
SERVICE STATION MANUAL

**664719 IT-664720 EN-664721 FR-664722 DE-664723
ES-664724 PT-664725 OL-664726 EL**



XEVO 250ie



SERVICE STATION MANUAL

XEVO 250ie

The descriptions and illustrations given in this publication are not binding. While the basic specifications as described and illustrated in this booklet 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 models should be checked at the official Piaggio sales network.

"© Copyright 2008 - 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

XEVO 250ie

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

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

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

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



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



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



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



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

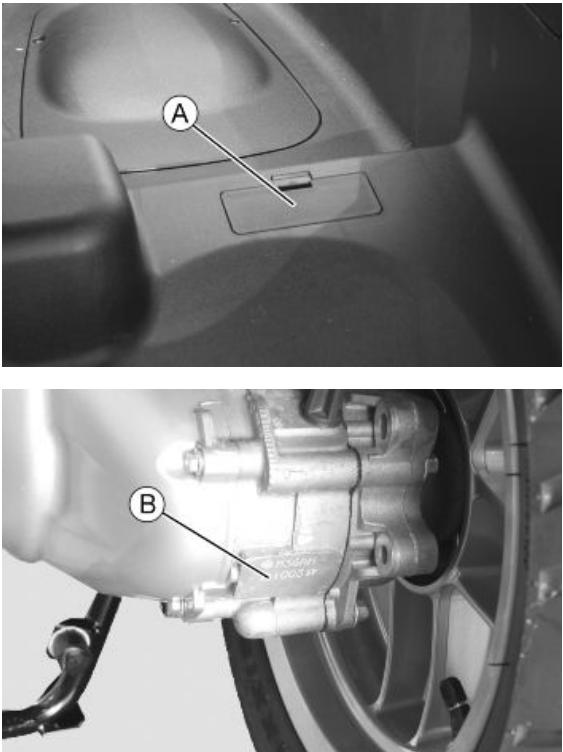
- If work can only be done on the vehicle with the engine running, make sure that the premises are well-ventilated, using special extractors if necessary; never let the engine run in an enclosed area. Exhaust fumes are toxic.
 - The battery electrolyte contains sulphuric acid. Protect your eyes, clothes 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 spare parts may damage the vehicle.
 - Use only the appropriate tools designed for this vehicle.
 - Always use new gaskets, sealing rings and split pins upon refitting.
 - After removal, clean the components using non-flammable or low flash-point solvents. Lubricate all the work surfaces, except tapered couplings, before refitting these parts.
 - After refitting, make sure that all the components have been installed correctly and work properly.
 - For removal, overhaul and refit operations use only tools with metric measures. Metric bolts, nuts and screws are not interchangeable with coupling members with English measurement. Using unsuitable coupling members and tools may damage the 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

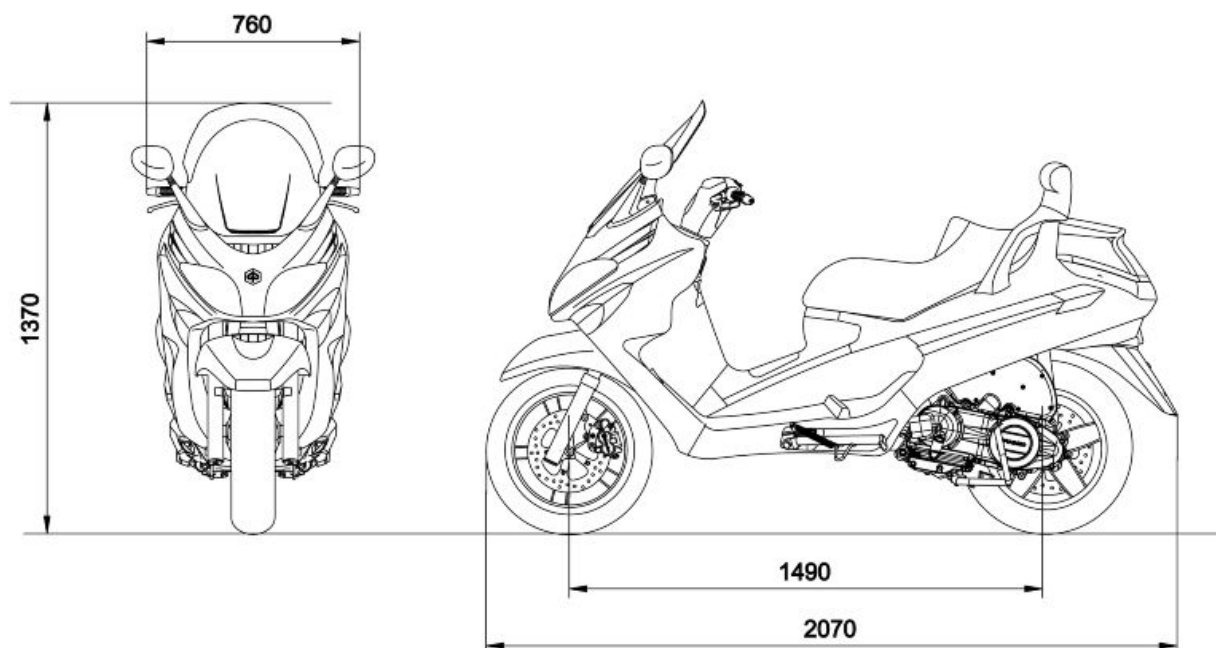
Frame Prefix M36401
Engine Prefix M36AM



Dimensions and mass

WEIGHTS AND DIMENSIONS

Specification	Desc./Quantity
Kerb weight	171 ± 5 kg
Maximum weight allowed	360 kg
Height	1370 mm
Width (handlebar)	760 mm
Wheelbase	1490 mm
Overall length	2070 mm



Engine

ENGINE

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	16.0 Nm at 8,500 rpm
Max. Torque	20.5 Nm at 6,750 rpm
LUBRICATION	Engine lubrication with lobe pump (inside crankcase) controlled by a chain and 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)
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.

Specification	Desc./Quantity
Final reduction	Gear reduction unit in oil bath.

Capacities

CAPACITY

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

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

FRAME AND SUSPENSIONS

Specification	Desc./Quantity
Chassis	Tubular and sheet steel.
Front suspension	Hydraulic telescopic fork with Ø 35-mm stem
Front suspension travel	90 mm
Rear suspension	Two double-acting shock absorbers, adjustable to four positions at preloading.
Rear suspension travel	90 mm

Brakes

BRAKES

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

Wheels and tyres

WHEELS AND TYRES

Specification	Desc./Quantity
Wheel rim type	Light alloy rims.
Front rim	14" x 3.50
Rear rim	12" x 3.00
Front tyre	Tubeless 120/70 - 14" 55P

Specification	Desc./Quantity
Rear tyre	Tubeless 130/70 12" 62P
Front tyre pressure (with passenger)	2 bar (-)
Rear tyre pressure (with passenger)	2 bar (2.6 bar)

N.B.

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

Tightening Torques

STEERING

Name	Torque in Nm
Upper steering ring nut	30 ÷ 33
Steering lower ring nut	10 ÷ 13 then loosen by 90°
Handlebar fixing screw	50 ÷ 55
Fixing screws for the handlebar control unit U-bolts	7 ÷ 10

STEERING (VERSION WITH FIFTH WHEEL)

Name	Torque in Nm
Upper steering ring nut	40 ÷ 45
Steering lower ring nut	10 ÷ 12

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

CHASSIS

Product	Description	Specifications
(°) Loctite 243	Medium-strength threadlock	Apply LOCTITE 243 medium-strength threadlock

FRONT SUSPENSION

Name	Torque in Nm
Fork leg screw	6 ÷ 7
Front wheel axle	45 ÷ 50
Fork plate screw	25 ÷ 34

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
Muffler arm clamping screws	27 ÷ 30

FRONT BRAKE

Name	Torque in Nm
Oil bleed screw	8 ÷ 12
Disc tightening screw (°)	5 ÷ 6
Brake fluid pipe-calliper fitting	16 ÷ 20
Brake fluid pump-hose fitting	16 ÷ 20
Tightening screw for calliper support to the fork	45 ÷ 55

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

REAR BRAKE

Product	Description	Specifications
(°) Loctite 243	Medium-strength threadlock	Apply LOCTITE 243 medium-strength threadlock

MUFFLER

Name	Torque in Nm
Muffler heat guard fixing screw	4 ÷ 5
Screw for fixing muffler to the support arm	20 ÷ 25
Lambda probe tightening on exhaust manifold	40 ÷ 50
Exhaust manifold-muffler joint tightening	12÷13
Manifold - muffler diaphragm tightening clamp	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 the crankcase	5 ÷ 6
Oil pump command 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 adjustment check nut	6 ÷ 8
Inlet manifold screws	11 ÷ 13
Timing chain tensioner slider screw	10 ÷ 14
Start up counterweight 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
Rear hub cap screws	24 ÷ 27

FLYWHEEL

Name	Torque in Nm
Flywheel cover screw	11 ÷ 13

Name	Torque in Nm
Stator assembly screws	3 ÷ 4 (Apply LOCTITE 242 medium-strength threadlock)
Flywheel nut	94 ÷ 102
Pick-up fixing 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 screws	11 ÷ 13
Crankcase timing cover screws	3.5 ÷ 4.5 (Apply LOCTITE 242 medium-strength threadlock)

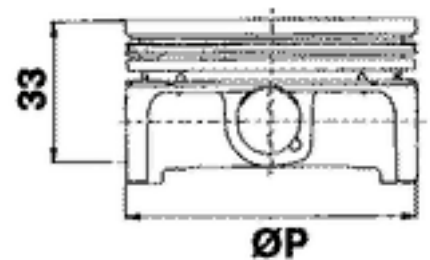
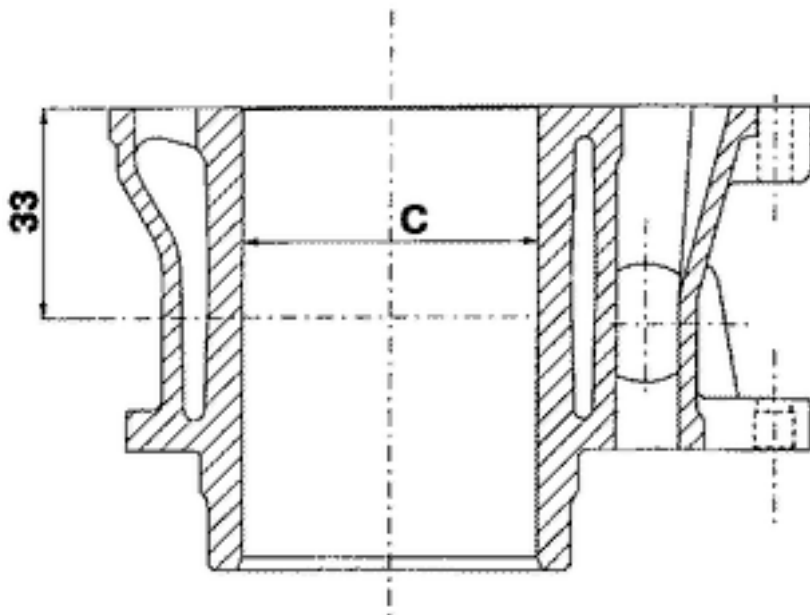
COOLING

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

Overhaul data

Assembly clearances

Cylinder - piston assy.



ENGINE COUPLING CATEGORY

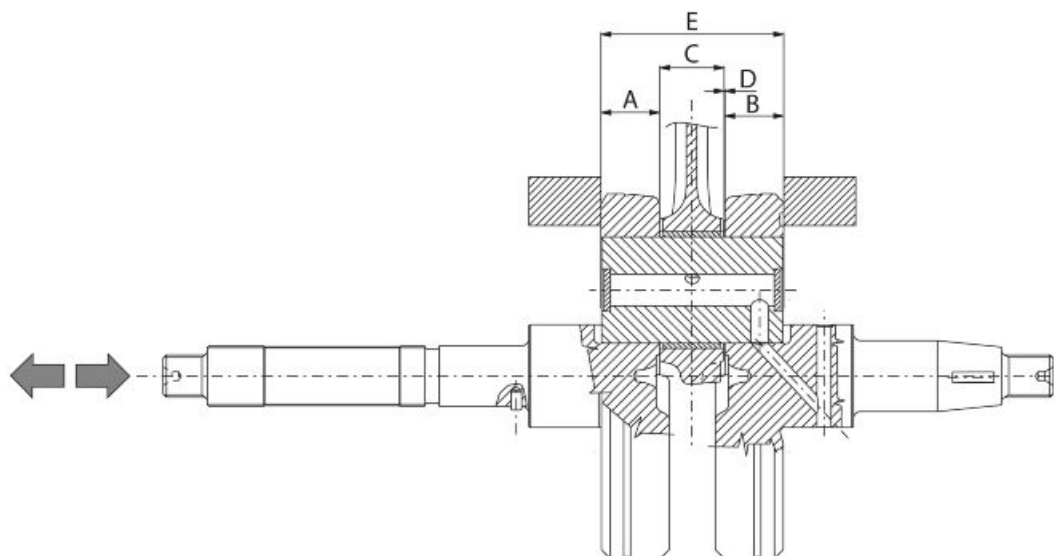
Name	Initials	Cylinder	Piston	Play on fitting
Cylinder	M	72.01 ÷ 72.017	71.953 ÷ 71.960	0.050 - 0.064
Cylinder	N	72.017 - 72.024	71.960 ÷ 71.967	0,050 - 0,064
Piston	O	72.024 ÷ 72.031	71.967 ÷ 71.974	0,050 - 0,064
Piston	P	72.031 ÷ 72.038	71.974 ÷ 71.981	0,050 - 0,064

Crankcase - crankshaft - connecting rod

CRANKSHAFT

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

Crankshaft to connecting rod axial clearance



CRANKSHAFT/ CRANKCASE AXIAL CLEARANCE

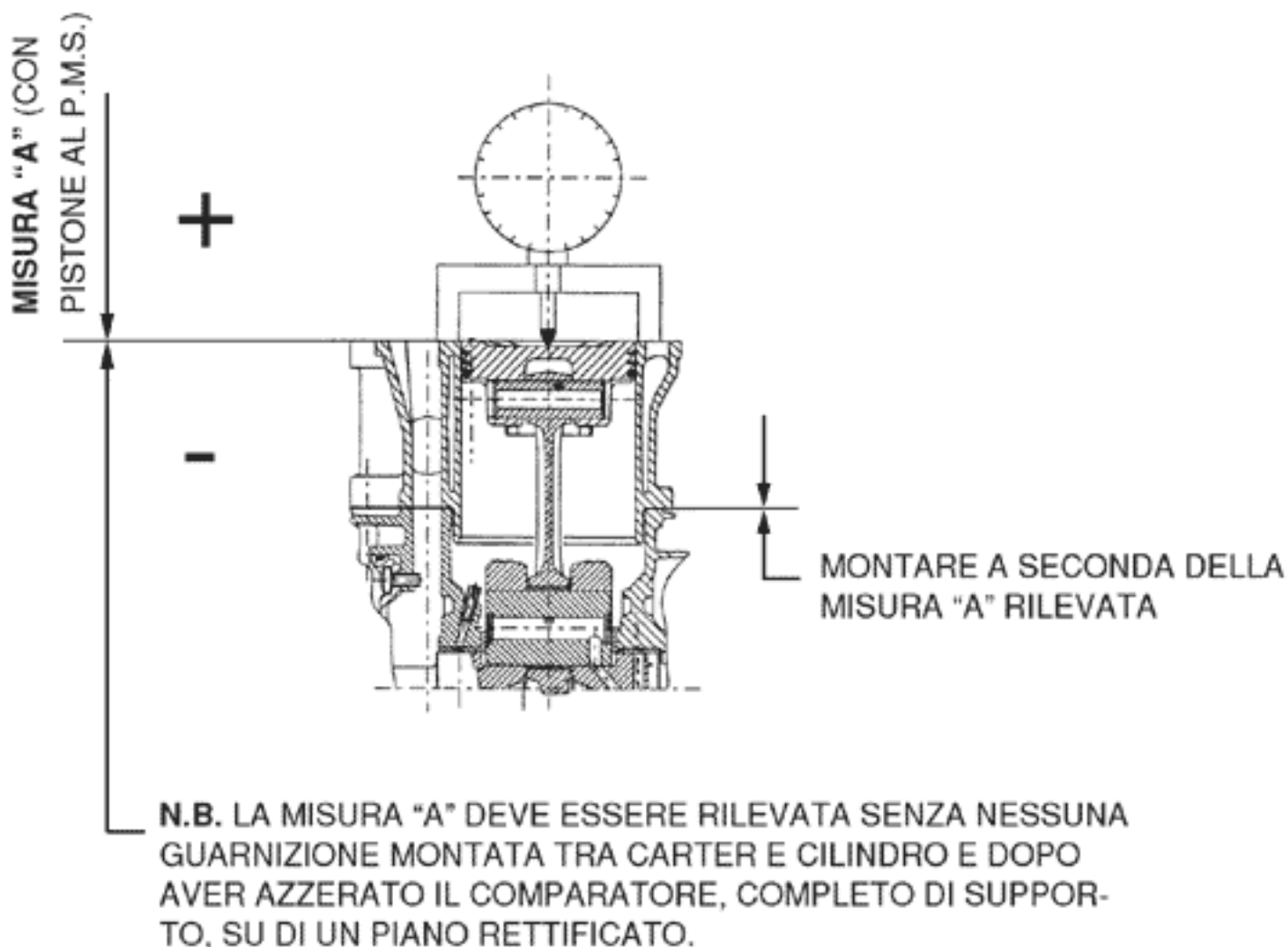
Name	Description	Dimensions	Initials	Quantity
Half-shaft, transmission side		16.6 +0-0.05	A	D = 0.20 ÷ 0.50
Flywheel-side half shaft		16.6 +0-0.05	B	D = 0.20 ÷ 0.50
Connecting rod		18 -0.10 -0.15	C	D = 0.20 ÷ 0.50
Spacer tool		51.4 +0.05	E	D = 0.20 ÷ 0.50

Slot packing system

Characteristic

Compression ratio

10.5 ÷ 11.5 : 1



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

N.B.

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

ENGINE 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

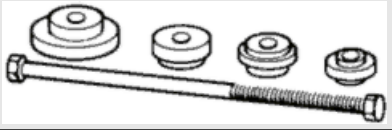
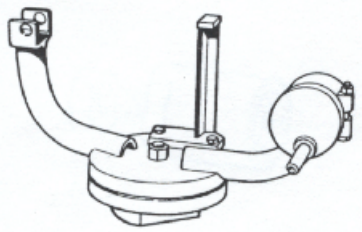
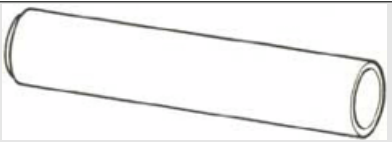
Product	Description	Specifications
AGIP ROTRA 80W-90	Rear hub oil	SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications
AGIP CITY HI TEC 4T	Oil to lubricate flexible transmissions (throttle control)	Oil for 4-stroke engines
AGIP FILTER OIL	Oil for air filter sponge	Mineral oil with specific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

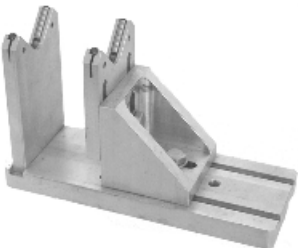
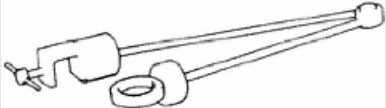
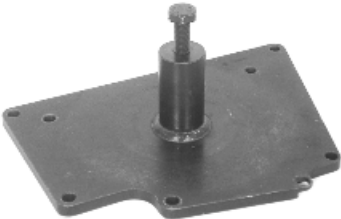
INDEX OF TOPICS

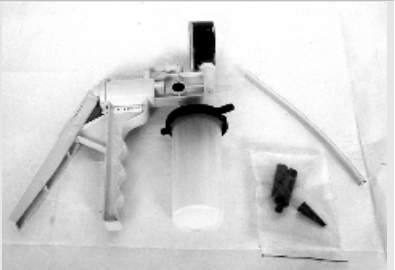
TOOLING

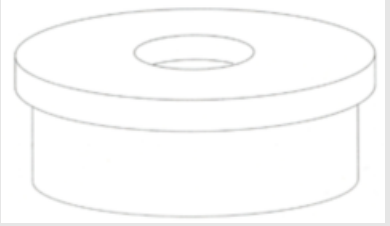
TOOL

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	

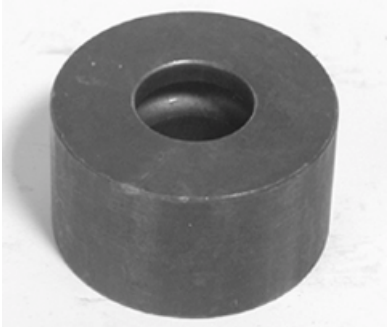
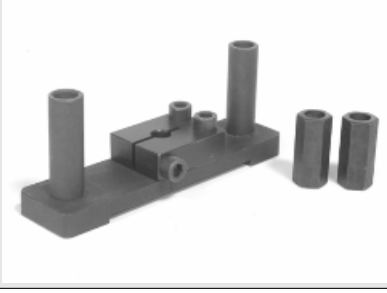
Stores code	Description	
020074Y	Support base for checking crankshaft alignment	
020150Y	Air heater support	
020151Y	Air heater	
020193Y	Oil pressure check gauge	
020262Y	Crankcase splitting plate	
020263Y	Driven pulley assembly sheath	

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 rpm indicator	

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

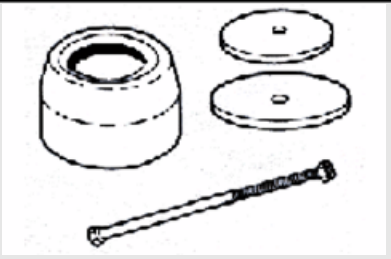
Stores code	Description	
020375Y	28 x 30 mm adaptor	
020376Y	Adaptor handle	
020382Y	Valve cotters equipped with part 012 removal tool	
020382Y011	adapter for valve removal tool	
020393Y	Piston assembly band	
020412Y	15-mm guide	

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

Stores code	Description	
020456Y	Ø 24 mm adaptor	
020477Y	37 mm adaptor	
020483Y	30-mm guide	
020489Y	Hub cover support stud bolt 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	Bearing housing, outside ø 47 mm	
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 diagnostic tester	
020487Y	Fork oil seal extractor	
020458Y	Puller for lower bearing on steering tube	

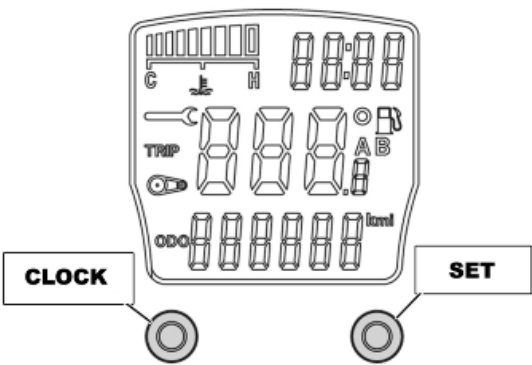
INDEX OF TOPICS

MAINTENANCE

MAIN

Follow these steps to reset the service icons:

- 1. With the key set to OFF, hold down the "SET" button and turn the key to ON : the "BELT" and "SERVICE" icons start flashing.
- 2. Push the "CLOCK" button for less than 1 second and the icons are displayed sequentially. The icon selected remains ON and the other is no longer displayed.
- 3. Press the "CLOCK" button again for more than 3 seconds to reset the relative maintenance step and the icon is no longer displayed.



Maintenance chart

EVERY 2 YEARS

60'

Action
Coolant - change
Brake fluid - change

AFTER 1,000 KM

60'

Action
Safety locks - check
Throttle lever - adjustment
Engine oil - change
Electrical system and battery - check
Coolant level - check
Brake fluid level - check
Engine oil - replacement
Brake pads - check condition and wear
Tyre pressure and wear - check
Vehicle and brake test - road test
Hub oil - change
Steering - Check

AFTER 5,000 KM; 25,000 KM; 35,000 KM; 55,000 KM; 65,000 KM

10'

Action
Engine oil - level check/ top-up
Brake pads - check condition and wear

AFTER 10,000 KM; 50,000 KM; 70,000 KM

Action
Driven pulley roller casing - Greasing
Safety locks - check
Driving belt - Check
Throttle lever - adjustment
Air filter - clean
Engine oil - change

Action

Electrical system and battery - check
Coolant level - check
Brake fluid level - check
Engine oil - replacement
Brake pads - check condition and wear
Sliding block / variable speed rollers - change
Tyre pressure and wear - check
Vehicle and brake test - road test
Hub oil - check
Suspensions - check
Steering - Check

AFTER 15,000 KM; 45,000 KM; 75,000 KM

45'

Action

Engine oil - level check/ top-up
Brake pads - check condition and wear

AFTER 20,000 KM; 40,000 KM; 80,000 KM

150'

Action

Spark plug - replacement
Driving belt - replacement
Throttle lever - adjustment
Air filter - clean
Engine oil - change
Valve clearance - check
Electrical system and battery - check
Coolant level - check
Brake fluid level - check
Engine oil - replacement
Brake pads - check condition and wear
Sliding block / variable speed rollers - change
Tyre pressure and wear - check
Vehicle and brake test - road test
Hub oil - change
Suspensions - check
Steering - Check

30,000 KM

140'

Action

Safety locks - check
Throttle lever - adjustment
Air filter - cleaning
Engine oil - change
Electrical system and battery - check
Coolant level - check
Brake fluid level - check
Engine oil - replacement
Hub oil - check
Brake pads - check condition and wear
Sliding block / variable speed rollers - change
Tyre pressure and wear - check
Vehicle and brake test - road test
Suspensions - check
Steering - Check

60,000 KM

190'

Action

Spark plug - replacement

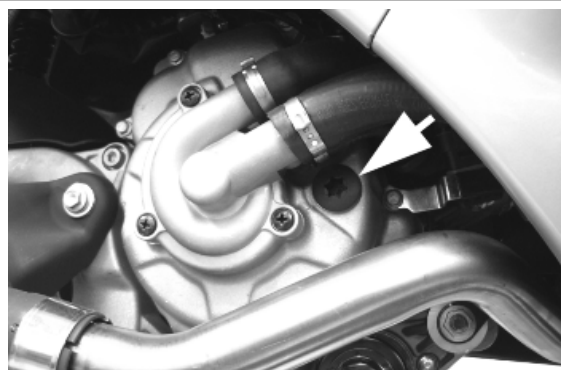
Action
Driving belt - replacement
Throttle lever - adjustment
Air filter - cleaning
Engine oil - change
Valve clearance - check
Electrical system and battery - check
Coolant level - check
Brake fluid level - check
Engine oil - replacement
Hub oil - change
Brake pads - check condition and wear
Sliding block / variable speed rollers - change
Tyre pressure and wear - check
Vehicle and brake test - road test
Suspensions - check
Steering - Check

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 declare the reference values based on the engine rpm. The ignition timing value is detectable any time using the diagnostic tester. It is possible to check whether the ignition advance determined by the system does in fact correspond with the value actually activated on the engine, by means of the stroboscopic light.

Proceed as follows:

- Remove the spark plug.
- Remove the transmission crankcase.
- Rotate the driving pulley fan until the reference marks between the flywheel and flywheel cover coincide as shown in the photograph.
- Bring the reference mark onto the transmission side between the fan and the transmission cover as shown in the 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 calliper on the spark gap cable respecting the proper polarity (the arrow on the calliper 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:

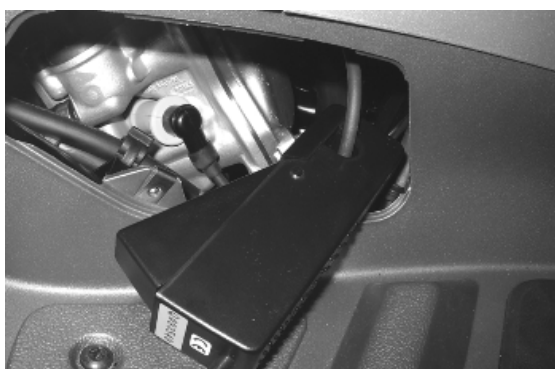
- distribution timing
- revolution-timing sensor
- Injection control unit

Specific tooling

020460Y Scooter diagnosis and tester

020330Y Stroboscopic light to check timing

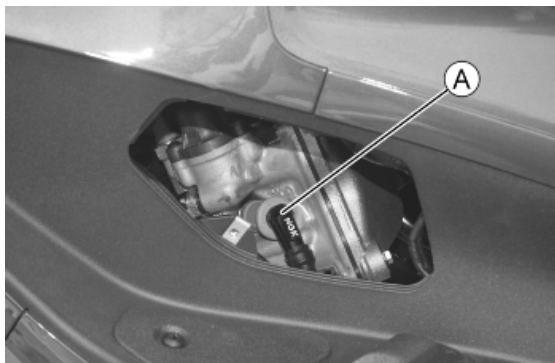
020621Y HV cable extraction adaptor



Spark plug

Proceed as follows:

1. Remove the access cover over the spark plug on the right-hand side of the scooter, reach the spark plug and slide it off with your hand;
2. Disconnect spark plug HV wire cap «A»;
3. Unscrew the spark plug using the wrench supplied;
4. Upon refitting, place the spark plug into the hole at the required angle and tighten it by hand.
5. Use the wrench only to tighten it;
6. Push cap «A » fully over the spark plug.



N.B.

USING SPARK PLUGS OTHER THAN THE INDICATED TYPE OR SHIELDLESS SPARK PLUG CAPS CAN CAUSE ELECTRICAL SYSTEM FAILURES.

WARNING



THE SPARK PLUG MUST BE REMOVED WHEN THE ENGINE IS COLD. CHECK THE SPARK PLUG AS INDICATED IN THE SCHEDULED MAINTENANCE TABLE. USING NON-COMPLYING ELECTRONIC CENTRAL UNITS AND ELECTRONIC IGNITIONS OR SPARK PLUGS OTHER THAN THOSE PRESCRIBED MAY SERIOUSLY DAMAGE THE ENGINE. IF THE SPARK PLUG IS REMOVED AFTER A FLOODED ENGINE (EXCESSIVE FUEL EXPULSION IN THE «SAFE RIDING» SECTION), KEEP THE TUBE CONNECTED TO THE SPARK PLUG AND THE LATTER IN CONTACT WITH A GROUND POINT FAR FROM THE SPARK PLUG HOLE ITSELF IN ORDER TO AVOID THE EXPELLED FUEL FROM CATCHING FIRE.

Characteristic

Spark plug

CHAMPION RG 4 PHP

Electrode gap

0.7-0.8 mm

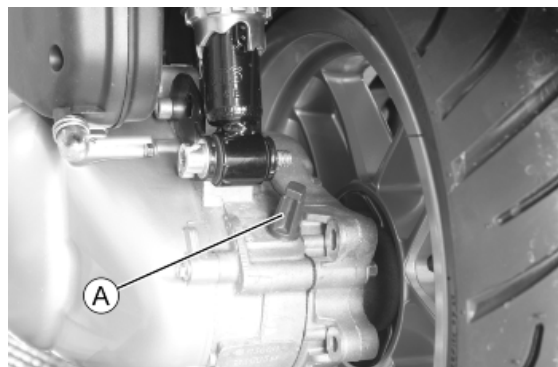
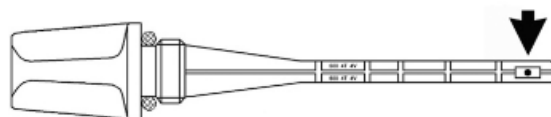
Hub oil

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 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

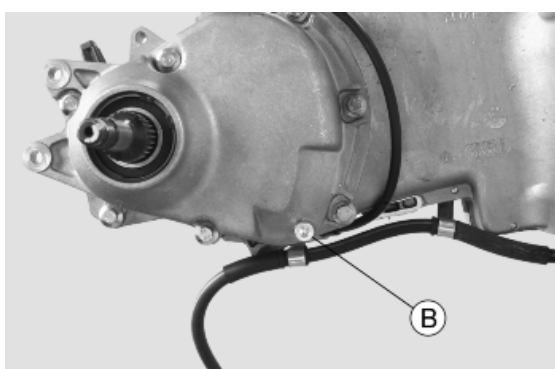
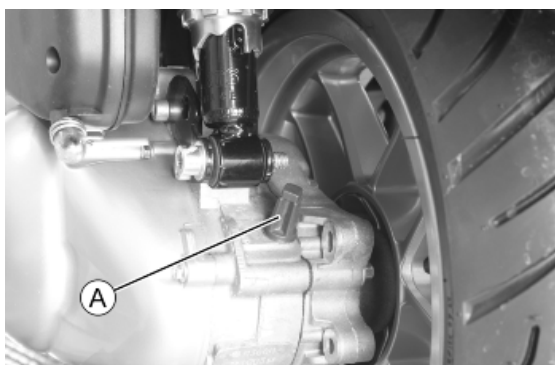
Characteristic

Transmission oil

250 cm³

Locking torques (N*m)

Hub oil drainage screw 15 ÷ 17 Nm



Air filter

- Remove the two knob screws «A».
- Undo the six fixing screws «B», remove the air cleaner cover then take out the filtering element.
- Wash with water and neutral soap.
- Dry with a clean cloth and short blasts of compressed air.
- Impregnate with a 50 % mixture of petrol and recommended oil.
- Drip dry the filtering element and then squeeze it with your hands without wringing.

CAUTION

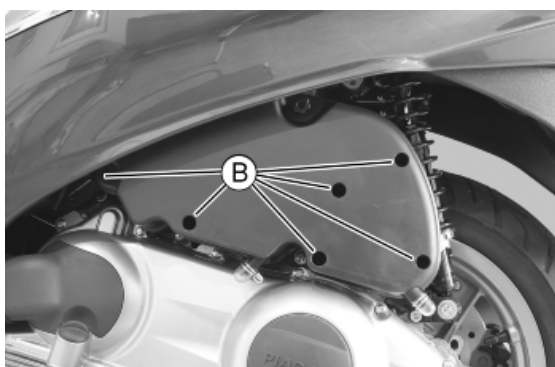
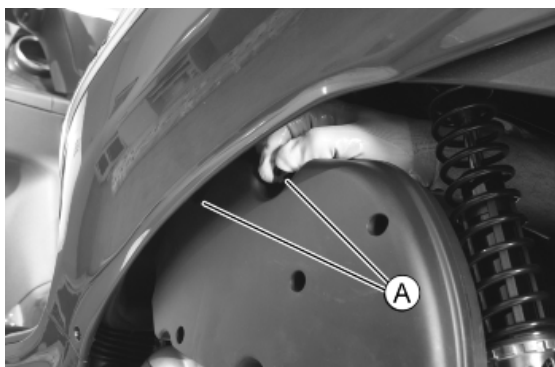
NEVER RUN THE ENGINE WITHOUT THE AIR FILTER, THIS WOULD RESULT IN AN EXCESSIVE WEAR OF THE PISTON AND CYLINDER.

CAUTION

WHEN TRAVELLING ON DUSTY ROADS, THE AIR FILTER MUST BE CLEANED MORE OFTEN THAN SHOWN IN THE SCHEDULED MAINTENANCE CHART.

Recommended products

AGIP FILTER OIL Oil for air filter sponge



Mineral oil with specific additives for increased adhesiveness

Engine oil

In 4T engines, engine oil is used to lubricate the distribution elements, main bearings and thermal group. **An insufficient quantity of oil can seriously damage the engine.** In all four-stroke engines, a loss of efficiency in oil performance and certain consumption should be considered normal. Consumption can particularly reflect the conditions of use (i.e. when driving at 'full acceleration' all the time, oil consumption increases). The replacement intervals provided for by the maintenance programme are defined depending on the total content of oil in the engine and the average consumption measured following standardised methods. **In order to prevent any problems, we recommend checking oil level more frequently than indicated in the Scheduled Maintenance table or before setting off on long journeys. The vehicle is, however, equipped with an oil pressure warning light on the instrument panel.**

Replacement

Replace oil and filter as indicated in the scheduled maintenance table. The engine must be emptied by draining the oil through the drainage plug «B» of the mesh pre-filter, flywheel side. furthermore, to facilitate oil drainage, loosen the cap/dipstick «A». Once all the oil has drained through the drainage opening, unscrew and remove the oil cartridge filter «C».

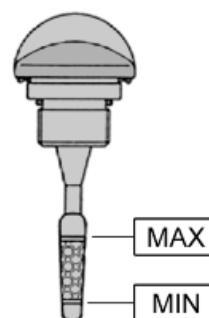
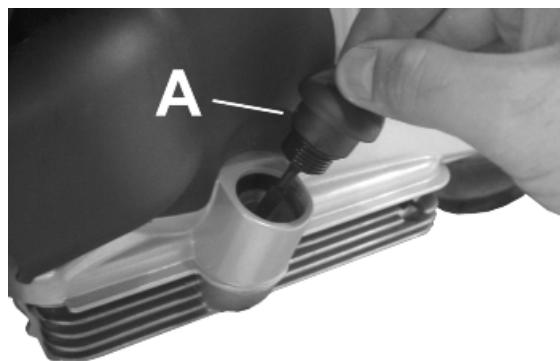
Make sure the pre-filter and discharge tap O-rings are in good condition.

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.

Since a certain quantity of oil still remains in the circuit, engine oil must be added through the plug «A». Then start up the scooter, leave it running for a few minutes and switch 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. Use new oil of the recommended type for topping up and changing purposes.

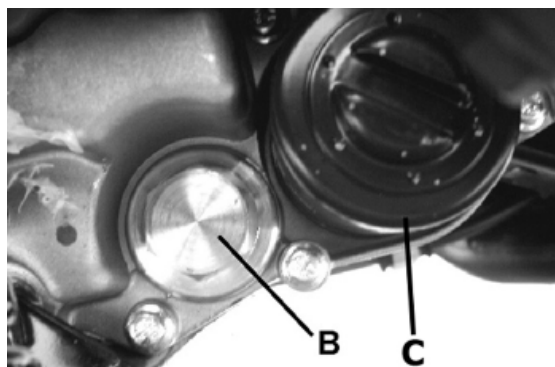
N.B.

THE ENGINE MUST BE HOT WHEN THE OIL IS CHANGED.

Recommended products

AGIP CITY HI TEC 4T Engine oil

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

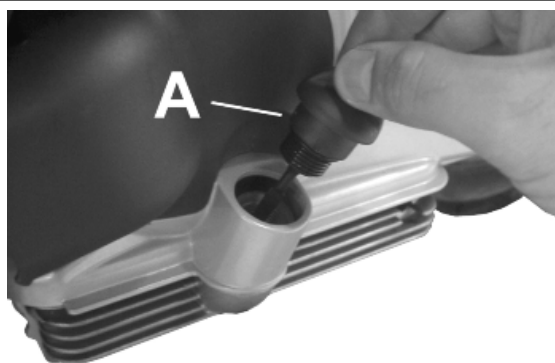


Check

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.
- Unscrew the cap/dipstick "A", dry it with a clean cloth and reinsert it, **screwing it all the way down**.
- Remove the cap/dipstick again and check that the level is between the min and max reference 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 ever exceeding the MAX. level**.

Restoring the level from **MIN** to **MAX** requires approximately **200 cm³** of oil.

Characteristic

Engine oil

1.3 l

Engine oil filter

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

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

Recommended products

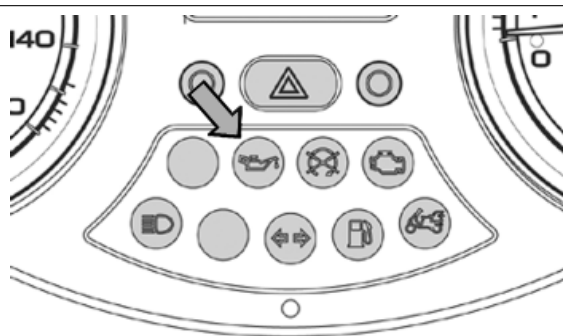
AGIP CITY HI TEC 4T Engine oil

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

Oil pressure warning light

The vehicle is equipped with a 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

Adding engine coolant.

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

Place the scooter on its centre stand and on flat ground.

- Undo the screw shown in the figure and remove the expansion tank cap on RHS.
- Top up if the fluid level is near or below the MIN level edge. The liquid level must always be between the MIN and MAX level.

CAUTION

DO NOT EXCEED THE MAX LEVEL WHEN FILLING SO THAT COOLANT DOES NOT SPILL OVER THE EXPANSION TANK WHEN THE VEHICLE IS BEING USED.

Recommended products

SPECIAL AGIP PERMANENT fluid coolant

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



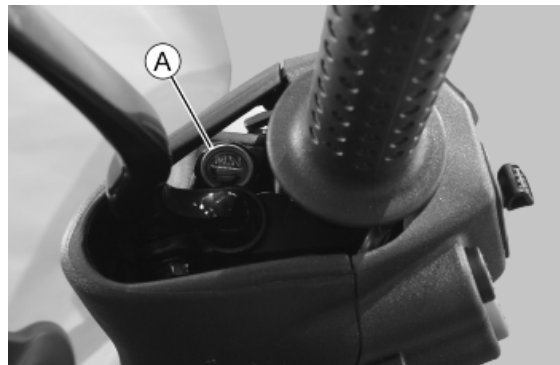
Braking system

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.

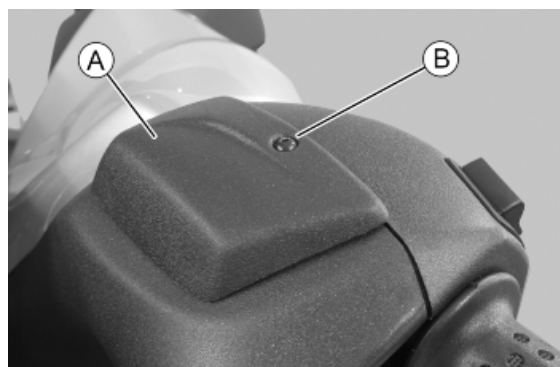


Top-up

Proceed as follows: Loosen the screw «B» and lift the plastic cover «A» in order to access the brake fluid reservoir. Loosen the two fixing screws and remove the reservoir cover; top-up with the recommended fluid without exceeding the 'MAX.' mark.

This procedure applies to the rear brake pump top-up operation; follow the same procedure for the front brake pump.

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



WARNING



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

CAUTION



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

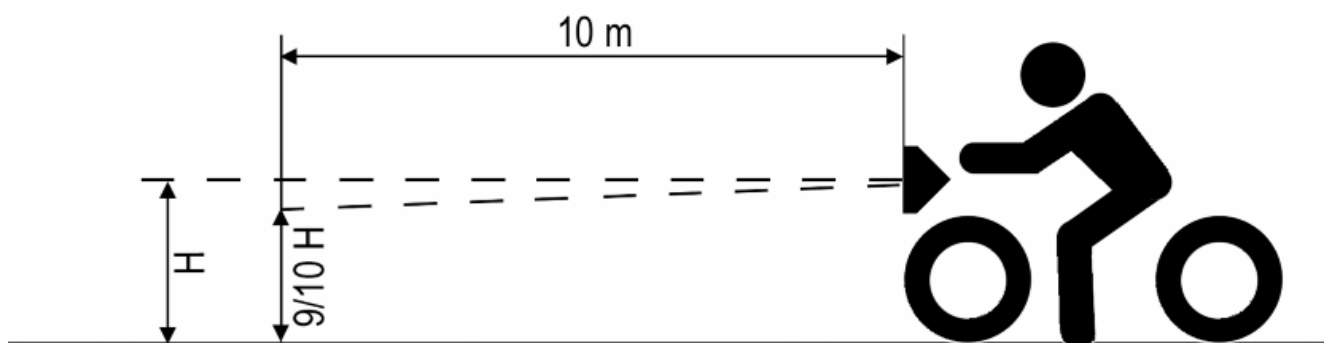
Recommended products

AGIP BRAKE 4 Brake fluid

FMVSS DOT 4 Synthetic fluid



Headlight adjustment



Proceed as follows:

1. Position the unloaded vehicle, in running order and with the tyres inflated to the prescribed pressure, on a flat surface 10 m away from a half-lit white screen; ensure that the longitudinal axis of the vehicle is perpendicular to the screen;
2. Turn on the headlight and check that the borderline of the projected light beam should be lower than 9/10 of the distance from the ground to the centre of the vehicle's headlight, and higher than 7/10;
3. If not, adjust the headlight by turning the central screw «A» underneath the Piaggio badge.



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.

INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

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

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

Engine

Excessive oil consumption/Exhaust smoke

EXCESSIVE CONSUMPTION

Possible Cause	Operation
Wrong valve adjustment	Adjust the valve clearance properly
Overheated valves	Remove the head and the valves, grind or replace the valves
Misshapen/worn valve seats	Replace the head unit
Worn cylinder, Worn or broken piston rings	Replace the piston cylinder assembly or piston rings
Worn or broken piston rings or piston rings that have not been fitted properly	Replace the piston cylinder unit or just the piston rings
Oil leaks from the couplings or from the gaskets	Check and replace the gaskets or restore the coupling seal
Worn valve oil guard	Replace the valve oil 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 faying surface with the bell is mainly in the centre with equivalent characteristics on the three masses. Check that the clutch casing is not scored or worn in an anomalous way

Insufficient braking

INEFFICIENT BRAKING SYSTEM

Possible Cause	Operation
Inefficient braking system	Check the pad wear (1.5 min). Check that the brake discs are not worn, scored or warped. Check the correct level of fluid in the pumps and change brake fluid if necessary. Check there is no air in the circuits; if necessary, bleed the air. Check that the front brake calliper moves in axis with the disc.
Fluid leakage in hydraulic braking system	Failing elastic fittings, plunger or brake pump seals, replace

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

Steering and suspensions

Heavy steering

STEERING HARDENING

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

Excessive steering play

EXCESSIVE STEERING CLEARANCE

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

Noisy suspension

NOISY SUSPENSION

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

Suspension oil leakage

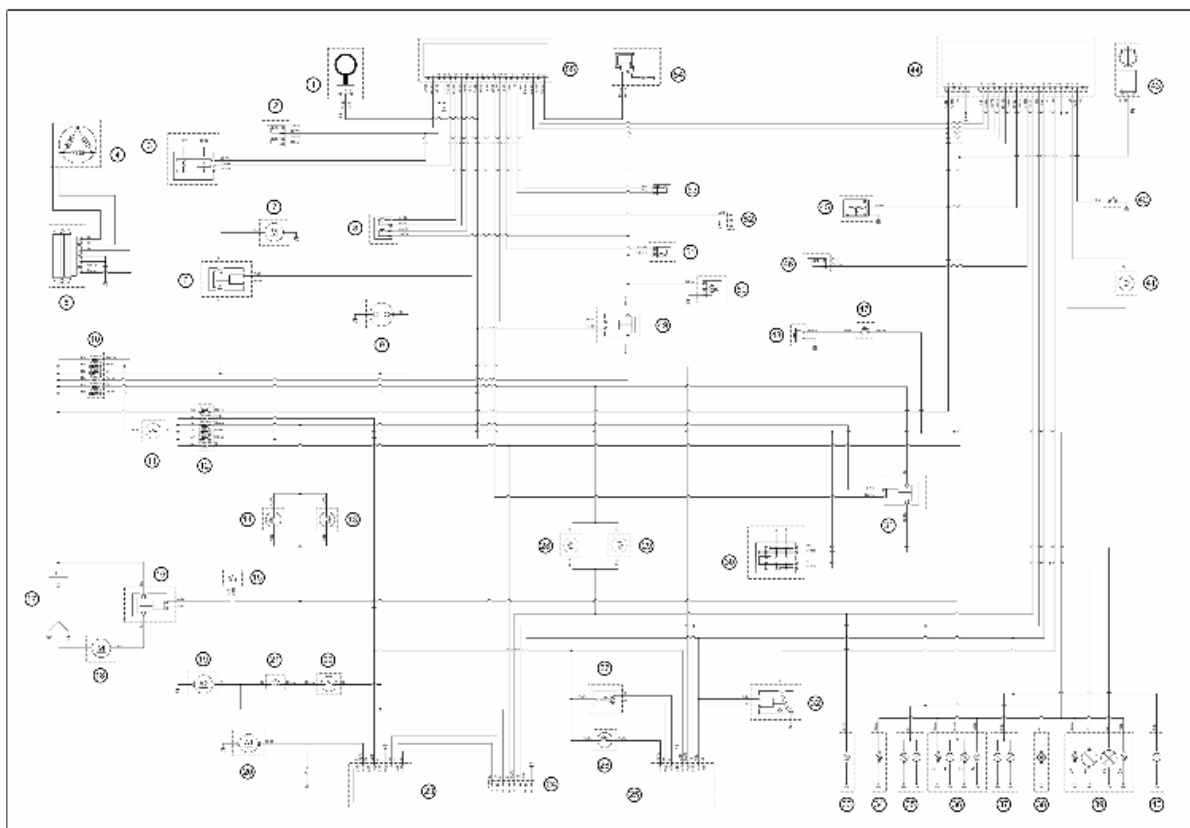
OIL LEAKAGE FROM SUSPENSION

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

INDEX OF TOPICS

ELECTRICAL SYSTEM

ELE SYS

**KEY**

1. Immobilizer aerial
2. Coolant temperature sensor
3. Engine stop switch
4. Magneto flywheel
5. Voltage regulator
6. Electric fan remote control
7. Electric fan
8. Lambda probe
9. Plug socket
10. Main fuses
11. Key switch contacts
12. Secondary fuses
13. Stop button on front brake
14. Stop button on rear brake
15. Starter button
16. Start-up remote control switch
17. Battery
18. Starter motor
19. Boot opening actuator

- 20. Saddle opening actuator
- 21. Boot opening switch
- 22. Key switch contacts
- 23. Saddle opening control unit
- 24. Wiring for anti-theft device
- 25. Turn indicator control device
- 26. Hazard button
- 27. Turn indicator switch
- 28. Boot opening switch
- 29. Saddle opening button
- 30. Light switch
- 31. Headlight remote control
- 32. Light switch remote control
- 33. Helmet compartment light bulb
- 34. License plate bulb
- 35. Rear left turn indicator
- 36. Rear light
 - A. Tail light bulbs
 - B. Stop light bulbs
- 37. Rear right turn indicator
- 38. Front left turn indicator
- 39. Front light
 - A. Tail light bulbs
 - B. High-beam light bulb
 - C. Low-beam light bulb
- 40. Front right turn indicator
- 41. MODE button
- 42. Oil pressure sensor
- 43. Wheel turning sensor
- 44. Instrument panel
- 45. Fuel level transmitter
- 46. External temperature sensor
- 47. Horn button
- 48. Horn
- 49. Injection load remote control
- 50. Fuel pump
- 51. Fuel injector
- 52. Diagnostics socket connector

53. Revolution sensor

54. HV coil

55. Injection ECU

Key

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

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

Components arrangement





1. Instrument panel: remove the front shield and, if required, the instrument panel support to reach it.



2. Turn indicator control device: remove the front shield to reach it.



3. Remote controls: injection load remote control, light switch remote control, headlight remote control, electric fan remote control. Remove the front shield to reach them.



4. Electric fan: remove the shield back plate to reach it.



5. Horn: remove the front shield to reach it.



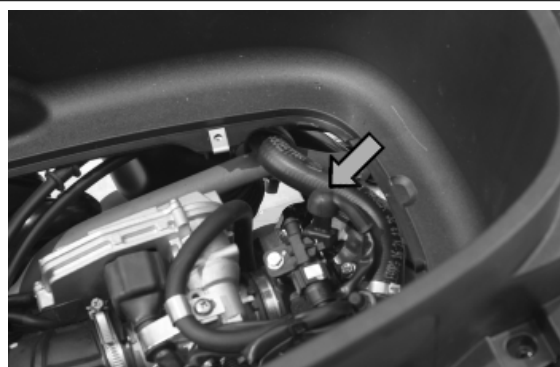
6. Lambda probe: remove the right footrest to reach it.



7. HV coil: remove the central cover to reach it.



8. Injector: remove the helmet compartment cover to reach it.



9. Saddle opening control unit: remove the left side panel to reach it.



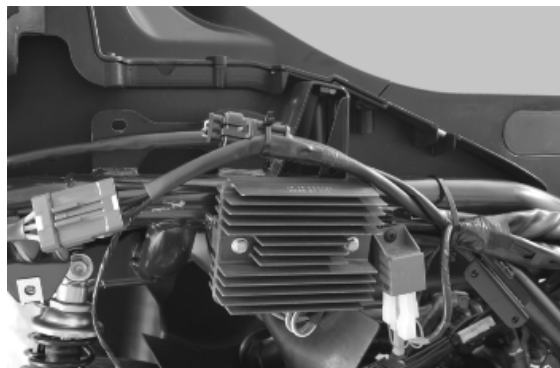
10. Main fuses: remove the battery cover under the saddle to reach them.



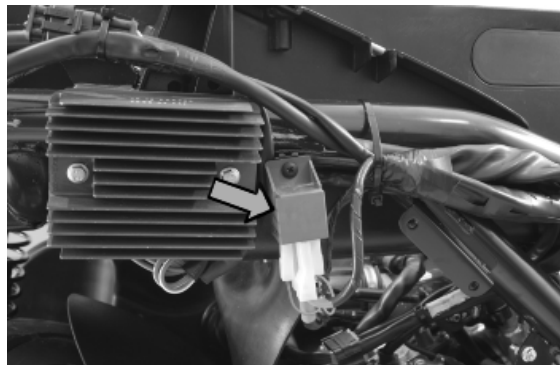
11. Auxiliary fuses: remove the battery cover under the saddle to reach them.



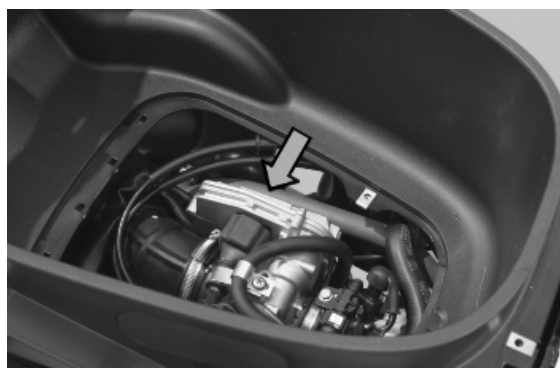
12. Voltage regulator: remove the right side panel to reach it.



13. Start-up remote control: remove the right side panel to reach it.



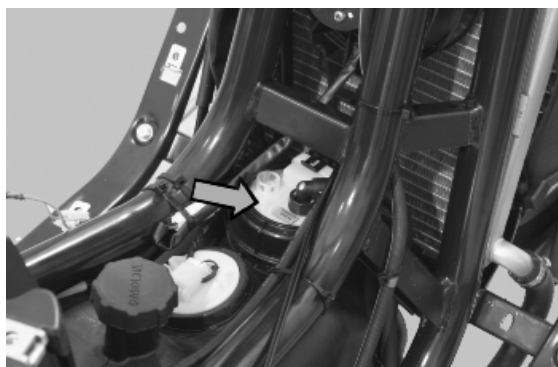
14. MIU control unit: remove the helmet compartment cover to reach it.



15. Diagnostics socket connector: remove the battery cover under the saddle to reach them.



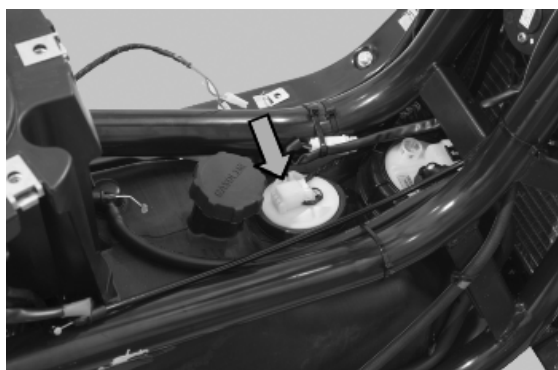
16. Fuel pump: remove the central cover to reach it.



17. Immobilizer aerial: remove the front shield to reach it.



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



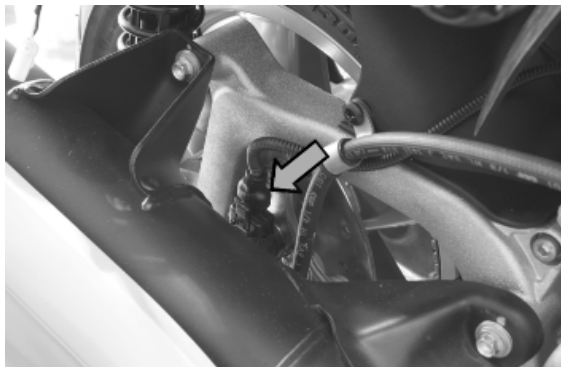
19. Engine temperature sensor: remove the helmet compartment cover or the right side panel to reach it.



20. Oil pressure sensor: remove the right side panel to reach it.

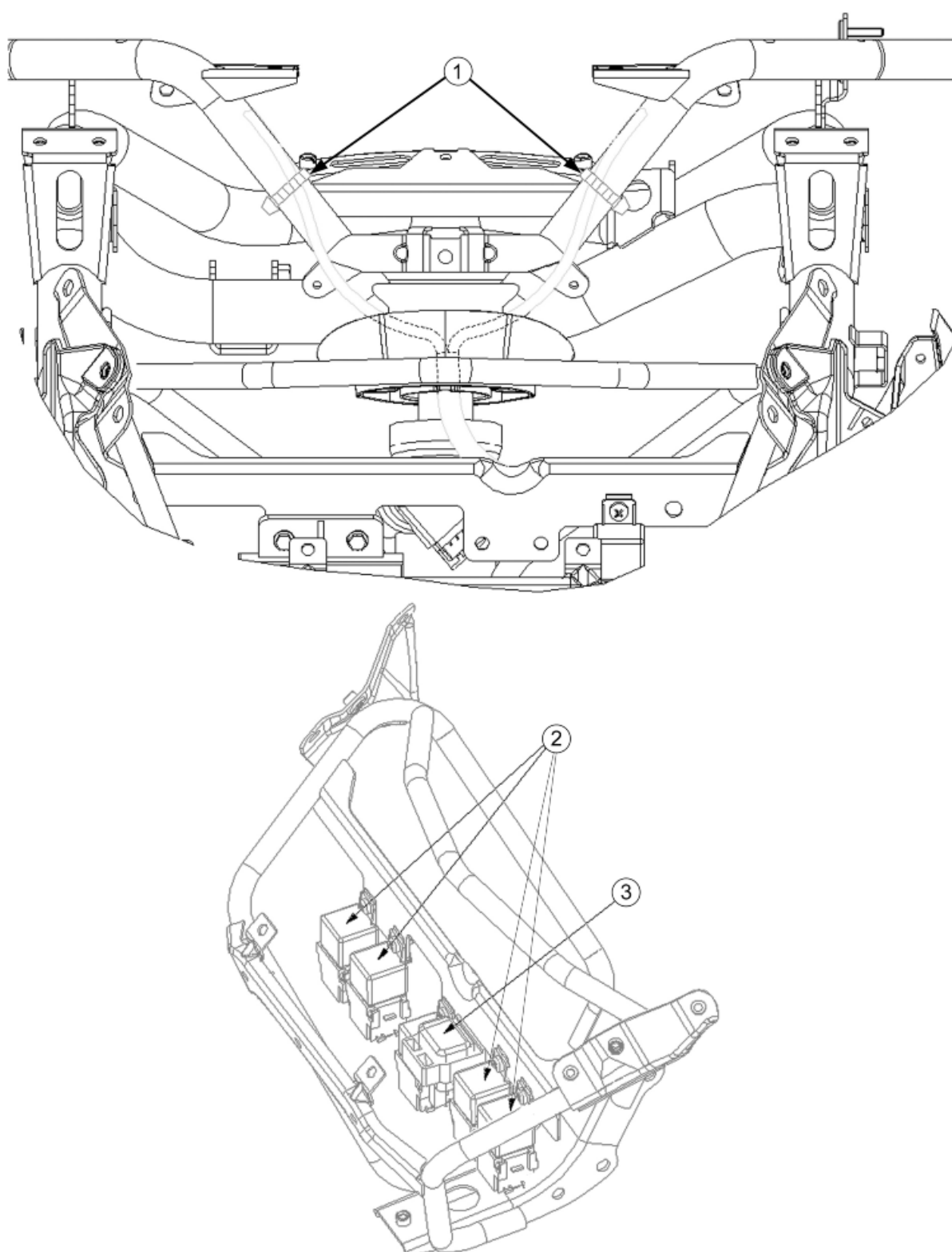


21. Wheel turning sensor: located on the rear wheel.



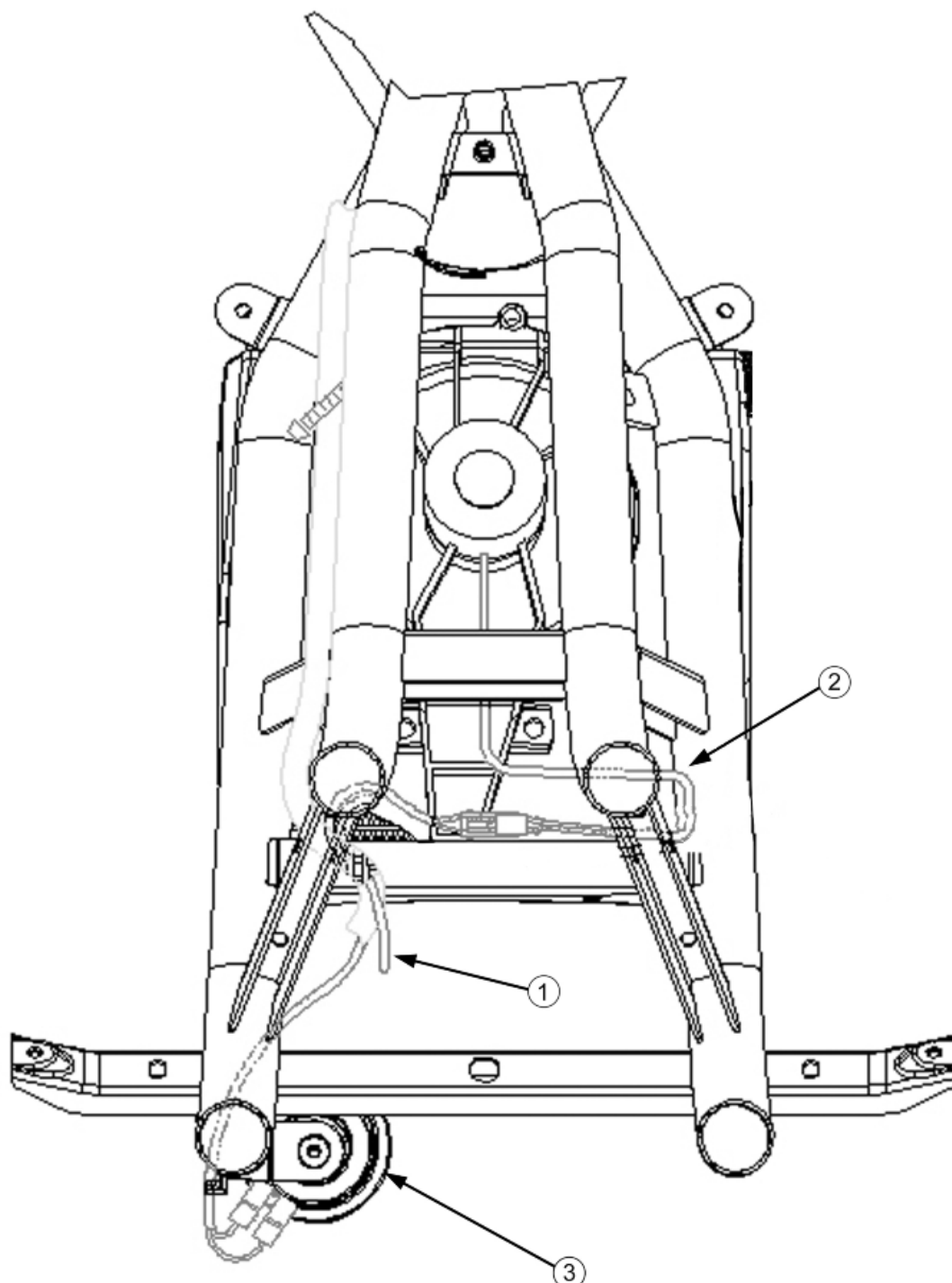
Electrical system installation

Front side

**KEY**

- 1. Clamps
- 2. Remote controls

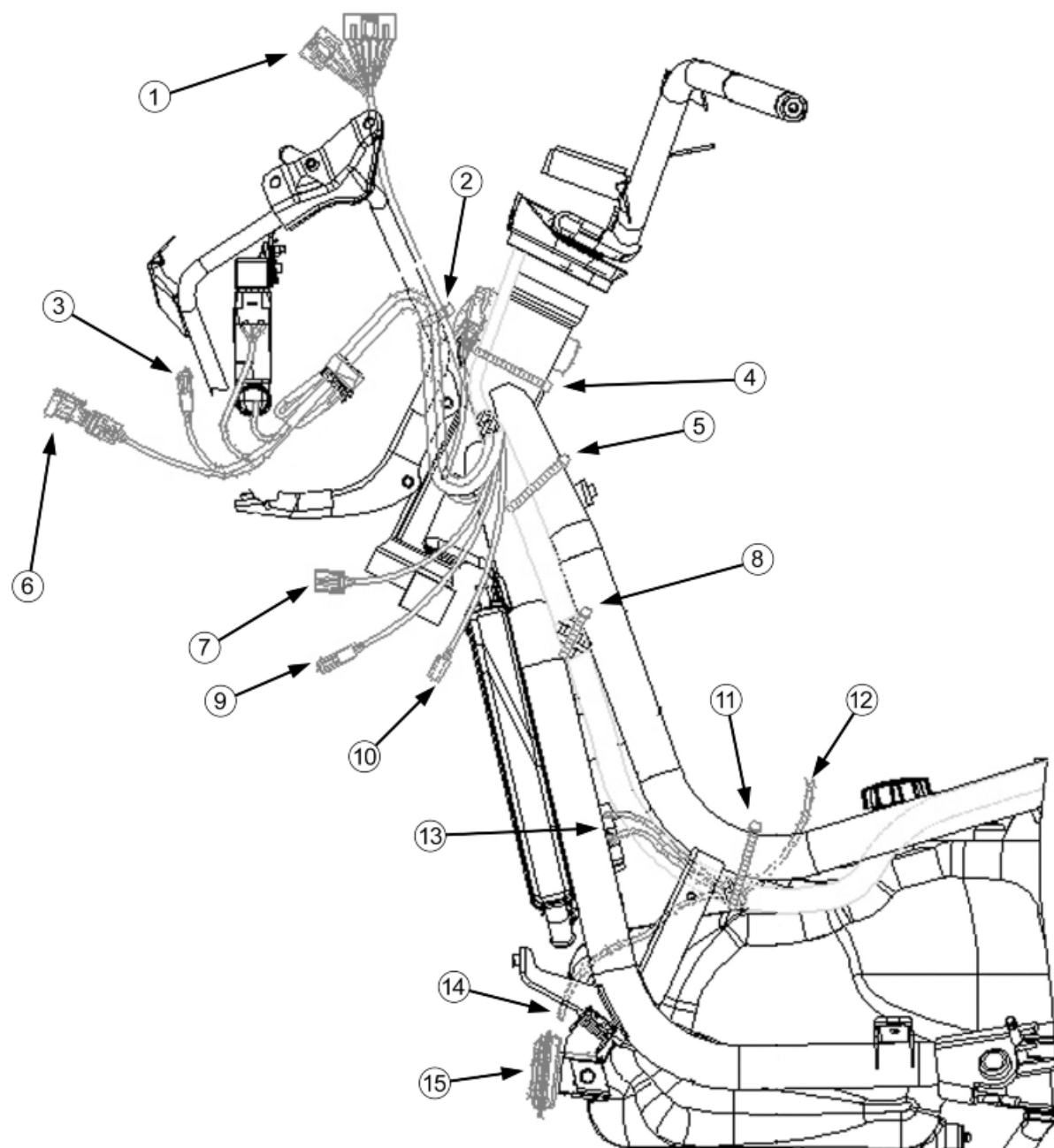
3. Turn indicator device

**KEY**

1. To the tank

2.To the electric fan

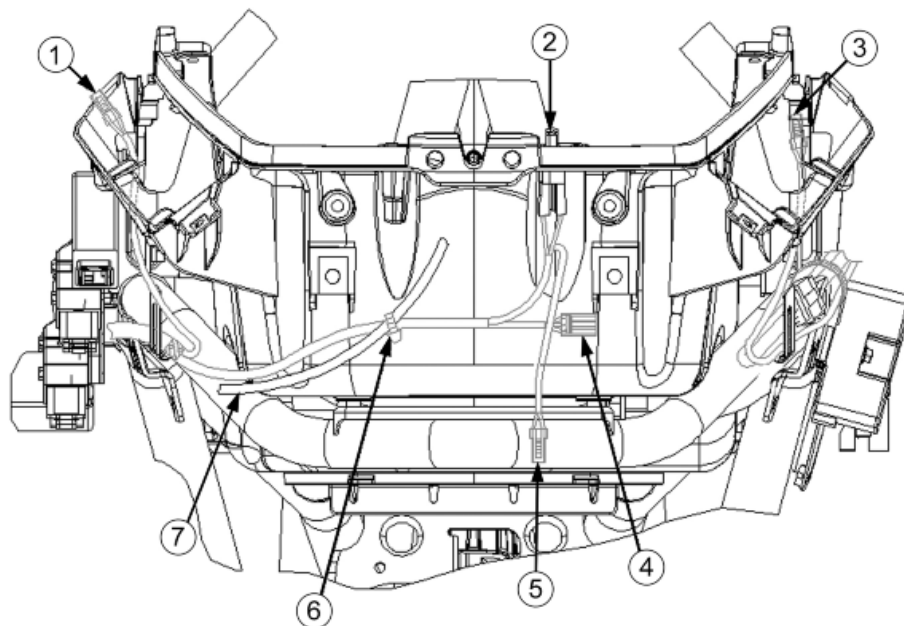
3. Horn



KEY

1. To the instrument panel
2. Clamp
3. To front right turn indicator
4. Clamp
5. Clamp
6. To the headlight
7. To LV coil
8. Clamp
9. To front left turn indicator
10. To clock adjustment button
11. Clamp
12. To the tank
13. To the electric fan
14. To horn
15. Horn

