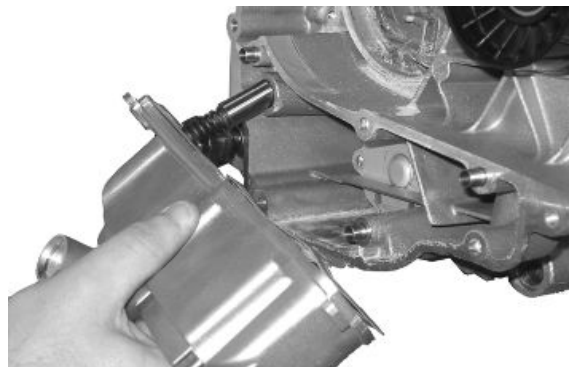
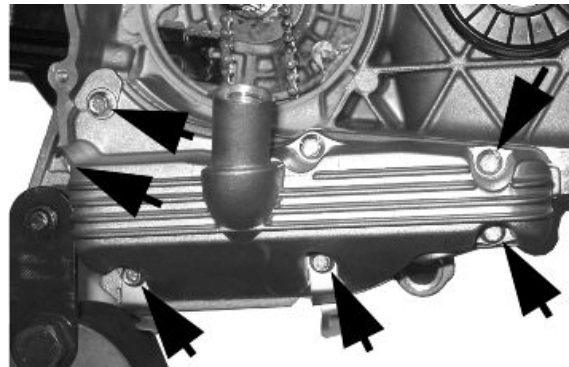
FIT THE BELLEVILLE WASHER SO THAT ITS OUTER RIM TOUCHES THE PULLEY. MAKE SURE THAT THE PUMP TURNS FREELY.

Locking torques (N*m)

Screws fixing oil pump to crankcase 5 - 6 Oil pump control crown screw 10 ÷ 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 previously.
- Remove the seven screws, shown in the diagram, and the two rear brake fluid pipe fixing brackets.
- Remove the screw, the by-pass piston, the gasket and centring dowels shown in the figure.



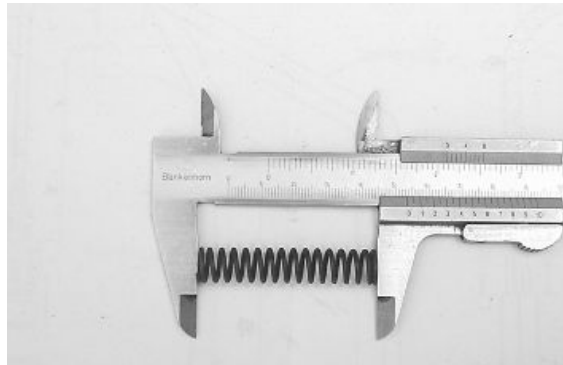
Inspecting the by-pass valve

- 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

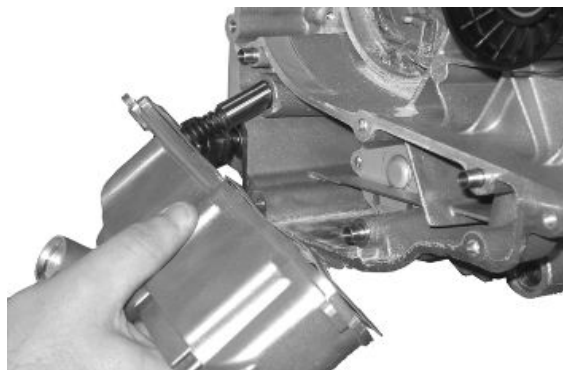
By-pass check up: Standard length

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



Locking torques (N*m)

Oil sump screws 10 ÷ 14

INDEX OF TOPICS

INJECTION

INJEC



DISPOSIZIONE COMPONENTI

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

MIU injection system

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

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

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

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

- Coolant temperature.
- Intake air temperature
- Lambda probe 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 supply pressure is kept constant based on the ambient pressure.

The **feed circuit** consists of:

- Fuel pump
- Fuel filter
- Injector
- Pressure regulator

Pump, filter and regulator are placed into the fuel tank using a single support.

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

The fuel pump is controlled by the MIU; this ensures the scooter's 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.

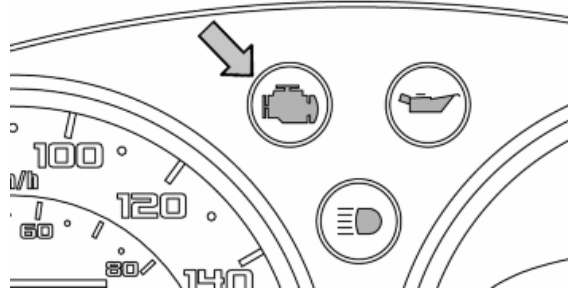
The MIU injection-ignition system controls engine functions by means of a pre-set program.

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.



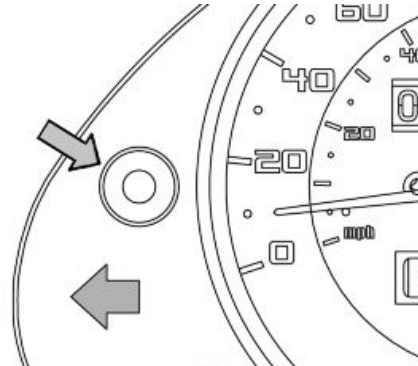
Specific tooling

020460Y Scooter diagnosis and tester

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

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

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



The MIU control unit power supply is furthermore controlled by the emergency switch; that is to provide further safety for the scooter.

Precautions

Troubleshooting hints

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

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

A: Electrical power supply

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

d. Connectors

B: Chassis 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 have been correctly made.

Check the connections as follows:

A check that the terminals are not bent.

B check that the connectors have been properly connected.

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

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

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

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

2. The fuel feed system is pressurised at 250 kPa (2.5 BAR). Before disconnecting the quick coupler of a pipe in the fuel supply system, check that there are no naked flames, and do not smoke. Act with caution to prevent spraying in the eyes.

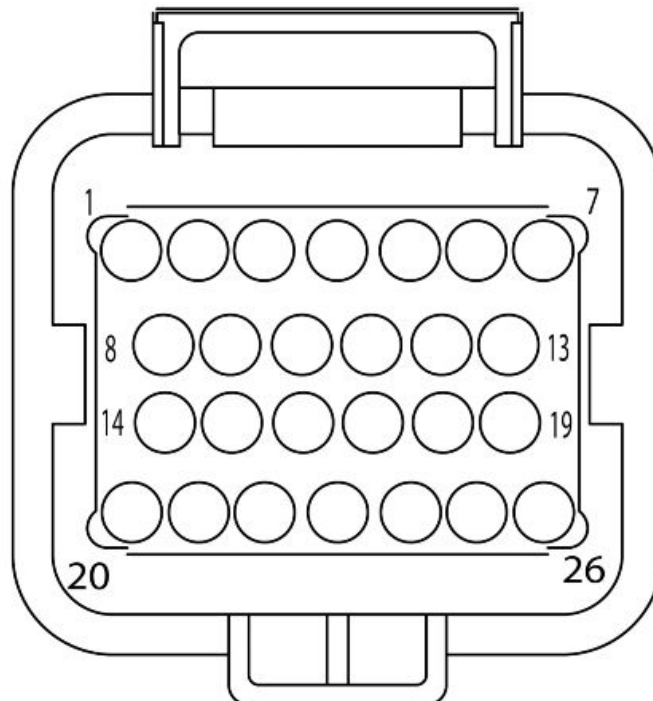
3. When fixing electric components, operate with the battery connected only when actually required.

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

5. Before trying to start up, 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 scooter 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 fault is detected, start the checks from the battery and the injection system connections.
9. Before disconnecting the MIU control unit connector, perform the following steps in the order shown:
 - Set the switch to «OFF»
 - Disconnect the batteryFailure to respect this norm may damage the control unit.
10. Do not invert the polarity when fitting the battery.
11. To avoid damage, only disconnect and reconnect the MIU system connectors 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, protect the system connector with its cap. Failure to do this may damage the MIU control unit.
14. Before reconnecting the quick couplers of the power supply system, check that the terminals are perfectly clean.

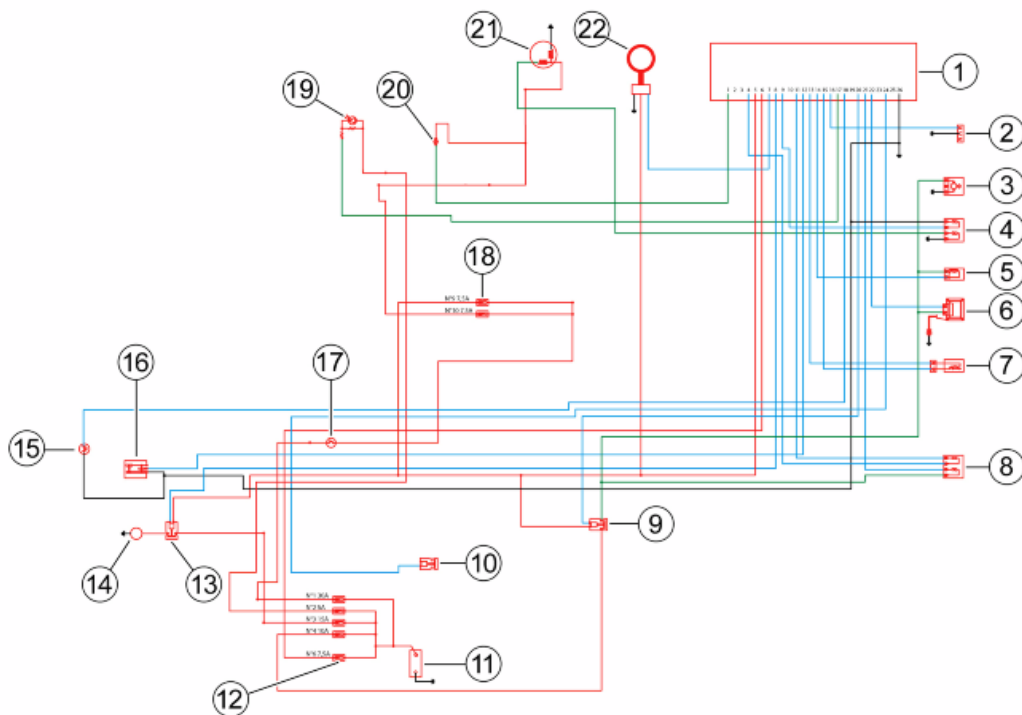
Terminals setup



DISPOSIZIONE TERMINALI

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

EMS circuit diagram



SCHEMA IMPIANTO

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

Troubleshooting procedure**Engine does not start****ENGINE DOES NOT START IF ONLY PULLED**

Possible Cause	Operation
Immobiliser enabling signal	System not encoded System not efficient, repair according to the indications of the self-diagnosis
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector revolution timing sensor
Fuel supply	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 engine speed	Starter motor and remote control

Possible Cause	Operation
	Battery Ground connections
End of compression pressure Power to the spark plug	End of compression pressure Spark plug Shielded cap HV coil Rpm-timing sensor Ignition advance
Fuel supply	Fuel pressure (low) Injector capacity (low) Injector seal (poor)
Correctness of the parameters	Coolant temperature Stepper throttle valve position intake air temperature (steps and actual opening) Cleaning of the auxiliary air pipe and throttle valve; air filter efficiency

Engine stops at idle

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

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

Engine does not rev down

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

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector revolution timing sensor Air temperature Coolant temperature
Ignition efficiency	Ignition timing
Correctness of the parameters	Throttle valve position sensor Stepper Coolant temperature sensor Intake air temperature sensor
Intake system sealing (infiltrations)	Intake manifold - head Throttle body - manifold Intake sleeve

Possible Cause	Operation
Fuel feed (low pressure)	Filter box Fuel pump Pressure regulator Fuel filter Injector capacity

Exhaust backfires in deceleration

EXHAUST BACKFIRES WHEN DECELERATING

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

Engine revs irregularly

ENGINE IRREGULAR PERFORMANCE WITH VALVE SLIGHTLY OPEN

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

Poor performance at full throttle

POOR ENGINE PERFORMANCE AT FULL POWER/ ENGINE IRREGULAR PROGRESS 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 sensor
Spark plug power supply	Spark plug Shielded cap HV cable HV coil
Intake system	Air filter Filter box (sealing) Intake sleeve (sealing)
Parameter reliability	Throttle valve position signal Coolant temperature indicator Intake air temperature indicator Ignition advance
Fuel supply	Fuel level in the tank Fuel pressure Fuel filter Injector capacity

Engine knocking

PRESENCE OF KNOCKING (COMBUSTION SHOCKS)

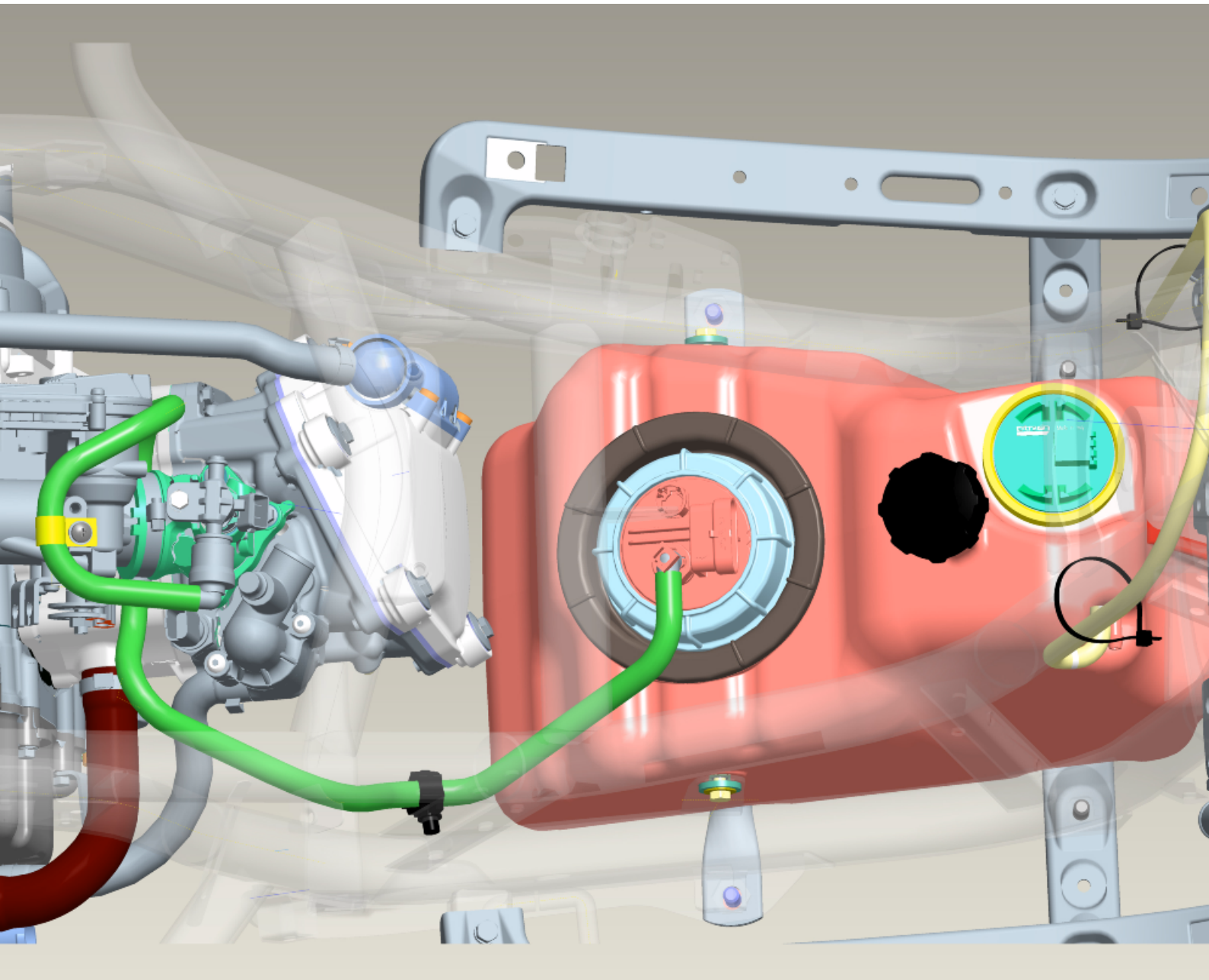
Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector revolution timing sensor Air temperature Coolant temperature Lambda sensor
Ignition efficiency Parameter reliability	Spark plug Throttle valve position signal Coolant temperature indicator Intake air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

Fuel supply system

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

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

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

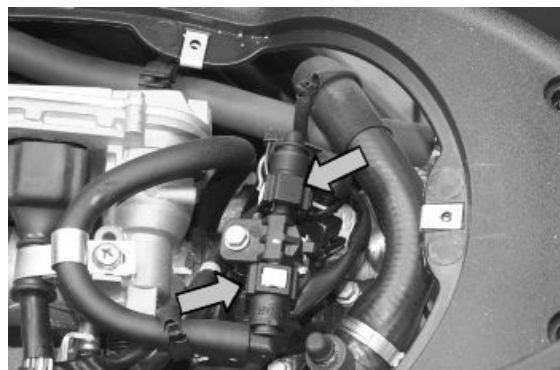


Removing the butterfly valve

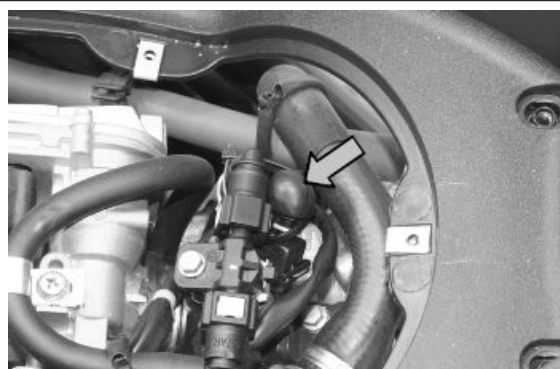
Remove the fuel piping clamping screw indicated in the figure.



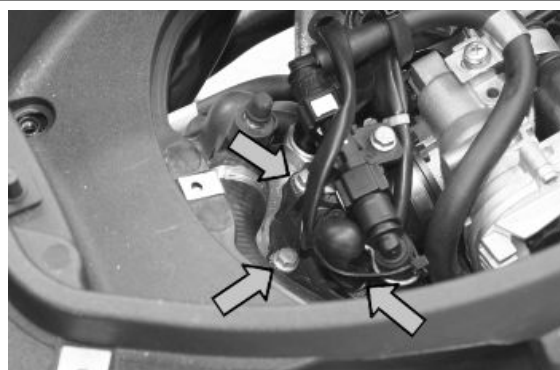
Remove the fast-release fittings from the injector support.



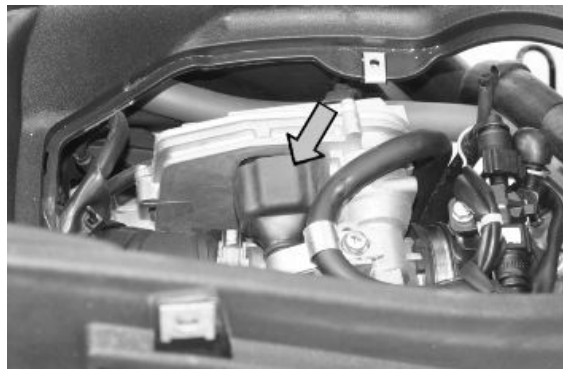
Remove the injector connector.



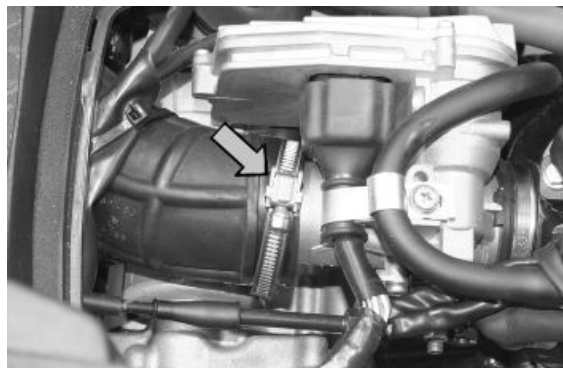
Remove the three screws fixing the manifold to the cylinder head and the clip fixing the throttle body to the manifold.



Remove the MIU ECU connector.



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

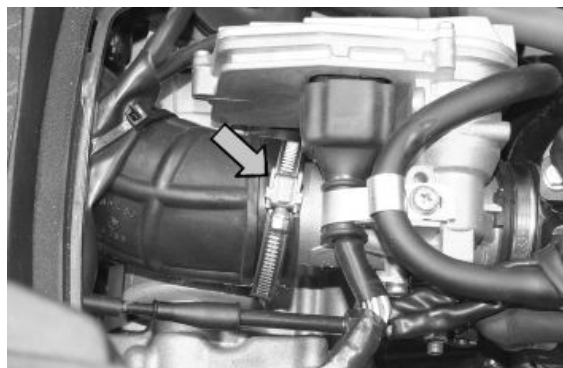


Remove the gas command fitting as indicated in the photograph

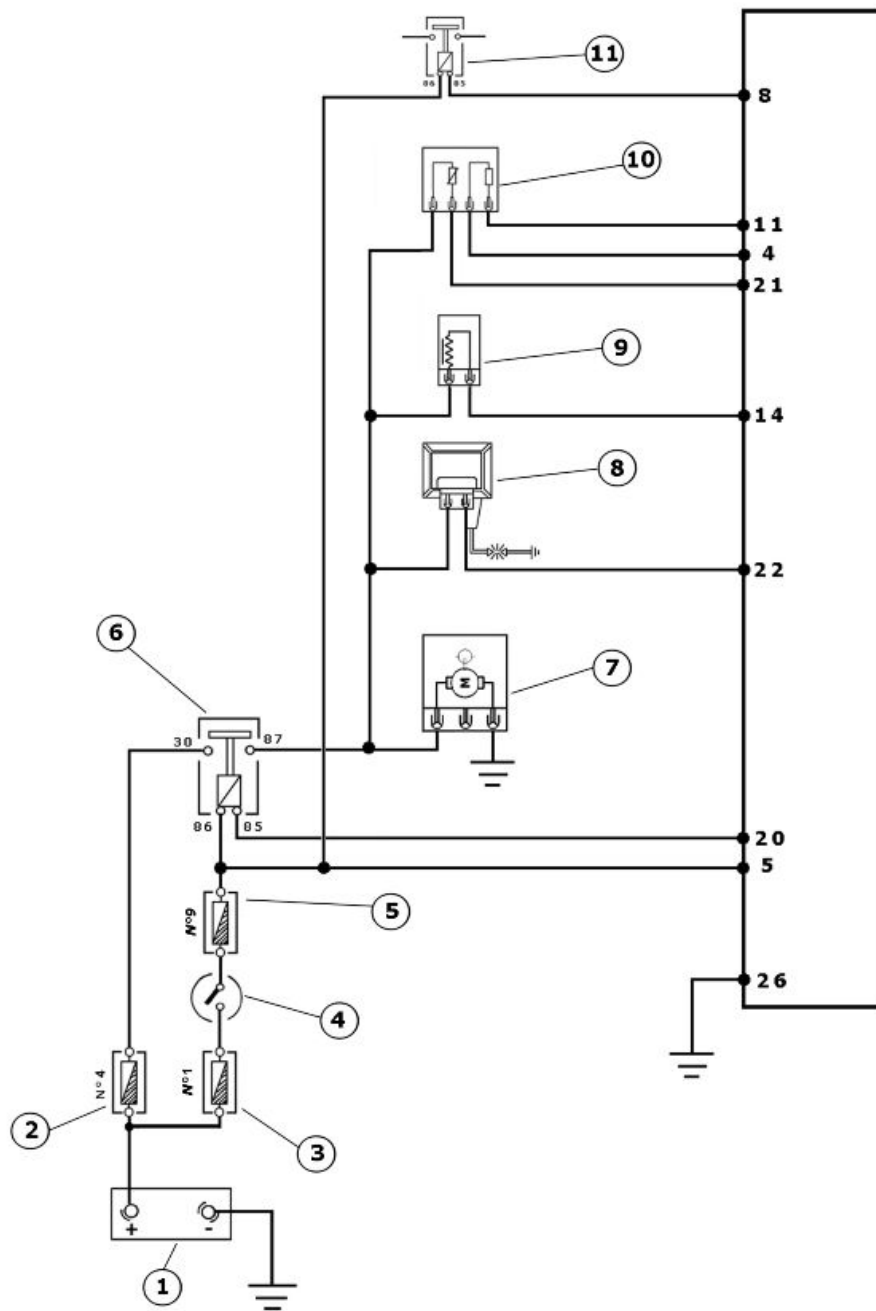


Refitting the butterfly valve

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 bellows at 45° as shown in the photograph.



Pump supply circuit



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	10 A
3	Fuse	30 A
4	Key switch contacts	
5	Fuse	7.5 A
6	Injection load remote control	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Lambda sensor	

	Specification	Desc./Quantity
11	Electric fan remote control	

When switched to «ON», the fuel pump starts to rotate for 2 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)

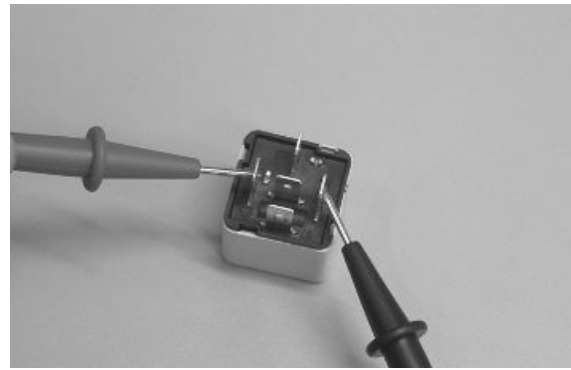
Check the efficiency of 10 A fuse N° 4 injection load .

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

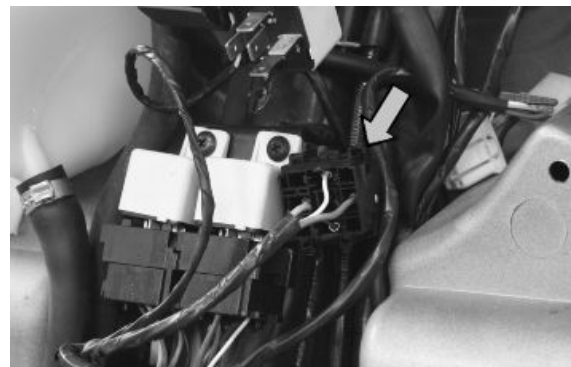


Check the efficiency of the injection load remote control: Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm
Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the remote control.



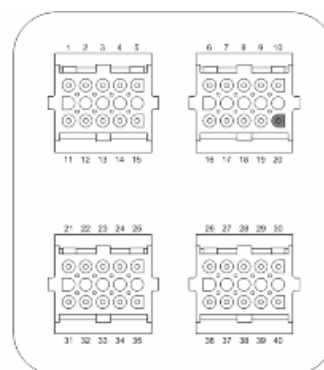


Check the power supply line of the injection load remote control energising coil: after switching to «ON», make sure there is battery voltage, for 2 seconds, between the Red-White cable and the Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-White cable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

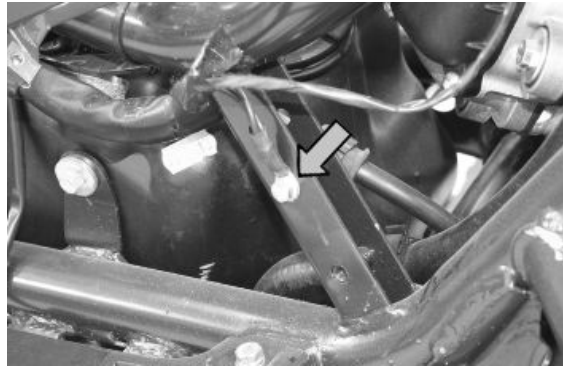


N.B.

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



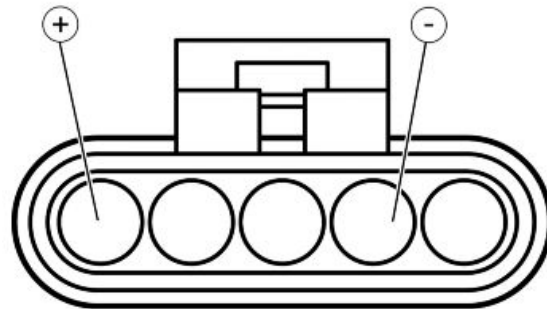
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.



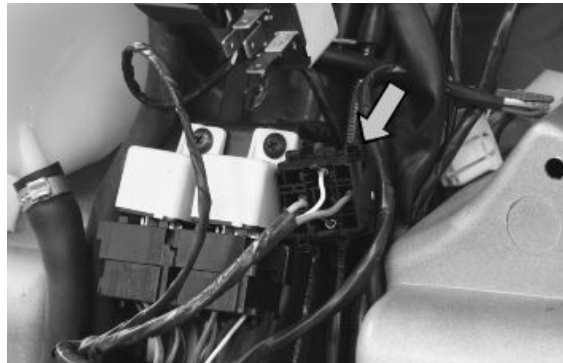
N.B.

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

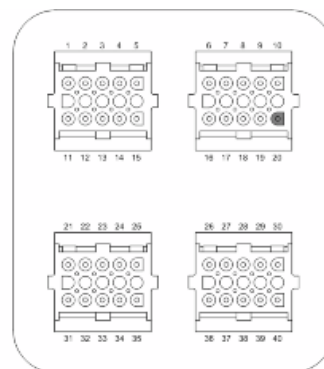
After switching to «ON», check that there is battery voltage, for about 2 seconds, between the Black-Green cable of the pump connector and the ground lead with the pump connector disconnected. Otherwise, check the continuity of the Black-Green cable between the pump connector and the remote control base.



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



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

Circuit leak test

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

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



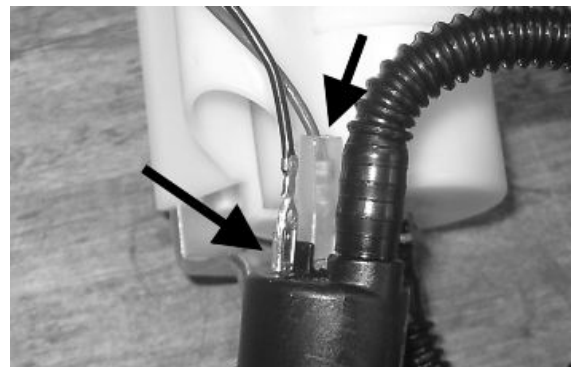
With the battery voltage > 12 V, check the pump flow rate by disconnecting from the injector the pipe equipped with the pressure gauge of the appropriate tool. Make a graded burette available with a flow rate of approximately 1 L. Rotate the pump using the active diagnosis of the palm top computer. Using a pair of long flat needle-nose pliers, choke the fuel pipe making the pressure stabilise at approx. 2.5 BAR. Check that, in fifteen seconds, the pump has a flow rate of around 110 cm³.

