
SERVICE STATION MANUAL

633823



MP3 250 i.e.



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

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

SERVICE STATION MANUAL

MP3 250 i.e.

This service station manual has been drawn up by Piaggio & C. Spa to be used by the workshops of Piaggio-Gilera dealers. It is assumed that the user of this manual for maintaining and repairing Piaggio vehicles has a basic knowledge of mechanical principles and vehicle repair technique procedures. Any significant changes to vehicle characteristics or to specific repair operations will be communicated by updates to this manual. Nevertheless, 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 relating to 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

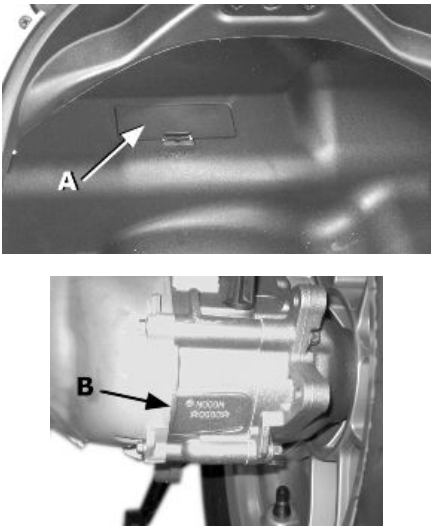
- If work can only be done on the vehicle with the engine running, make sure that the premises are well-ventilated, using special extractors if necessary; never let the engine run in an enclosed area. Exhaust fumes are toxic.
 - The battery electrolyte contains sulphuric acid. Protect your eyes, clothes 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 open flames or sparks.
 - Clean the brake pads in a well-ventilated area, directing the jet of compressed air in such a way that you do not breathe in the dust produced by the wear of the friction material. Even though the latter contains no asbestos, inhaling dust is harmful.
-

Maintenance rules

- Use original PIAGGIO spare parts and lubricants recommended by the Manufacturer. Non-original or non-conforming spares may damage the vehicle.
 - Use only the appropriate tools designed for this vehicle.
 - Always use new gaskets, sealing rings and split pins upon refitting.
 - After removal, clean the components using non-flammable or low flash-point solvent. Lubricate all the work surfaces except the tapered couplings before refitting.
 - 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

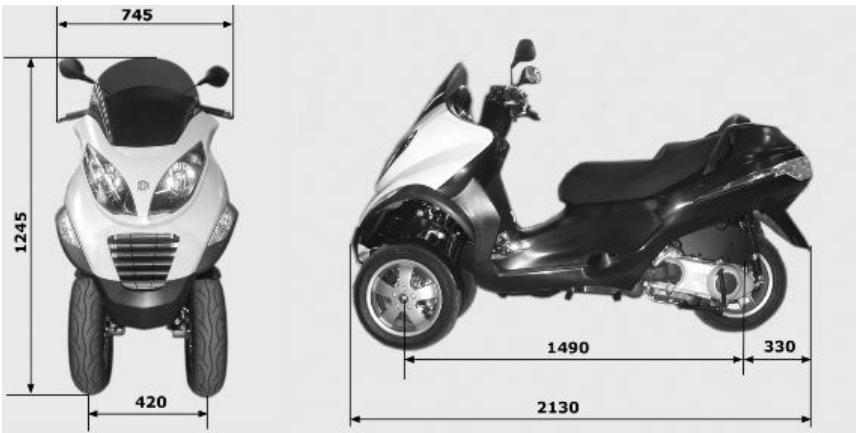
Chassis prefix (FULL OPTIONAL): **M47201**
Chassis prefix (BASE): **M47200**
Engine prefix: **M472M**



Dimensions and mass

WEIGHTS AND DIMENSIONS

Specification	Desc./Quantity
Kerb weight	224 ± 5 Kg
Wheelbase	1490 mm
Height	1245 mm
Width (handlebar)	745 mm
Overall length	2130 mm
Track	420 mm



Engine

DATA

Specification	Desc./Quantity
Type	single-cylinder, four-stroke and four liquid-cooled valves

Specification	Desc./Quantity
Timing system	single overhead camshaft chain driven on the left-hand side, three-arm rocking levers set up with threaded set screw
Bore	72 mm
Stroke	60 mm
Cubic capacity	249.29 mm
Compression ratio	10.5 ÷ 11.5
Air filter	sponge, impregnated with mixture (50% petrol and 50% oil)
Starting system	electric starter motor with freewheel
Lubrication	with lobe pump (inside the crankcase) chain-driven and double filter: mesh and paper
Fuel supply	by electronic injection with electric fuel pump
valve clearance	intake: 0.10 mm - discharge: 0.15 mm
Engine idle speed	approx. 1600 ÷ 1800 rpm
Max. speed	125 km/h

Transmission

TRANSMISSION

Specification	Desc./Quantity
Transmission	Automatic expandable pulley variator with torque server, V belt, automatic clutch, gear reduction unit and transmission housing with forced air circulation cooling