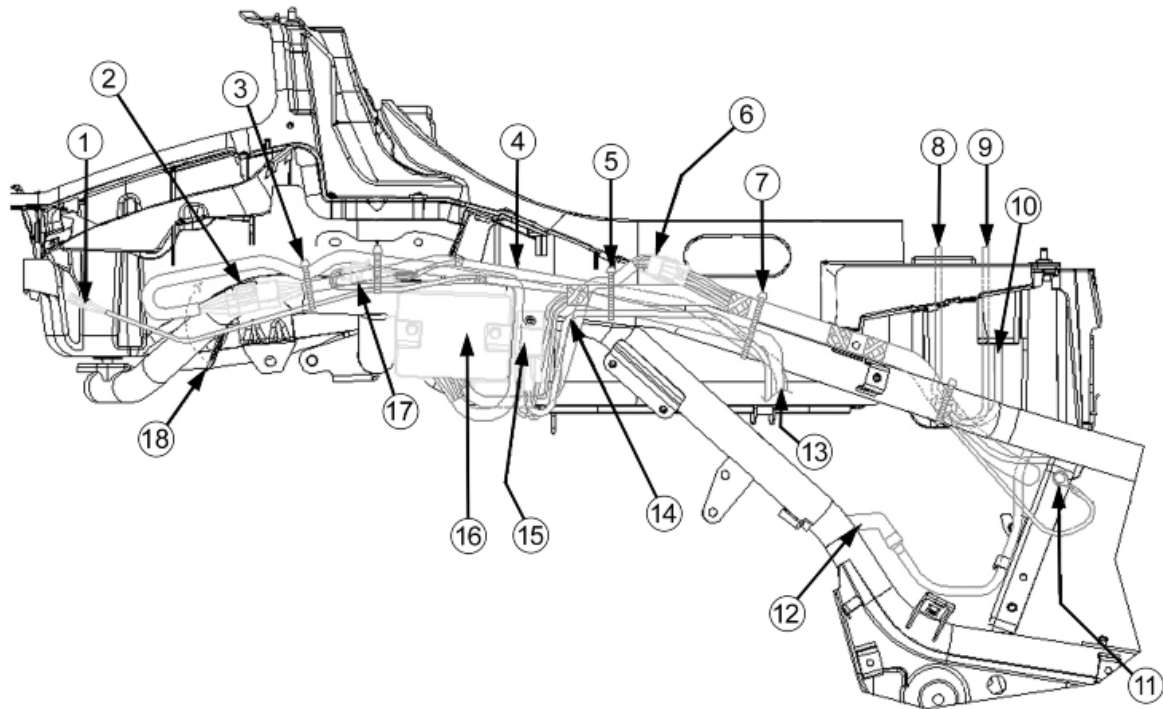
Back side



KEY

1. To left turn indicator
2. Helmet compartment light switch
3. To right turn indicator

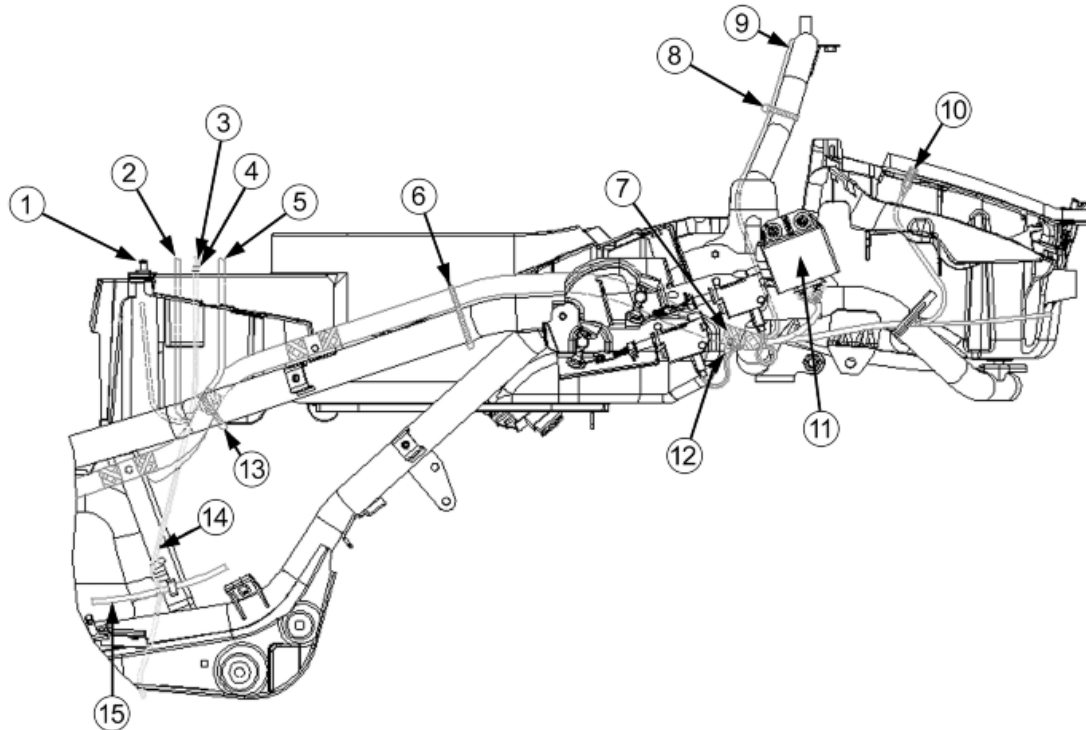
4. To the rear light
5. To the license plate light
6. Clamp
7. Boot opening transmission

**KEY**

1. To right turn indicator
2. Regulator-flywheel connection
3. Clamp
4. Magneto flywheel cable
5. Clamp
6. Regulator - cable assembly connection
7. Clamp
8. To right fuse box
9. To the battery negative lead
10. Diagnostics socket wire
11. To ground lead on frame
12. Spark plug cap
13. To engine
14. Starter motor positive wire
15. Starter remote control
16. Voltage regulator

17. Pick-up connection

18. Foldable clamp, welded to the frame, to hold cables

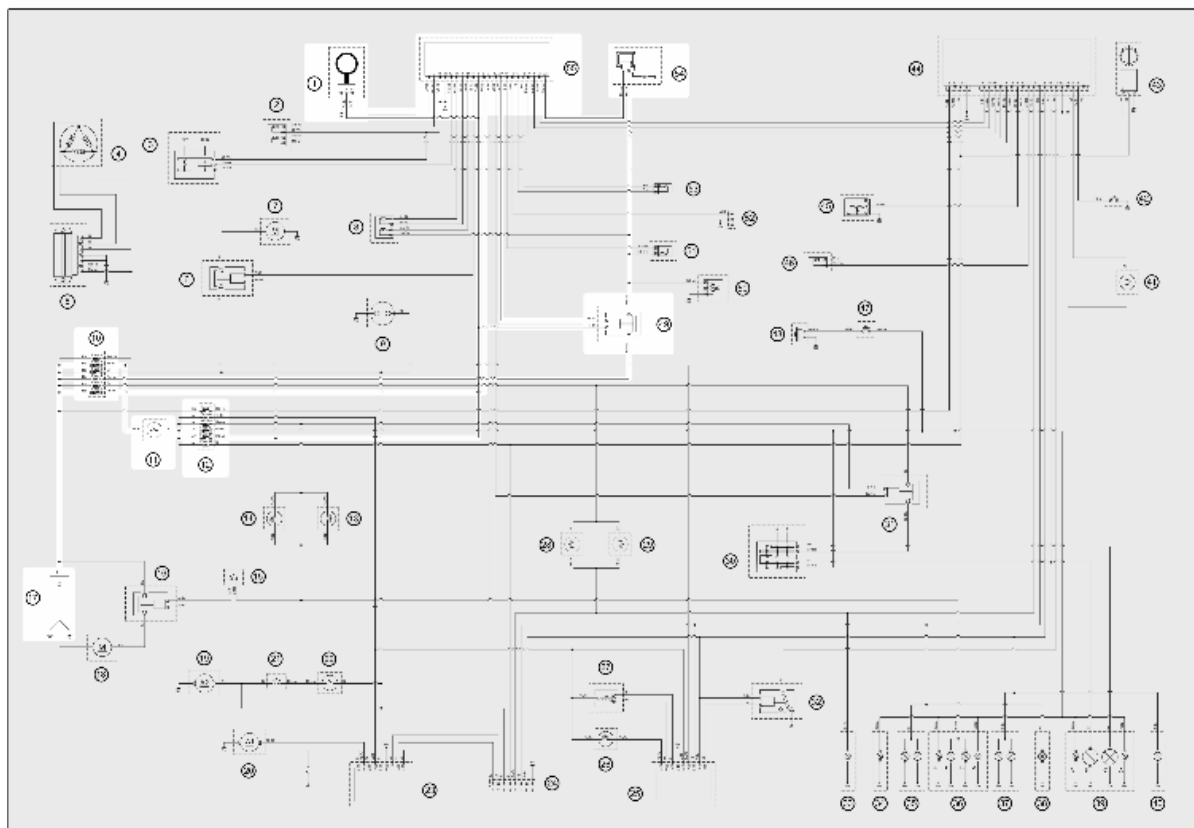


KEY

- 1. Helmet compartment light switch
- 2. To the battery positive lead
- 3. Battery breather pipe
- 4. Clamp
- 5. To left fuse box
- 6. Clamp
- 7. Red sheathing
- 8. Clamp
- 9. To the light
- 10. To left turn indicator
- 11. Saddle opening control unit
- 12. Clamp
- 13. Clamp
- 14. Battery breather pipe
- 15. Throttle control transmission

Conceptual diagrams

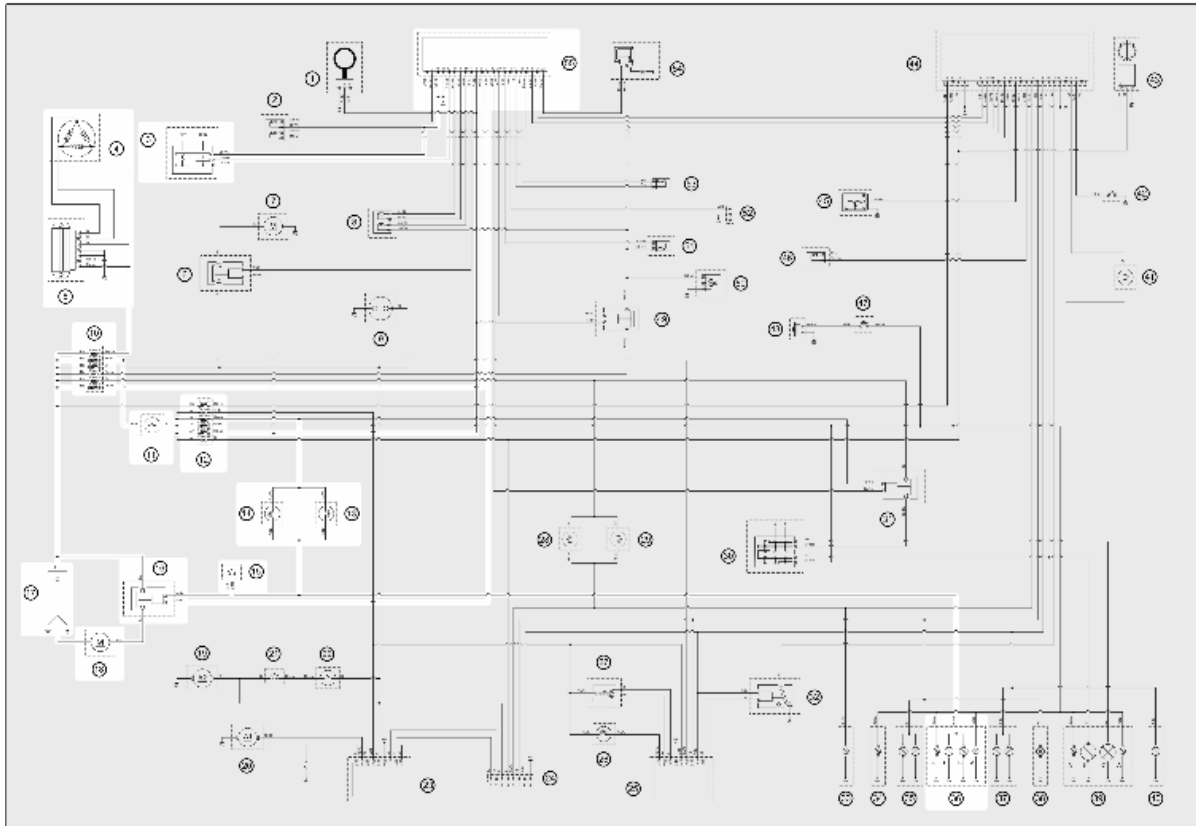
Ignition



KEY

- 1.** Immobilizer aerial
- 10.** Main fuses
- 11.** Key switch contacts
- 12.** Secondary fuses
- 17.** Battery
- 49.** Injection load remote control
- 54.** HV coil
- 55.** Injection ECU

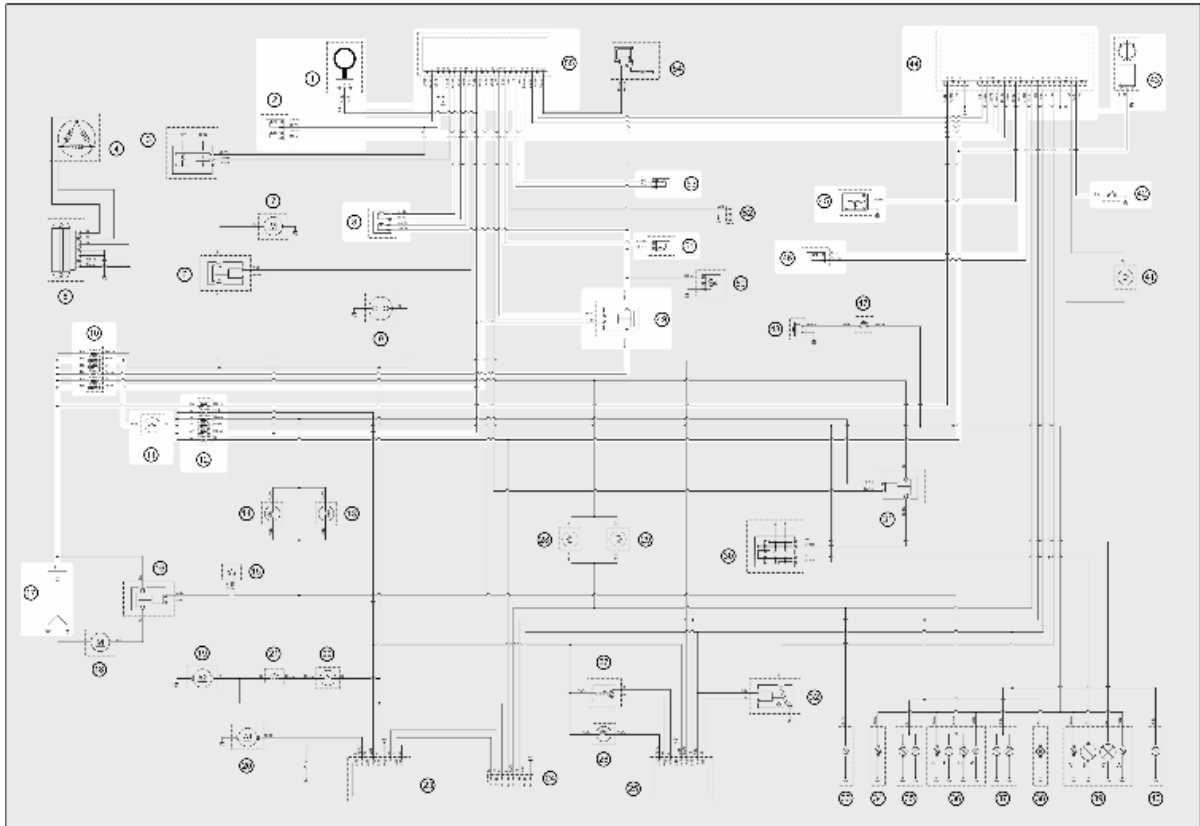
Battery recharge and starting



KEY

- 3. Engine stop switch
- 4. Magneto flywheel
- 5. Voltage regulator
- 10. Main fuses
- 11. Key switch contacts
- 12. Secondary fuses
- 13. Stop button on front brake
- 14. Stop button on rear brake
- 15. Starter button
- 16. Start-up remote control switch
- 17. Battery
- 18. Starter motor
- 36. Rear light
- B. Stop light bulbs
- 55. Injection ECU

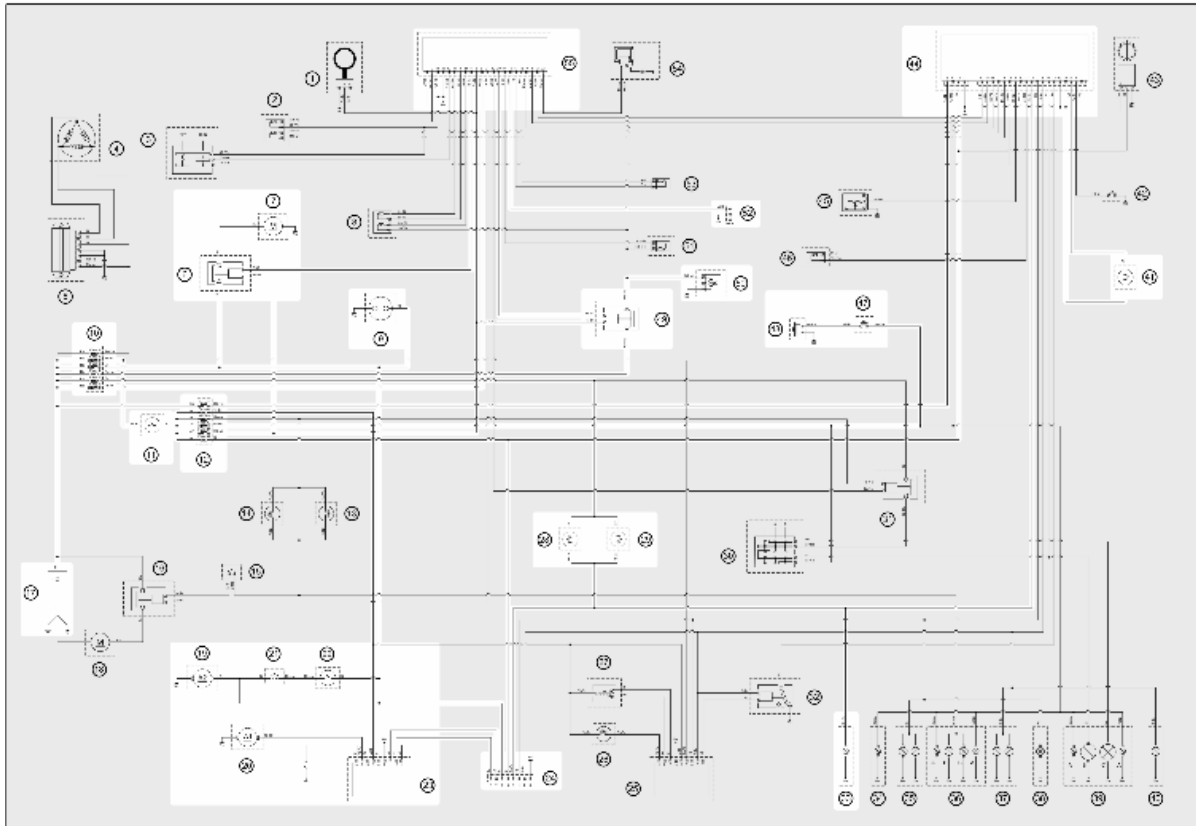
Level indicators and enable signals section



KEY

- 1. Immobilizer aerial
- 2. Coolant temperature sensor
- 8. Lambda probe
- 10. Main fuses
- 11. Key switch contacts
- 12. Secondary fuses
- 17. Battery
- 42. Oil pressure sensor
- 43. Wheel turning sensor
- 44. Instrument panel
- 45. Fuel level transmitter
- 46. External temperature sensor
- 49. Injection load remote control
- 51. Fuel injector
- 53. Revolution sensor
- 55. Injection ECU

Devices and accessories

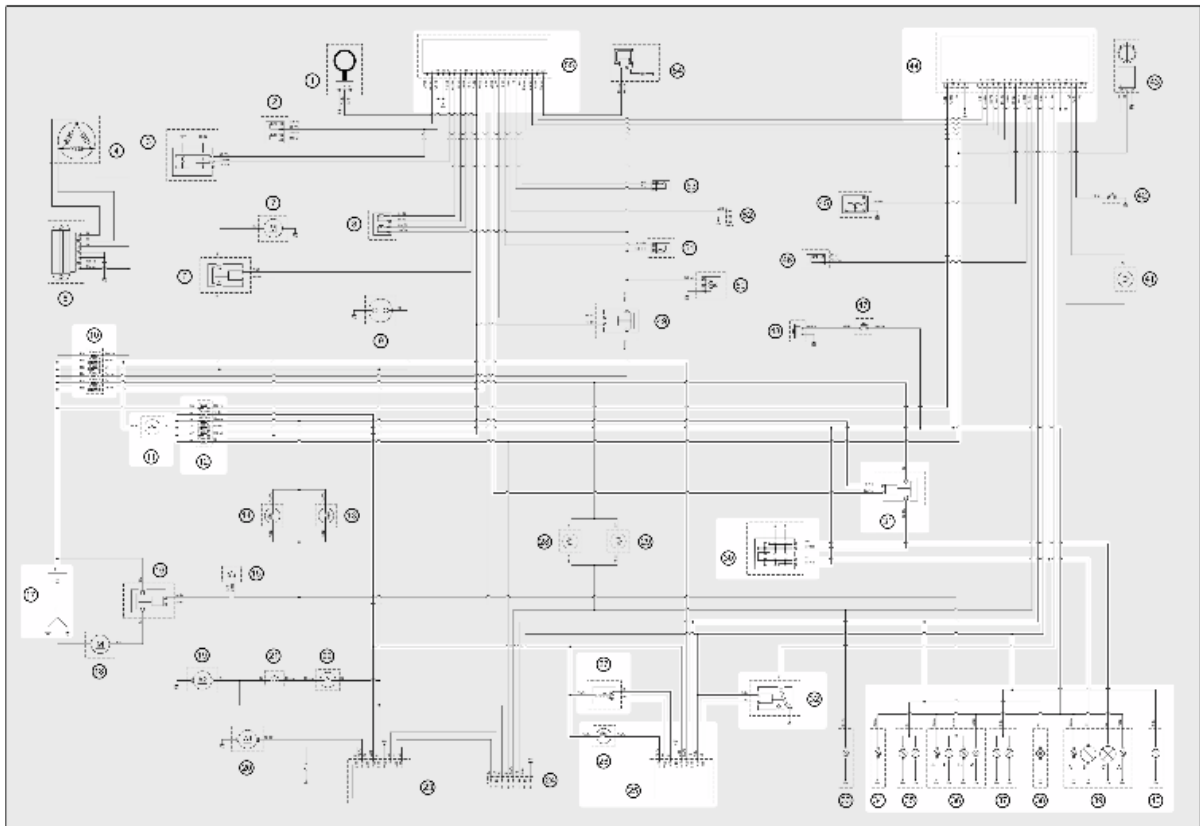


KEY

- 6. Electric fan remote control
- 7. Electric fan
- 9. Plug socket
- 10. Main fuses
- 11. Key switch contacts
- 12. Secondary fuses
- 17. Battery
- 19. Boot opening actuator
- 20. Saddle opening actuator
- 21. Boot opening switch
- 22. Key switch contacts
- 23. Saddle opening control unit
- 24. Wiring for anti-theft device
- 28. Boot opening switch
- 29. Saddle opening button
- 33. Helmet compartment light bulb
- 41. MODE button

- 44. Instrument panel
- 47. Horn button
- 48. Horn
- 49. Injection load remote control
- 50. Fuel pump
- 52. Diagnostic socket connector
- 55. Injection ECU

Lights and turn indicators



KEY

- 10. Main fuses
- 11. Key switch contacts
- 12. Secondary fuses
- 17. Battery
- 25. Turn indicator control device
- 26. Hazard button
- 27. Turn indicator switch
- 30. Light switch
- 31. Headlight remote control
- 32. Light switch remote control

- 34. License plate bulb
 - 35. Rear left turn indicator
 - 36. Rear light
 - A. Tail light bulbs
 - 37. Rear right turn indicator
 - 38. Front left turn indicator
 - 39. Front light
 - A. Tail light bulbs
 - B. High-beam light bulb
 - C. Low-beam light bulb
 - 40. Front right turn indicator
 - 44. Instrument panel
 - 55. Injection ECU
-

Checks and inspections

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

Immobiliser

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

- electronic control unit
- immobilizer aerial
- Master key with integrated transponder (brown key)
- service key with incorporated transponder (black key)
- HV coil
- Diagnosis LED

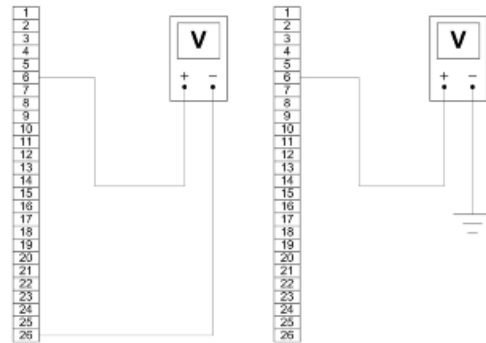
The diagnosis LED also works as a blinking light to deter theft. This function is activated every time the ignition switch is turned to the "OFF" position, or the emergency stop switch is turned to the "OFF" position. It remains activated for 48 hours in order not to affect the battery charge. When the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

- there is battery voltage
- fuses 6,7,11,12 are in working order
- there is power to the control unit as specified below:

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

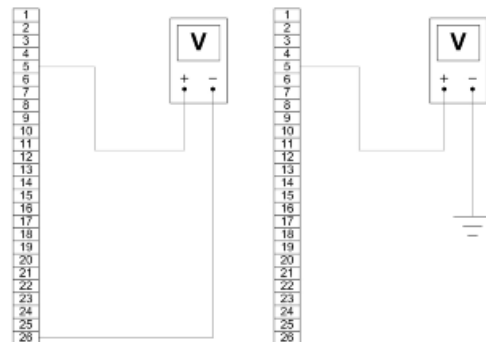
With the key switch set to OFF:

- 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 are in working order.



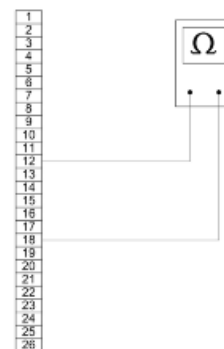
With the key switch in the OFF position:

- there is battery voltage between terminals 5-26 and terminal 5-frame earth (fixed power supply). If there is no voltage, check the key switch contacts, that fuse no. 11 and its cable are working order.

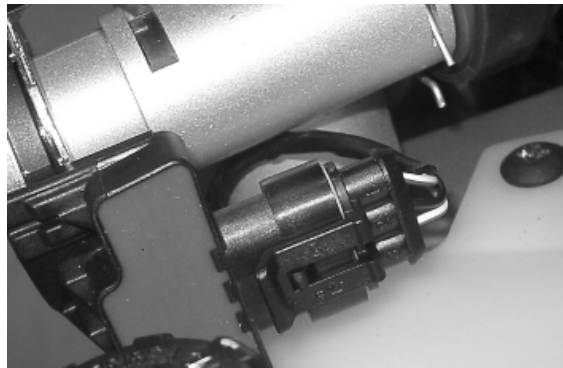


- There is continuity between terminals 12-18 with the emergency cut-out switch set to RUN. If there is no continuity, check the contacts of the switch.

If no faults are found, replace the electronic control unit.



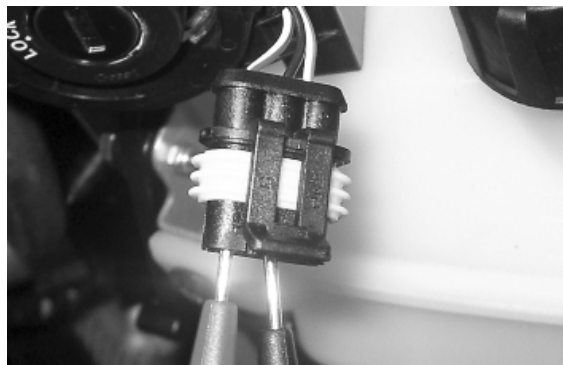
After removing the shield back plate, remove the electrical connection from the aerial as shown in the picture.



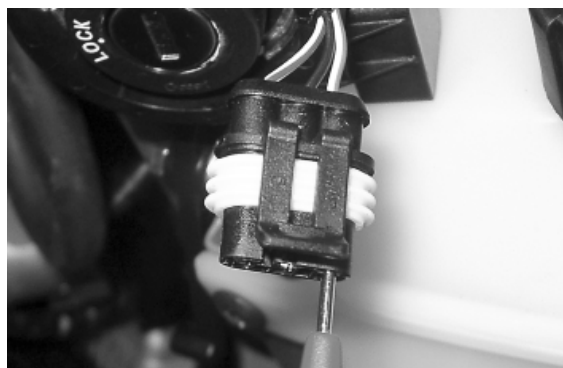
Remove the protective base from the connector.



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



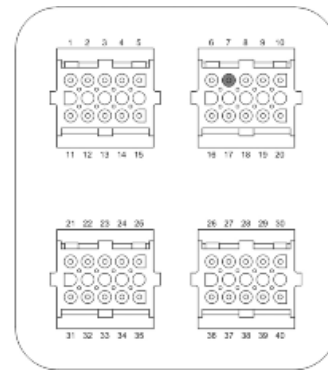
With MIU connector disconnected, check the continuity between the Orange-White cable and pin 7 of the interface wiring .



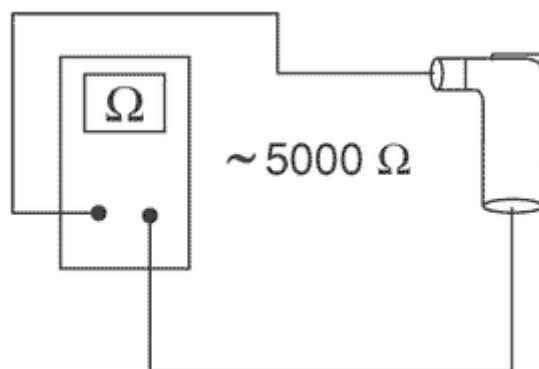
Specific tooling

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.

Characteristic

MASTER key:

BROWN KEY

SERVICE key.

BLACK KEY

Diagnostic codes

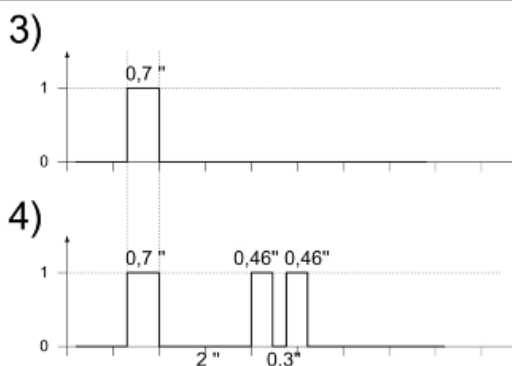
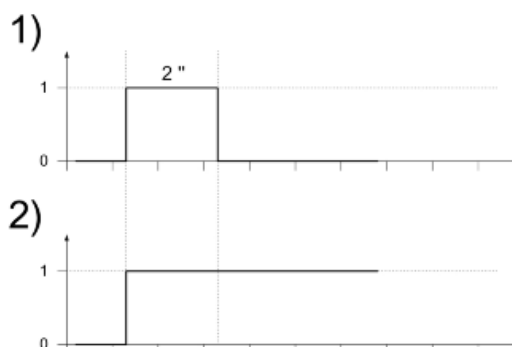
The Immobilizer system is tested each time the key switch is turned from «OFF» to «ON». During this diagnosis phase a number of control unit statuses can be identified and various light codes displayed. Regardless of the code transmitted, if at the end of the diagnosis the LED remains off permanently,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

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

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

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

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



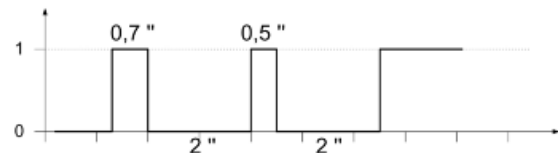
LED remains permanently OFF. The engine can be started.

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

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

Diagnostic code - 1 flash

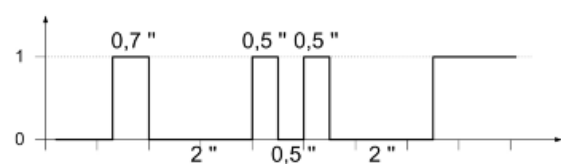
A one-flash code indicates a system where the serial line is not present or is not detected. Check the Immobilizer aerial wiring and change it if necessary.



Diagnostic code - 2 flashes

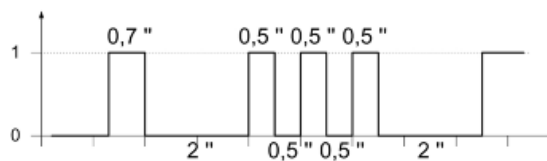
A two-flash code shows a system where the control unit does not show the transponder signal. This might depend on the inefficiency of the immobiliser aerial or the transponder.

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



Diagnostic code - 3 flashes

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



Battery recharge circuit

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

The generator is directly connected to the voltage regulator.

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

Checking the stator windings

WARNING

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

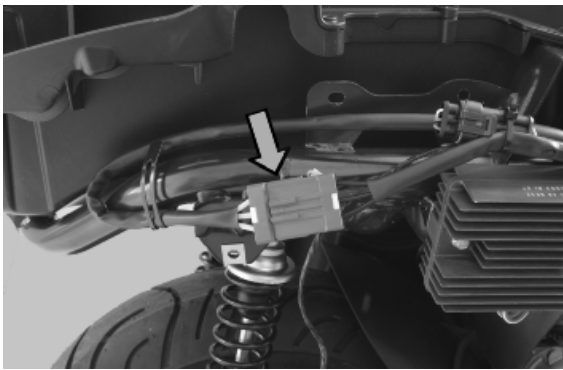
- 1) Remove the right side panel.
- 2) Disconnect the connector between stator and regulator with the three yellow cables as shown in the photograph.
- 3) Measure the resistance between each of the yellow terminals and the other two.

Electric characteristic

Resistance:

0.2 - 1 Ω

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



Recharge system voltage check

Look for any leakage

- 1) Access the battery by removing 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 position OFF, connect the terminals of the tester between the negative pole (-) of the battery and the black cable and only then disconnect the black cable from the negative pole (-) of the battery.
- 4) With the ignition key always at OFF, the reading indicated by the ammeter must be ≤ 0.5 mA.

Charging current check

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

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

Electric characteristic

Voltage ranging between 14.0 and 15.0V at 5000 rpm.

Maximum current output check.

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

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

VOLTAGE REGULATOR/RECTIFIER

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

Turn signals system check

The circuit of the turn indicators is supplied by the turn indicator control device. If it does not work, it is necessary to:

- Check that the light bulb works properly
- Check that fuse No. 8 with ignition switch key set to ON works properly
 - Check if there is voltage on the turn indicator control device;
 - if it is powered, check the continuity of the wiring, with the turn indicator switch ON, between the white-blue turn indicator control device output cable and the white-blue cable of the indicator bulbs. Also check the pink cable of the turn indicator control device and the cable of the indicator bulbs. If there is no continuity, check that the wiring and the connections between the turn indicator switch and the turn indicator control device are in good conditions. Otherwise, replace the turn indicator control device because it is certainly defective.

Fuses

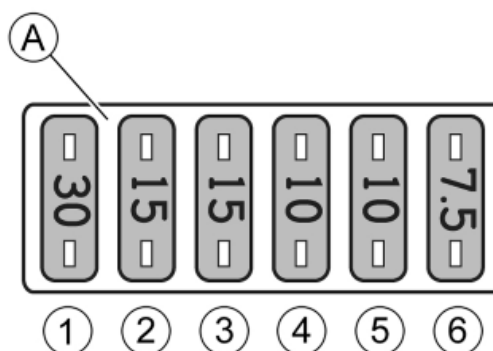
The electrical system is fitted with twelve fuses divided between two fuse boxes, located in the battery compartment, for the protection of the various circuits in the system.

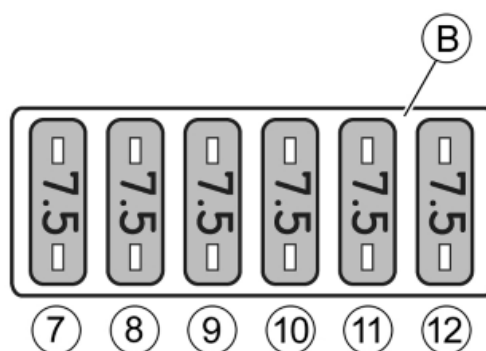
The chart shows the position and characteristics of the fuses in the vehicle.

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).





FUSE TABLE

	Specification	Desc./Quantity
1	Fuse No. 1	Capacity: 30 A Protected circuits: battery recharge. Location: battery compartment, on vehicle LHS.
2	Fusibile n°2	Capacità: 15A Circuiti protetti: Alimentazione dispositivo comando lampeggiatori, fusibili n° 8-9-10-11-12 sotto chiave. Collocazione: Vano portabatteria lato sinistro veicolo
3	Fuse No. 3	Capacity: 15A Protected circuits: - LV socket, electric fan (via relay), wiring for anti-theft device, saddle opening power supply, saddle opening button (live). - live power supply to boot opening switch. Location: Battery compartment, on vehicle LHS
4	Fuse No. 4	Capacity: 10 A Protected circuits: injection load power (via relay). Location: battery compartment, on vehicle LHS.
5	Fuse No. 5	Capacity: 10 A Protected circuits: luggage light, headlight (via relay). Location: battery compartment, on vehicle LHS.
6	Fuse No. 6	Capacity: 7.5A Protected circuits: MIU control unit power supply Location: battery compartment, on vehicle LHS.
7	Fuse No. 7	Capacity: 7.5A Protected circuits: instrument panel power supply. Location: battery compartment, on vehicle RHS.
8	Fuse No. 8	Capacity: 7.5A Protected circuits: saddle opening control unit power supply, hazard button, turn indicator switch, turn indicator control device, hazard warning light relay. Location: battery compartment, on vehicle RHS.
9	Fuse No. 9	Capacity: 7.5A Protected circuits: stop light power supply, start-up button, headlamp remote control. Location: battery compartment, on vehicle RHS.
10	Fuse No. 10	Capacity: 7.5A Protected circuits: horn power supply, instrument panel lightning, tail lights. Location: battery compartment, on vehicle RHS.
11	Fuse No. 11	Capacity: 7.5A Protected circuits: injection load remote control power supply, immobilizer aerial, MIU control unit, electric fan remote control. Location: battery compartment, on vehicle RHS.
12	Fuse No. 12	Capacity: 7.5A Protected circuits: wheel turning sensor power supply, instrument panel, wiring for antitheft device. Location: battery compartment, on vehicle RHS.

Dashboard

A = Immobilizer / anti-theft LED

B = Speedometer with twin scale (km/h and mph)

C = CLOCK switch

D = Digital display

E = Emergency turn indicator warning light

F = SET switch

G = Rpm indicator

H = Fuel gauge

I = Warning light for helmet compartment courtesy light on

L = Engine control telltale light and injection system failure warning light

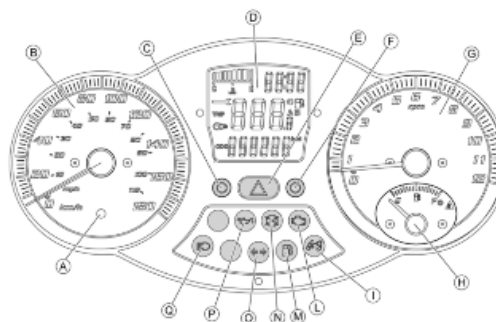
M = Low fuel warning light

N = Engine stop warning light

O = Turn indicator warning light

P = Low oil pressure warning light

Q = High-beam warning light



Sealed battery

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

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

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

INSTRUCTIONS FOR THE RENEWAL RECHARGE AFTER OPEN-CIRCUIT STORAGE

1) Voltage check up

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

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

2) Constant voltage battery charge mode

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

10 to 12 h recommended

Minimum 6 h

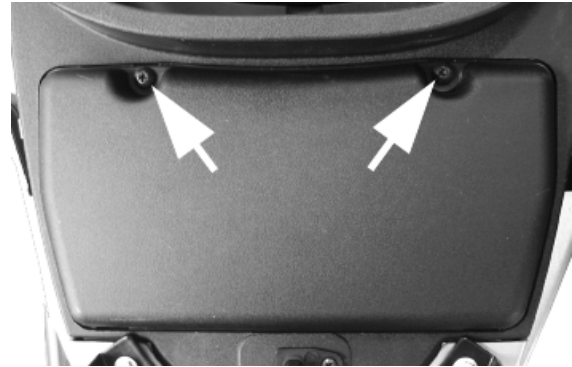
Maximum 24 h

3) Constant current battery charge mode

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

Battery installation

- Remove the battery cover after undoing the 2 screws shown in the photograph.



- Insert the battery by connecting the battery breather tube as shown in the photograph.

N.B.

IN ORDER TO FIT THE CABLES ON THE BATTERY TERMINALS CORRECTLY, REST THE LOWER END OF THE TERMINAL SIDE OF THE BATTERY ON THE EDGE OF THE BATTERY WELL.



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

N.B.

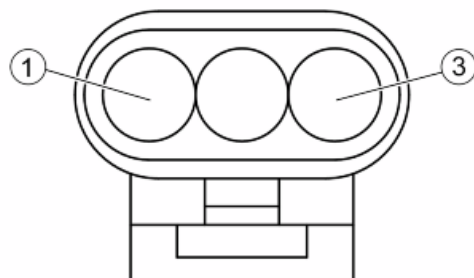
DO NOT USE WRENCHES TO TIGHTEN UP THE SCREWS FOR FIXING THE TERMINALS TO THE BATTERY TERMINALS

- Refit the battery cover

Connectors

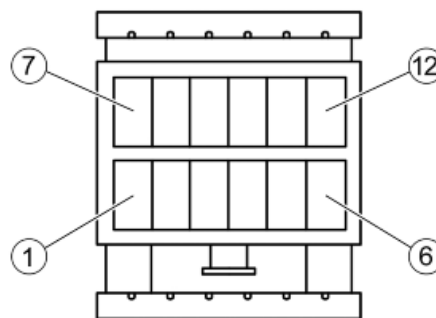
IMMOBILIZER AERIAL CONNECTOR

1. Live supply (Red-White)
2. Ground (Black)
3. To MIU control unit (Orange-White)

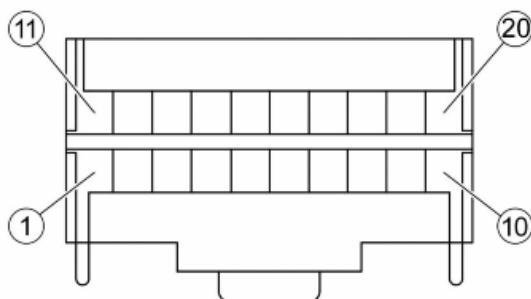


INSTRUMENT PANEL CONNECTOR "A"

1. Not connected
2. Not connected
3. Not connected
4. Not connected
5. Instrument panel lighting (Yellow-Black)
6. Battery powered (Red-Black)
7. Not connected
8. Not connected
9. Not connected
10. Not connected
11. Ground (Black)
12. Live supply (White)

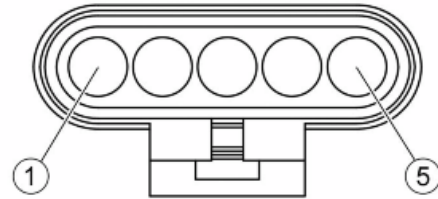
**INSTRUMENT PANEL CONNECTOR "B"**

1. Speed sensor (Green)
2. Fuel level signal (Grey-Black)
3. Water temperature sensor (Green-Yellow)
4. Water temperature sensor negative wire (Brown-Yellow)
5. MODE button (Grey)
6. Oil pressure warning light (Pink-White)
7. Left turn indicator warning light (Pink)
8. Right turn indicator warning light (White-Blue)
9. High-beam warning light (Purple)
10. Boot open warning light (Red-Yellow)
11. Rpm indicator (Red-Blue)
12. External temperature sensor (White-Yellow)
13. Ambient temperature sensor negative wire (Green-Black)
14. Engine disabled warning light (Purple-Black)
15. Immobilizer LED (Red-Green)
16. Injection check warning light (Brown-Black)
17. Ground (Black)
18. Hazard warning light (Sky blue)
19. Ground (Black)
20. Not connected

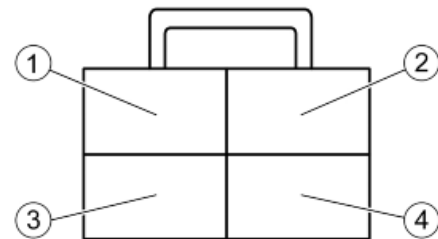


FUEL PUMP CONNECTOR

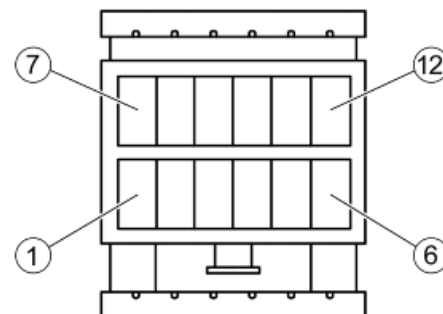
1. Not connected
2. Ground (Black)
3. Not connected
4. Not connected
5. power via remote control (Black-Green)

**VOLTAGE REGULATOR CONNECTOR**

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

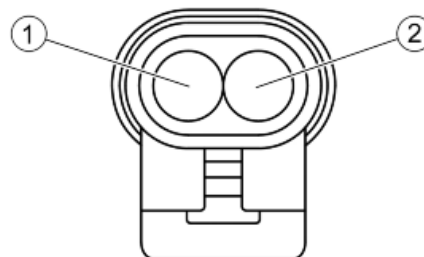
**TURN INDICATOR CONTROL DEVICE CONNECTOR**

1. Hazard button (Yellow-Grey)
2. LHS turn indicator switch (Red)
3. RHS turn indicator switch (Blue)
4. LHS Turn indicator bulbs (Pink)
5. RHS Turn indicator bulbs (White-Blue)
6. Battery powered (Red-Blue)
7. Light switch remote control (Green)
8. Live supply (Purple-White)
9. Ground (Black)
10. Not connected
11. Not connected
12. Not connected

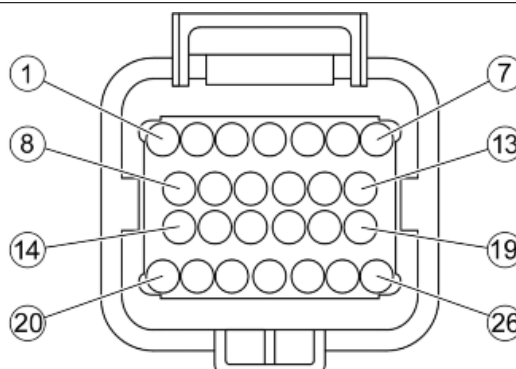


HV COIL CONNECTOR

1. Power via remote control (Black-Green)
2. To MIU control unit (Pink-Black)

**INJECTION ELECTRONIC CONTROL UNIT**

1. Injection telltale light (Brown-Black)
2. Rpm indicator on instrument panel (Red-Blue)
3. Not connected
4. Lambda probe negative terminal (White-Green)
5. Live supply (Red-White)
6. Battery powered (Orange-Black)
7. Immobilizer aerial (Orange-White)
8. Electric fan remote control (Blue-Yellow)
9. Water temperature sensor (Sky blue-Green)
10. Not connected
11. Lambda probe positive (Sky blue-Black)
12. Engine stop switch (Green-Black)
13. Engine revolution sensor positive (Red)
14. Fuel injector (Red-Yellow)
15. Engine revolution sensor negative (Brown)
16. Diagnostics socket output (Purple-White)
17. Immobilizer LED (Red-Green)
18. Ground (Grey-Green)
19. Headlight remote control (White-Black)
20. Injection load remote control (Black-Purple)
21. Lambda probe heater (Green-Yellow)
22. HV coil (Pink-Black)
23. Not connected
24. Start-up enabling switch (Orange-Blue)
25. Not connected
26. Ground (Black)



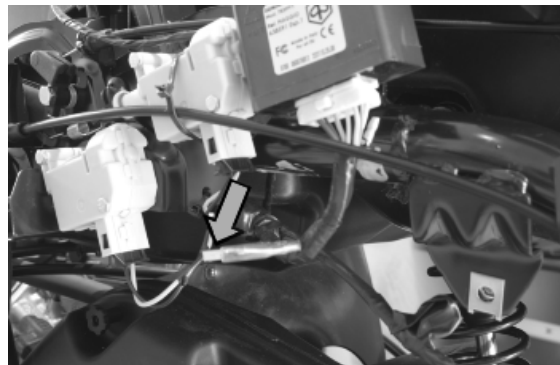
Remote seat opening

Zeroing

- Pull off the metal terminal with a pair of pliers and connect it to a good ground point or to terminal 7 (black), for at least 10 seconds.
- In this operation all the remote controls stored in the control unit will be deleted.

WARNING

THE CONTROL UNIT CAN PROGRAMME UP TO 8 REMOTE CONTROLS.



Programming

Follow these steps to program the remote controls:

1. Insert the remote control key to be programmed in the steering lock key block.
2. Turn the key to «ON», press the button on the remote control, release the button, then turn the key back to «OFF» within four seconds of turning «ON».
3. Wait 1 to 8 seconds.
4. Repeat steps 2 and 3 four more times without removing the key.

The control unit confirms the programming has been successful by opening the saddle.

WARNING

TO STORE THE OTHER REMOTE CONTROLS TO MEMORY (8 MAXIMUM) YOU NEED TO REPEAT THE WHOLE PROCEDURE AGAIN. FAILURE TO CARRY OUT THESE OPERATIONS WITHIN THE INDICATED TIMES WILL RESULT IN THE AUTOMATIC CANCELLATION OF THE PROCESS FOR PROGRAMMING THE REMOTE-CONTROLLED KEYS.

WARNING

AVOID PRESSING THE REMOTE CONTROL BUTTON MORE THAN ONCE WHEN FAR AWAY FROM THE SCOOTER. THE SYNCHRONISM BETWEEN THE REMOTE CONTROL AND THE RECEIVER CAN BE IMPAIRED. SHOULD THIS BE THE CASE, REPEAT THE PROGRAMMING PROCEDURE. DO NOT KEEP THE REMOTE CONTROL IN PLACES WITH TEMPERATURES EXCEEDING 60° C THE BATTERY WILL RUN DOWN TOO QUICKLY.

WARNING

TO AVOID BATTERY DISCHARGE, THE SADDLE OPENING REMOTE CONTROL RADIO RECEIVER DEACTIVATES 7 DAYS AFTER THE LAST TIME THE VEHICLE WAS SHUT OFF. JUST TURN THE KEY TO «ON» TO REACTIVATE THE RECEIVER.

INDEX OF TOPICS

ENGINE FROM VEHICLE

ENG VE

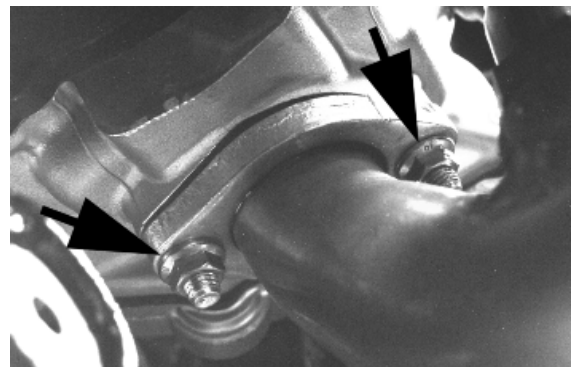
This section describes the operations to carry out when removing the engine from the vehicle.

Exhaust assy. Removal

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



- Undo the two exhaust manifold fixings on the head. To unscrew the nuts that fix the 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 supporting arm.
- Remove the full muffler unit.



Remove the lambda probe from the manifold.



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

Removal of the engine from the vehicle

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

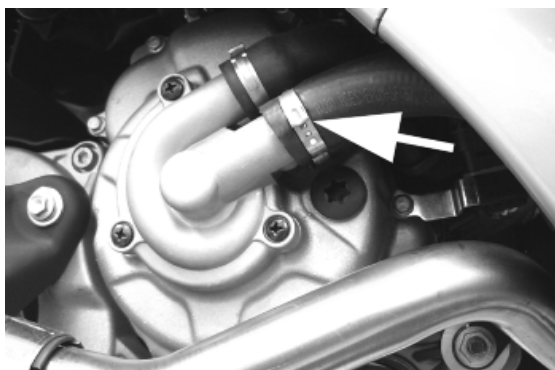
Remove the full muffler assembly.

CAUTION

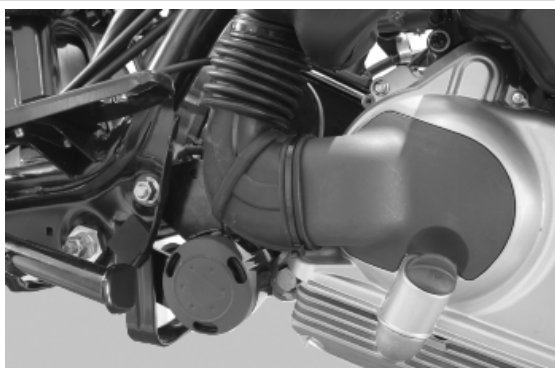


THIS OPERATION MUST BE CARRIED OUT WHEN THE ENGINE IS COLD.

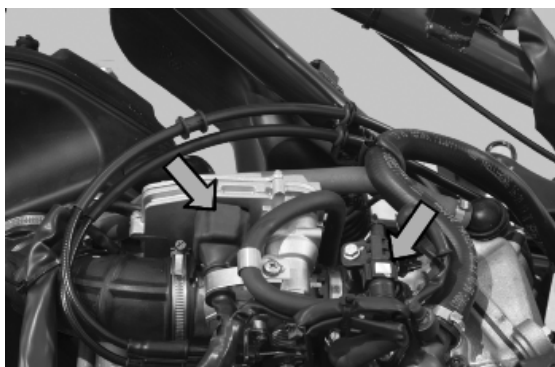
- Remove the pipe feeding coolant into the pump as shown in the photograph and then empty the system.



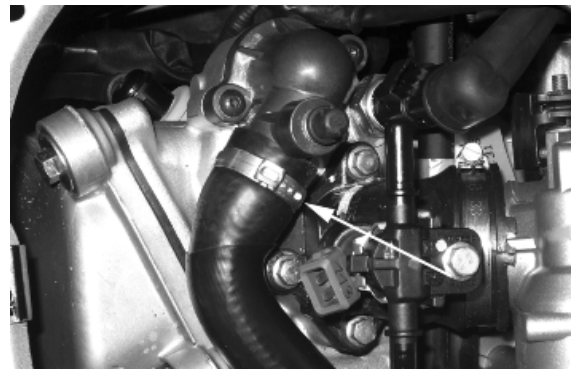
- Remove the clamp fastening the intake coupling from the air deflector and remove the bellows from the coupling.



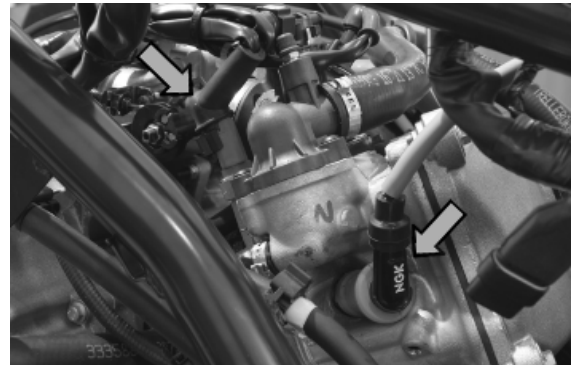
- Disconnect the fuel delivery and return pipes from the injector by removing the screw locking the retaining clamp.
- Disconnect the injector wiring and the throttle body control unit wiring.



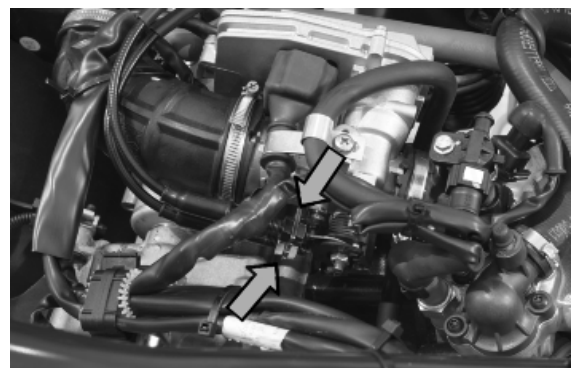
- Remove the coolant outlet pipe from the motor as indicated.



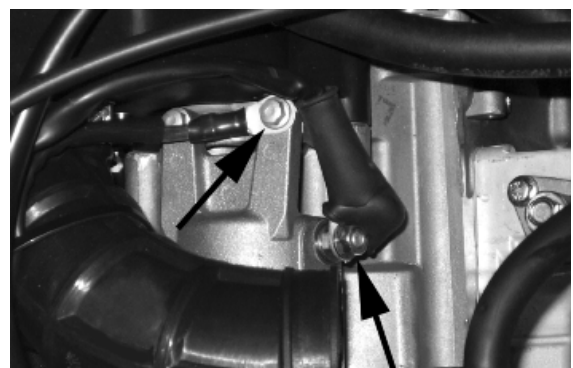
- Remove the spark plug caps.
- Remove the coolant temperature sensor connector indicated in the photograph.



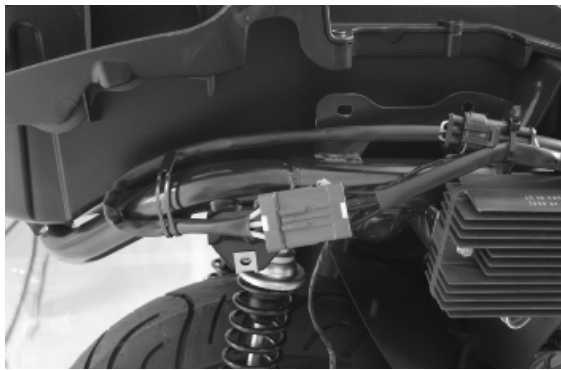
- Remove the throttle cables from the throttle body by undoing the nuts indicated in the photograph.



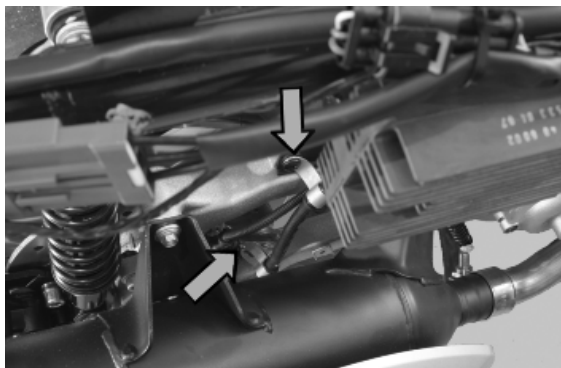
- Remove the positive and negative wiring from the starter motor as shown in the photograph.



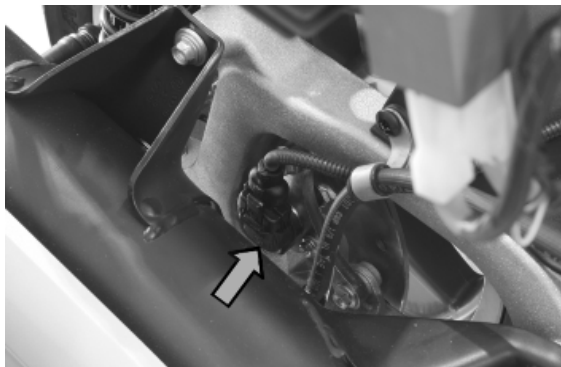
- Disconnect the connectors from the flywheel wiring as shown in the photo.
- Remove the cable from the retaining clip on the flywheel cover.



- Undo the 2 screws fastening the locking clamps of the brake pipe from the swinging arm.

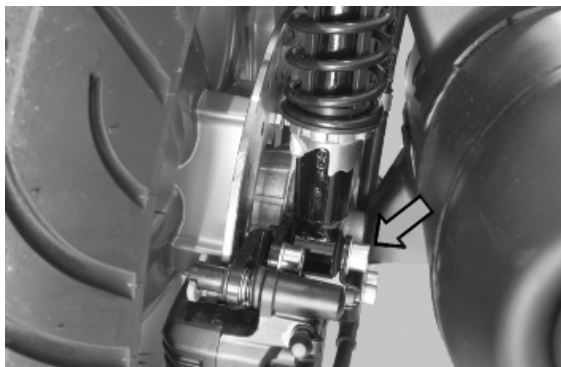


- Undo the screw fixing the rpm sensor and take it out of the steel plate screwed to the swinging arm.



Removal of swinging arm, right side

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



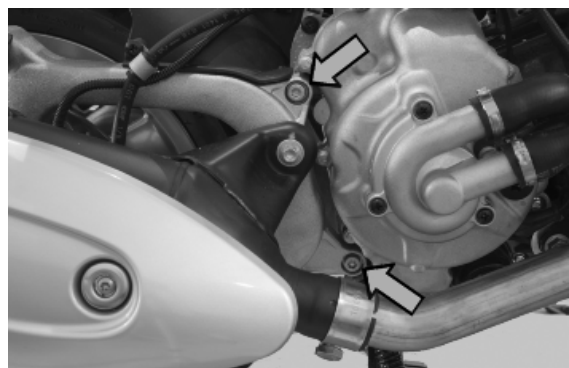
- Remove the cotter pin, the cap and unscrew the wheel axle nut. Operate the rear brake by pulling the left lever on the handlebar so that the axle does not turn.



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



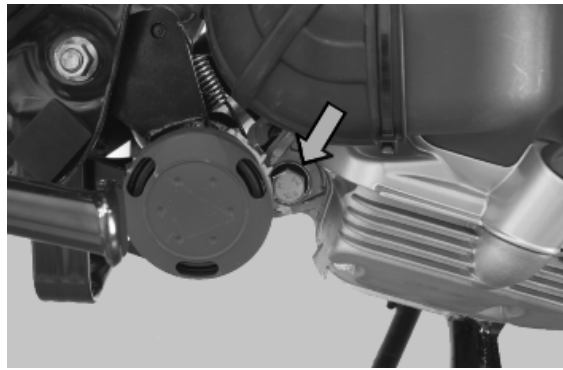
- Undo the 2 screws fixing the swinging arm to the engine.
- Remove the swinging arm.



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

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





When refitting the engine onto the 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

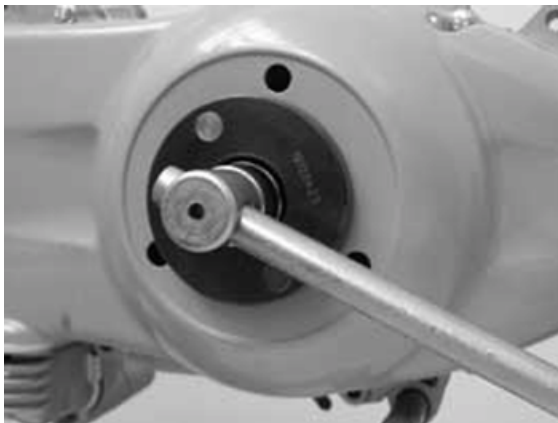
ENG

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

Automatic transmission

Transmission cover

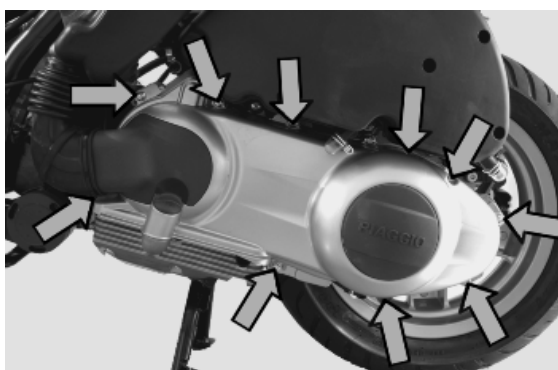
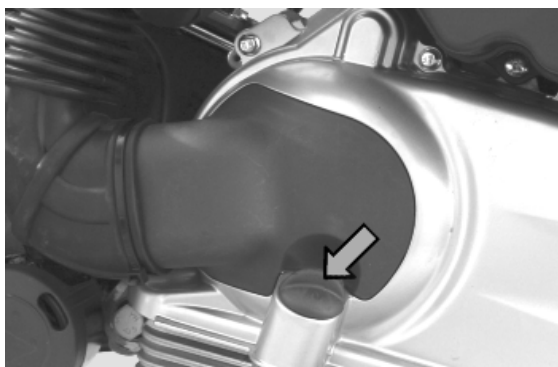
- To remove the transmission cover it is necessary to remove the plastic cover first, by inserting a screwdriver in the slotted holes. Using the clutch bell lock wrench shown in the figure, remove the driven pulley shaft locking nut and washer.



Specific tooling

020423Y Driven pulley lock wrench

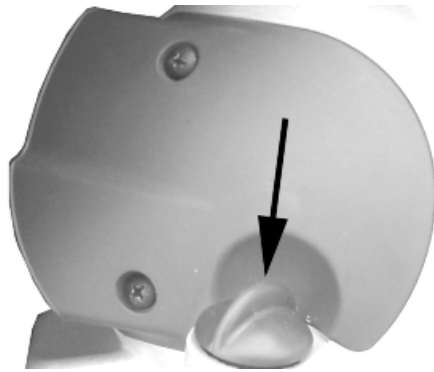
- Remove the cap/dipstick from the engine oil filling hole.
- Remove the ten screws.



-
- Remove the transmission cover.

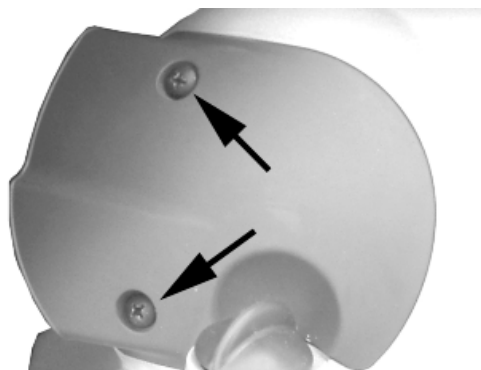
N.B.

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

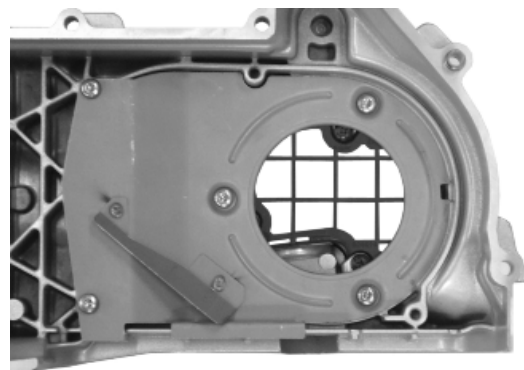


Air duct

-
- 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

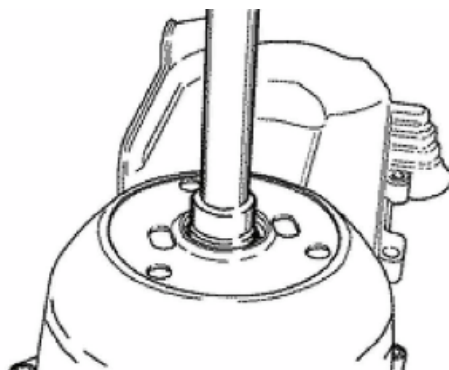
-
- Remove the clip from the inside of the cover.
 - Remove the bearing from the crankcase by means of:

Specific tooling

020376Y Adaptor handle

020375Y 28 x 30 mm adaptor

020412Y 15-mm guide



Refitting the driven pulley shaft bearing

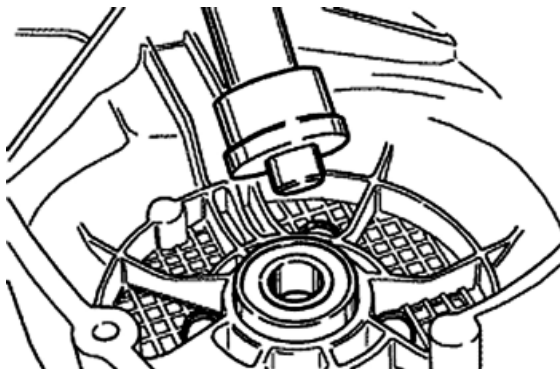
- Slightly heat the crankcase from the inside so as not to damage the painted surface.
- Insert the bearing in its seat.
- Refit the Seeger ring.

CAUTION

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

N.B.

ALWAYS REPLACE THE BEARING WITH A NEW ONE UPON REFITTING.



Specific tooling

020376Y Adaptor handle

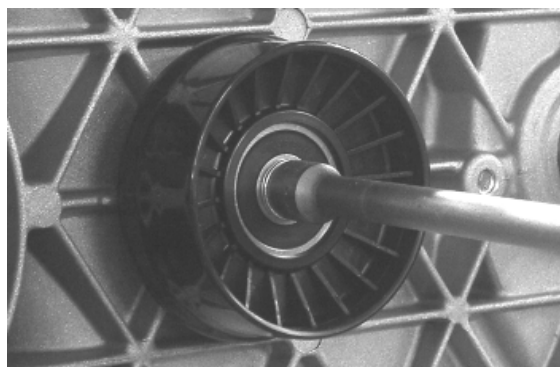
020357Y 32x35-mm Adaptor

020412Y 15-mm guide

Baffle roller

Plastic roller

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



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

Locking torques (N*m)

Anti-flapping roller 12 - 16

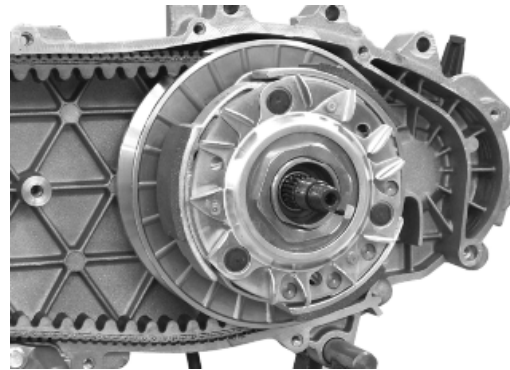


Removing the driven pulley

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

N.B.

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



Inspecting the clutch drum

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

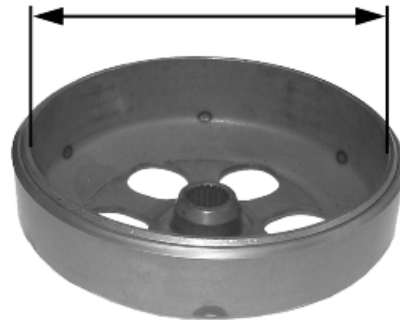
Characteristic

Max. value clutch bell

Max. value: Ø 134.5 mm

Clutch bell standard value

Standard value: Ø 134 - 134.2 mm



Checking the bell working surface eccentricity

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



- Using a feeler 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.