Specific tooling

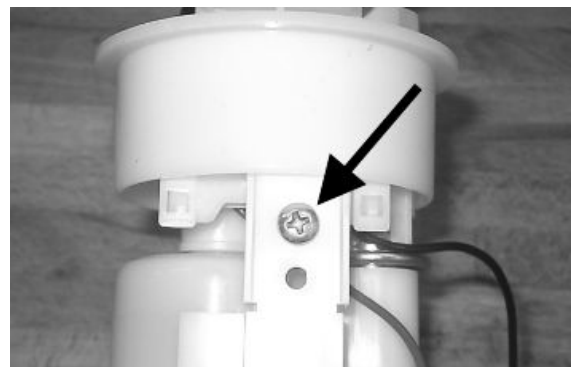
020480Y Petrol pressure check set

Fuel filter check

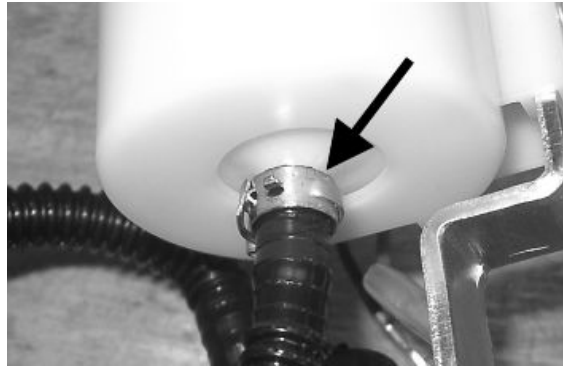
Disconnect the terminals from the electric pump



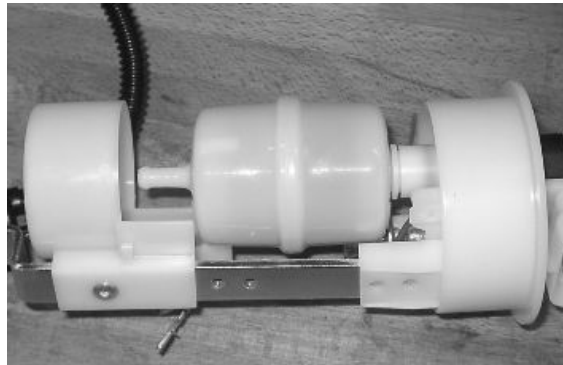
Remove the screw shown in the photograph



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



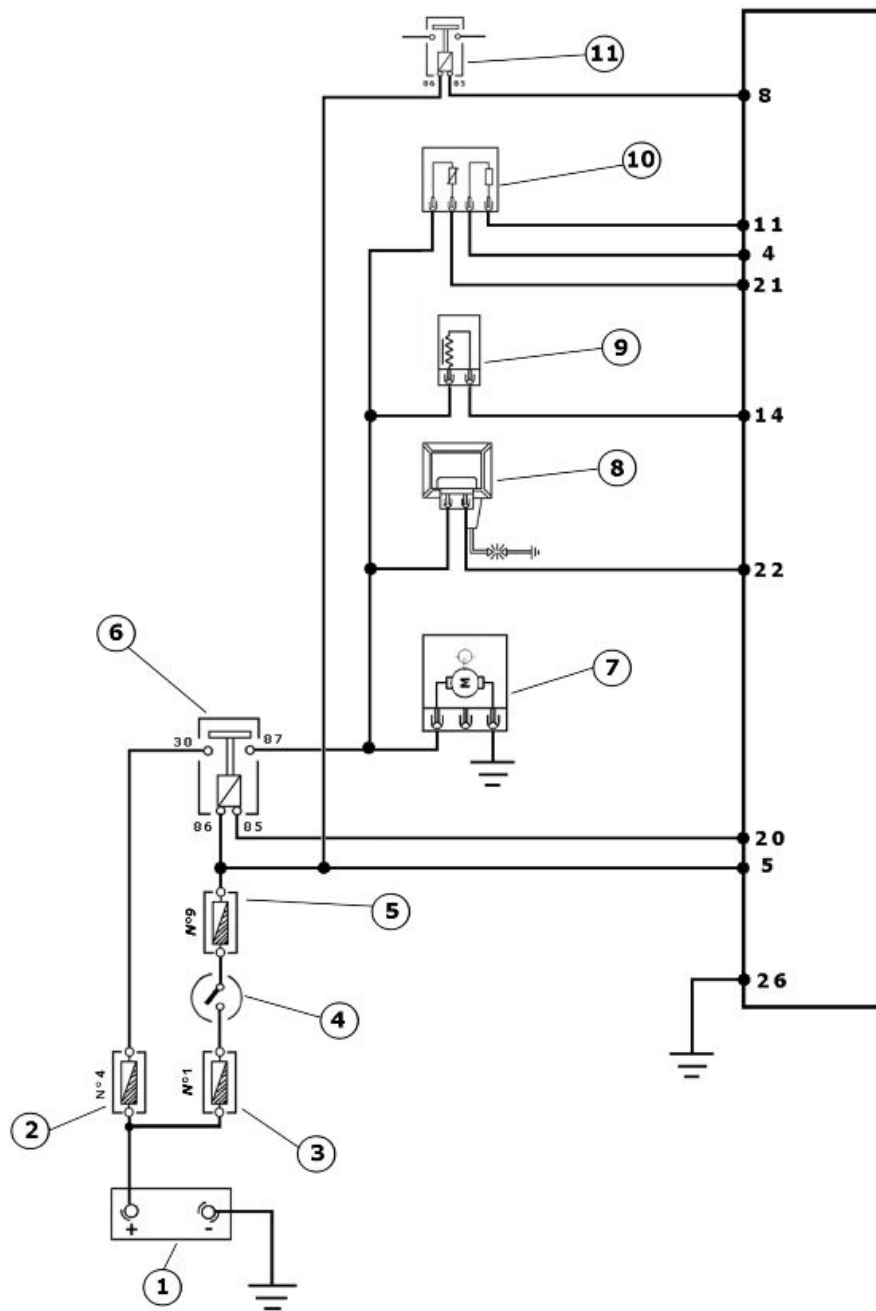
Separate the lower part of the pump support as shown in the photograph.



Remove the filter from the pump support



Inspecting the injector circuit



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	10 A
3	Fuse	30 A
4	Key switch contacts	
5	Fuse	7.5 A
6	Injection load remote control	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Lambda sensor	

	Specification	Desc./Quantity
11	Electric fan remote control	

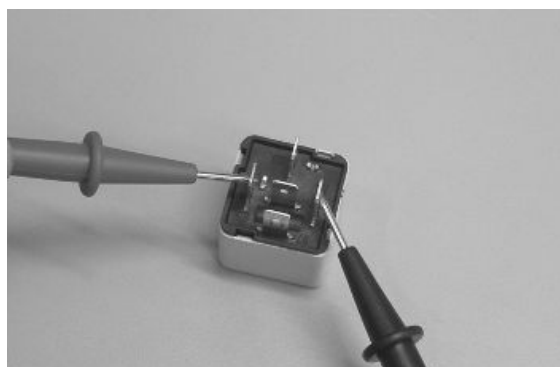
Check the resistance at the injector ends: $14.5 \pm 5\%$ Ohm

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

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

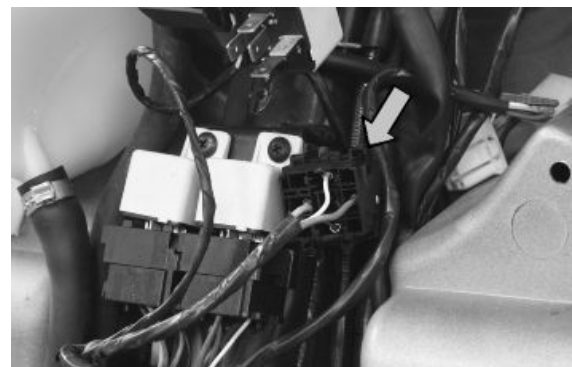


Check the efficiency of the injection load remote control: Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm
Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the remote control.



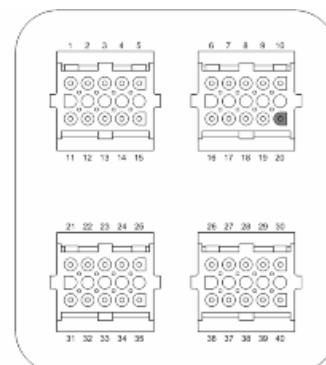


Check the power supply line of the injection load remote control energising coil: after switching to «ON», make sure there is battery voltage, for 2 seconds, between the Red-White cable and the Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-White cable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



N.B.

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



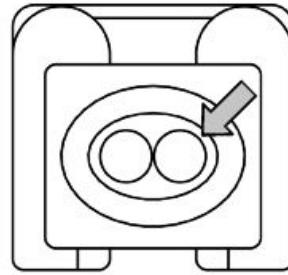
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.



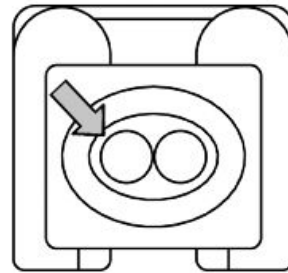
N.B.

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

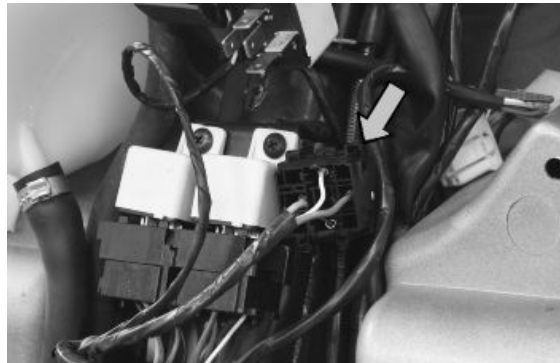
With the control unit and the injector disconnected, check the continuity of the Red-Yellow cable between pin 14 of the interface wiring and the injector connector



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

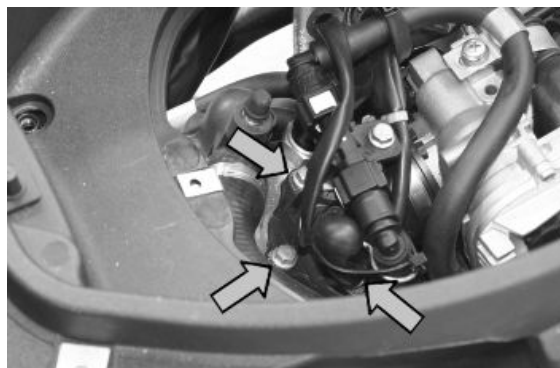


With injector disconnected and the injector load remote control disconnected, check the continuity of the Black-Green cable between the injector connector and remote control base.



Inspecting the injector hydraulics

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





Install the appropriate tool for checking fuel pressure and position the manifold over a container graduated by at least 100 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 set



Proceed with the injector seal test.

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

Value limit = 1 drop per minute



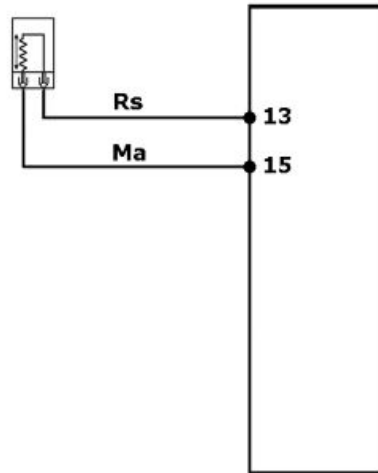
Components location



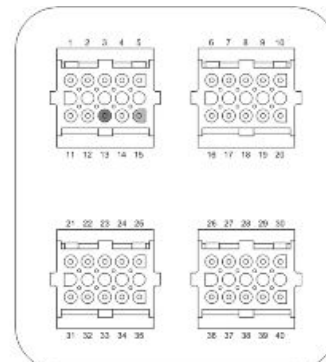
DISPOSIZIONE COMPONENTI

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

Tachometer



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



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

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

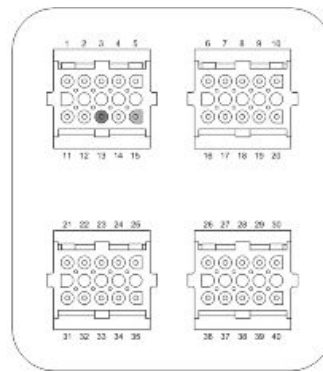


With the interface wiring disconnected from the control unit and rpm sensor connector, check that the red and brown cables (pin 13 - 15) are isolated from each other and insulated from the earth.

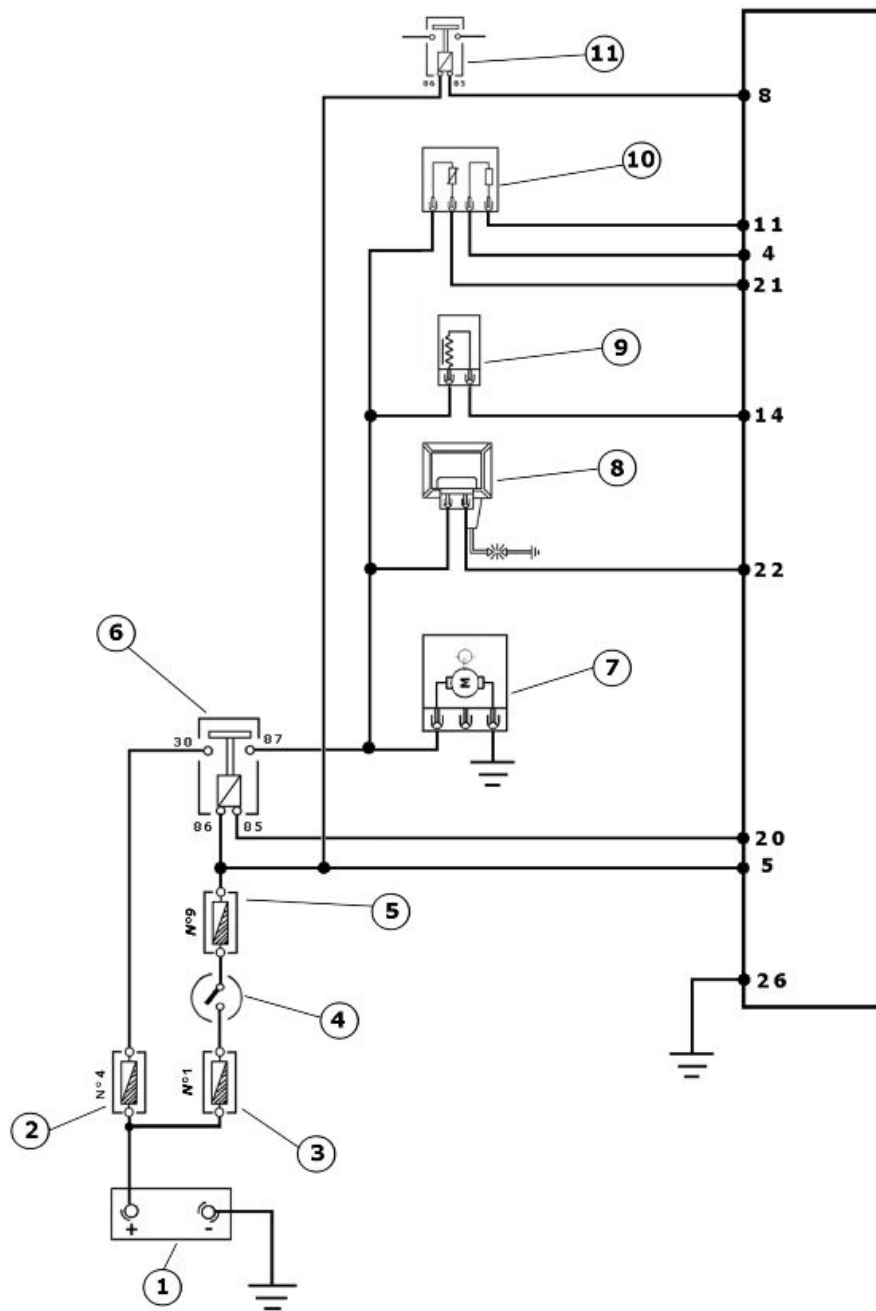
Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter



HT coil



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	10 A
3	Fuse	30 A
4	Key switch contacts	
5	Fuse	7.5 A
6	Injection load remote control	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Lambda sensor	

	Specification	Desc./Quantity
11	Electric fan remote control	

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

The control unit manages two important parameters:

- Ignition advance

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

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

- Magnetisation time

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

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

Specific tooling

020331Y Digital multimeter

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

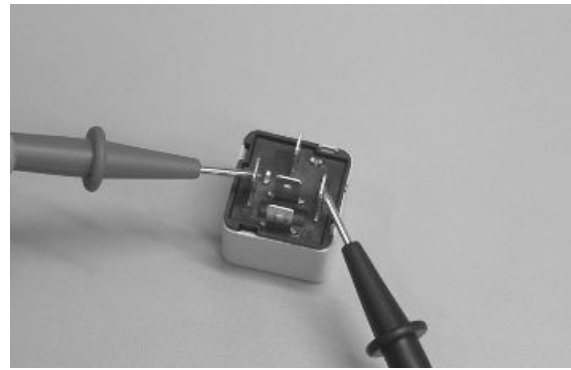
Check the efficiency of 7.5 A fuse No. 9 key-controlled control unit power supply.



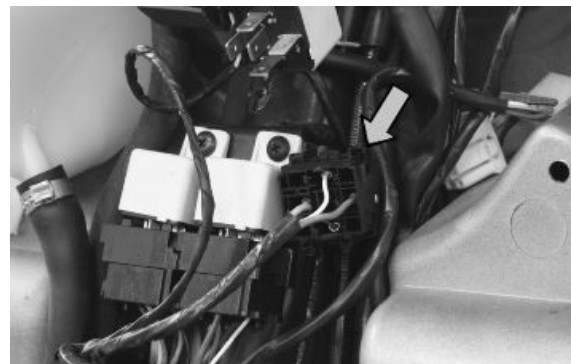
Check the efficiency of the injection load remote control: Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm

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



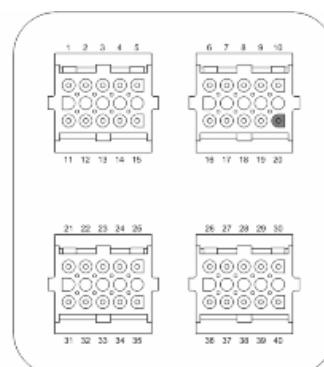


Check the power supply line of the injection load remote control energising coil: after switching to «ON», make sure there is battery voltage, for 2 seconds, between the Red-White cable and the Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-White cable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

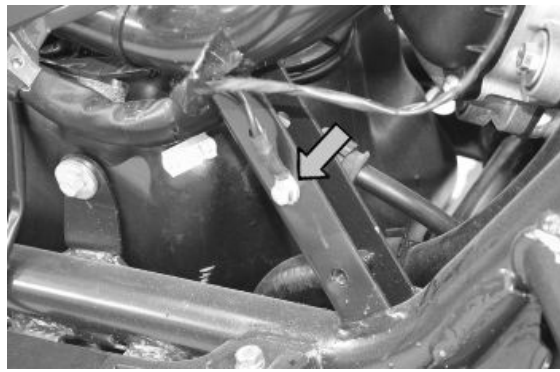


N.B.

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



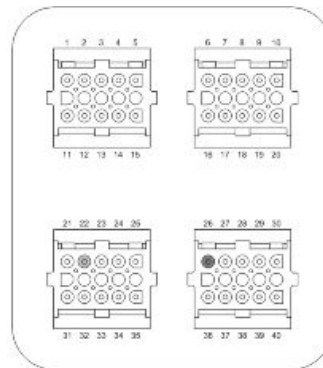
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.



N.B.

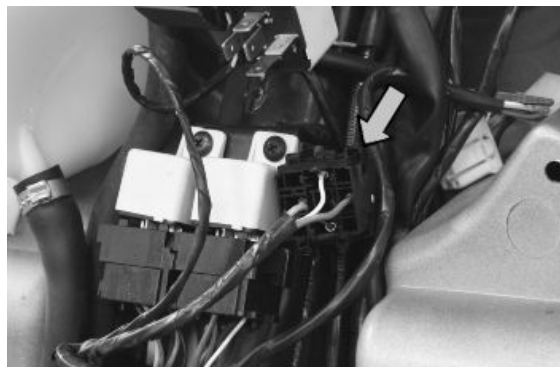
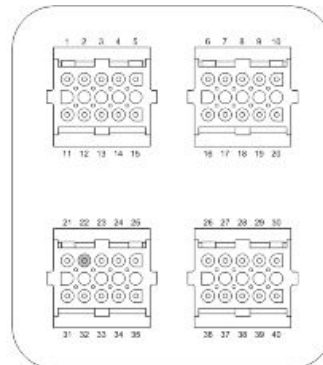
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).

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

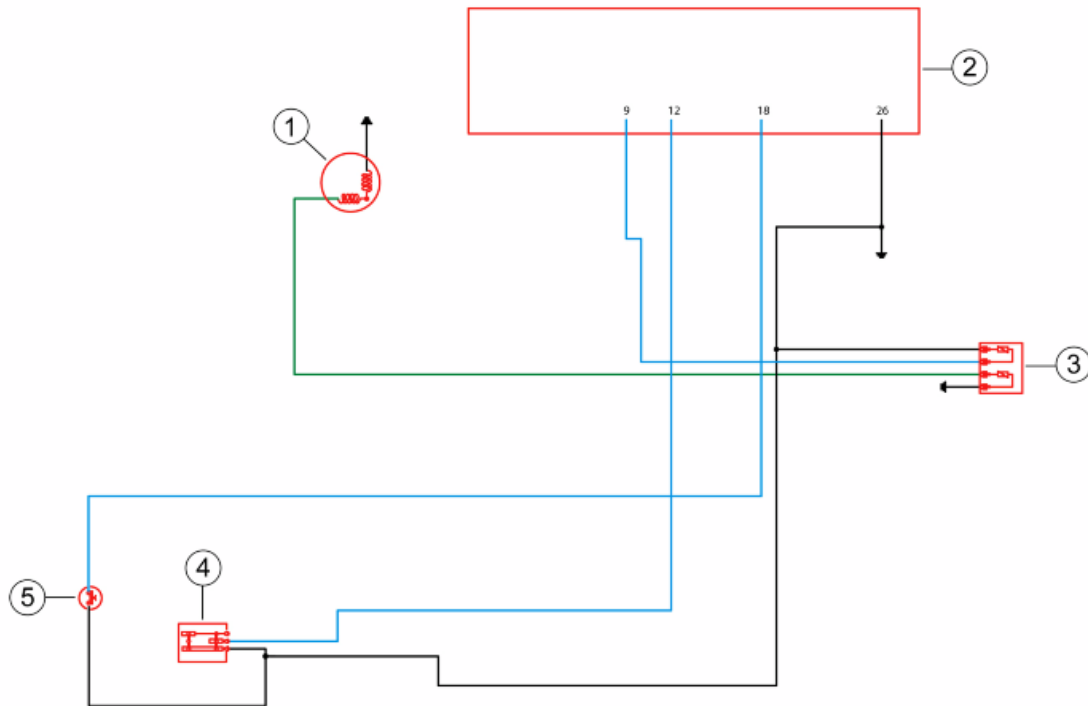


Check the resistance of the primary coil between pin 22 of the interface wiring and the green black cable of the injection load remote control base with the control unit disconnected and the remote control disconnected.

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



Coolant temperature sensor



TEMPERATURE SENSOR

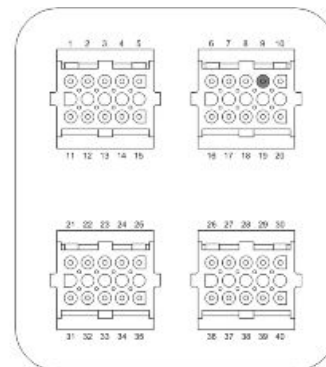
Specification	Desc./Quantity
1	Instrument panel
2	Electronic control unit
3	Water temperature sensor
4	Engine stop switch
5	Side stand switch

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

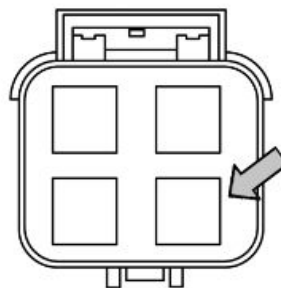
20° = 2500 ± 100 Ω

80° = 308 ± 6 Ω

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



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



Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter

Zeroing the throttle

Resetting the throttle valve position signal (TPS reset)

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

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

Pre-calibration ensures optimal air flow to control idling.

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

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

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

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

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

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

To reset, proceed as follows.

Connect the diagnostic tester.

Switch to «ON».

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

Specific tooling

020460Y Scooter diagnosis and tester



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.



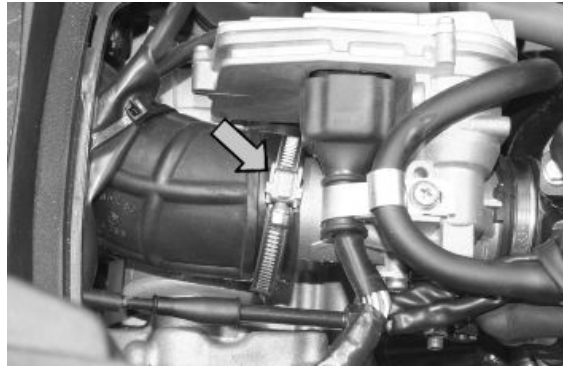
Reset should be performed in the following cases:

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

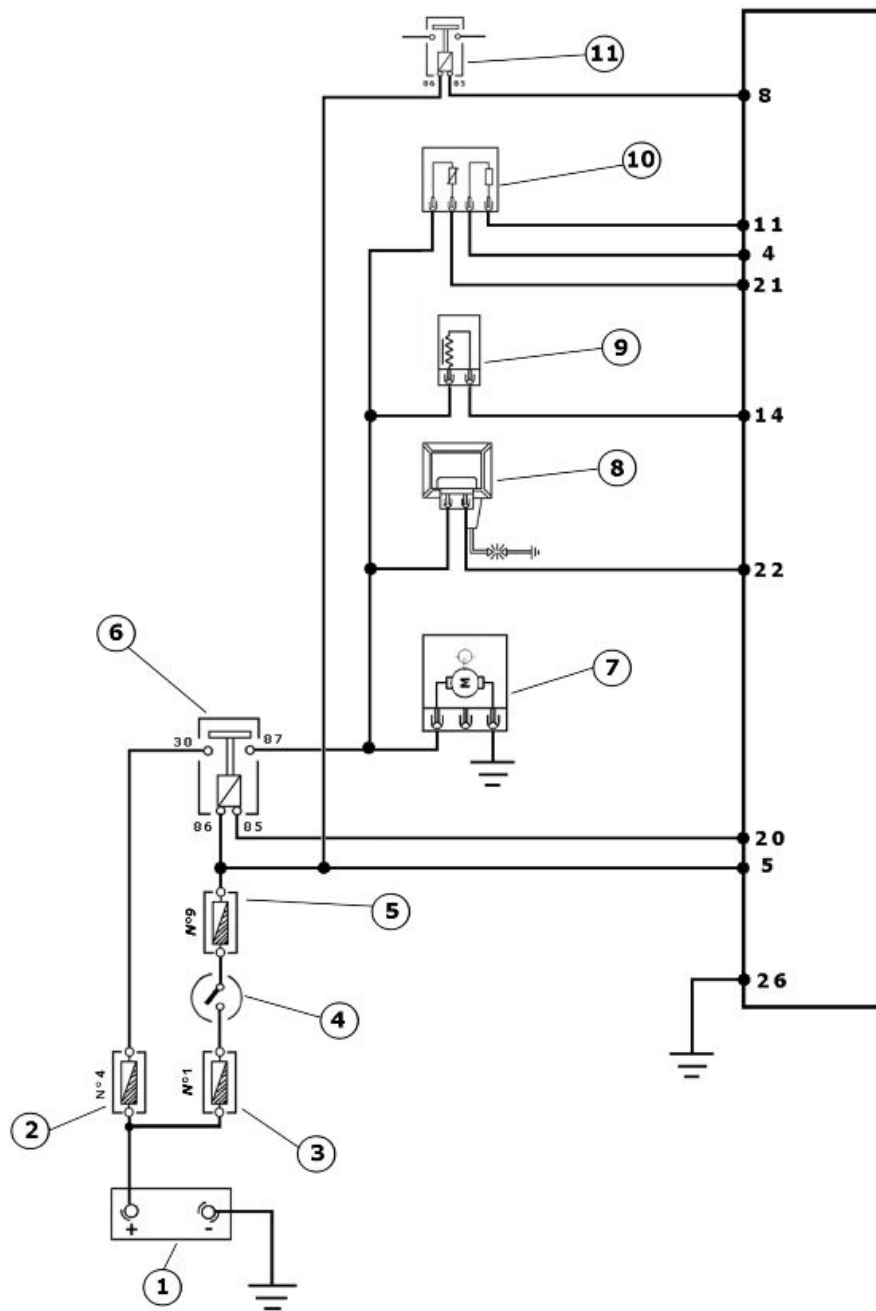
N.B.

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

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



Lambda probe



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	10 A
3	Fuse	30 A
4	Key switch contacts	
5	Fuse	7.5 A
6	Injection load remote control	
7	Fuel pump	
8	HV coil	
9	Fuel injector	
10	Lambda sensor	

	Specification	Desc./Quantity
11	Electric fan remote control	

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

Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter

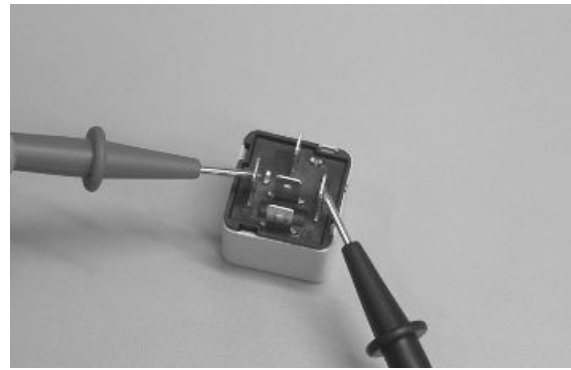
Check the efficiency of 10 A fuse N° 4 injection load .

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

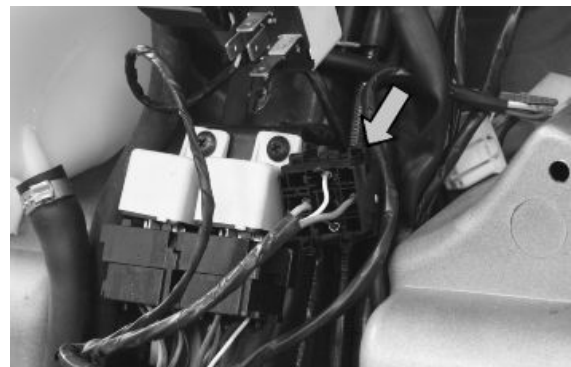


Check the efficiency of the injection load remote control: Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm
Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the remote control.



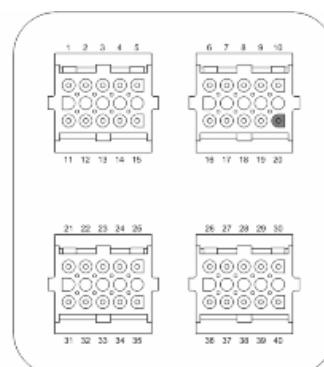


Check the power supply line of the injection load remote control energising coil: after switching to «ON», make sure there is battery voltage, for 2 seconds, between the Red-White cable and the Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-White cable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

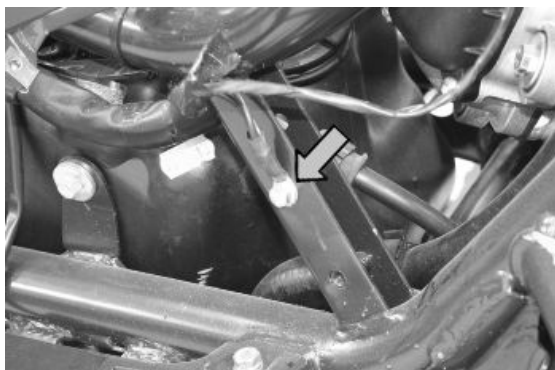


N.B.

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



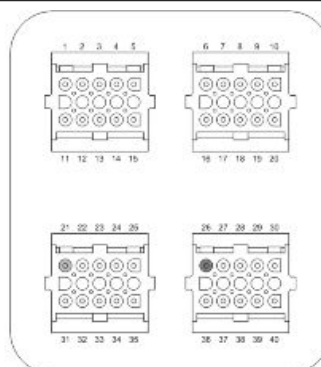
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.



N.B.

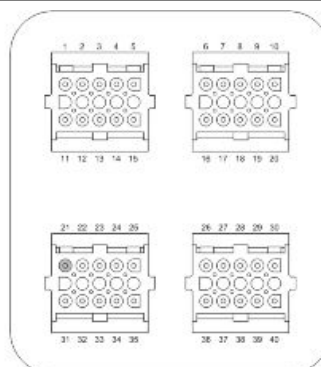
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).

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



With the engine cold, check the resistance of the Lambda sensor heater between pin 21 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.

Resistance of the heater at approximately 20° = 9 Ohm ± 20%



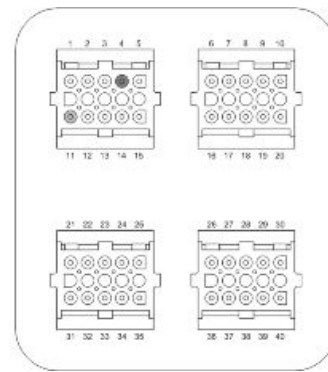
CONTROLLO DEL SEGNALE

Install the electronic control unit interface wiring.

Start the engine and warm up until the electric fan switches on.

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

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

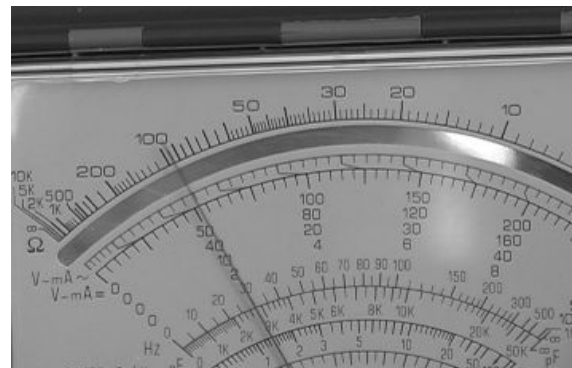


With the engine running at idle speed, check that the voltage oscillates between 0V and 1V

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

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

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



INDEX OF TOPICS

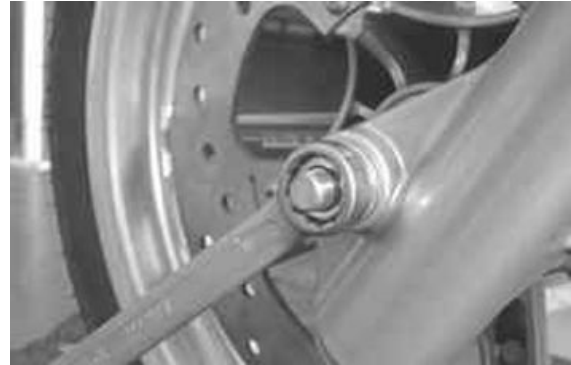
SUSPENSIONS

SUSP

Front

Removing the front wheel

- Remove the front calliper.
- Loosen the wheel axle lock-nut.



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



See also

[Removal](#)

Front wheel hub overhaul

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

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

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



* Either tool can be used.



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



Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020412Y 15 mm guide

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



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



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

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

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



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



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

Specific tooling**020376Y Adaptor handle****020357Y 32 x 35 mm adaptor****020412Y 15 mm guide**

- Refit the cap and tighten the five fixing screws.



Refitting the front wheel

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

N.B.

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



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

Locking torques (N*m)

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



Handlebar

Removal

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



See also

[Rear handlebar cover](#)

Refitting

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



Locking torques (N*m)

Handlebar fixing screw (*) 45 ÷ 50

(*) Lubricate the nuts with engine oil before installation

Front fork

Removal

Overhaul

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

CAUTION

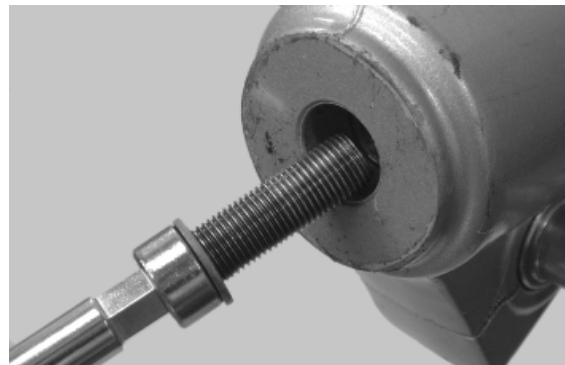
THE STEM CLOSING CAP KEEPS THE MAIN SPRING PRE-LOADED. KEEP THE CAP PROPERLY FITTED DURING THE REMOVAL FINAL STAGE TO AVOID ACCIDENTS.



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



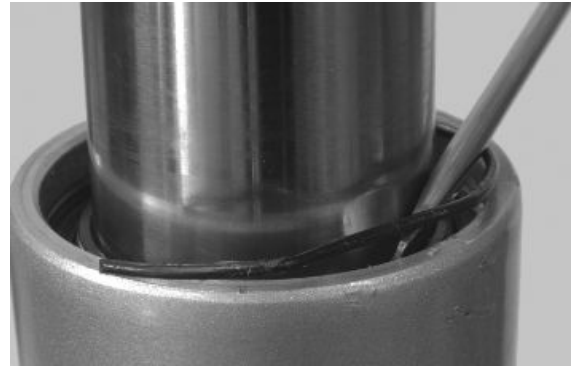
-
- Remove the hydraulic rod fixing screw with the corresponding sealing gasket:
 - With a 19-mm hexagonal spanner, lock hydraulic rod rotation.
 - Undo the fixing screw and collect the copper washer.



-
- Remove the stem dust guard with a screwdriver.



-
- Remove the circlip retaining the oil seal.



-
- Take out the stem.



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

Characteristic**Maximum leg diameter**

35.10 mm

Minimum stem diameter

34.90 mm

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

Specific tooling

020487Y Fork oil seal extractor



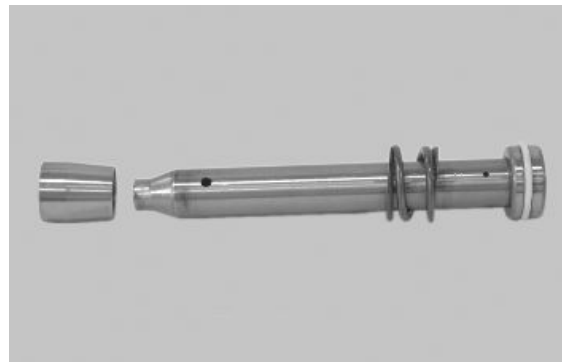
- Hold the tie rod manually so that it does not fall into the fork leg and/or that both half-rings are not in their position.
- Fit the bell.
- Tighten the nut until it stops.
- Act on the tool until the oil seal is completely removed.

Specific tooling

020487Y Fork oil seal extractor



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

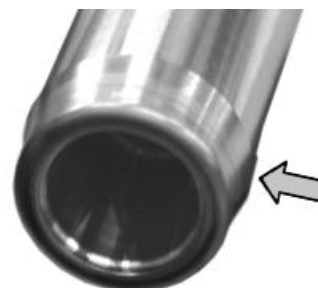


COMPONENT CHECK

CAUTION

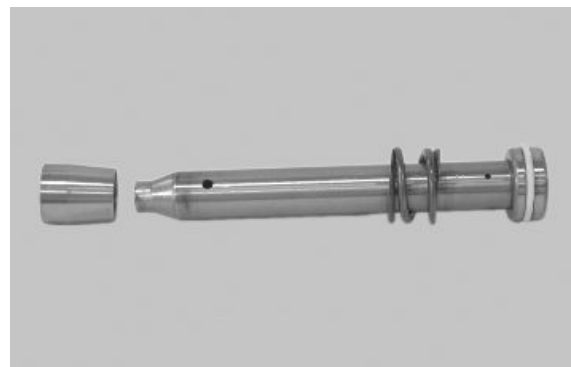
CLEAN ALL THE COMPONENTS THOROUGHLY.

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





- Check that hydraulic rod 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.



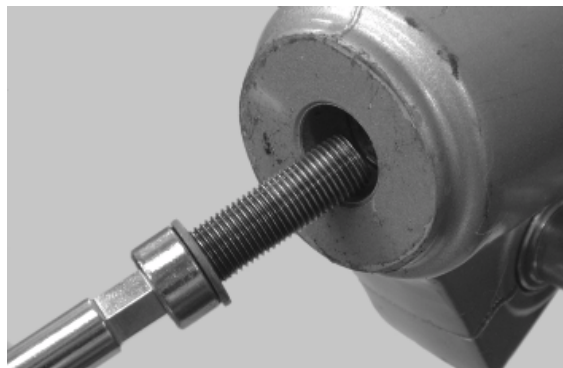
- Fit the hydraulic rod fixing screw with the copper sealing washer and tighten to the prescribed torque using the recommended product.

CAUTION

ALWAYS USE NEW COPPER WASHER.

Locking torques (N*m)

Hydraulic rod fixing screw 25 ÷ 35*

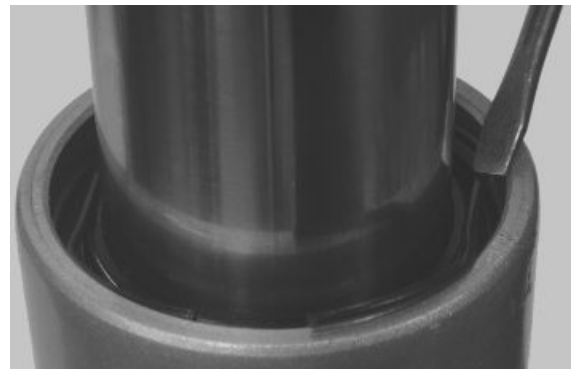


(°) Apply LOCTITE 243 threadlock

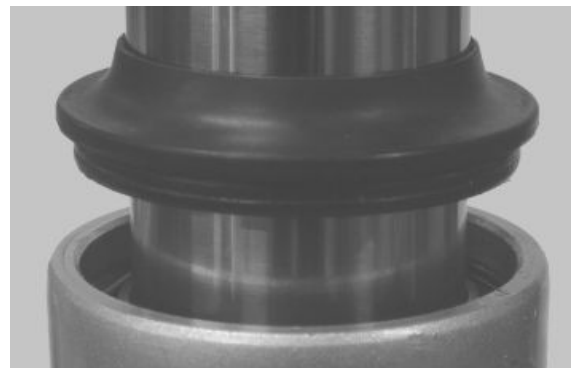
- Lock hydraulic rod rotation using a 19-mm hexagonal spanner.



- 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 photograph.



Locking torques (N*m)

Stem support clamp tightening screws 20 ÷ 25

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

Recommended products

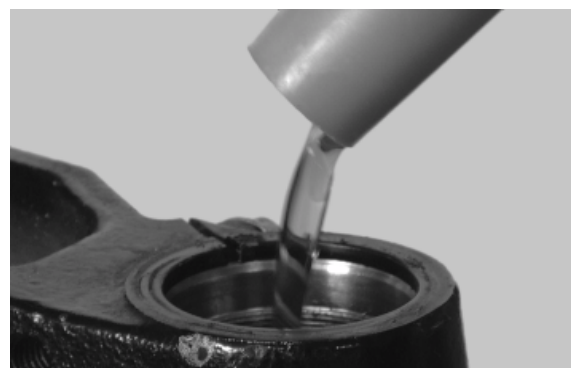
AGIP FORK 7.5 W Oil for front fork

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**

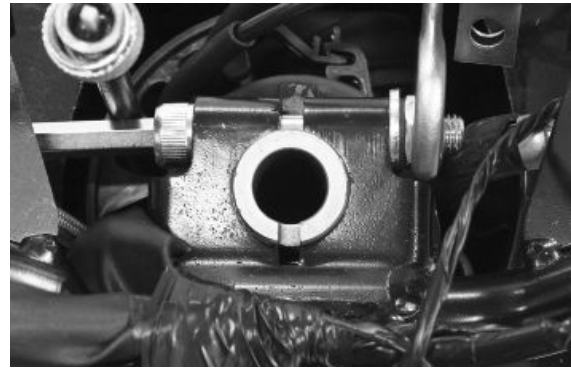
- Repeat the procedure for the other fork leg.

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.**

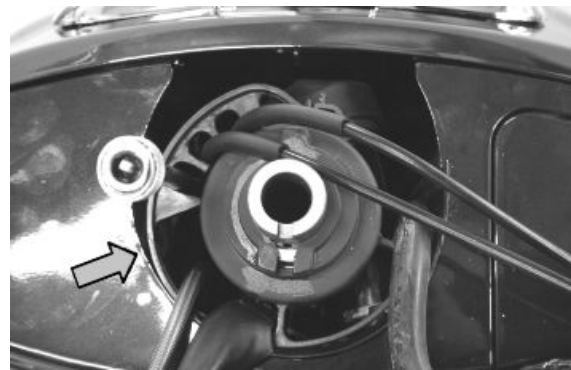
Steering column

Removal

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



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



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

- Extract the fork.

N.B.

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

Specific tooling

020055Y Wrench for steering tube ring nut



Refitting

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

N.B.

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

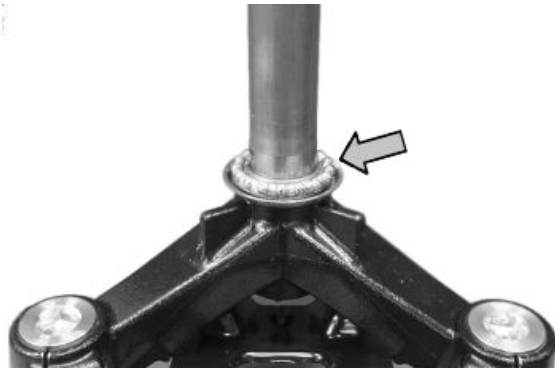
Recommended products

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



ing surface of driven pulley spring (only pulley side)

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



- Fit the upper steering fifth wheel.

CAUTION

INSERT THE UPPER FIFTH WHEEL WITH THE CAGE FACING UPWARDS.



- Fit the steering fifth wheel upper seat.



- Fit the cover plate.



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

Specific tooling

020055Y Wrench for steering tube ring nut

Locking torques (N*m)

Steering tube lower ring nut 14 ÷ 17



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



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

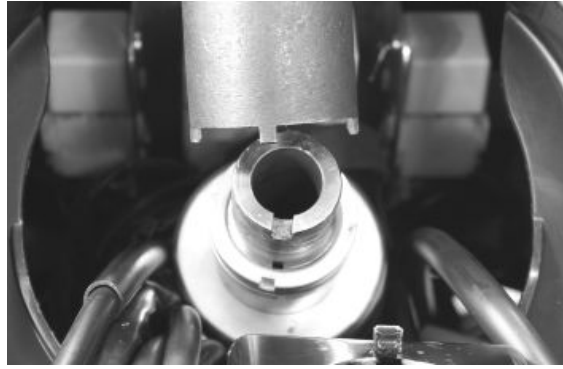
Specific tooling

020055Y Wrench for steering tube ring nut

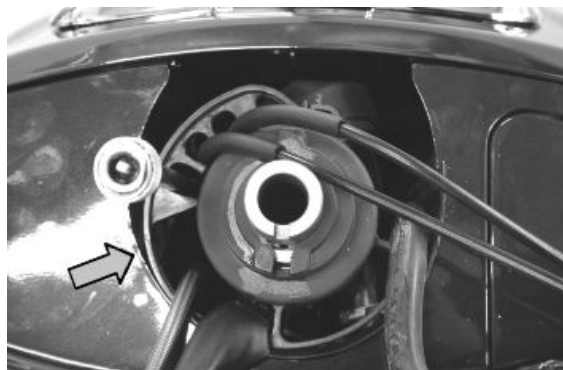
Locking torques (N*m)

Steering tube upper ring nut 40 ÷ 45





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



- Fit the front wheel.

Steering bearing

Removal

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



- Check the lower steering fifth wheel for wear.



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

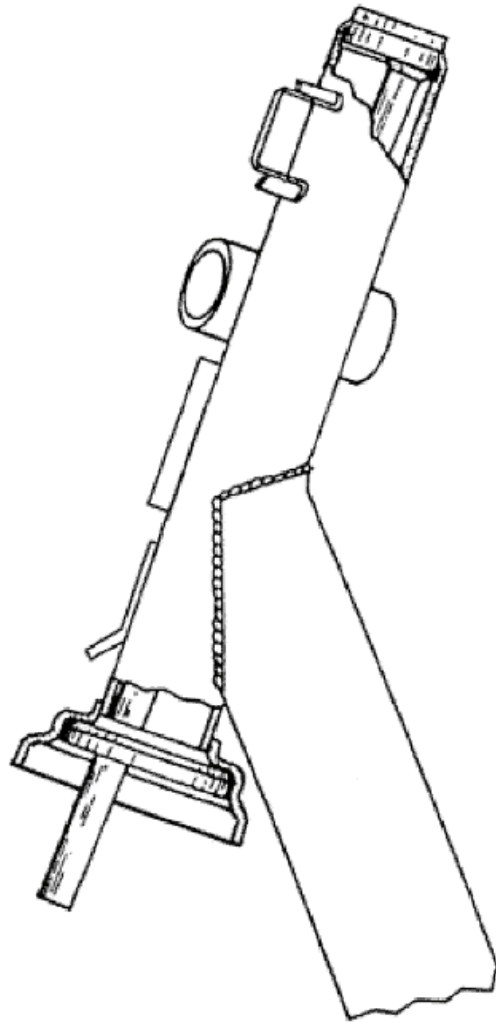
STEERING FIFTH WHEEL TRACK REMOVAL

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



Specific tooling

020004Y Punch for removing fifth wheels from headstock



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

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

Specific tooling

020004Y Punch for removing fifth wheels from headstock



Refitting

STEERING FIFTH WHEEL TRACK FITTING

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

N.B.

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

Specific tooling

001330Y Tool for fitting steering seats

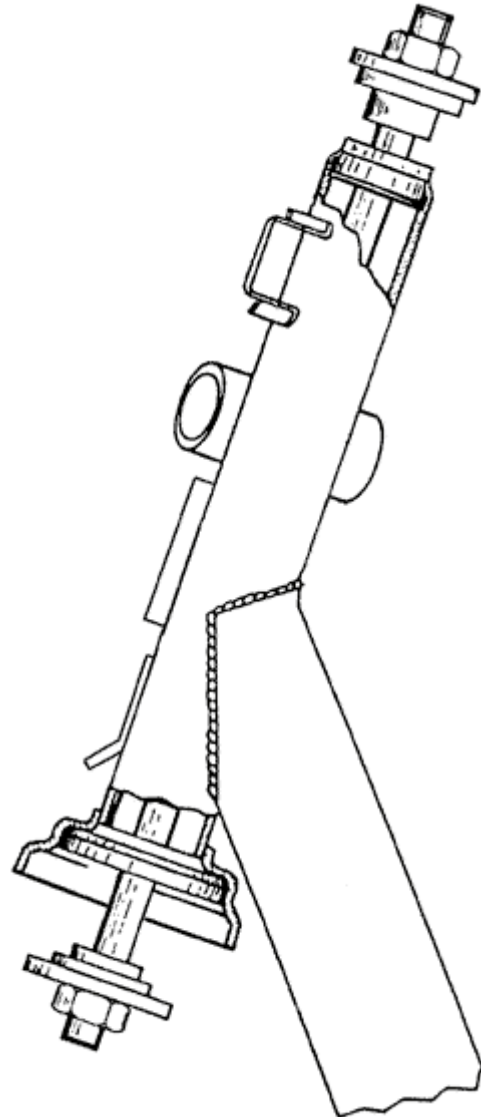
001330Y014 Tool for fitting steering seats

001330Y015 Tool for fitting steering seats

Recommended products

AGIP GREASE PV2 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 support bracket
- Remove the 5 screws shown in the photograph



Refitting the rear wheel

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

Locking torques (N*m)

Fixing screw for wheel rim to hub 34 ÷ 38

Swing-arm

Removal

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



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

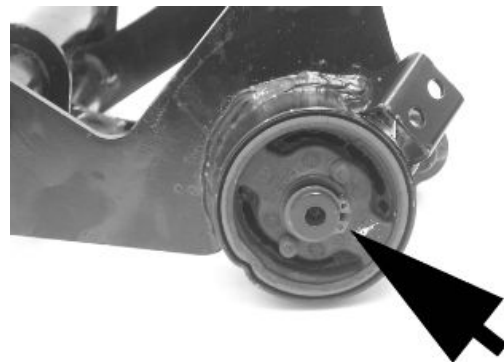


- Loosen the nut on the inside of the frame from the left-hand side (see figure) and remove the relevant spindle;
- Remove the swinging arm.

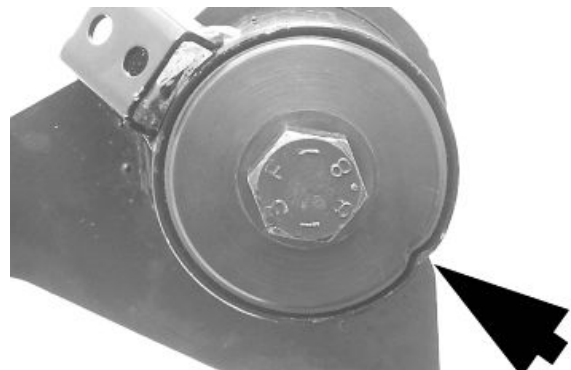


Overhaul

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



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

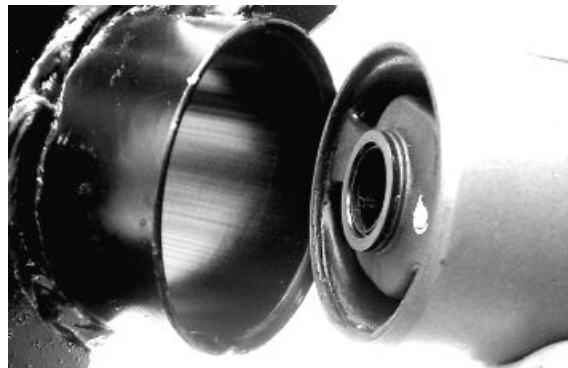


Specific tooling

020271Y Tool for removing-fitting silent bloc



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



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

Specific tooling

020271Y Tool for removing-fitting silent bloc



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

Characteristic

Allowable limit after use:

1 mm

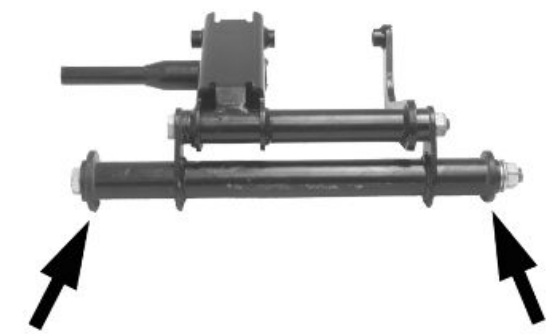
standard clearance

0.40 ÷ 0.70 mm



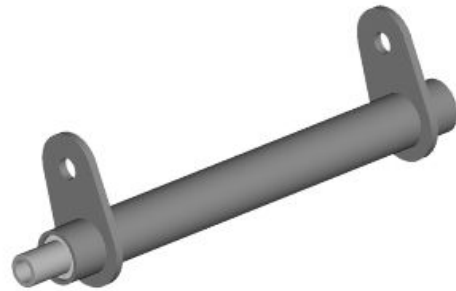
- In order to check the clearance of the swinging arm on the frame side, prepare a retainer using the fixing pin of the swinging arm on the frame and two rings from the special tool 020229Y.

Alternatively, use two washers with inside diameter of 12 mm for pins, outside diameter min. 30 mm and thickness min. 4 mm.



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

- Remove the internal spacer shown in the photograph



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



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

Specific tooling

020115Y Ø 18 punch

020244Y 15 mm diameter punch



SWINGING ARM SERVICE

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

- Lubricate the roller bearing housings with grease
- Insert the spacers
- Assemble the two arms with the relative bolt in the position shown in the photograph
- Adjust the bolt as shown in the photograph
- Position the frame side swinging arm with the most protruding part pointing towards the silent block side as shown in the photograph



Recommended products

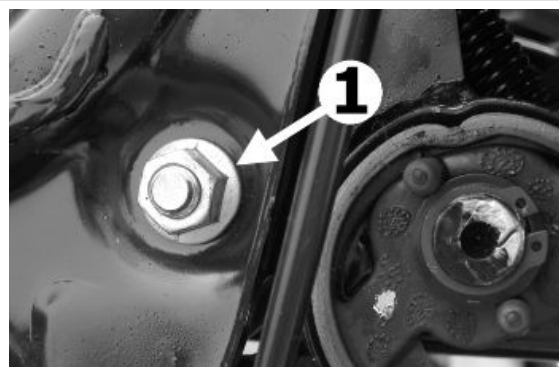
AGIP GREASE PV2 Grease for control levers on the engine

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

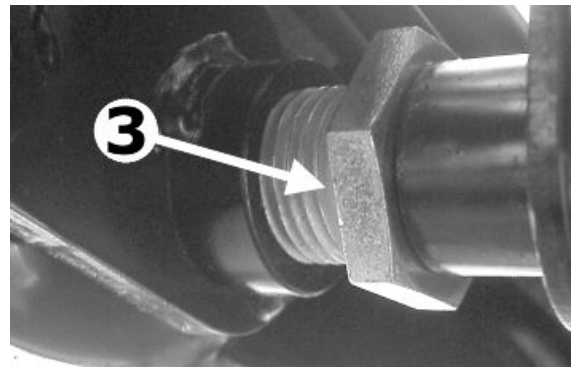
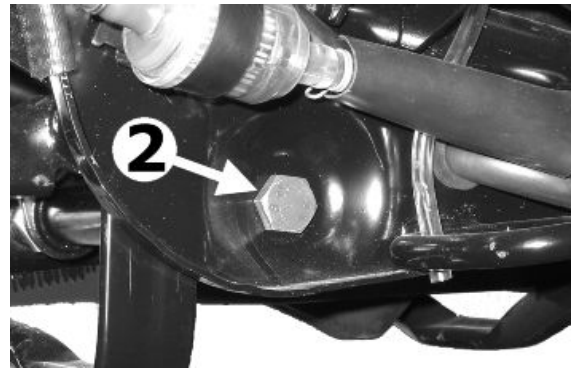
Refitting

For correct installation of the swinging arm on the scooter, proceed as follows:

1. Position the silent block supporting clamp with part 3 inserted, and slightly tighten part 1
2. Position the swinging arm, inserting part 2
3. Tighten part 3 to the prescribed torque
4. Screw on and tighten part 4 to the prescribed torque



- 5. Screw on and tighten part 5 to the prescribed torque
 - 6. Tighten part 1 to the prescribed torque
- Insert the swinging arm - engine bolt and tighten to the prescribed torque



SWINGING ARM FITTING

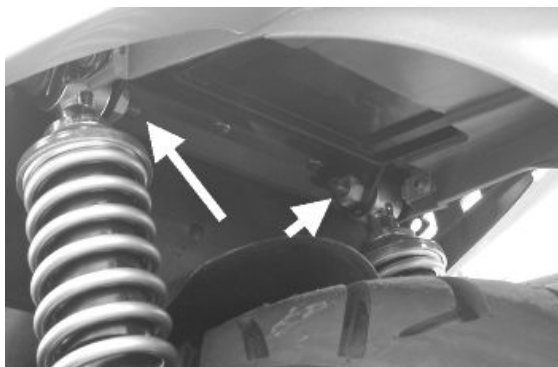
Name	Torque in Nm
Part 1	64 ÷ 72 Nm
Part 3	5 - 7 Nm
Part 4	90 ÷ 110 Nm
Part 5	64 ÷ 72 Nm
Engine-swinging arm bolt	64 - 72

Shock absorbers

Removal

Proceed as follows:

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



See also

[Exhaust assy. Removal](#)

Refitting

Carry out the previous operations but in reverse order.

Locking torques (N*m)

Lower shock absorber clamp 33 ÷ 41 Upper shock absorber clamp 33 ÷ 41

Exhaust bracket

Removal

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



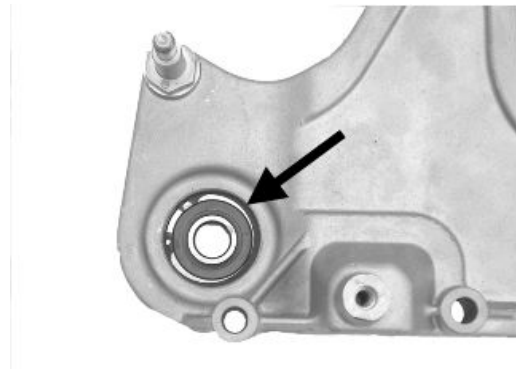
Remove the full muffler assembly.

See also

[Exhaust assy. Removal](#)
[Exhaust assy. Removal](#)

Overhaul

- Remove the circlip shown in the photograph

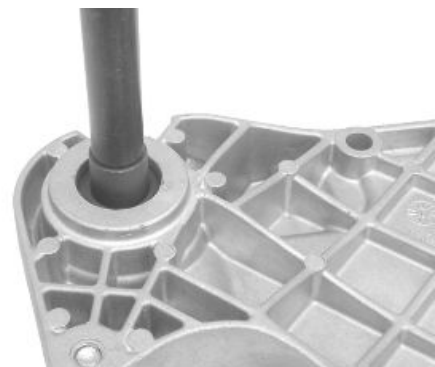


- Support the muffler support bracket sufficiently
- Using the special punch, remove the bearing from its seat as shown in the photograph

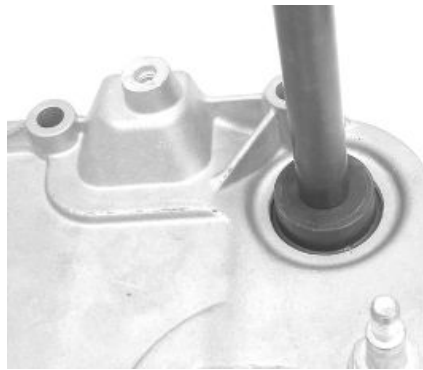
Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor



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

Specific tooling**020376Y Adaptor handle****020151Y Air heater****Refitting**

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

Locking torques (N*m)

Rear wheel axle nut 104 ÷ 126 Muffler support arm to engine screws (*) 20 ÷ 25 Lower shock absorber clamp 33 ÷ 41

Centre-stand

- Remove the two return springs from the centre stand.
- Undo the nut shown in the figure.
- Remove the bolt from the right side.
- Remove the centre stand.
- On refitting tighten the nut to the specified torque.

**Locking torques (N*m)****Centre stand bolt 32 ÷ 40****Side stand****Removal of the side stand**

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

Fitting

Carry out the previous operations but in reverse order.

Locking torques (N*m)**Side stand fixing bolt 40 ÷ 45**

INDEX OF TOPICS

BRAKING SYSTEM

BRAK SYS

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

Interventions rules

WARNING

BRAKING SYSTEM FLUID IS CORROSIVE: ALWAYS WEAR PROTECTIVE GLOVES. IN THE EVENT OF ACCIDENTAL CONTACT WITH YOUR EYES, RINSE THE CONTACT AREA WELL WITH ABUNDANT WATER.

THE BRAKE FLUID DRAINED FROM THE SYSTEM IS HARMFUL TO THE ENVIRONMENT. COLLECTION AND DISPOSAL MUST BE CARRIED OUT IN COMPLIANCE WITH THE REGULATIONS IN FORCE. UNDER NORMAL DRIVING AND CLIMATIC CONDITIONS YOU SHOULD CHANGE THE FLUID EVERY TWO YEARS. IF BRAKES ARE USED INTENSELY AND/OR IN HARSH CONDITIONS, CHANGE THE FLUID MORE FREQUENTLY.

DURING INSTALLATION, THE PARTS TO BE REUSED MUST BE ABSOLUTELY CLEAN AND FREE FROM ANY TRACES OF OIL, FUEL AND GREASE: IT IS THEREFORE NECESSARY TO CLEAN THEM THOROUGH WITH DENATURED ALCOHOL.

N.B.

FOR TOPPING UP AND CHANGE, USE ONLY BRAKE FLUID DOT4 - NHTSA 116.

OBSERVE THE MAXIMUM DEGREE OF CLEANLINESS. HYDRAULIC FLUID IS EXTREMELY CORROSIVE FOR PAINTED SURFACES.

BRAKE FLUID IS HYGROSCOPIC; THAT IS, IT ABSORBS MOISTURE FROM THE SURROUNDING AIR.

IF THE MOISTURE CONTENT IN THE BRAKE FLUID EXCEEDS A CERTAIN VALUE, IT WILL RESULT IN POOR BRAKING EFFICIENCY DUE TO A LOW BOILING POINT OF THE FLUID.

N.B.

ALWAYS USE FLUID FROM SEALED CONTAINERS.

N.B.

RUBBER PARTS SHOULD NEVER BE LEFT IN ALCOHOL LONGER THAN 20 SECONDS. AFTER WASHING, THE PIECES MUST BE DRIED WITH A BLAST OF COMPRESSED AIR AND A CLEAN CLOTH.

THE SEAL RINGS MUST BE IMMERSSED IN THE OPERATING FLUID; THE USE OF PRF1 PROTECTIVE DEVICE IS ALLOWED.

WARNING

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

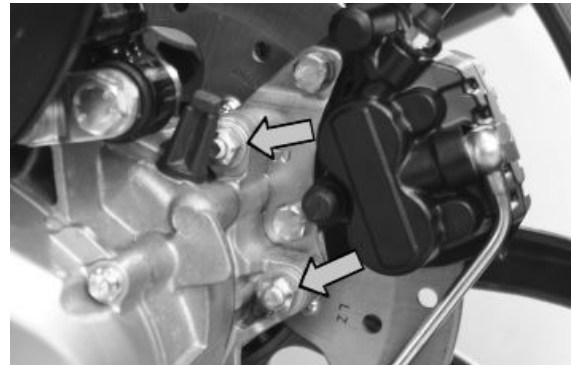
Rear brake calliper

Removal

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

N.B.

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



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

Loctite 243 medium-strength threadlock

Locking torques (N*m)

Screw tightening calliper to the 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 ÷ 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 photograph.

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 the support 20 ÷ 25

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 tube-calliper fitting 20 ÷ 25

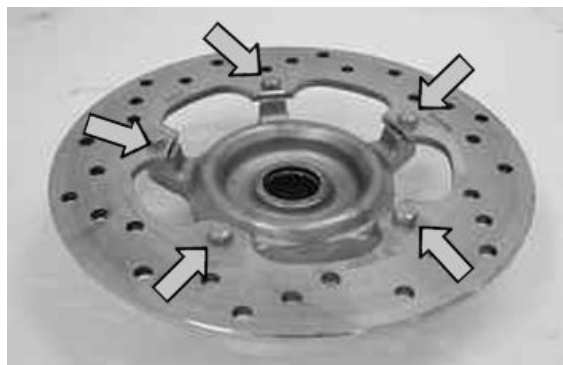
See also

[Front](#)

Rear brake disc

Removal

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



See also

[Removing the rear wheel](#)

Refitting

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

N.B.

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

Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

Locking torques (N*m)

Brake disc fixing screws 11 ÷ 13

Disc Inspection

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



Characteristic

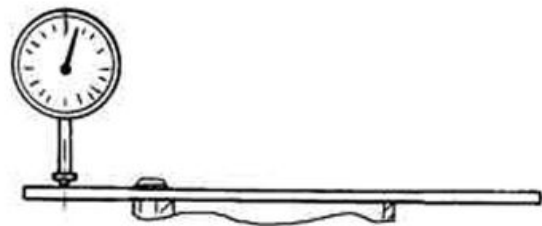
New rear disc thickness

4.0 mm

Disc thickness at wear limit (rear)

3.5 mm

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



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

Characteristic

Max. axial run-out

0.1 mm

Front brake disc

Removal

Proceed as follows:

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



See also

[Removing the front wheel](#)

Refitting

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

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

N.B.