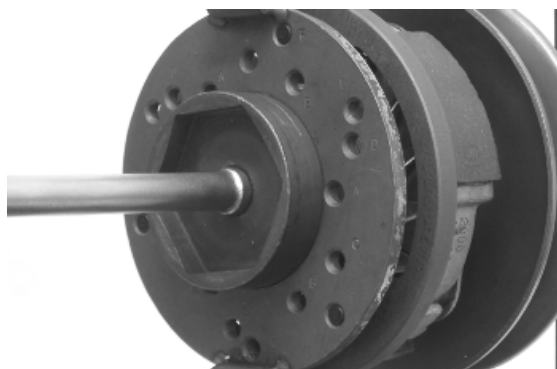
Admissible limit eccentricity: 0.15 mm



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



CAUTION

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

Specific tooling

020444Y011 adapter ring

020444Y009 wrench 46 x 55

020444Y Tool for fitting/ removing the driven pulley clutch

Inspecting the clutch

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

N.B.

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

CAUTION

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

Characteristic**Check minimum thickness**

1 mm



Pin retaining collar

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

N.B.

USE TWO SCREWDRIVERS IF YOU HAVE ANY DIFFICULTY.

N.B.

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

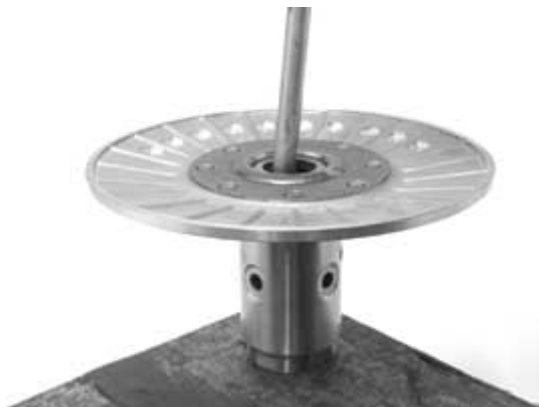


- Remove the 4 torque server pins and pull the pulley halves apart.



Removing the driven half-pulley bearing

- Check there are no signs of wear and/or noise; - 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 Bearing housing, outside $\varnothing$ 47 mm



- Remove the roller bearing using the modular punch.

Specific tooling

020376Y Adaptor handle

020456Y $\varnothing$ 24 mm adaptor

020363Y 20-mm guide

Inspecting the driven fixed half-pulley

- Measure the outer 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: $\varnothing$ 40.96 mm

Half-pulley standard diameter

Standard diameter: $\varnothing$ 40.985 mm

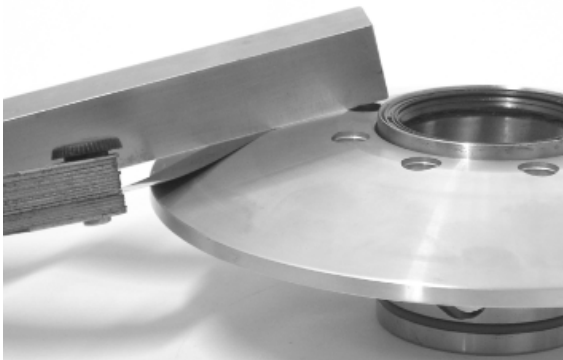
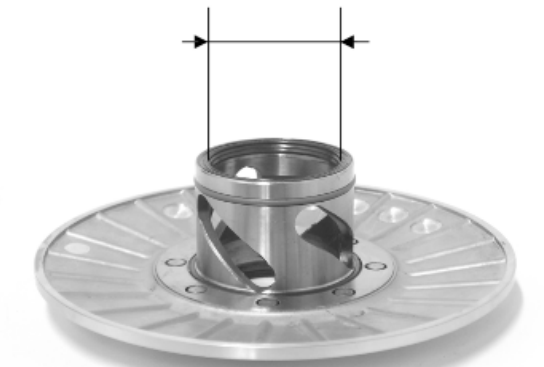


Wear limit
0.3 mm



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



MOVABLE DRIVEN HALF-PULLEY DIMENSIONS

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

Refitting the driven half-pulley bearing

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

Fit the snap ring

WARNING

N.B.

FIT THE BALL BEARING WITH THE VISIBLE SHIELD

Specific tooling

020376Y Adaptor handle

020375Y 28 x 30 mm adaptor

020424Y Driven pulley roller casing fitting punch



Refitting the driven pulley

- Insert the new oil 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 grams of grease. Apply grease through one of the holes in the bushing until it comes out through the hole on the opposite side. This operation is necessary to avoid the presence of grease beyond the O-rings.

N.B.



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

Specific tooling

020263Y Driven pulley assembly sheath

Recommended products

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

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



Inspecting the clutch spring

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

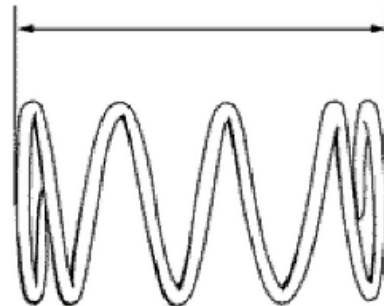
Characteristic

Standard length

123 mm

Acceptable limit after use:

118 mm

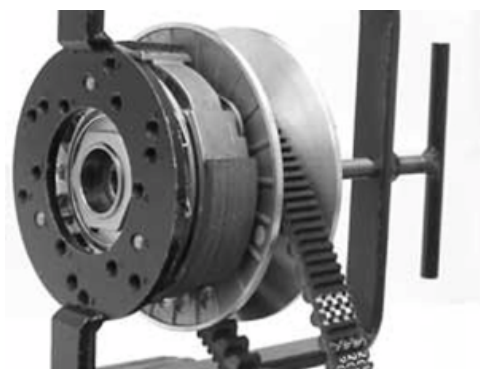


Refitting the clutch

- Support the driven pulley spring compressor specific tool with the control screw in vertical axis.
- Arrange the tool with the medium length pins screwed in position "C" on the inside.
- Introduce the adapter ring No. 11 with the chamfering facing upwards.
- Insert the clutch on the adapter ring.
- Lubricate the end of the spring that abuts against the 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

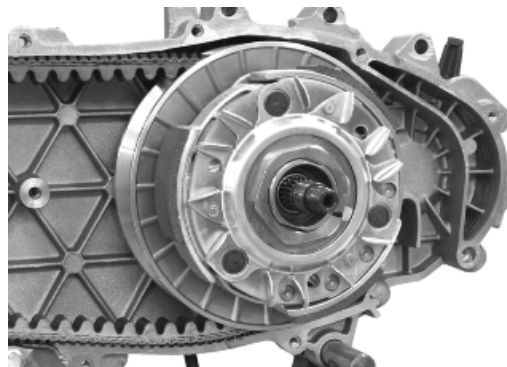
020444Y009 wrench 46 x 55

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.

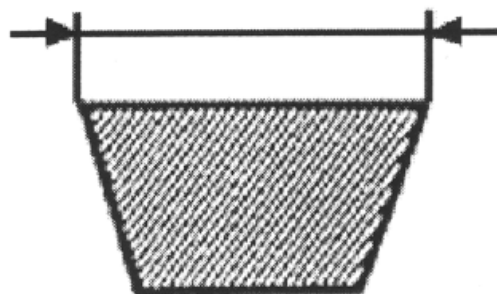
Characteristic

Driving belt -

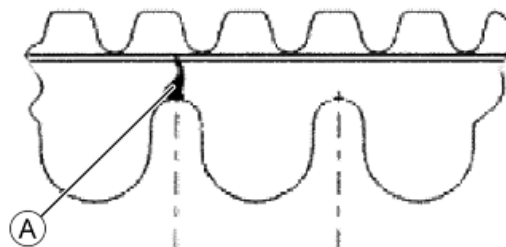
Standard width: 21.3 ± 0.2 mm

Driving belt -

Minimum width: 19.5 mm



During the wear checks foreseen in the scheduled maintenance, check that the rim bottom of the toothing does not show signs of incisions or cracking (see figure); otherwise, replace the belt.

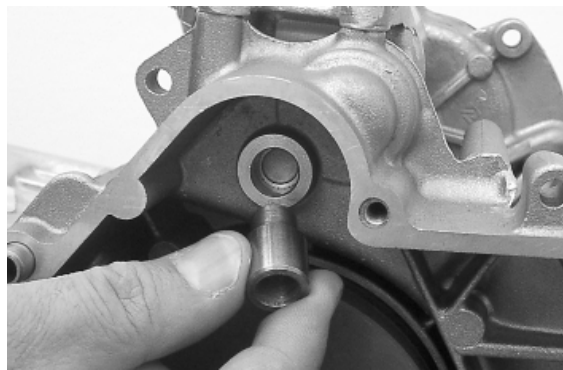


Removing the driving pulley

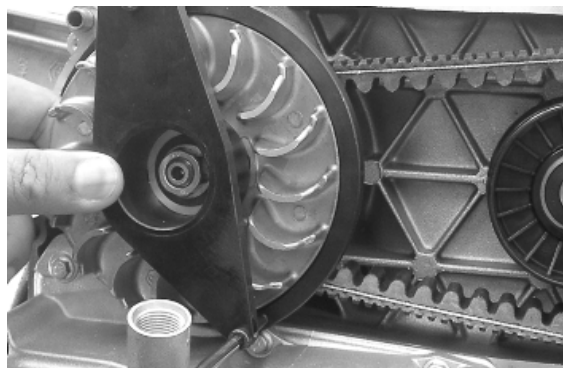
- Turn the crankshaft until the ropes of the pulley are on a horizontal axis



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



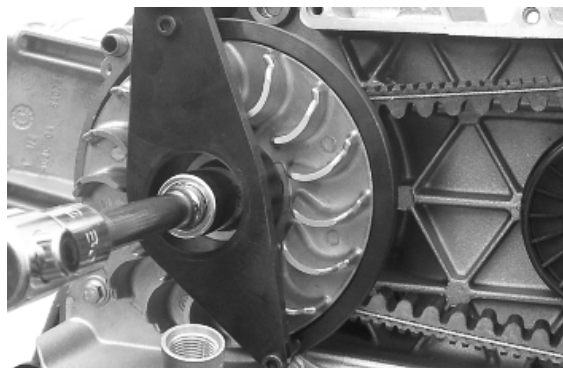
- Insert the tool in the hollows and apply the retention ring
- Bring in the ring's clamping screws while keeping the tool to support the pulley



Specific tooling

020626Y Driving pulley lock wrench

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



Inspecting the rollers case

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

CAUTION

DO NOT LUBRICATE OR CLEAN SINTERED BUSHINGS

Characteristic

movable driving half-pulley bushing: Standard Diameter

26.000 - 26.021 mm

movable driving half-pulley bushing: Maximum allowable diameter

Ø 26.12 mm

Sliding bushing: Standard Diameter

Ø 25.959 ÷ 25.98 mm

Sliding bushing: Minimum admissible diameter

Ø 25.95 mm

Roller: Standard Diameter

Diameter 20.5 - 20.7 mm

Roller: Minimum diameter allowed

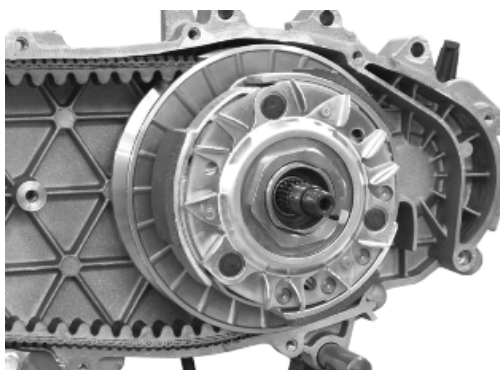
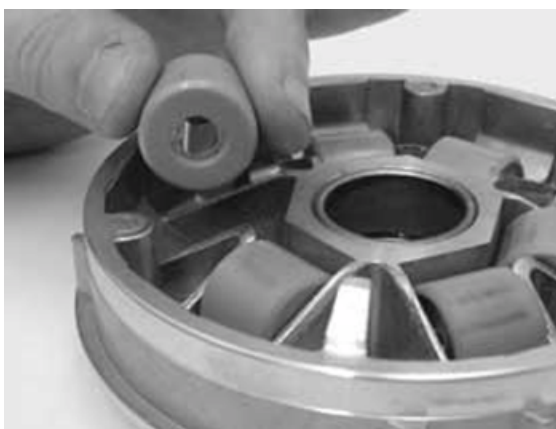
Ø 20 mm



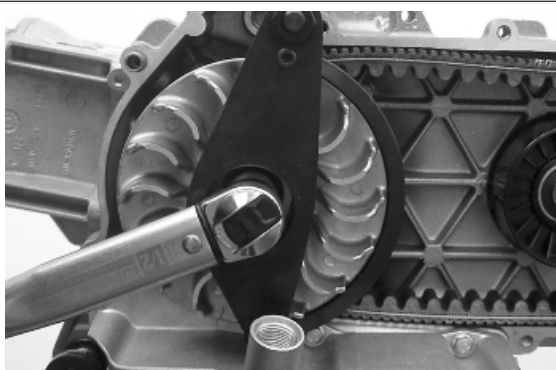


Refitting the driving pulley

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

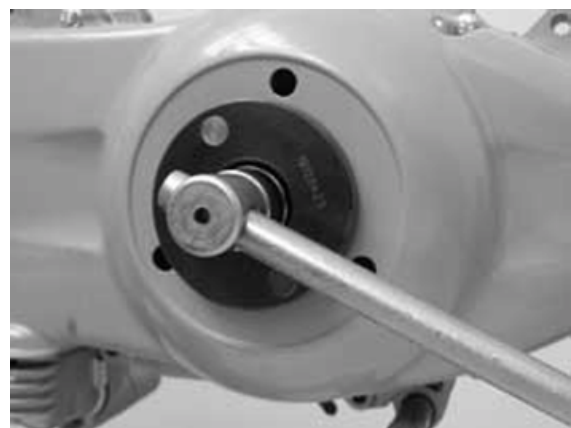
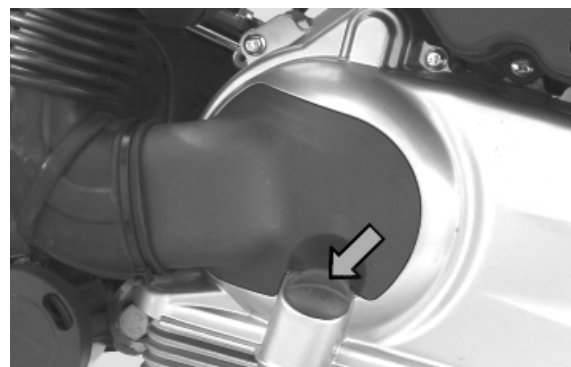
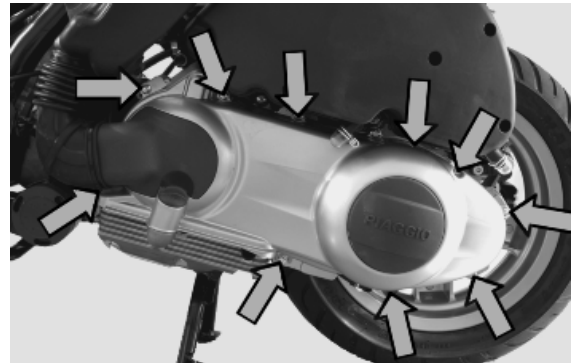
- Check that there are 2 centring dowels and that the sealing gasket for the oil sump on the transmission cover is adequately fitted.
- Replace the cover and tighten the 10 screws to the specified torque.
- Refit the oil loading cap/bar.
- Refit the steel washer and the driven pulley nut.
- Tighten the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

Specific tooling

020423Y Driven pulley lock wrench

Locking torques (N*m)

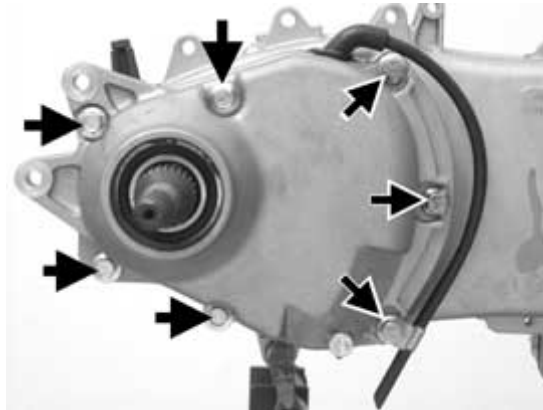
Transmission cover screws 11 ÷ 13 Driven pulley shaft nut 54 ÷ 60



End gear

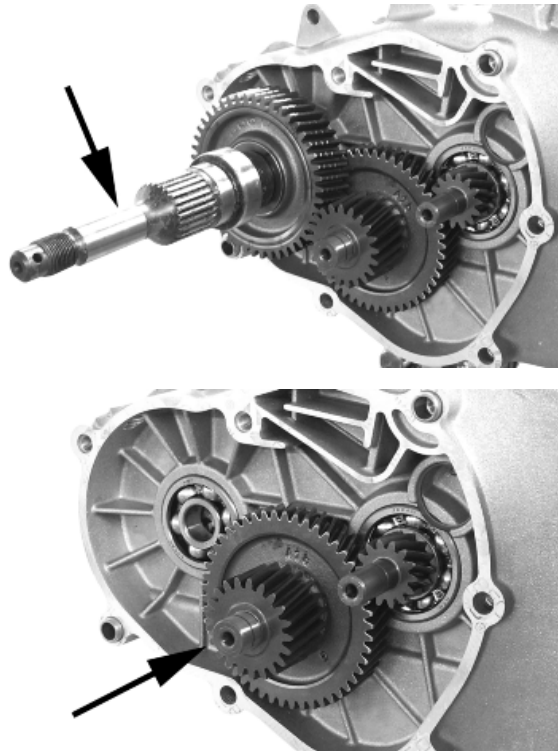
Removing the hub cover

- 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 ø 15-mm bearings



Removing the wheel axle bearings

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

Specific tooling

020376Y Adaptor handle

020477Y 37 mm adaptor

020483Y 30-mm guide

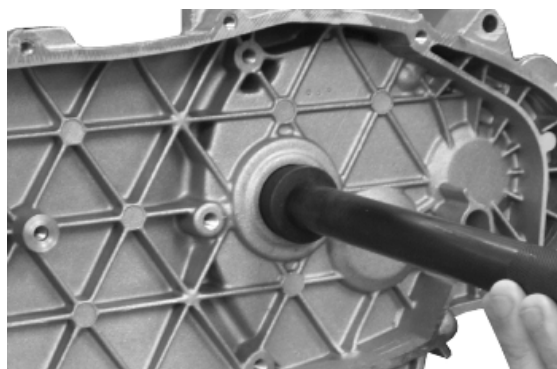
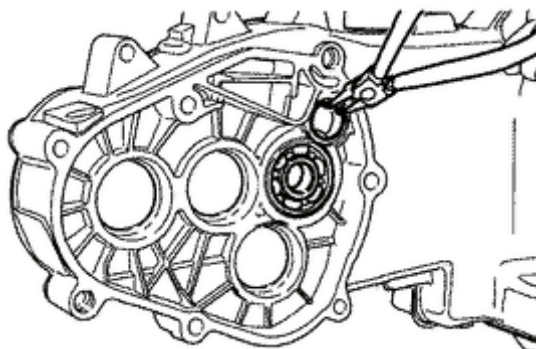
020359Y 42x47-mm Adaptor

020489Y Hub cover support stud bolt 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 28 x 30 mm adaptor

020363Y 20-mm guide

Inspecting the hub shaft

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



Inspecting the hub cover

- Check that the fitting surface is not dented or distorted.
 - Check the bearing bearings.
 - In case of 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.

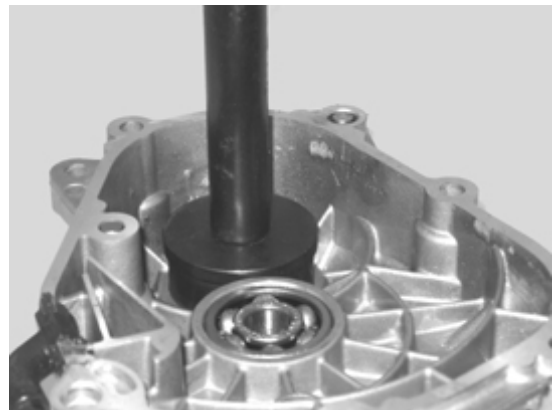
The 52-mm side of the adapter must be turned towards the bearing.

Specific tooling

020376Y Adaptor handle

020360Y 52x55-mm Adaptor

020483Y 30-mm guide



Refitting the hub cover bearings

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

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

Specific tooling

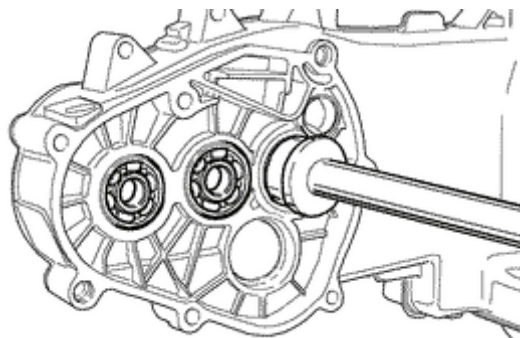
020150Y Air heater support

020151Y Air heater

020376Y Adaptor handle

020359Y 42x47-mm Adaptor

020412Y 15-mm guide



N.B.

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



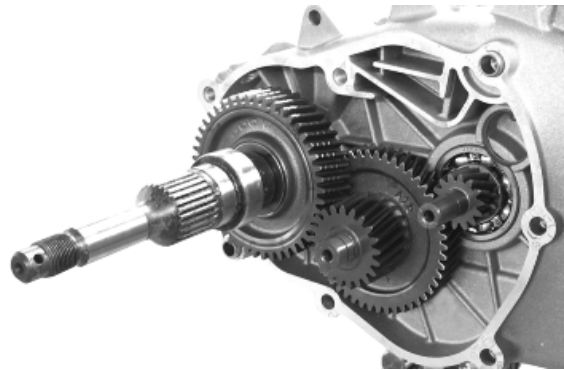
N.B.

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.

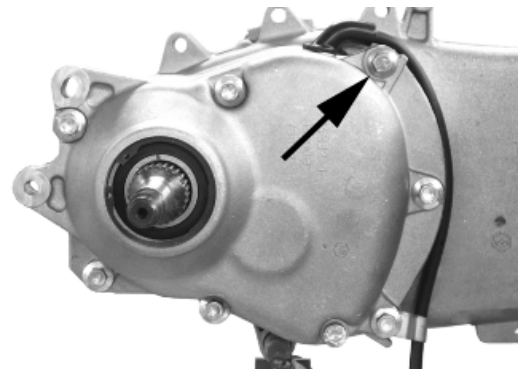
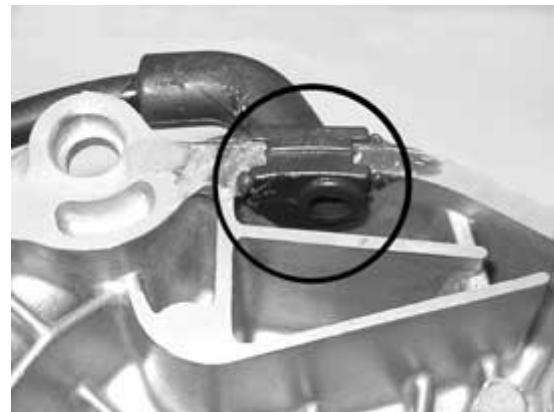
Refitting the hub bearings

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



Refitting the gearbox cover

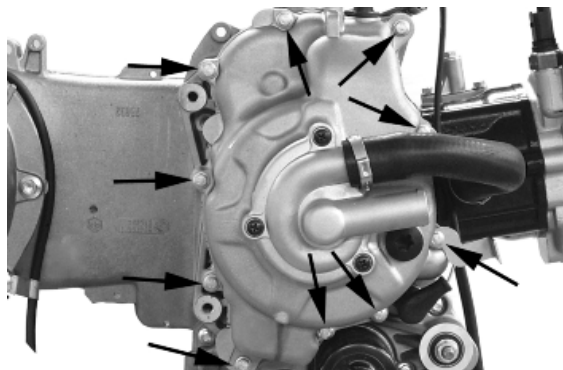
- Fit a new gasket together with the centring dowels.
- Seal the gasket of the breather pipe using black silicone sealant.
- Fit the gearbox cover, making sure the breather pipe is in the correct position.
- Position the shorter screw that can also be recognised from the different colour as shown in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



Flywheel cover

Removing the hub cover

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

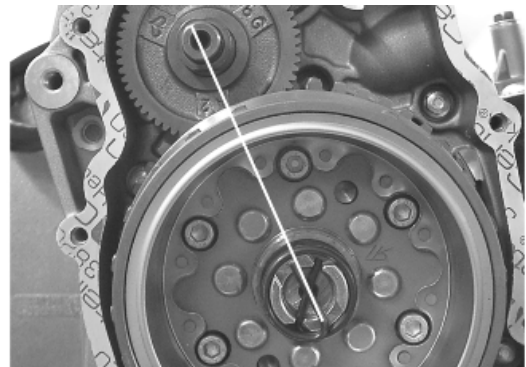
Locking torques (N*m)

Stator assembly screws (°) 3 ÷ 4

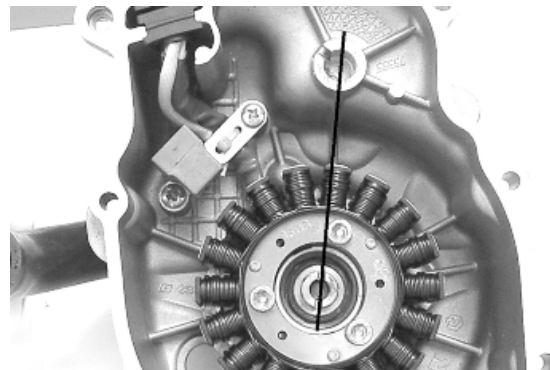


Refitting the flywheel cover

- 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 removal steps but in the reverse order.

CAUTION

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

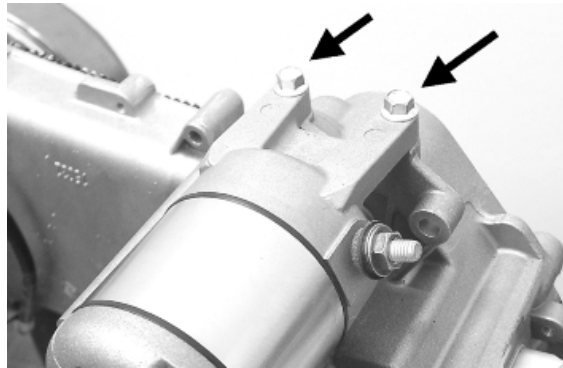
Locking torques (N*m)

Flywheel cover screws 11 - 13

Flywheel and starting

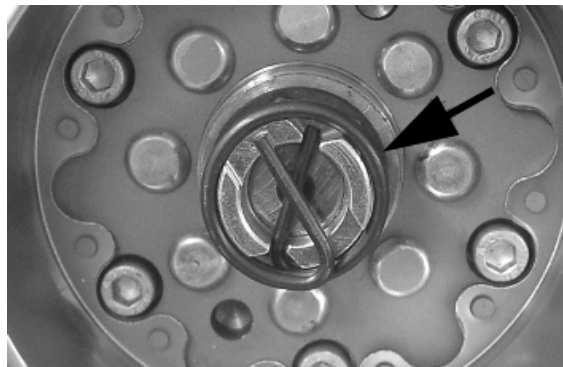
Removing the starter motor

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

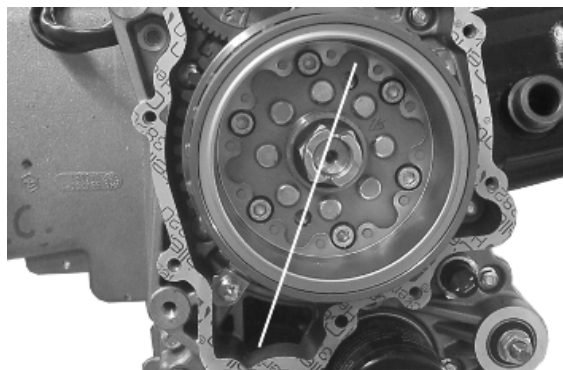


Removing the flywheel magneto

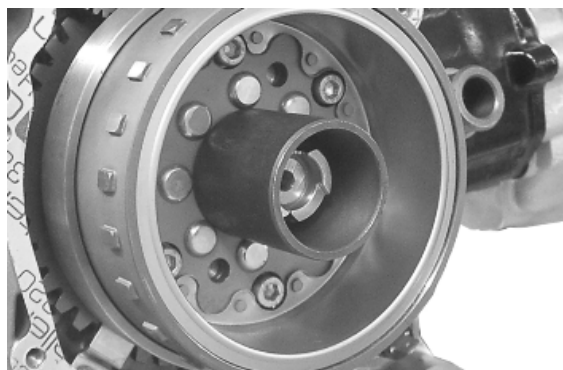
- Remove the water pump shaft and crankshaft spline clip



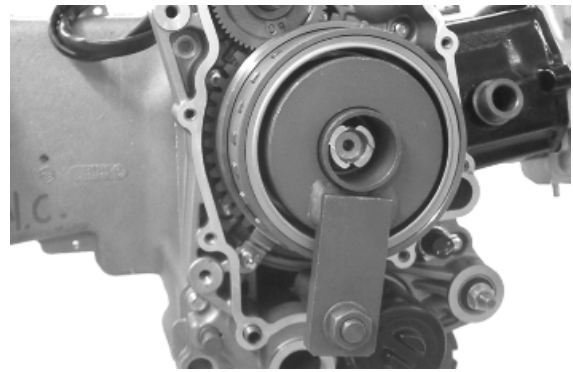
- Line up the two holes in the flywheel as shown in the photo



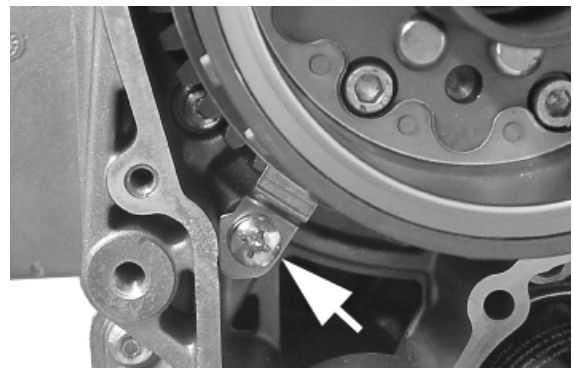
- Screw in the guide bushing that is part of the special flywheel stop tool on the flywheel as shown in the photo.



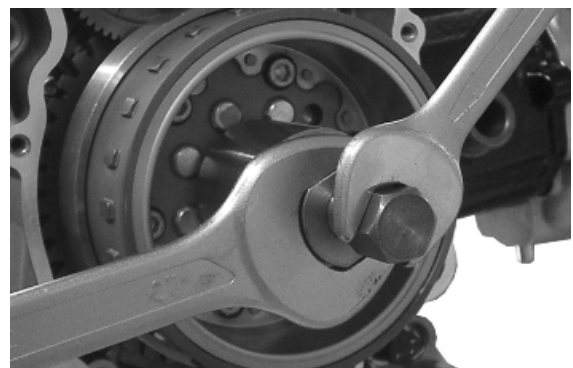
- Insert the special flywheel stop tool on the flywheel as shown in the photo

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.

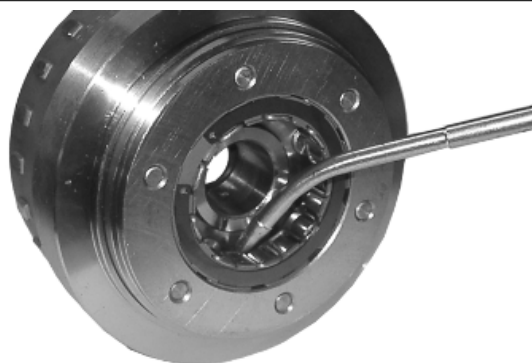
Recommended products**Loctite 243 Medium strength threadlock**

Medium Loctite 243 threadlock

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

Locking torques (N*m)**Screw fixing freewheel to flywheel $13 \div 15$** 

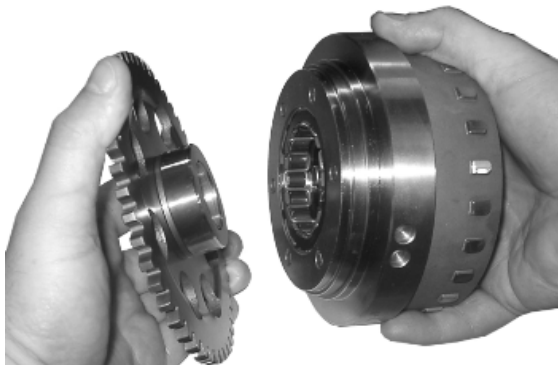
- Oil the free wheel "rollers".

**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



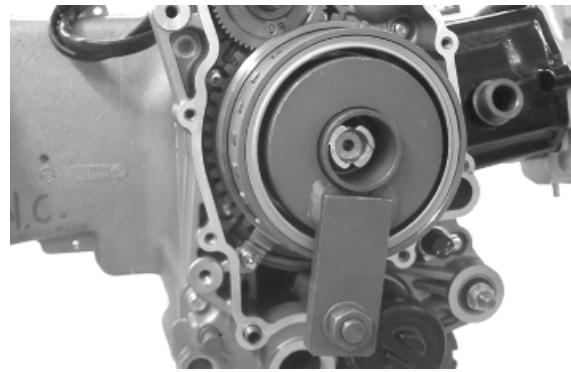
- Using the special flywheel lock wrench, tighten up the flywheel fixing nut to the prescribed torque
- Refit the retention plate

Specific tooling

020627Y Flywheel lock wrench

Locking torques (N*m)

Flywheel nut $94 \div 102$

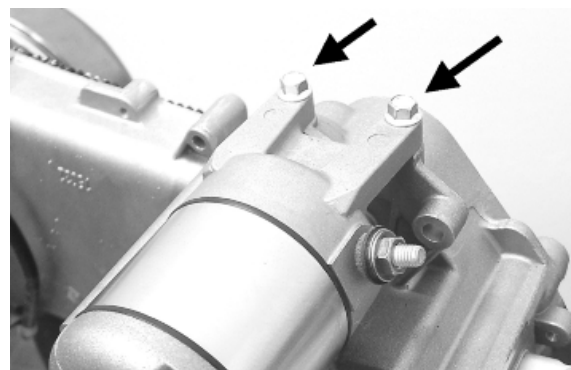


Refitting the starter motor

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

Locking torques (N*m)

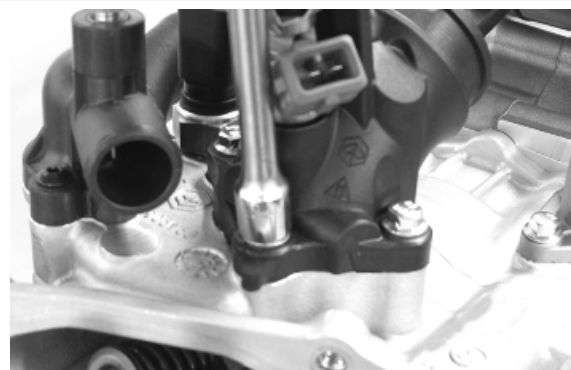
Starter screws $11 \div 13$



Cylinder assy. and timing system

Removing the intake manifold

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



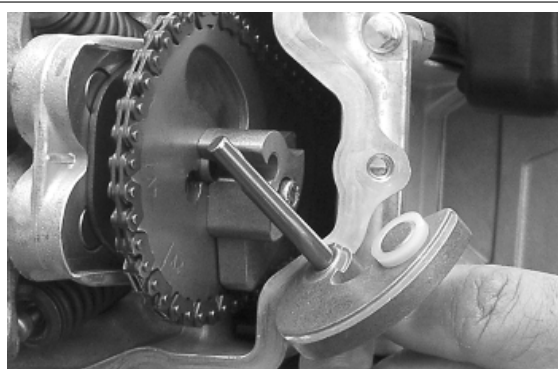
Removing the rocker-arms cover

- Remove the 5 screws indicated in the figure

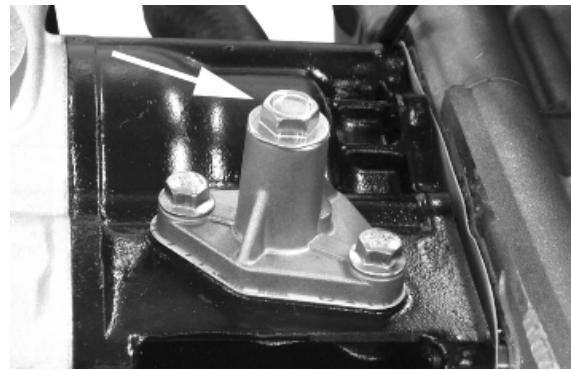


Removing the timing system drive

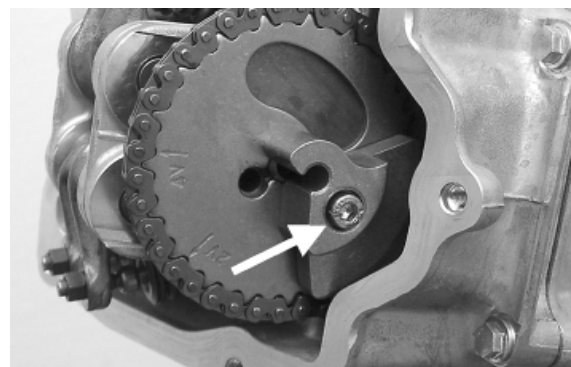
- First remove the parts listed below: transmission cover, drive pulley with belt, oil sump with spring and by-pass piston, oil pump pulley cover, O-ring on the crankshaft and the sprocket wheel separation washer.
- Remove the tappet cover.
- Remove the central screw fastener and the automatic valve-lifter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



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



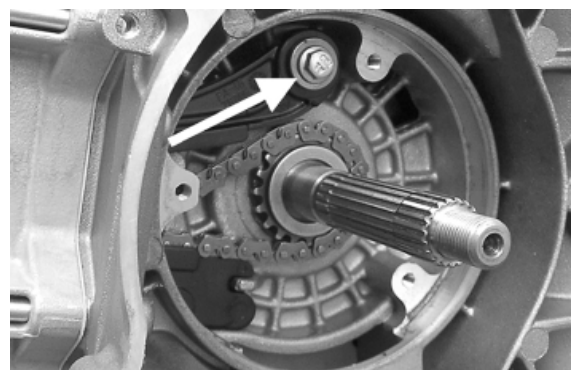
- Remove the internal hex screw and the counterweight shown in the figure.



- Remove the camshaft control pulley with its washer.



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

**N.B.**

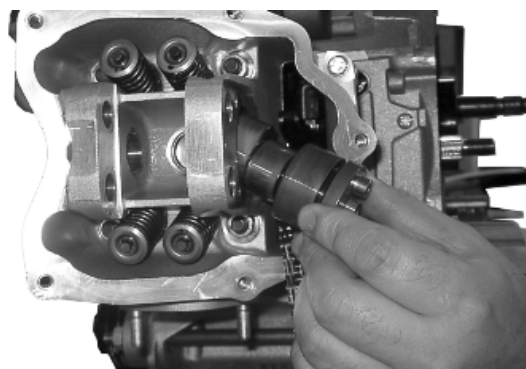
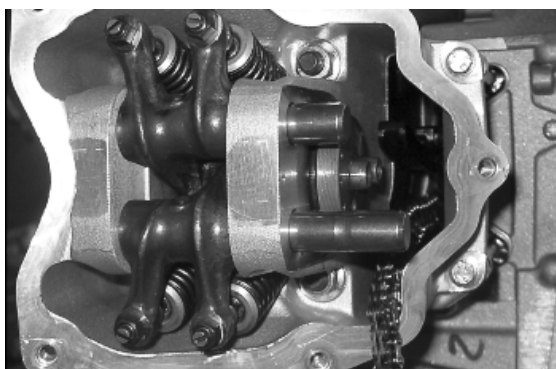
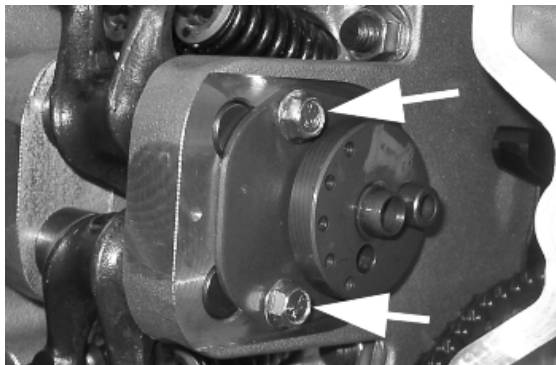
IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.

Removing the cam shaft

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

N.B.

IF NEEDED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, ROCKING LEVER PINS AND FIXING BRACKET. THE HEAD CAN ALSO BE REMOVED WITHOUT REMOVING THE CHAIN AND THE DRIVING SHAFT CHAIN TIGHTENER.

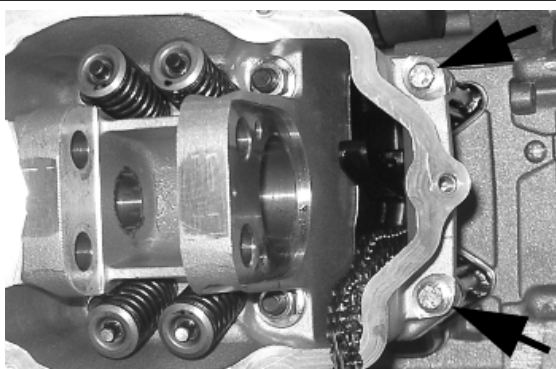


Removing the cylinder head

- 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.

IF NEEDED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, ROCKING LEVER PINS 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

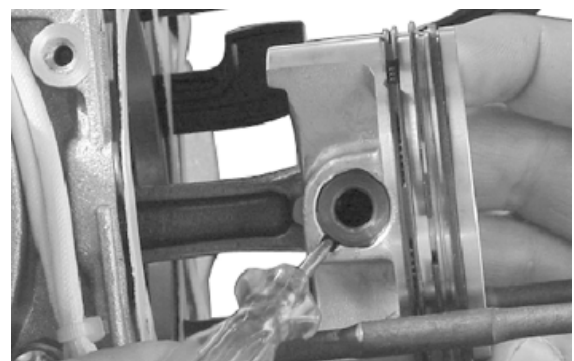
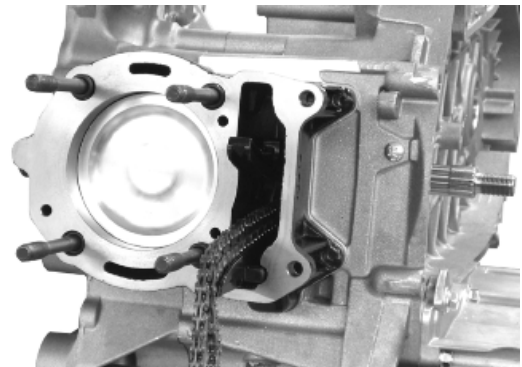
- Remove the chain guide slider.
- Remove the 4 O-rings on the stud bolts.
- Pull out the cylinder.
- Remove the cylinder base gasket.
- Remove the two stop rings, the wrist pin and the piston.
- Remove the piston seals.

CAUTION

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

N.B.

BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.



Inspecting the small end

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

N.B.

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

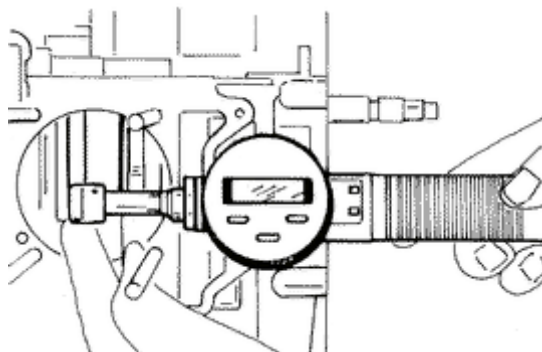
Characteristic

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

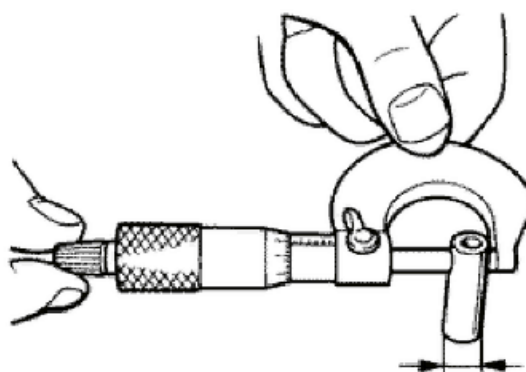
Characteristic

Pin diameter: Standard clearance

0.015 ÷ 0.029 mm

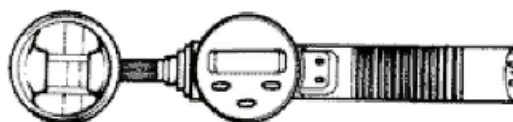
Pin diameter Standard diameter

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.



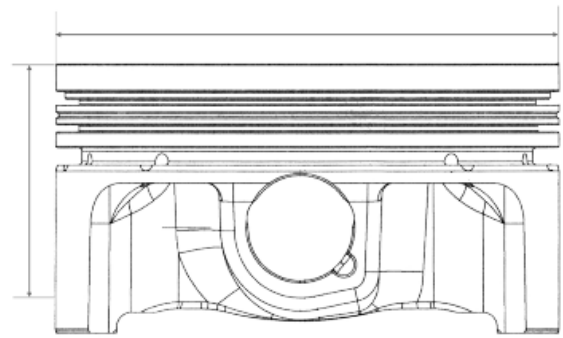
- If the clearance is greater than that indicated in the table, replace the piston.

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

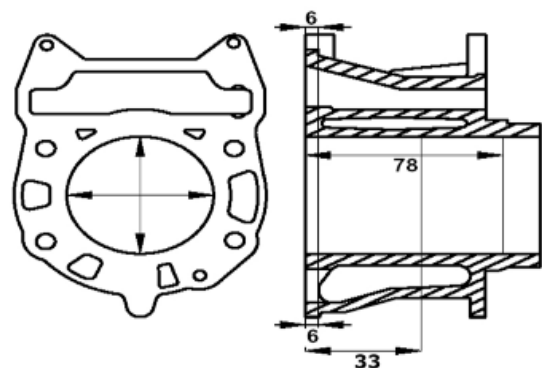
oil scraper ring - maximum clearance allowed after use 0.07 mm

oil scraper ring - maximum clearance allowed after use 0.07 mm

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 their 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)

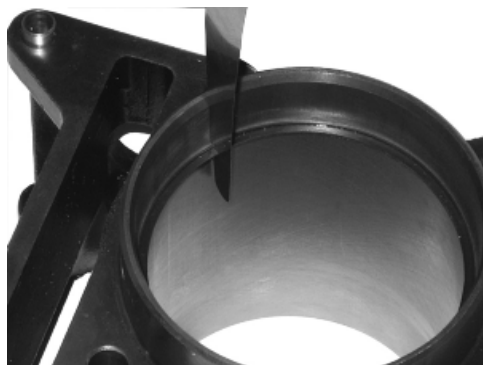
Maximum allowable run-out:

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: $0.15 \div 0.30$ mm

Middle piston ring

Standard opening: $0.20 \div 0.40$ mm

scraper ring

Standard opening: $0.20 \div 0.40$ 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.

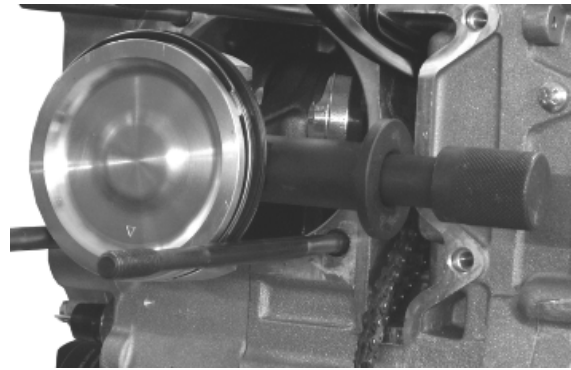
THE TOOL FOR INSTALLING THE SNAP RINGS MUST BE USED MANUALLY.

CAUTION

USING A HAMMER MIGHT DAMAGE THE STOPS' HOUSING.

Specific tooling

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

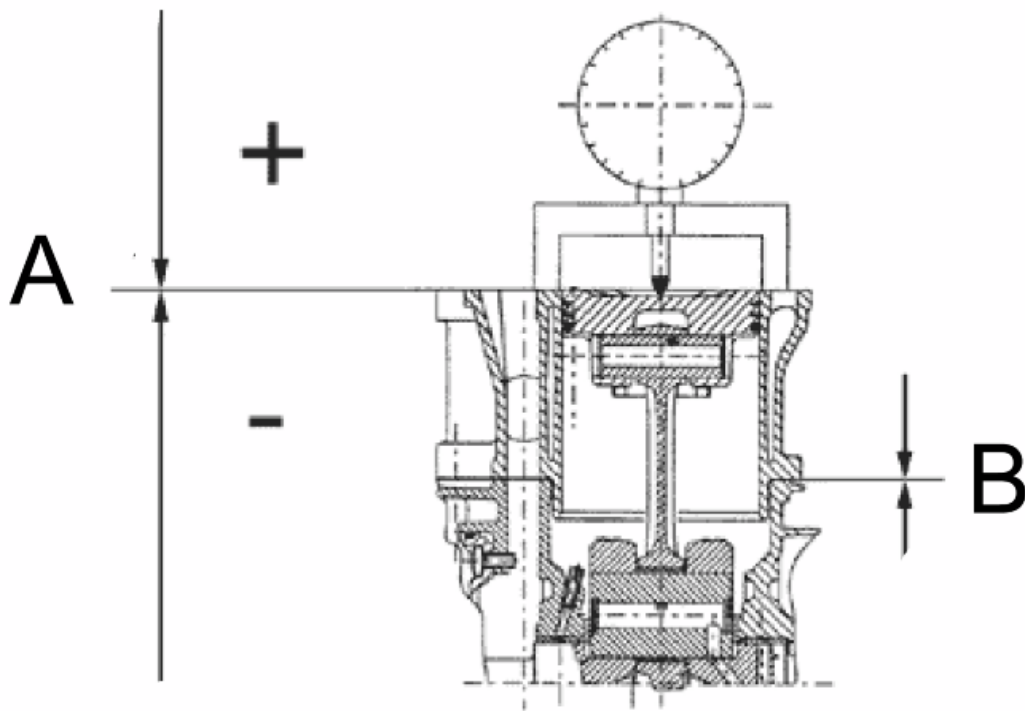


Choosing the gasket

Characteristic

Compression ratio

$11 \pm 0.5 : 1$



Measurement «A» to be taken, is a value of piston re-entry. It indicates by how much the plane formed by the piston crown descends below the plane formed by the upper part of the cylinder. The further the piston travels into the cylinder, the thinner the thickness «B» of the base gasket to be applied (to obtain the required compression ratio) and vice versa.

N.B.

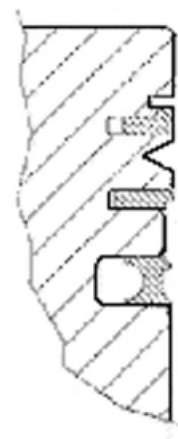
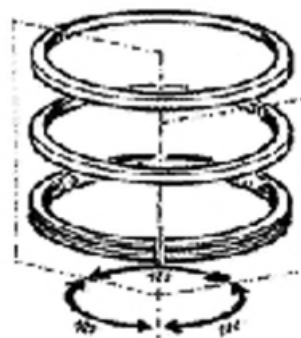
MEASUREMENT «A» MUST BE TAKEN WITH NO GASKET FITTED BETWEEN THE CRANKCASE AND CYLINDER AND AFTER RESETTING THE GAUGE, EQUIPPED WITH A SUPPORT, ON A GROUND PLANE.

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 engine has an L-shaped 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.

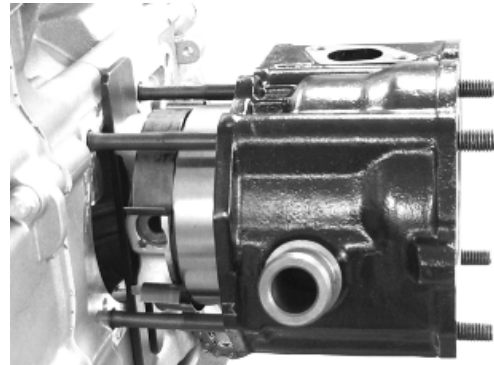
N.B.

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

Specific tooling

020426Y Piston fitting fork

020393Y Piston assembly band



Inspecting the cylinder head

- Using a trued bar and a feeler thickness 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 rocking lever 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»

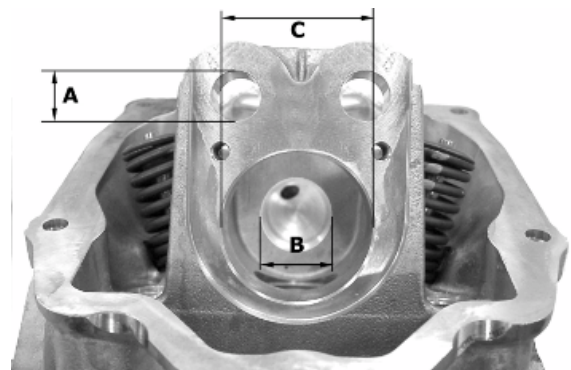
Diameter 12.000 - 12.018 mm

bearing «B»

Ø 20.000 ÷ 20.021 mm

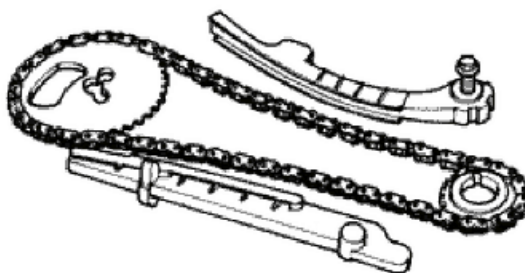
bearing «C»

Ø 37.000 - 37.025 mm



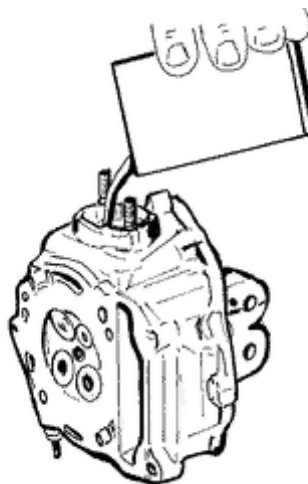
Inspecting the timing system components

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



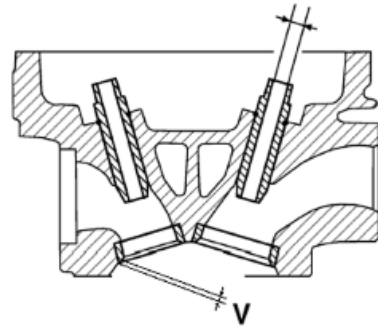
Inspecting the valve sealings

- 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

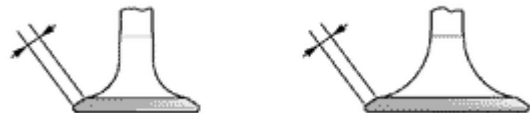
- Measure the width of the sealing surface on the valve seats and on the valves.

Characteristic

Sealing surface length: 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 discharge:

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 faying surface with the articulated set screw terminal.
- If no anomalies are found during the above checks, 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. Upon 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**

Exhaust: 94.4 mm

Valve check Standard length

Inlet: 94.6 mm

Valve check Maximum admissible clearance

Exhaust: 0.072 mm

Valve check Maximum admissible clearance

Inlet: 0.062 mm

Valve check standard clearance

Exhaust: $0.025 \div 0.052$ mm

Valve check standard clearance

Inlet: $0.013 \div 0.040$ mm

Valve check Minimum admissible diameter:

Exhaust: 4.95 mm

Valve check Minimum admissible diameter:

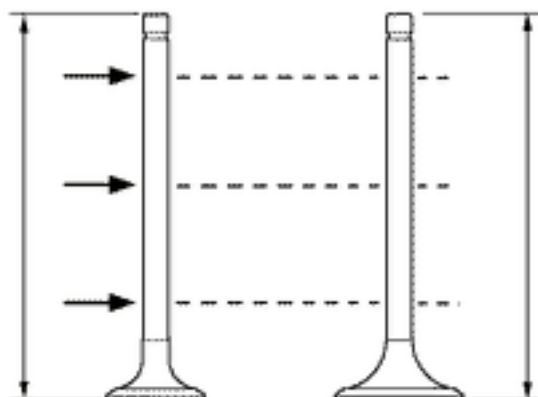
Inlet: 4.96 mm

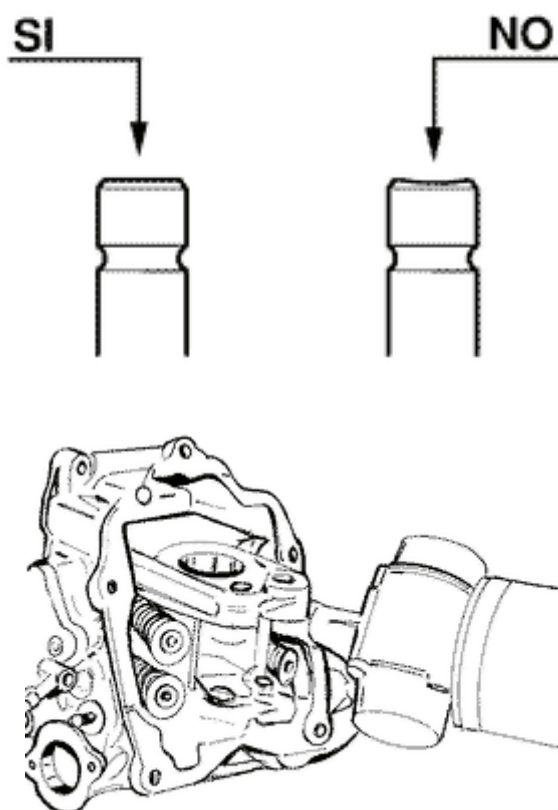
Valve check Standard diameter:

Inlet: $4.972 \div 4.987$ mm

Valve check Standard diameter:

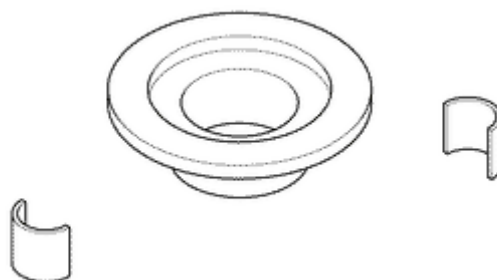
Exhaust: $4.96 \div 4.975$ mm





Inspecting the springs and half-cones

- Check that the upper and lower supporting washers of the springs, the cotters and the oil seal do not show signs of abnormal wear.
- Replace the components when worn.



Refitting the valves

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

N.B.

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

Specific tooling

020306Y Punch for assembling valve seal rings

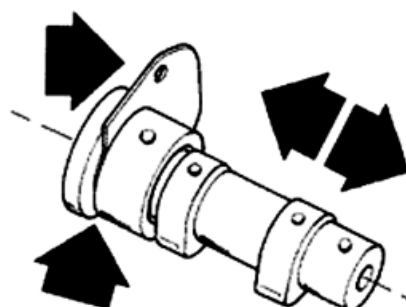
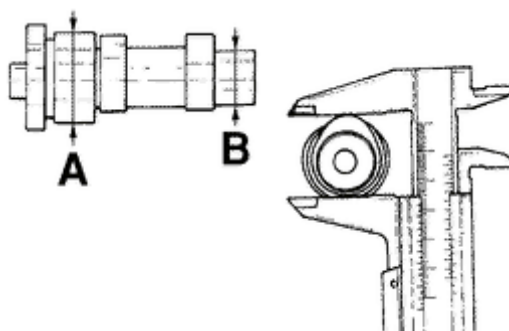
020382Y Valve cotters equipped with part 012 removal tool

020382Y011 adapter for valve removal tool



Inspecting the cam shaft

- Inspect the camshaft for signs of abnormal wear on the cams.
- Check the cam height.
- Check there is no wear on the camshaft retaining plate and its associated groove on the camshaft.
- 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 rocking lever pins do not show signs of wear or scoring.



- Measure the internal diameter of each rocking lever.

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



Characteristic

Rocking lever inside diameter: Standard diameter

Diameter 12.000 - 12.011 mm

Rocking lever pin diameter: Standard diameter

Diameter 11.977 - 11.985 mm

Camshaft check: Maximum admissible axial clearance

0.42 mm

Camshaft check: Standard axial clearance:

0.11 - 0.41 mm

Camshaft check: Standard height

Exhaust: 29.209 mm

Camshaft check: Standard height

Inlet: 30.285 mm

Camshaft check: Minimum admissible diameter

Bearing B diameter: 19.950 mm

Camshaft check: Minimum admissible diameter

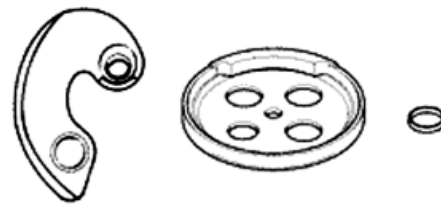
Bearing A Ø: 36.94 mm

Camshaft check: Standard diameter

Bearing B diameter: 19.959 ÷ 19.98 mm

Camshaft check: Standard diameter

Bearing A Ø: 36.95 ÷ 36.975 mm



Refitting the head and timing system components

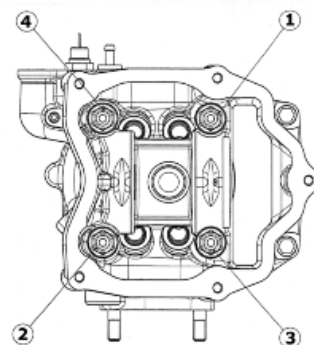
- Fit the timing chain guide slider.
- Insert the centring dowel between the cylinder head to the cylinder, fit the cylinder head gasket and the cylinder head.
- Lubricate the stud bolt threading.
- Tighten up the nuts to an initial pre-torque of 7 ± 1 N·m
- Tighten up the nuts to a second pre-torque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

N.B.

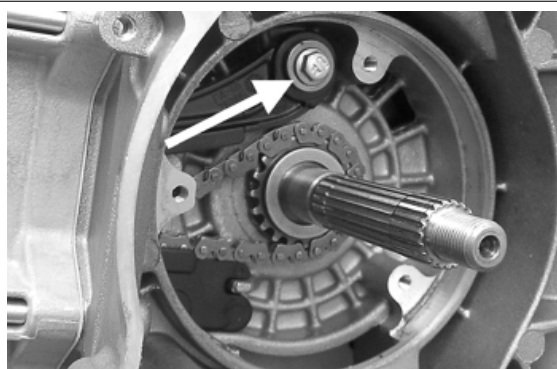
BEFORE INSTALLING THE HEAD, MAKE SURE THAT THE LUBRICATION CHANNEL IS CLEAN USING A COMPRESSED AIR JET.

Locking torques (N*m)

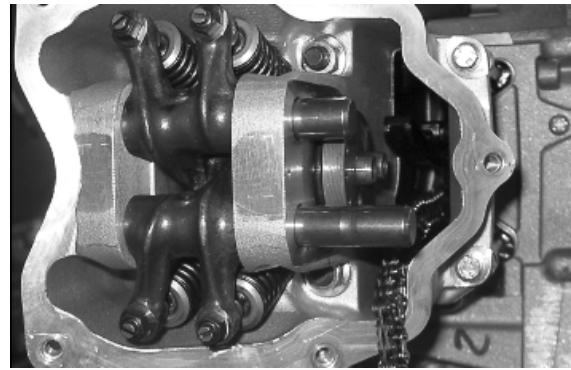
Timing chain tensioner support screw $11 \div 13$



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



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



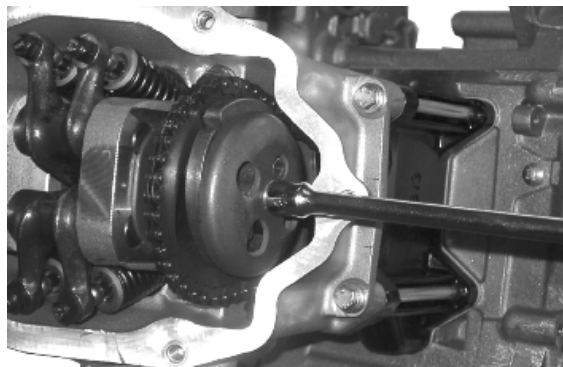
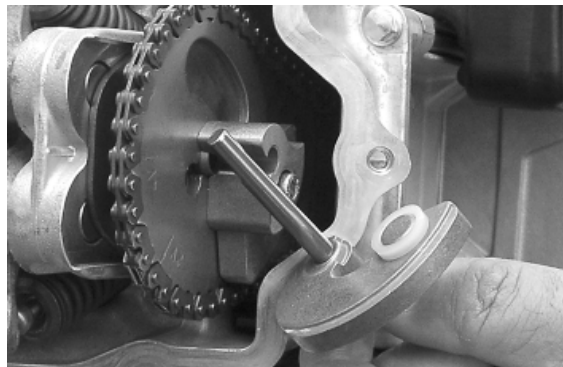
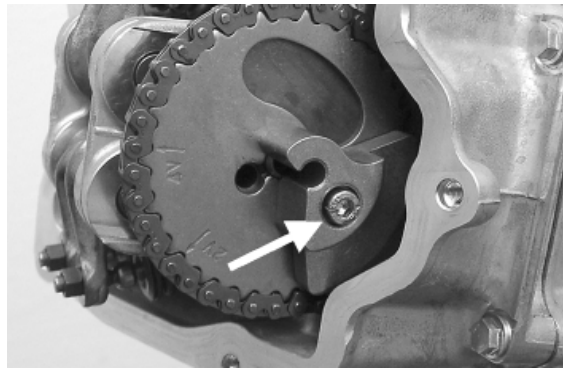
Electrode distance 0.8 mm

N.B.

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

Locking torques (N*m)

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

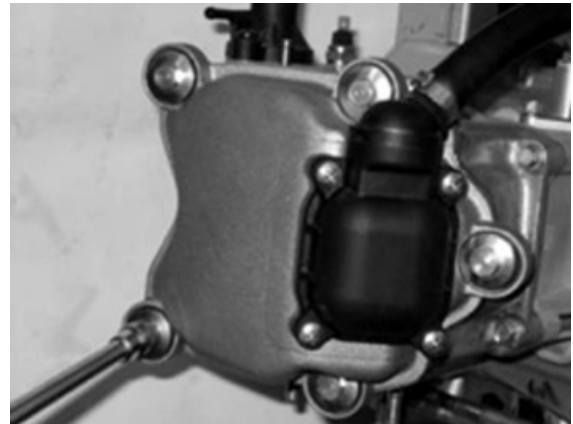


Refitting the rocker-arms cover

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

Locking torques (N*m)

Tappet cover screws 6 - 7 Nm

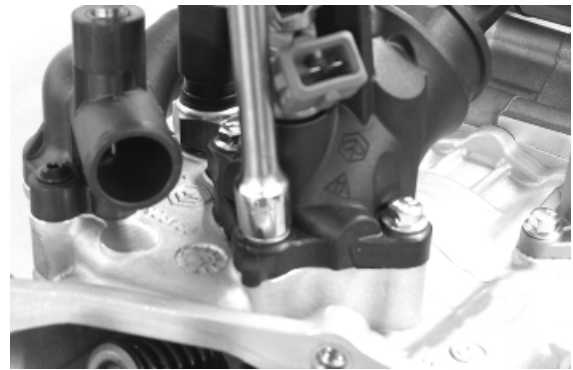


Refitting the intake manifold

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

Locking torques (N*m)

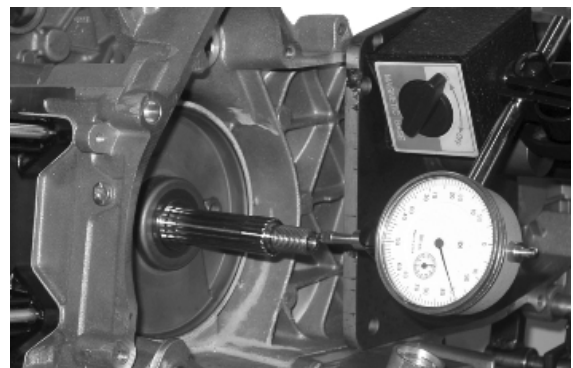
Inlet manifold screws 11 ÷ 13



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.

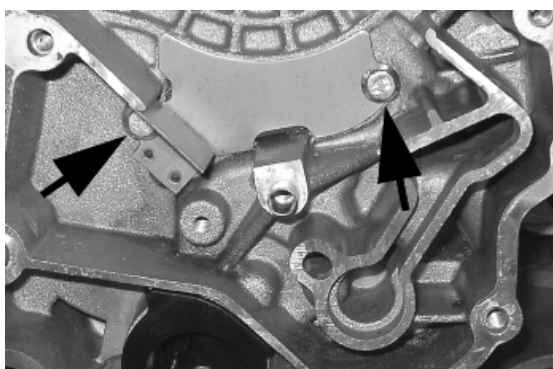
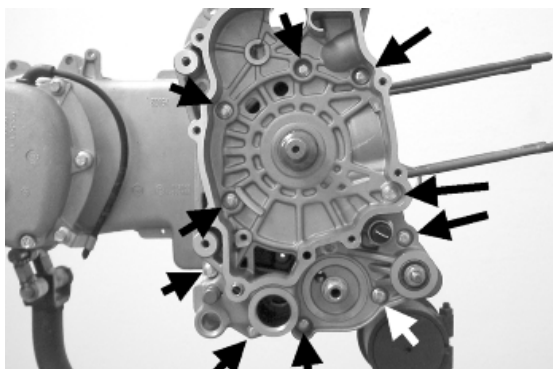
Specific tooling

020262Y Crankcase splitting plate

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

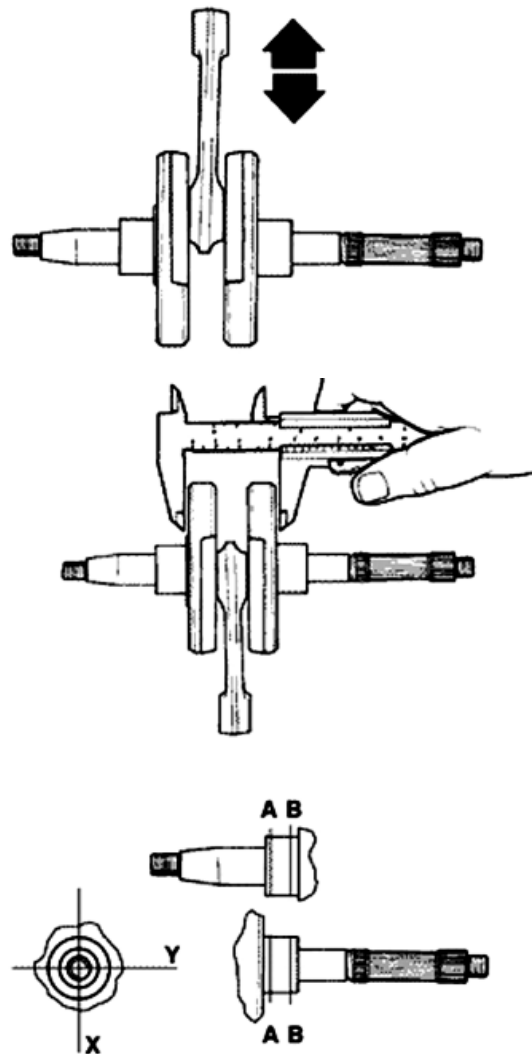
55.67 ÷ 55.85 mm

Crankshaft bearings: Standard diameter: Cat.
1

28.994 ÷ 29.000

Crankshaft bearings: Standard diameter: Cat.
2

29.000 ÷ 29.006

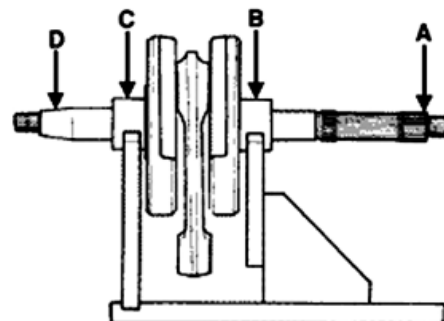


Inspecting the crankshaft alignment

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

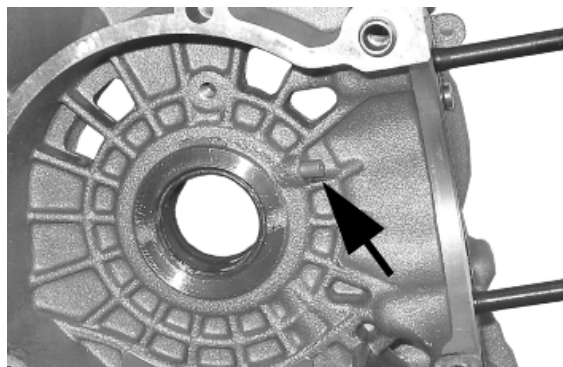
B = 0.01 mm

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 of 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.