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

Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

Locking torques (N*m)

Brake disc fixing screw 5 ÷ 6.5

Disc Inspection

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

Characteristic

Thickness of a new front disc

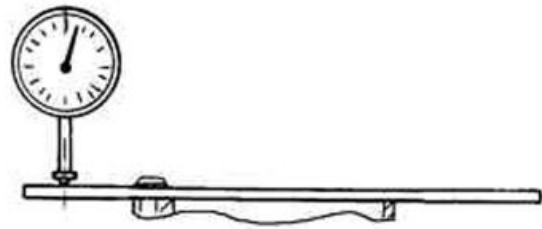
4.0 mm

Disc thickness at wear limit (front)

3.5 mm



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



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

Characteristic

Max. axial run-out

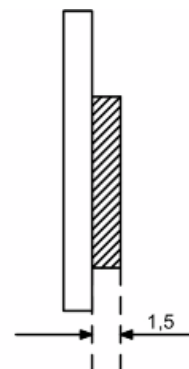
0.1 mm

Front brake pads

Removal

Proceed as follows:

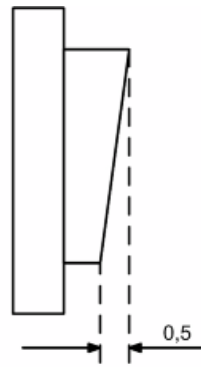
- Remove the front calliper.
- Loosen the two pins shown in the figure that lock the two pads.
- Remove the pads, being careful with the pad spring clamp.
- Check the thickness of the friction material of the pads.
- Replace the pads if the thickness is below the minimum value.
- The replacement must 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

Loctite 243 medium-strength threadlock

Locking torques (N*m)

Pad fastening pin 19.6 ÷ 24.5

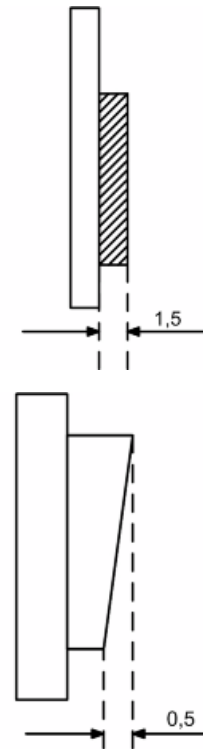
Rear brake pads

Removal

- Remove the rear brake calliper
- Loosen the two pins shown in the figure that lock the two pads; be careful with the pad spring clamp.
- Remove the brake pad and check there are no faults or warping. Replace it if such anomalies are present.
- Check the thickness of the friction material is more than 1.5 mm. If it is not, replace it



- The replacement must be made with greater residual thickness if the pad has not worn evenly. A 0.5 mm thickness difference in the residual friction material is permitted.



See also

[Removal](#)

Refitting

To fit, proceed as follows:

- Insert the two pads in the callipers.
- Screw the two pad lock pins to the correct torque, and apply the recommended product.
- Fit the calliper on its support, tightening the two screws to the prescribed torque.

N.B.

IF IT IS NOT POSSIBLE TO CORRECTLY POSITION THE CALLIPER ON THE DISC DURING FITTING, GENTLY EXPAND THE PADS.



Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

Locking torques (N*m)

Screw tightening calliper to the support 24 ÷ 27

Pad fastening pin 19.6 ÷ 24.5

Fill

Rear - combined

- Remove the rubber hood 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 COMPLY WITH THIS NORM WILL ENDANGER THE PROPER WORKING AND EFFICIENCY OF THE BRAKING SYSTEM

Specific tooling

020329Y MityVac vacuum-operated pump

Locking torques (N*m)

System bleed calliper fitting: 12 ÷ 16 Nm

Front

- Remove the rubber hood 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 COMPLY WITH THIS NORM WILL ENDANGER THE PROPER WORKING AND EFFICIENCY OF THE BRAKING SYSTEM

Specific tooling

020329Y MityVac 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 handlebars. 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 pads.



Front brake pump

Removal

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



Refitting

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

N.B.

WHILE REFITTING, REPLACE THE COPPER GASKETS ON THEIR FITTINGS.

WARNING

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

CAUTION

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

Locking torques (N*m)

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

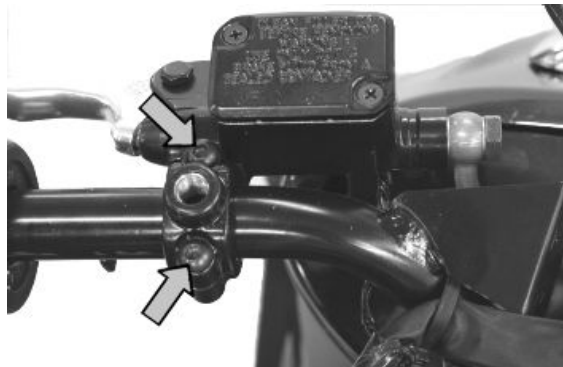
See also

[Front](#)

Rear brake pump - combined

Removal

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

**Refitting**

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

N.B.

WHILE REFITTING, REPLACE THE COPPER GASKETS ON THEIR FITTINGS.

WARNING

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

CAUTION

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

Locking torques (N*m)

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

See also

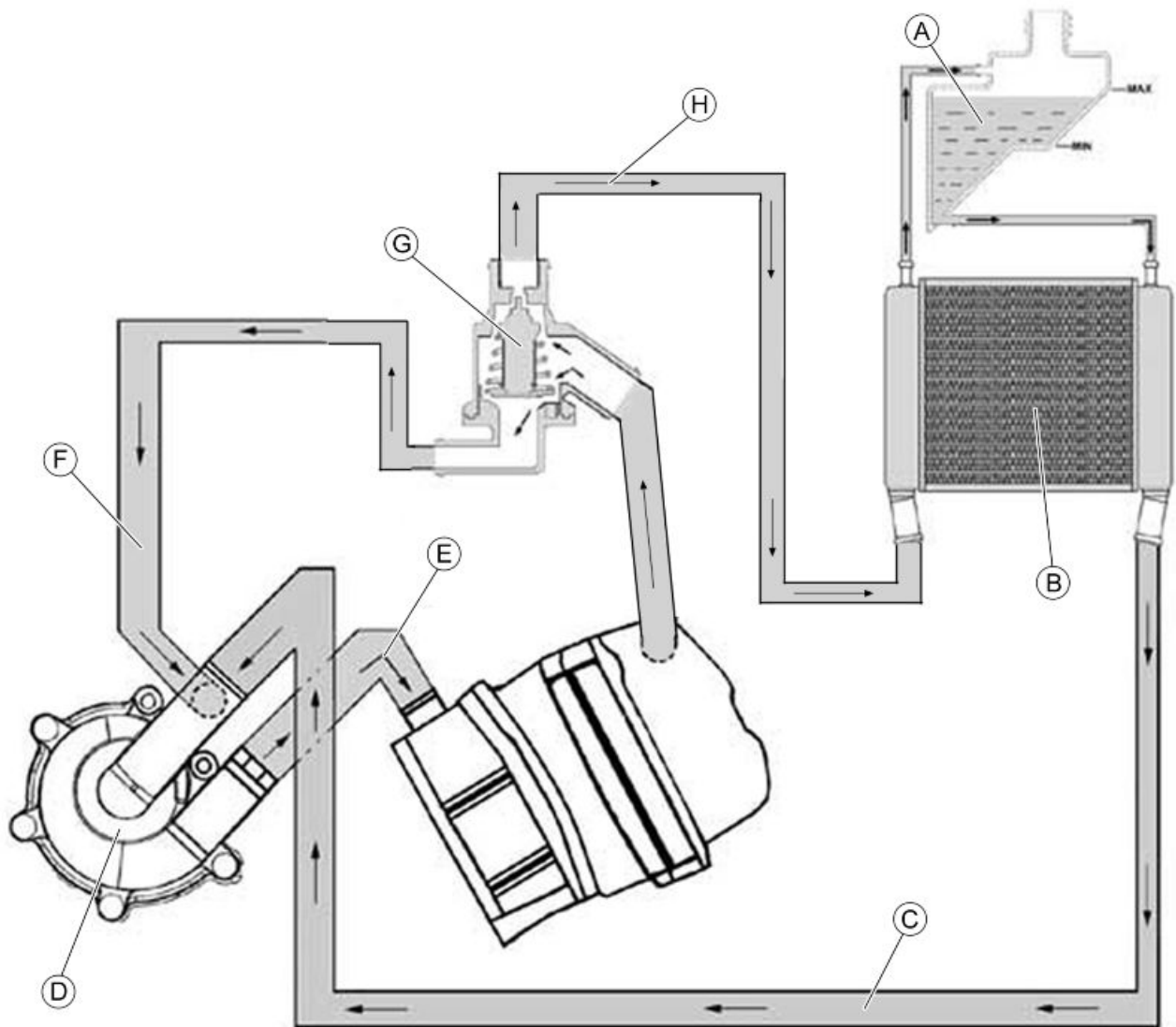
[Rear - combined](#)

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

Electric fan check

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

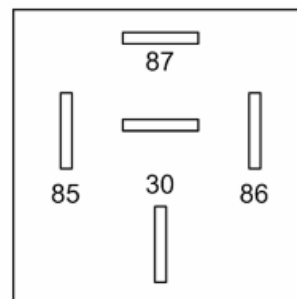
Characteristic**Battery voltage**

12V

- Check that the electric ventilation relay is working properly.



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



- For checking 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 photo
- 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



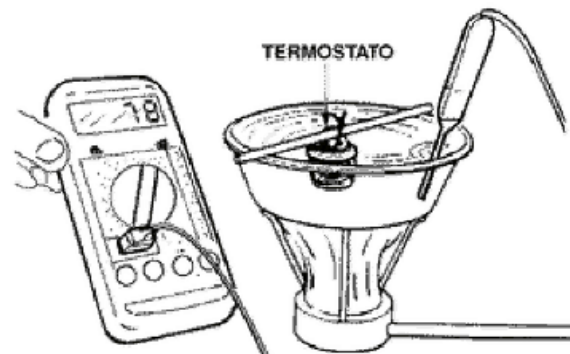
Removal

- Loosen the two screws indicated in the figure and remove the thermostat cover.
- Remove the thermostat with its gasket.



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 \div 1.5°C

Refitting

- Place the thermostat with the bleeding hole at the highest point.
- Make sure that the rubber gasket is positioned properly.
- Fit the thermostat cover with the connection for the carburettor heating pipe facing the flywheel.
- Tighten the two screws to the torque indicated below.

**Locking torques (N*m)****Thermostat cover screws 3 \div 4**

INDEX OF TOPICS

CHASSIS

CHAS

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

Seat

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



Side fairings

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



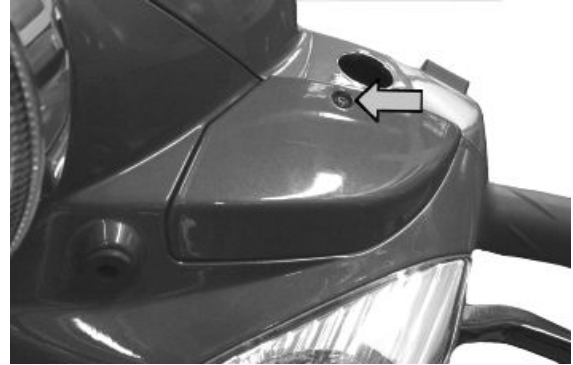
Rear rack

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



Rear handlebar cover

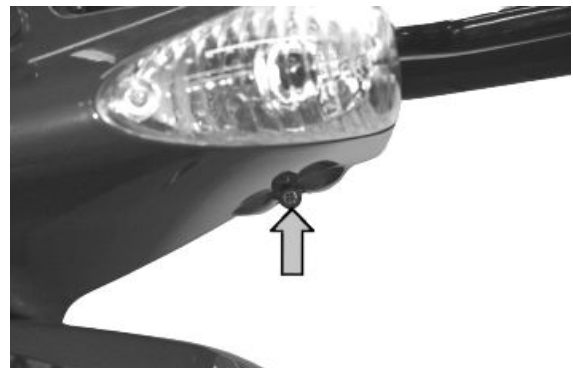
- Remove the windshield.
- Remove the rear-view mirrors.
- On both sides of the handlebar undo the screw indicated and remove the brake pump compartment inspection cover.



-
- Undo the screw indicated.



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

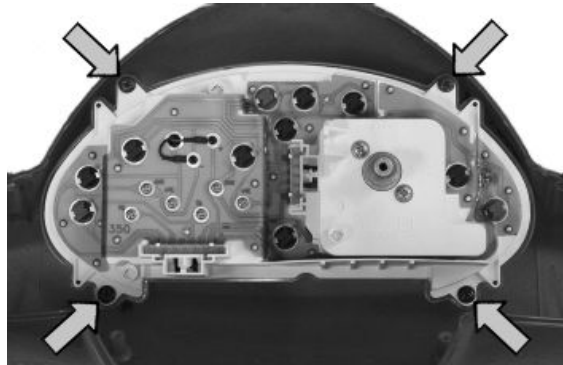


-
- Undo the two screws fixing it to the frame.
 - Remove the rear handlebar cover after disconnecting the electrical connectors and the odometer cable.



Instrument panel

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



See also

[Rear handlebar cover](#)

Front handlebar cover

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



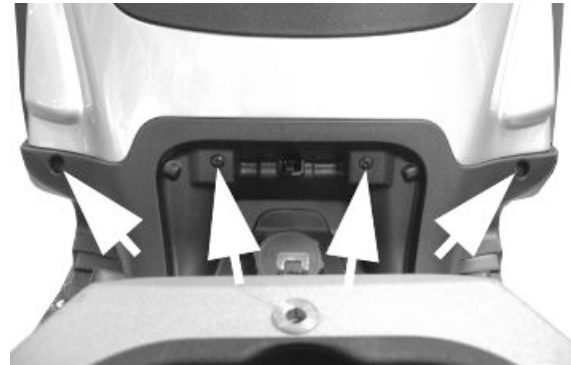
- During the fitting stage, make sure that the retainer clamp indicated is placed correctly.



Headlight assy.

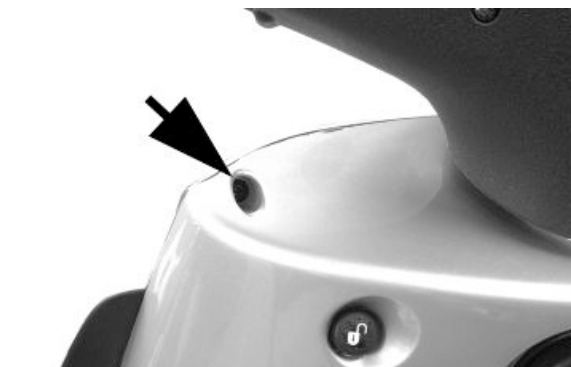
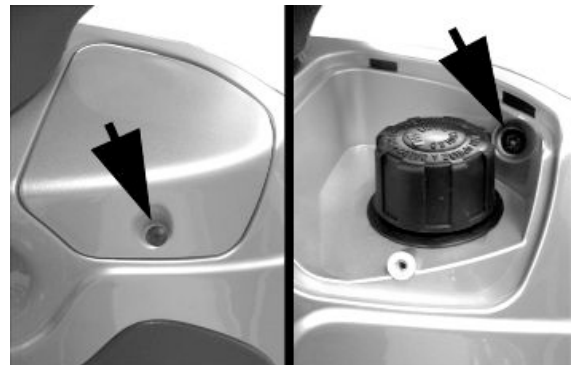
Frame central cover

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



Legshield

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



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



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

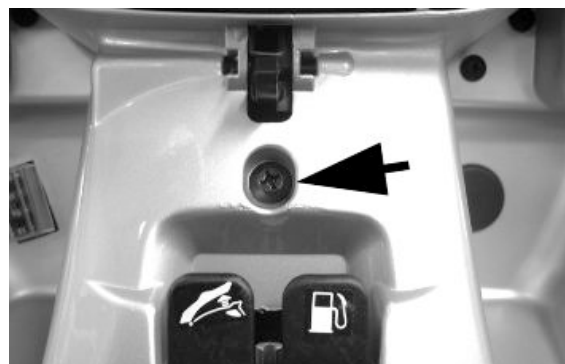


See also

Headlight assy.
[Frame central cover](#)

Knee-guard

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



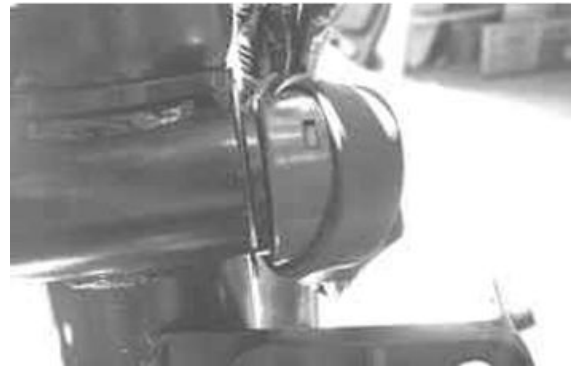
**See also**[Legshield](#)

Removing the ignition key-switch when on *off*

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



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



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

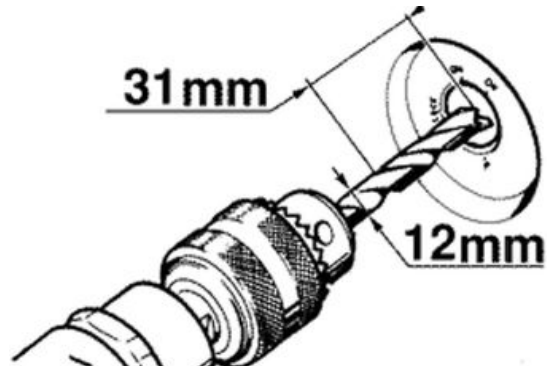
**See also**

[Knee-guard](#)**Removing the ignition key-switch when on *lock***

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

N.B.

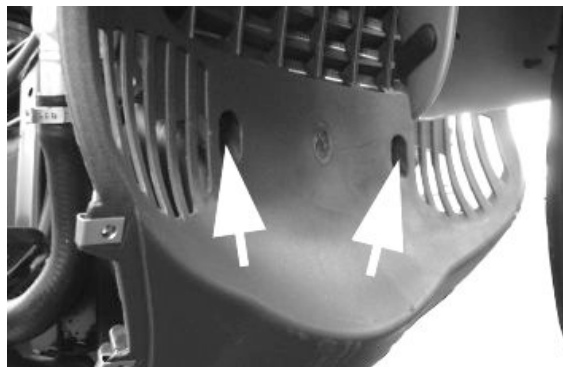
TO REFIT THIS ITEM, THE SCOOTER STEERING LOCK MUST BE RELEASED WITH THE LOCK BODY (INTERNAL AND EXTERNAL PART) IN POSITION "OFF". PROCEED AS DESCRIBED IN THE PREVIOUS PARAGRAPH.

**See also**

[Removing the ignition key-switch when on *off*](#)

Front wheel housing

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

**See also**

[Footrest](#)

[Removing the front wheel](#)

[Knee-guard](#)

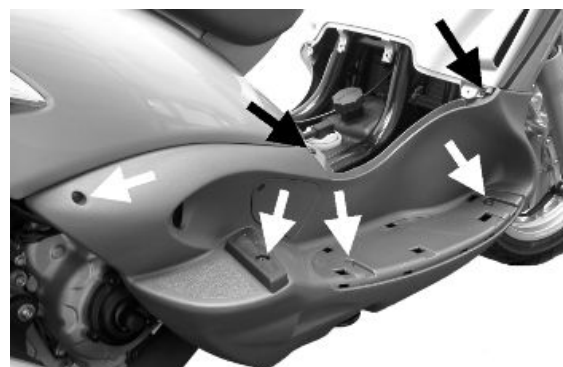
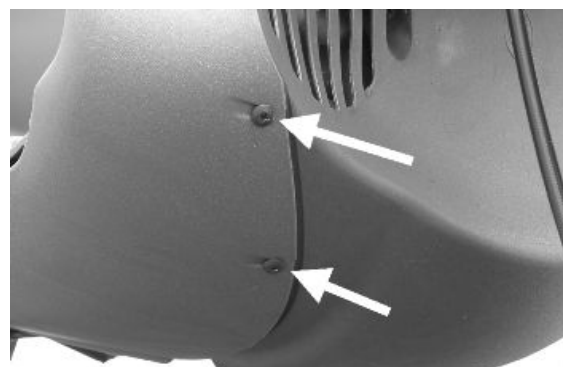
Taillight assy.

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



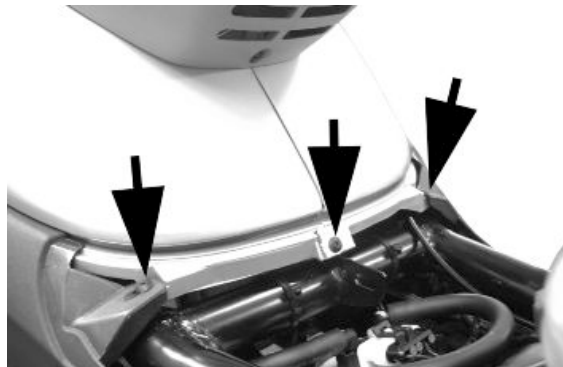
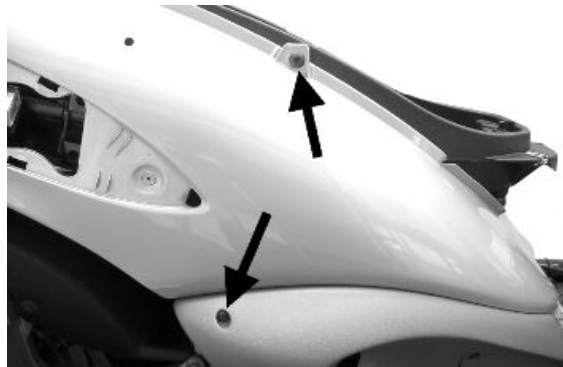
**See also**[Rear rack](#)[Side fairings](#)**Footrest**

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

**See also**

[Frame central cover](#)**Side fairings**

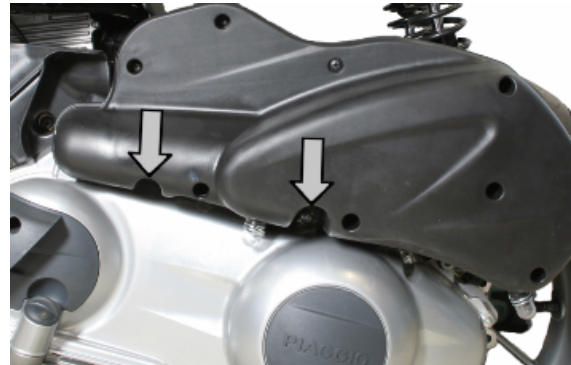
- Remove the saddle.
- Remove the luggage rack.
- Remove the central cover.
- Remove the rear light assembly.
- Remove the cover under the saddle by loosening the retaining screw located under the saddle mounting plate.
- Loosen the 6 side-fairing fixing screws indicated in the 3 photographs.
- Remove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

**See also**

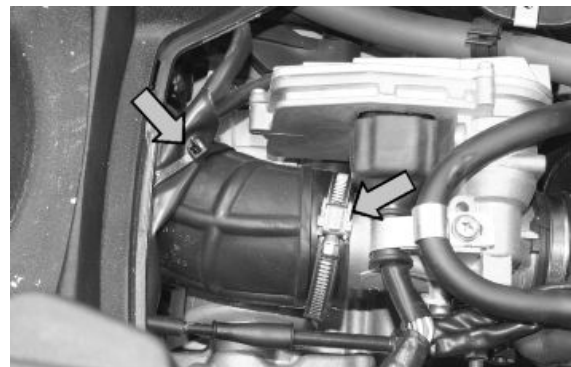
[Taillight assy.](#)
[Rear rack](#)
[Frame central cover](#)
[Seat](#)

Air filter

- Undo the two screws indicated.



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



- Scollegare le tre fascette di collegamenti della tubazione Blow-By.



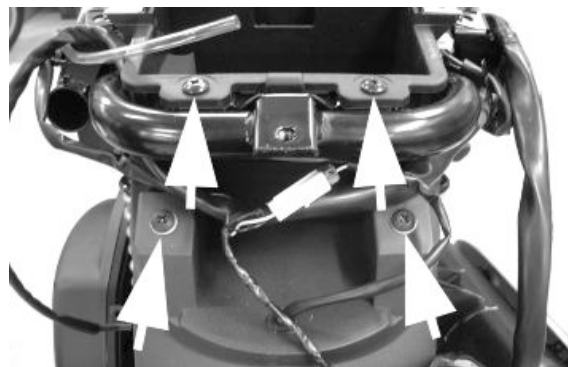
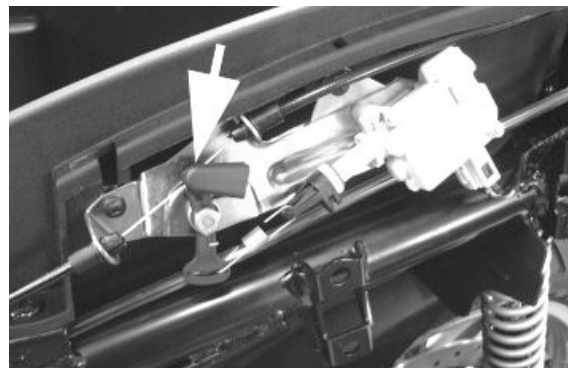
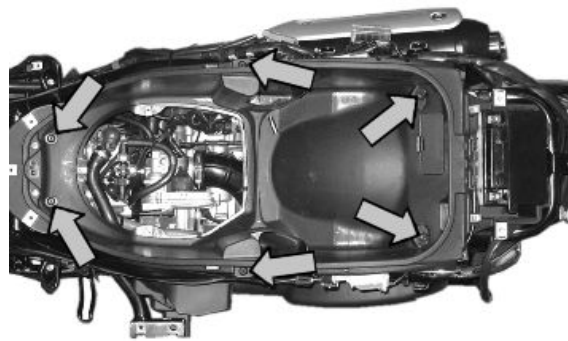
Rear mudguard

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



Helmet bay

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

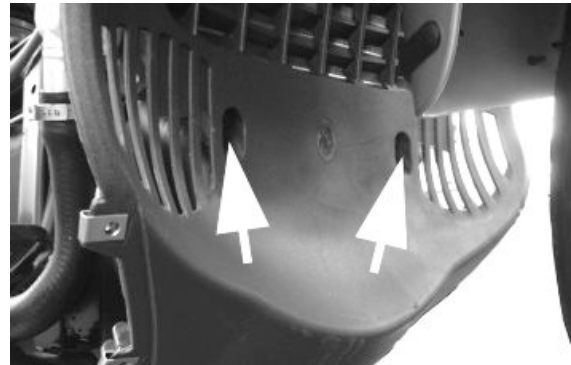


Fuel tank

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

N.B.

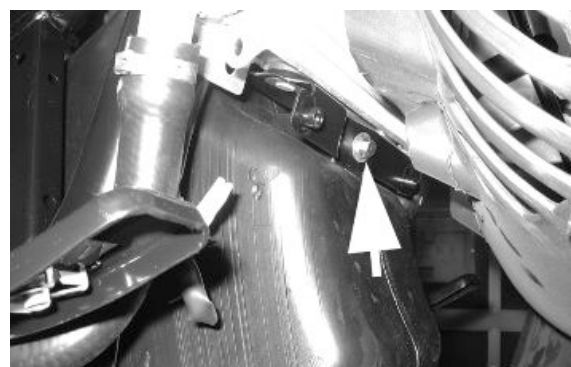
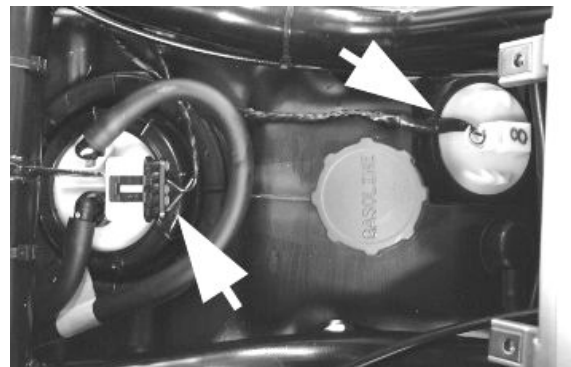
THIS OPERATION SHOULD PREFERABLY BE PERFORMED WITH THE TANK EMPTY.



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

N.B.

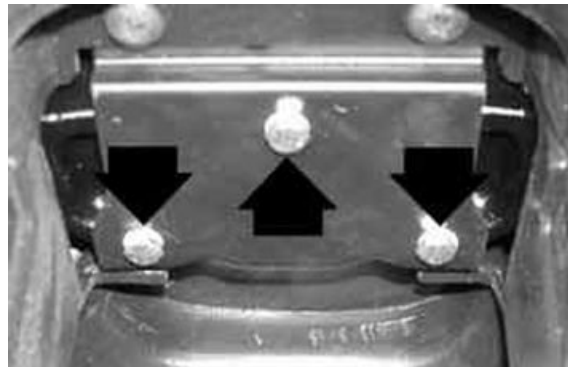
BE VERY CAREFUL WHEN PULLING OUT THE CARBURRETOR PIPING SINCE AN EXCESSIVE FORCE MAY DAMAGE THE PLASTIC INSERTS ON THE PUMP BODY. UPON REASSEMBLY, IT IS THEREFORE NECESSARY TO SLIGHTLY PRESS THE PIPING AND THE RETAIN RIM TOWARDS THE PUMP, THEN KEEP THE RIM PRESSED AND PULL THE COUPLING UPWARDS.



**See also**[Knee-guard](#)[Front wheel housing](#)[Footrest](#)

Front mudguard

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



Radiator fan

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

**See also**[Front wheel housing](#)

Flyscreen

- Undo the screw indicated.



- Undo the four screws indicated and remove the windshield.



INDEX OF TOPICS

PRE-DELIVERY

PRE DE

Carry out the listed tests before delivering the vehicle.

Warning- be very careful when handling fuel.

Aesthetic inspection

Appearance check:

- Paintwork
 - Fitting of plastics
 - Scratches
 - Dirt
-

Tightening torques inspection

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

FRONT SUSPENSION

- Front wheel pin nut
- Screw fixing wheel pin on right fork leg

FRONT BRAKE

- Screws fixing front brake callipers to fork
- Brake pipes to front brake callipers couplings

REAR SUSPENSION

- Rear wheel tightening screws
- Shock absorber lower clamp
- Upper shock absorber clamp
- Swinging arm - engine retainer
- Swinging arm - chassis retainer
- Nuts fixing muffler supporting arm - engine
- Screws fixing muffler to supporting arm

REAR BRAKE

- Screws fixing rear brake calliper to supporting plate
- Brake pipe / rear brake calliper coupling
- Screws fixing the support plate to engine

STAND

- Central stand bolt nuts
-

Electrical system

- Main switch
 - Lights: high beams, low beams, side/taillights (front and rear) and relevant warning lights
-

-
- Regulating the headlights according to the regulations currently in force
 - Front and rear stop light buttons and relative light
 - Turn indicators and relative telltales
 - Instrument lighting
 - instruments: fuel and temperature indicator
 - Instrument panel lights
 - Horn
 - electric start up
 - Engine stopping with emergency stop switch
 - electric saddle opening button

CAUTION

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

CAUTION

WHEN INSTALLING THE BATTERY, ATTACH THE POSITIVE LEAD FIRST AND THEN THE NEGATIVE LEAD.

WARNING

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 IS SWALLOWED, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.

BATTERIES PRODUCE EXPLOSIVE GAS; KEEP THEM AWAY FROM NAKED FLAMES, SPARKS AND CIGARETTES. IF THE BATTERY IS CHARGED IN A CLOSED PLACE, TAKE CARE TO ENSURE ADEQUATE VENTILATION. ALWAYS PROTECT YOUR EYES WHEN WORKING CLOSE TO BATTERIES.

KEEP OUT OF THE REACH OF CHILDREN

CAUTION

NEVER USE FUSES WITH A CAPACITY HIGHER THAN THE RECOMMENDED CAPACITY. USING A FUSE OF UNSUITABLE RATING MAY SERIOUSLY DAMAGE THE VEHICLE OR EVEN CAUSE A FIRE.

Levels check

Level check:

- Hydraulic brake system liquid level.
- Rear hub oil level
- Engine coolant level
- Engine oil level

Road test

Test ride

- Cold start
- Instrument operations
- Response to the throttle control

- Stability on acceleration and braking
 - Rear and front brake efficiency
 - Rear and front suspension efficiency
 - Abnormal noise
-

Static test

Static control after the test ride:

- Hot engine restart
- Minimum seal (turning the handlebar)
- Uniform steering rotation
- Possible losses
- electric radiator fan operation

CAUTION

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

CAUTION

NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES OR TYRES MAY BURST.

Functional inspection

Functional check up:

- Hydraulic braking system: lever travel
 - Clutch: proper functioning check
 - Engine: proper general functioning and no abnormal noise check
 - Other: papers check, frame 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

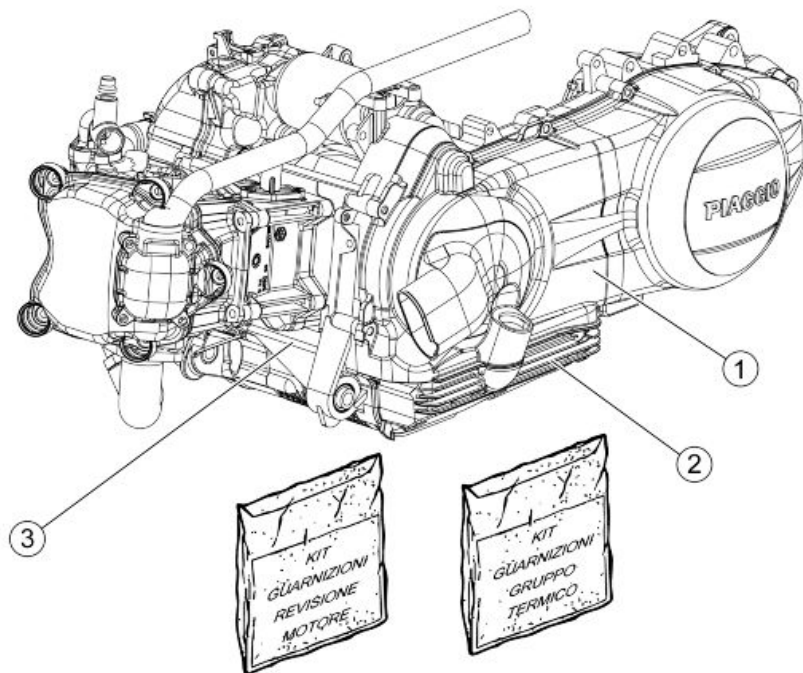
TIME

TIME

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

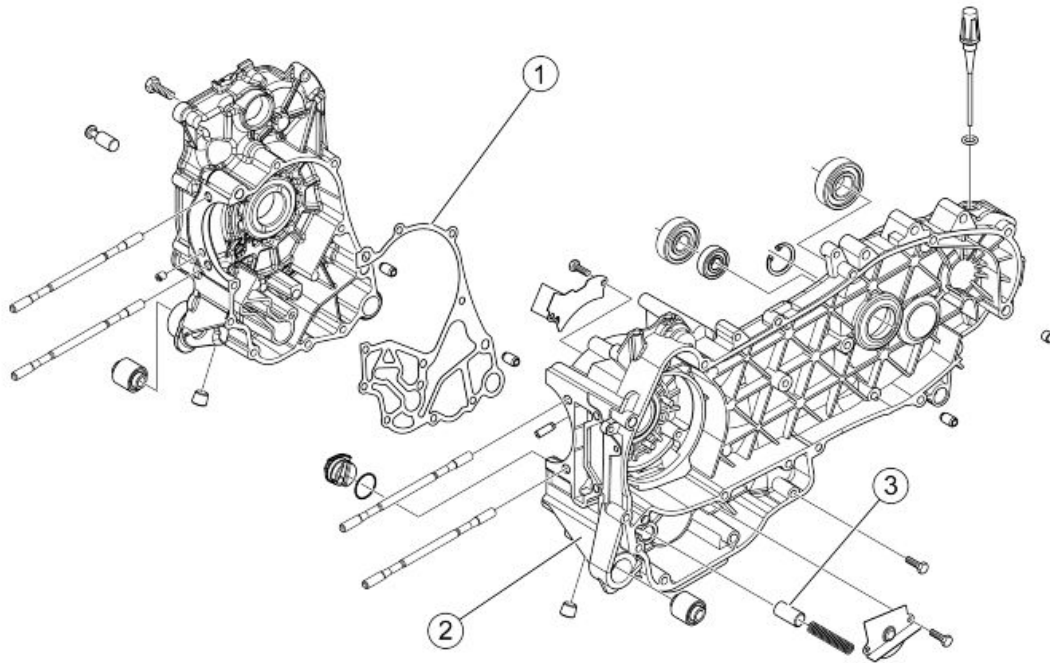
For each operation, the description, code and time envisages are specified.

Engine



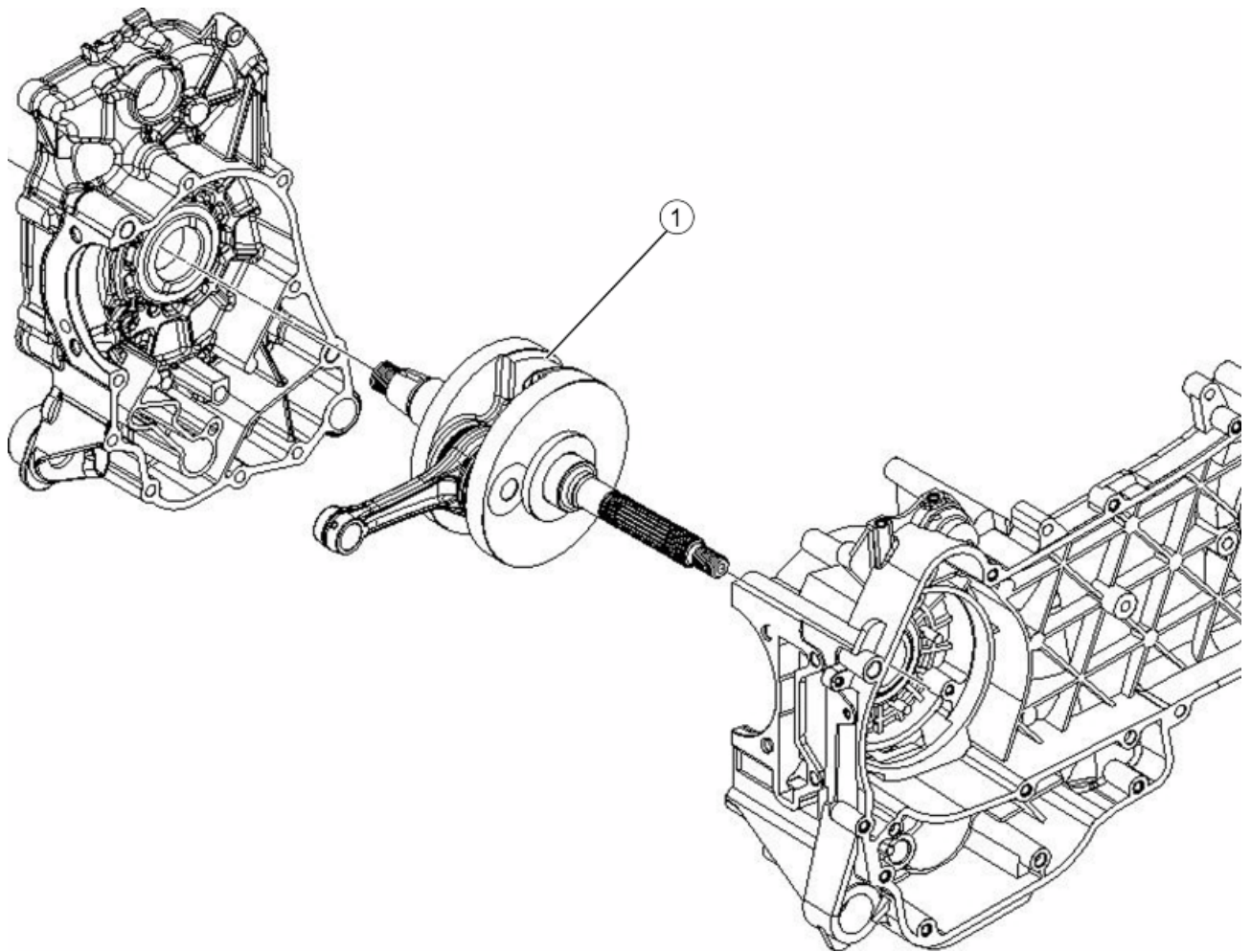
ENGINE

	Code	Action	Duration
1	001001	Engine from frame - Removal and re-fit.	
2	003064	Engine oil - Change	
3	001127	Engine - Complete service	

Crankcase**CRANKCASE**

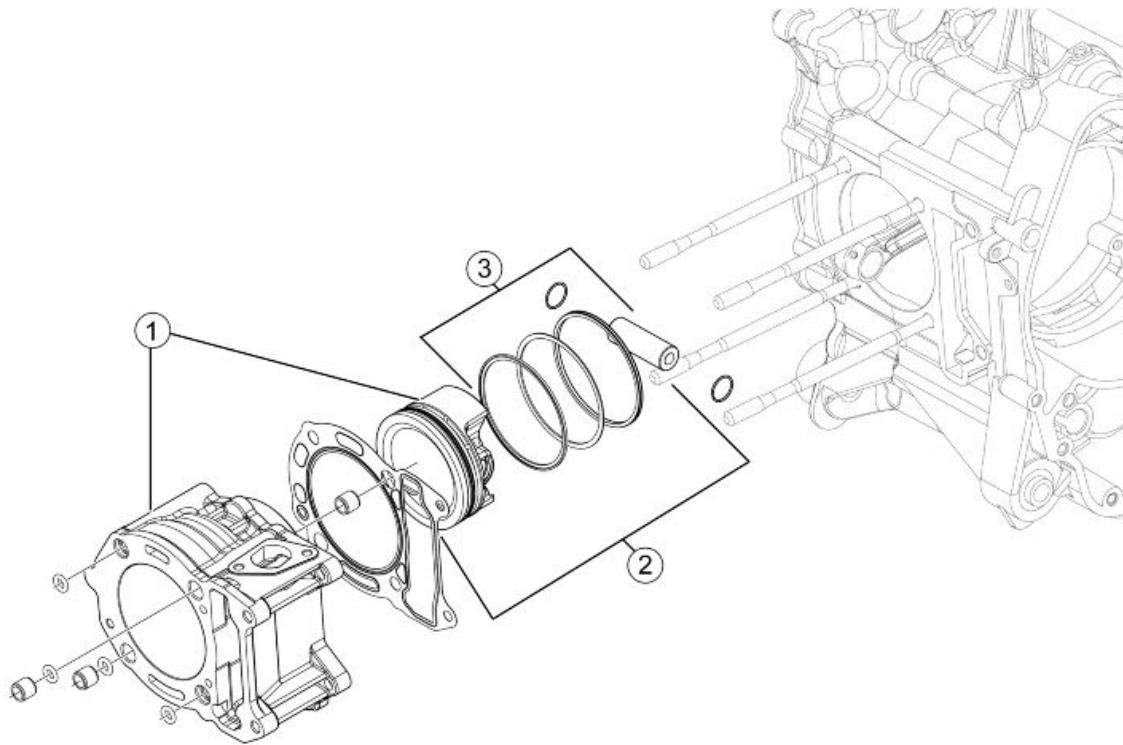
	Code	Action	Duration
1	001153	Crankcase halves gasket - Replacement	
2	001133	Engine crankcase- Replacement	
3	001124	Lubrication by-pass - Replacement	

Crankshaft



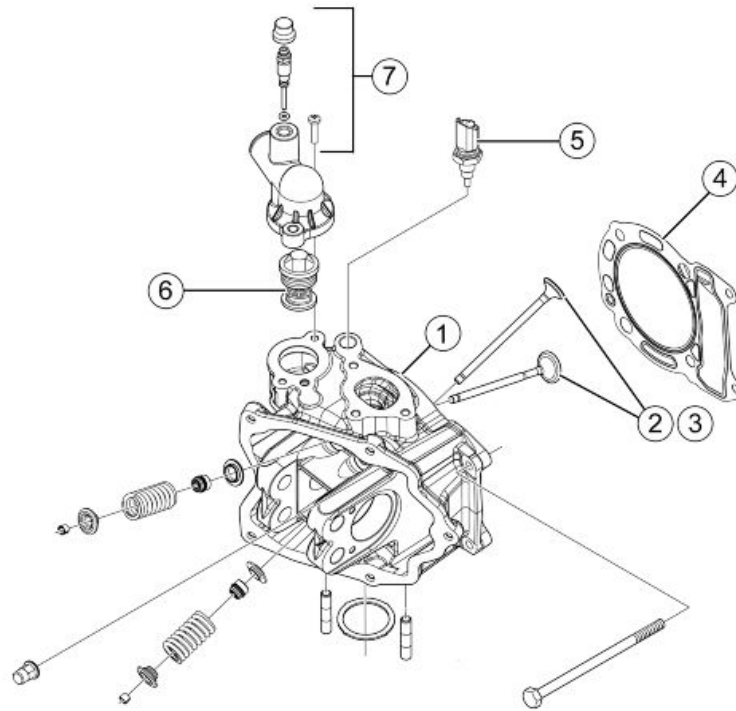
CRANKSHAFT

	Code	Action	Duration
1	001117	Crankshaft - Replacement	

Cylinder assy.**CYLINDER - PISTON**

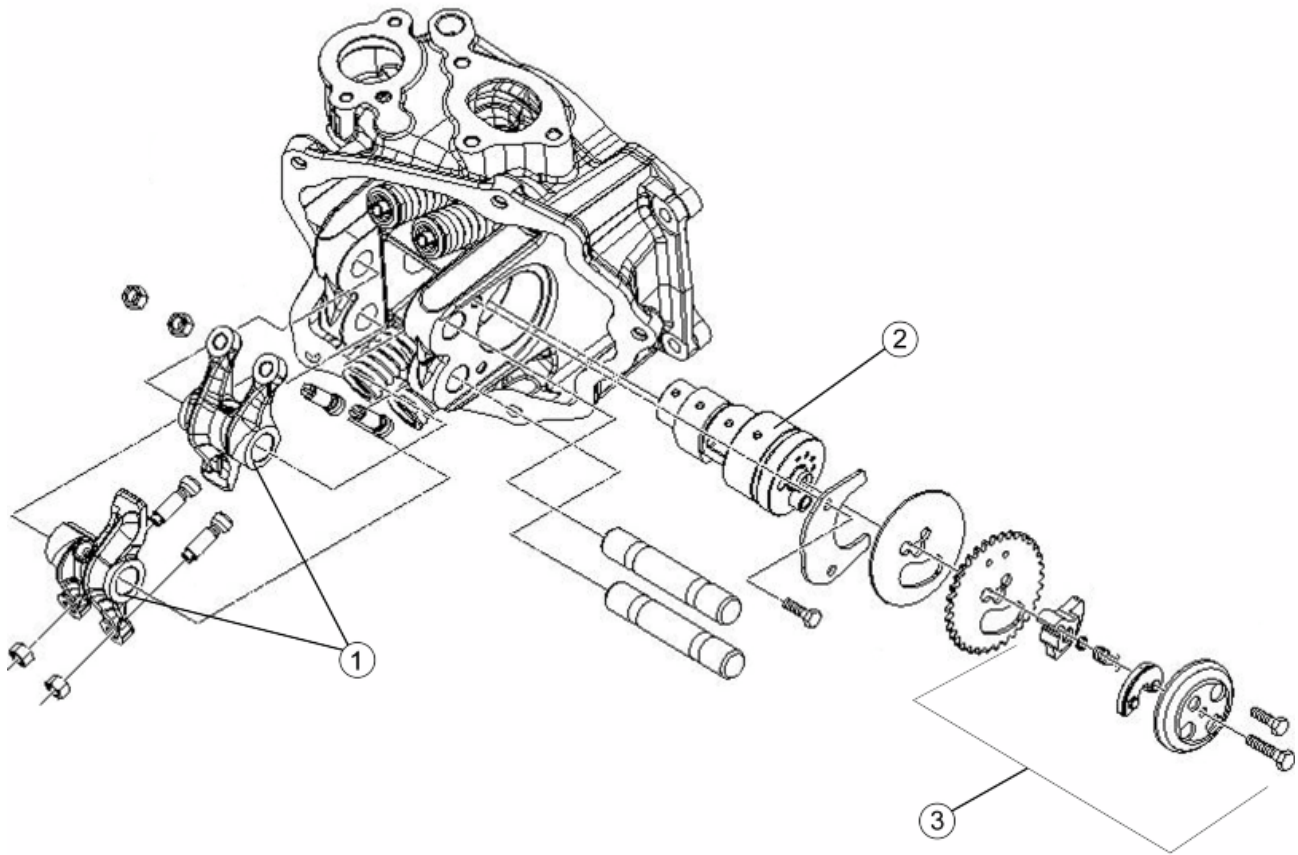
	Code	Action	Duration
1	001002	Cylinder-Piston - Replacement	
2	001154	Pin-ring-piston assembly - Service	
3	001176	Rings / Pin - Replacement	

Cylinder head assy.



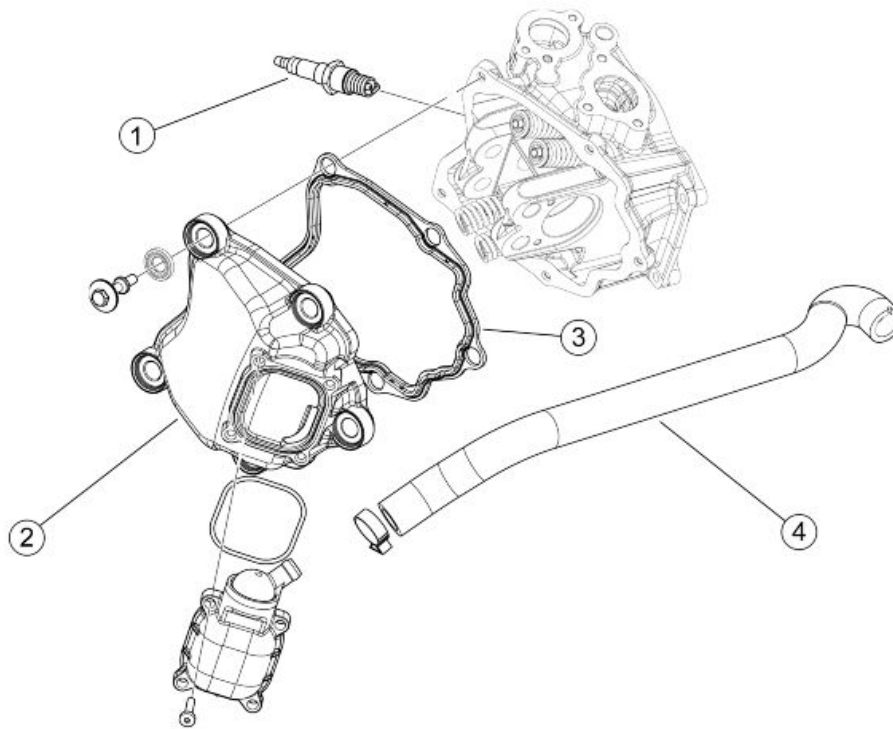
VALVE HEAD

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

Rocker arms support assy.**CAMSHAFT**

	Code	Action	Duration
1	001148	Rocking lever valve - Replacement	
2	001044	Camshaft - Replacement	
3	001169	Decompressor - Replacement	

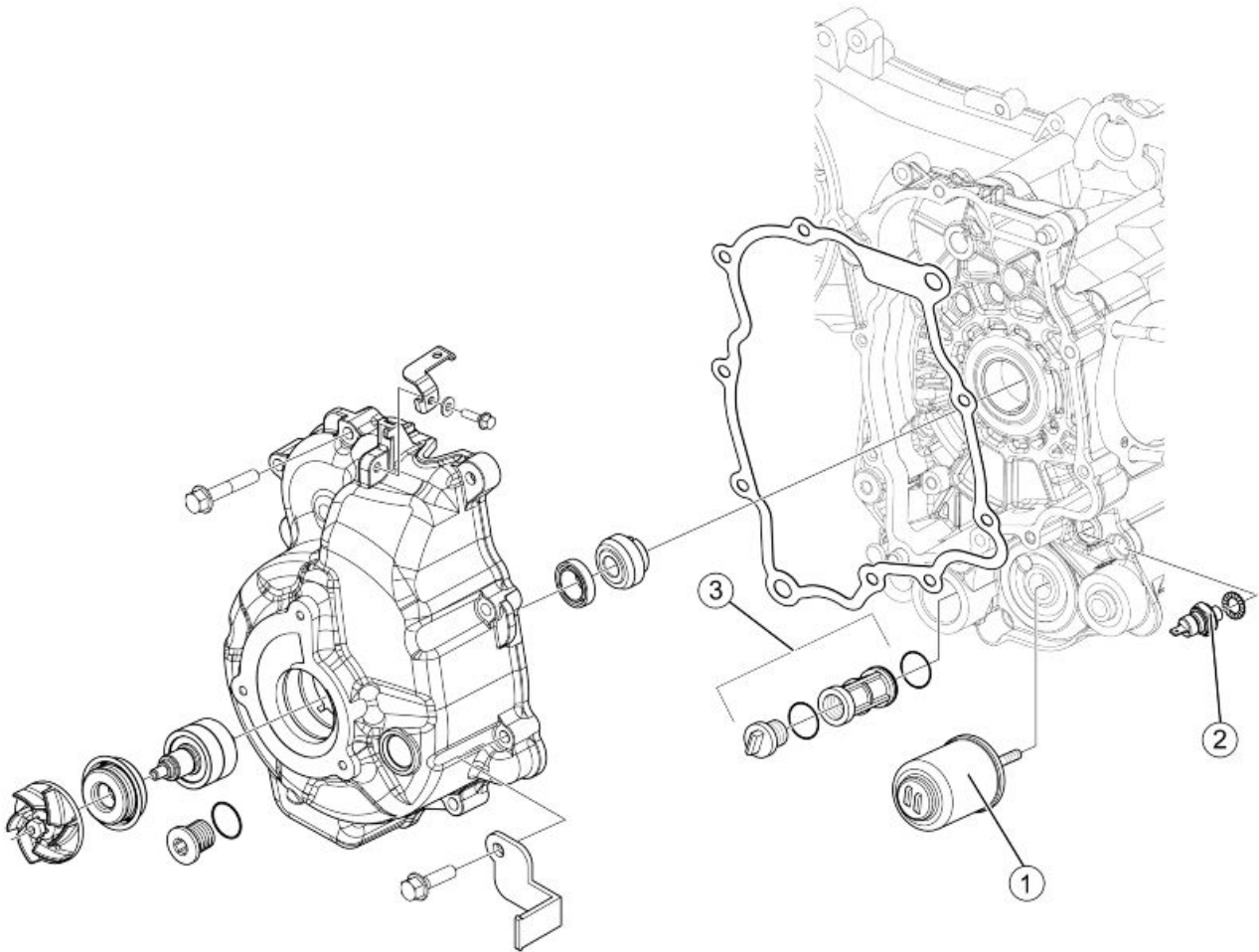
Cylinder head cover



HEAD COVER

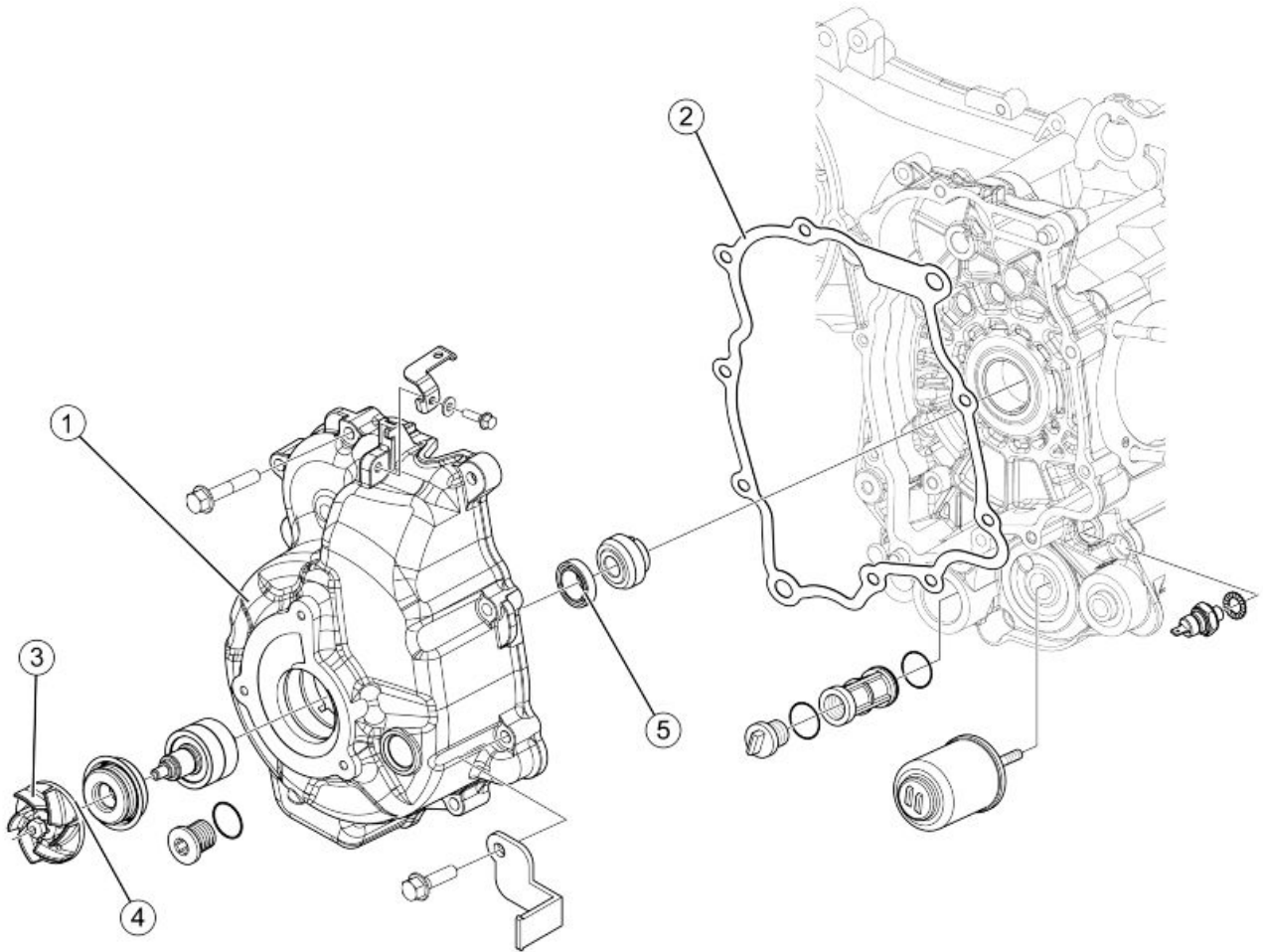
	Code	Action	Duration
1	001093	Spark plug - Replacement	
2	001089	Head cover - Replacement	
3	001088	Head cover gasket - Replacement	
4	001074	Oil vapour recovery pipe - Replacement	

Oil filter

**OIL FILTER**

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

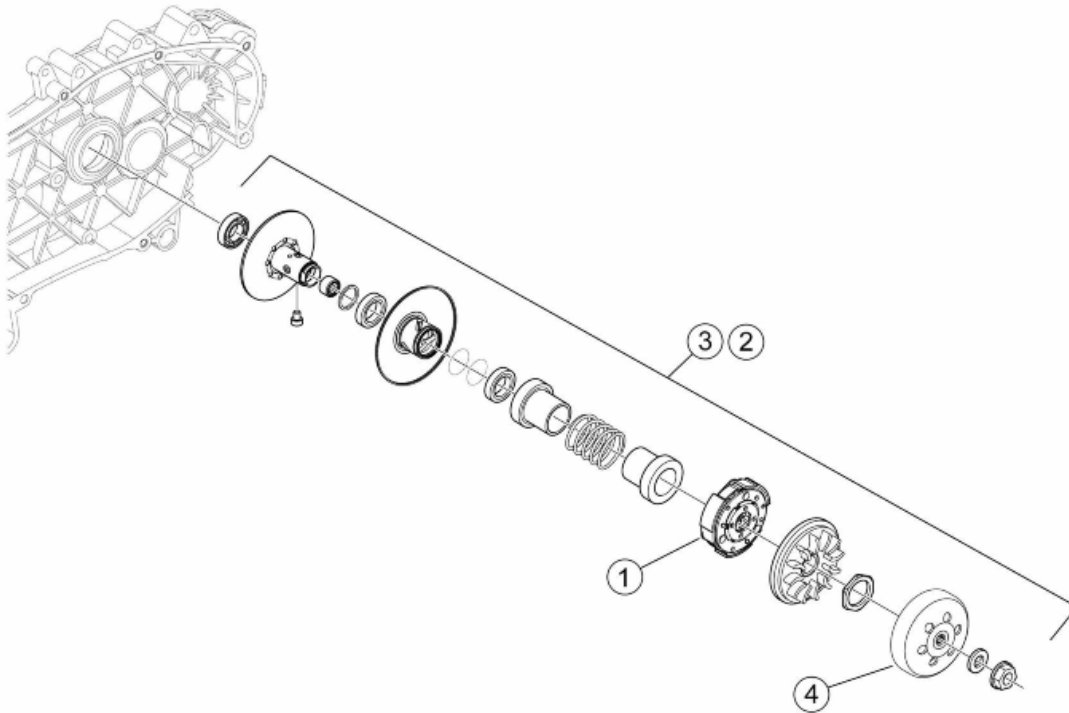
Flywheel cover



FLYWHEEL COVER

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

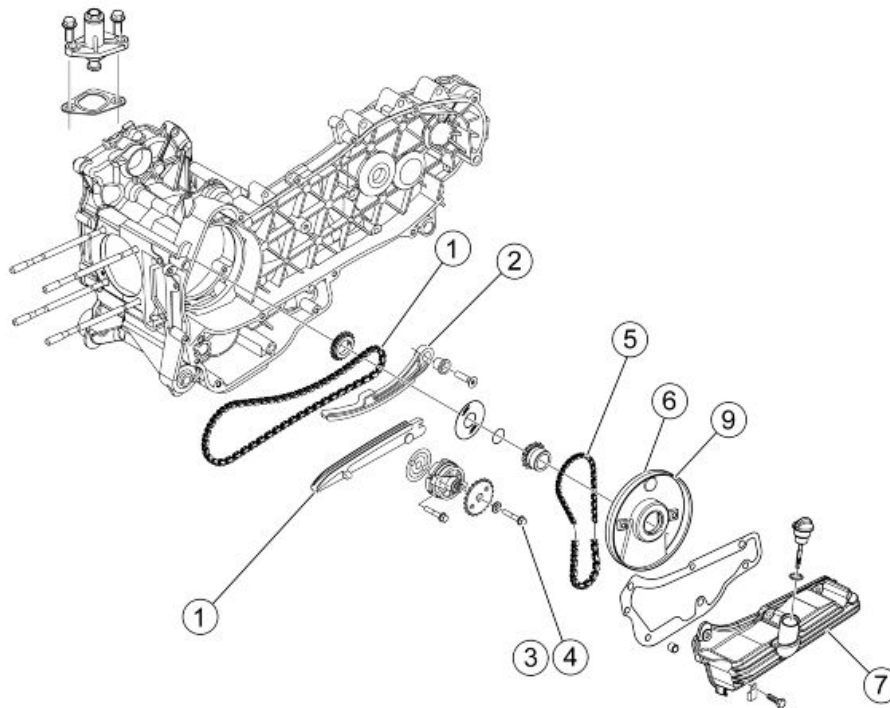
Driven pulley



DRIVEN PULLEY

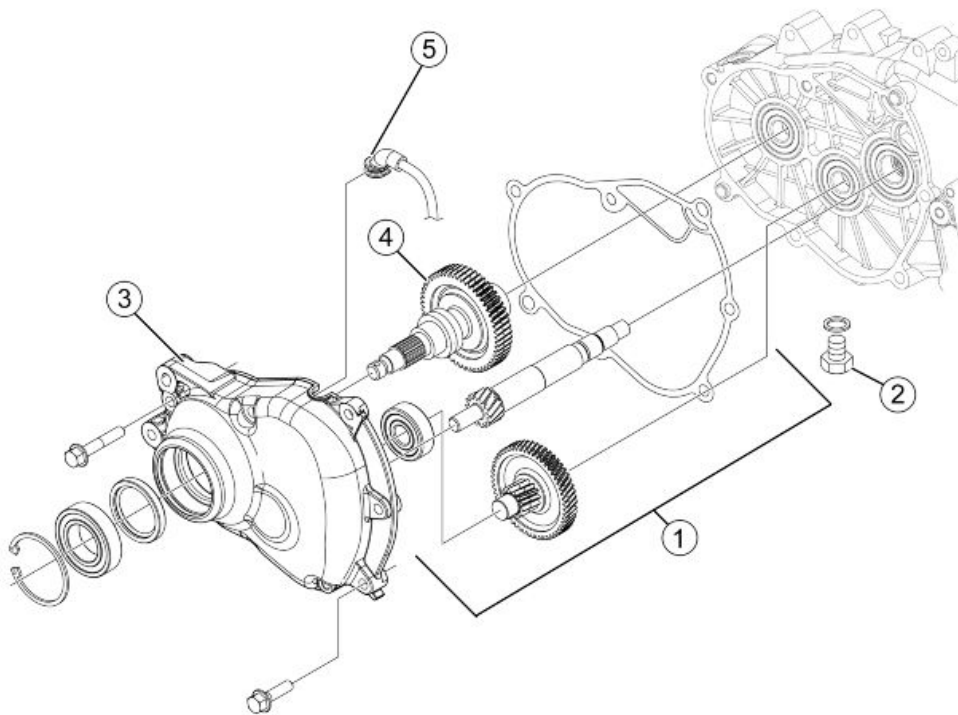
	Code	Action	Duration
1	001022	Clutch - Replacement	
2	001012	Driven pulley - Service	
3	001110	Driven pulley - Replacement	
4	001155	Clutch bell - Replacement	