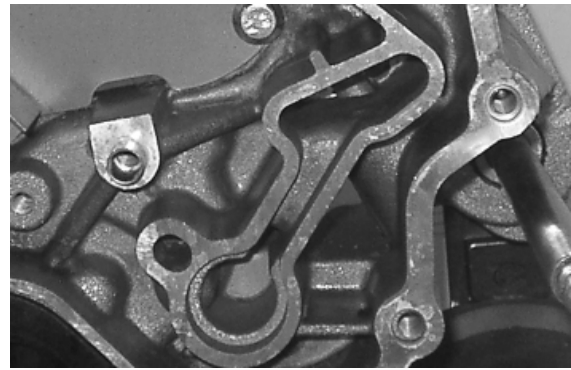
- Inspect the coupling surfaces on the crankcase halves for scratches or deformation, taking particular care with the cylinder/crankcase surfaces and the crankcase halves surfaces.
- Defects in the crankcase coupling gasket between the crankcase halves or the mating surfaces shown in the diagram, could 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 PISTON CROWN COOLING. CLOGGING HAS EFFECTS THAT ARE DIFFICULT TO DETECT (PISTON TEMPERATURE INCREASE). FAILURE OR LEAKS CAN CAUSE A CONSIDERABLE DROP IN THE LUBRICATION PRESSURE FOR MAIN BUSHINGS AND CONNECTING ROD .

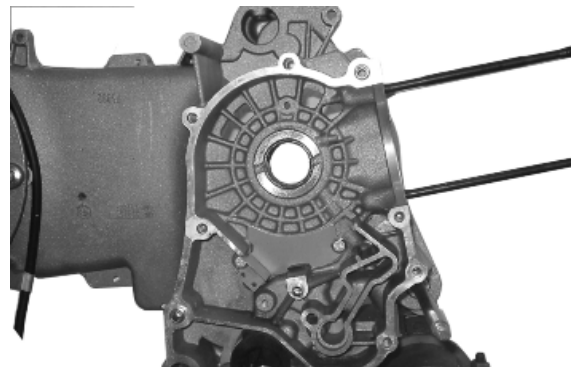
N.B.

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

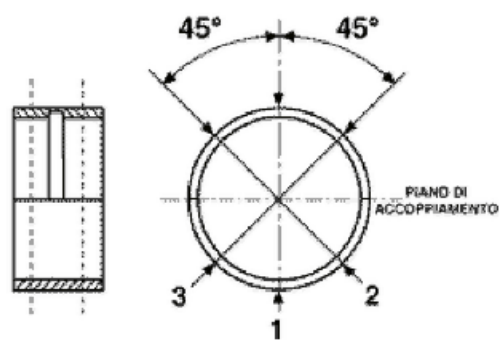


Inspecting the crankshaft plain bearings

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



- The solid half-bearing is intended to stand the thrusts caused by combustion, and for this reason it is arranged opposed the cylinder.
 - To prevent shutters in the oil feeding channels, the matching surface of the two half-bearings must be perfectly orthogonal to the cylinder axis, as shown in the figure.
 - The oil feeding channel section is also affected by the bushings driving depth compared with the crankshaft axial clearance of the limiting surface.
 - Check the inside diameter of the main bushings in the three directions indicated in the diagram.
 - Repeat the measurements for the other bushing half. see diagram.
 - There are three crankcase versions: with RED main bushings, with BLUE main bushings and with YELLOW main bushings.
 - There is only one type of main bushing housing hole in the crankcase
- The standard bushing diameter after driving is variable on the basis of a coupling selection.
- The bushing housings in the crankcase are available in two categories, Cat. 1 and Cat. 2, as are the crankshafts.
 - The main bushings are available in three thickness categories, identified by colour markings, as shown in the table below.



TYPE	IDENTIFICATION		
A	RED		
B	BLUE		
C	YELLOW		

	Type "A" - RED	Type "B" - BLUE	Type "C" - YELLOW
Main half-bearing	1.970 ÷ 1.973	1.9703 ÷ 1.976	1.976 ÷ 1.979

Bushing category	Crankcase halves category	Internal bushing diameter after fitting	Possible fitting
A	1	29.025 ÷ 29.040	Original
B	1	29.019 ÷ 29.034	Original and
	2	29.028 ÷ 29.043	spare
C	2	29.022 ÷ 29.037	Original

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

Crankcase halves	Engine half-shaft	Bushing
Cat. 1	Cat. 1	B
Cat. 2	Cat. 2	B
Cat. 1	Cat. 2	A
Cat. 2	Cat. 1	C

N.B.

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

N.B.

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

Characteristic**Standard driving depth**

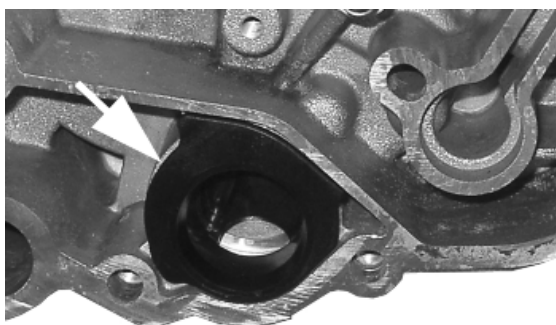
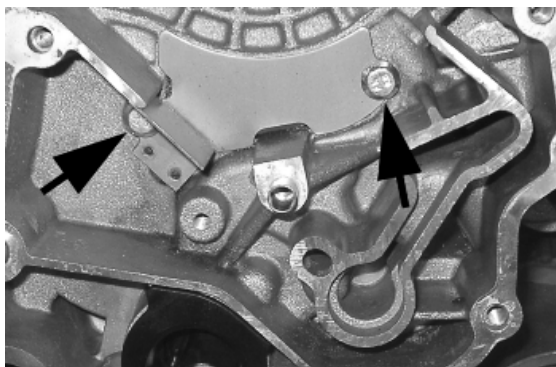
1.35 ÷ 1.6

Diameter of crankcase without bushing

32.953 ÷ 32.963

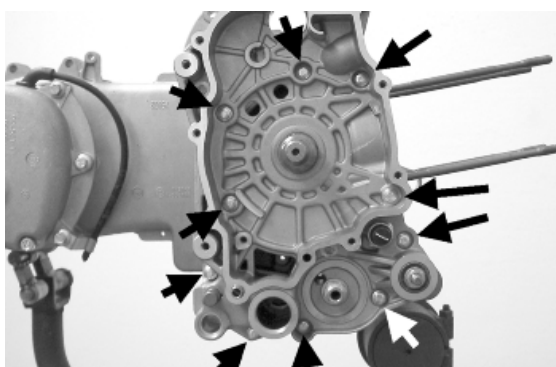
Refitting the crankcase halves

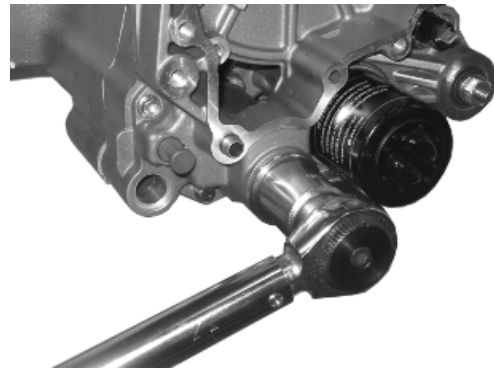
- Fit the internal bulkhead and lock the 2 screws to the prescribed torque.
- Fit the oil filter fitting and tighten it to the prescribed torque.
- Position the oil pre-filter element as shown in the photograph.
- Place a new gasket on one of the crankcase halves, preferably on the transmission side,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



Locking torques (N*m)

Internal engine crankcase bulkhead (transmission-side half shaft) screws 4 ÷ 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 picture. If it varies significantly from the driving depth indicated, it means that the stud bolt has yielded.

In this case, replace it.



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

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

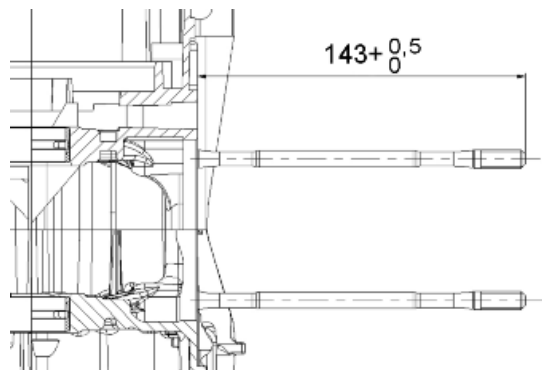
Tighten up to the depth of the driving indicated.



Recommended products

Loctite Quick Set Loctite 270 high strength threadlock

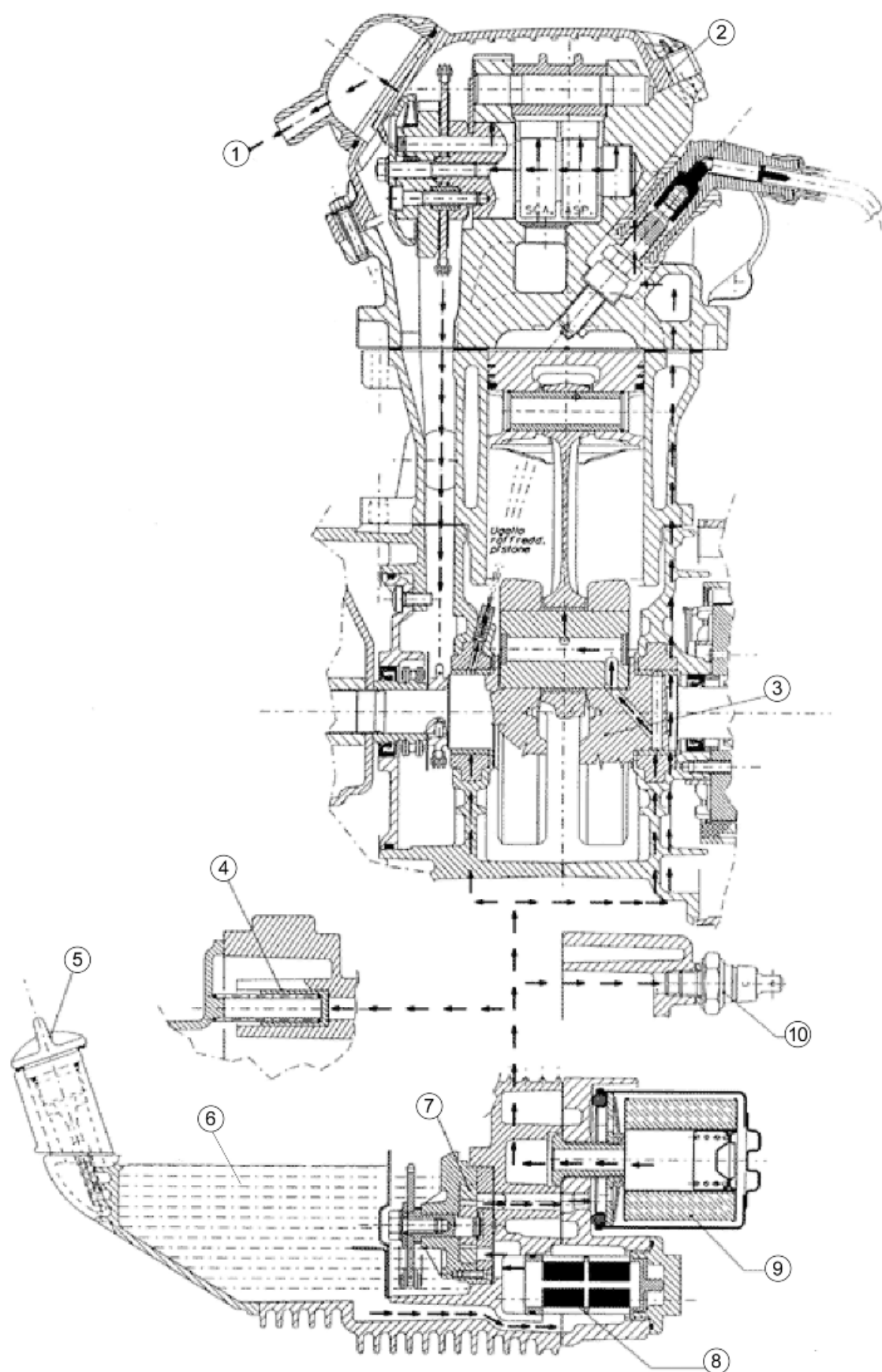
Loctite 270 high strength threadlock



Lubrication

Conceptual diagrams

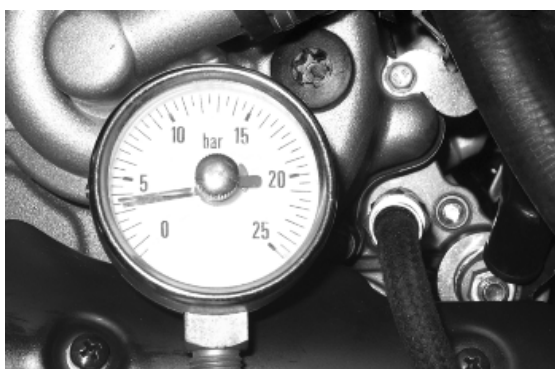
LUBRICATION CIRCUIT



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

Oil pressure check

- Remove the electrical minimum oil pressure switch connection and remove the switch.
- Connect the coupling and the pressure gauge to check the oil pressure to the hole on the minimum pressure sensor.
- Check 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 PROPER CONDITION.

Specific tooling

020193Y Oil pressure check gauge

Characteristic**Oil pressure**

Minimum pressure admitted at 6000 rpm: 3.2 atm.

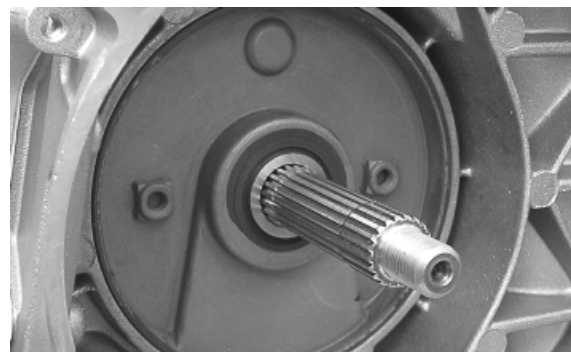
Locking torques (N*m)

Minimum oil pressure sensor 12 ÷ 14

Crankshaft oil seals

Removal

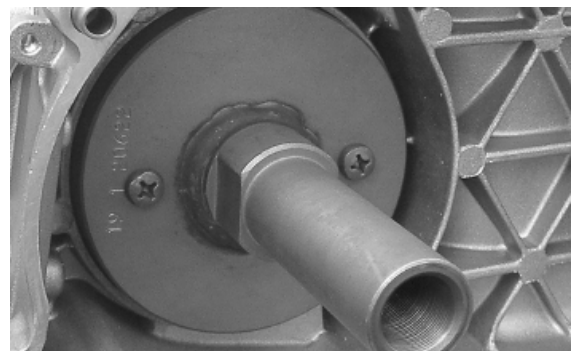
- Remove the transmission cover and the complete drive pulley beforehand



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

Specific tooling

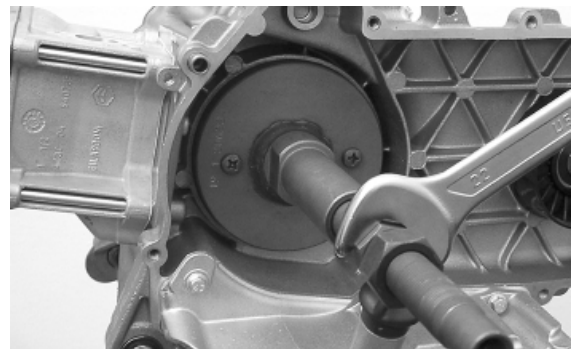
020622Y Transmission-side oil guard punch



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

Specific tooling

020622Y Transmission-side oil guard punch



Refitting

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

CAUTION

DO NOT LUBRICATE THE KEYING SURFACE ONTO THE ENGINE CRANKCASE.

CAUTION

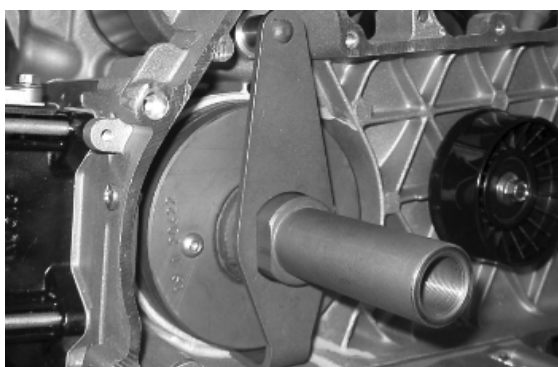
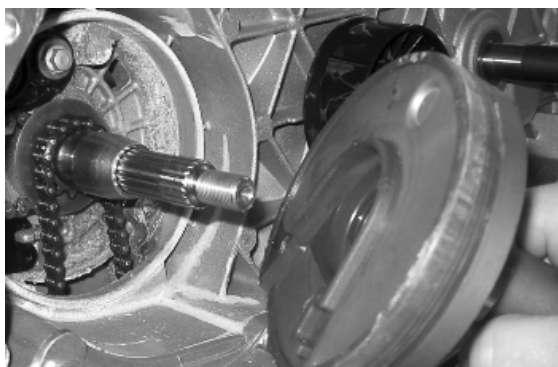
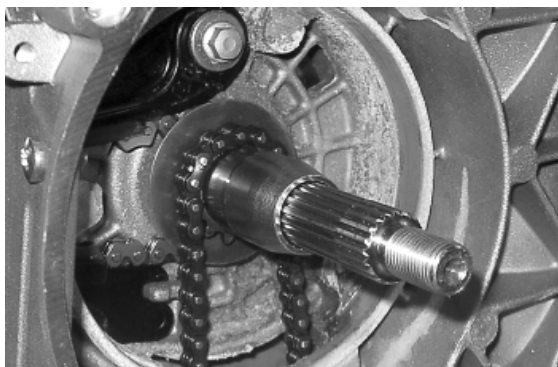
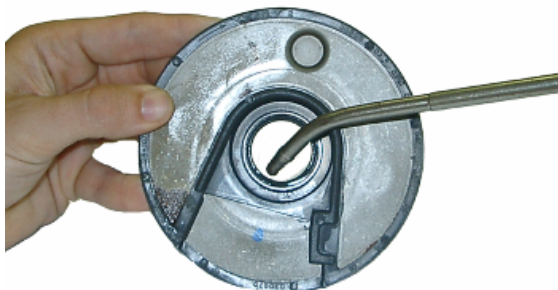
ORIENT THE OIL GUARD BY POSITIONING THE CHAIN HOUSING CHANNEL FACING DOWNWARDS. WHEN THE POSITION IS REACHED, DO NOT RETRACT THE OIL GUARD. FAILURE TO COMPLY WITH THIS RULE CAN CAUSE A WRONG POSITIONING OF THE OIL GUARD SHEATH.

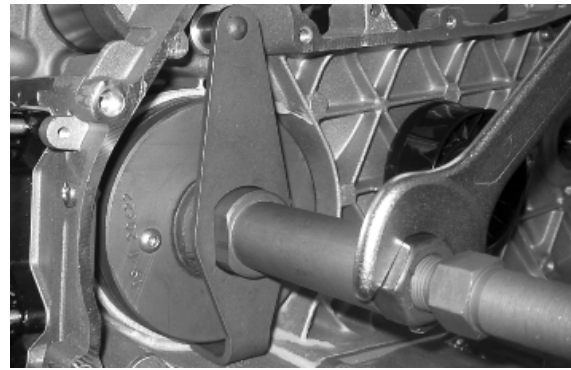
CAUTION

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

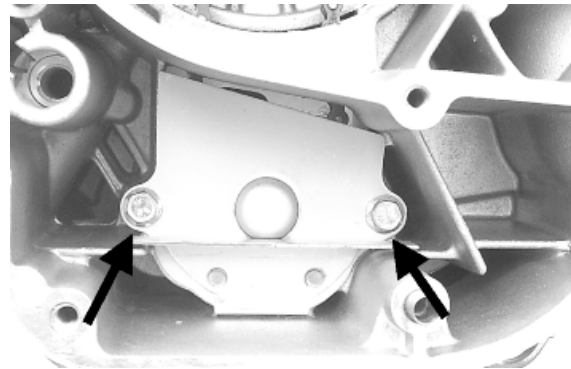




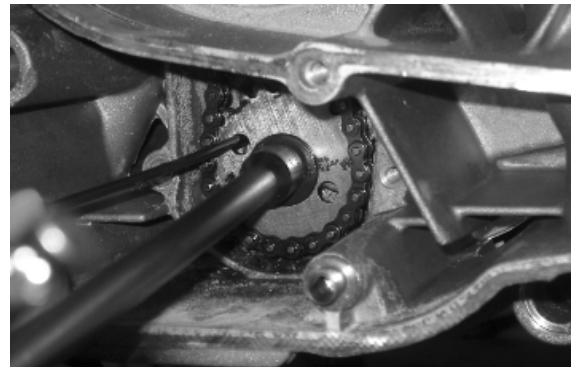
Oil pump

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



N.B.

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

Inspection

- Remove the two screws and the oil pump cover.
- Remove the 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

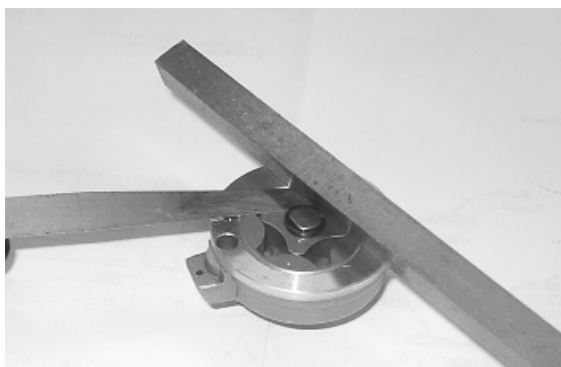
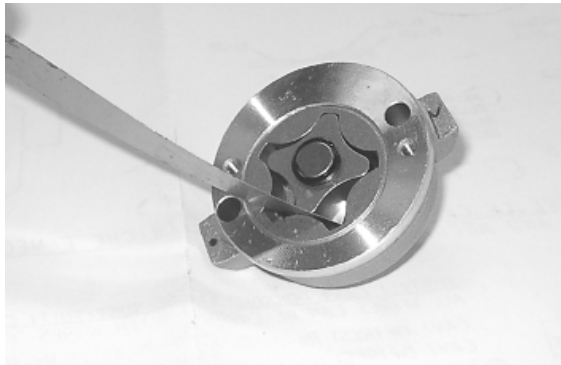
Limit values admitted: 0.09 mm

Distance between the outer rotor and the pump body

Admissible limit clearance: 0.20 mm

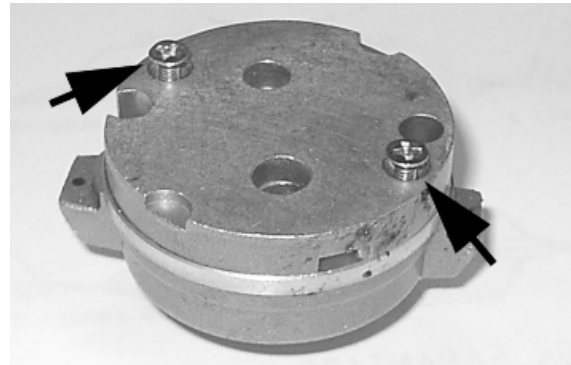
Distance between the rotors

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 clamping screws to be aligned.
 - Make sure the gasket is positioned properly and refit the pump on the engine crankcase. The pump can only be fitted in one position.
 - Tighten the screws to the prescribed torque.
 - Fit the sprocket wheel with a new O-ring.
 - Fit the chain.
 - Fit the central screw and the belleville washer.
- Tighten to the prescribed torque.
- Fit the oil pump cover, by tightening the two screws to the prescribed torque.



N.B.

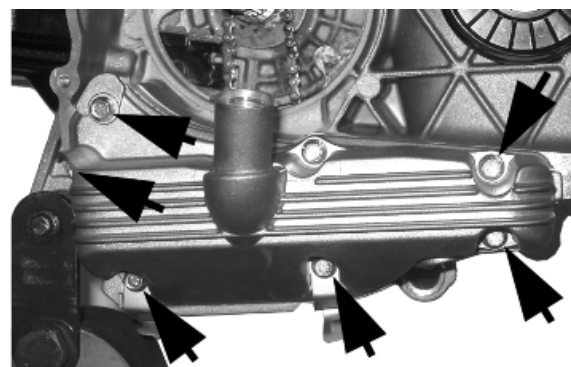
FIT THE BELLEVILLE WASHER SO THAT ITS OUTER RIM TOUCHES THE PULLEY. MAKE SURE THAT THE PUMP TURNS FREELY.

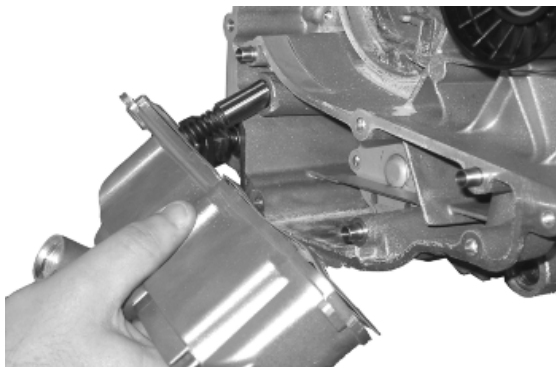
Locking torques (N*m)

Screws fixing oil pump to the crankcase 5 ÷ 6
Oil pump command 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 above.
- Remove the 7 screws, shown in the diagram, and the 2 rear brake fluid pipe fixing brackets.
- Remove the screw, the by-pass piston, the gasket and the centring dowels shown in the figure.





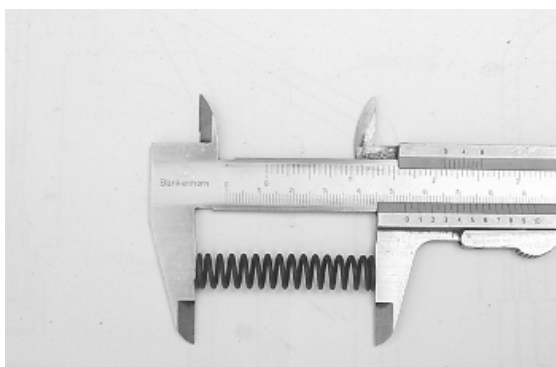
Inspecting the by-pass valve

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

Characteristic

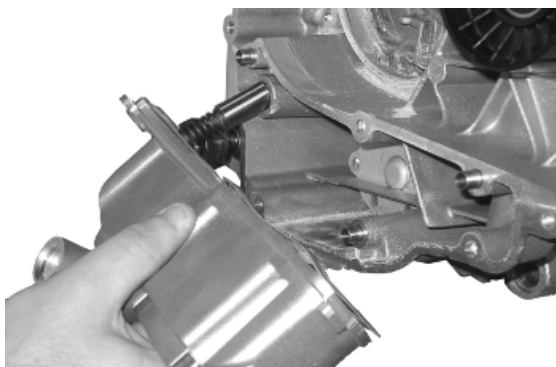
By-pass check up: Standard length

54.2 mm



Refitting the oil sump

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



N.B.

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

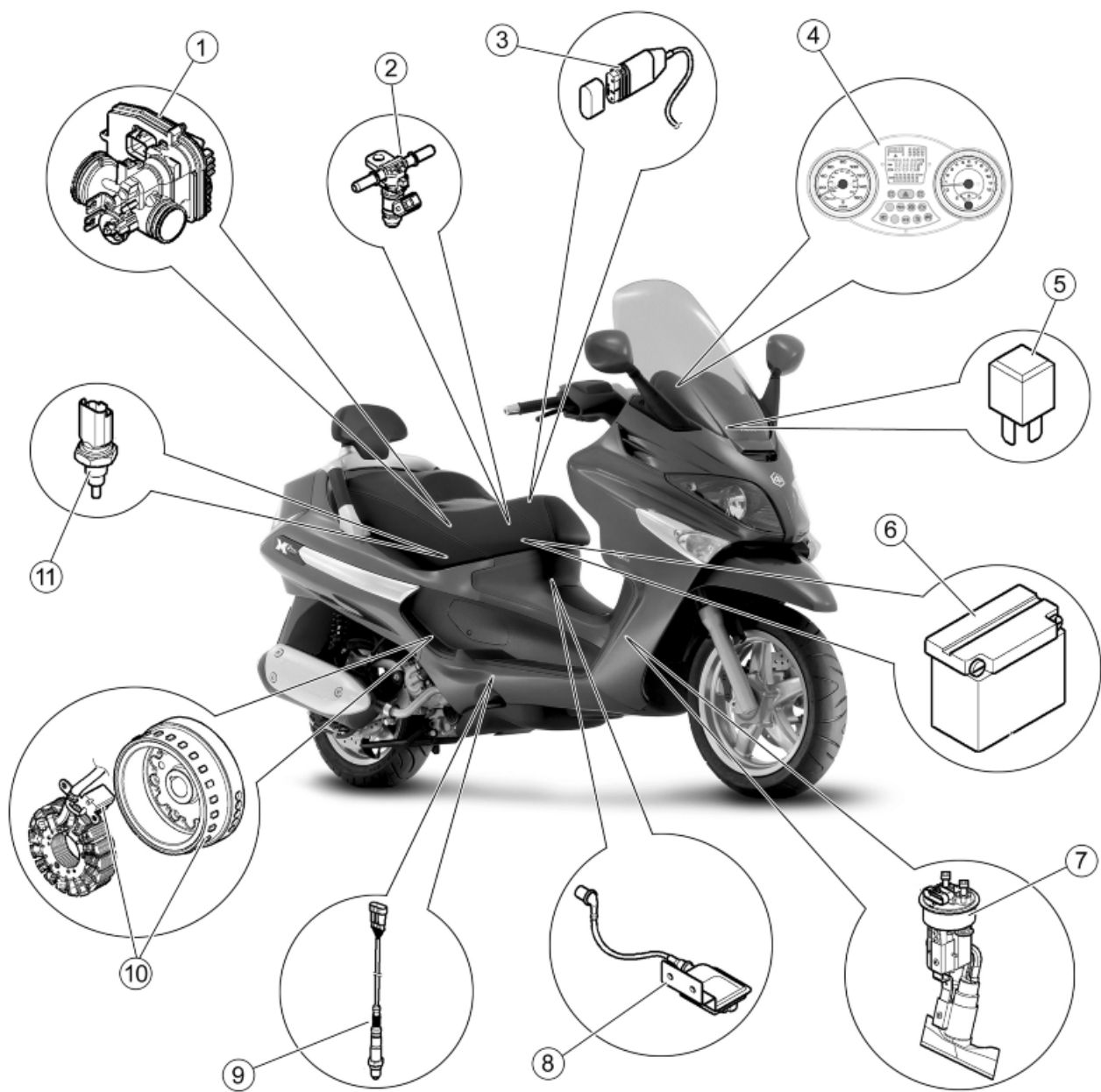
ON LUBRICATING THE CRANKSHAFT AND CONNECTING
ROD.

Locking torques (N*m)

Oil sump screws 10 ÷ 14

INDEX OF TOPICS

INJECTION	INJEC
-----------	-------



INJECTION COMPONENTS

	Specification	Desc./Quantity
1	Throttle body and electronic injection control unit (MIU)	
2	Fuel injector	
3	Diagnostics socket connector	
4	Instrument panel	
5	Injection load remote control	
6	Battery	12V - 12 Ah
7	Fuel pump	

	Specification	Desc./Quantity
8	HV coil	
9	Lambda sensor	
10	Engine rpm sensor	
11	Water temperature sensor	

MIU injection system

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

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

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

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

- Coolant temperature.
- Intake air temperature
- Lambda probe 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 **fuel supply circuit** consists of:

- Fuel pump
- Fuel filter
- Injector
- Pressure regulator

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

The injector is connected by a delivery pipe. The pressure regulator is situated at the end of the circuit.

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

The **ignition circuit** consists of:

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

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

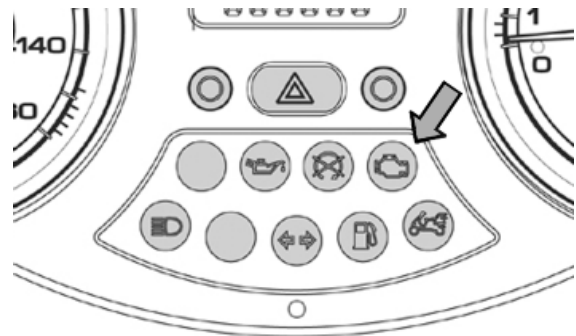
The MIU injection-ignition system controls engine functions by means of a pre-set program.

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

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

- Fuel pump
- HV coil
- Injector

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



Failures are detected and restored by the diagnostic tester.

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

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



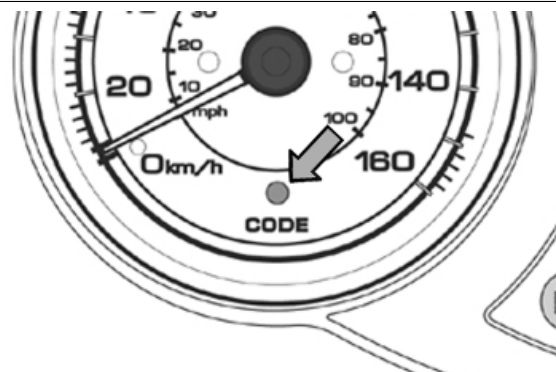
Specific tooling

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 failure of the EMS system is more likely to be due to the connections than to the components.

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

A: Electrical power supply

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

B: Chassis earthing

C: Fuel supply

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

D: Ignition system

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

E: Intake circuit

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

F: Other

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

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

Check the connectors being careful of the following:

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

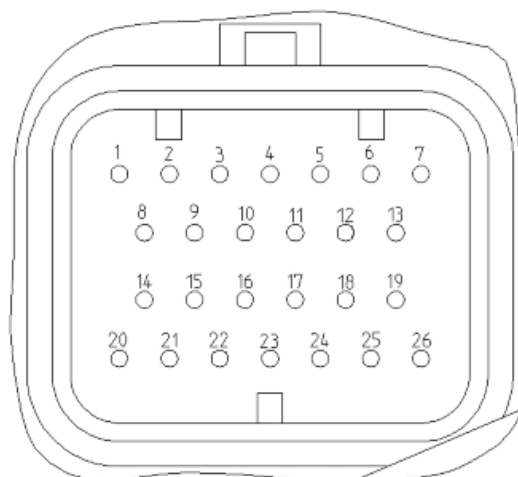
3 - check the entire system thoroughly before replacing the MIU control unit. If the fault is fixed by replacing the MIU control unit, install the original control unit again and check if the fault occurs again.

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

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

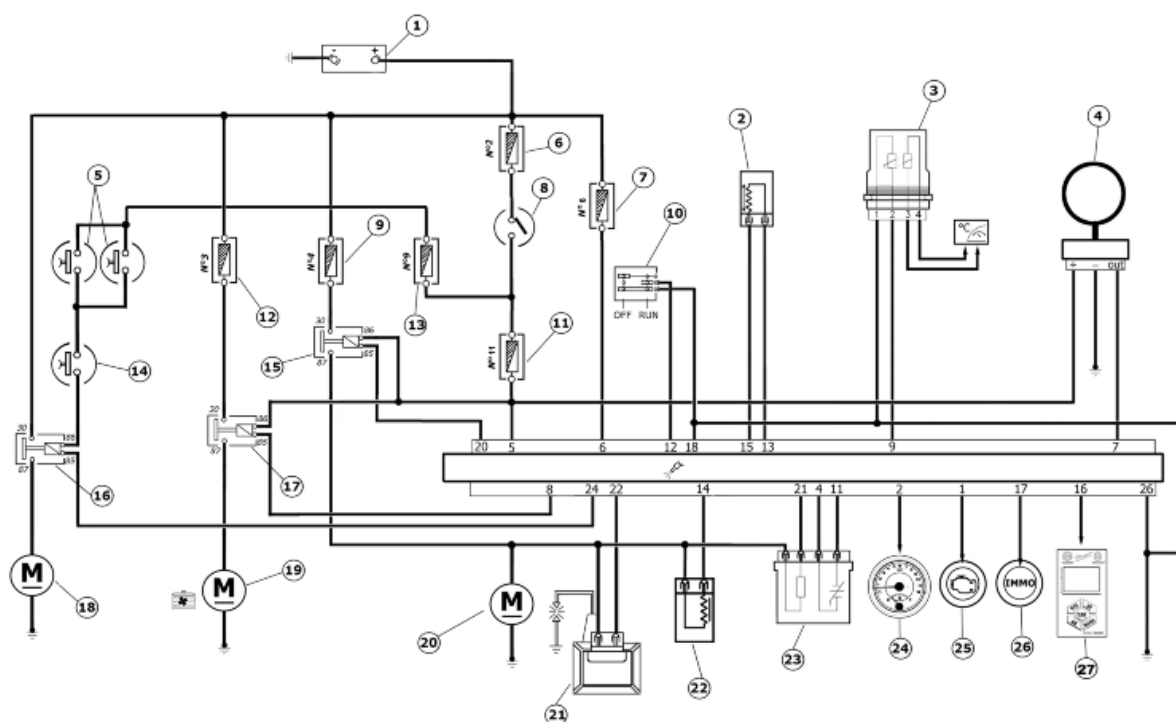
2. The fuel feed system is pressurised at 250 kPa (2.5 BAR). Before disconnecting the quick coupler of a pipe in the fuel supply system, check that there are no naked flames, and do not smoke. Act with caution to prevent spraying in the eyes.
3. When fixing electric components, operate with the battery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



TERMINAL LAYOUT

	Specification	Desc./Quantity
1	Injection telltale light	
2	Rpm indicator on instrument panel	
3	-	
4	- Lambda probe	
5	+ battery under permanent power supply	
6	+ Battery	
7	Immobilizer aerial	
8	Electric fan remote control	
9	Water temperature sensor	
10	-	
11	+ Lambda probe	
12	Engine stop switch	
13	Engine rpm sensor (+)	
14	Fuel injector	
15	Engine rpm sensor (-)	
16	Diagnostics socket output	
17	Immobilizer LED	
18	Ground lead	Connected with: water temperature sensor, engine stop switch.
19	Headlight remote control	
20	Injection load remote control	
21	Lambda probe heater	
22	HV coil	
23	-	
24	Start up enabling	
25	-	
26	Ground lead	

EMS circuit diagram

SYSTEM SCHEMATIC

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Engine rpm sensor	
3	Water temperature sensor	
4	Immobilizer aerial	
5	Stop button	
6	Fuse	15A
7	Fuse	7.5 A
8	Key switch contacts	
9	Fuse	10 A
10	Engine stop switch	
11	Fuse	7.5 A
12	Fuse	15A
13	Fuse	7.5 A
14	Starter button	
15	Injection load remote control	
16	Starter remote control	
17	Electric fan remote control	
18	Starter motor	
19	Electric fan	
20	Fuel pump	
21	HV coil	
22	Fuel injector	
23	Lambda sensor	
24	Rpm indicator	
25	"WARNING" light	
26	Immobilizer LED	
27	Diagnostics socket connector	

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

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

Engine stops at idle

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

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

Possible Cause	Operation
Intake system sealing (infiltrations)	Coolant temperature sensor
	Intake air temperature sensor
	Intake manifold - head
	Throttle body - manifold
Fuel feed (low pressure)	Intake sleeve
	Filter box
	Fuel pump
	Pressure regulator
	Fuel filter
	Injector capacity

Exhaust backfires in deceleration

EXHAUST BACKFIRES WHEN DECELERATING

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay
	HV coil
	Injector
	Revolution timing sensor
	Air temperature
	Coolant temperature
Correctness of the parameters	Lambda sensor
	Throttle valve position sensor
	Stepper
	Coolant temperature sensor
Intake system sealing (infiltrations)	Intake air temperature sensor
	Intake manifold - head
	Throttle body - manifold
	Intake sleeve
Fuel feed (low pressure)	Filter box
	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 sealing	Intake sleeve
	Filter box
Ignition system	Spark plug wear check
	Throttle valve position signal
Parameter reliability	Coolant temperature indicator
	Intake air temperature indicator
	Ignition advance
	TPS reset successful
TPS reset successful	TPS reset successful
	Pump relay
Presence of faults detected by the self diagnosis	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 PERFORMANCE ON PICKUP

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

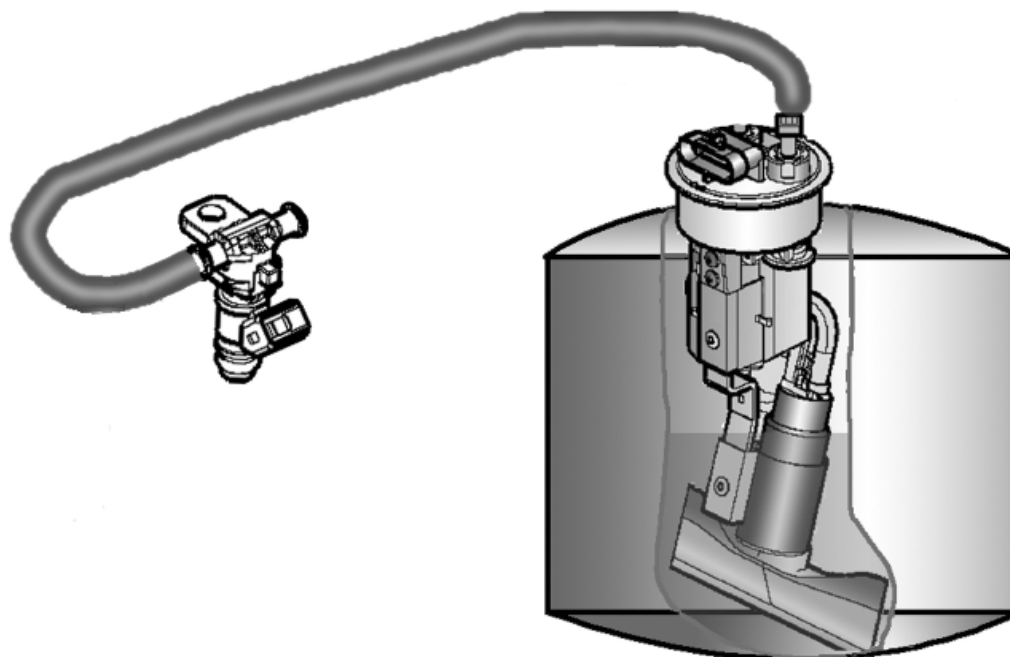
Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector Revolution timing sensor Air temperature Coolant temperature Lambda sensor
Ignition efficiency	Spark plug
Parameter reliability	Throttle valve position signal Coolant temperature indicator Intake air temperature indicator Ignition advance
Intake system sealing	Intake sleeve Filter box
TPS reset successful	TPS reset successful
Fuel supply	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.

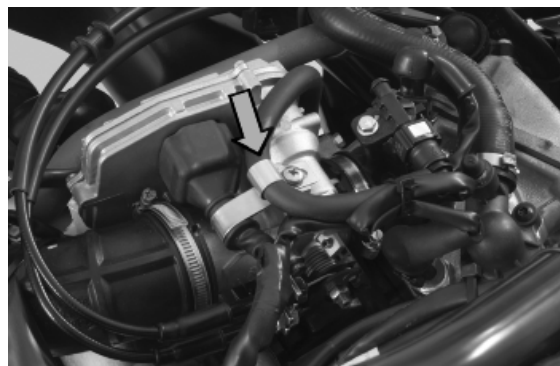
The electrical pump is located in the tank from which the fuel is pumped and sent to the injector through the filter.

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

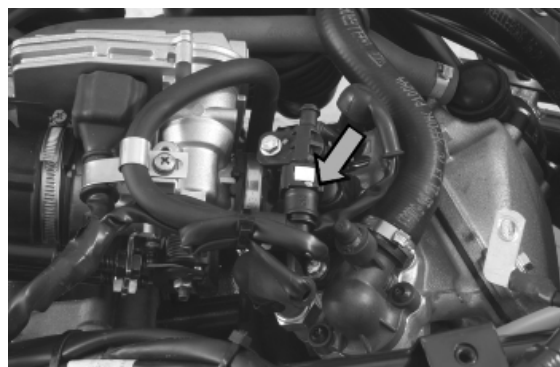


Removing the butterfly valve

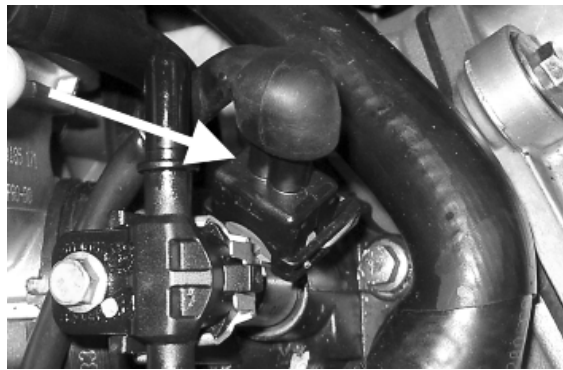
Remove the fuel piping clamping screw indicated in the figure.



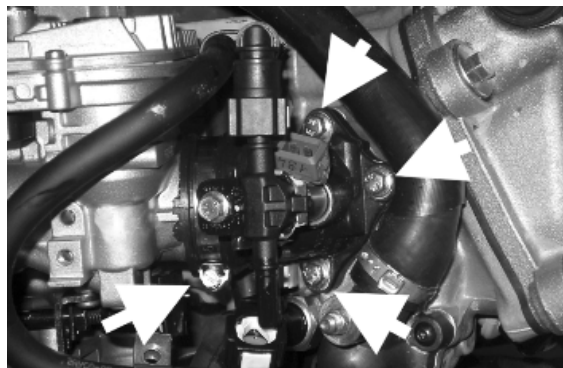
Remove the fast-release fitting from the injector support



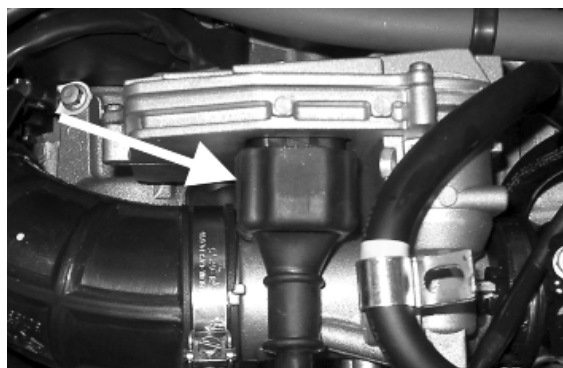
Remove the injector connector.



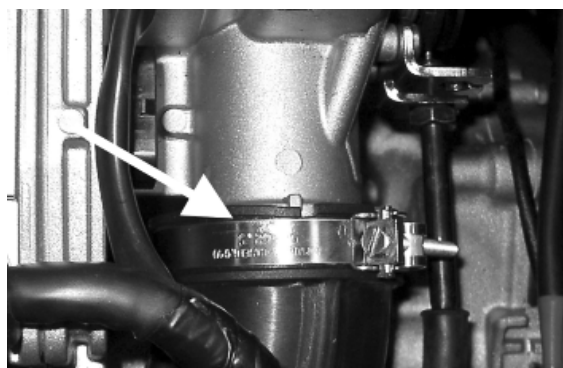
Remove the three screws fixing the manifold to the cylinder head and the clip fixing the throttle body to the manifold.



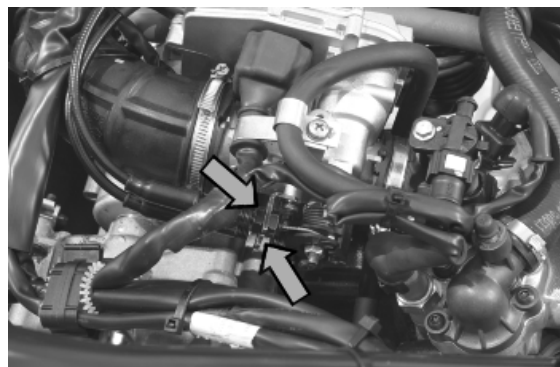
Remove the MIU ECU connector.



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



Remove the gas control retainers as indicated in the photograph

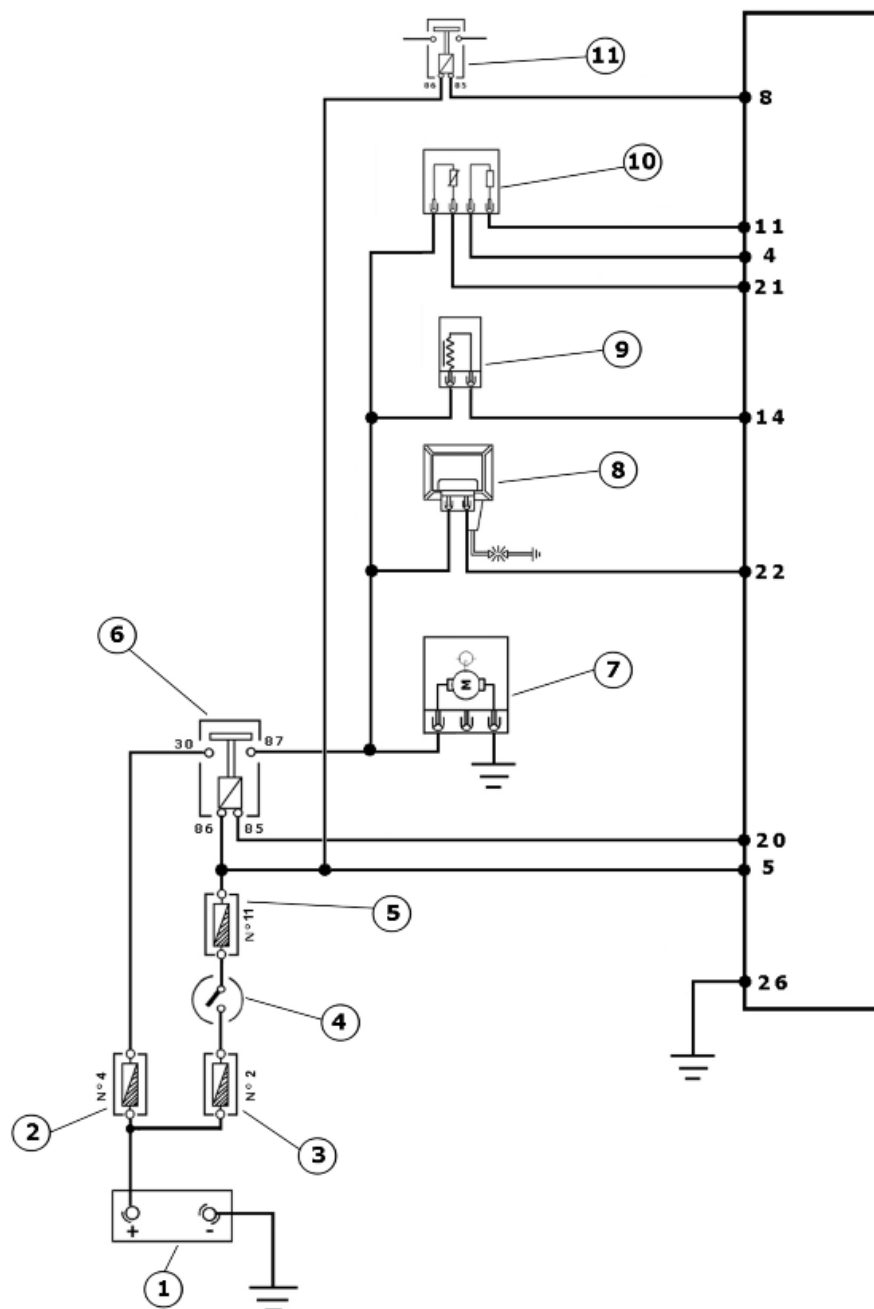


Refitting the butterfly valve

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



Pump supply circuit



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	10 A
3	Fuse	15A
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 two seconds and then stops. When the engine starts up, in the presence of rpm timing signal the pump is continuously supplied.

ELECTRICAL DATA

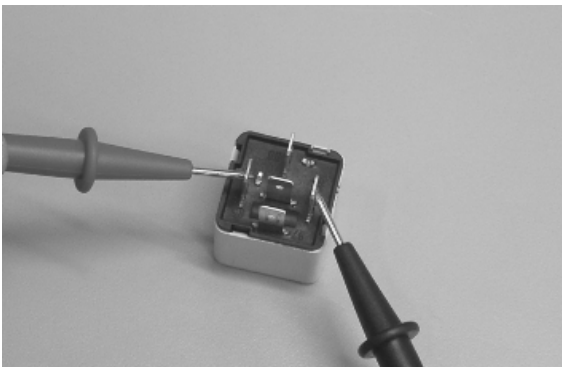
- Pump winding resistance ~ 1.5 Ohm
- Input current during normal functioning 1.4 ÷ 1.8 A
- Input current to the closed hydraulic circuit ~ 2 A (to be checked with specific tool for fuel pressure control, choking the circuit on the return pipe)

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

Check the efficiency of 7,5 A fuse No. 11 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.

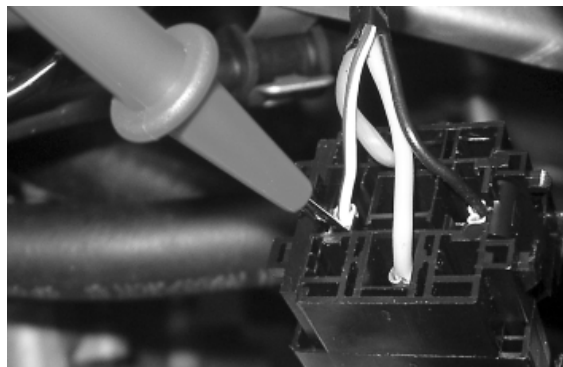
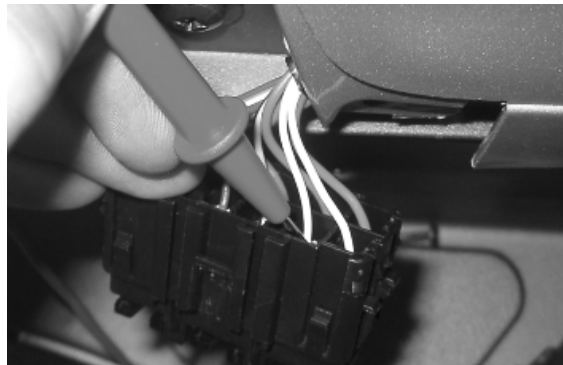
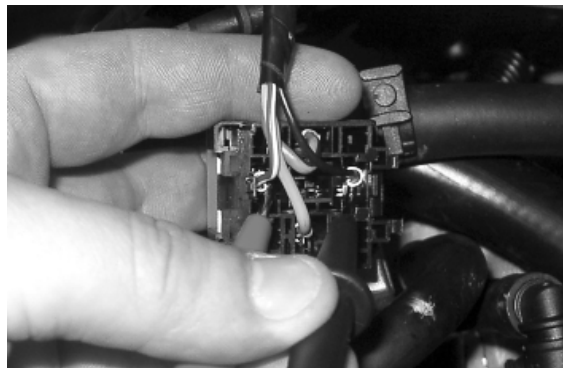


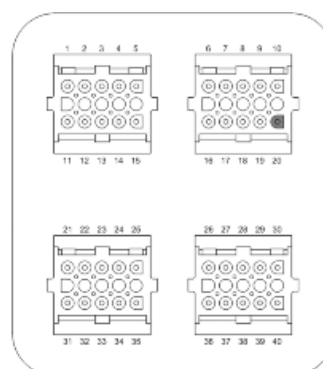
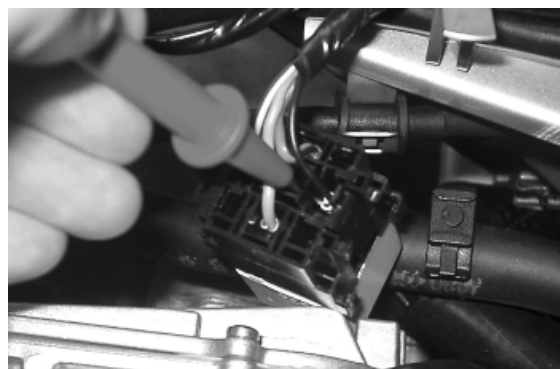


Check the power supply line of the injection load remote control energising coil: after switching to "ON", make sure there is battery voltage, for two seconds, between the Red-White cable and Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-White cable between 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.).

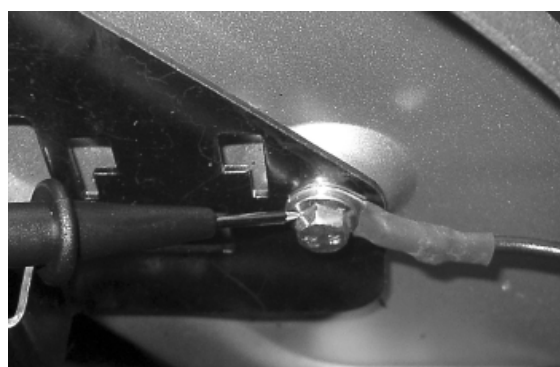
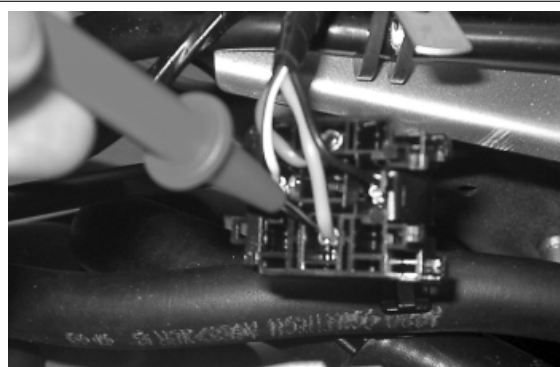


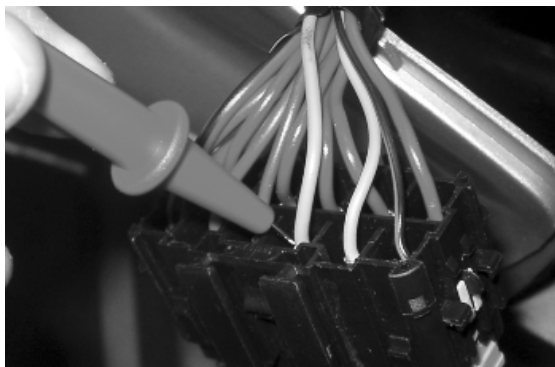


Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.

N.B.

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

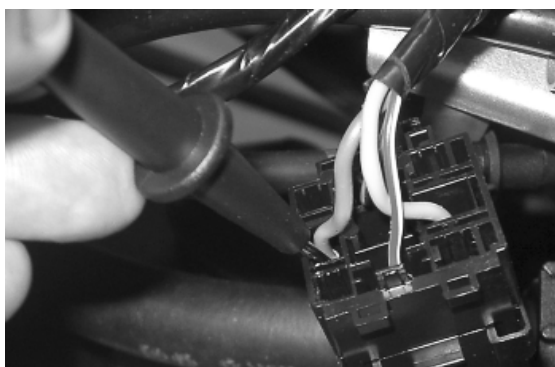




pump circuit 6

Check, on switching to "ON", that there is battery voltage, for about two seconds, to the Black-Green cable of the pump connector and earth with 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 two 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 earth.



Specific tooling

020331Y Digital multimeter

Circuit leak test

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



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



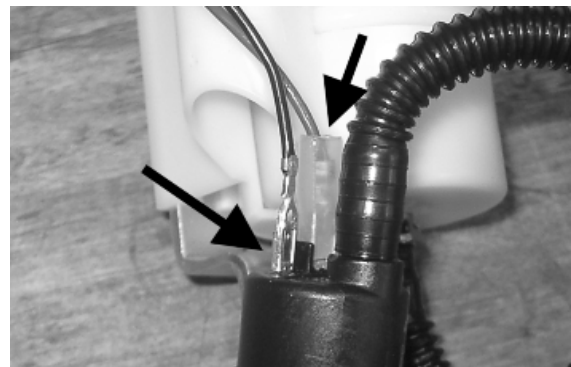
With the battery voltage > 12 V, check the pump flow rate by disconnecting from the injector the pipe equipped with the pressure gauge of the appropriate tool. Get a graded burette with a flow rate of approximately 1 L. Rotate the pump using the active diagnoses of the palm top computer. Using a pair of long flat needle-nose pliers, choke the fuel pipe making the pressure stabilise at approx. 2.5 BAR. Check that within 15 seconds the pump has a flow rate of approx. 110 cm³.

Specific tooling

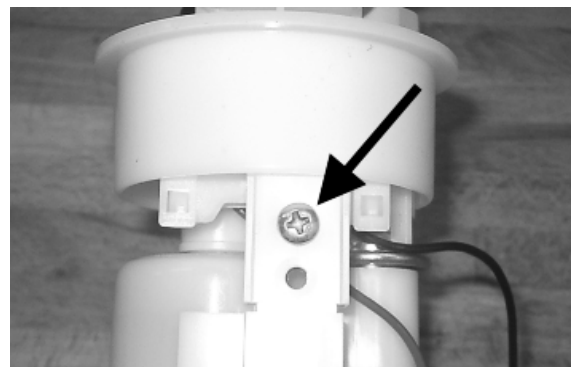
020480Y Petrol pressure check set

Fuel filter check

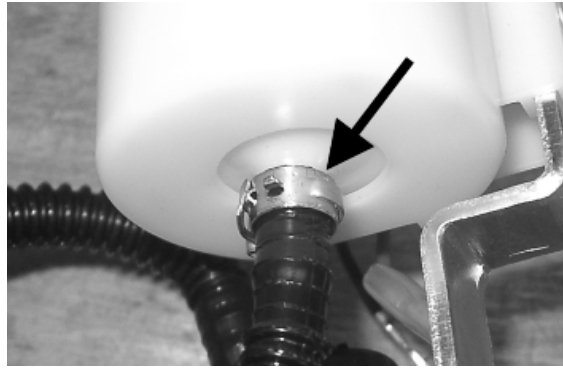
Disconnect the terminals from the electric pump



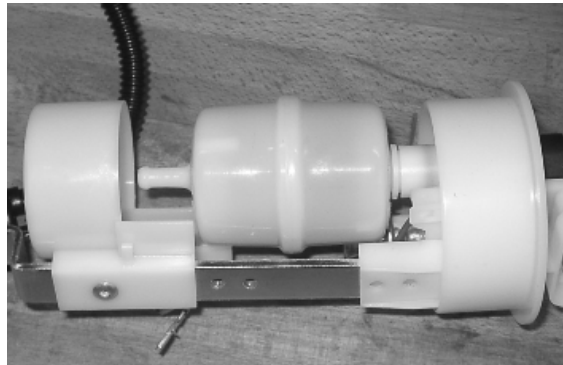
Remove the screw shown in the picture



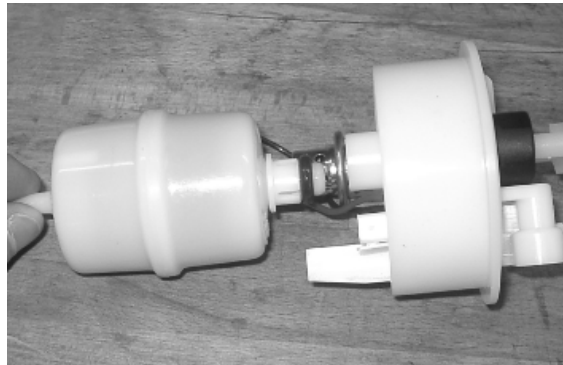
Remove the clip fixing the piping to the filter shown in the picture



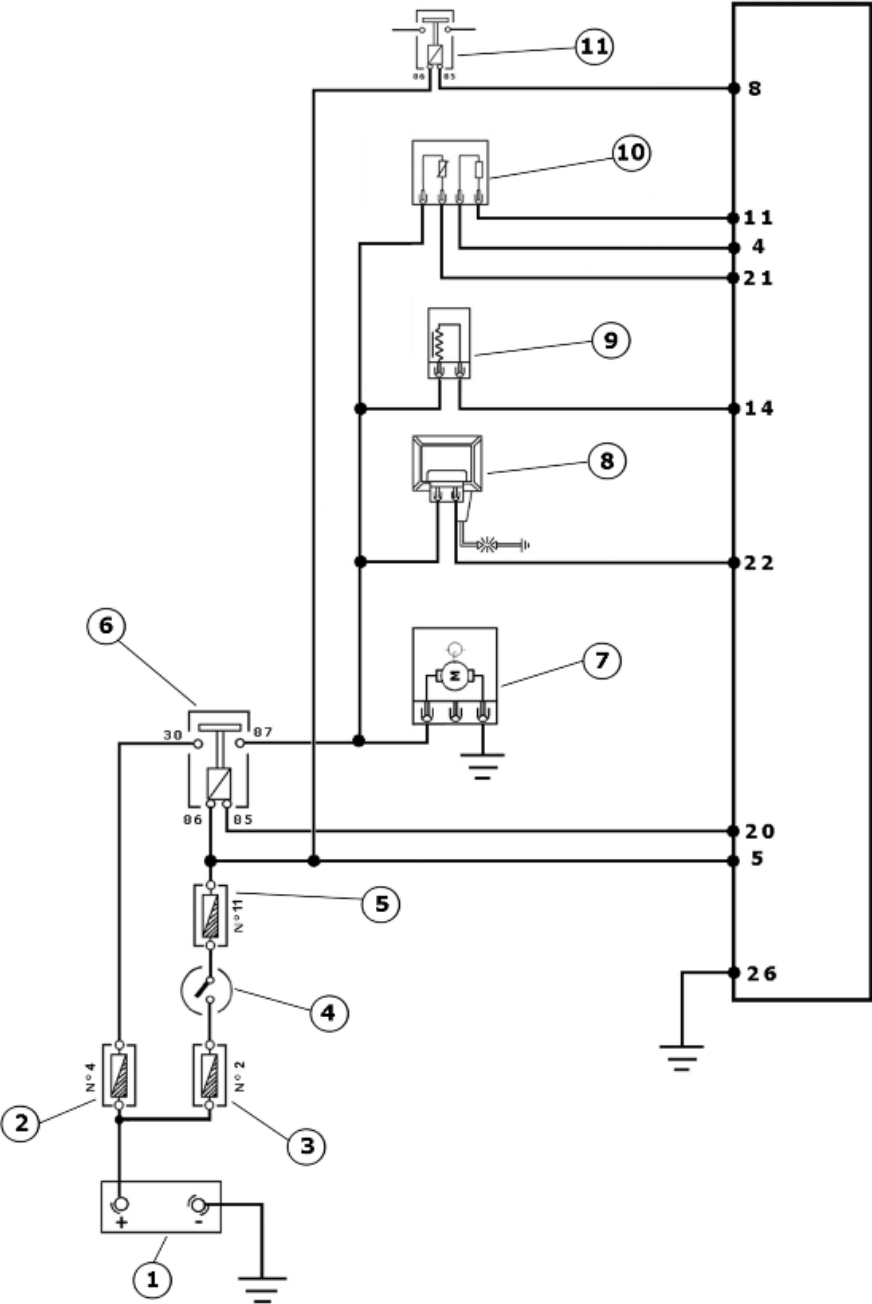
Separate the lower part of the pump support as shown in the picture.



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	15A
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	

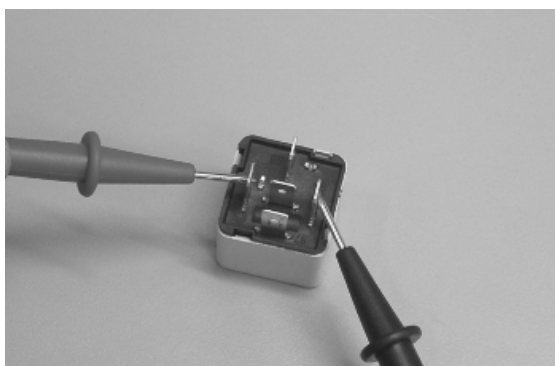
Check the resistance at the injector ends: $14.5 \pm 5\%$ Ohm

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

Check the efficiency of 7,5 A fuse No. 11 key-controlled control unit power supply.



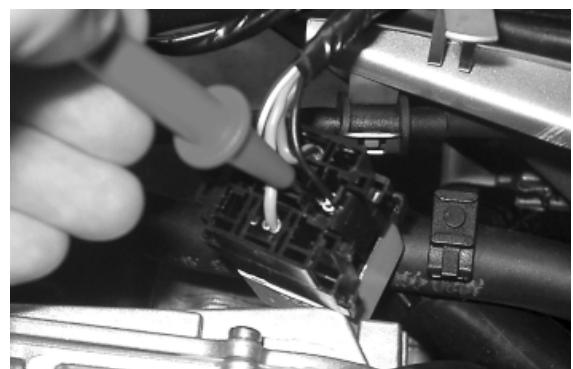
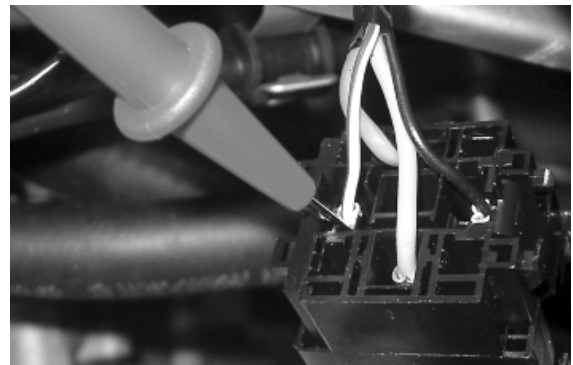
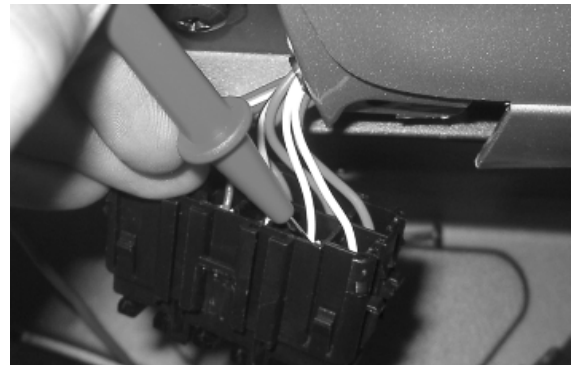
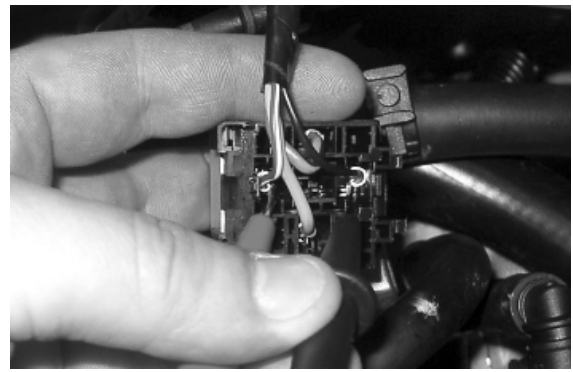
Check the efficiency of the injection load remote control: Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm
Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the remote control.

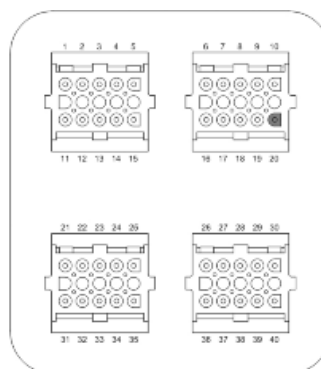


Check the power supply line of the injection load remote control energising coil: after switching to "ON", make sure there is battery voltage, for two seconds, between the Red-White cable and Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-White cable between 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.).

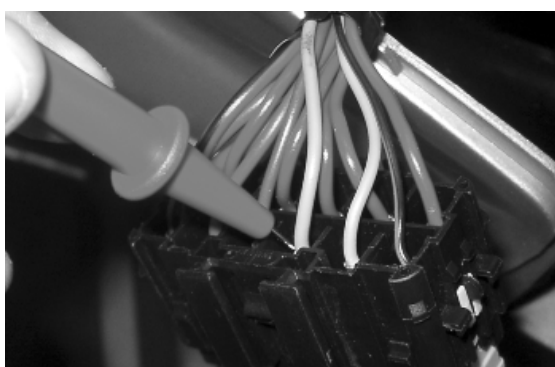
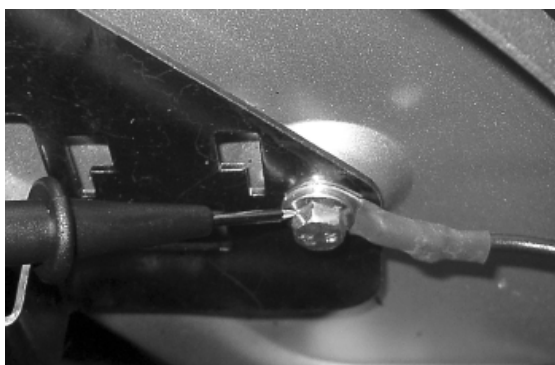
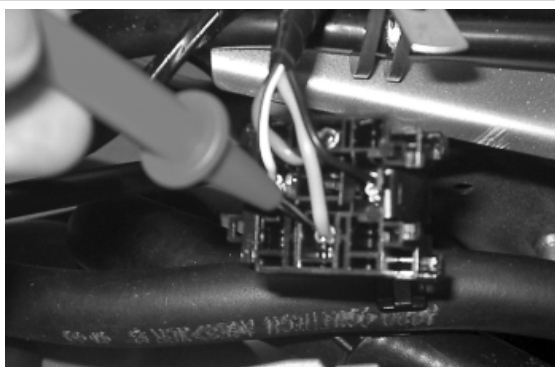




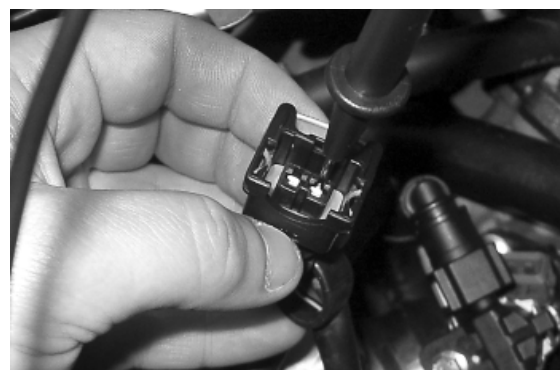
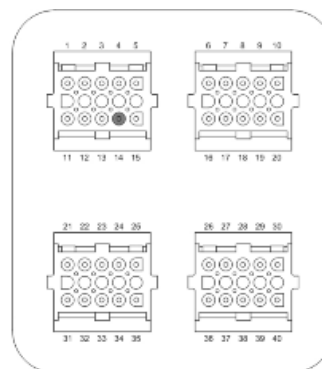
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.

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

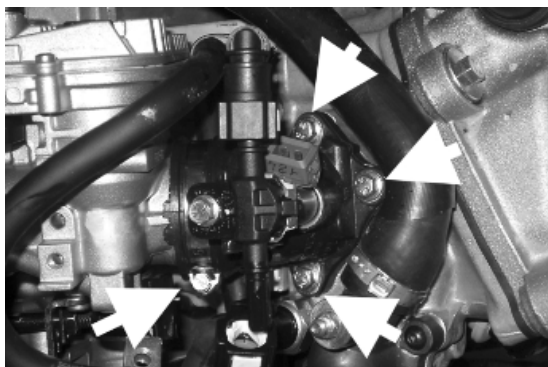


With injector disconnected and the injector load remote control disconnected, check the continuity of the Black-Green cable between the injector connector and remote control base.



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



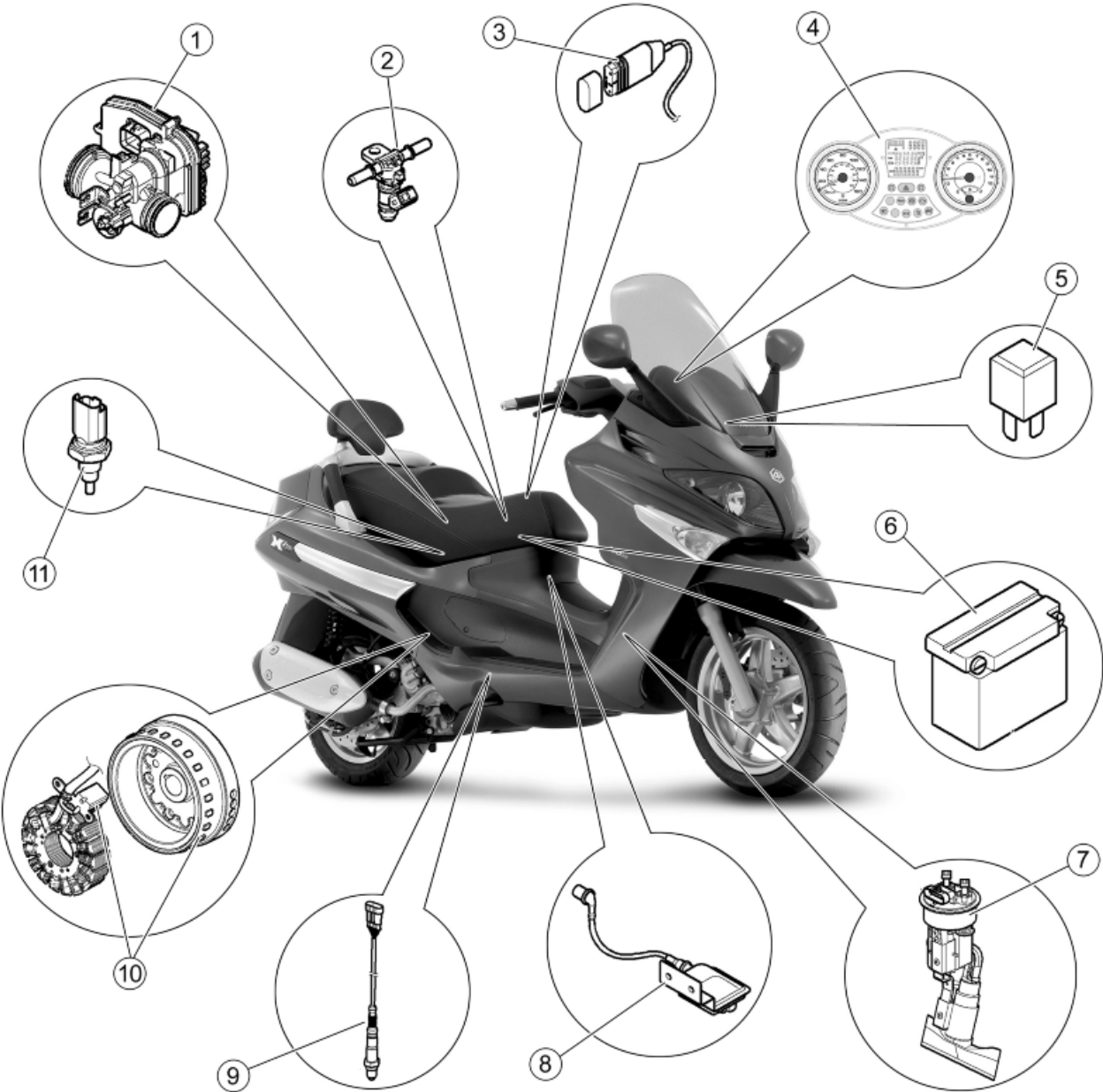
Proceed with the injector seal test.

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

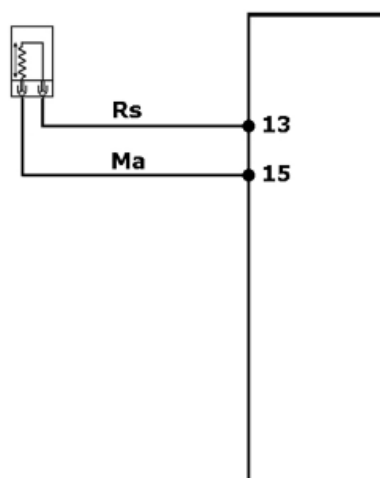


INJECTION COMPONENTS

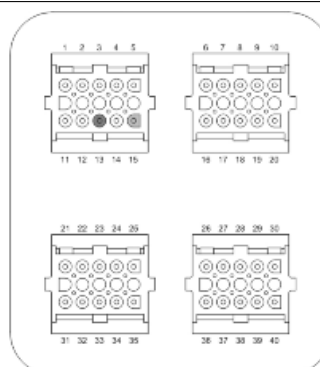
	Specification	Desc./Quantity
1	Throttle body and electronic injection control unit (MIU)	
2	Fuel injector	
3	Diagnostics socket connector	
4	Instrument panel	

	Specification	Desc./Quantity
5	Injection load remote control	
6	Battery	12V - 12 Ah
7	Fuel pump	
8	HV coil	
9	Lambda sensor	
10	Engine rpm sensor	
11	Water temperature sensor	

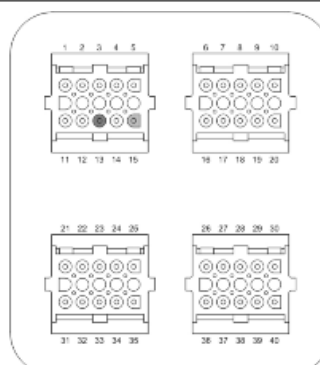
Tachometer



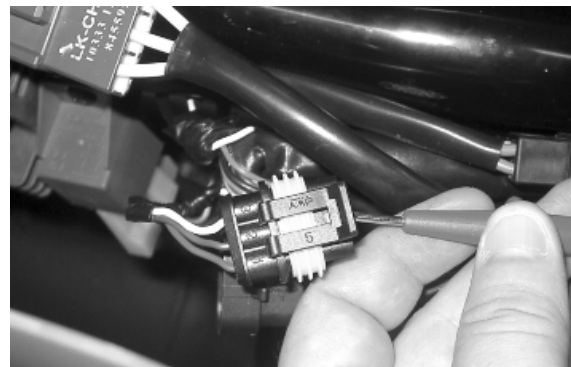
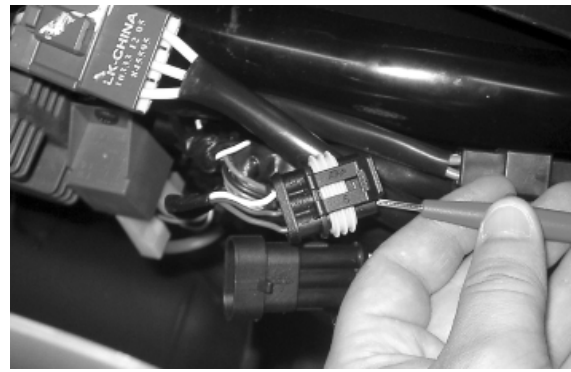
With wiring disconnected from the control unit and connected to the system, check that the sensor resistance between pins 13 - 15 is between 100 and 150 Ohm at an engine temperature of approximately 20°



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

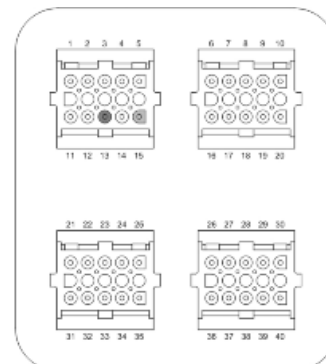


With the interface wiring disconnected from the control unit and rpm sensor connector, check that the red and brown cables (pin 13 - 15) are isolated from each other and insulated from the earth.

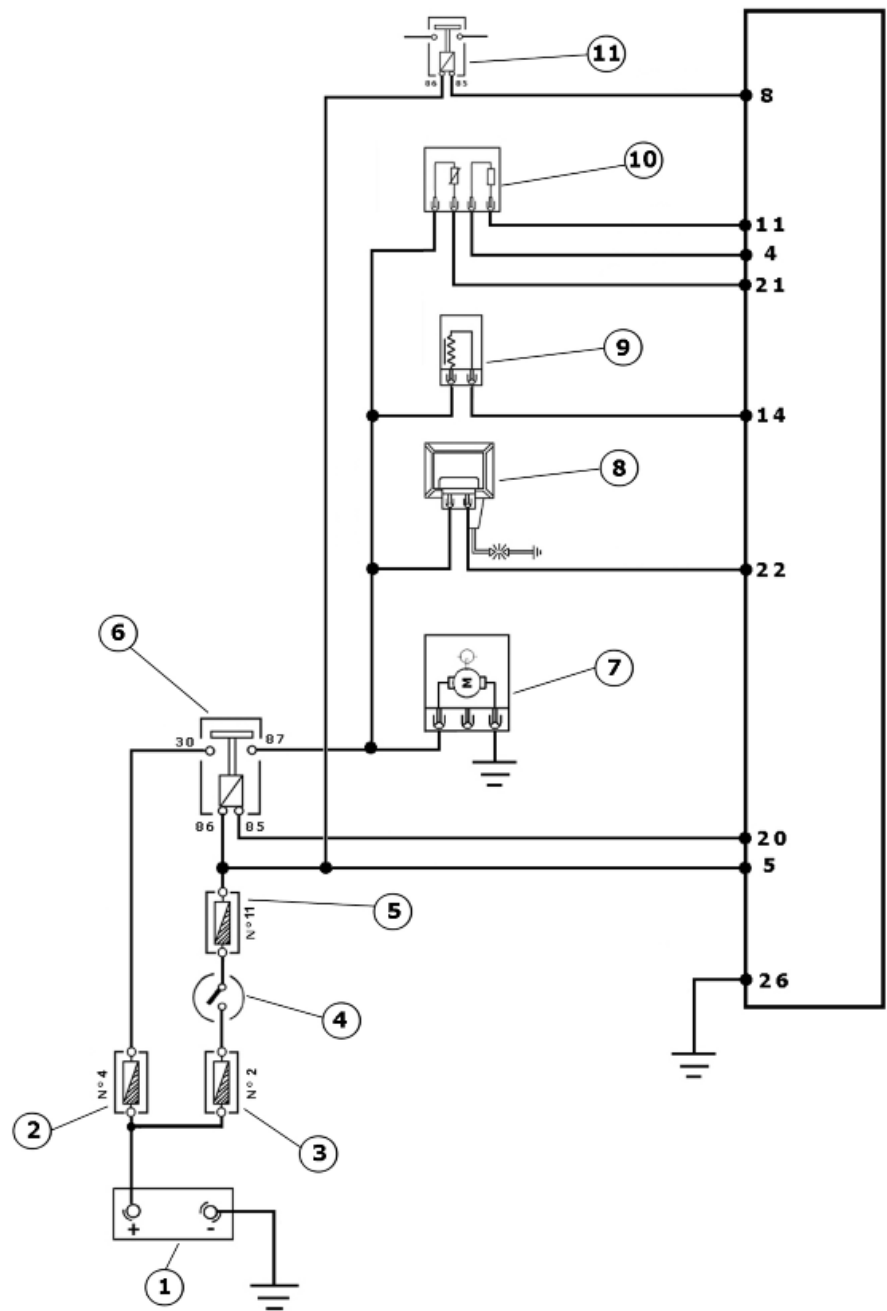
Specific tooling

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	15A
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 phase.

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

Specific tooling

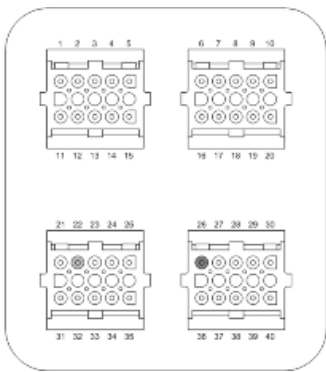
020331Y Digital multimeter

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

Check the efficiency of 7,5 A fuse No. 11 key-controlled control unit power supply.

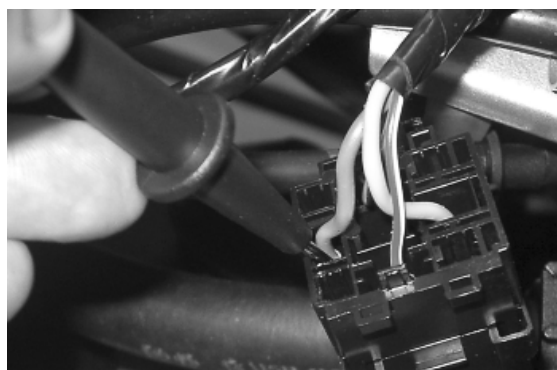
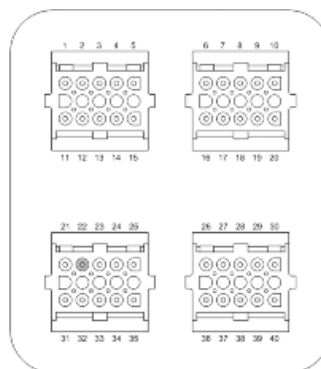


Check there is voltage between pins 22 and 26 of the interface wiring for around two seconds when switching to «ON».

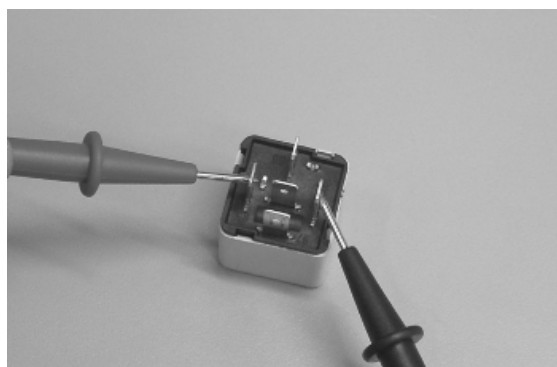


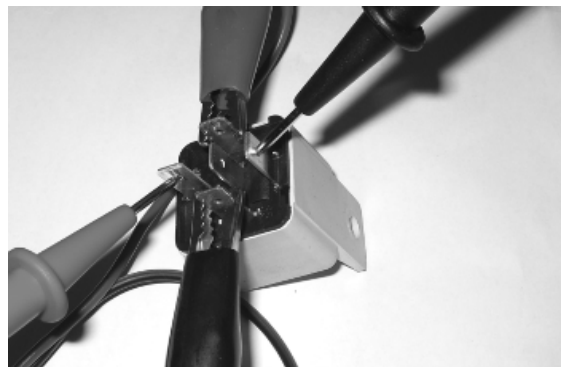
Check the resistance of the primary coil between pin 22 of the interface wiring and the green black cable of the injection load remote control base with the control unit disconnected and the remote control disconnected.

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



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.

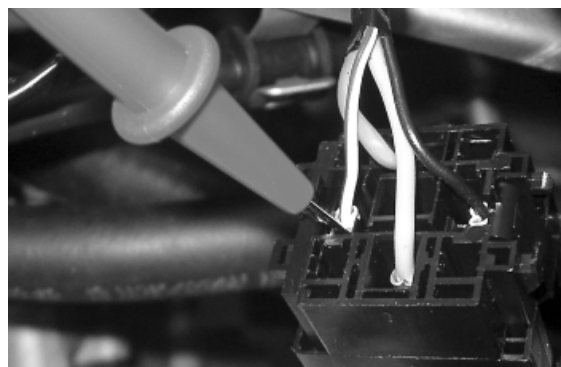
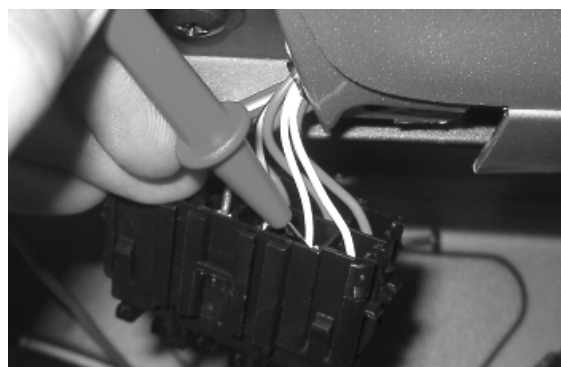
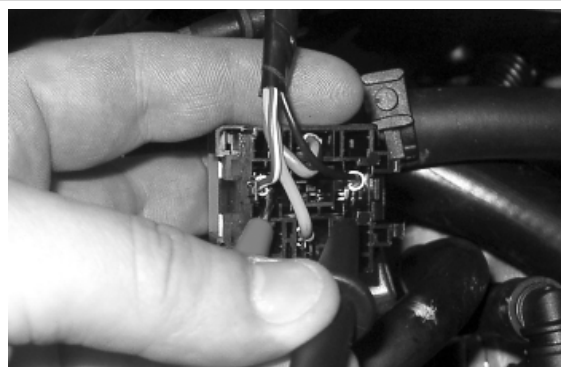


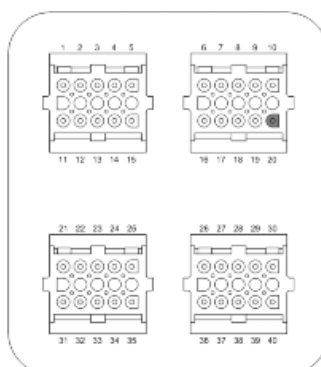
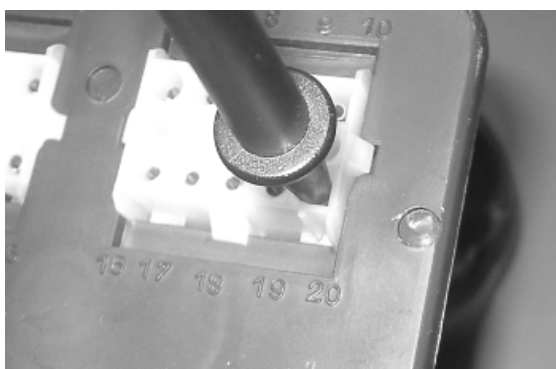
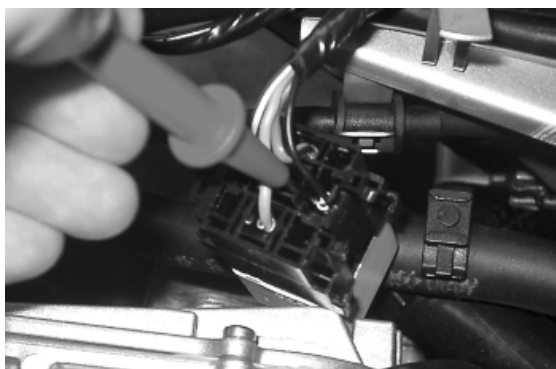


Check the power supply line of the injection load remote control energising coil: after switching to "ON", make sure there is battery voltage, for two seconds, between the Red-White cable and Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-White cable between 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.).

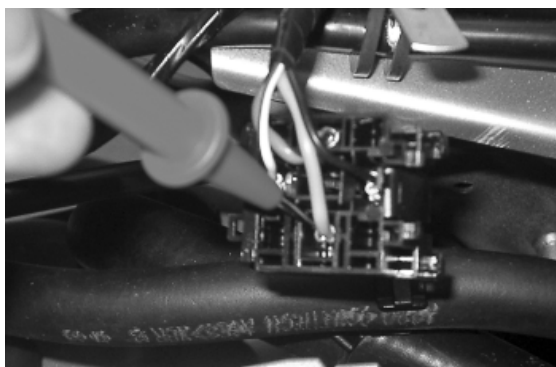


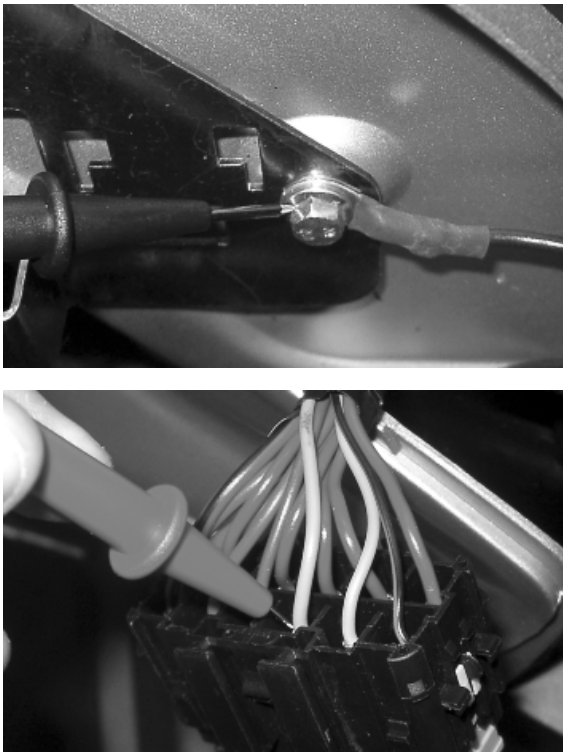


Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.

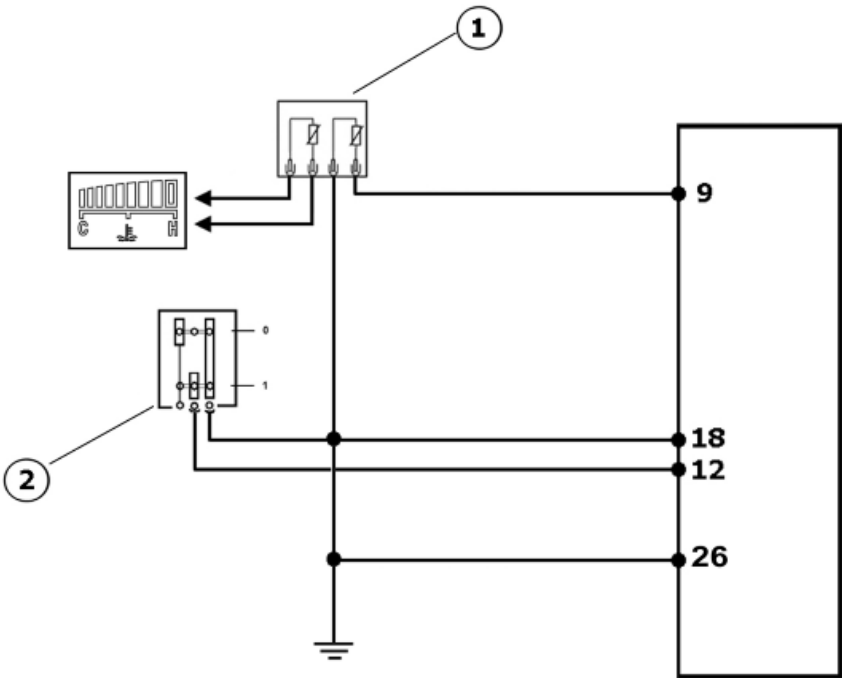
N.B.

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





Coolant temperature sensor



TEMPERATURE SENSOR 1

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

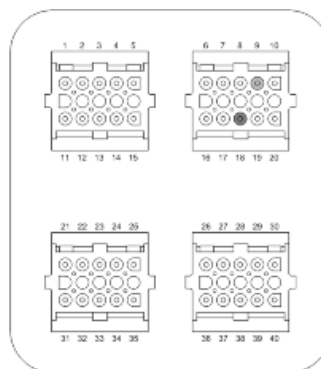
With the connector on the control unit side disconnected and the coolant temperature sensor connector connected, check the resistance values between pins 9 and 18 correspond to the engine temperature.

$20^{\circ} = 2500 \pm 100 \Omega$

$80^{\circ} = 308 \pm 6 \Omega$

With the control unit side connector disconnected and the coolant temperature connector disconnected, check the insulation between the two light blue-green and grey-green cables

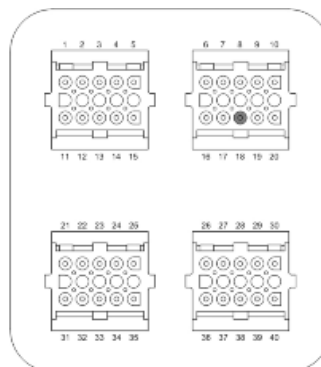
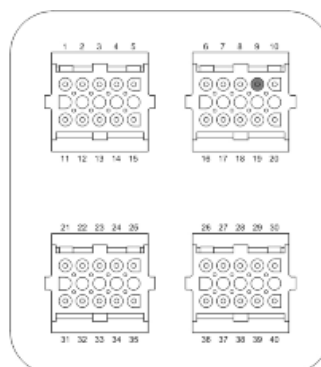
With the connector on the control unit side disconnected and the coolant temperature sensor connector disconnected, check the continuity between pin 9 of the interface wiring and the blue-green cable of the connector, and between pin 18 of the interface wiring and the grey-green cable of the connector.



Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter



Zeroing the throttle

Resetting the throttle valve position signal (TPS reset)

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

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

Pre-calibration ensures optimal air flow to control idling.

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

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

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

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

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

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

To reset, proceed as follows.

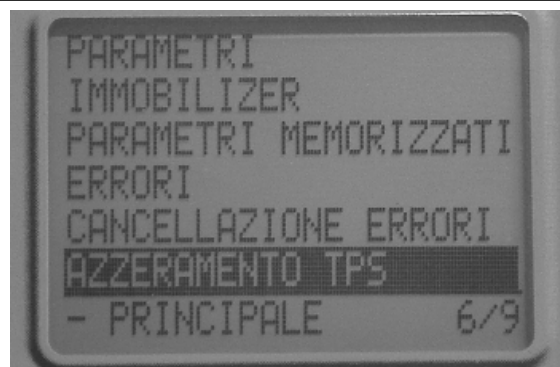
Connect the diagnostic tester.

Switch to «ON».

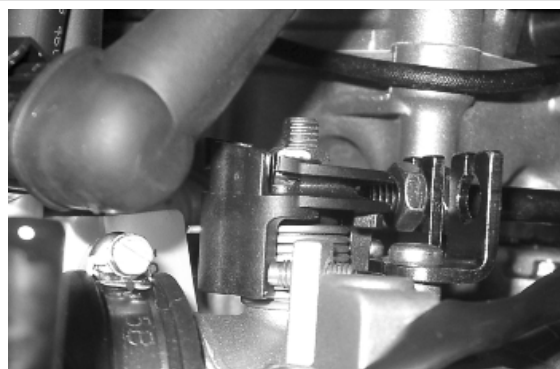
Select the functions of the diagnostic tester on
«TPS RESET».

Specific tooling

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

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



Lambda probe

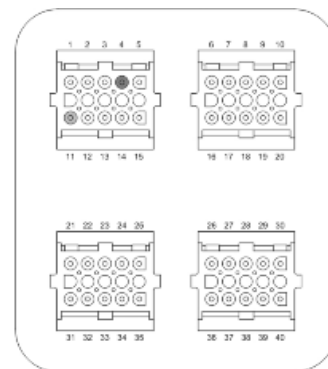
SIGNAL CONTROL

Install the electronic control unit interface wiring.

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

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

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



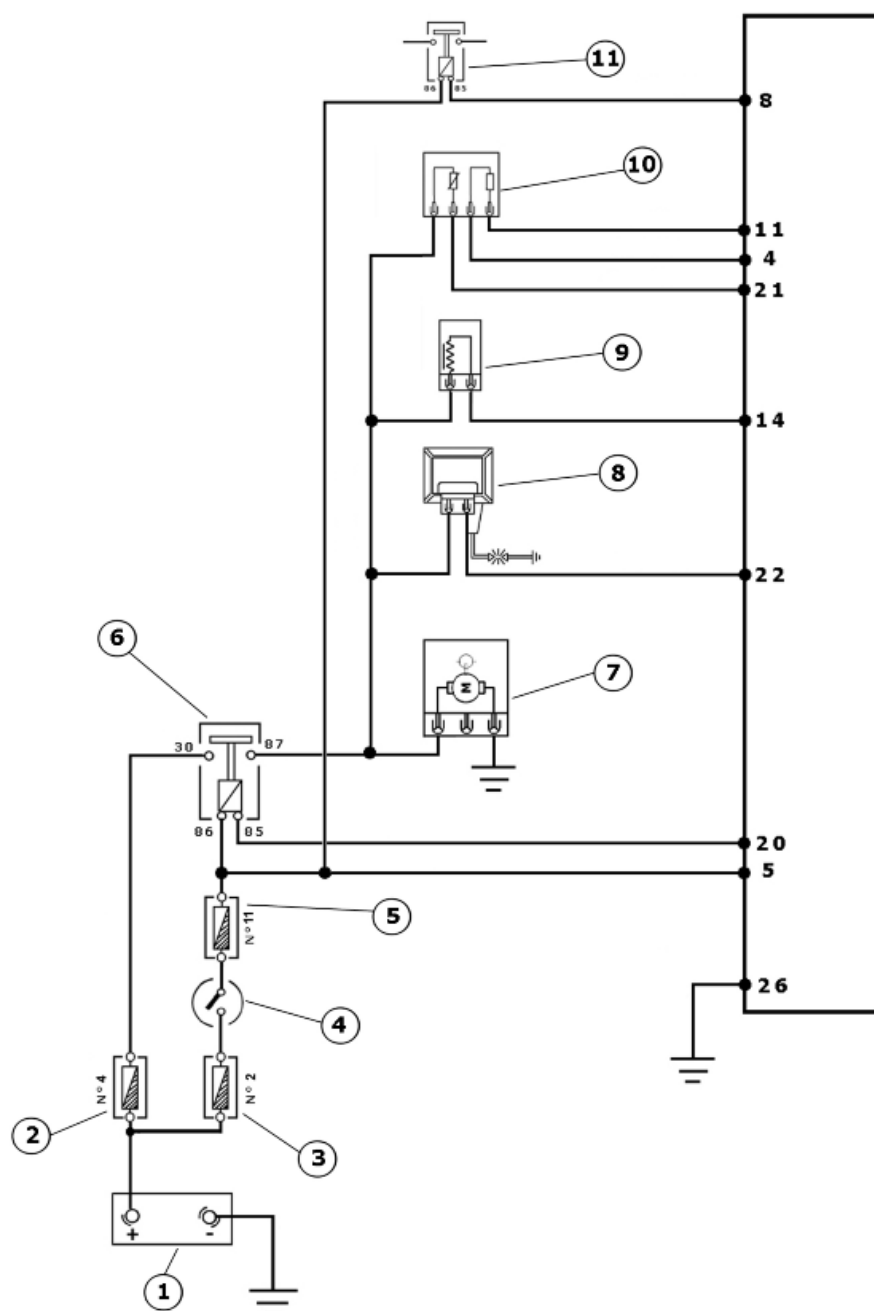
With the engine running at idle speed, check that the voltage oscillates between 0V and 1V

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

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

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





INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	10 A
3	Fuse	15A
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	
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

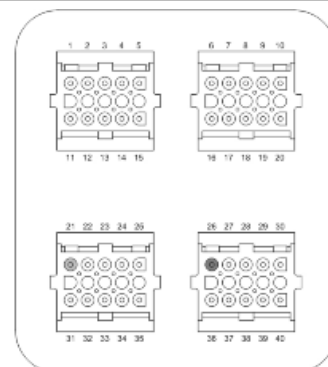
020331Y Digital multimeter

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

Check the efficiency of 7,5 A fuse No. 11 key-controlled control unit power supply.

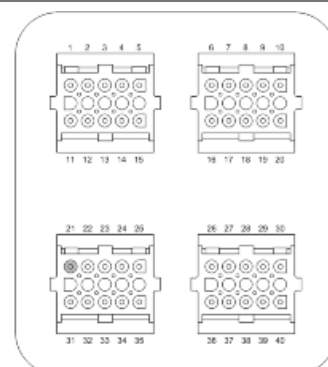


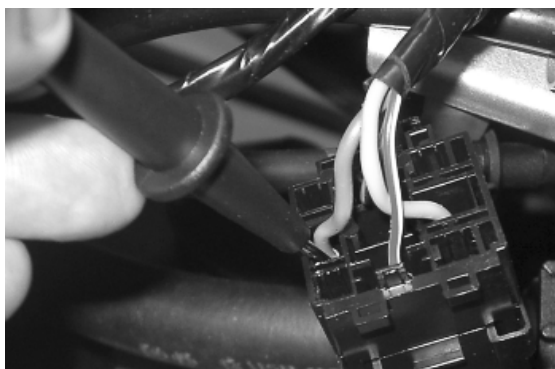
Check there is voltage between pins 21 and 26 of the interface wiring, for around two seconds, when switching to «ON».



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.

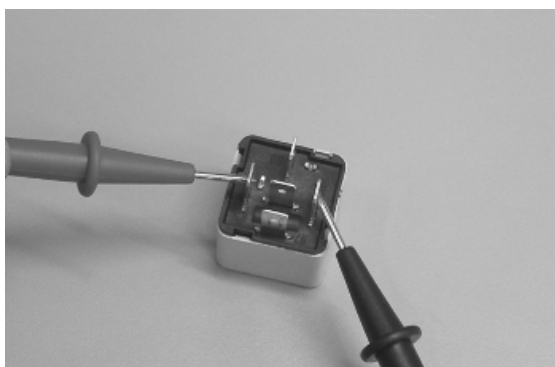
Resistance of the heater at approximately 20° = 9 Ohm $\pm$ 20%





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

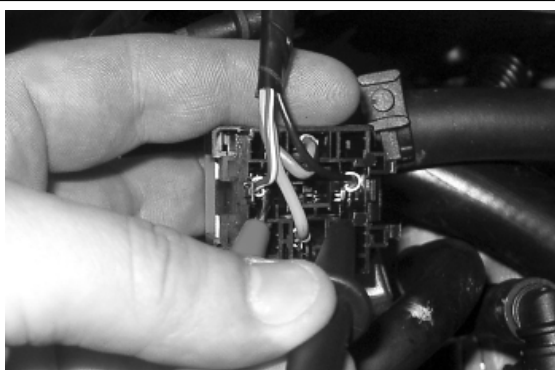
Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the remote control.

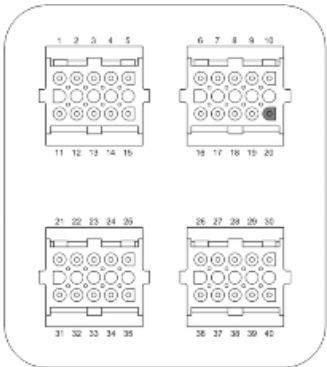
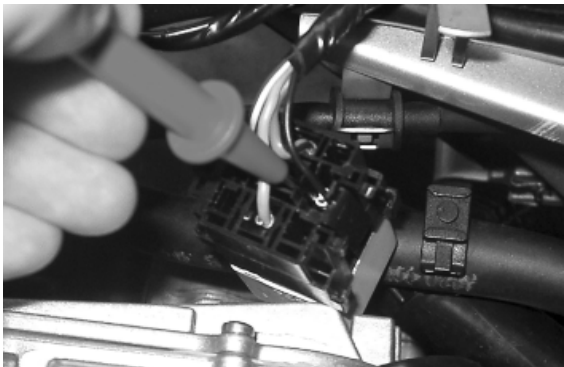
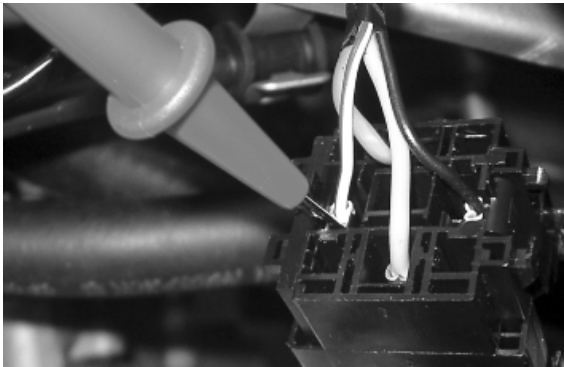
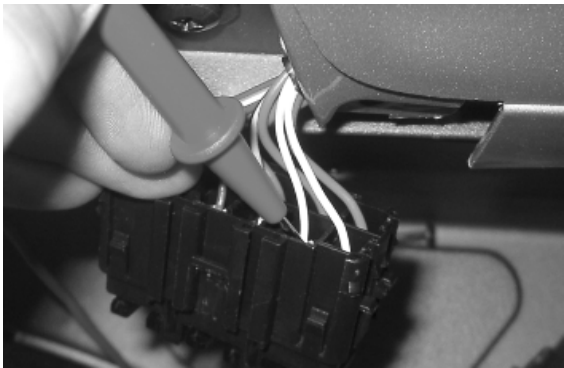


Check the power supply line of the injection load remote control energising coil: after switching to "ON", make sure there is battery voltage, for two seconds, between the Red-White cable and Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-White cable between 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.).

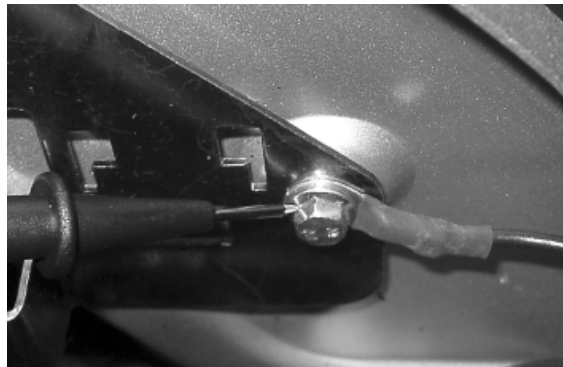
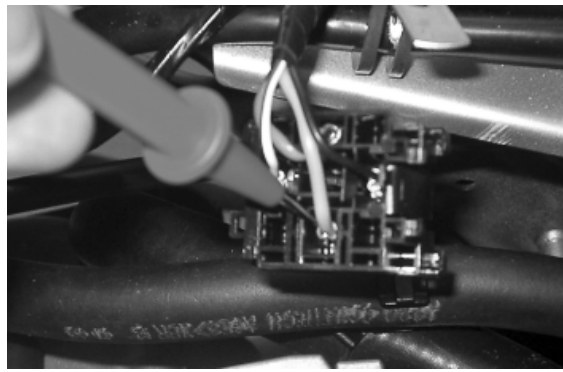




Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.

N.B.

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



INDEX OF TOPICS

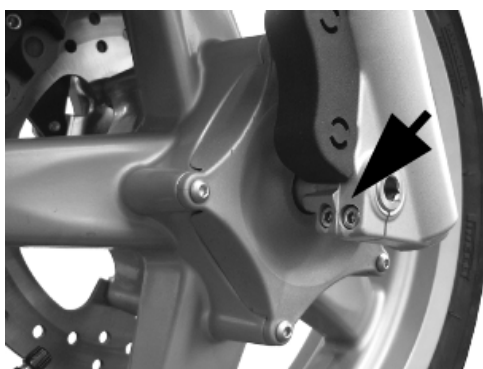
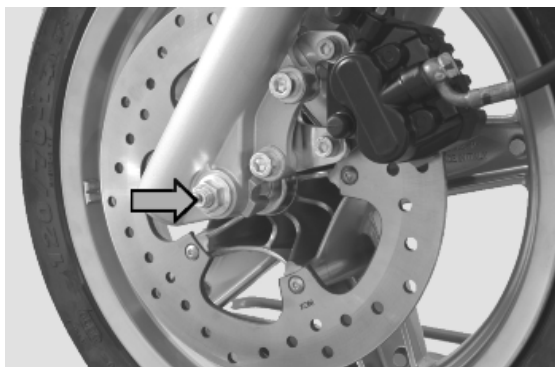
SUSPENSIONS	SUSP
-------------	------

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

Front

Removing the front wheel

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



Front wheel hub overhaul

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

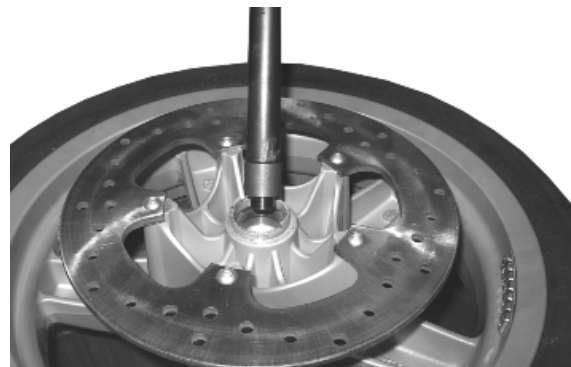
If you have to replace the wheel bearings, proceed as follows:

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





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



Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020412Y 15-mm guide

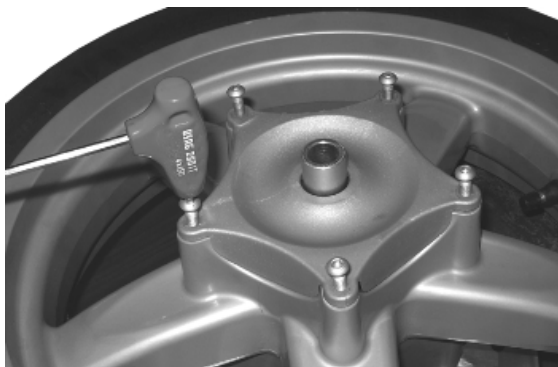
- Heat the bearing seat on the side opposite the brake disc with the heat gun.



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



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

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

- Refit the cap and tighten the five fixing screws.



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



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



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

Specific tooling

020376Y Adaptor handle

020357Y 32x35-mm Adaptor

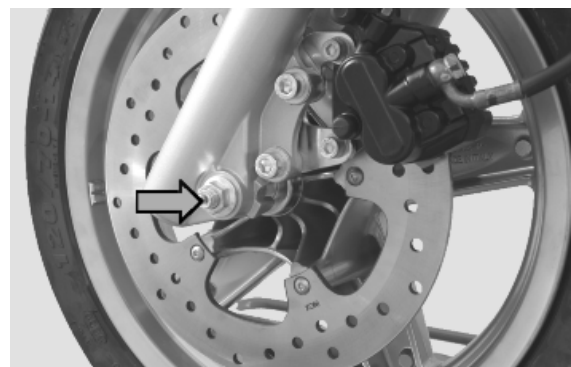
020412Y 15-mm guide

Refitting the front wheel

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

Locking torques (N*m)

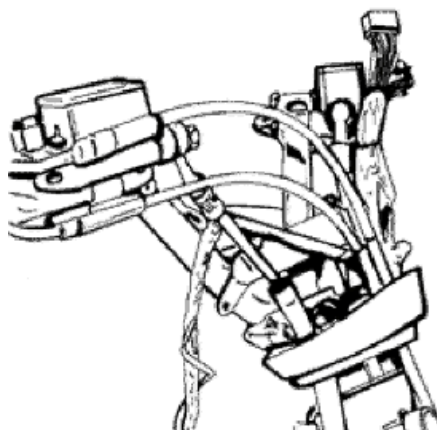
**Wheel axle nut 45 ÷ 50 Wheel axle clamp
screws 6 - 7 Nm**



Handlebar

Removal

- Remove the two handlebar covers as explained in the Bodywork Chapter.
- Remove the handlebar wiring fixing clips and disconnect the electric connectors from the brake levers.
- Unscrew the fittings, then remove the front and rear brake pump piping.
- Remove the flexible transmission of the accelerator and remove the throttle.
- Loosen the clamp fixing the handlebar to the steering tube and pulling upwards, remove the handlebar, then remove the lower plastic cover.

**N.B.**

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

Refitting

Carry out the above operations by working in the reverse order from those of the removal.

Locking torques (N*m)

Handlebar fixing screw (*) 43 ÷ 47

Front fork

Removal

- Remove the front wheel.
- Remove the handlebar and tip it onto the shield back plate being careful not to damage the plate.

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

N.B.

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

Specific tooling

020055Y Wrench for steering tube ring nut

See also

[Removing the front wheel](#)



Overhaul

- With the 10 mm hexagonal wrench for internal parts loosen the upper stem closing cap.



- Loosen the stem support clamp and remove fork leg and stem.



- Remove the spring
- Drain the oil.
- Separate the stem from the leg by removing the screws with copper washer shown in the figure. To prevent the rotation of the pumping insert a 12 mm hexagonal wrench for internal parts in the stem.



-
- Remove the dust guard ring using a screwdriver as shown in the figure.



-
- Remove the oil guard safety lock using a screwdriver.
 - Using the appropriate special tool, remove the oil seal.
 - Insert the tie rod complete with cable into the oil guard.
 - Insert in sequence the two half-rings per Ø 35-mm stems.

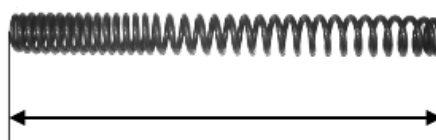


-
- Keeping the tie rod in vertical position, insert the bell for the Ø 35 mm stems.
 - Insert the nut in the thread and take out the oil guard



Specific tooling

020487Y Fork oil seal extractor



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

Characteristic

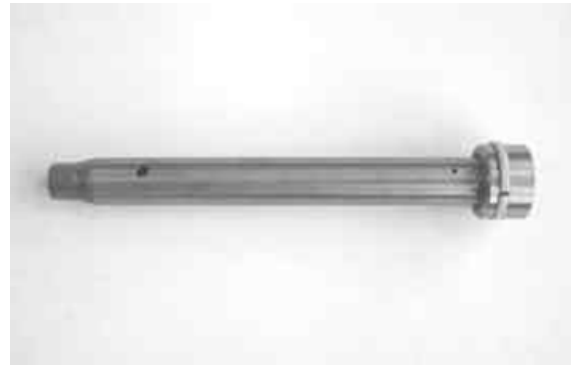
Maximum leg diameter

35.10 mm

Minimum stem diameter

34.90 mm

Check that the oil holes on the pumping element are not clogged. - Check that the O-ring shows no sign of damage.



-
- Insert a new oil guard with the special adaptor handle and take it to the stop.
 - Insert the safety clip.
 - Insert a new dust guard.



-
- Insert the contrast spring into the pumping member.
 - Insert the pumping element inside the stem.
 - Insert the pumping element guide bushing at the lower stem end.
 - Insert the stem in the leg being careful not to let the stem guide bushing come out.



-
- Inset and screw up the copper washer to the prescribed torque. To prevent the pumping member from rotating, insert a 12 mm Allen key into the stem.
 - Pour $133 \pm 2.5 \text{ cm}^3$ of oil into the stem.

**Recommended products****AGIP FORK 7.5 W Fork oil**

Grade 7.5 W

- Insert the spring inside the stem

- Insert the stem into the fork clamp.
- Do up the clamp once to allow the stem closure upper cap to be tightened.
- Check that the sealing ring on the cap is in good working order, then tighten the cap on the stem to the prescribed torque.



- Loosen the fork clamp screws and ensure the stem closure cap is fitted properly on the clamp.
- Tighten the clamp screws to the prescribed torque.



Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm Adaptor

Locking torques (N*m)

Fork clamp screws 20 ÷ 25 **Stem upper cap** 15 ÷ 30 **Lower screw with copper washer** 25 - 35

Refitting

- Grease using lithium soap grease on the roller bearings.

Recommended products

AGIP GREASE PV2 Grease for the steering bearings, pin seats and swinging arm

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



- Insert the fork into the headstock.
- Insert the spacer ring.
- Using an appropriate tool do up the first ring nut in the steering tube (upper steering ball bearing). Lock with a torque of 10 ÷ 13 Nm and rotate the wrench anticlockwise by 90°.
- Install the space washer.



- Using the appropriate tool tighten the second locking ring in the steering tube to a torque of $30 \div 36$ Nm.
- 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.

- Refit the three handlebar covers as described in the «Bodywork» Chapter.

- Install the front wheel.

- Refit the brake calliper on the fork leg.



Specific tooling

020055Y Wrench for steering tube ring nut

Locking torques (N*m)

screw fixing handlebar to the steering tube $45 \div 50$ Upper steering ring nut $30 \div 36$ Steering lower ring nut $10 \div 13$ then loosen by 90° Tightening screw for calliper support to the fork $45 \div 55$ Front wheel axle $45 \div 50$

See also

[Refitting the front wheel](#)

Steering bearing

Removal

For the version with steering fifth wheel remove the seat on the steering tube by means of the special punch as indicated in the photograph

Specific tooling

020004Y Punch for removing fifth wheels from headstock



- Remove the fork
- Check that the upper ball bearing and the seat of the lower roller bearings do not show signs of wear or pricking.

In case of replacement, proceed as follows:

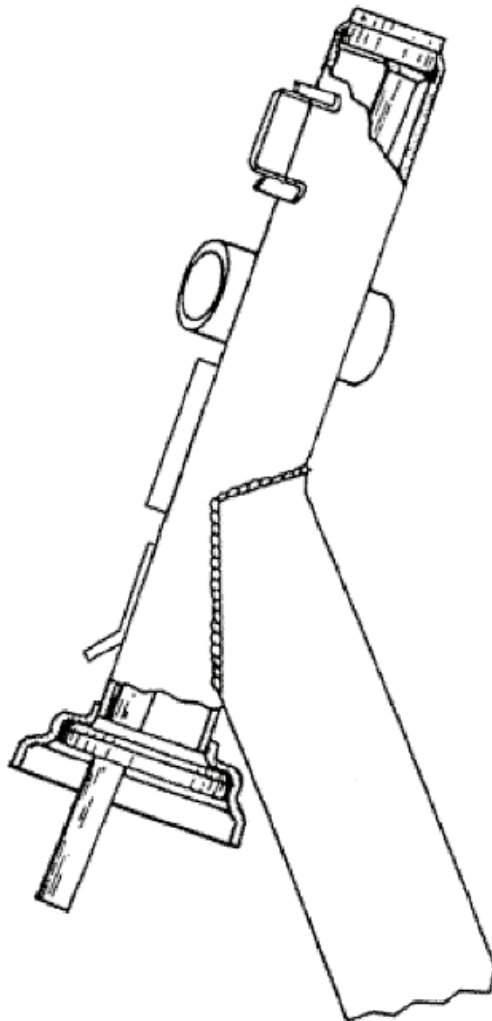
- Using a punch to remove the bearings, insert it from the bottom and remove the ball bearing above the headstock. Then remove the lower seat of the roller bearing by inserting the punch from the top of the headstock.

N.B.

ONLY REMOVE THE UPPER BALL BEARING IF YOU REALLY NEED TO.

Specific tooling

020004Y Punch for removing fifth wheels from headstock



- Check that the roller bearing does not show signs of wear or pricking.

In case of replacement, proceed as follows:

- Support the fork in a vice.
- Insert the contrast plate in the upper end of the steering tube

N.B.

ONLY REMOVE THE UPPER BALL BEARING IF YOU REALLY NEED TO.



- Insert the special tool as shown in the figure.



- Insert the retaining band of the two half-rings.



- Using a 19 mm hexagonal spanner, extract the roller bearing.

Specific tooling

020458Y Puller for lower bearing on steering tube



Refitting

Using the appropriate tool, refit the upper ball bearing and the seat of the lower roller bearings on the headstock as described below:

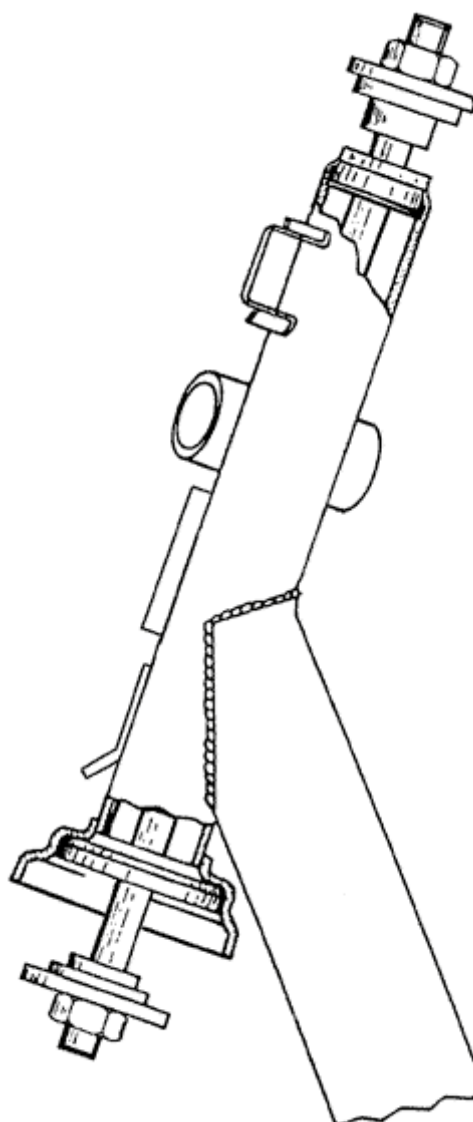
- Place a new ball bearing on the headstock and a roller bearing seat on the lower part.
- Insert the tie rod screw of the appropriate tool fitted out with the adaptors for planting the bearing and seat it in the headstock as in the photograph.
- Using two 24 mm wrenches, tighten the screw until the seat and the bearing are fully set in place.

N.B.

ALWAYS USE A NEW BEARING AND A NEW SEAT.

Specific tooling

001330Y Tool for fitting steering seats



- Insert the a new plate and a new dust guard in the steering tube
- Insert a new roller bearing in the roller tube.
- Using the special tool and a mallet to move the dust guard and the bearing in abutment.

Specific tooling

006029Y Punch for fitting fifth wheel seat on steering tube

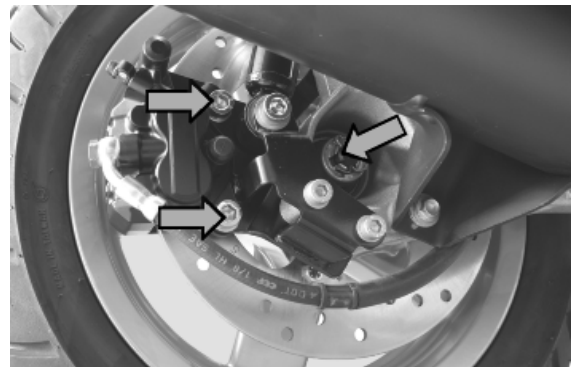


Rear

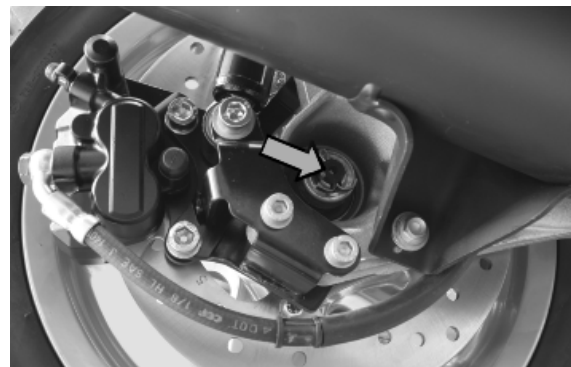
Removing the rear wheel

Remove the full muffler assembly.

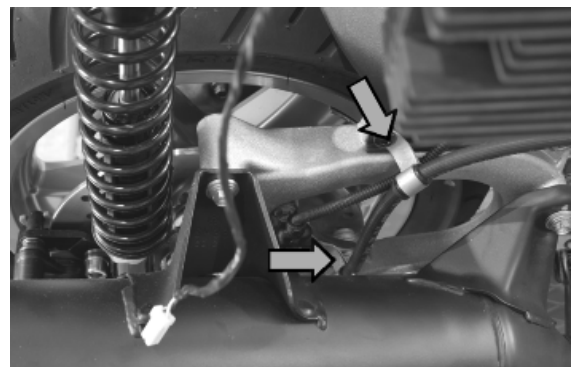
- Remove the screw fixing the right-hand shock absorber to the bracket
- Remove the two screws supporting the brake calliper on the bracket

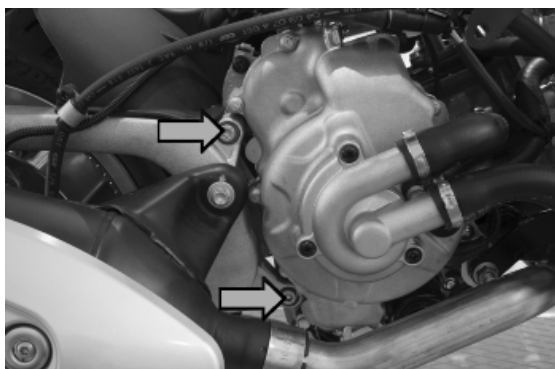


- Remove the cotter pin, the cap, the wheel axle fixing nut and the outer one of the two spacers.



- Remove the screws fixing the mudguard and the brake pipe to the bracket.
- Remove the screw fixing the brake pipe to the bracket.
- Remove the two screws fixing the bracket to the engine.





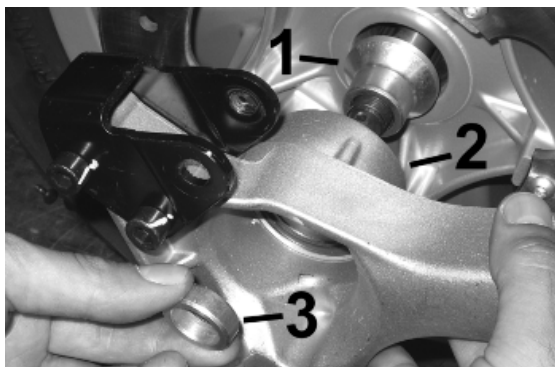
- Slide off the wheel axle bracket, using the heat gun if necessary.

Refitting the rear wheel

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

Locking torques (N*m)

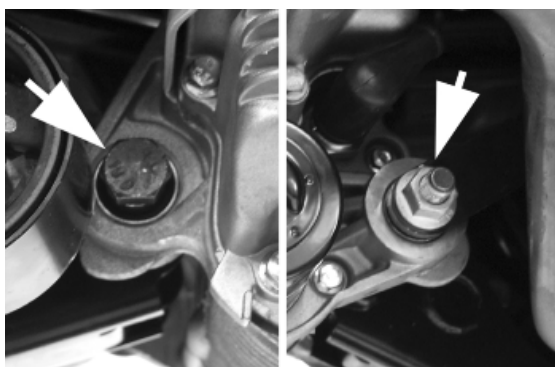
Muffler arm clamping screws 27 ÷ 30 **Rear wheel axle nut** 104 ÷ 126 **Shock absorber-crankcase attachment bracket** 20 ÷ 25 **Lower shock absorber clamping screw** 33 ÷ 41 Nm **Rear brake calliper fixing screws** 25 ÷ 30 Nm



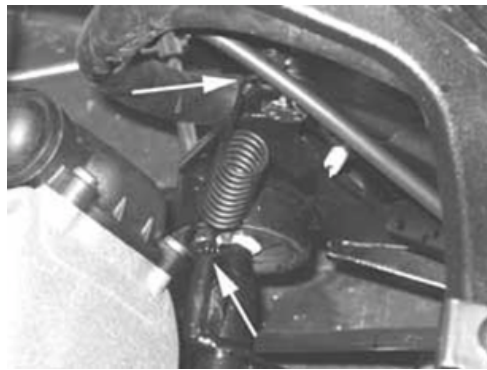
Swing-arm

Removal

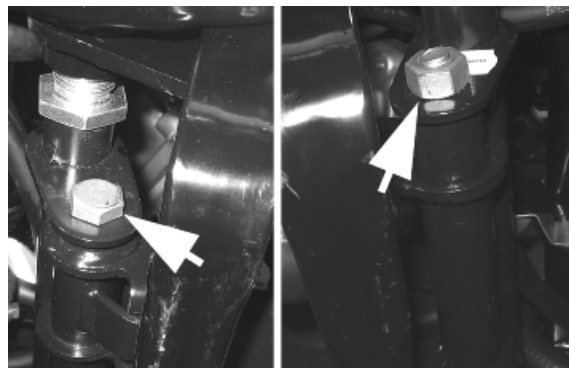
- Place the vehicle on its centre stand;
- Remove the swinging arm/engine fitting shown in the picture
- Move the engine back



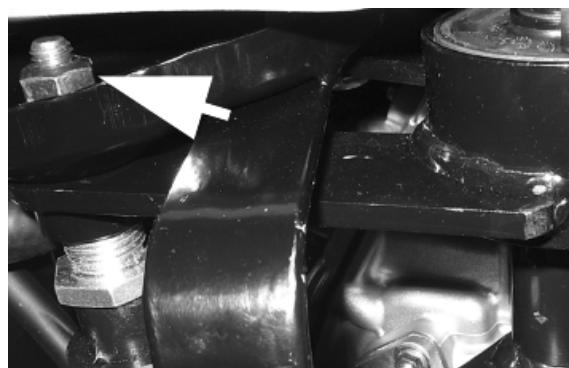
- remove the spring anchoring the swinging arm to the frame as shown in the picture



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



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



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



Overhaul

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

Characteristic

Standard clearance

0.40 ÷ 0.60 mm

Allowable limit after use:

1.5 mm



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



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

Characteristic

Standard clearance

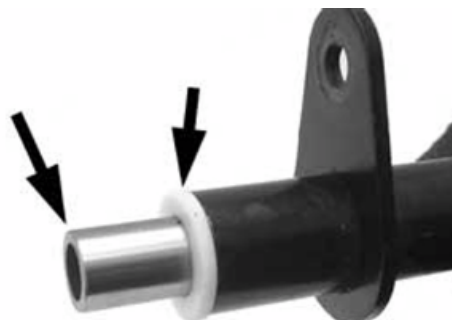
0.40 ÷ 0.60 mm

Allowable limit after use:

1.5 mm



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



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



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

Specific tooling

020244Y 15-mm diameter punch

020115Y Ø 18 punch

Characteristic

Length of the swinging arm tube on the engine side:

175.3 ± 0.3 mm

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

183 ± 0.3 mm

Engine side swinging arm plastic bushing shim:

3.5 ± 0.05 mm

Frame side swinging arm plastic bushing shim:

3.5 ± 0.05 mm

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

290 ± 0.1 mm

Length of the swinging arm tube on the frame side:

283 ± 0.1 mm



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

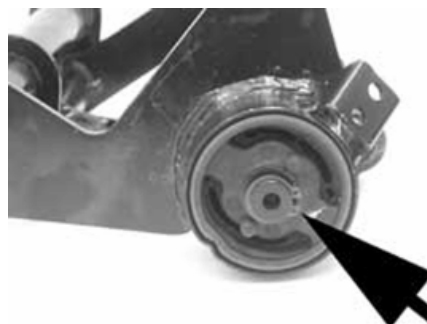


Recommended products

AGIP GREASE PV2 Grease for the steering bearings, pin seats and swinging arm

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

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



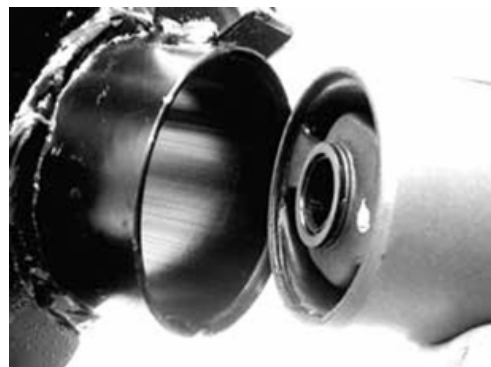
- Remove the full silent bloc bracket
- Undo the silent bloc ring shown in the picture



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



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



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



Refitting

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

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

Locking torques (N*m)

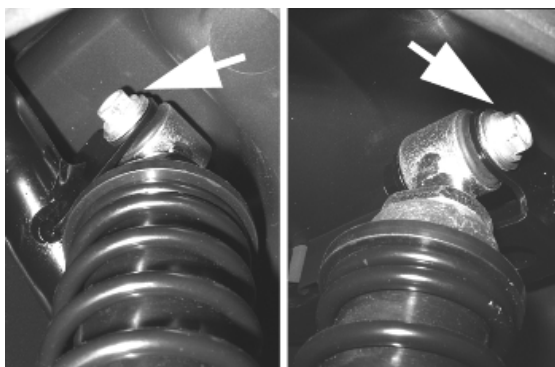
Engine and vehicle side swinging arm junction bolt 33 ÷ 41 Nm Swinging arm pin - Engine 64 - 72 Body shell - Swinging arm pin 76 ÷ 83 Screw fixing the silent-block support plate to the body 42 ÷ 52

Shock absorbers

Removal

Proceed as follows:

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



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

Centre-stand

REMOVAL

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



FITTING

- On refitting tighten the nut to the specified torque.