Oil pump



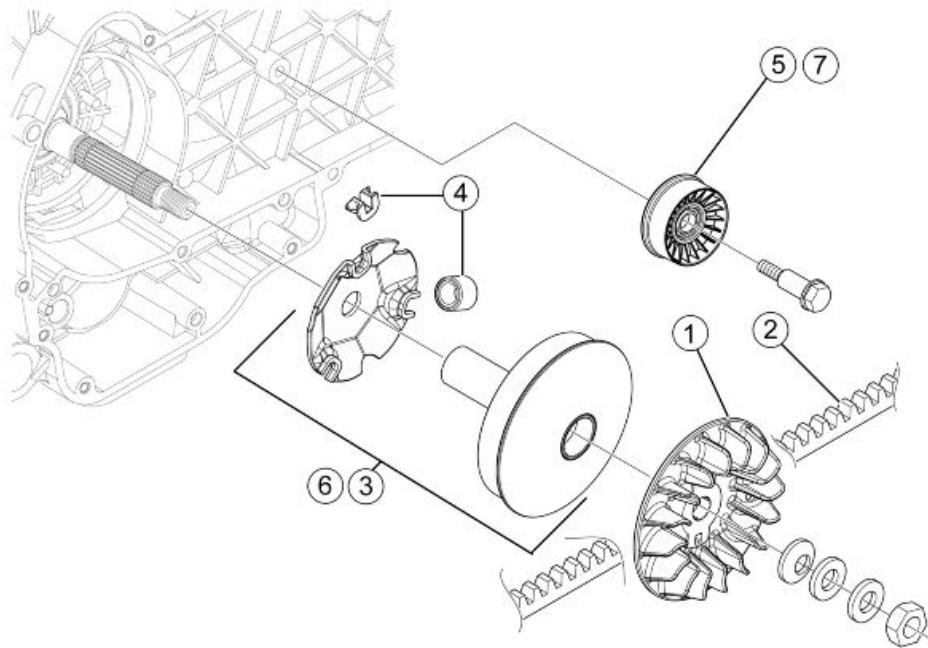
OIL PUMP

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

Final gear assy.**FINAL REDUCTION GEAR**

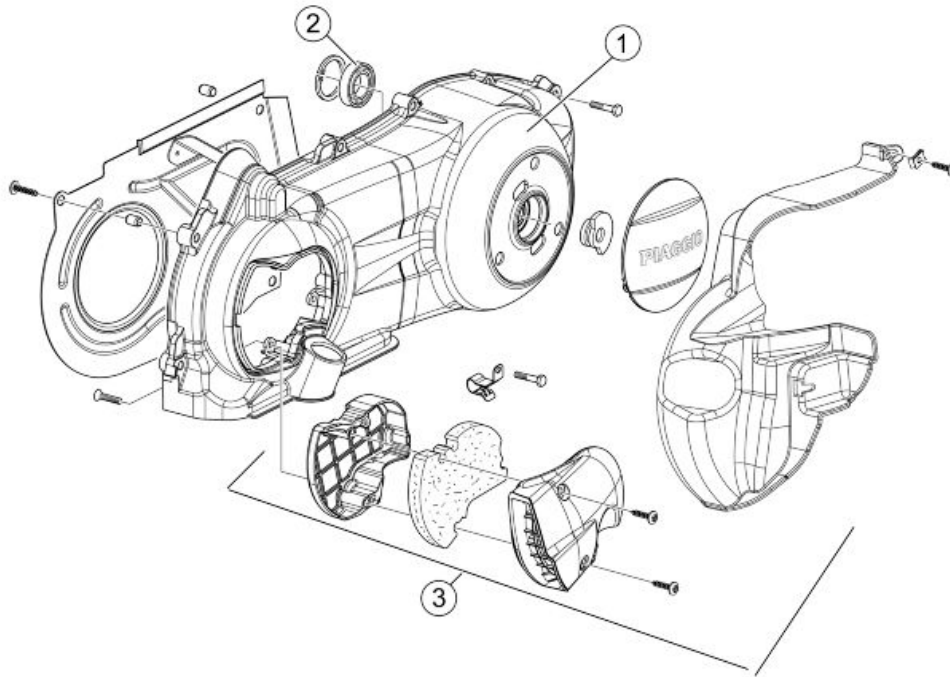
	Code	Action	Duration
1	001010	Reduction gear - Replacement	
2	003065	Gear box oil - Replacement	
3	001156	Geared reduction unit cover - Replacement	
4	004125	Rear wheel axle - Replacement	
5	004180	Reduction gear breather pipe - Replacement	

Driving pulley



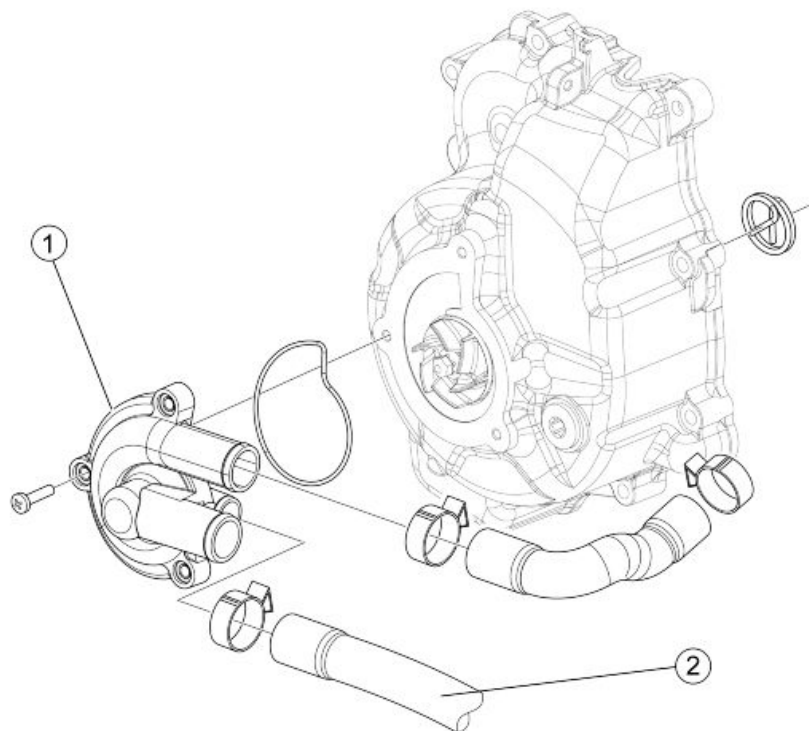
DRIVING PULLEY

	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	rear-view pulley - Service	
7	001175	Anti-flapping roller/ Belt - Service	

Transmission cover**TRANSMISSION COVER**

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

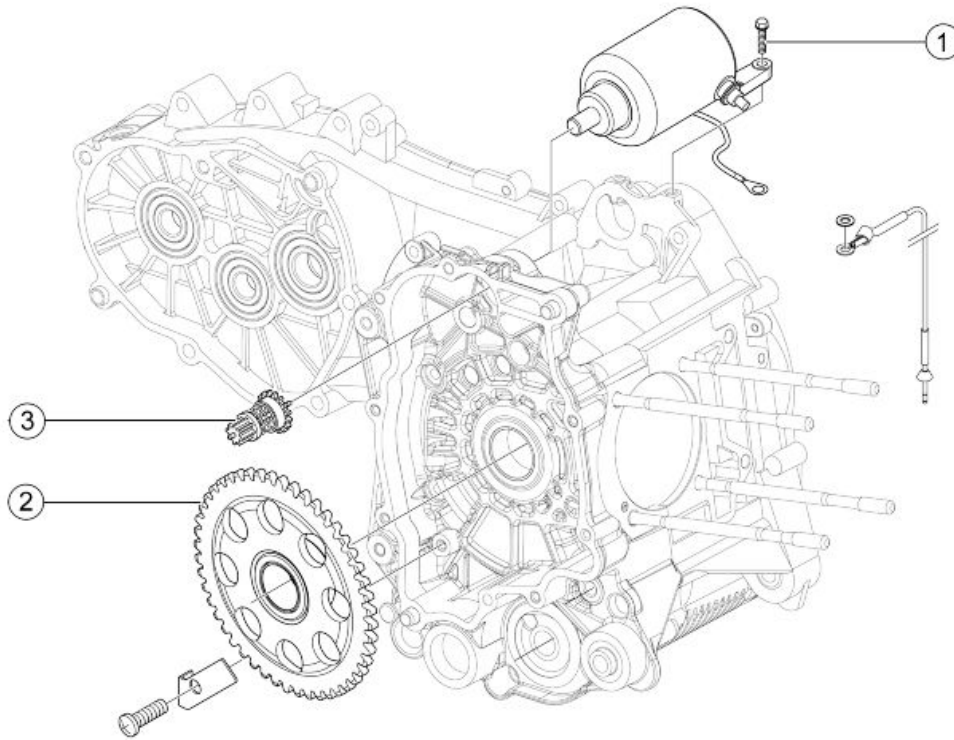
Water pump



WATER PUMP

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

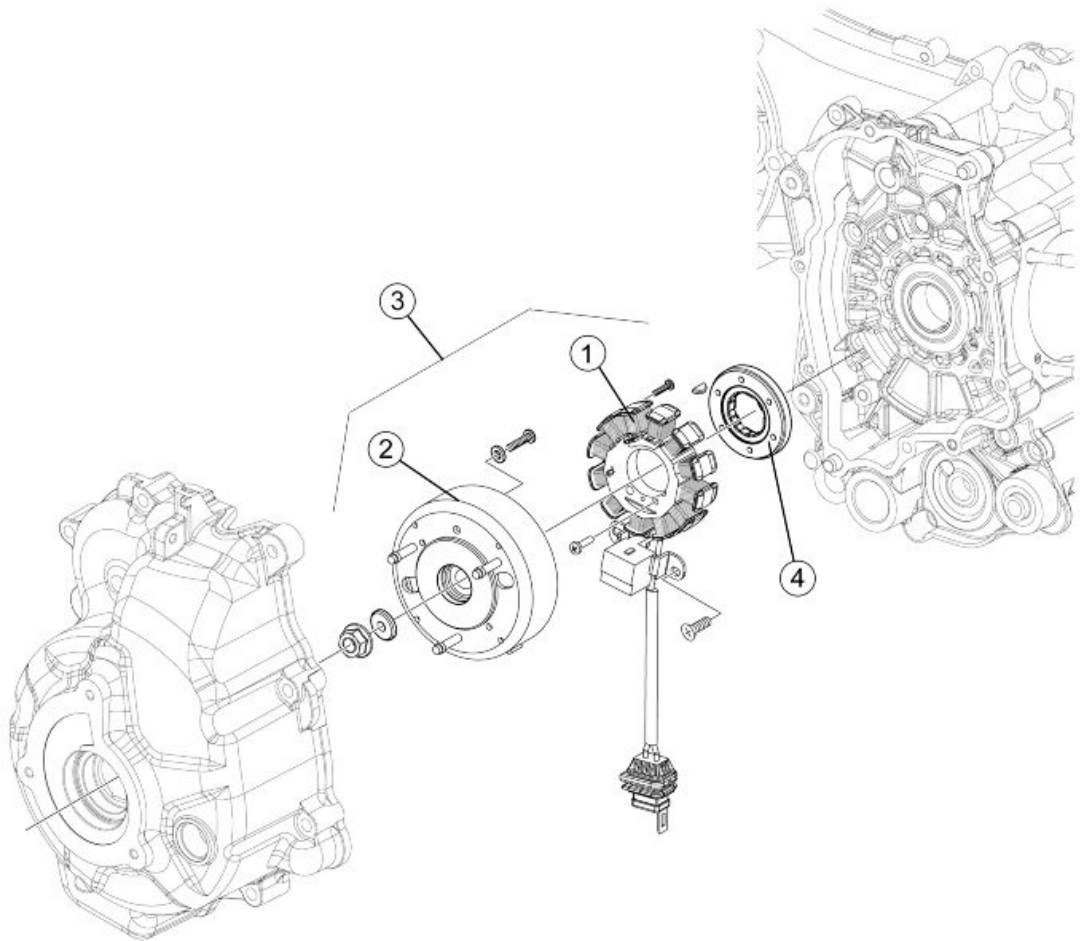
Starter motor



ELECTRICAL START-UP

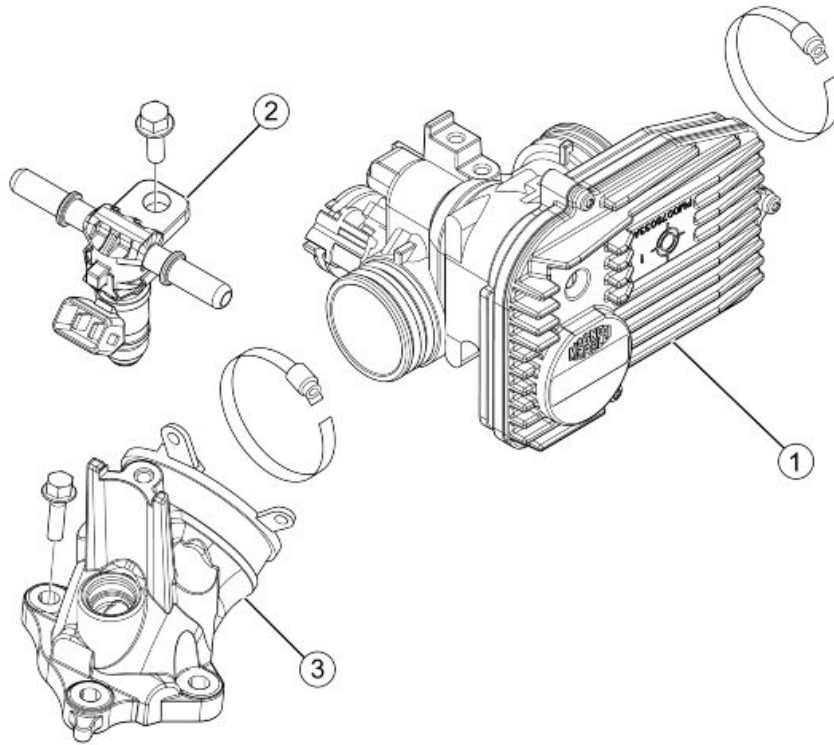
	Code	Action	Duration
1	001020	Starter motor - Replacement	
2	001151	Start-up driven gearing - Replacement	
3	001017	Start-up pinion - Replacement	

Flywheel magneto



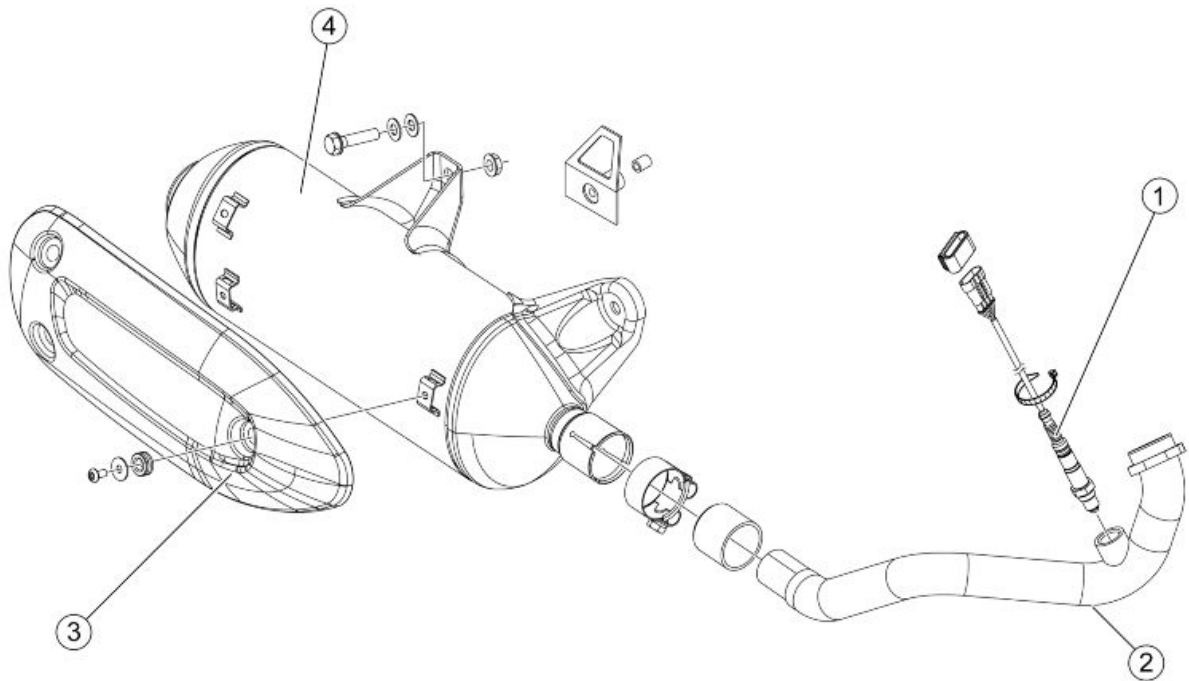
MAGNETO FLYWHEEL

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

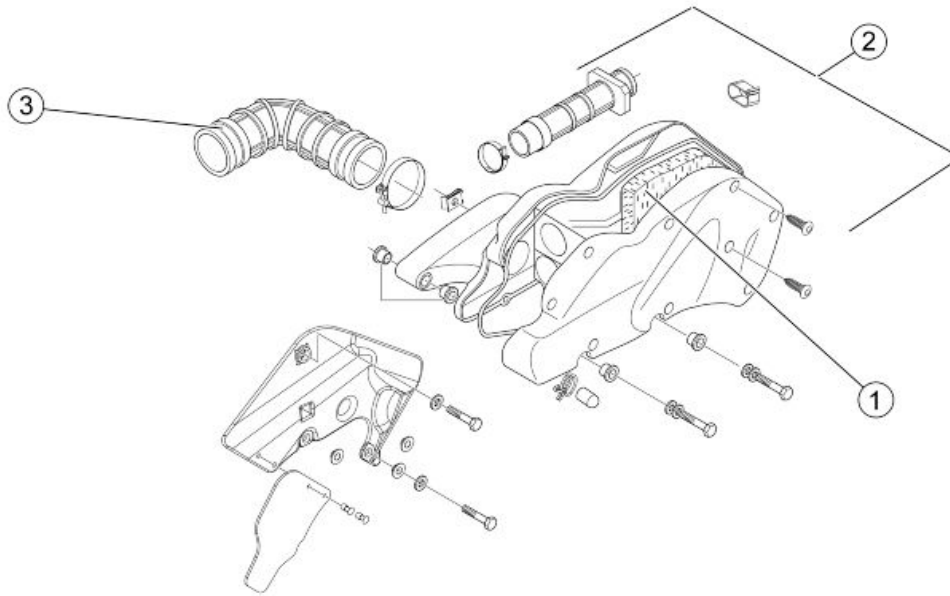
Exhaust pipe



MUFFLER

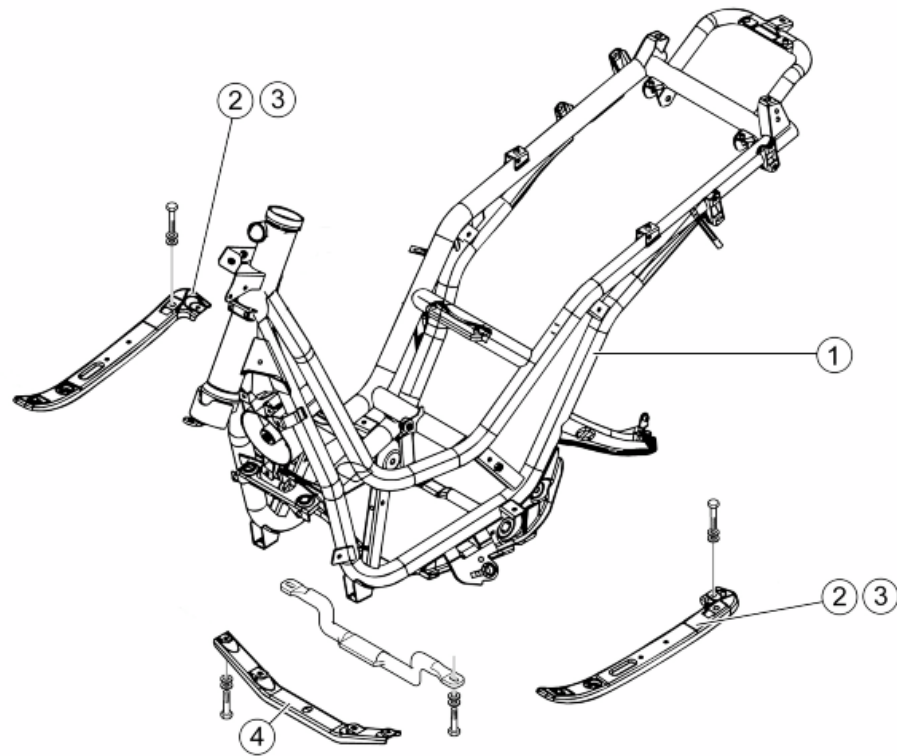
	Code	Action	Duration
1	005138	Lambda probe - Replacement	
2	001092	Exhaust manifold - Replacement	
3	001095	Muffler guard - Replacement	
4	001009	Muffler - Replacement	

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	

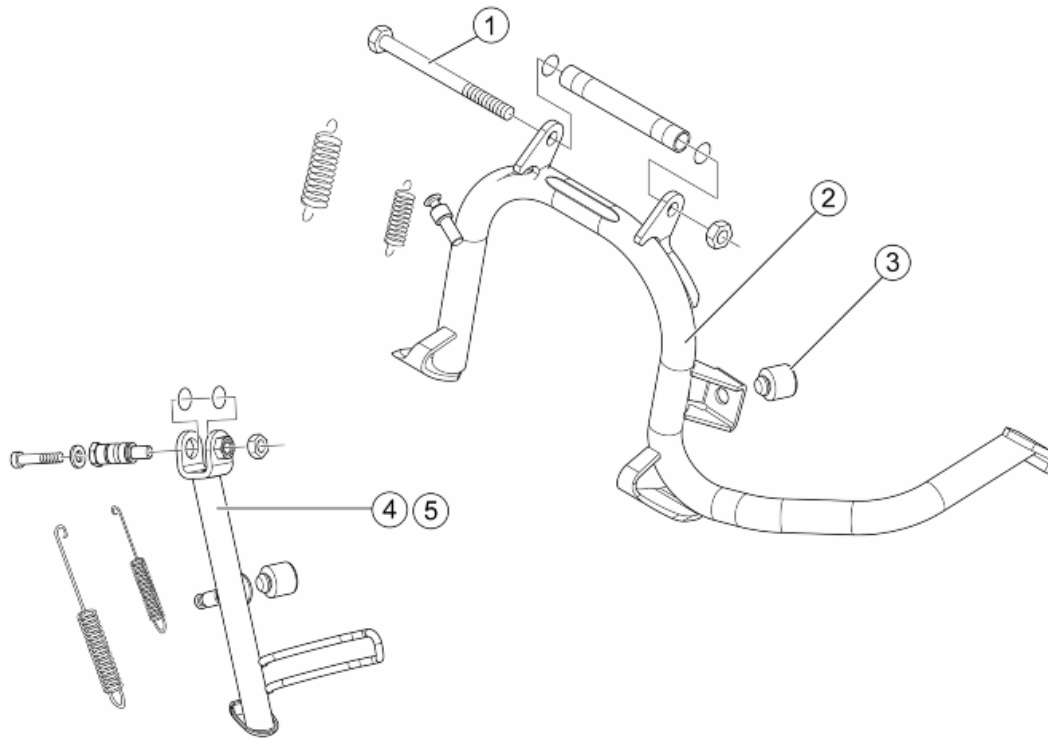
Frame



CHASSIS

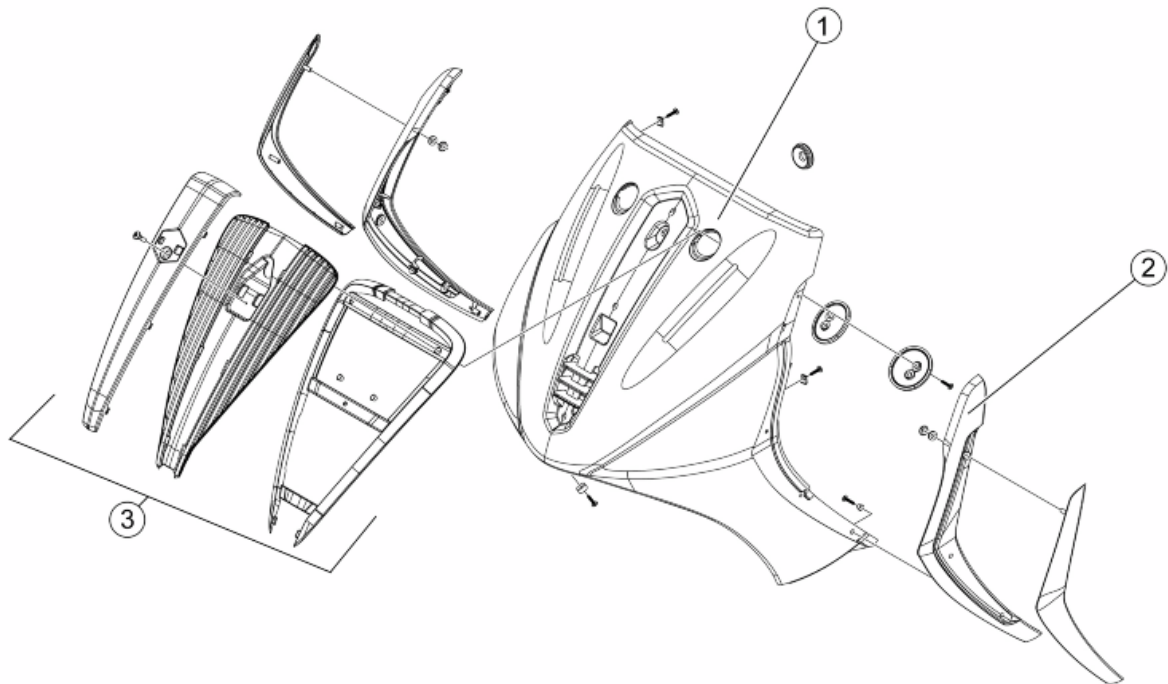
	Code	Action	Duration
1	004001	Chassis - Replacement	
2	004147	Footrest support bracket, one side - Replacement	
3	004148	Footrest support bracket, both sides - Replacement	
4	004146	Front frame - Replacement	

Centre-stand

**STAND**

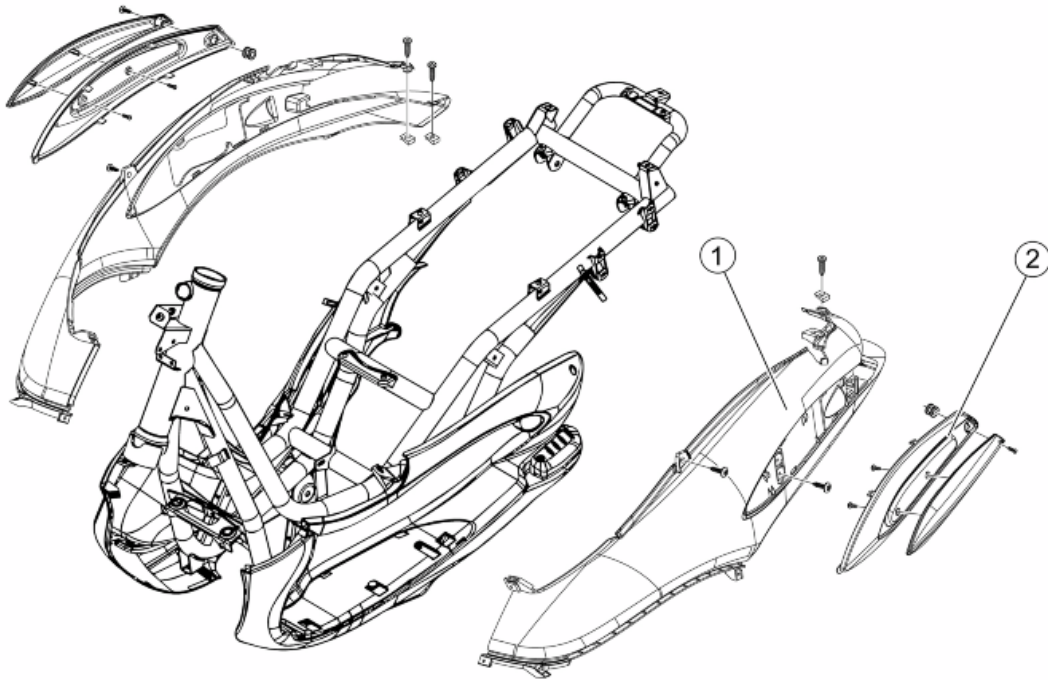
	Code	Action	Duration
1	001053	Stand bolt - Replacement	
2	004004	Stand - Replacement	
3	004179	Stand buffer - Replacement	
4	004102	Side stand - Replacement	
5	005079	Stand switch - Replacement	

Legshield spoiler



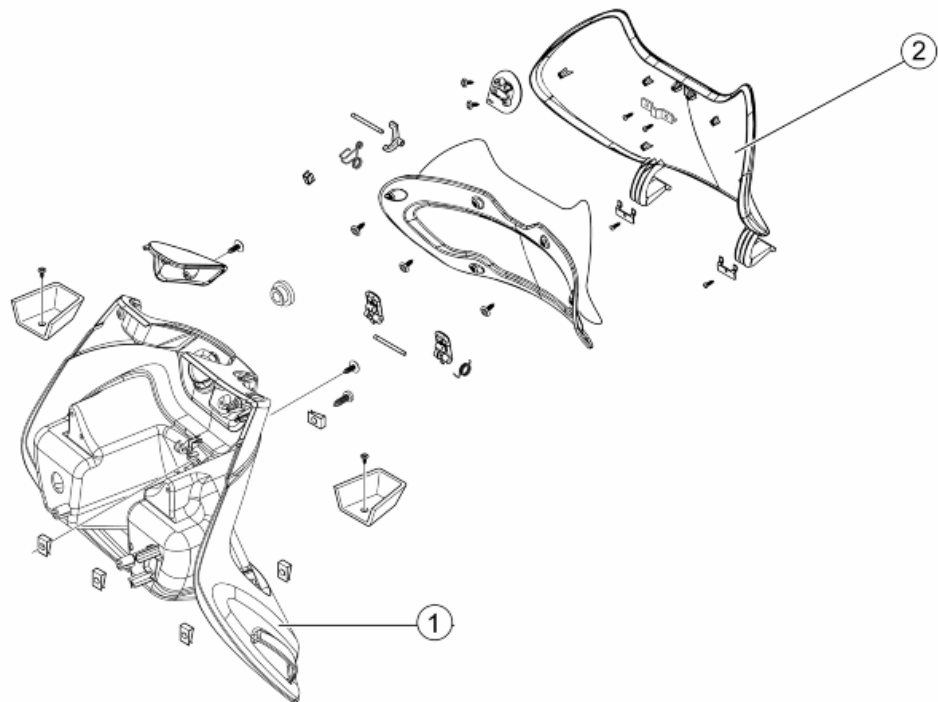
LEGSIELD - SPOILER

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

Side fairings**SIDE COVERS**

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

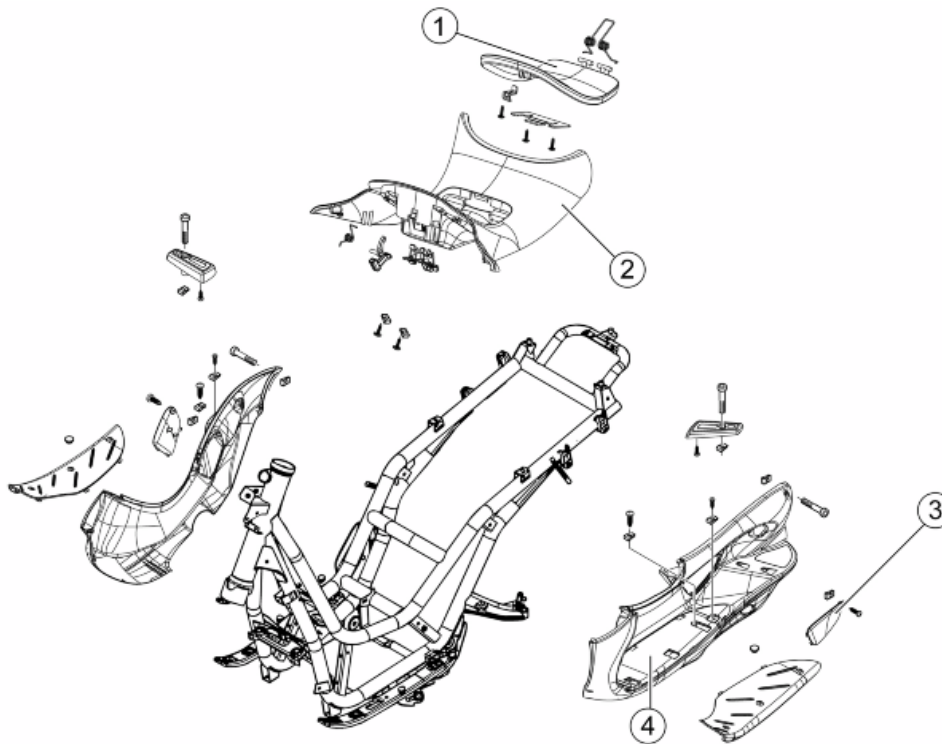
Rear cover



REAR SHIELD

	Code	Action	Duration
1	004065	Shield back plate - Replacement	
2	004081	Glove box door - Replacement	