Locking torques (N*m)

Centre stand bolt 32 ÷ 40

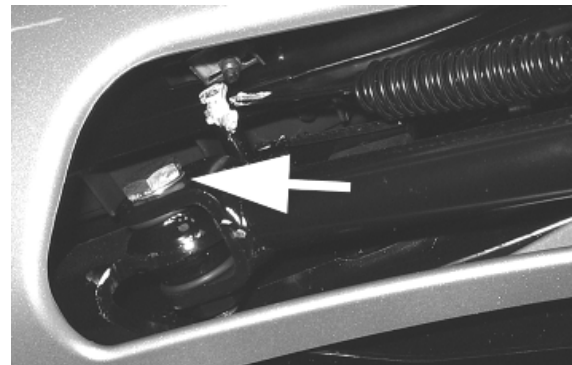
Side stand

REMOVAL

- Uncouple the centre stand return spring;
- Remove the screw shown in the photograph

FITTING

To refit, carry out the removal operations in reverse order and comply with the specified torque.



Locking torques (N*m)

Side stand fixing bolt 35 ÷ 40

INDEX OF TOPICS

BRAKING SYSTEM

BRAK SYS

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

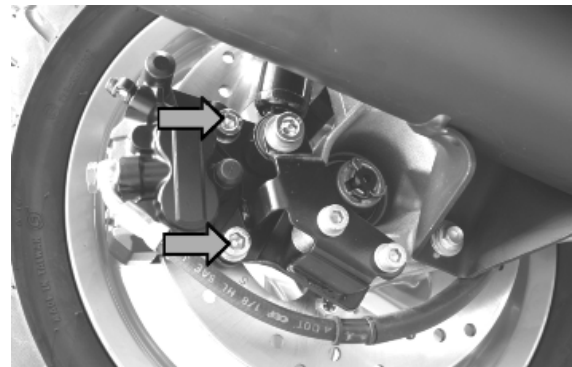
Rear brake calliper

Removal

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

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

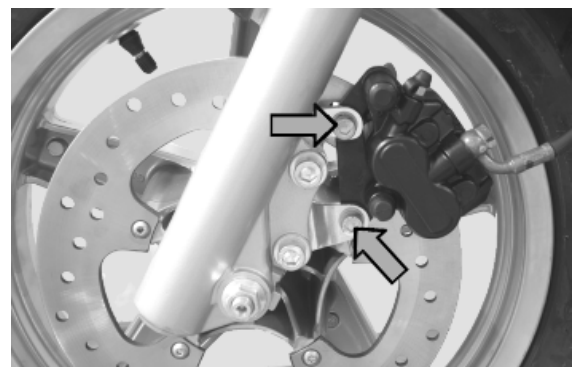
Front brake calliper

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.
-

Rear brake disc

Removal

- Remove the rear wheel.
- Undo the five clamping screws shown in the photograph



Refitting

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

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

N.B.

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

Recommended products

Loctite 243 Medium strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

Brake disc fixing screw 5 ÷ 6.5

Disc Inspection

- Remove the rear brake calliper
- Check the disc thickness with a micrometer.

Characteristic

Standard thickness:

5 ± 0.2 mm

- Repeat the measurement at no fewer than six points on the disc.
- Check the regular nature of the rotation of the brake disc assembly using the appropriate tool fixed onto the brake calliper as shown in the photo.
- In order to be able to anchor the appropriate tool properly use a metal plate with M8 threaded hole and fix it to one of the two rear brake calliper attachment points.
- Suitably fix the flange to the wheel axle with the original nut and spacer and a Ø 17-mm bearing

N.B.

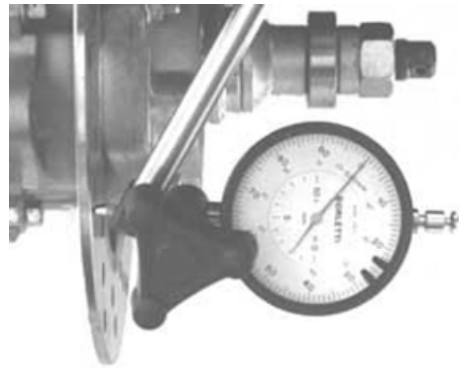
SO AS NOT TO GET A DISTORTED READING, CAUSE THE DRIVEN PULLEY SHAFT TO TURN IN ORDER TO ROTATE THE DISC.

Specific tooling

020335Y Magnetic support for dial gauge**Characteristic****Max. deviation allowed:**

0.1 mm

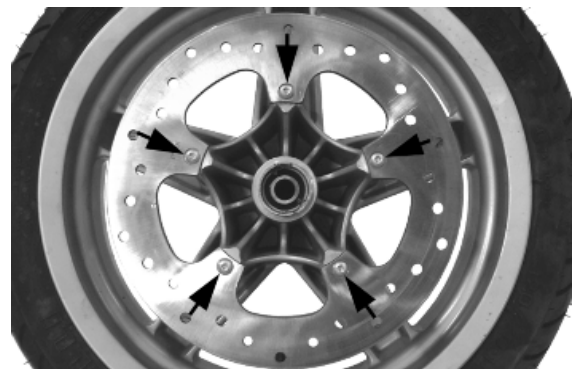
- If you detect incorrect values, replace the disc. If the anomaly persists, replace the hub.



Front brake disc

Removal

- Remove the front wheel.
- Undo the five clamping screws shown in the photograph



Refitting

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

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

N.B.

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

Recommended products

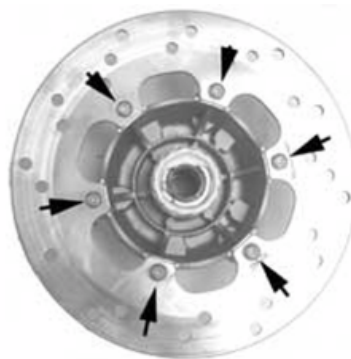
Loctite 243 Medium strength threadlock

Medium Loctite 243 threadlock

Locking torques (N*m)

Brake disc fixing screw 5 ÷ 6.5

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

Locking torques (N*m)**Brake disc 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 other dirt and must not show signs of deep scoring.

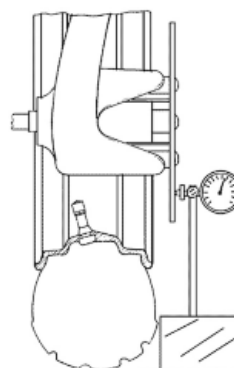
Characteristic**New rear disc thickness**

4.0 mm

Disc thickness at wear limit (front)

3.5 mm

- Using the appropriate tool, measure how much the disc protrudes when the wheel is fitted properly. The protrusion, measured near the external edge of the disc, must be less than 0.1 mm.
- If a value is measured other than the specified value, remove the front wheel (Front/Rear Suspension chapter) and check the protrusion of the disc. Maximum permissible out of true is 0.1 mm. If the value measured is greater, replace the disc and repeat the check.
- If the problem persists, check and replace the wheel hub if necessary.

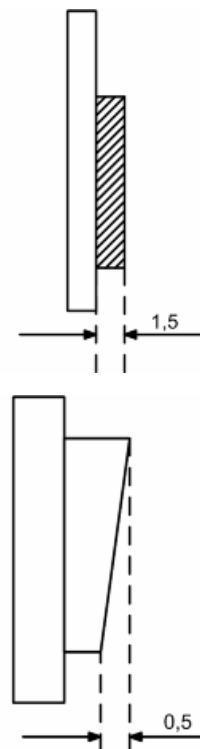
**Specific tooling****020335Y Magnetic support for dial gauge**

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

Medium Loctite 243 threadlock

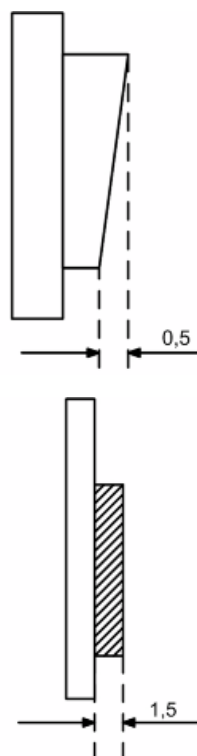
Locking torques (N*m)

Screw tightening calliper to support 24 ÷ 27 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

[Rear](#)
brake calliper

Refitting

To fit, proceed as follows:

- Insert the two pads in the callipers.

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

N.B.

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

Recommended products

Loctite 243 Medium strength threadlock

Medium Loctite 243 threadlock

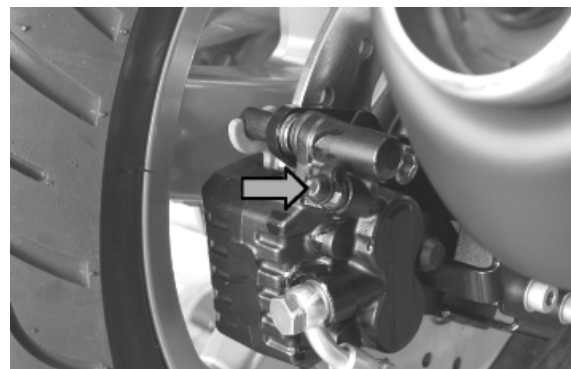
Locking torques (N*m)

Screw tightening calliper to support 24 ÷ 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 left-hand brake lever, load the system and bring it up to the required pressure.
- Keeping the left-hand brake lever pulled, loosen the bleed screw to permit the air in the system to escape. Then tighten the bleed screw



- Repeat the operation until only brake fluid comes out of the rubber pipe.
- Remove the fluid recovery pipe and refit the rubber cap over the bleed screw.
- Top up the brake fluid to the right level in the reservoir.

If necessary, bleeding can be done using a special vacuum pump

N.B.

DURING THE BLEEDING OPERATIONS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE BODYWORK SO AS NOT TO DAMAGE IT. FURTHERMORE, DURING THE BLEEDING OPERATIONS REGARDING THE BRAKE CALLIPERS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE DISC BRAKES AND WITH THE BRAKE PADS. FAILURE TO OBSERVE THIS PRECAUTION WILL ENDANGER THE PROPER WORKING AND EFFICIENCY OF THE BRAKING SYSTEM

Specific tooling

020329Y 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 left-hand brake lever, load the system and bring it up to the required pressure.
- Keeping the left-hand brake lever pulled, loosen the bleed screw to permit the air in the system to escape. Then tighten the bleed screw
- Repeat the operation until only brake fluid comes out of the rubber pipe.
- Remove the fluid recovery pipe and refit the rubber cap over the bleed screw.
- Top up the brake fluid to the right level in the reservoir.



If necessary, bleeding can be done using a special vacuum pump

N.B.

DURING THE BLEEDING OPERATIONS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE BODYWORK SO AS NOT TO DAMAGE IT. FURTHERMORE, DURING THE BLEEDING OPERATIONS REGARDING THE BRAKE CALLIPERS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE DISC BRAKES AND WITH THE BRAKE PADS. FAILURE TO OBSERVE THIS PRECAUTION WILL ENDANGER THE PROPER WORKING AND EFFICIENCY OF THE BRAKING SYSTEM

Specific tooling

020329Y MityVac vacuum-operated pump

Locking torques (N*m)

System bleed calliper fitting: 12 ÷ 16 Nm

Brake fluid level check

- Position the vehicle on a flat surface and on the centre stand
- Remove the brake pump cover as indicated in the photo



- Use the appropriate spyglass on the pump to check the level of the brake fluid, as shown in the photograph



- If the level is below the minimum, fill using the two screws shown in the figure
- Remove the gasket and fill with DOT 4 until the spyglass is completely covered

CAUTION



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

CAUTION



THE BRAKING CIRCUIT FLUID IS HIGHLY CORROSIVE. THEREFORE, WHEN TOPPING IT UP, AVOID LETTING IT COME INTO CONTACT WITH THE PAINTED PARTS OF THE VEHICLE. THE BRAKING CIRCUIT FLUID IS HYGROSCOPIC, THAT IS, IT ABSORBS HUMIDITY FROM THE SURROUNDING AIR. IF MOISTURE CONTAINED IN THE BRAKE FLUID EXCEEDS A CERTAIN VALUE, THIS WILL RESULT IN INEFFICIENT BRAKING.



Locking torques (N*m)

Brake pump reservoir screws $1.5 \div 2$

Never use brake liquid in open or partially used containers.

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

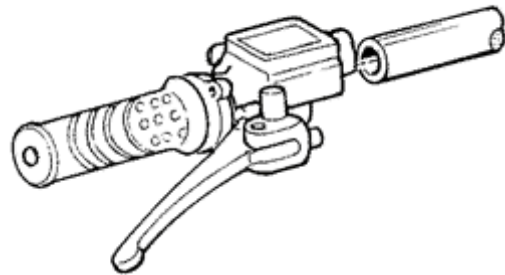
For refitting purposes carry out the operations in the reverse order from the removal operation and respect the tightening torque of the tank cover screws.

Front brake pump

Removal

- 1) remove the front and rear handlebar covers;
- 2) placing a suitable container to catch the oil, disconnect the oil pipe from the calliper and work the brake lever until no more oil comes out;
- 3) disconnect the oil pipe from the pump then unscrew the two u-bolt clamping screws and remove the pump.

- On refitting, tighten up the fitting to the specified torque and bleed the system.



Locking torques (N*m)

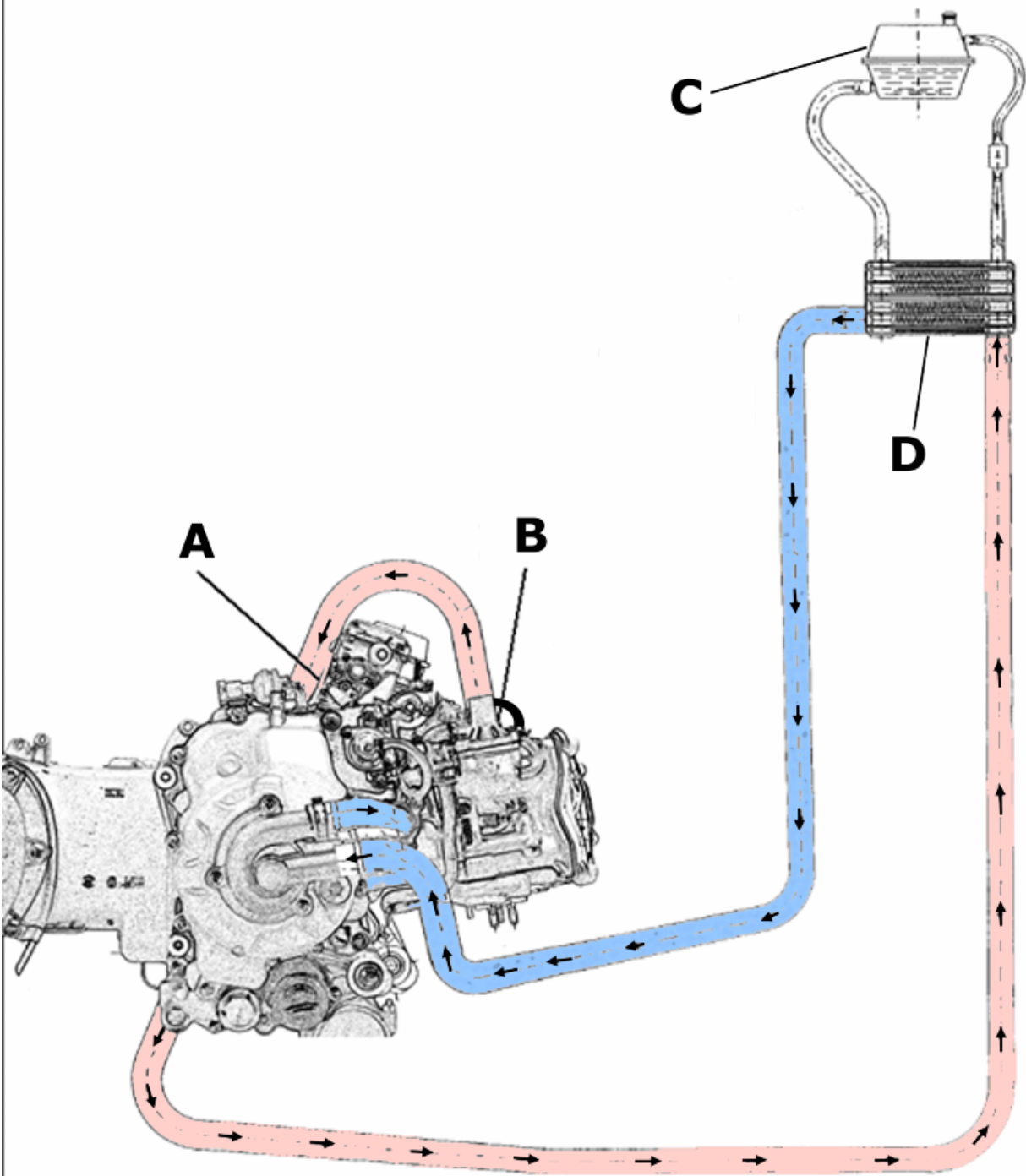
Brake fluid pump-hose fitting 16 ÷ 20

INDEX OF TOPICS

COOLING SYSTEM

COOL SYS

Circuit diagram

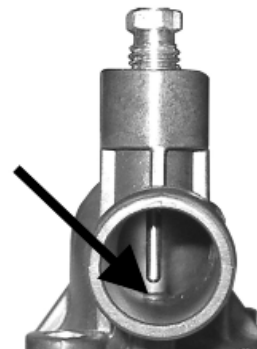
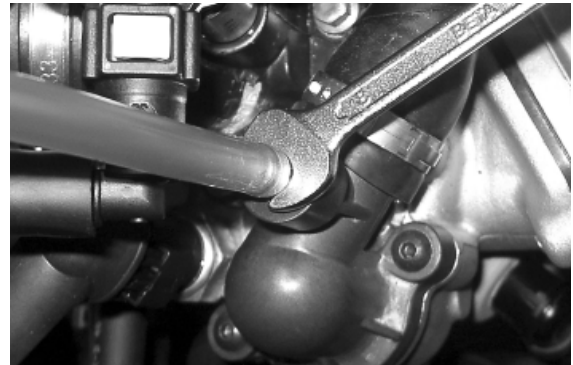


COOLING CIRCUIT

Specification	Desc./Quantity
A	Carburettor heating circuit
B	Thermostat with by-pass
C	Expansion tank
D	Radiator

System bleed

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



Locking torques (N*m)

Bleed screw 3

Check

- 1) Look to see that the thermostat is not damaged.
- 2) Fill a metal container with approx. 1 litre of water.

Immerse the thermostat, and keep it in the centre of the container.

Immerse the multimeter temperature probe, and keep it close to the thermostat.

Heat up the container using the thermal gun.

Check the temperature when the thermostat starts to open:

Heat up until the thermostat is completely open.

- 3) Replace the thermostat if it is not working properly.



CAUTION

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

Specific tooling

020331Y Digital multimeter

020151Y Air heater

Characteristic

Thermostat check: Opening start temperature

69.5 ÷ 72.5°C

INDEX OF TOPICS

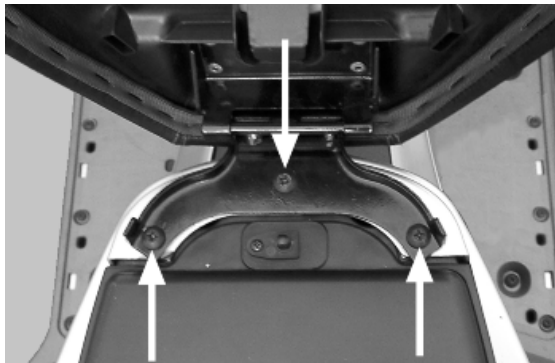
CHASSIS

CHAS

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

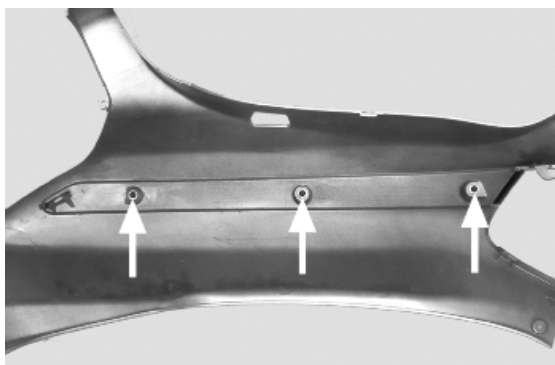
Seat

- Raise the saddle
- Undo the three screws fixing the plate to the central cover and remove the saddle.



Side fairings

- Remove the side panel
- Undo the three clamping screws of the bumper band and remove it.

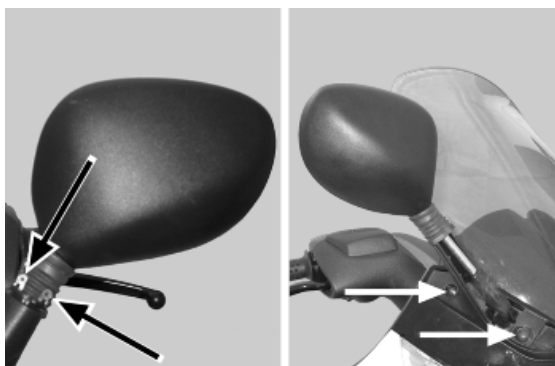


See also

[Side fairings](#)

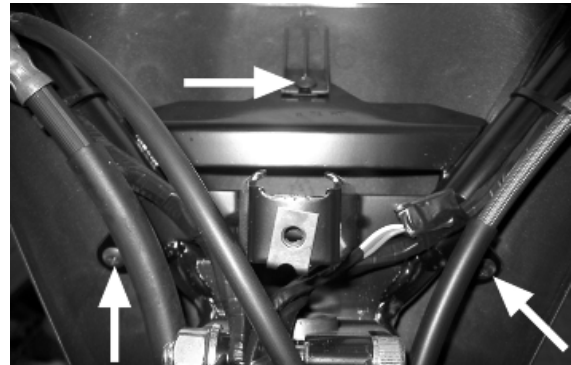
Driving mirrors

- Remove the joint rubber of the mirror housing from the bottom;
- Unscrew the two screws, then remove the covering from the support arm;
- Remove the 2 lower retainers fixings the mirror to the frame.



Rear handlebar cover

- - Remove the front handlebar cover
- Undo the 3 screws fixing the rear handlebar cover and remove the cover once the connectors of the controls have been disconnected.

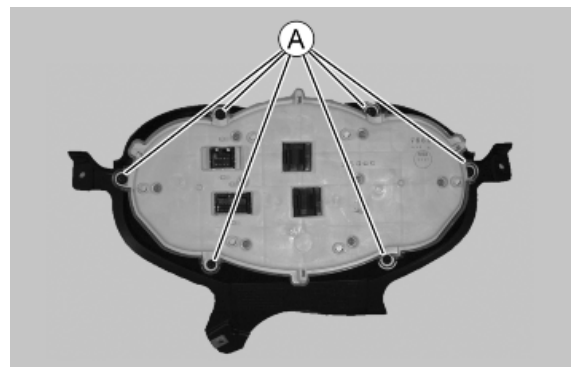


See also

[Front handlebar cover](#)

Instrument panel

- Remove the instrument panel support and tip it.
- Undo the six fixing screws «A» to remove the instrument panel.

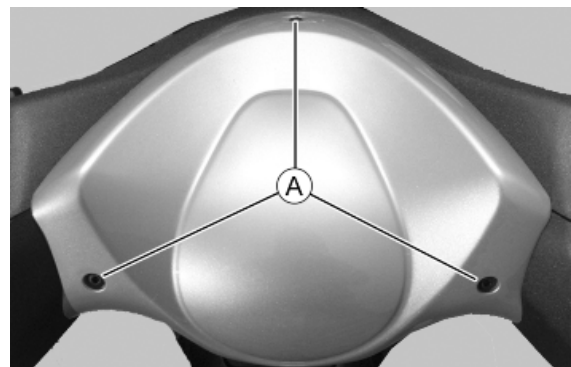


See also

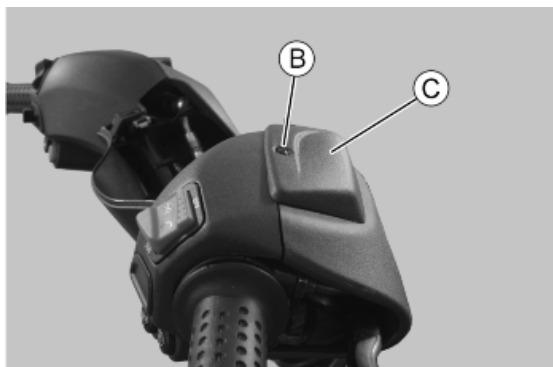
[Analogue instrument panel support](#)

Front handlebar cover

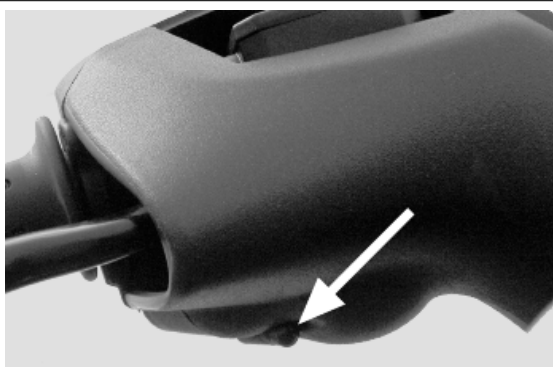
- Undo the three screws«A» fixing the handlebar upper cover and slide it off upwards.



- Undo the screw «B», then remove the cover «C» on both sides of the handlebar.

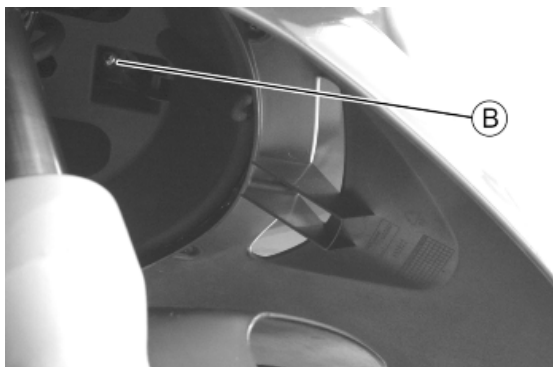


- Undo the two fixing screws at the bottom part.
- Take out the cover by pulling it upwards.



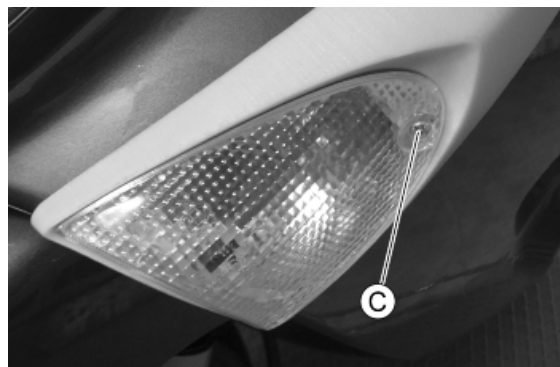
Headlight assy.

- Remove the upper cover of the headlight
- Undo the two upper fixing screws «A», the lower screw «B» and remove the headlight assembly once the connector has been removed.



For the front turn indicators:

- Undo the screw «C» and remove the plastic cover.
- Undo the screw «D» and remove the turn indicator once the connector has been removed.



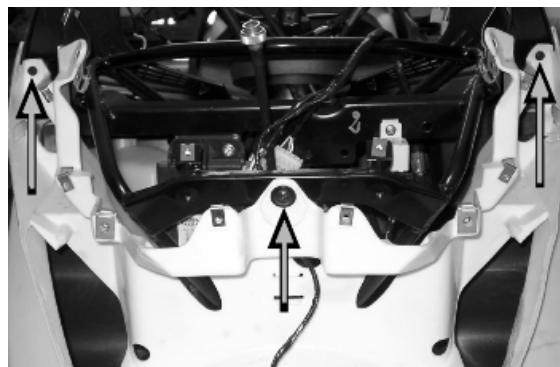
See also

[Flyscreen](#)

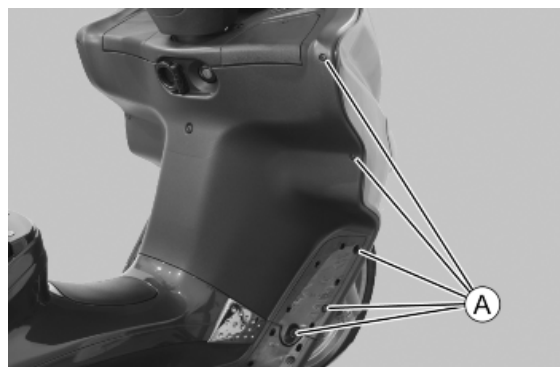
[Legshield](#)

Legshield

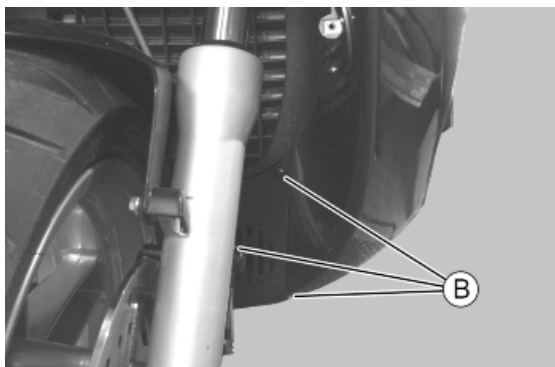
- Remove the front headlight.
- Remove the three upper retainers.



- Remove the mats on the footrest.
- Remove the ten fixing screws «A» (five per side) on the shield back plate.



- Remove the front mudguard.
- Remove the six screws «B» (four per side) fixing the shield with the radiator grille and the spoiler.
- Remove the shield.

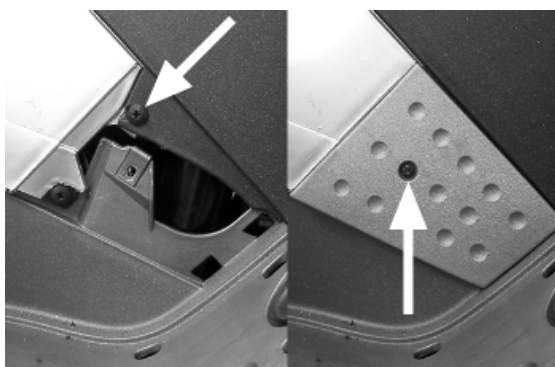
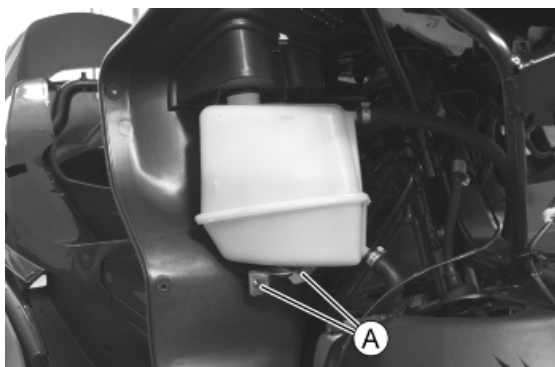


See also

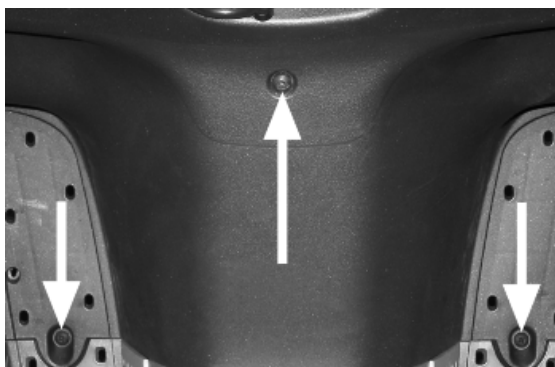
[Front mudguard](#)

Knee-guard

- - Remove the front shield.
- Remove the expansion tank from the shield back plate by undoing the two screws «A» and fix it to the small front frame in such a way that it does not turn over.
- Disconnect the connectors of the MODE button and the plug socket.
- Undo the screw fixing the caps of the two lower screws and remove them.



- Remove the three fixing screws to the frame.
- Remove the instrument panel support.
- Remove the shield back plate by removing the lower part.
- To make the operation easier it might be necessary to turn the steering alternately to right and left to free the upper appendages.

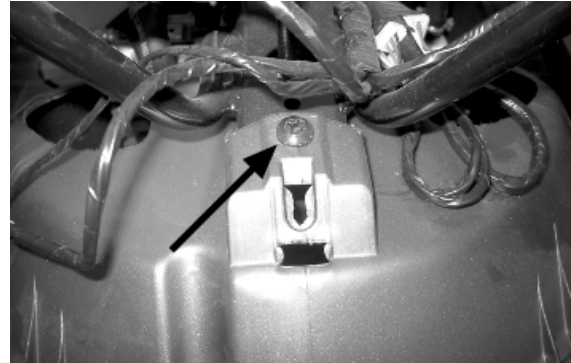


See also

[Legshield](#)
[Analogue](#)
instrument panel support

Front wheel housing

- - Remove the front shield.
- Remove the front fork.
- Undo the central screw fixing the wheel house to the frame.
- Disconnect the brake pipe to the pump and slide it off.

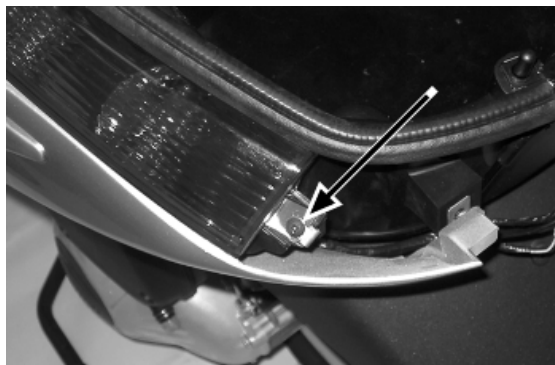


See also

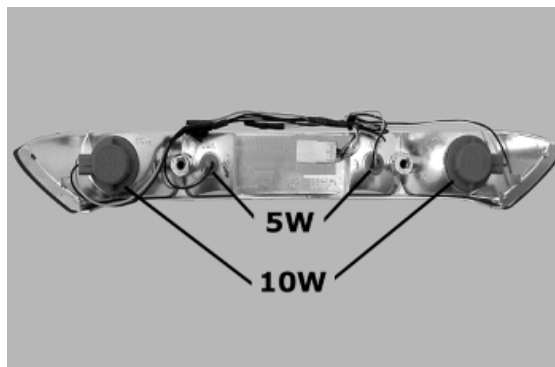
[Legshield](#)

Taillight assy.

- After accessing the rear glove box, undo two rear light clamping screws «D».
- Once you have removed the rear light, remove screw «E» and remove the turn indicator.

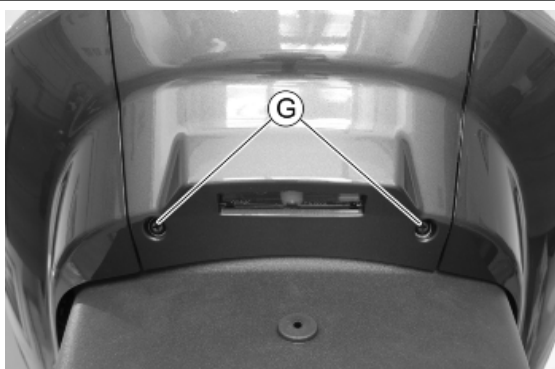


- Central lights: parking lights;
- Side lights: stop lights.



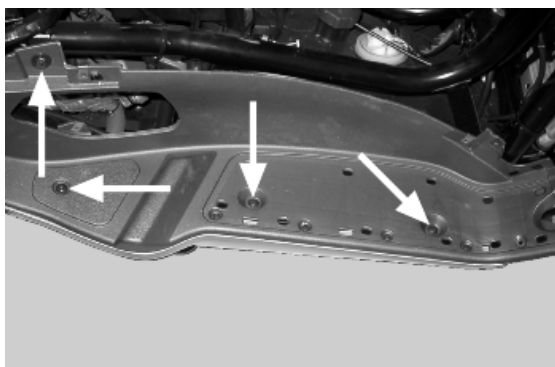
License plate light

- Remove the two screws «G», then remove the side panels and light support junction after disconnecting the electrical connection.

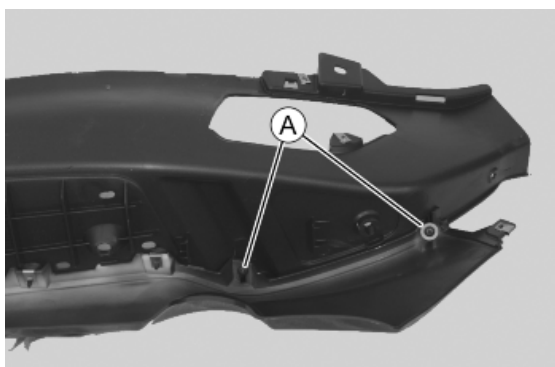


Footrest

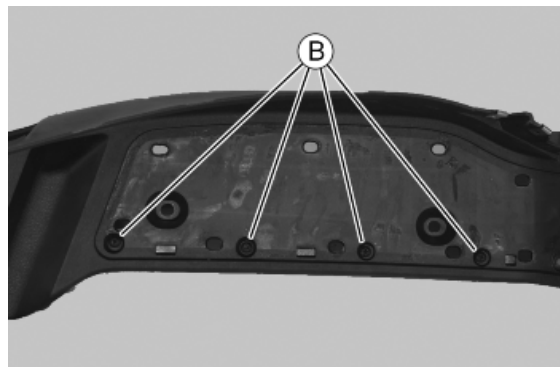
- Remove the frame central cover.
- Undo the four screws fixing the footrest, two of which are underneath the mat, and remove the footrest.



- Undo the two screws «A» on the internal side of the footrest.
- Undo the four fixing screws «B» on the edge of the footrest and remove the lower cover.

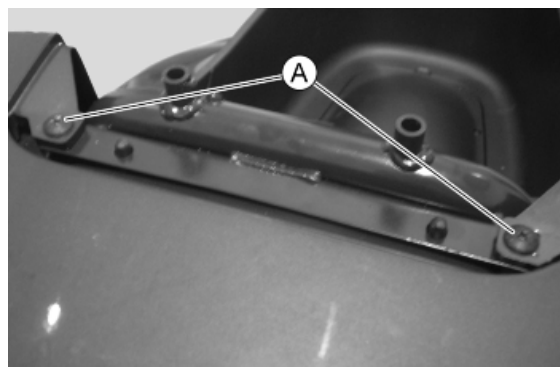


The diagram illustrates what to do on the right-hand footrest; follow the same procedure to remove the left-hand footrest.

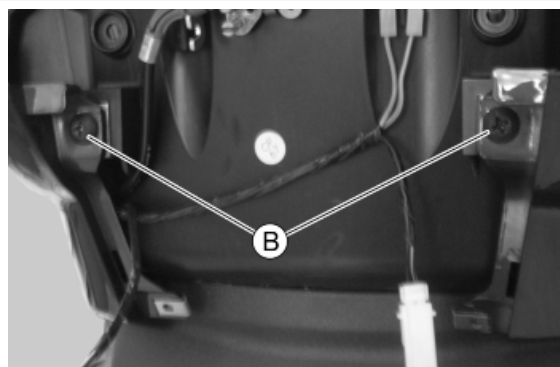
**See also**[Central cover](#)

Side fairings

- Remove the passenger grab handle.
- Remove the two upper screws «A» fixing the side fairings.



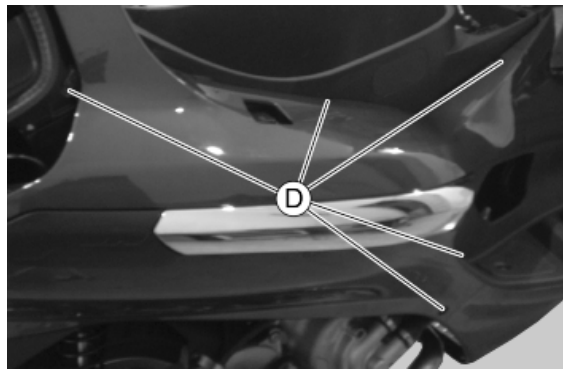
- Remove the license plate light support then undo the two fairing fixing screws «B» underneath it.



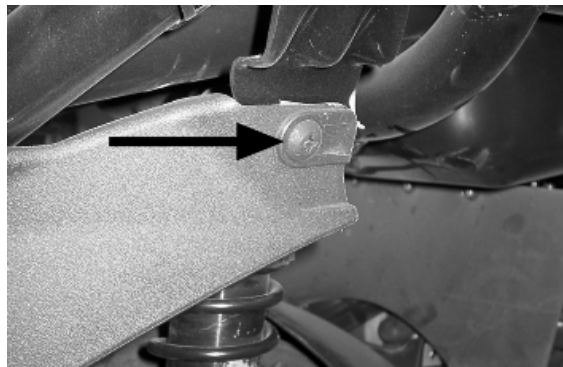
- Remove the rear light unit.
- Undo the screw «C» under the turn indicator.



- Remove the five screws «D», then slide off the side panel by pulling it backwards to free the teeth hooking it to the central cover.

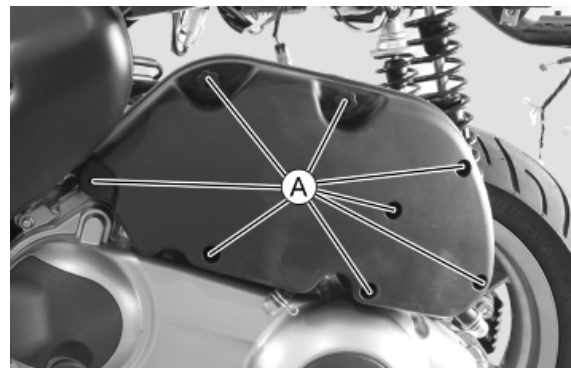
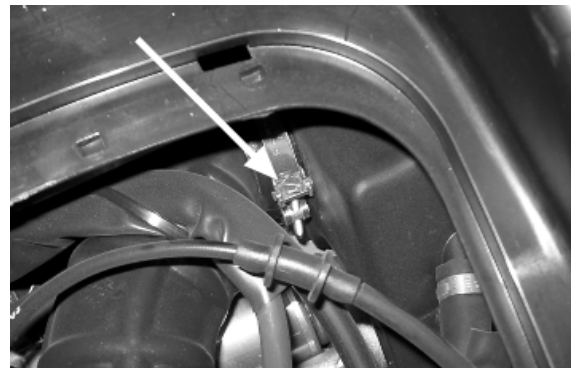
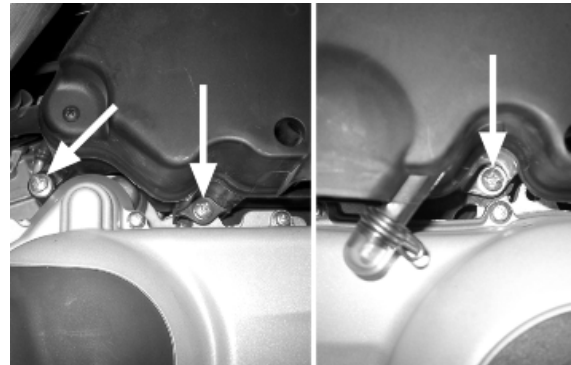
**See also**[License plate light](#)[Handles and top side fairings](#)[Taillight assy.](#)**License plate holder**

- Remove the rear and side fittings and the pipe above the helmet compartment retaining frame;
- Remove the two side licence plate support clamping screws;
- Lift the helmet compartment to allow the licence plate support to free itself from the two threaded appendages on the rear frame tube.

**See also**[Helmet bay](#)

Air filter

- Remove the left-hand side panel;
- Undo the three screws fixing the box to the crankcase;
- Loosen the hose tightening screw on the carburettor and remove the hose;
- Push the box upwards to free it from the appendages on the crankcase and remove it ;
- Undo the clamping screws «A» (two of which are on the knob-type head) and remove the air-box cover.

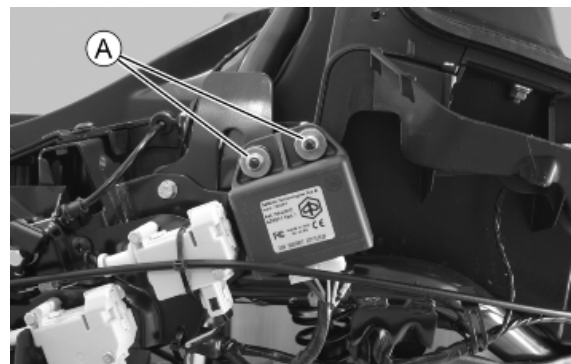


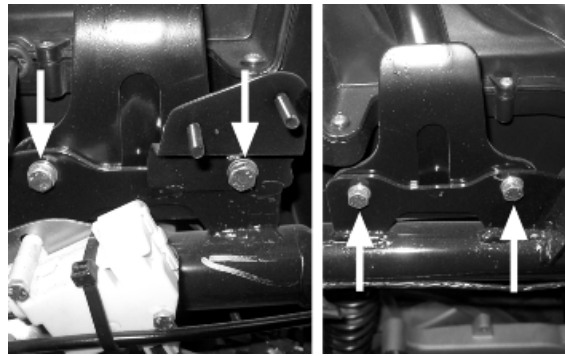
See also

[Side fairings](#)

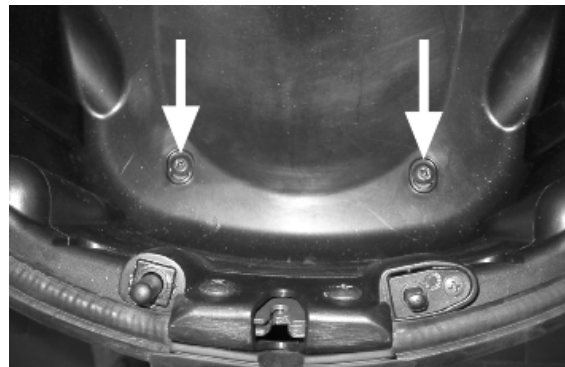
Helmet bay

- Remove the side fairings;
- Remove the frame central cover;
- Remove the saddle opening receiver from its support by undoing the two screws «A» on the left fairing;
- Undo the four screws fixing the frame upper pipe and remove it once the boot light connector has been removed.

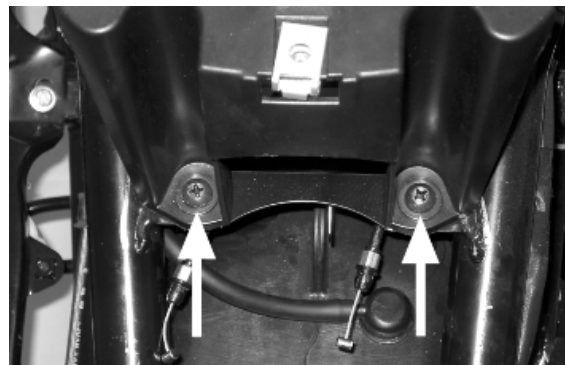




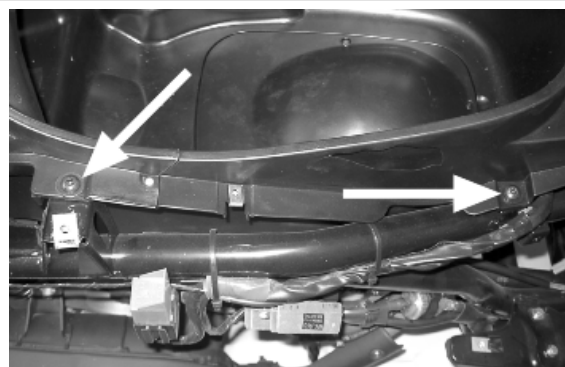
- Open the glove box flap;
- Undo the 2 screws two on the bottom of the helmet compartment.



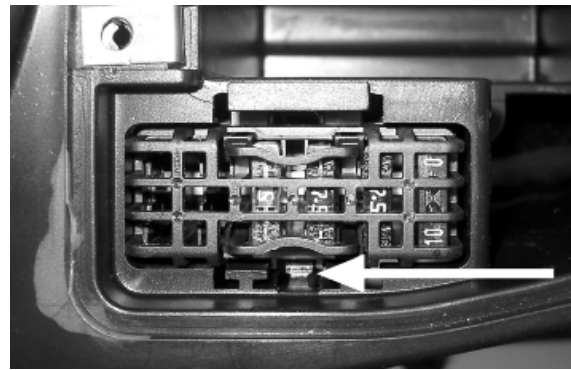
- Undo the 2 screws located in the front part of the helmet compartment.



- Undo the 4 screws (2 per side) on the sides of the helmet compartment.



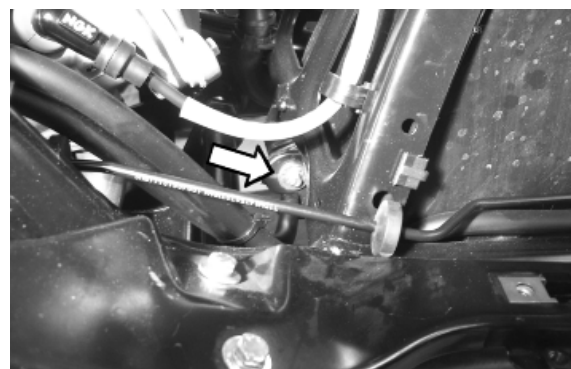
- Raise the helmet compartment as much as possible;
- Disconnect the electrical connection of the two light buttons;
- Remove the glove box flap hook;
- Remove the saddle hook;
- Disconnect the spark plug HV wire.
- Pull the right and left fuse box out downwards freeing the tooth with a screwdriver from above;
- Slide off the battery positive and negative leads and the diagnostics socket from the side slots.

**See also**

[Side fairings](#)

Fuel tank

- Remove the central chassis cover.
- Remove the footrest.
- Remove the three tank retainers.
- Disconnect the electric wiring and the fuel pipes.



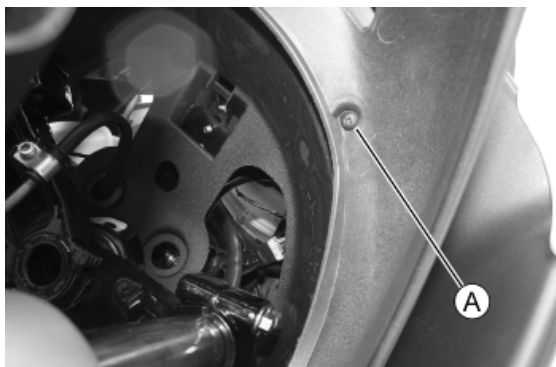


See also

[Footrest](#)

Front mudguard

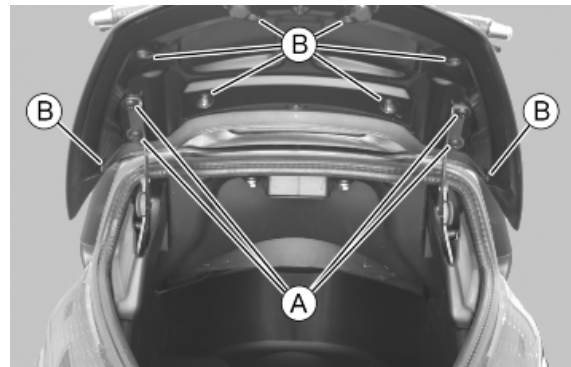
- Remove the four fixing screws «A» (two per side) on the mudguard internal side.



Top-case

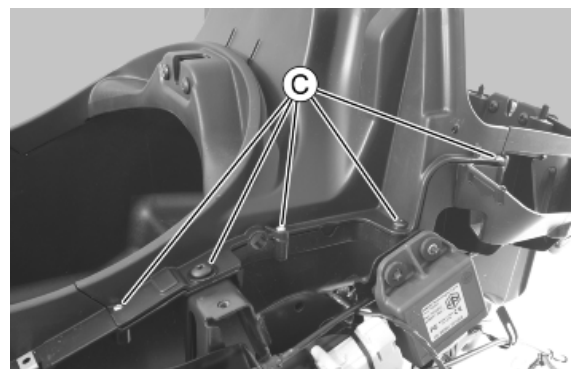
Rear

- Open the case;
- Undo the four screws «A» to remove the case cover;
- Undo the eight screws «B» to remove the plastic cover;

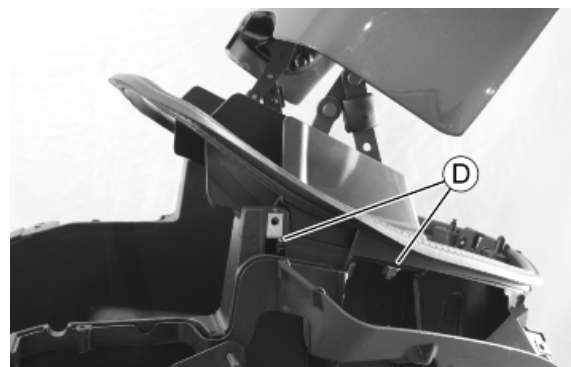


In order to remove the case support:

- Remove the side fairings;
- Remove the frame upper pipe;
- Undo the ten screws «C» (five per side) fixing the helmet compartment;
- First slide off the rubber rim and then remove the upper cover;



- Undo the four screws «D» (two per side) on the lower part of the case support;
- Pull up the case support to remove it.

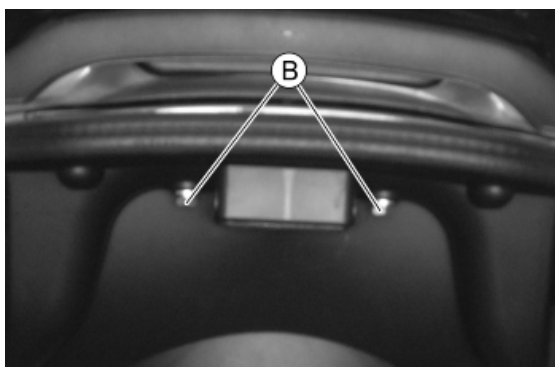
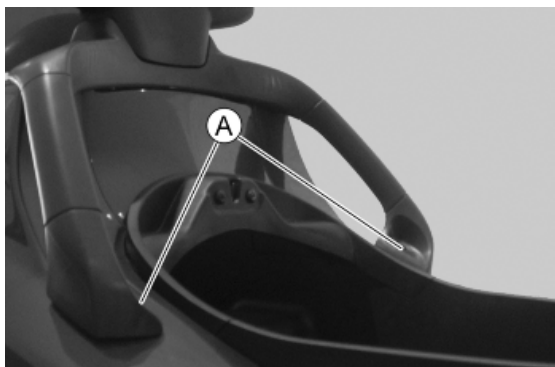


See also

[Side fairings](#)
[Helmet bay](#)

Handles and top side fairings

- Remove the passenger grab handle by undoing the two upper screws «A» and the two lower screws «B» in the helmet compartment.

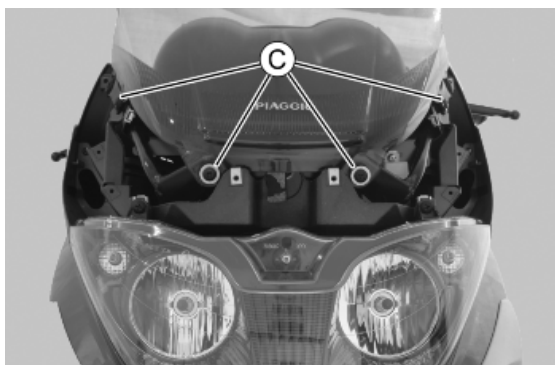


Flyscreen

- Remove the rear-view mirrors;
- Undo the four fixing screws «A» and the screw «B», then take out the cover.



- Remove the four screws «C» fixing the windshield;
- Remove the windshield being careful to collect the washers supporting the rubber support blocks.



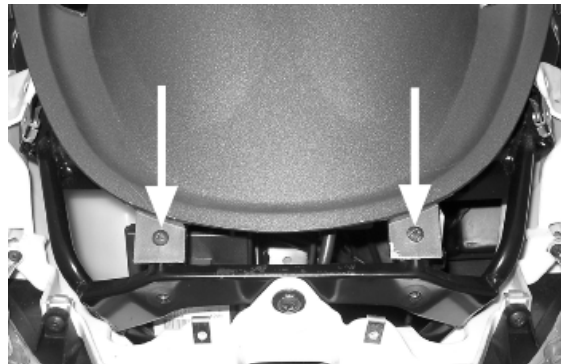
See also

[Driving](#)

mirrors

Analogue instrument panel support

- Remove the windshield;
- - Remove the front shield.
- Undo the two front screws.



- Undo the two screws «A» at the side of the handlebar cover and the two screws «B» on the upper part of the shield back plate;
- Detach the cover from the front frame;
- Remove the two instrument panel connectors;
- Remove the entire assembly.



See also

[Flyscreen](#)

[Legshield](#)

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

Lock check

- Safety locks
- clamping screws

Safety locks

Rear shock absorber upper fixing

Rear shock absorber lower fixing

Lower front shock absorber fitting

Front wheel axle nut

Front wheel screws

Rear wheel screws

Front and rear wheel hub nut

Front and rear brake calliper clamping screws

Frame - swinging arm bolt *

Swinging arm bolt - Engine

Engine arm pin - Frame arm

Handlebar lock nut

Steering lower ring nut

Upper steering ring nut

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 THE LIFE OF THE BATTERY.

CAUTION

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

WARNING

BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH YOUR EYES, SKIN AND CLOTHING.

IN CASE OF CONTACT WITH YOUR EYES OR SKIN, RINSE WITH ABUNDANT WATER FOR ABOUT 15 MINUTES AND SEEK IMMEDIATE MEDICAL ATTENTION.

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

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

KEEP OUT OF THE REACH OF CHILDREN

CAUTION

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

Levels check

Level check:

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

Road test

Test ride

- Cold start
 - Instrument operations
 - Response to the throttle control
 - Stability on acceleration and braking
 - Rear and front brake efficiency
 - Rear and front suspension efficiency
-

- Abnormal noise

Static test

Static control after the test ride:

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

CAUTION

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

CAUTION

NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES OR TYRES MAY BURST.

Functional inspection

Functional Checks:

- Hydraulic braking system: lever travel
 - Clutch: proper functioning check
 - Engine: proper general functioning and no abnormal noise check
 - Other: papers check, frame and engine number check, tools and equipment, licence plate fitting, lock check, tyre pressure check, rear-view mirror and any accessory fitting
-

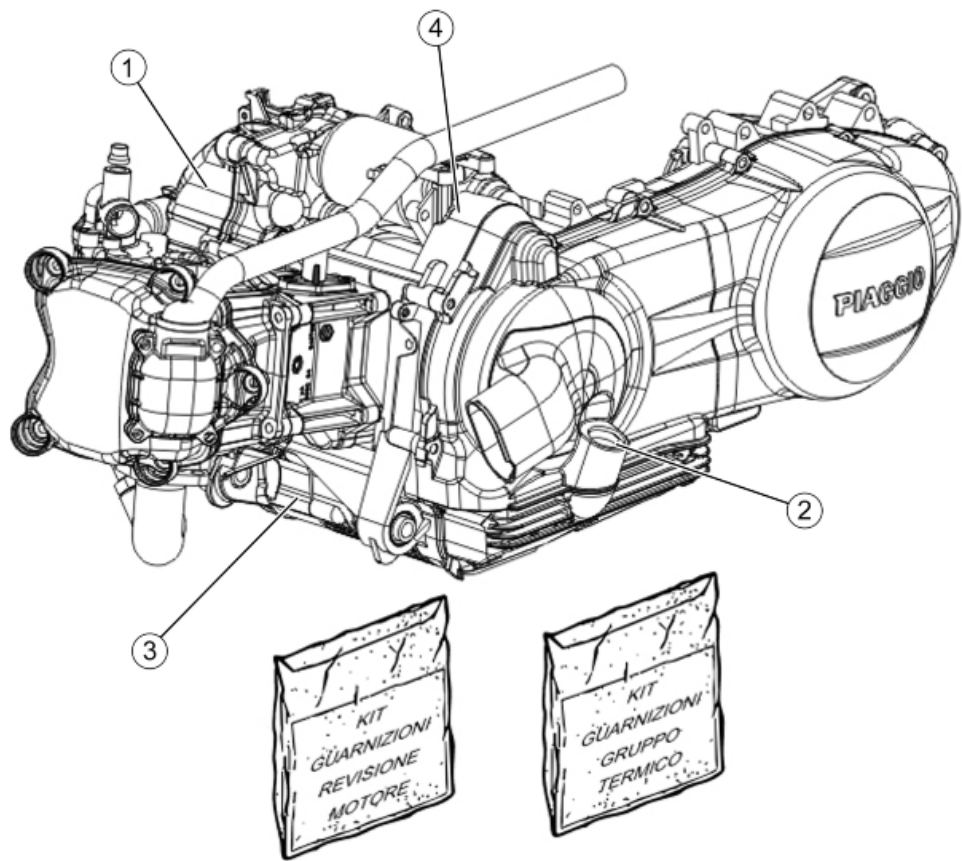
INDEX OF TOPICS

TIME

TIME

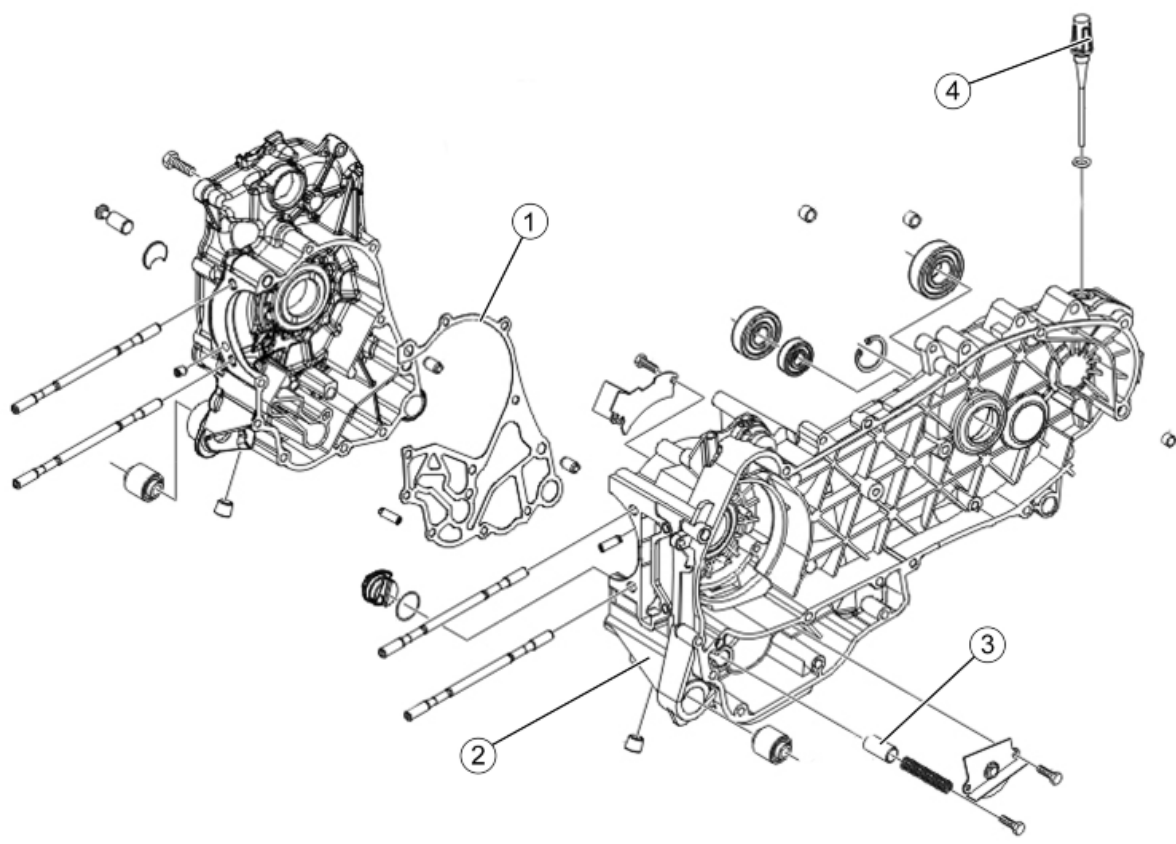
This section is devoted to the time necessary to carry out repairs.
For each operation, the description, code and time envisages are specified.

Engine



ENGINE			
	Code	Action	Duration
1	001001	Engine from frame - Removal and re-fit.	
2	003064	Engine oil - change	
3	001127	Engine - Complete service	
4	003057	Engine retainer - Tighten nuts	

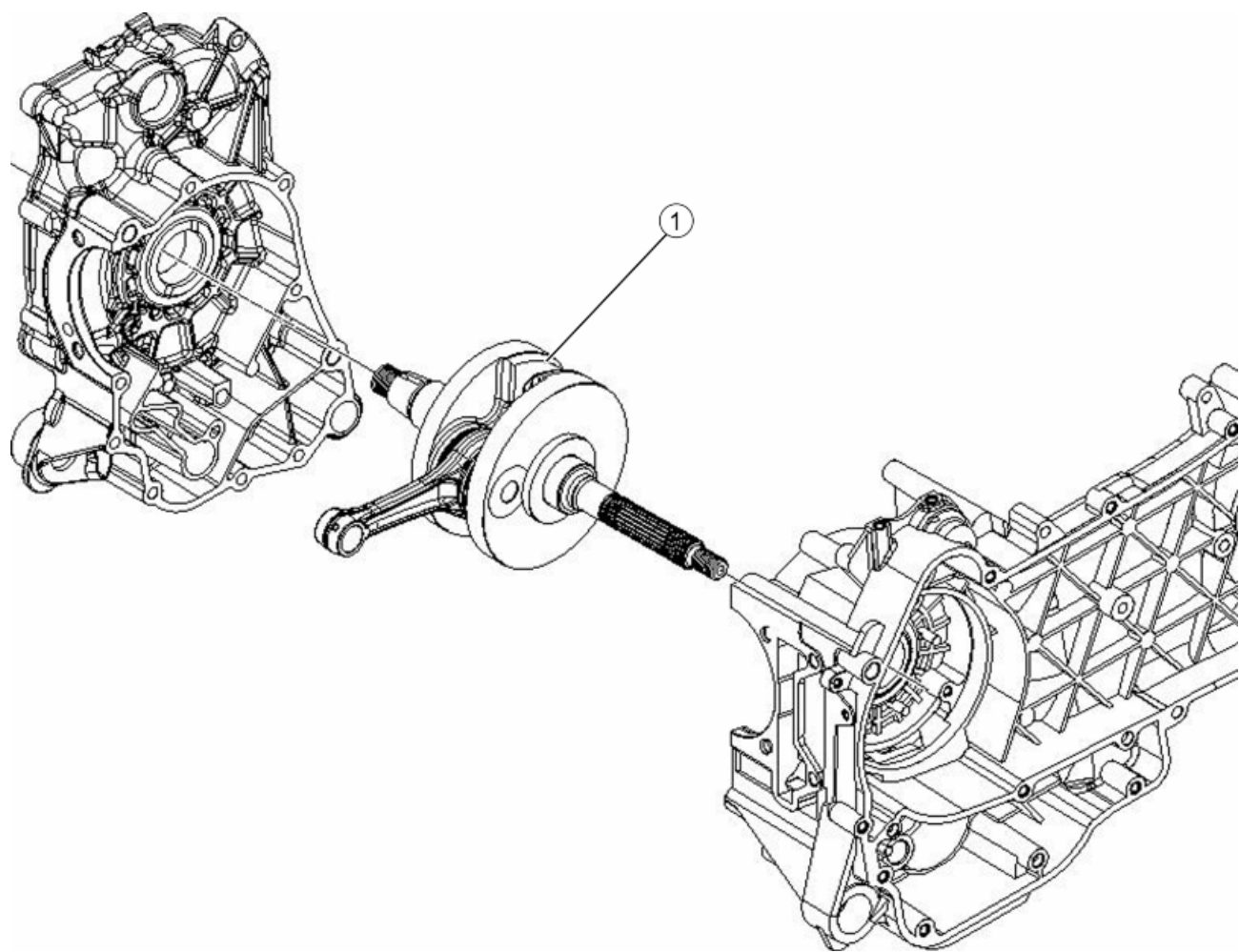
Crankcase



CRANKCASE

	Code	Action	Duration
1	001153	Crankcase halves gasket - Replacement	
2	001133	Engine crankcase - Replacement	
3	001124	Lubrication by pass - Replacement	
4	002028	Rear wheel hub - Replacement	

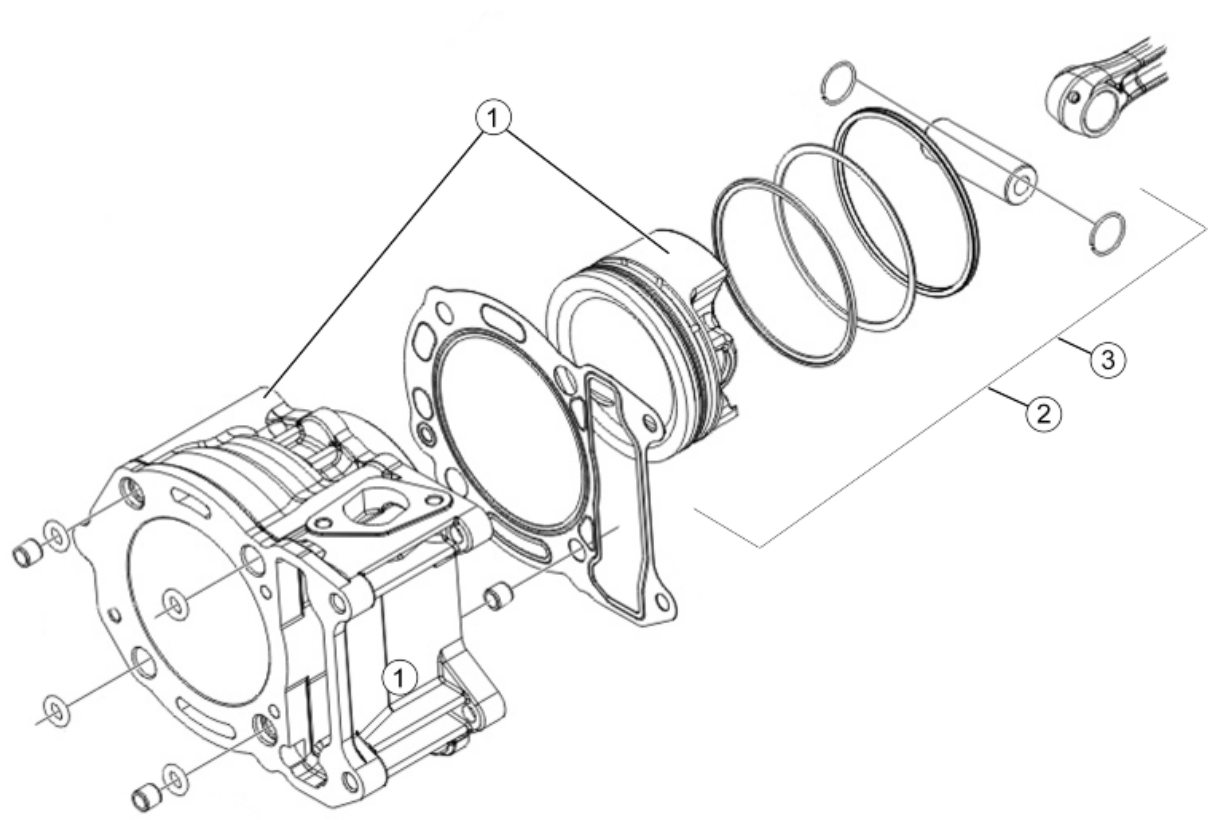
Crankshaft



CRANKSHAFT

	Code	Action	Duration
1	001117	Crankshaft - Replacement	

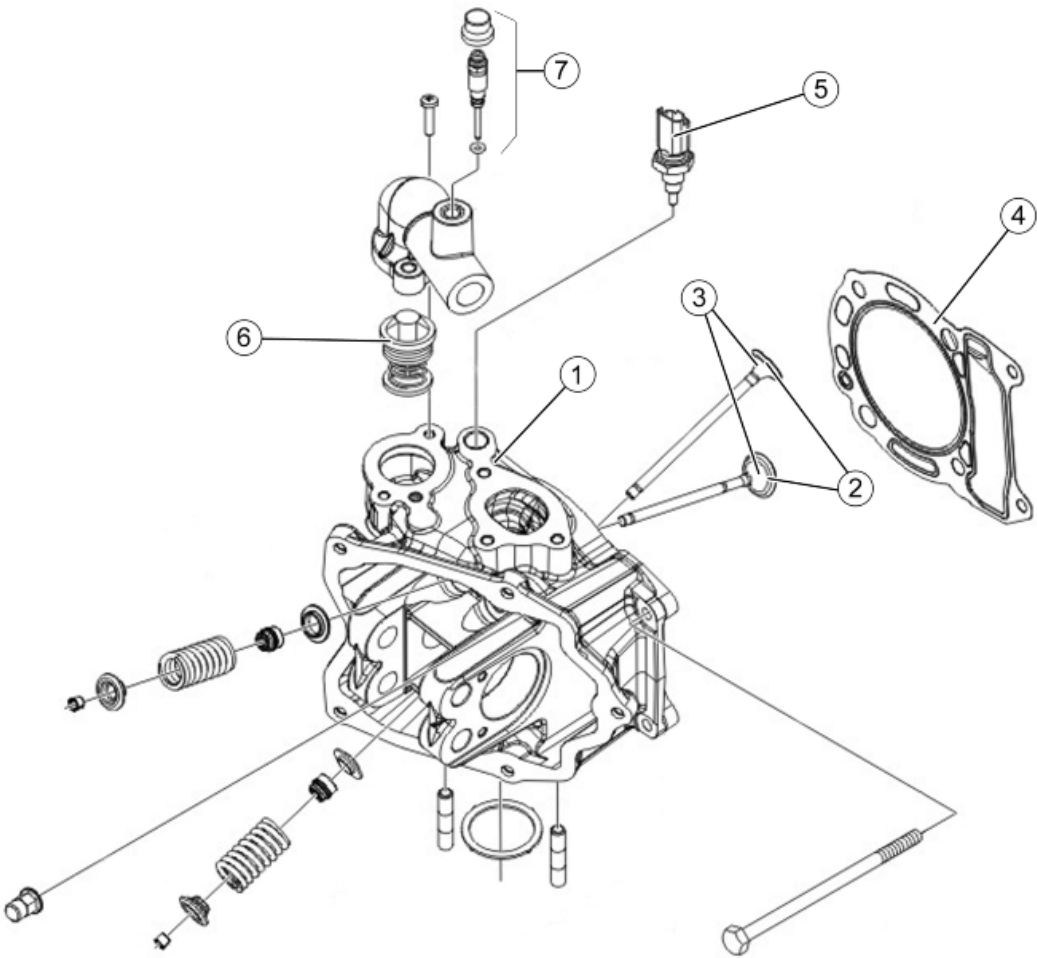
Cylinder assy.



CYLINDER - PISTON

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

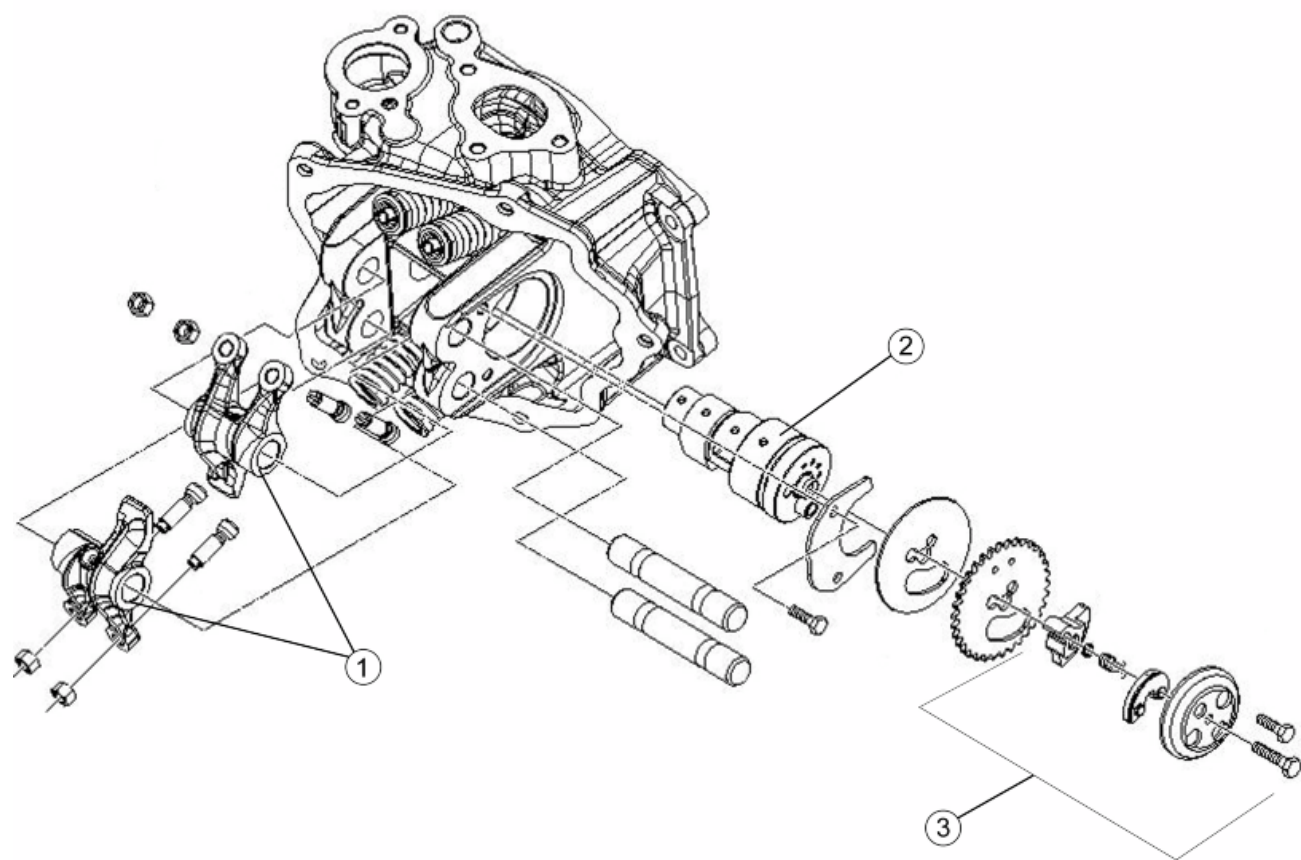
Cylinder head assy.



TESTA VALVOLE

	Code	Action	Duration
1	001126	Head - Replacement	
2	001045	Valves - Replacement	
3	001049	Valves - adjust	
4	001056	Head gasket - change	
5	001083	Thermistor - Replacement	
6	001057	Thermostat - Replacement	
7	007012	Coolant bleed valve - Replacement	

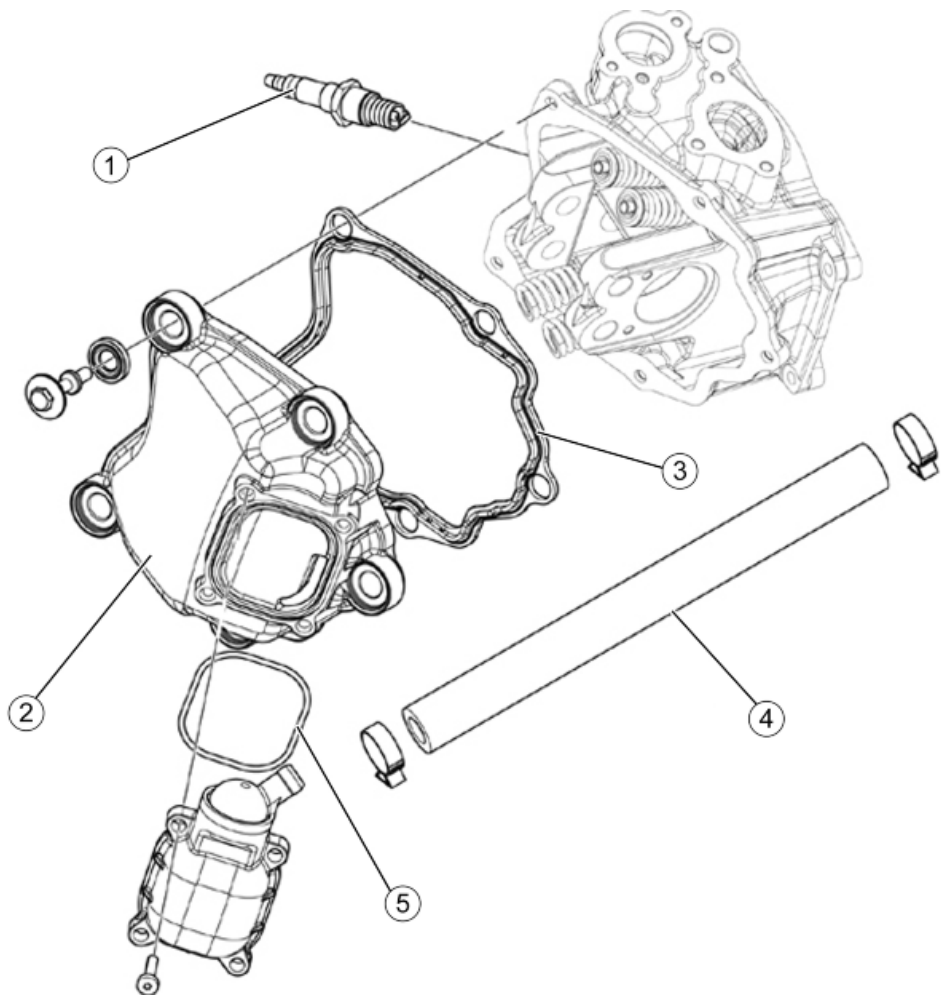
Rocker arms support assy.



CAMSHAFT

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

Cylinder head cover

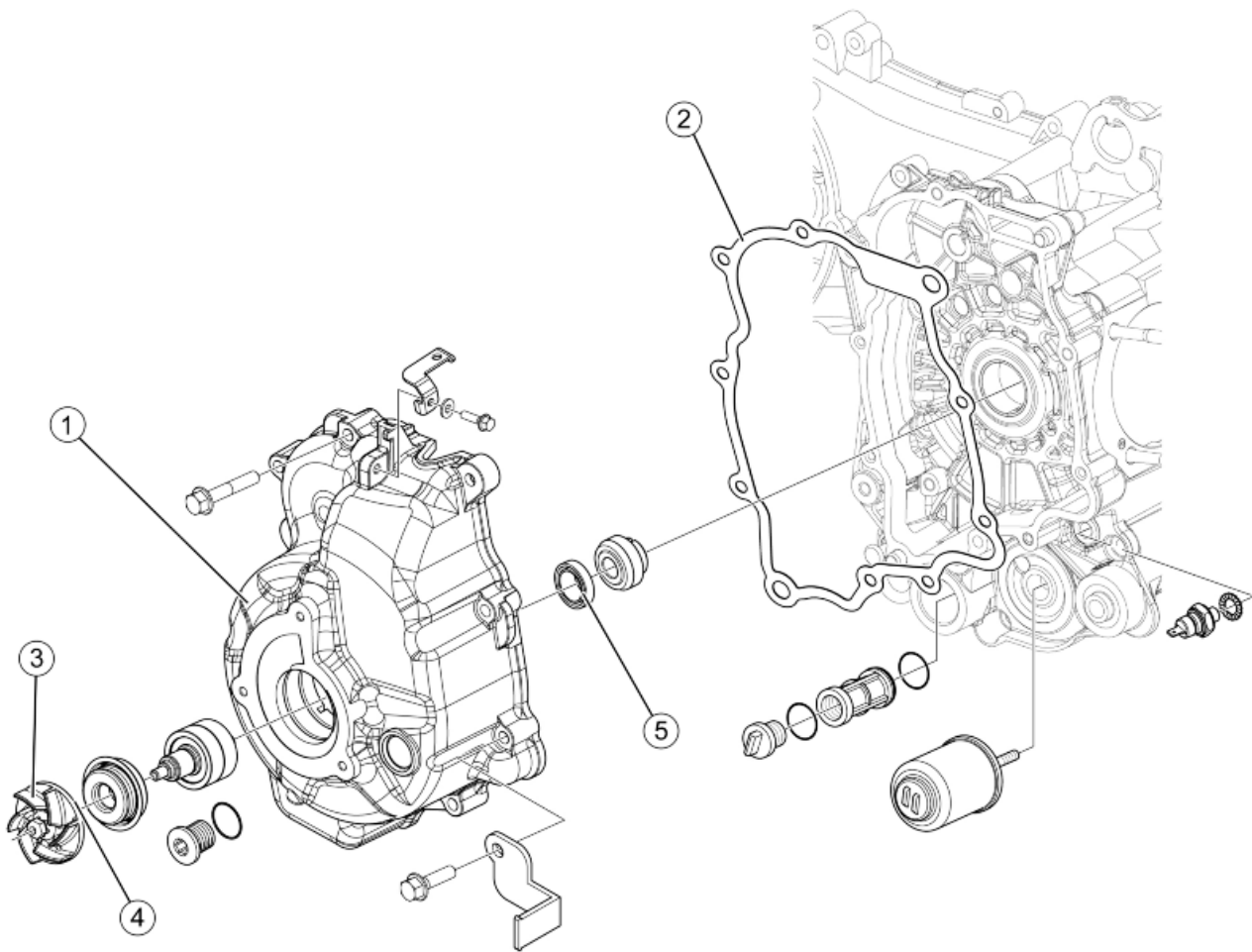


COPERCHIO TESTA

	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	
5	001091	Anello tenuta coperchio testa - Sostituzione	

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

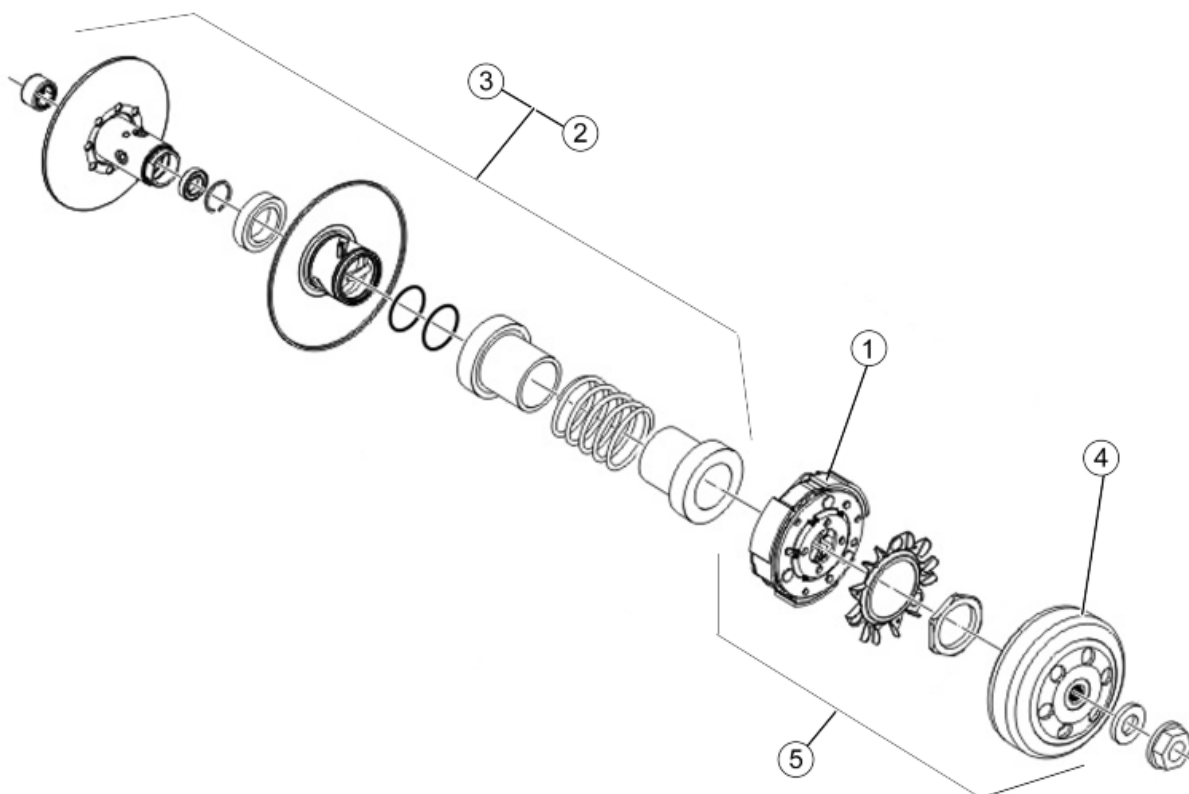
Flywheel cover



FLYWHEEL COVER

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

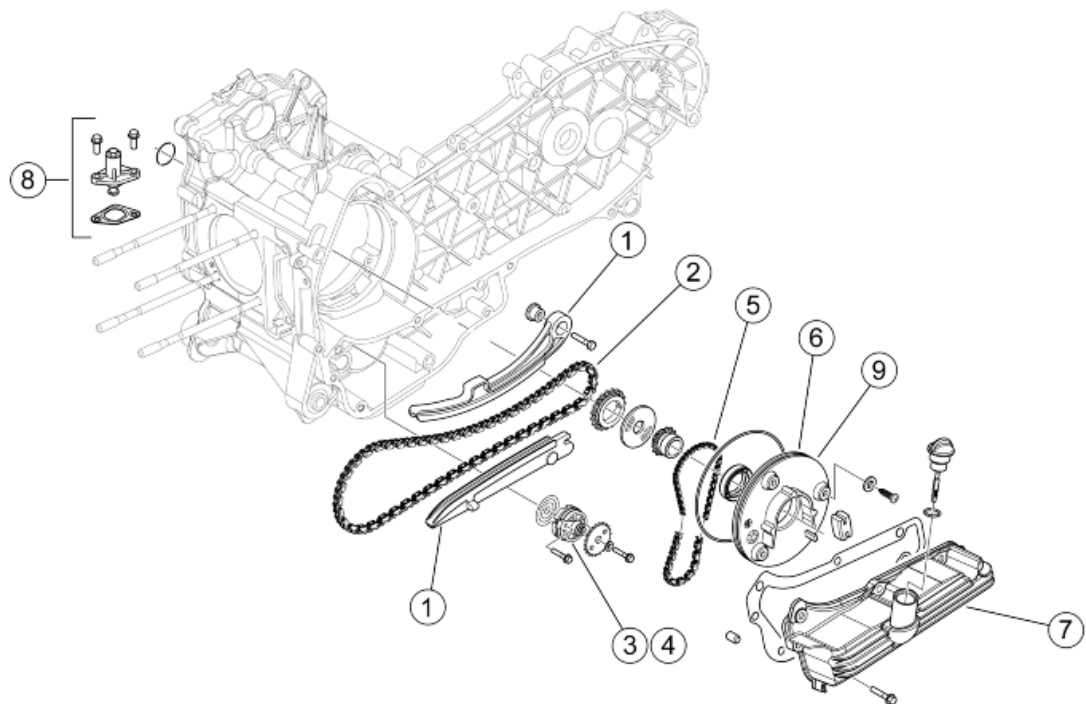
Driven pulley



PULEGGIA CONDOTTA

	Code	Action	Duration
1	001022	Clutch - Replacement	
2	001012	Driven pulley - overhaul	
3	001110	Driven pulley- Replacement	
4	001155	Clutch bell - Replacement	
5	003072	Clutch assembly - Check wear	

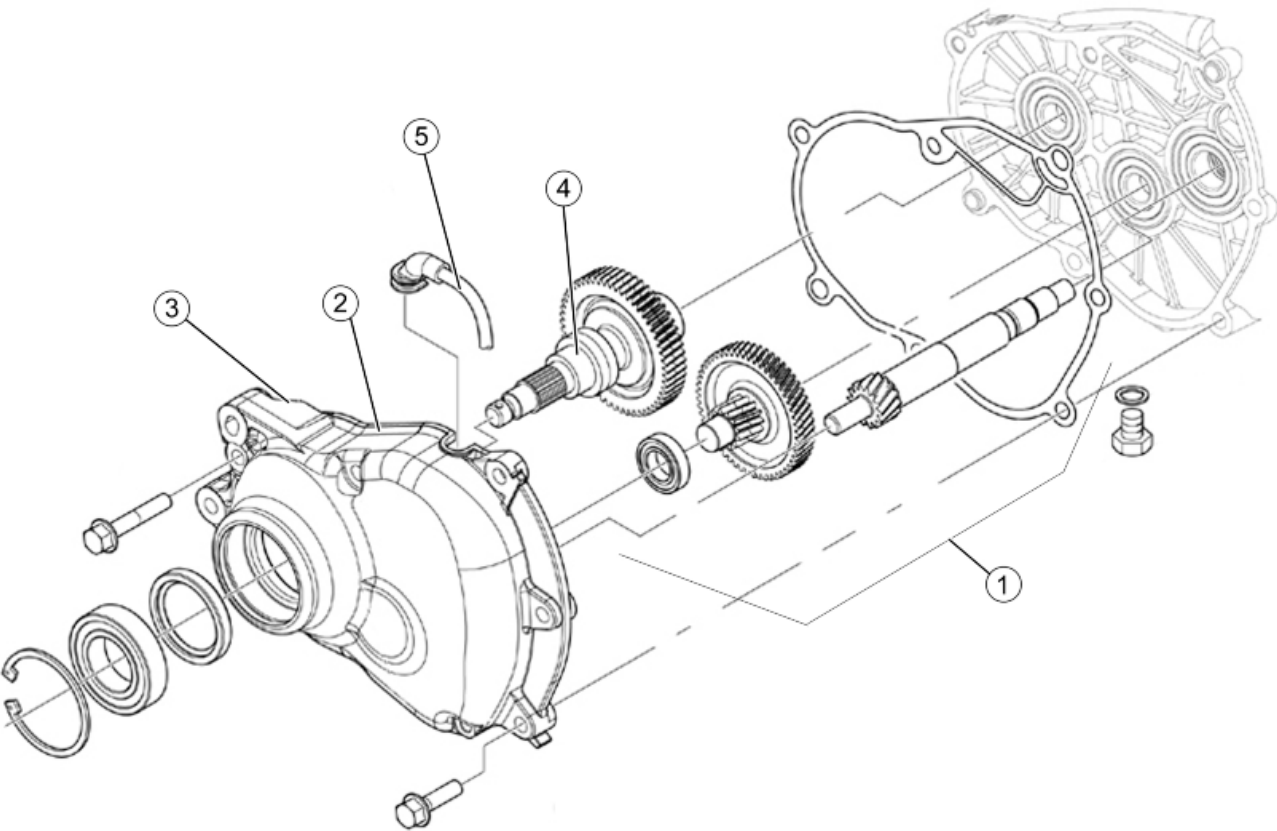
Oil pump



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 tensioner - Service and Replacement	
9	888133	Chain cover flap - Check / replacement	

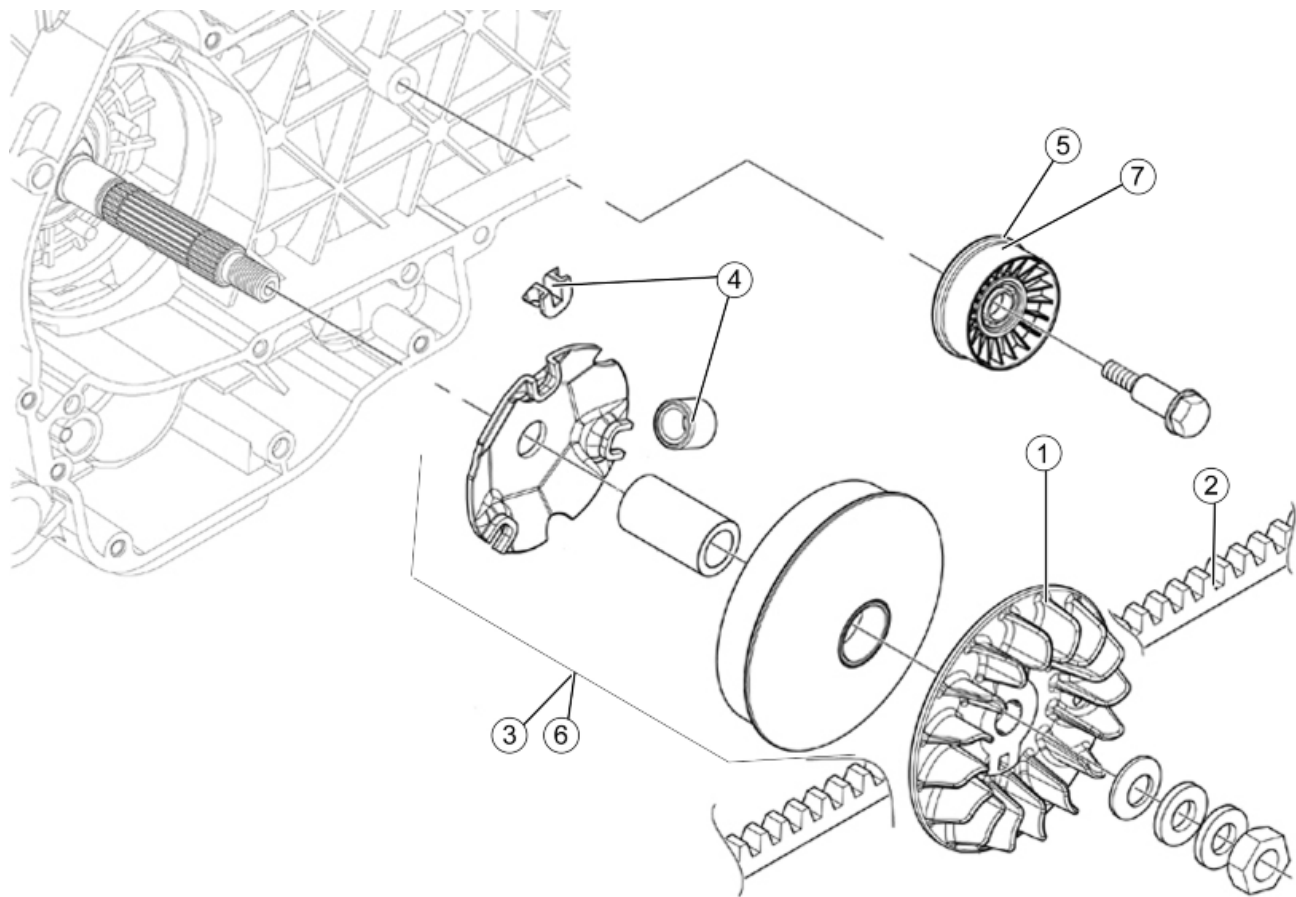
Final gear assy.



FINAL REDUCTION GEAR

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

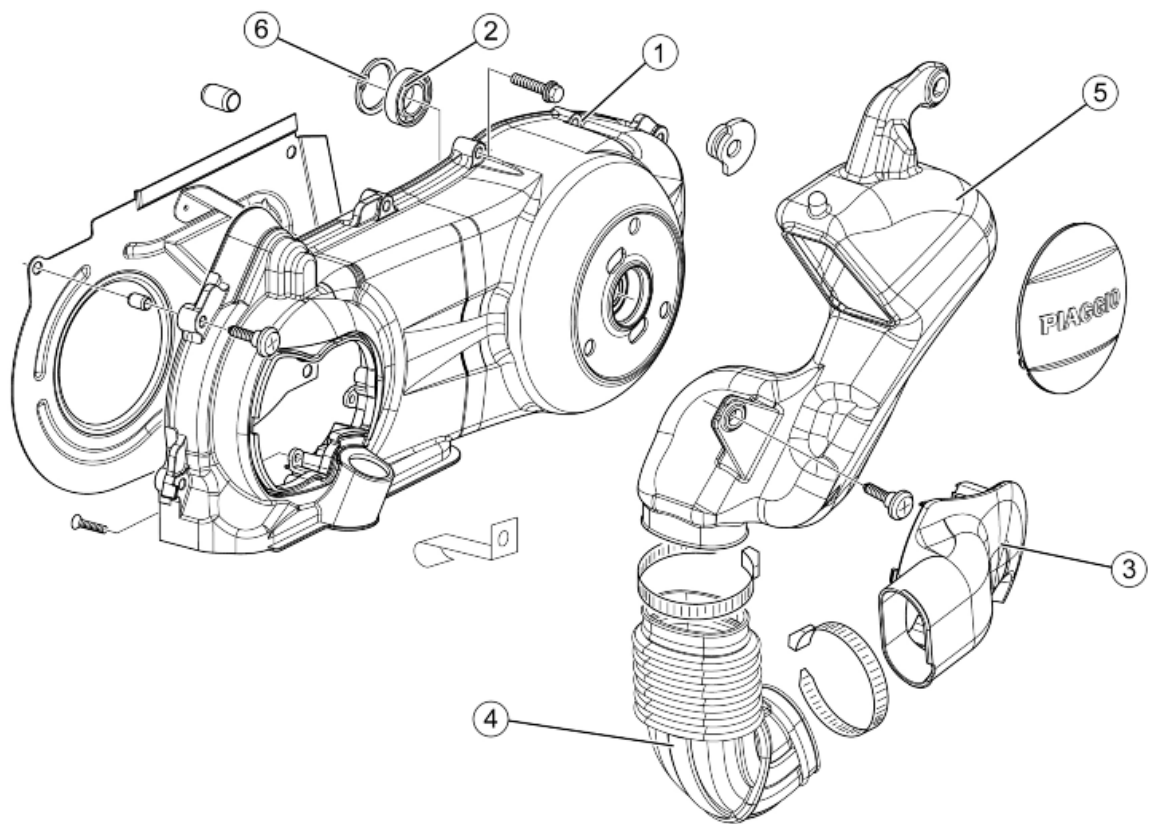
Driving pulley



DRIVING PULLEY

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

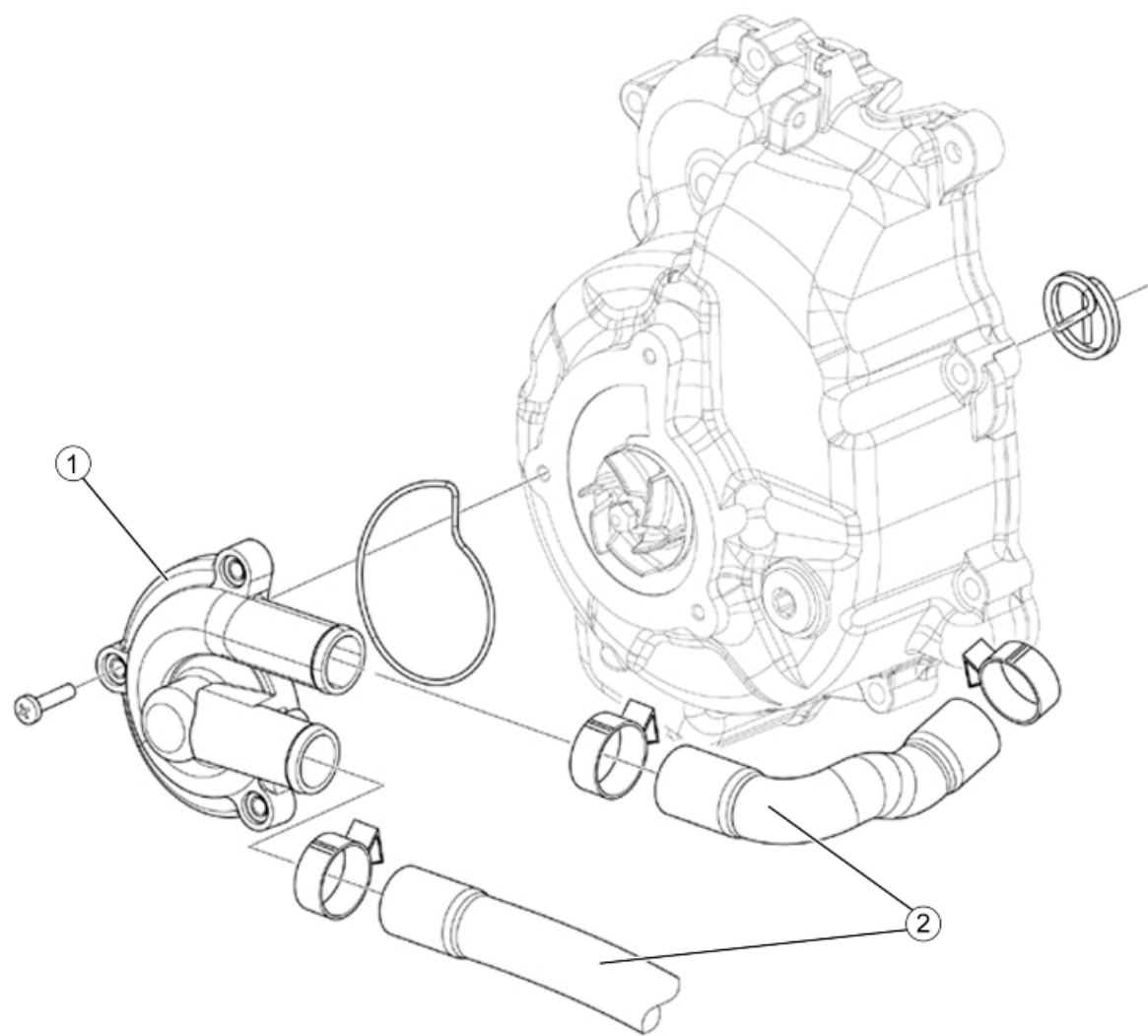
Transmission cover



COPERCHIO TRASMISSIONE

	Code	Action	Duration
1	001096	Transmission crankcase cover - Replacement	
2	001135	Transmission cover bearing - Replacement	
3	001170	Air deflector - Replacement	
4	001132	Transmission air intake pipe - Replacement	
5	001131	Transmission air intake - Replacement	
6	001121	Chain cover oil seal - Replacement	

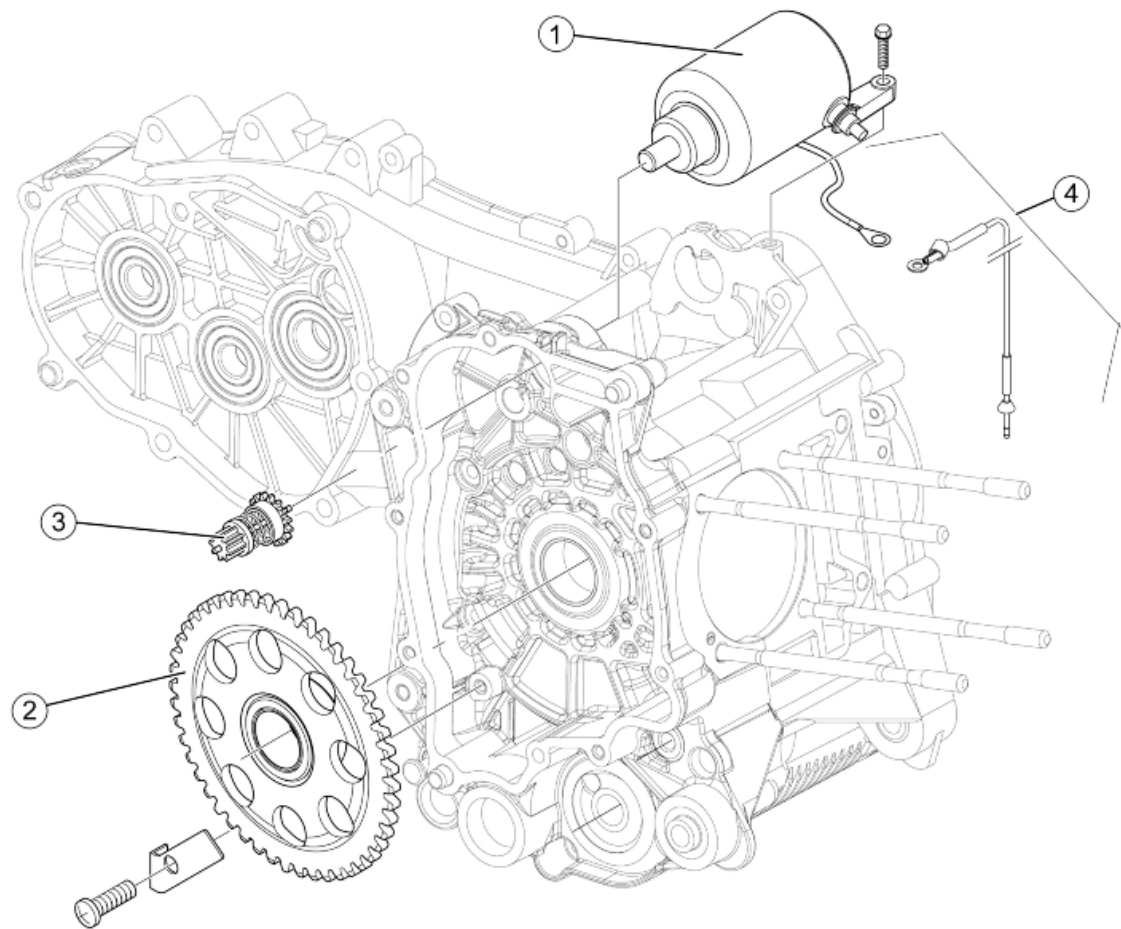
Water pump



WATER PUMP

	Code	Action	Duration
1	007017	Water pump cover - Replacement	
2	007003	Coolant delivery and return pipe - change	

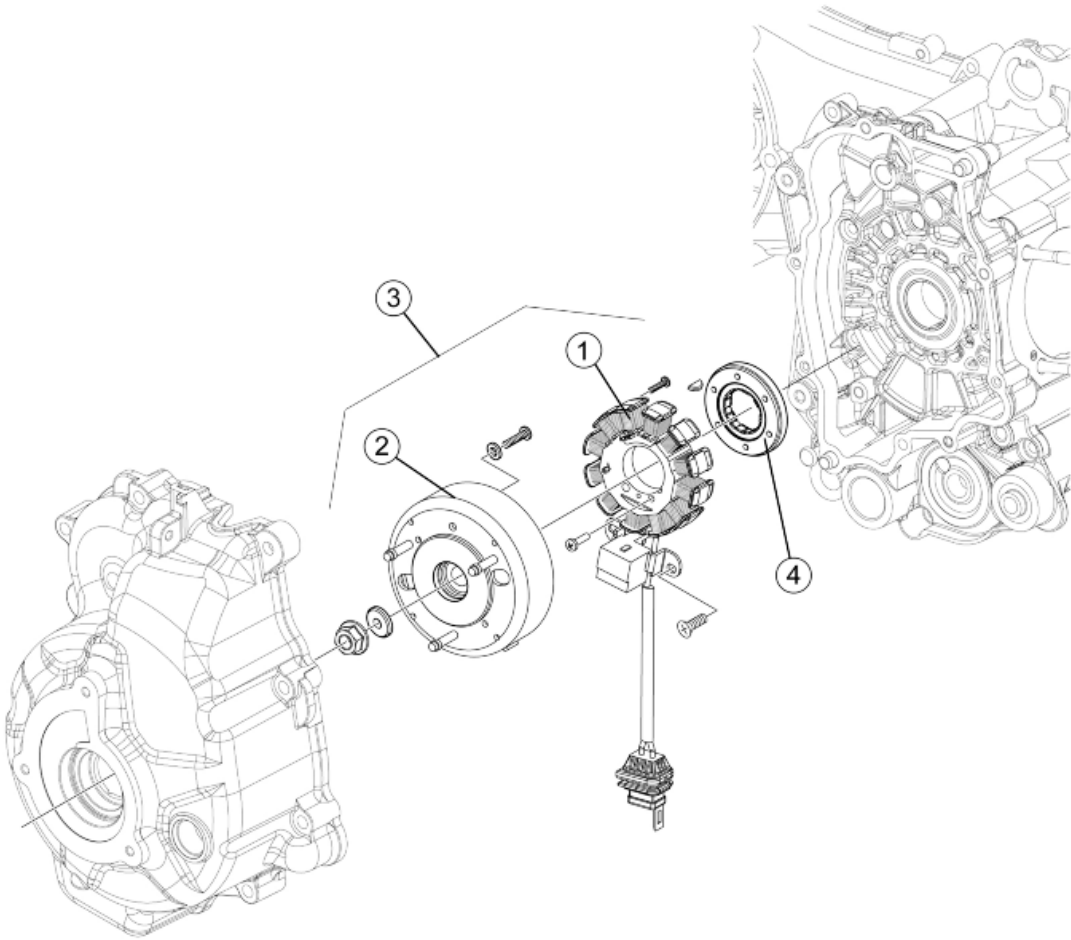
Starter motor



AVVIAMENTO ELETTRICO

	Code	Action	Duration
1	001020	Starter motor - Replacement	
2	001151	Start-up driven gearing - Replacement	
3	001017	Start-up pinion - Replacement	
4	005045	Starter motor cable harness - Replacement	

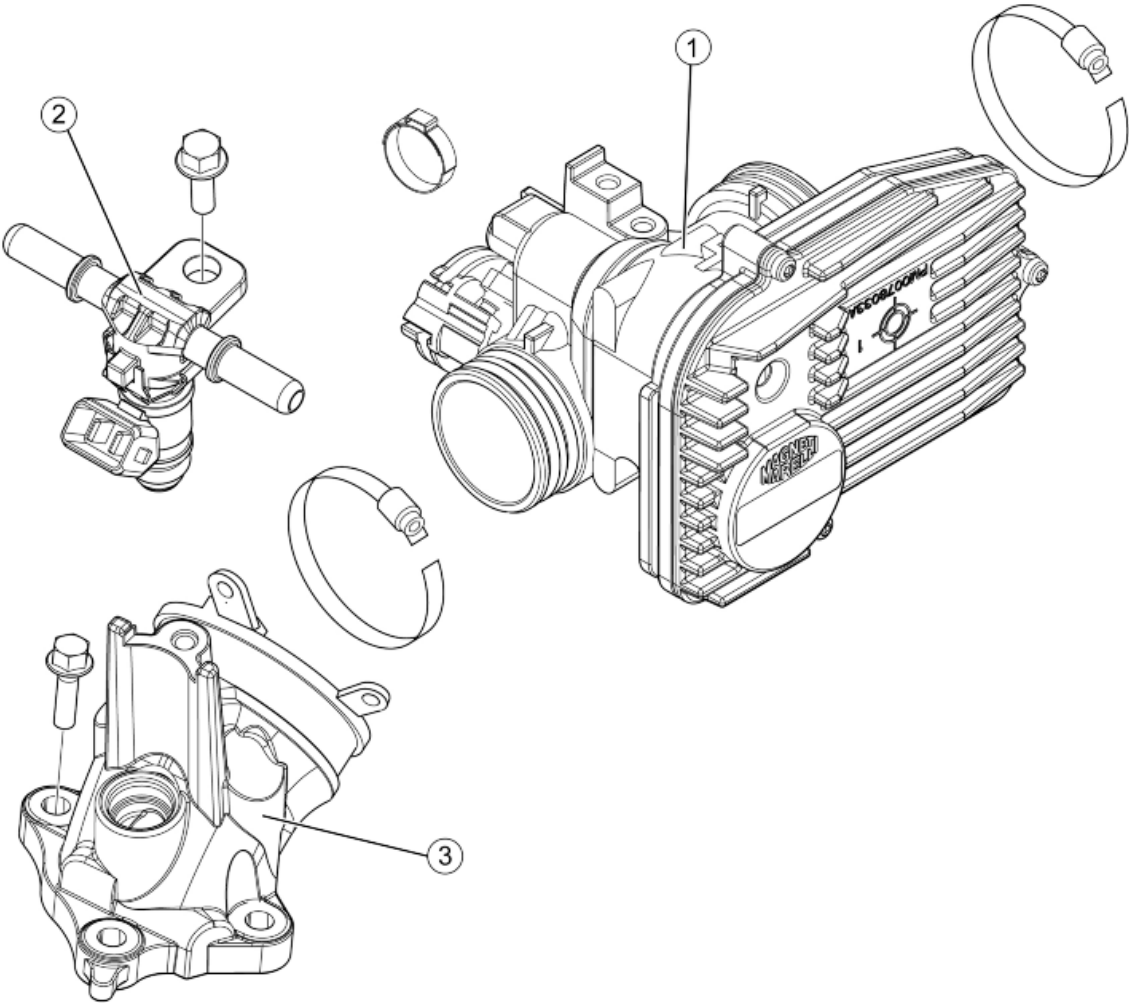
Flywheel magneto



MAGNETO FLYWHEEL

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

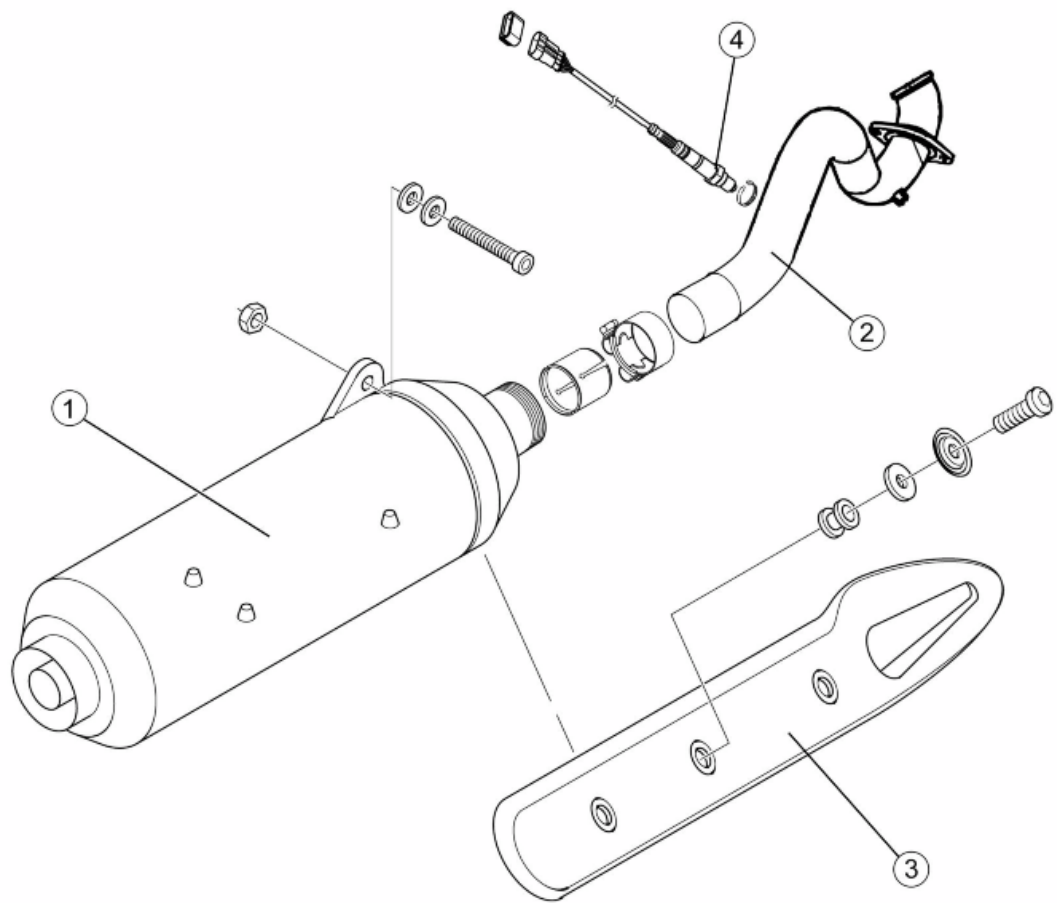
Butterfly valve



THROTTLE BODY

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

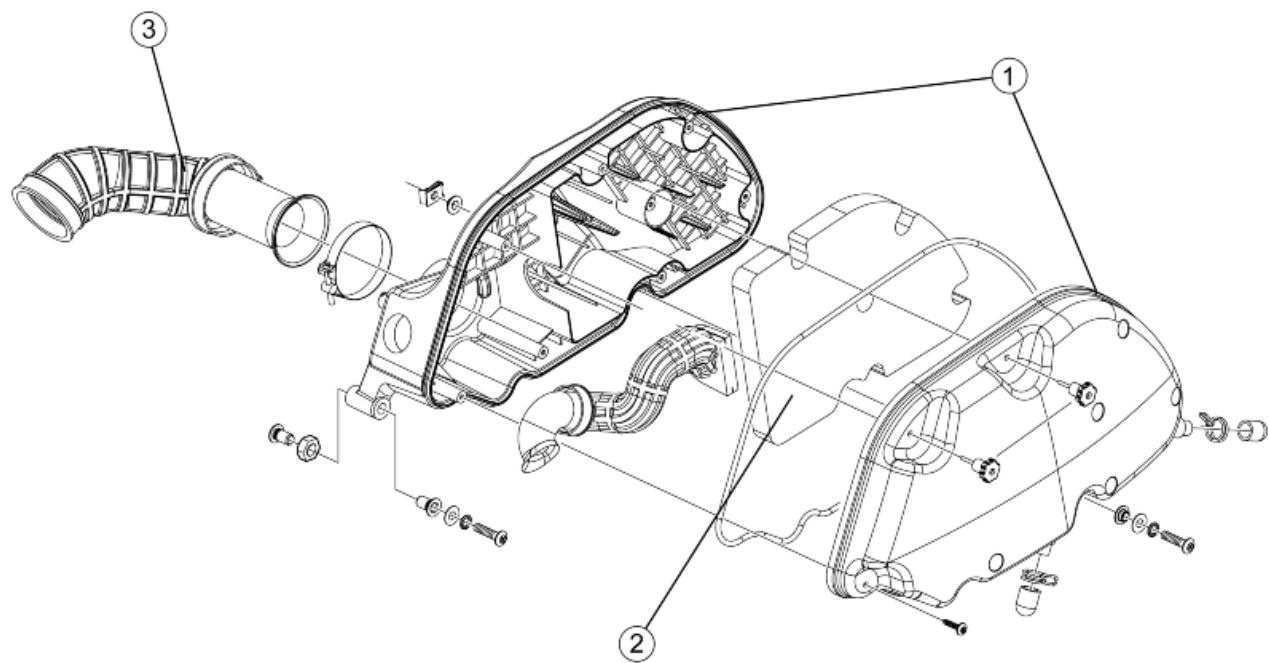
Exhaust pipe



MUFFLER

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

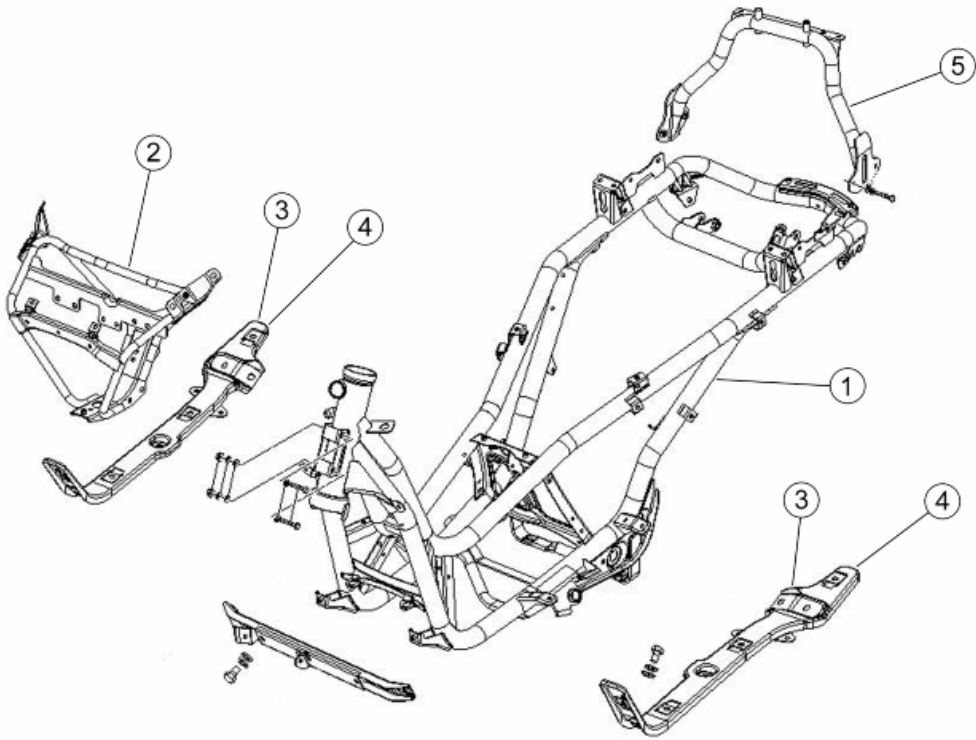
Air cleaner



DEPURATORE ARIA

	Code	Action	Duration
1	001015	Air filter box - Replacement	
2	001014	Air filter - Replacement / cleaning	
3	004122	Cleaner / Throttle body union - Re- placement	

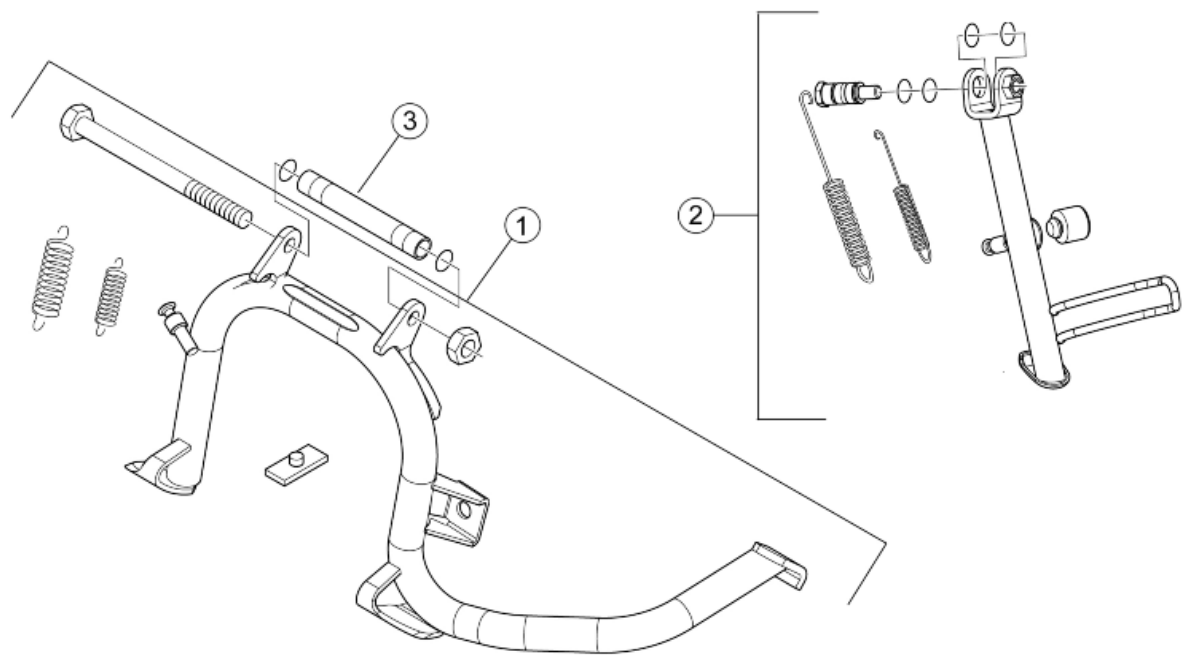
Frame



CHASSIS

	Code	Action	Duration
1	004001	Frame - Replacement	
2	004146	Front frame - Replacement	
3	004147	Footrest support bracket, one side - Replacement	
4	004148	Footrest support bracket, both sides - Replacement	
5	004116	Rear frame - Replacement	

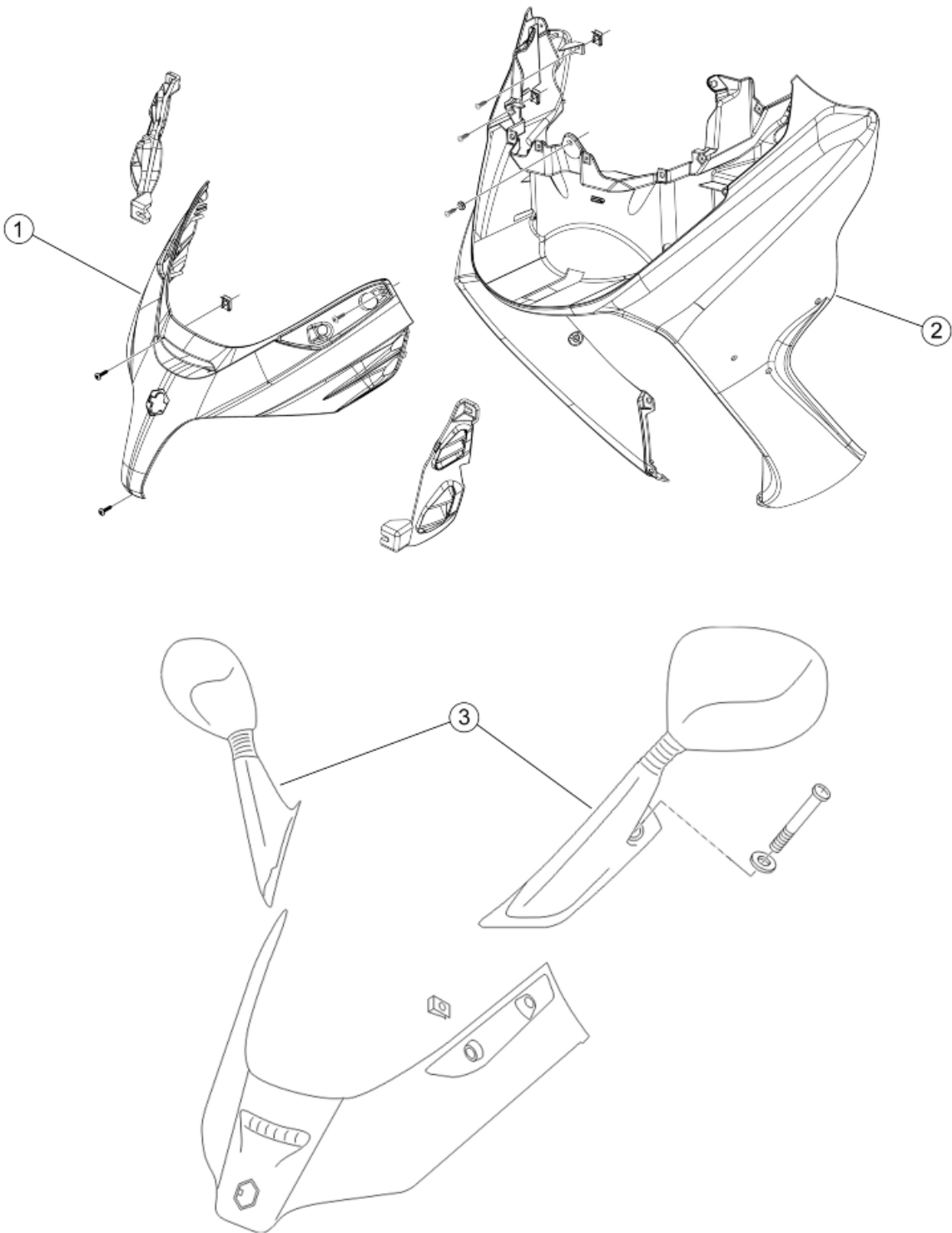
Centre-stand



STAND REPAIR TIME

	Code	Action	Duration
1	004004	Stand - Replacement	
2	004102	Side stand - Replacement	
3	001053	Stand bolt - Replacement	

Legshield spoiler

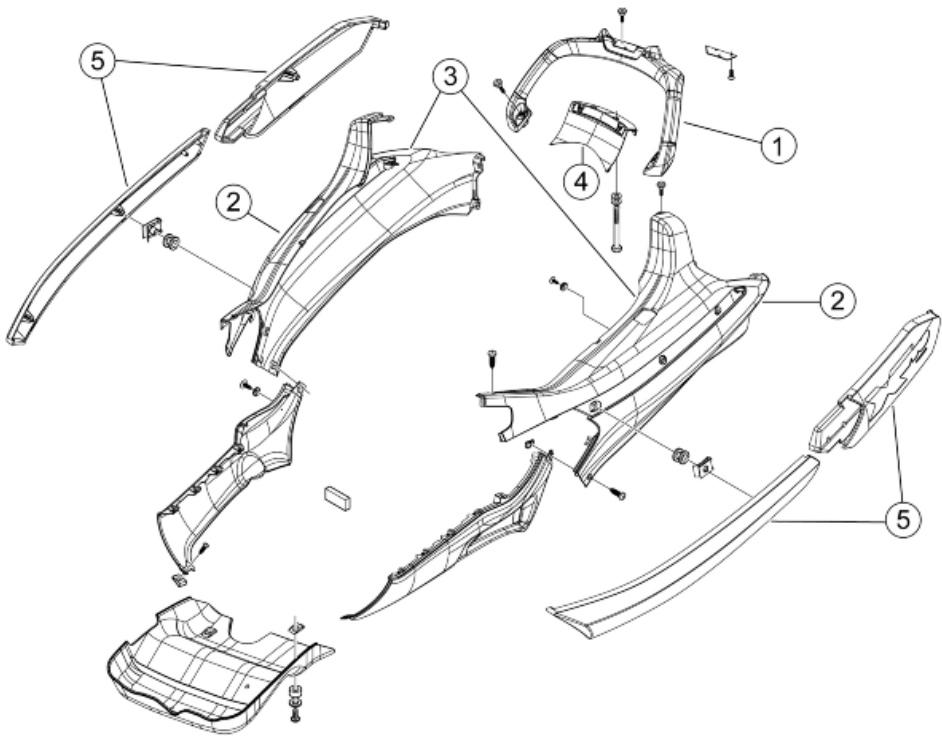


FRONT SHIELD

	Code	Action	Duration
1	004020	Headlight frame - Replacement	
2	004064	Legshield, front section - Replacement	

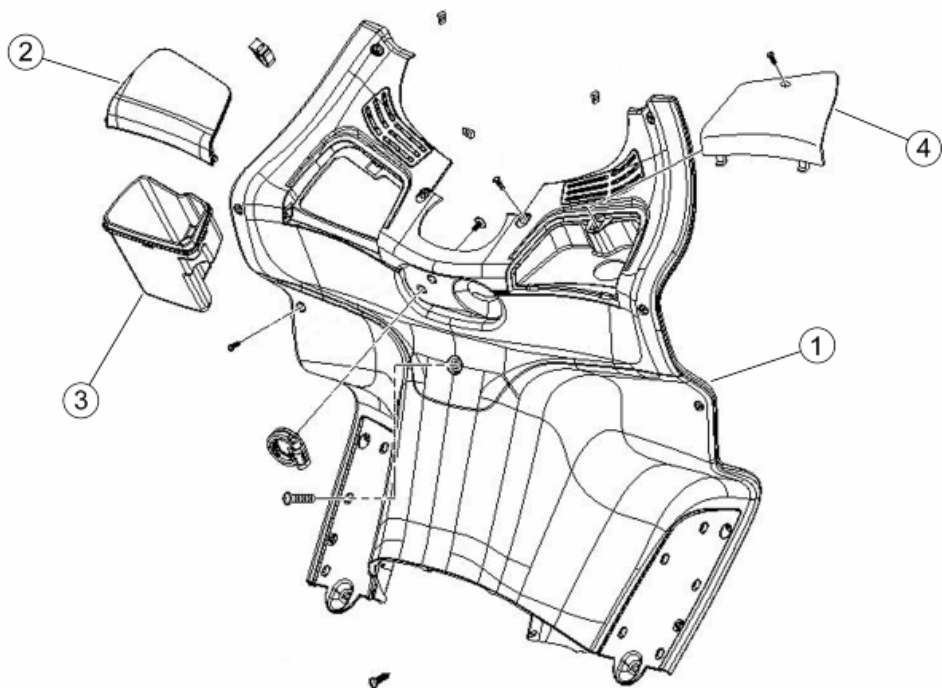
	Code	Action	Duration
3	004066	Driving mirror - Replacement	

Side fairings



SIDE COVERS			
	Code	Action	Duration
1	004068	Passenger handgrip - Replacement	
2	004085	Fairing (1) - Replacement	
3	004012	Rear side panels - Replacement	
4	004036	Frame cover - Replacement	
5	004013	Side bumper- Replacement	

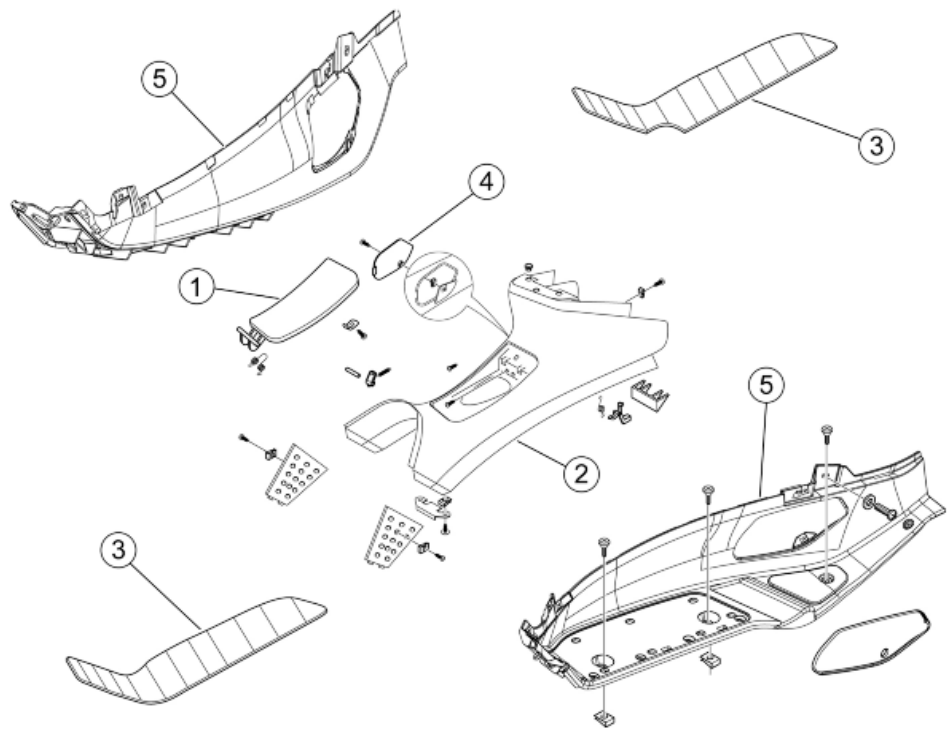
Rear cover



SHIELD BACK PLATE

	Code	Action	Duration
1	004065	Shield back plate - Replacement	
2	004156	Glove box flap and/or support - Replacement	
3	004145	Glove box - Replacement	
4	007024	Expansion tank cap - Replacement	

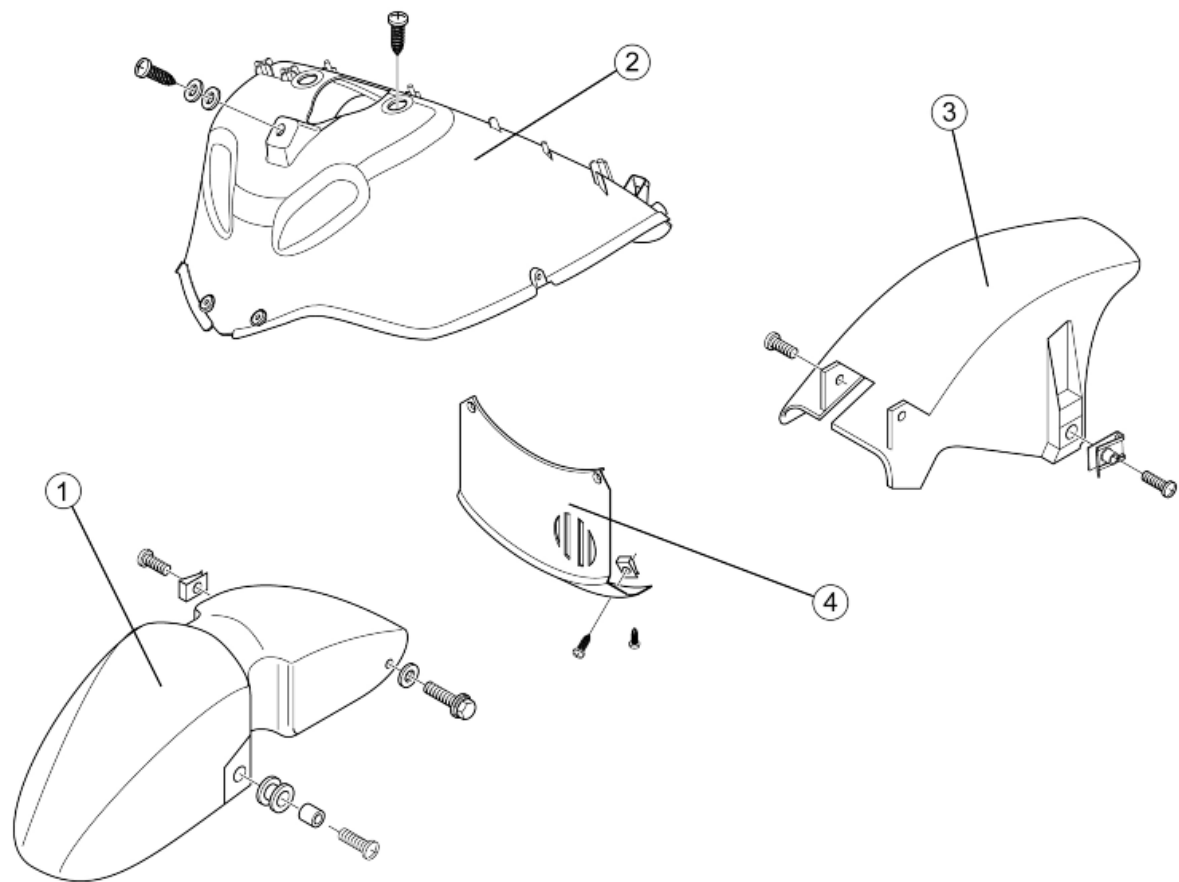
Central cover



CENTRAL COVER

	Code	Action	Duration
1	004135	Fuel tank lid - Replacement	
2	004011	Frame central cover - Replacement	
3	004075	Front mat - Replacement	
4	004059	Spark plug inspection flap - Replacement	
5	004015	Footrest - Replacement	