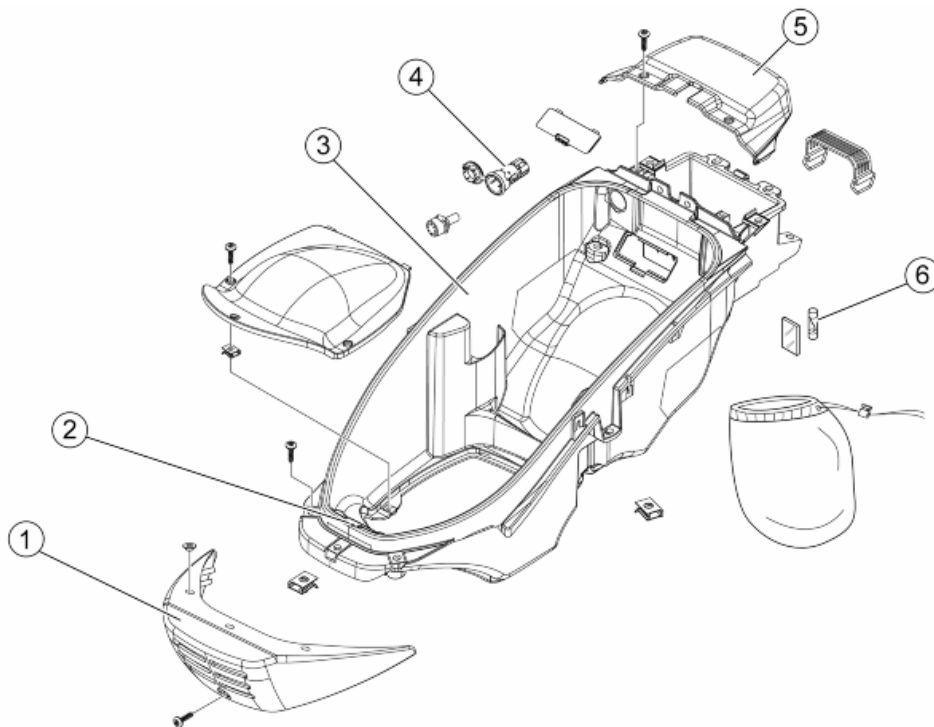
Central cover



CENTRAL COVER

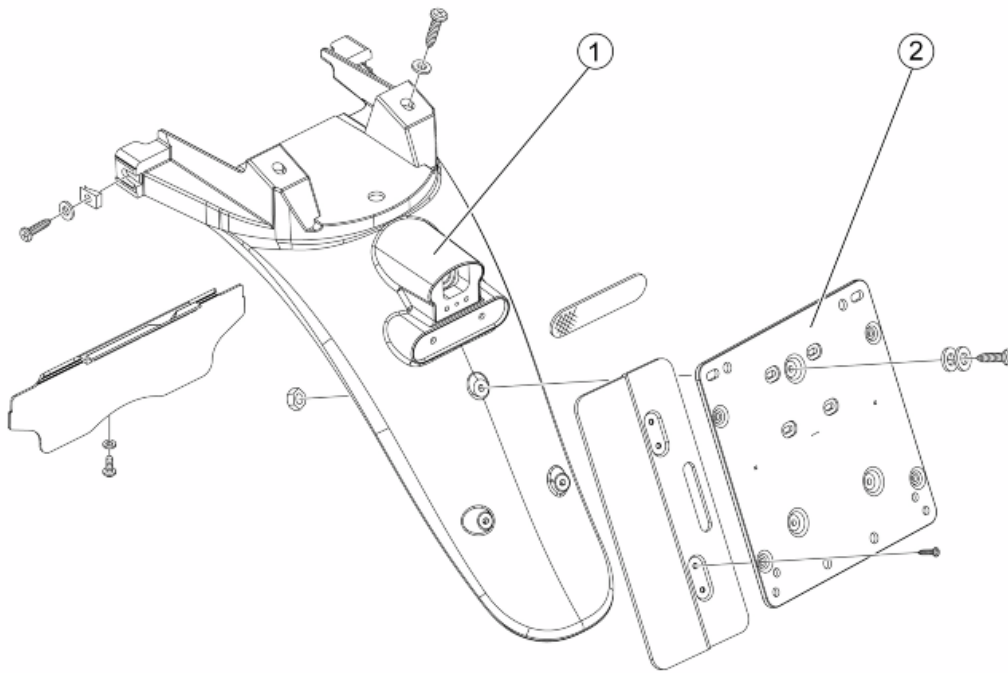
	Code	Action	Duration
1	004135	Fuel tank lid - Replacement	
2	004011	Central chassis cover - Replacement	
3	004059	Spark plug inspection flap - Replacement	
4	004015	Footrest - Replacement	

Underseat compartment



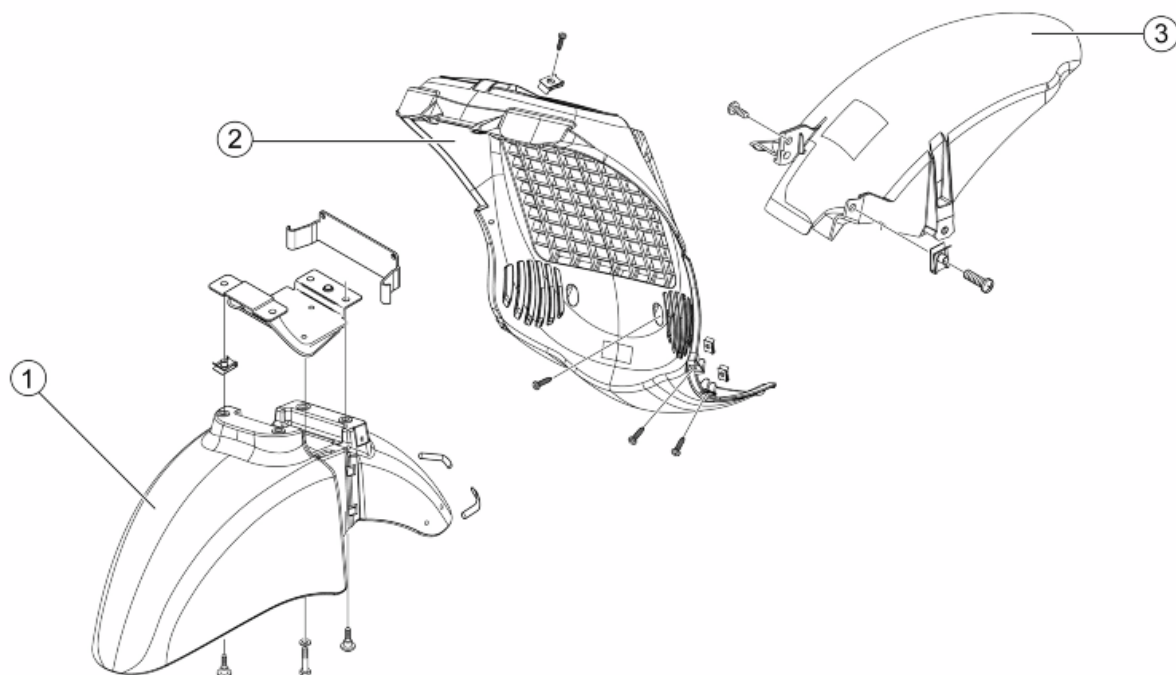
HELMET COMPARTMENT

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

Plate holder**LICENSE PLATE HOLDER**

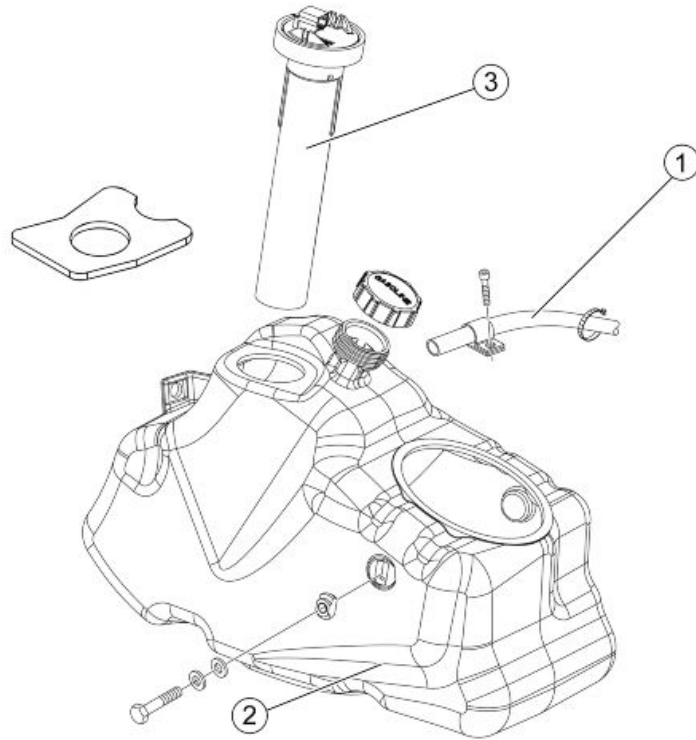
	Code	Action	Duration
1	004136	License plate holder support - Replacement	
2	005048	Licence plate holder - Replacement	

Mudguard



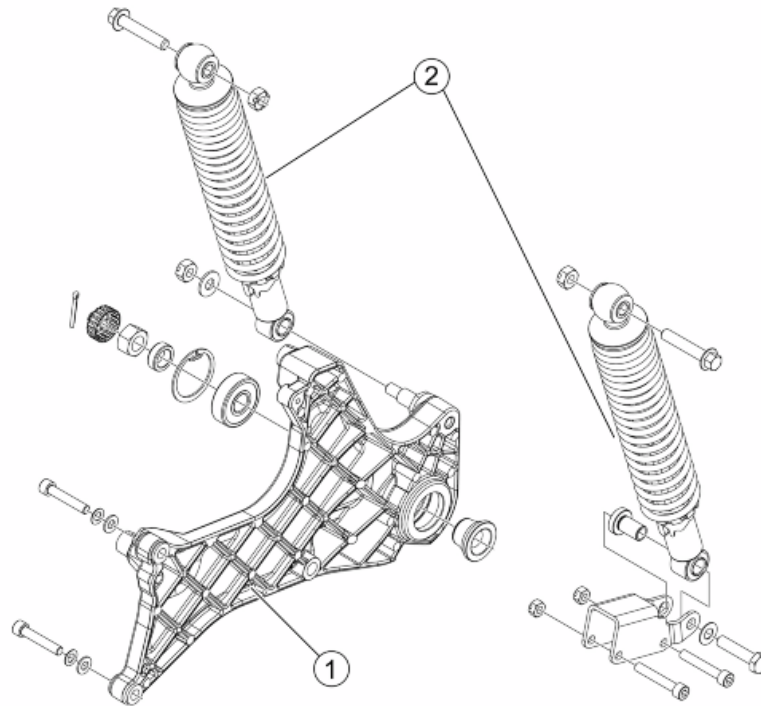
MUDGUARDS

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

Fuel tank**FUEL TANK**

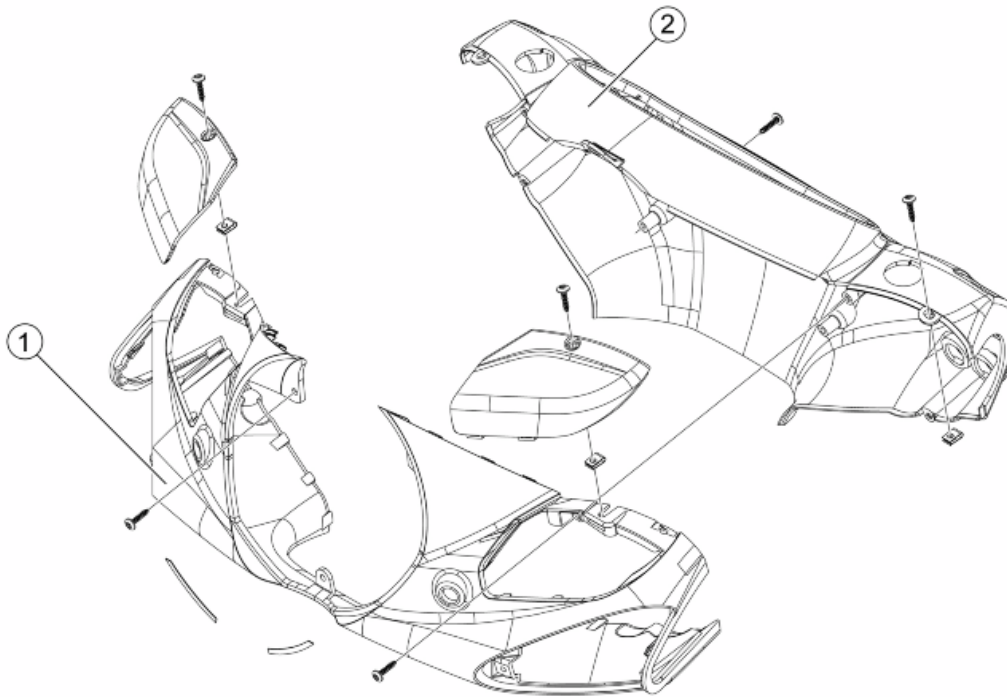
	Code	Action	Duration
1	004109	Fuel tank breather - Replacement	
2	004005	Fuel tank - Replacement	
3	005010	Tank float - Replacement	

Rear shock-absorber



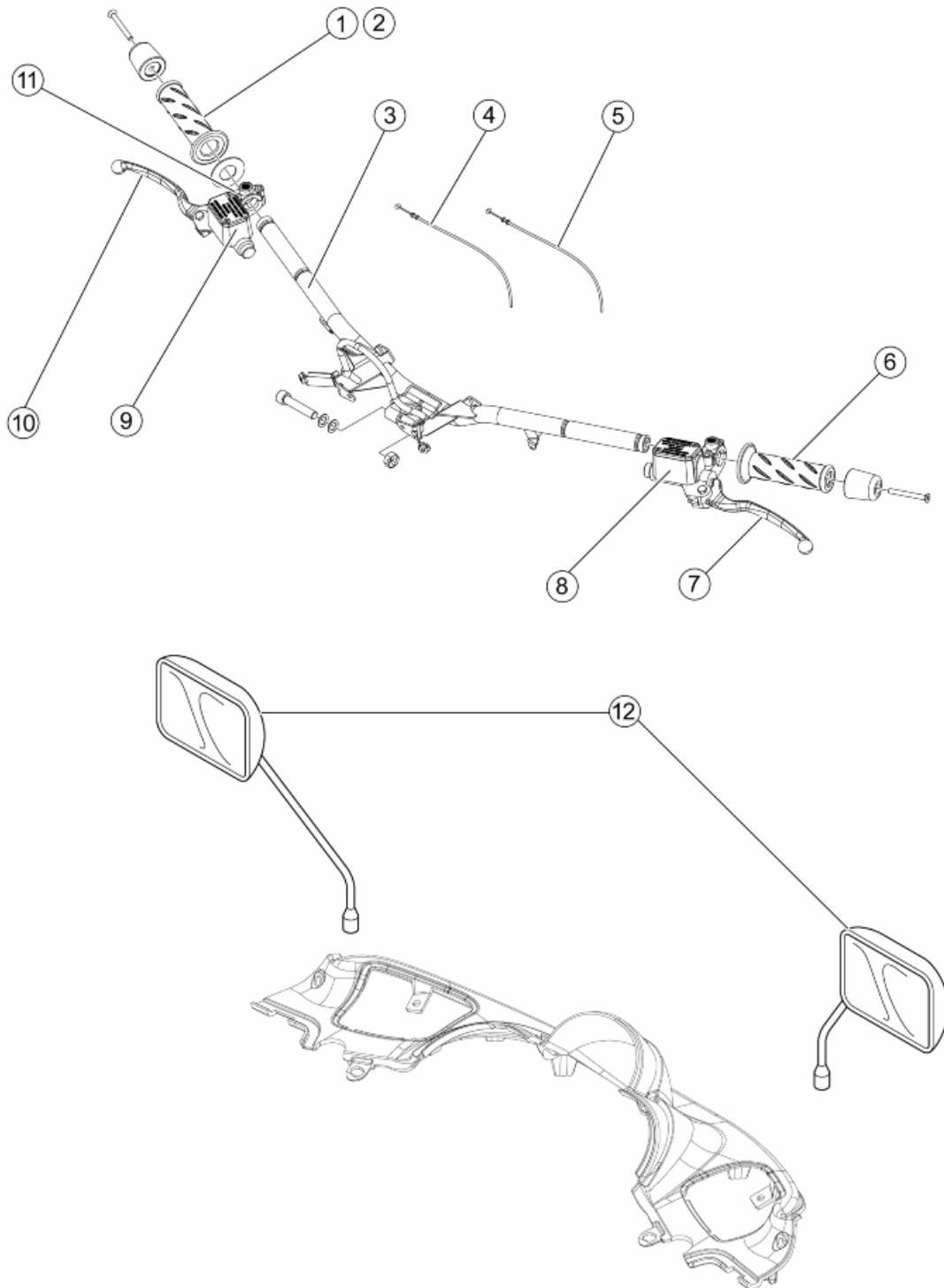
REAR SHOCK ABSORBER

	Code	Action	Duration
1	003077	Muffer supporting arm/ rear shock absorber - Replacement	
2	003007	Rear shock absorber - Replacement	

Handlebar covers**HANDLEBAR COVERS**

	Code	Action	Duration
1	004018	Front handlebar covers - Replacement	
2	004019	Rear handlebar cover - Replacement	

Handlebar components

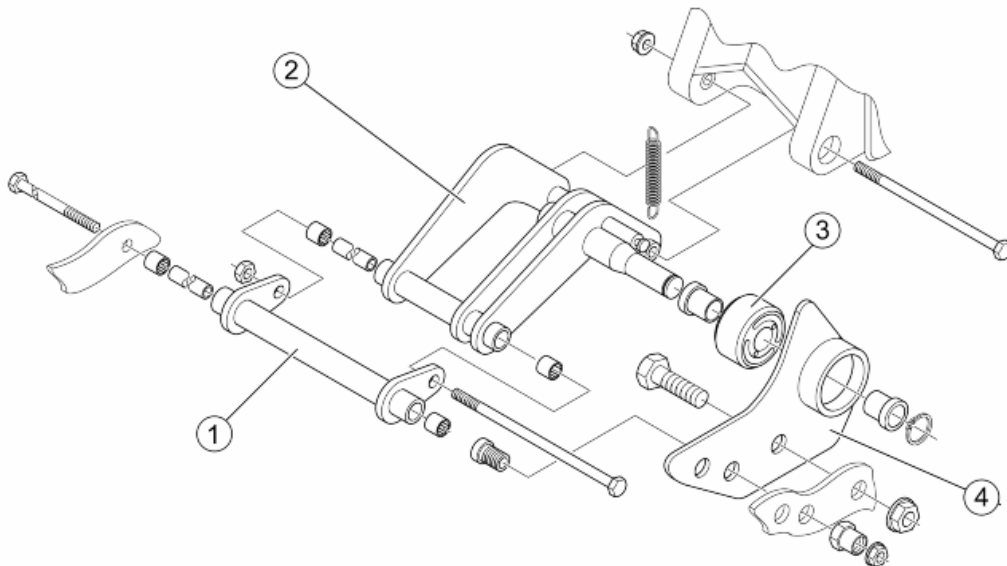


HANDLEBAR COMPONENTS

	Code	Action	Duration
1	002060	Complete throttle control - Replacement	
2	002059	Right-hand knob - Replacement	

	Code	Action	Duration
3	003001	Handlebar - Replacement	
4	003061	Accelerator transmission - Adjustment	
5	002063	Throttle control transmission - Replacement	
6	002071	Left knob - Replacement	
7	002037	Brake lever - Replacement	
8	002067	Rear brake pump - Replacement	
9	002024	Front brake pump - Replacement	
10	004162	Mirror support and/or brake pump fitting U-bolt - Replacement	
11	004066	Driving mirror - Replacement	

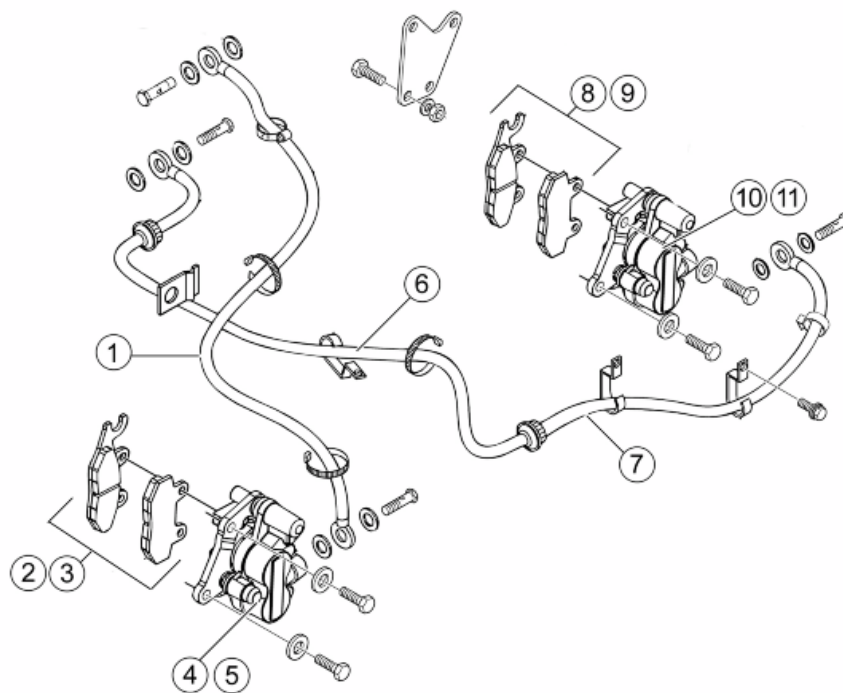
Swing-arm



SWINGING ARM

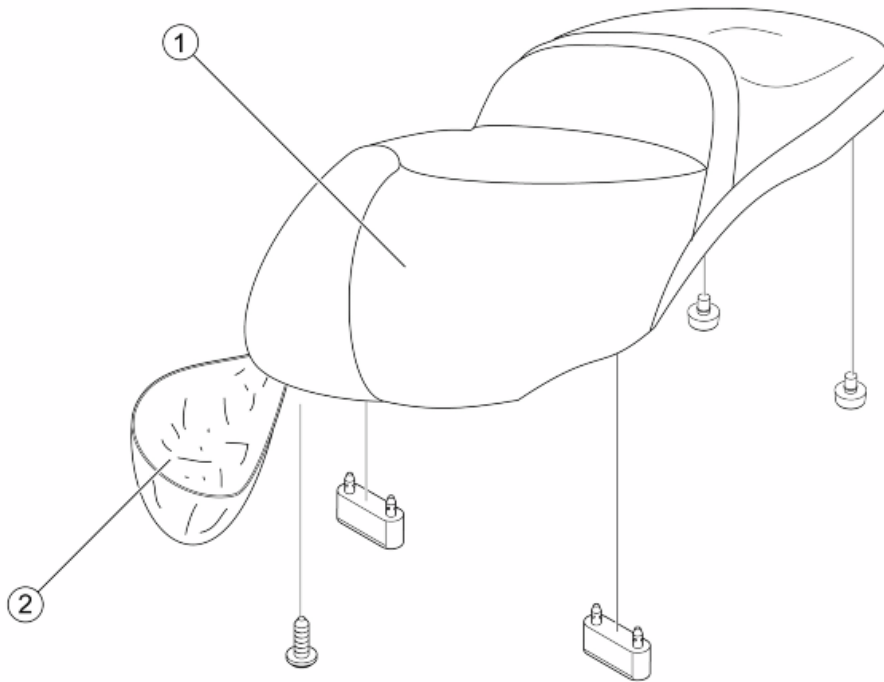
	Code	Action	Duration
1	003080	Swinging arm on frame - Replacement	
2	001072	Engine/frame swinging arm attachment - Replacement	
3	004058	Silent-block - Replacement	
4	003081	Swinging arm supporting flange - Replacement	

Brake hoses



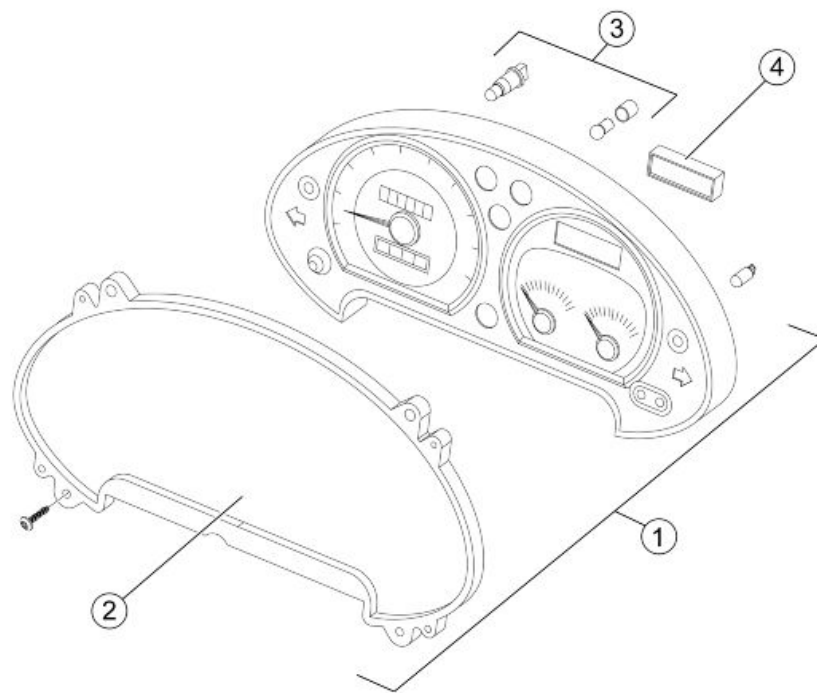
BRAKE PIPING

	Code	Action	Duration
1	002021	Front brake piping - Replacement	
2	003070	Front brake pads/shoes - Check for wear	
3	002007	Front brake pads - Replacement	
4	002039	Front brake calliper - Replacement	
5	002047	Front brake fluid and air bleeding system - Replacement	
6	002020	Rear brake disc piping - Replacement	
7	002081	Rear brake rigid pipes - Replacement	
8	003071	Rear brake pads/shoes - Check for wear	
9	002002	Rear brake pads - Replacement	
10	002080	Rear brake oil bleeding system - Replacement	
11	002048	Rear brake calliper - Replacement	

Seat**SADDLE**

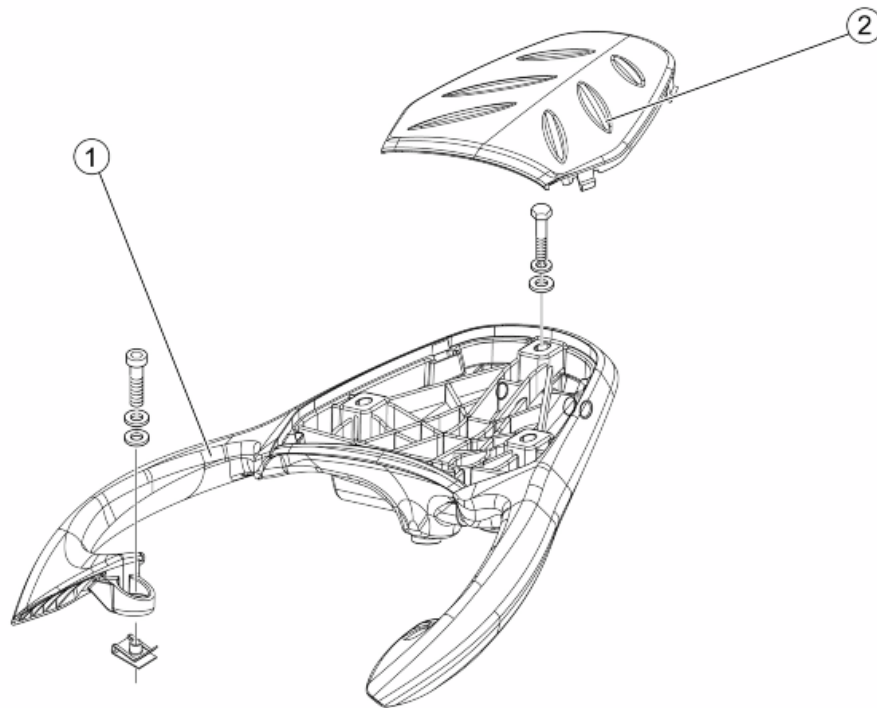
	Code	Action	Duration
1	004003	Saddle - Replacement	
2	004144	Saddle cover - Replacement	

Instrument panel



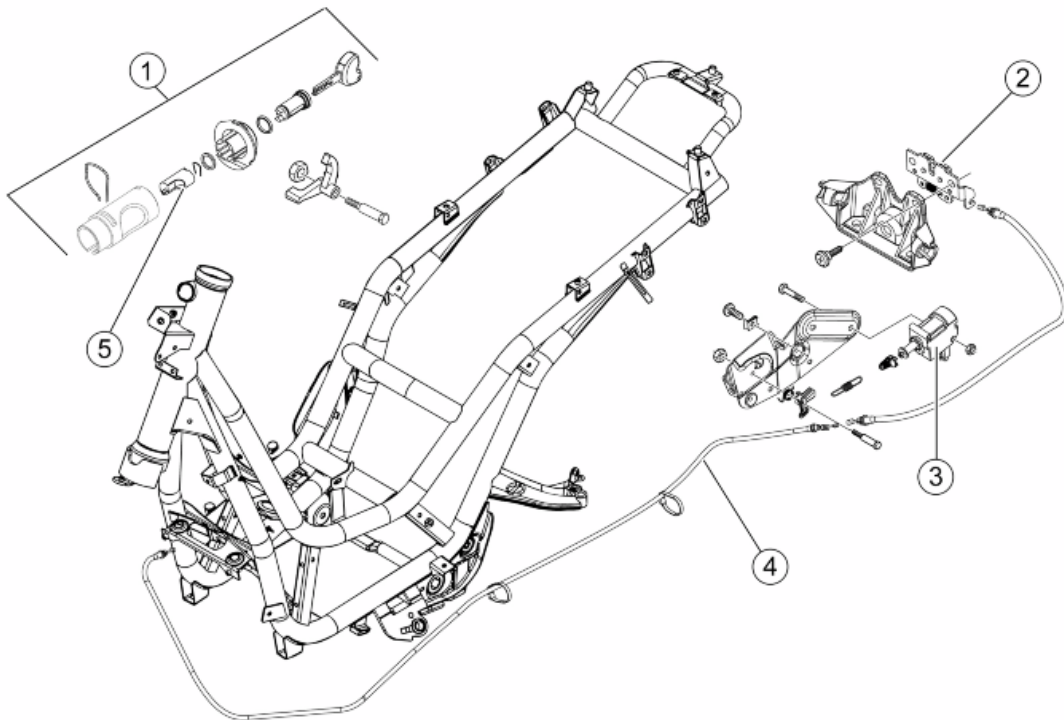
INSTRUMENT PANEL

	Code	Action	Duration
1	005014	Odometer - Replacement	
2	005078	Odometer glass - Replacement	
3	005038	Dashboard warning/telltale lights - Replacement	
4	005076	Clock / Cell - Replacement	

Rear rack**LUGGAGE RACK**

	Code	Action	Duration
1	004008	Luggage rack - Replacement	
2	004062	Luggage rack cover - Replacement	

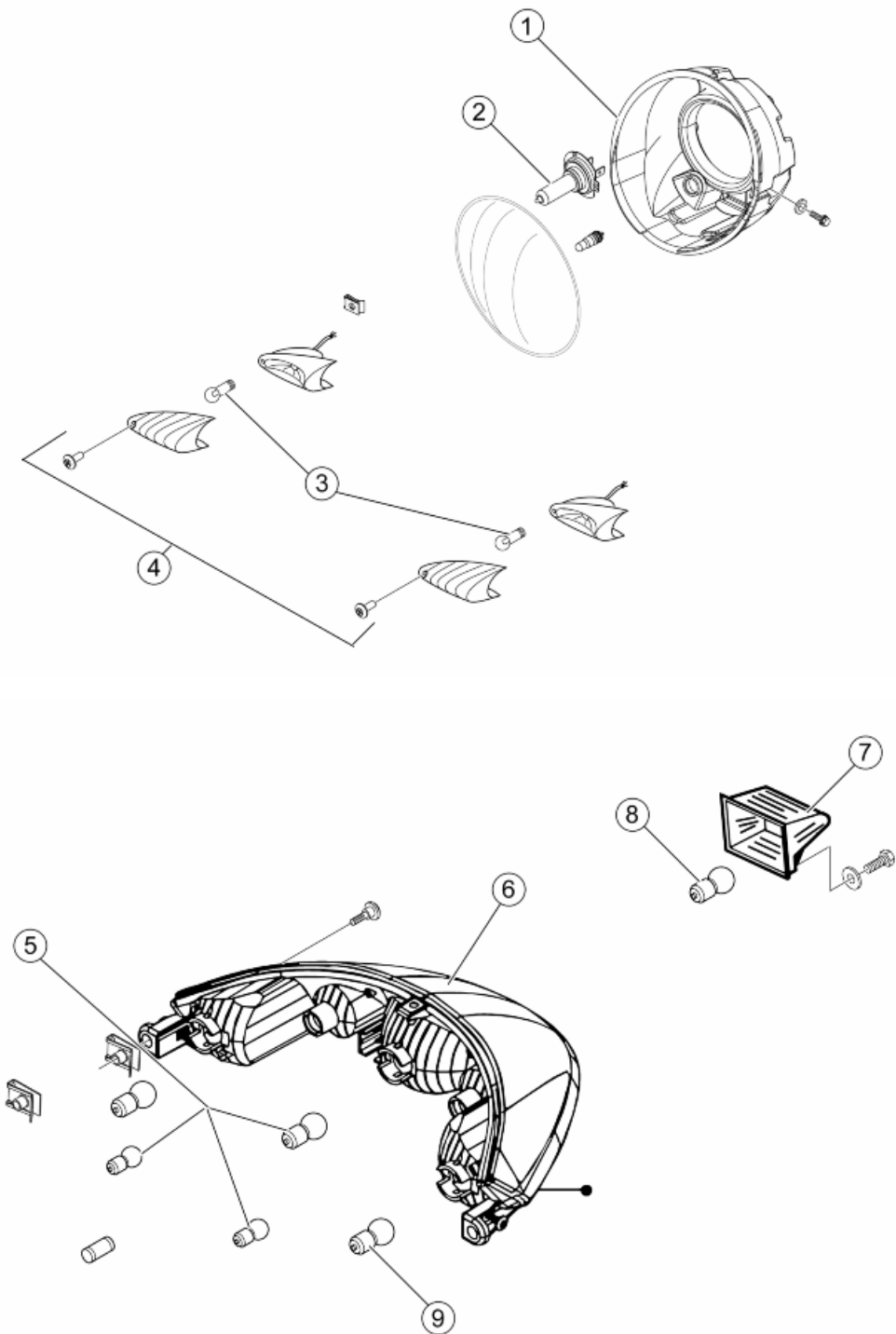
Locks



LOCKS

	Code	Action	Duration
1	004010	Anti-theft lock - Replacement	
2	004054	Saddle lock catch - Replacement	
3	005099	Electric saddle opening device - Replacement	
4	002083	Saddle opening transmission - Replacement	
5	005072	Immobilizer aerial - Replacement	

Turn signal lights

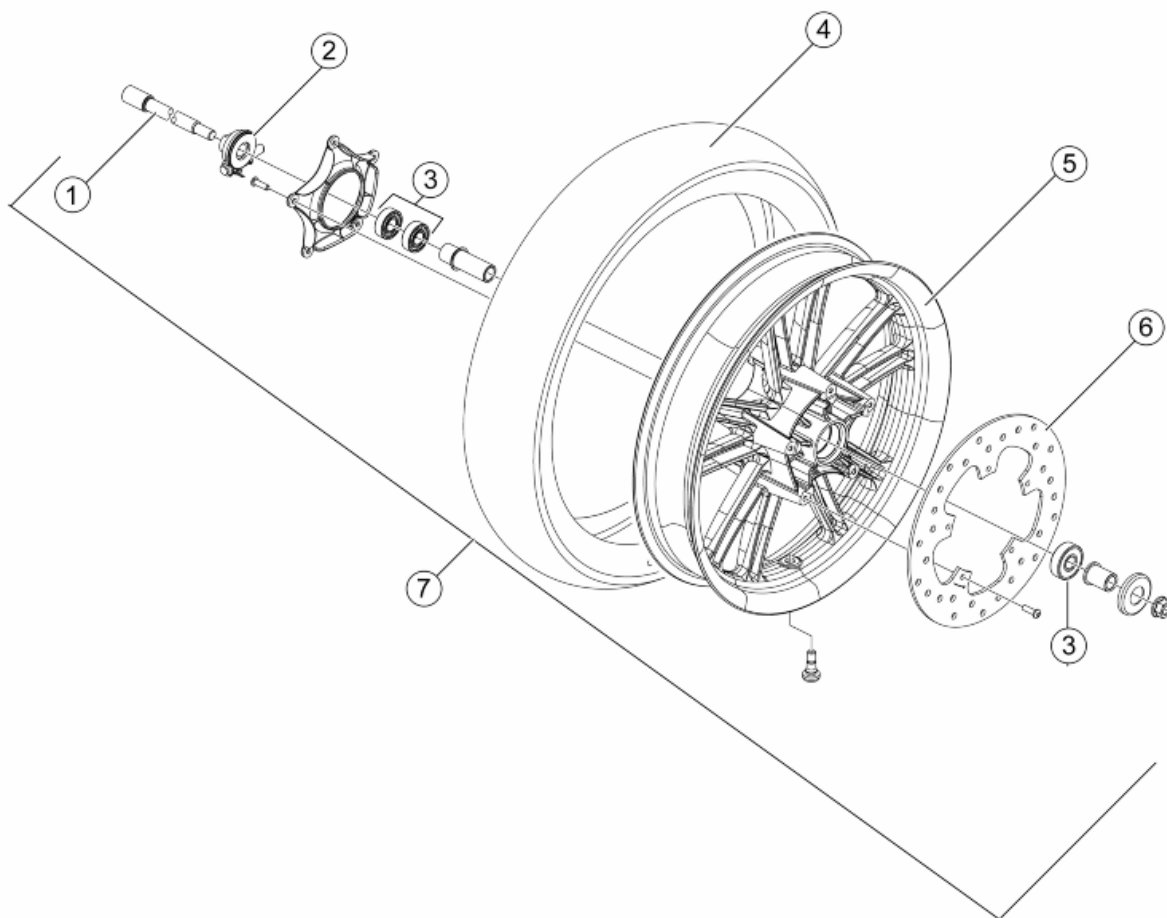


INDICATOR LIGHTS

	Code	Action	Duration
1	005002	Front light - Replacement	
2	005008	Headlight bulbs - Replacement	

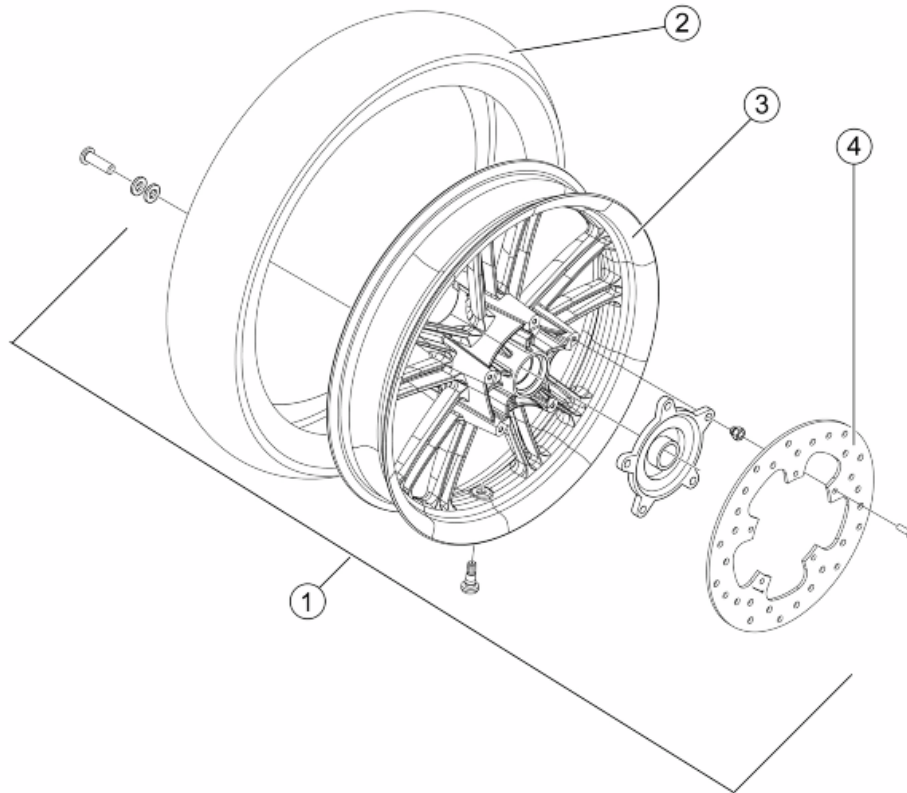
	Code	Action	Duration
3	005067	Front turn indicator bulb - Replacement	
4	005012	Front direction indicators - Replacement	
5	005066	Rear light bulbs - Replacement	
6	005005	Taillight - Replacement	
7	005032	Licence plate light glass - Replacement	
8	005031	Licence plate light bulb - Replacement	
9	005068	Rear turn indicator bulb - Replacement	

Front wheel



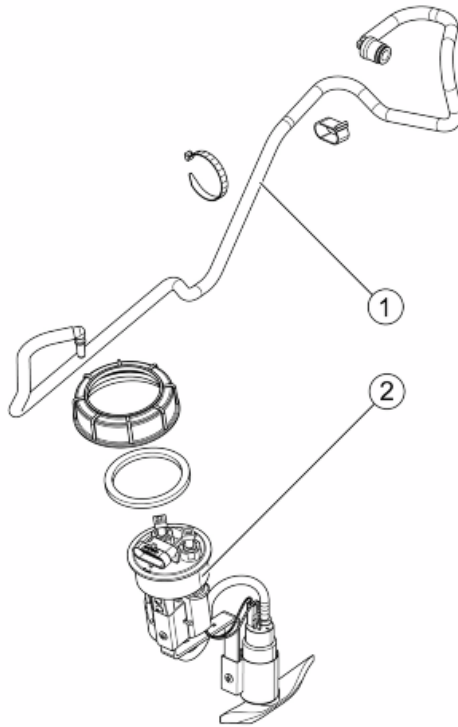
FRONT WHEEL

	Code	Action	Duration
1	003038	Front wheel axle - Replacement	
2	002011	Odometer drive - Replacement	
3	003040	Front wheel bearings - Replacement	
4	003047	Front tyre - replace	
5	003037	Front wheel rim- Replacement	
6	002041	Front brake disc - Replacement	
7	004123	Front wheel - Replacement	

Rear wheel**REAR WHEEL**

	Code	Action	Duration
1	001016	Rear wheel - Replacement	
2	004126	Rear wheel tyre - Replacement	
3	001071	Rear wheel rim - Replacement	
4	002070	Rear brake disc - Replacement	

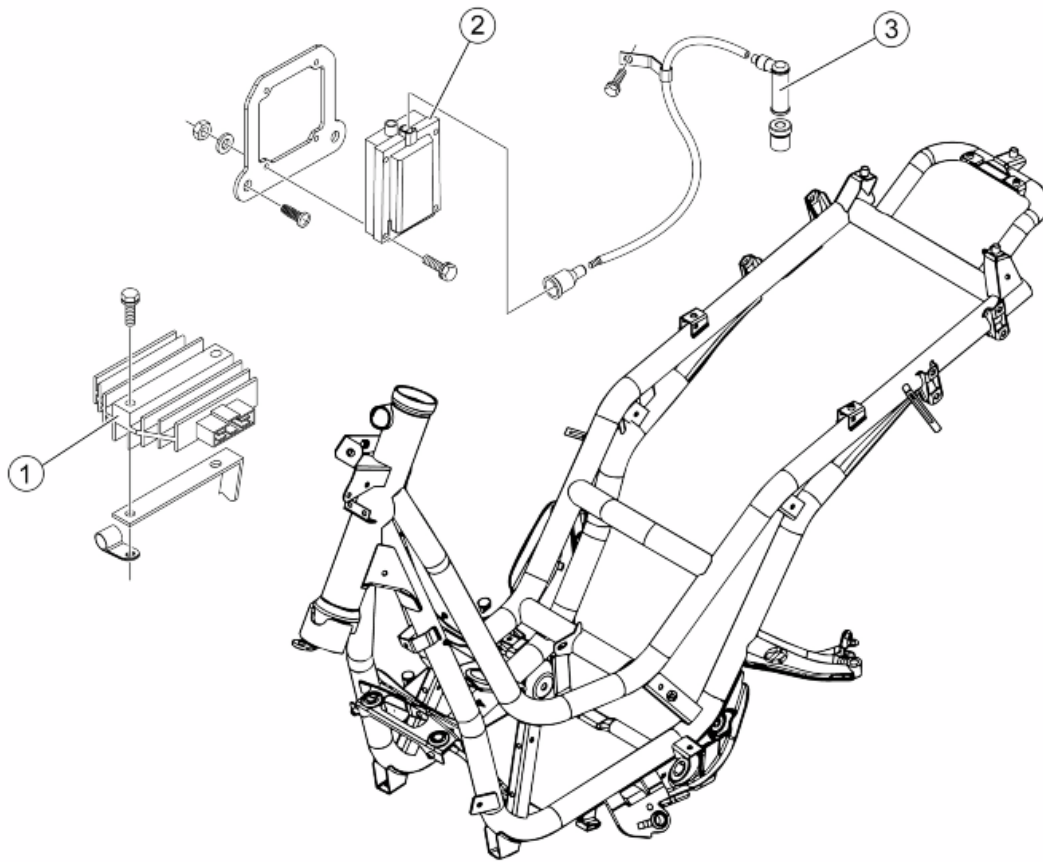
Fuel pump



FUEL PUMP

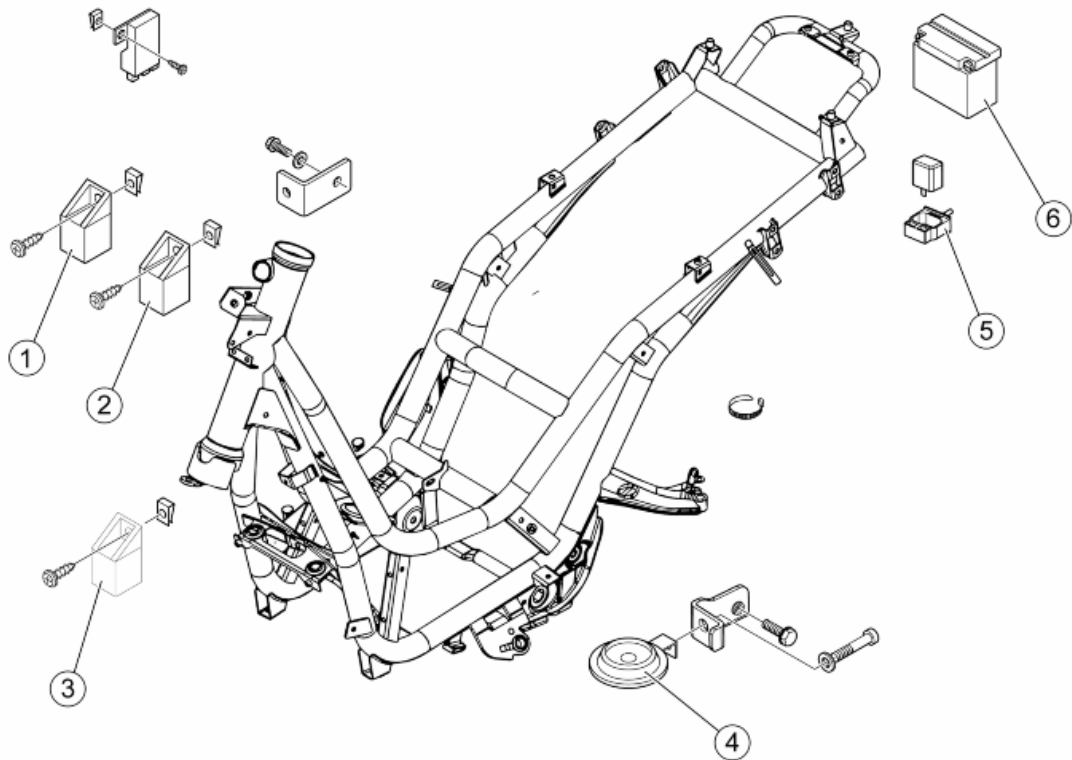
	Code	Action	Duration
1	004073	Fuel pump - Replacement	
2	004137	Injector pump pipe - Replacement	

Electric devices



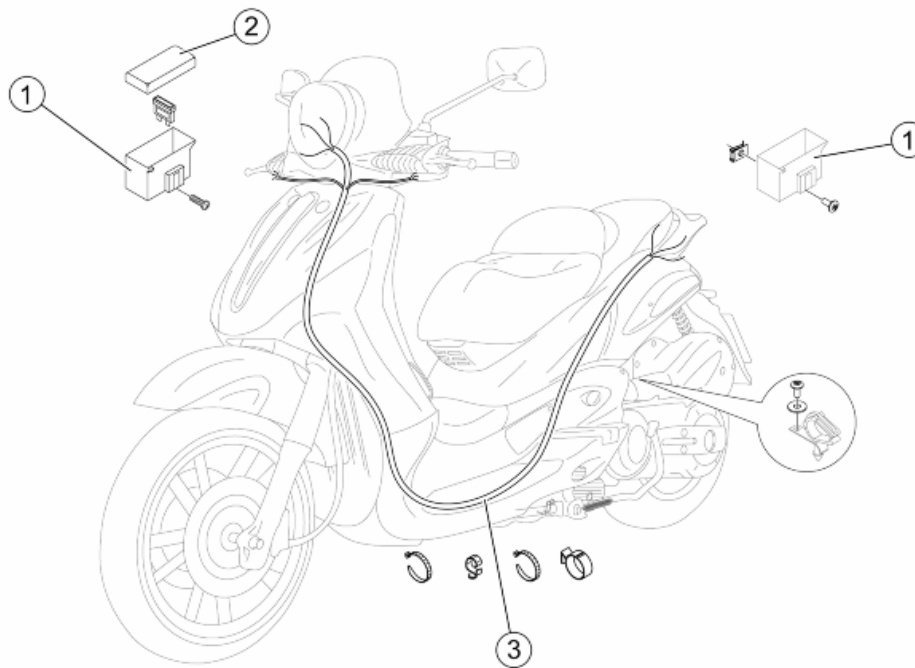
VOLTAGE REGULATOR

	Code	Action	Duration
1	005009	Voltage regulator - Replacement	
2	001069	HV coil - Replacement	
3	001094	Spark plug cap - Replacement	



REMOTE CONTROLS

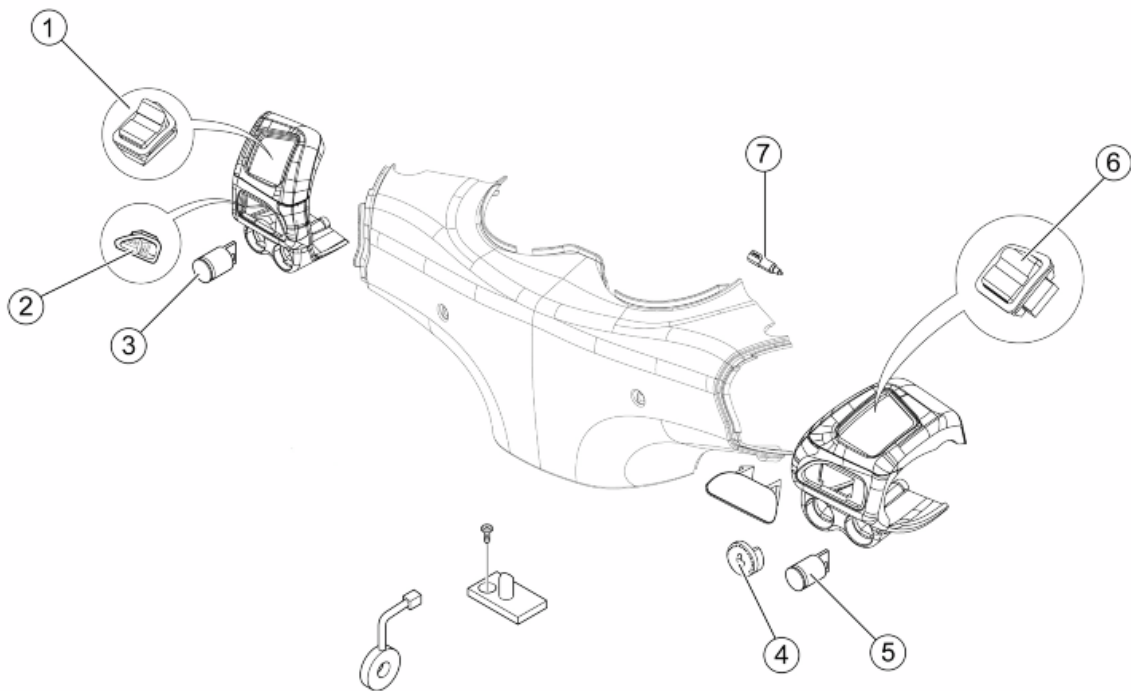
	Code	Action	Duration
1	005035	Headlight remote control - Replacement	
2	005096	Remote control for injection components - Replacement	
3	005117	Electric fan remote control - Replacement	
4	005003	Horn - Replacement	
5	005011	Start-up remote control switch - Replacement	
6	005007	Battery - Replacement	



WIRE UNIT

	Code	Action	Duration
1	005054	Fuse holder - Replacement	
2	005052	Fuse - Replacement	
3	005001	Electrical system - Replacement	

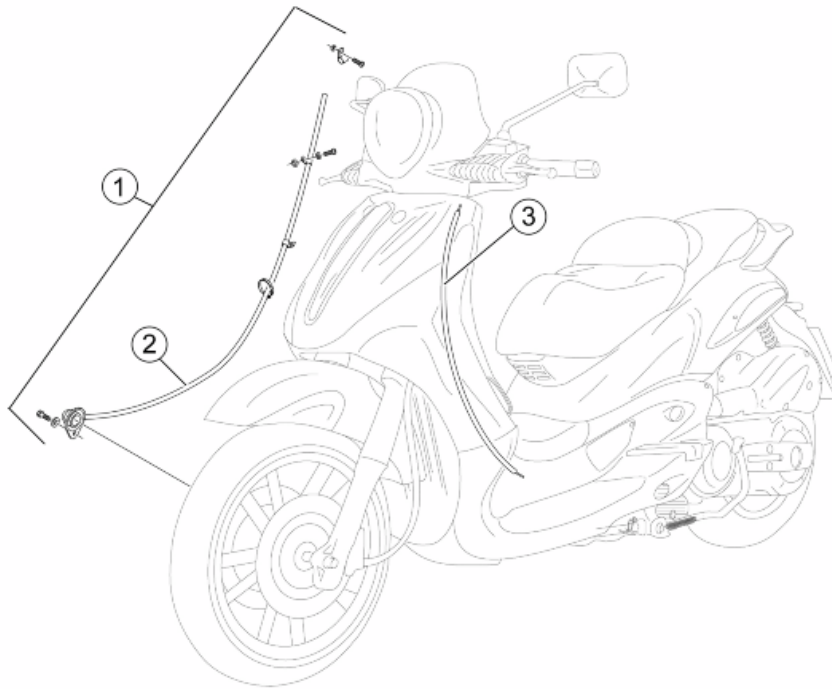
Electronic controls



ELECTRIC CONTROLS

	Code	Action	Duration
1	005039	Headlight switch - Replacement	
2	005006	Light switch or turn indicators - Replacement	
3	005040	Horn button - Replacement	
4	005121	Saddle opening button - Replacement	
5	005041	Starter button - Replacement	
6	005077	Emergency stop switch - Replacement	
7	005017	Stop switch - Replacement	

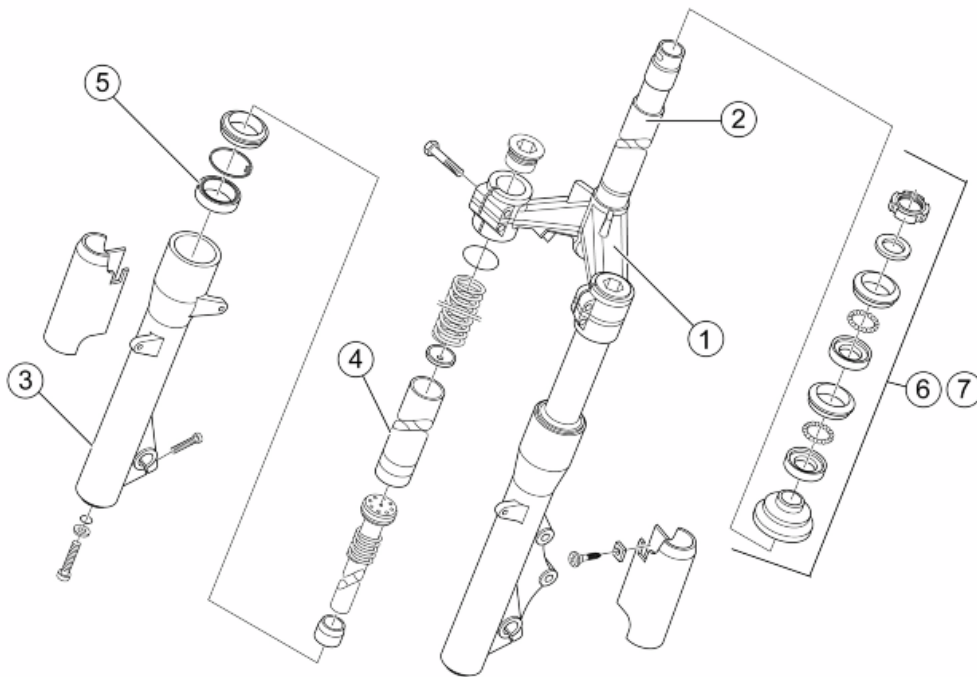
Transmissions



TRANSMISSIONS

	Code	Action	Duration
1	002051	Odometer transmission assembly - Replacement	
2	002049	Odometer cable - Replacement	
3	002082	Fuel tank cap opening drive - Replacement	

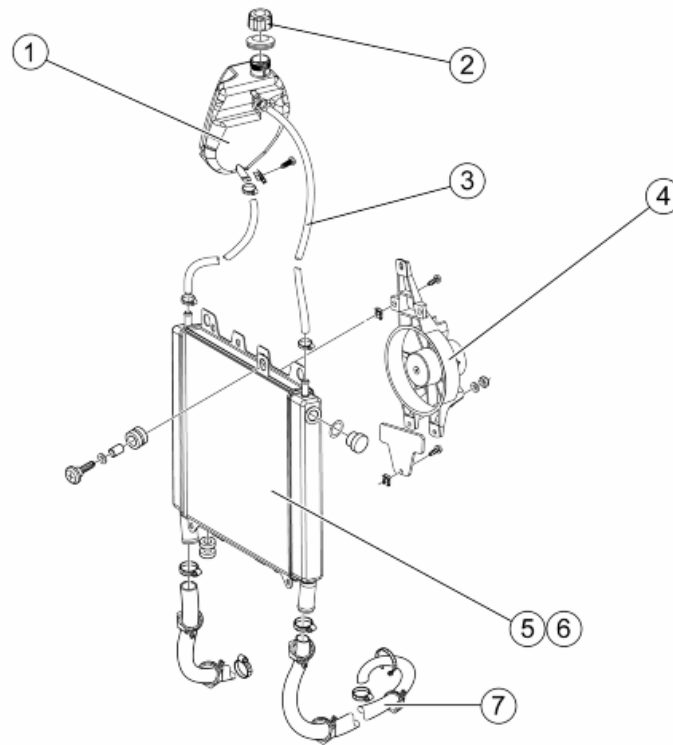
Front suspension



FRONT SUSPENSION

	Code	Action	Duration
1	003051	Complete fork - Replacement	
2	003010	Front suspension - Service	
3	003076	Fork sheath - Replacement	
4	003079	Fork stem - Replacement	
5	003048	Fork oil seal - Replacement	
6	003002	Steering thrust washer - Replacement	
7	003073	Steering clearance - Adjustment	

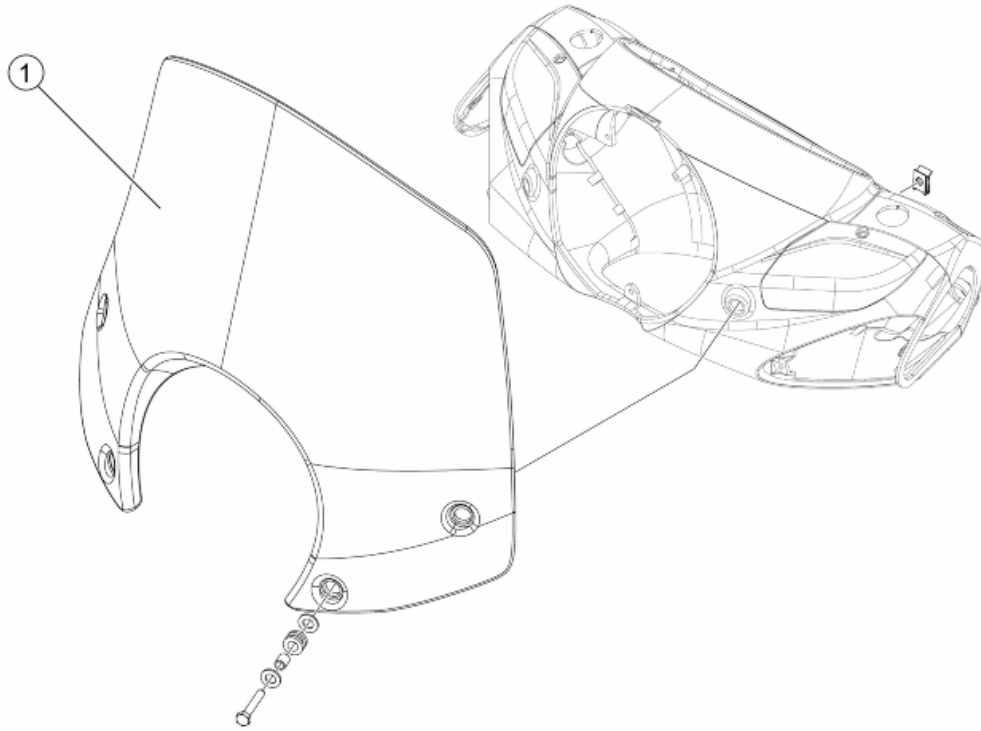
Cooling system



RADIATOR

	Code	Action	Duration
1	007001	Expansion tank - Replacement	
2	007024	Expansion tank cap - Replacement	
3	007013	Expansion tank - radiator connection pipe - Replacement	
4	007016	Fan with support - Replacement	
5	001052	Coolant and air bleed - Replacement	
6	007003	Coolant delivery and return pipe - Replacement	

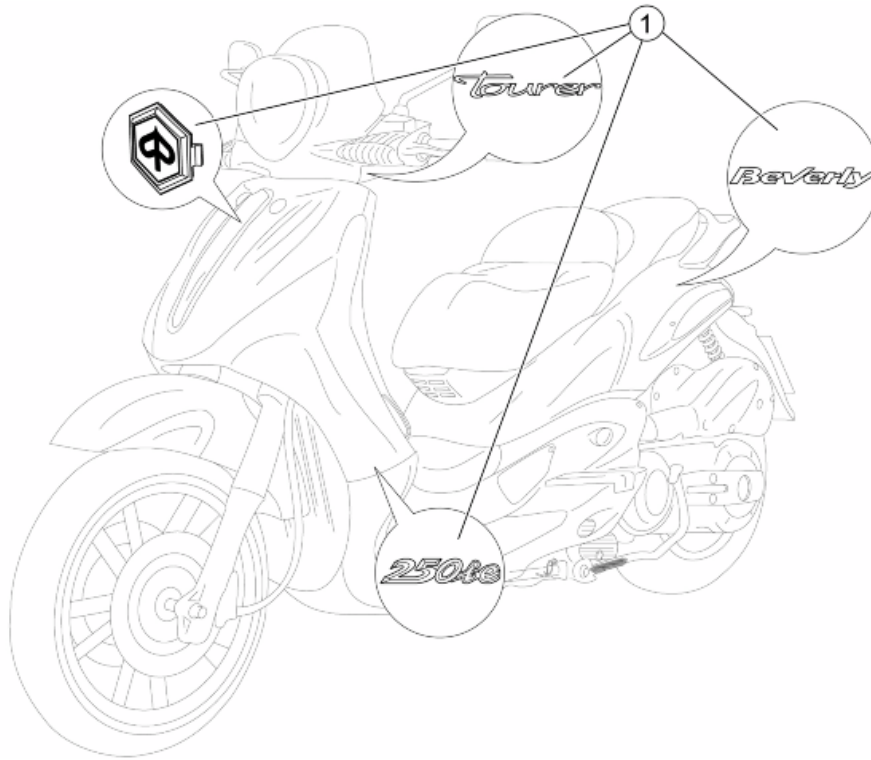
Windscreen



WINDSHIELD

	Code	Action	Duration
1	004028	Windshield glass - Replacement	

Stickers



TRANSFERS

	Code	Action	Duration
1	004159	Plates / Stickers - Replacement	

A

Air filter: 33, 255

B

Battery: 70, 79

Brake: 228–231, 233, 234, 237, 238, 299

Brake fluid: 237

C

Coolant: 189

E

Engine oil: 33

F

Fuel: 167, 175, 257, 294, 307

Fuses: 76

H

Headlight: 39, 248, 250

Horn: 73

Hub oil: 31

I

Identification: 8

Instrument panel: 57, 248, 301

L

Luggage rack:

M

Maintenance: 7, 29

O

Oil filter: 35, 272

S

Saddle:

Shock absorbers: 224

Spark plug: 31, 70

Stand: 226

Start-up:

T

Tank: 257, 294

Transmission: 10, 43, 95, 109, 278

Tyres: 11