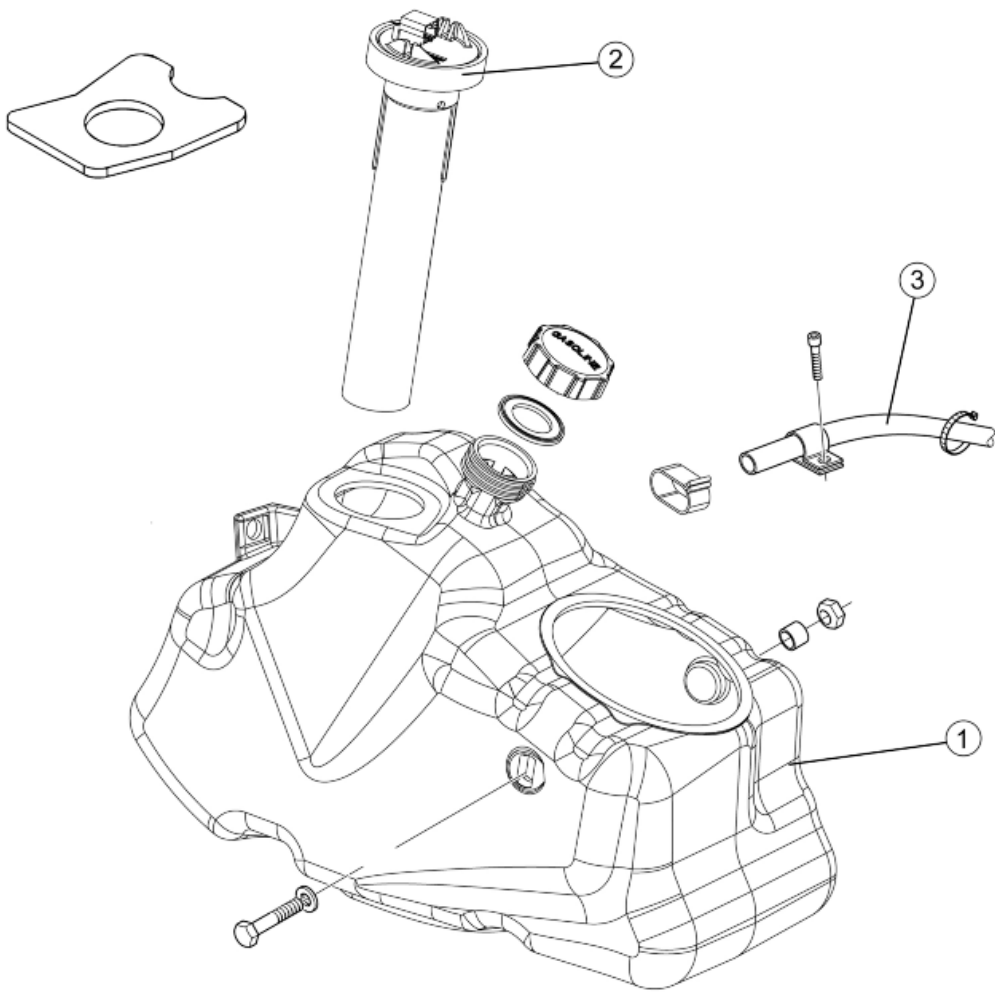
Mudguard



PARAFANGHI

	Code	Action	Duration
1	004002	Front mudguard - change	
2	004167	Grille / radiator cover - Replacement	
3	004009	Rear mudguard - Replacement	
4	004053	Spoiler - Replacement	

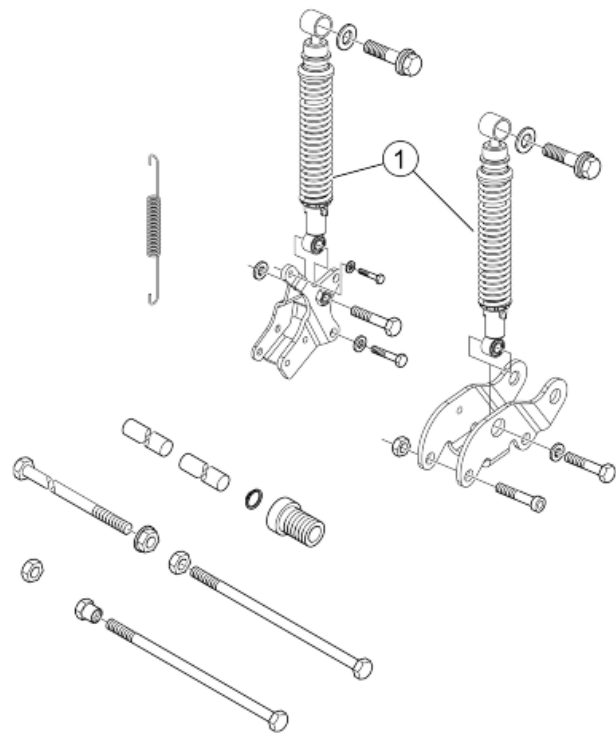
Fuel tank



FUEL TANK

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

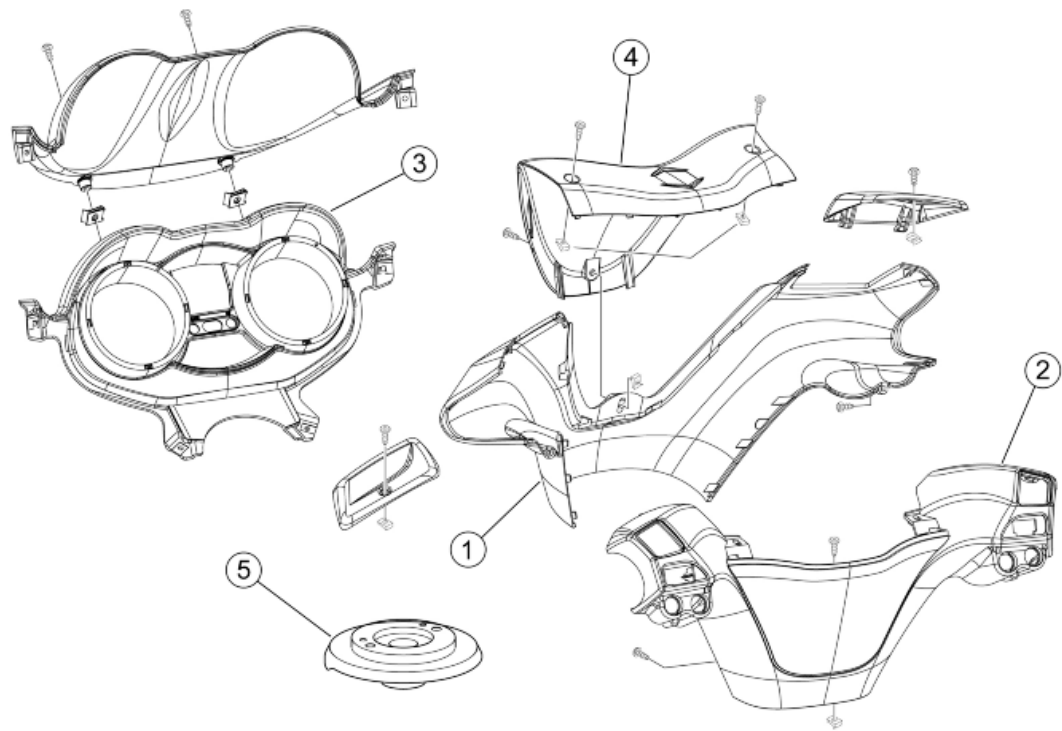
Rear shock-absorber



REAR SHOCK ABSORBER

	Code	Action	Duration
1	003007	Rear shock absorber - Replacement	

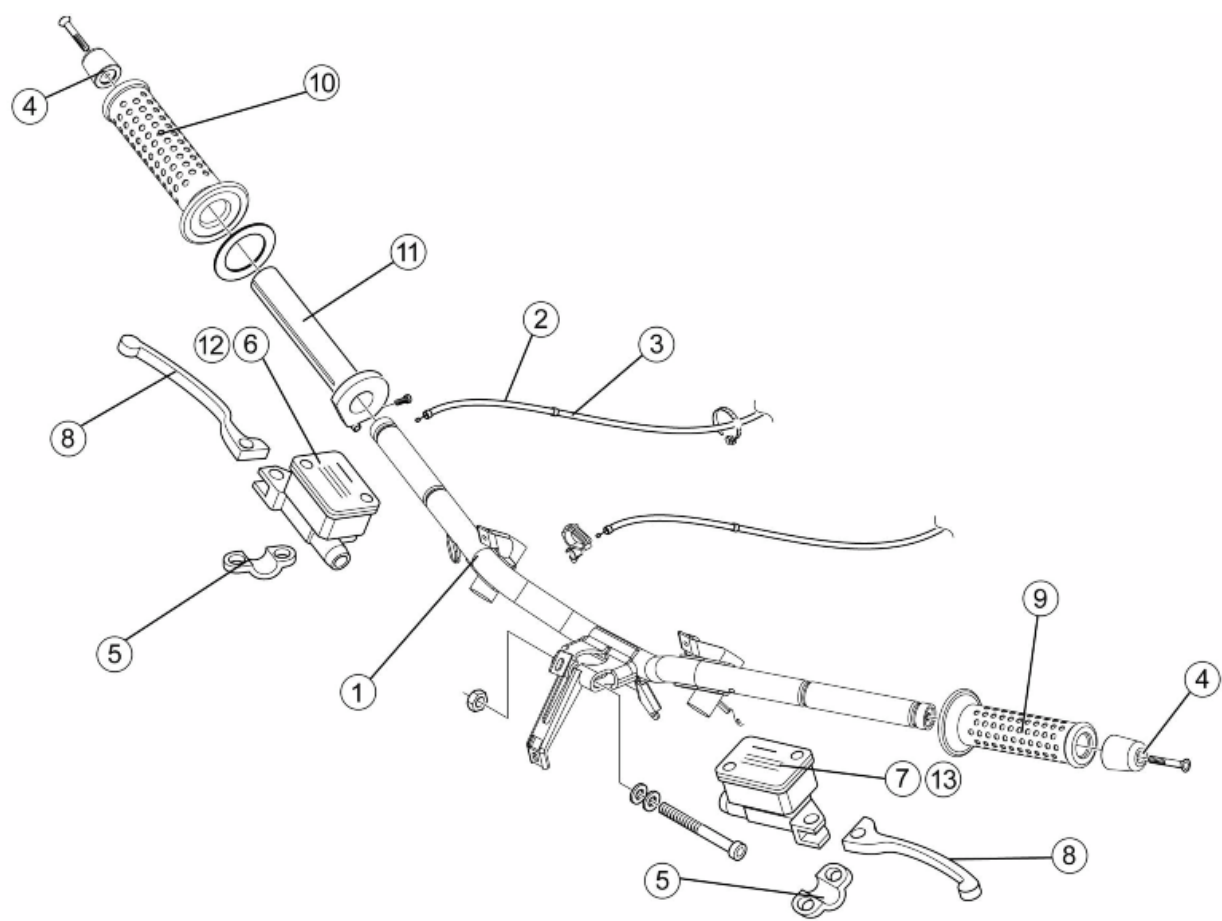
Handlebar covers



HANDLEBAR COVERS

	Code	Action	Duration
1	004018	Front handlebar covers - Replacement	
2	004019	Rear handlebar covers - Replacement	
3	004099	Odometer housing - Replacement	
4	004026	Handlebar cover - Replacement	
5	003043	Steering tube dust guard - Replacement	

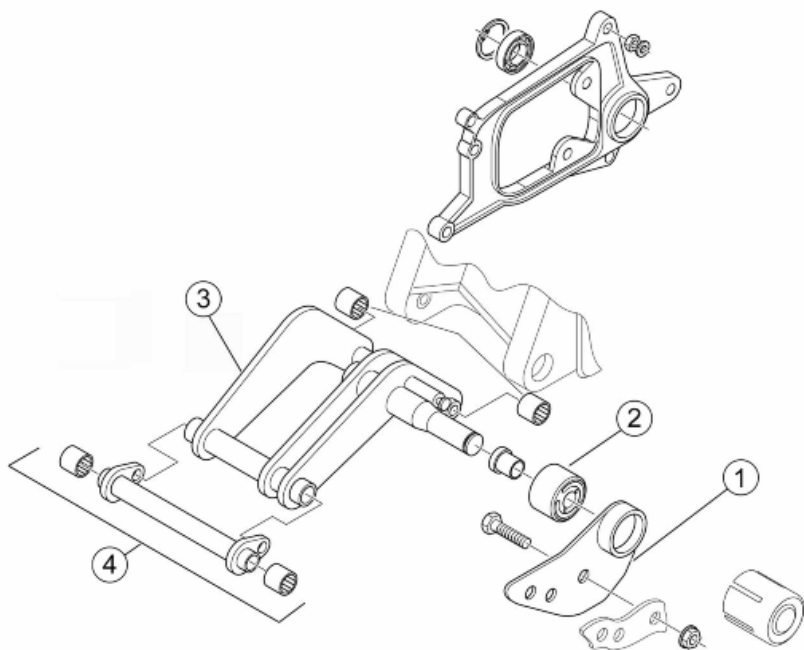
Handlebar components



HANDLEBAR COMPONENTS

	Code	Action	Duration
1	003001	Handlebar - Replacement	
2	002063	Complete throttle transmission - Replacement	
3	003061	Accelerator transmission - Adjustment	
4	003059	Counterweight - Replacement	
5	004162	Mirror support and/or brake pump fitting U-bolt - Replacement	
6	002024	Front brake pump - Replacement	
7	002067	Rear brake pump - Replacement	
8	002037	Brake lever - Replacement	
9	002071	Left knob - Replacement	
10	002059	Right-hand knob - Replacement	
11	002060	Complete throttle control - Replacement	
12	002047	Front brake fluid and air bleed system - Replacement	
13	002080	Rear brake oil bleed system - Change	

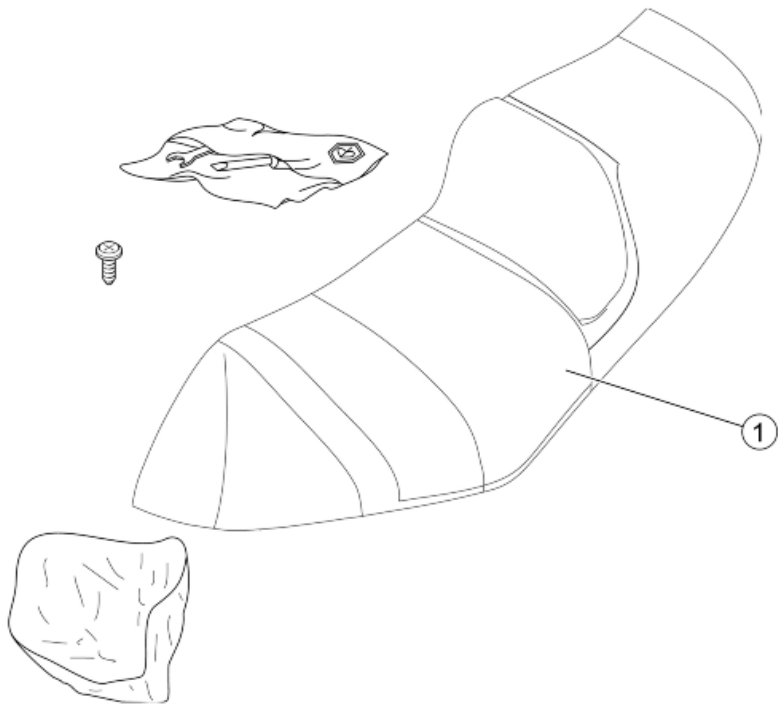
Swing-arm



BRACCIO OSCILLANTE

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

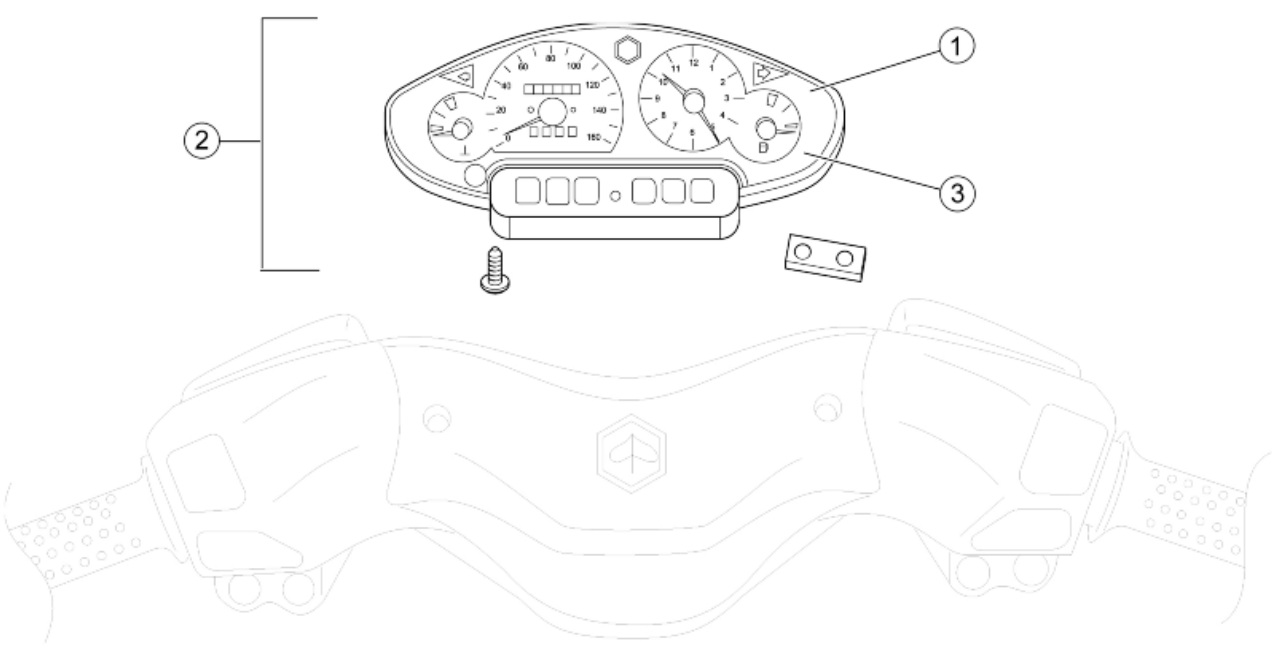
Seat



SADDLE

	Code	Action	Duration
1	004003	Saddle - Replacement	

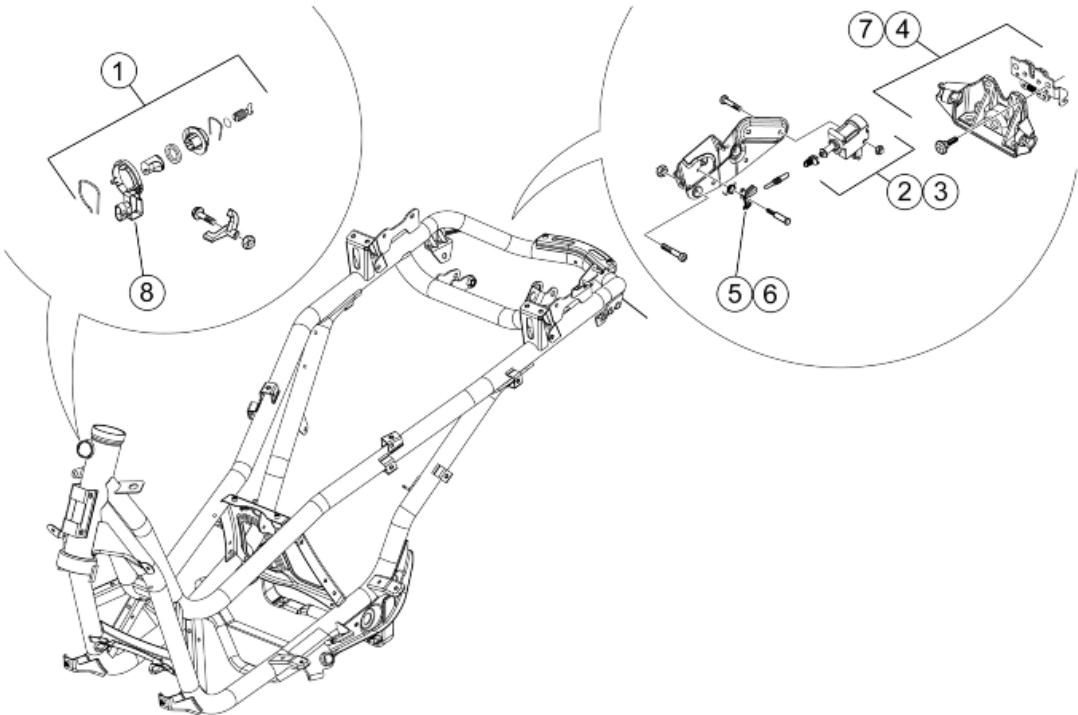
Instrument panel



GRUPPO STRUMENTI + COMANDI AL MANUBRIO

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

Locks

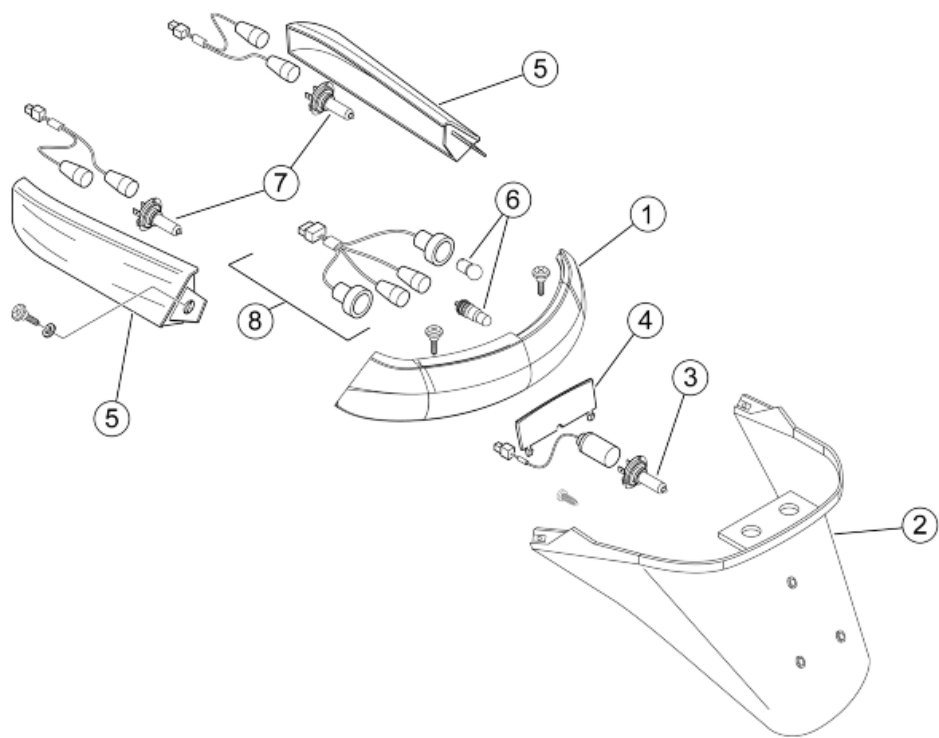


SERRATURE + TRASMISSIONI SERRATURE

	Code	Action	Duration
1	004010	Antitheft lock - Replacement	
2	005099	Saddle opening electric-actuator - Replacement	
3	005133	Electric glove box activator - Replacement	
4	004054	Saddle lock catch - Replacement	
5	004173	Trunk opening splitter - Replacement	
6	004158	Saddle opening splitter - Replacement	
7	004172	Rear case lock catch - Replacement	
8	005072	Immobilizer aerial - Replacement	

Turn signal lights

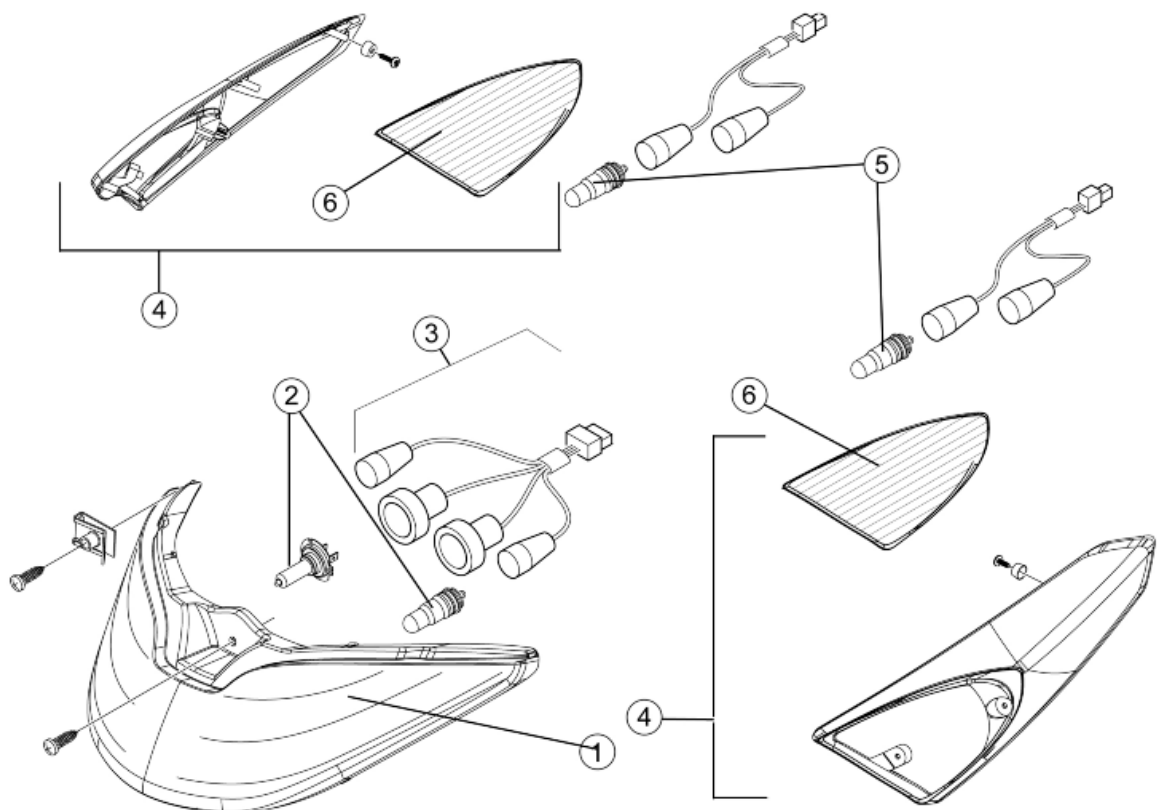
Fanaleria posteriore



REAR LIGHTS

	Code	Action	Duration
1	005005	Taillight - change	
2	005048	number plate holder - Replacement	
3	005031	number plate light bulb - Replacement	
4	005032	number plate light glass - Replacement	
5	005022	Rear turning indicators - Replacement	
6	005066	Rear light bulbs - Replacement	
7	005068	Rear turning indicator bulb - Replacement	
8	005030	Rear headlight cable unit- Replacement	

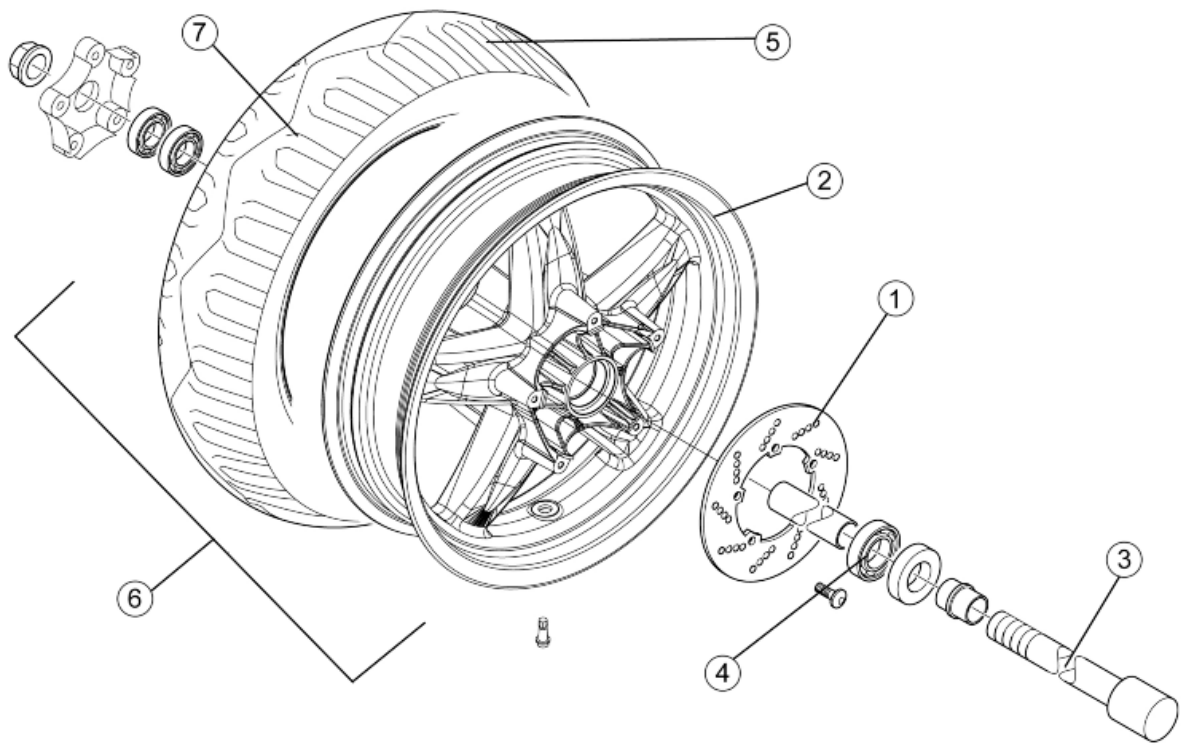
Fanaleria anteriore



TURN INDICATOR LIGHTS

	Code	Action	Duration
1	005002	Front light - replacement	
2	005008	Headlight bulbs - Replacement	
3	005044	Front lights cable unit- Replacement	
4	005012	Front turning indicators - Replacement	
5	005067	Front turning indicator bulb - replacement	
6	005091	Turn indicator glass - Replacement	

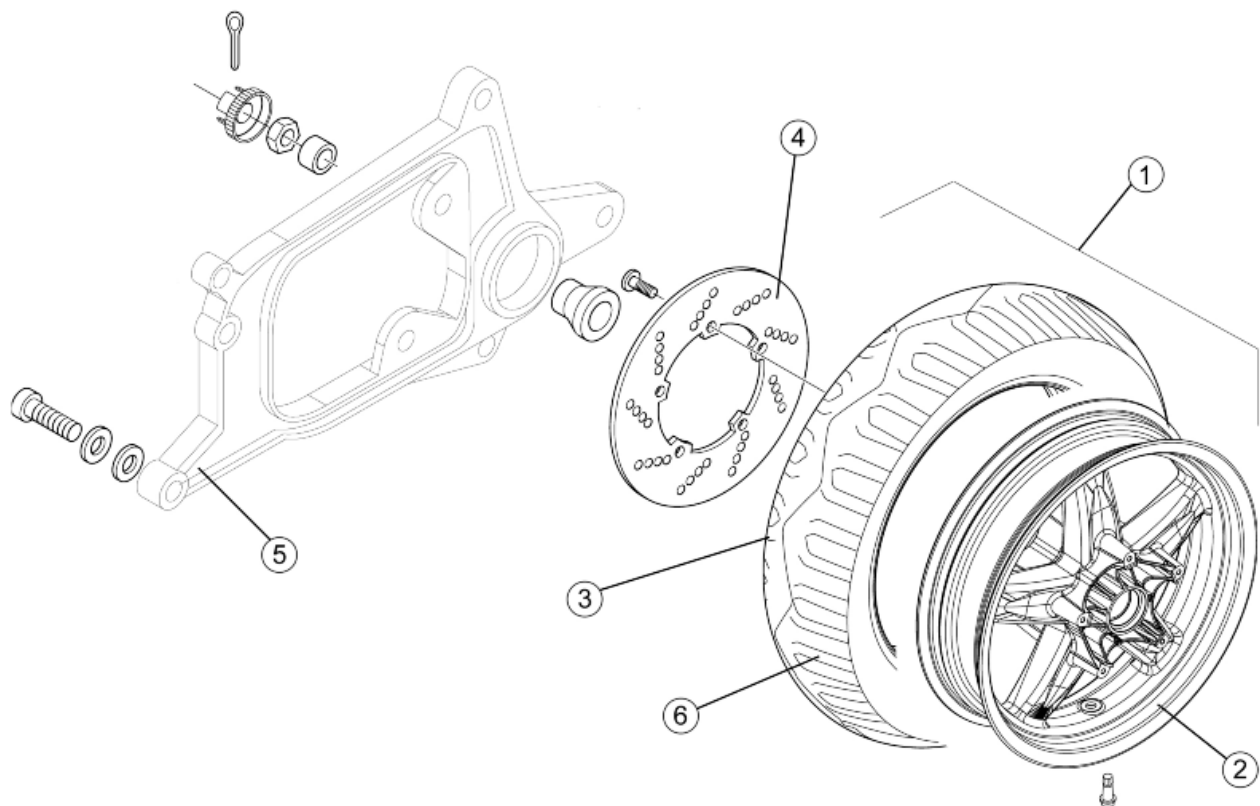
Front wheel



RUOTA ANTERIORE

	Code	Action	Duration
1	002041	Front brake disc - Replacement	
2	003037	Front wheel rim- Replacement	
3	003038	Front wheel axle - Replacement	
4	003040	Front wheel bearings - Replacement	
5	003047	Front tyre - replace	
6	004123	Front wheel - Replacement	
7	003063	Tyre pressure - Check	

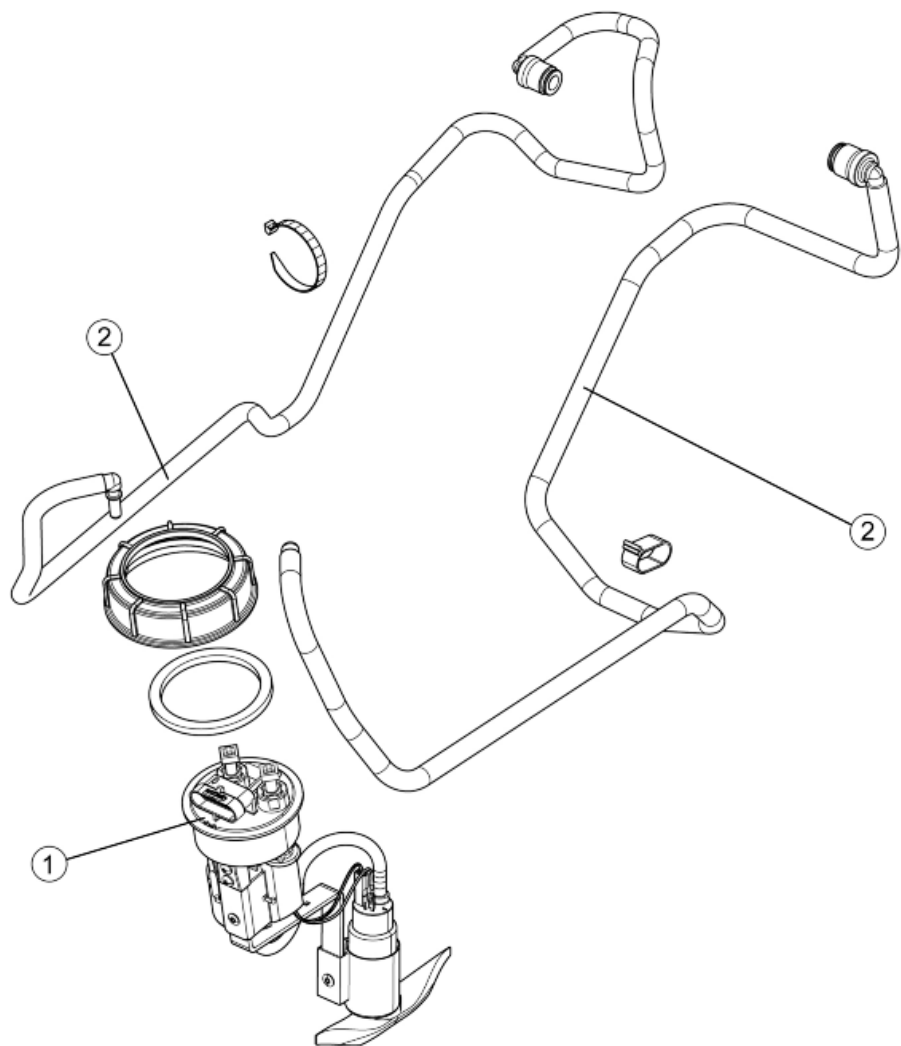
Rear wheel



RUOTA POSTERIORE

	Code	Action	Duration
1	001016	Rear wheel - Replacement	
2	001071	Rear wheel rim - Replacement	
3	004126	Rear wheel tyre - Replacement	
4	002070	Rear brake disc - Replacement	
5	003077	Muffler supporting arm/ rear shock absorber - Replacement	
6	003063	Tyre pressure - Check	

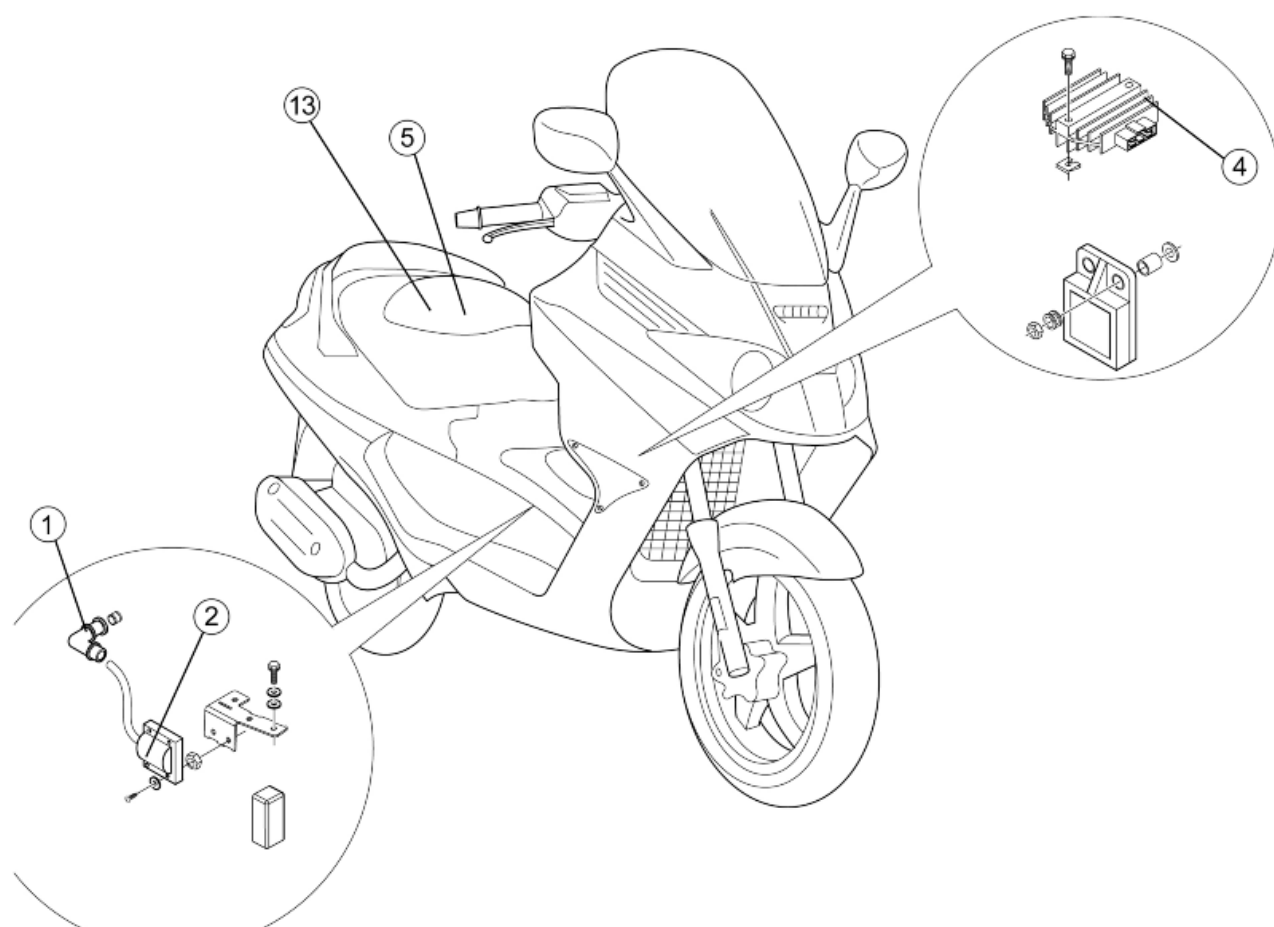
Fuel pump

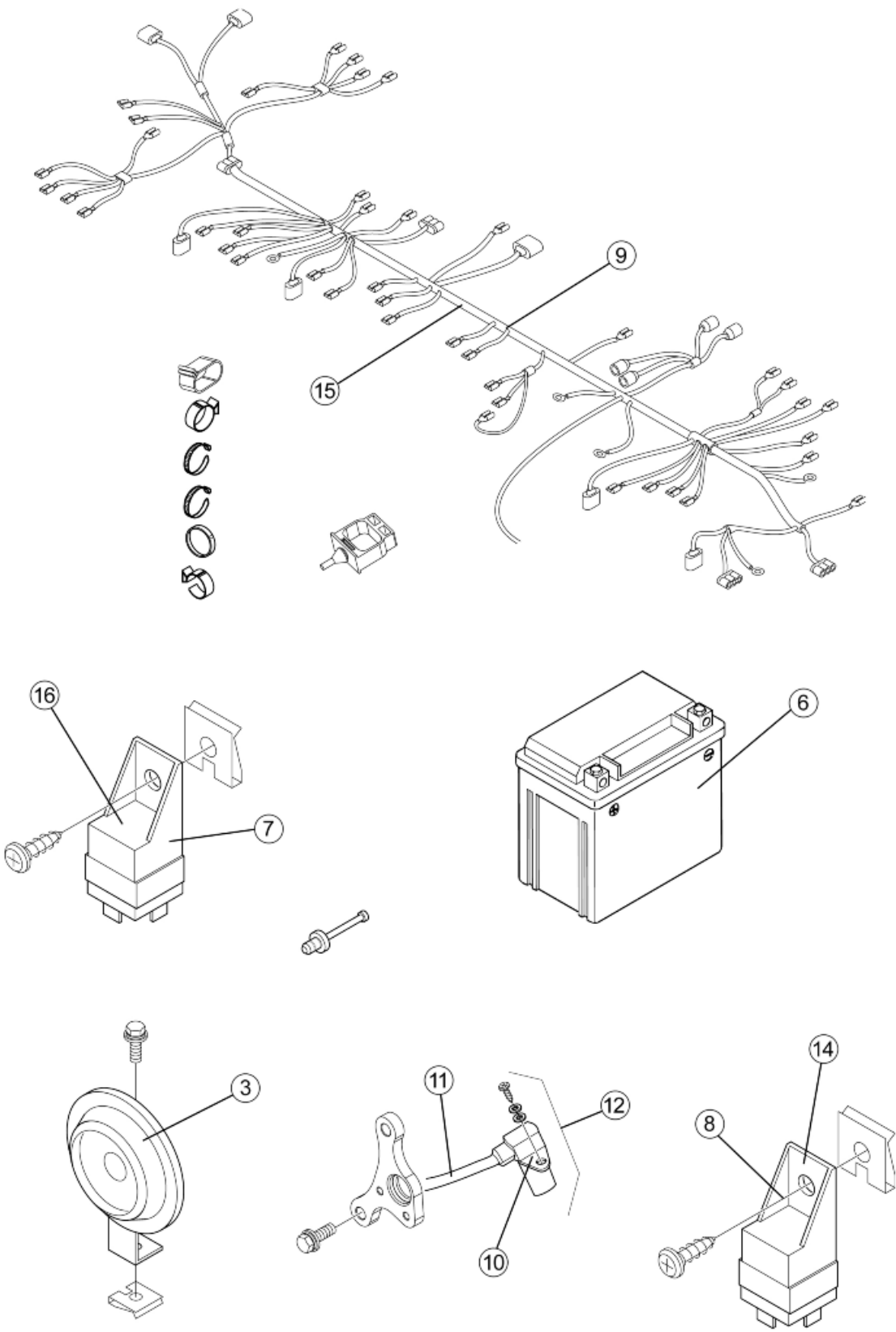


FUEL PUMP

	Code	Action	Duration
1	004073	Fuel pump - Replacement	
2	004137	Pump/ injector pipe - Replacement	

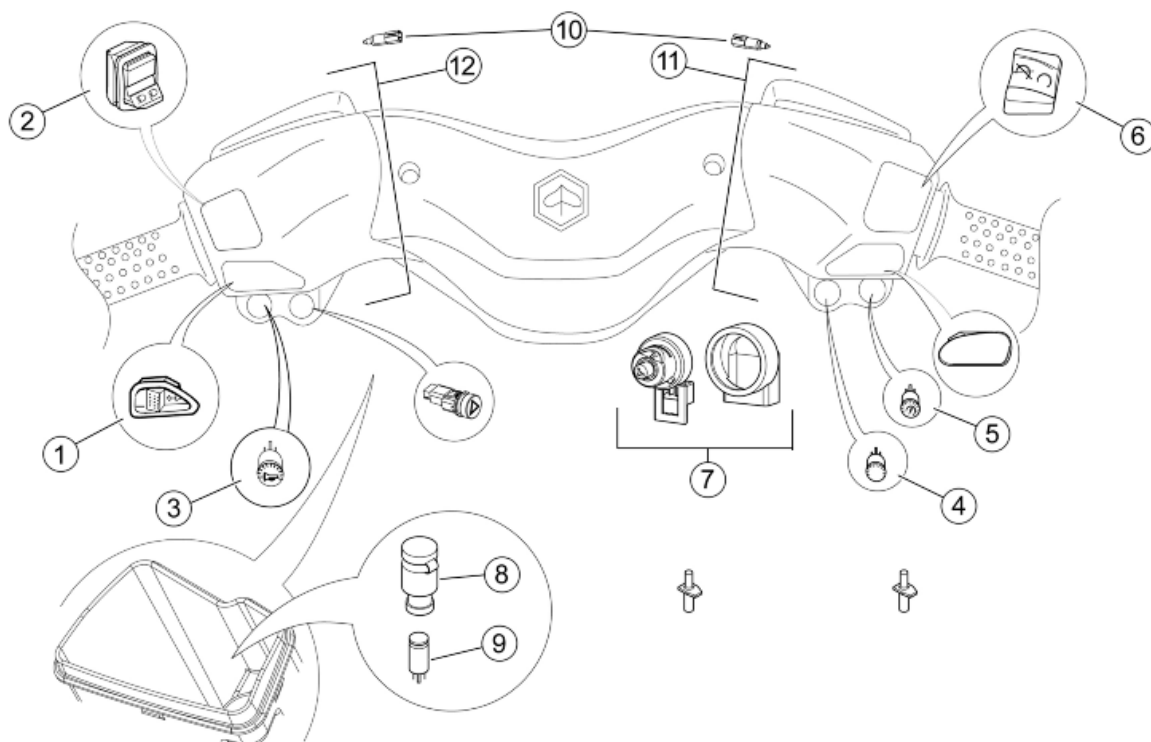
Electric devices





DISPOSITIVI ELETTRICI

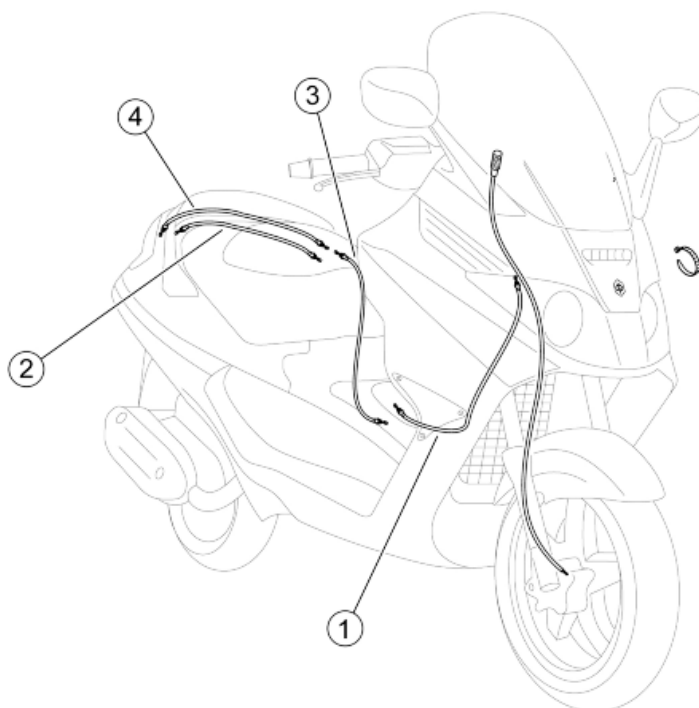
	Code	Action	Duration
1	001094	Spark plug cap - Replacement	
2	001069	HV coil - Replacement	
3	005003	Horn - Replacement	
4	005009	Voltage regulator - Replacement	
5	005052	Fuse (1) - Replacement	
6	005007	Battery - change	
7	005035	Headlight remote control - Replacement	
8	005011	Starter remote control switch - Replacement	
9	005001	Electrical system - Removal and re-fitting	
10	002011	Odometer movement sensor - Replacement	
11	002049	Odometer cable - Replacement	
12	002051	Odometer transmission assembly - Replacement	
13	005054	Fuse holder - Replacement	
14	005096	Remote control for injection components - Replacement	
15	005114	Electrical system - Service	
16	005117	Electric fan remote control - Replacement	

Electronic controls**ELECTRIC CONTROLS**

	Code	Action	Duration
1	005006	Light or turning indicator switch - Replacement	
2	005039	Lights switch - Replacement	
3	005040	Horn button - Replacement	

	Code	Action	Duration
4	005132	Trunk opening button - Replacement	
5	005041	Starter button - Replacement	
6	005077	Emergency stop switch - Replacement	
7	005016	Key switch - Replacement	
8	004142	electric socket - Replacement	
9	005085	Reset button - Replacement	
10	005017	Stop switch - Replacement	
11	003074	Handlebar right control - Replacement	
12	003075	Handlebar left control - Replacement	

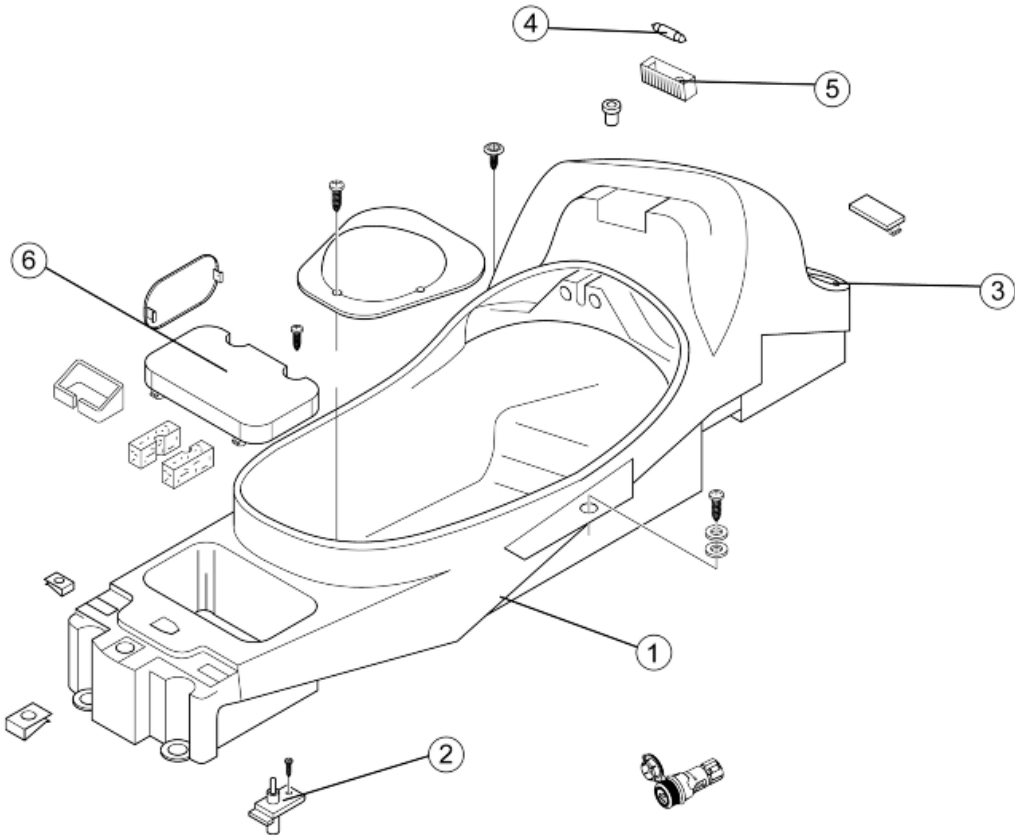
Transmissions



TRANSMISSIONS

	Code	Action	Duration
1	002082	Fuel tank door opening drive - Replacement	
2	002092	Transmission splitter/ hook transmission - Replacement	
3	002093	Top box opening transmission - Replacement	
4	002094	Trunk splitter/ hook transmission - Replacement	

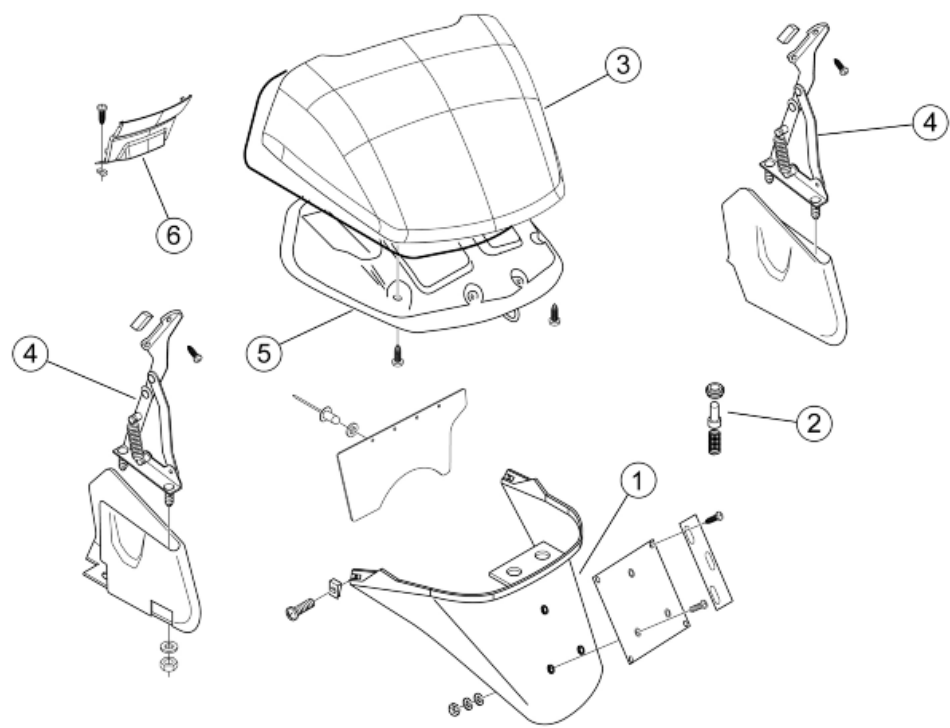
Helmet bay



PORTACASCO

	Code	Action	Duration
1	004016	Helmet compartment - Replacement	
2	005033	Glove-box light switch - Replacement	
3	004082	Trunk gasket - Replacement	
4	005026	Helmet compartment light - Replacement	
5	005027	Helmet compartment bulb support - Replacement	
6	005046	Battery cover - change	

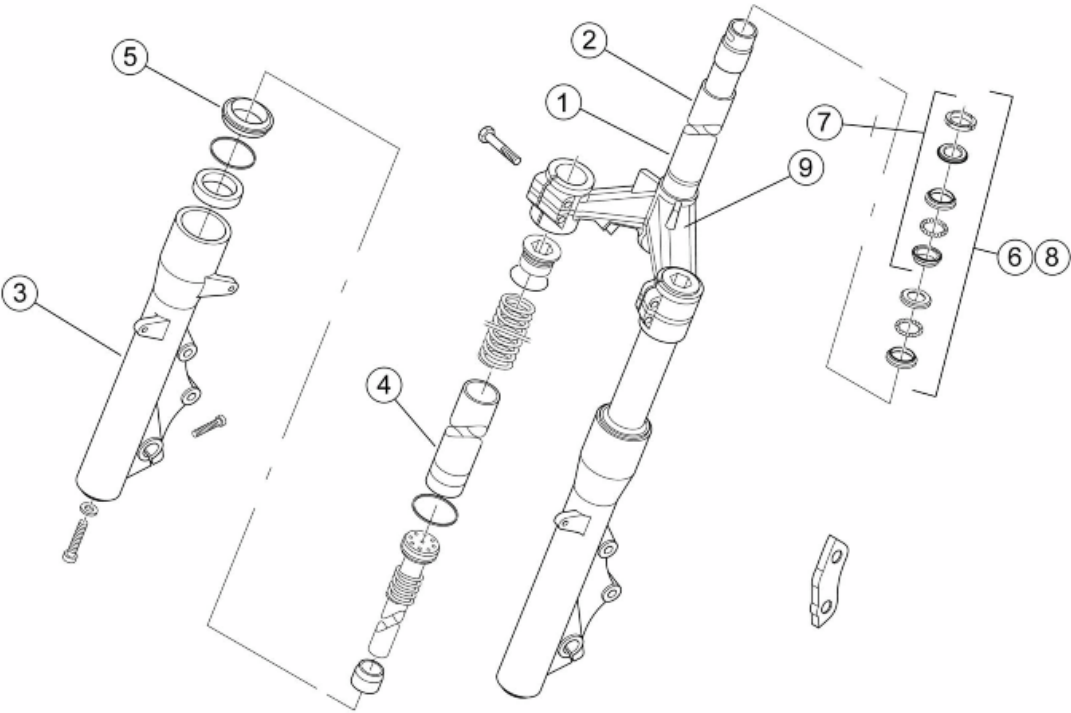
Rear side fairings



COPERTURE POSTERIORI

	Code	Action	Duration
1	005048	number plate holder - Replacement	
2	005033	Glove-box light switch - Replacement	
3	004081	Top box lid - Replacement	
4	004174	Trunk levers - Replacement	
5	004080	Trunk flap support - Replacement	
6	005131	number plate light support - Replacement	

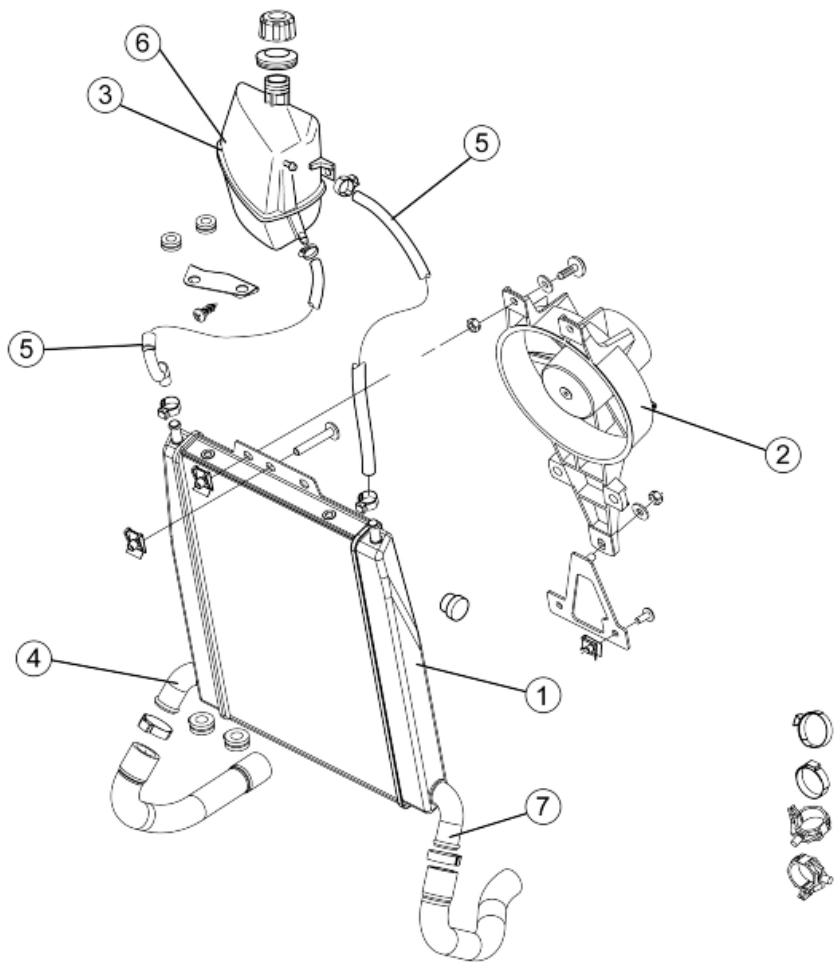
Front suspension



SOSPENSIONE ANTERIORE

	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	004119	Upper steering bearing - Housing	
8	003073	Steering clearance - Adjustment	
9	003050	Fork lower plate - Replacement	

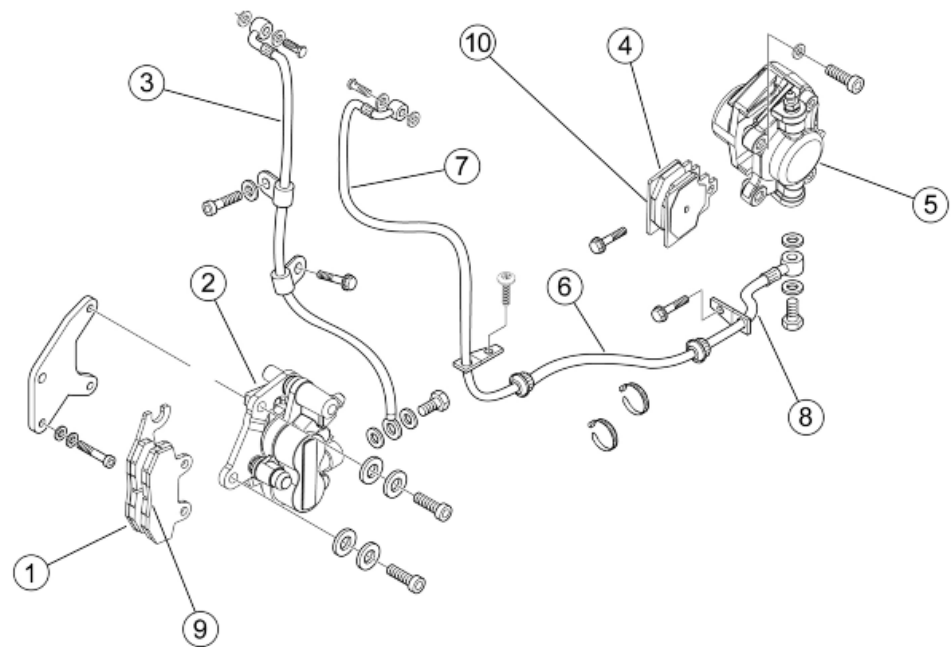
Cooling system



IMPIANTO DI RAFFREDDAMENTO

	Code	Action	Duration
1	007002	Water radiator - replacement	
2	007016	Fan with support - Replacement	
3	007001	Expansion tank - Replacement	
4	007022	Coolant delivery pipe - Replacement	
5	007013	Radiator expansion tank connection pipe - change	
6	001052	Coolant and air bleed - Replacement	
7	007019	Connection water pump pipe / return pipe - Replacement	

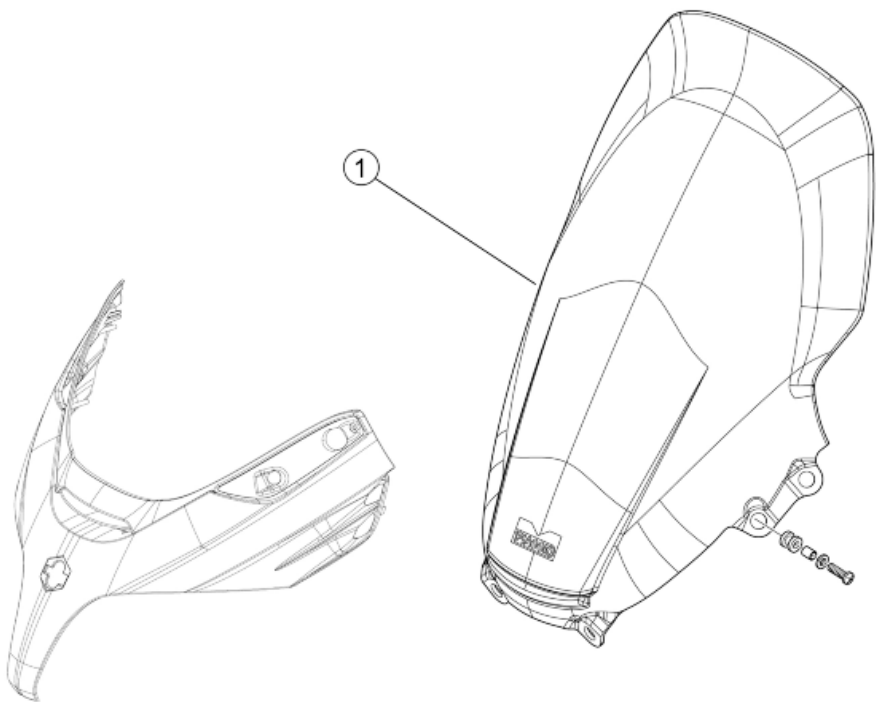
Braking system



IMPIANTO FRENANTE

	Code	Action	Duration
1	002007	Front brake pads - Replacement	
2	002039	Front brake calliper - Replacement	
3	002021	Front brake piping - Replacement	
4	002002	Rear brake pads - Replacement	
5	002048	Rear brake calliper - Replacement	
6	002081	Rear brake rigid pipes - Replacement	
7	002025	Tubazione freni principale - Sostituzione	
8	002020	Rear brake disc piping - Replacement	
9	003070	Front brake pads / Shoes - Check wear	
10	003071	Rear brake pads - Wear check	

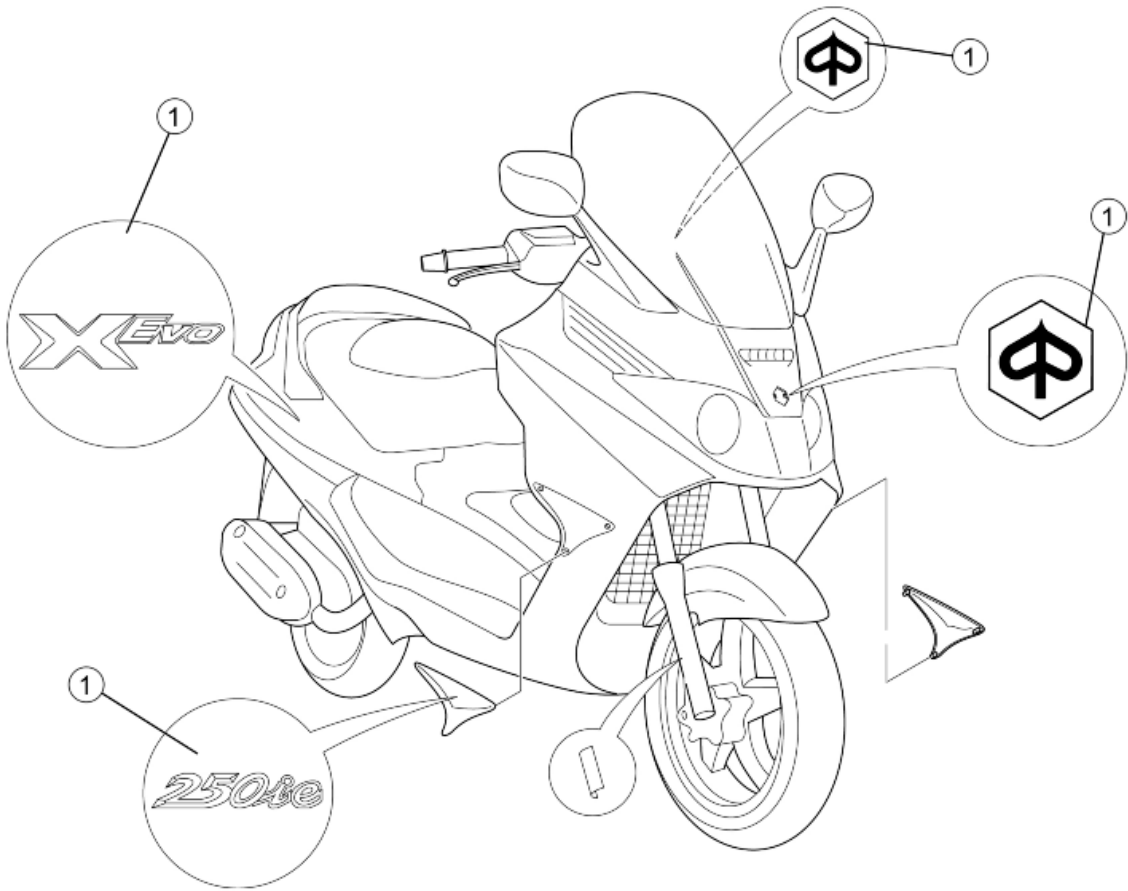
Windscreen



WINDSHIELD

	Code	Action	Duration
1	004101	Windscreen - Replacement	

Stickers



TRANSFERS

	Code	Action	Duration
1	004159	Plates / Stickers - Replacement	

A

Air filter: 34, 249

B

Battery: 62, 72, 76, 77

Brake: 225, 227–230, 232, 233

Brake fluid: 232

C

Coolant: 191

E

Engine oil: 35

F

Fuel: 166, 175, 251, 288, 300

Fuses: 74

H

Headlight: 40, 242

Hub oil: 33

I

Identification: 8

Instrument panel: 241, 245, 255, 294

M

Maintenance: 7, 29

Mirrors: 240, 255

O

Oil filter: 37, 268

S

Saddle:

Shock absorbers: 222

Spark plug: 32

Stand: 223

Start-up:

T

Tank: 251, 288

Transmission: 9, 42, 90, 105, 274

Turn indicators: 65

Tyres: 10