Capacities

CAPACITY

Specification	Desc./Quantity
Engine oil	approx. 1300 cc (recommended oil Selenia HI Scooter 4 Tech)
Rear hub	250 cc (recommended oil TUTELA MATRIX)
Fuel tank capacity	Tank capacity: ~12 l (approximate value)
Fuel reserve	approx. 2.5 litres (indicative value)
Cooling circuit	Capacity: ~ 2.0 l

Electrical system

ELECTRICAL COMPONENTS

Specification	Desc./Quantity
Ignition/advance	Electronic, with inductive discharge and variable advance with three-dimensional mapping
Spark plug	CHAMPION RG 4 PHP
Battery	12V-12Ah
Generator	alternating current

Frame and suspensions

FRAME AND SUSPENSIONS

Specification	Desc./Quantity
Chassis	Tubular and sheet steel.
Rear suspension	Single arm with two double-acting hydraulic shock absorbers and preloading adjustable to 4 positions.
Front suspension	The tilt mechanism is composed of an articulated parallelogram suspension with die-cast aluminium control arms and two side headstocks plus shock absorbers with hydraulic locking system.

Brakes

BRAKES

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

Wheels and tyres

WHEELS AND TYRES

Specification	Desc./Quantity
Front wheel	Alloy rims: 12" x 3.00"
Rear wheel	alloy rim: 12"x3,00
Front tyre	120/70-12", without inner tube
Rear tyre	Without inner tube: 130/70-12" 62P

TYRE PRESSURE

Specification	Desc./Quantity
Front tyre pressure (rider)	Front tyre pressure (rider): 1.6 bar
Front tyre pressure (rider and passenger)	Front tyre pressure (rider and passenger): 1.8 bar
Rear tyre pressure (rider)	Rear tyre pressure (rider): 2 bar
Rear wheel pressure (rider and passenger):	Rear tyre pressure (rider and passenger): 2.4 bar

N.B.

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

Tightening Torques

STEERING

Name	Torque in Nm
Steering lower ring nut (central headstock)	22 ÷ 27 loosen by 90°
Steering upper ring nut (central headstock)	27 ÷ 33
Handlebar fixing screw	50 ÷ 55
Fixing screws for handlebar control assembly U-bolts	7 ÷ 10

FRAME

Name	Torque in Nm
Engine arm bolt - frame arm	33 ÷ 41
Swinging arm buffer nut	64 - 72
Engine-swinging arm bolt	55 ÷ 61
Frame-swinging arm bolt	55 ÷ 61
Centre stand bolt	31 ÷ 39

FRONT SUSPENSION

Name	Torque in Nm
Shock absorber lower clamp	19 ÷ 26
Upper shock absorber clamp	19 ÷ 29
Front wheel fixing screws	19 ÷ 24
Steering arm bolt nut	20 ÷ 25
Tilt calliper fixing screws	20 ÷ 25
Front wheel shaft	74 ÷ 88
Arm coupling screws	45 ÷ 50
Screws fixing arms to side headstocks	45 ÷ 50
Screws fixing arms to central headstock	45 ÷ 50
Screws fixing the half-arm coupling flange	20 ÷ 25
Fixing screws for tilt locking disc section	20 ÷ 25
Side headstock upper ring nut	20 - 24
Side headstock lower ring nut	12 ÷ 15
Screw fixing sliding stem to shock absorber	45 ÷ 50
Clamp for sliding stem locking device	6.5 ÷ 10.5
Fixing nuts for constant-velocity universal joints	18 ÷ 20
Potentiometer to anti-tilting device clamp	8 ÷ 10
Electric motor to anti-tilting device clamp	11 ÷ 13
Clamp fixing pump bolt to anti-tilting device	11 ÷ 13
Pump to anti-tilting device clamp	11 ÷ 13
Pressure switch to distribution frame	18 ÷ 20
Sensor to tilt gripper clamp	2.5 ÷ 2.9
Pipe terminals to fifth wheel check spring	7 ÷ 11
Joint to anti-tilting device pump	20 ÷ 25
Lower fitting for shock absorber sliding locking clamp pipes	20 ÷ 25
Upper fitting for shock absorber sliding locking clamp pipes	20 ÷ 25

REAR SUSPENSION

Name	Torque in Nm
Upper shock absorber clamp	33 ÷ 41
Shock absorber lower 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 pump - hose fitting	16 ÷ 20
Brake fluid pipe-calliper fitting	20 ÷ 25

Name	Torque in Nm
Screw tightening calliper to the support	20 ÷ 25
Calliper upper pipe fitting	20 ÷ 25

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 clamp on exhaust manifold	40 ÷ 50
Exhaust manifold-muffler joint clamp	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 control crown screw	10 ÷ 14
Oil pump cover plate screws	4 ÷ 6
Oil sump screws	10 ÷ 14
Minimum oil pressure sensor	12 ÷ 14

CYLINDER HEAD

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

TRANSMISSION

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

FLYWHEEL

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

CRANKCASE AND CRANKSHAFT

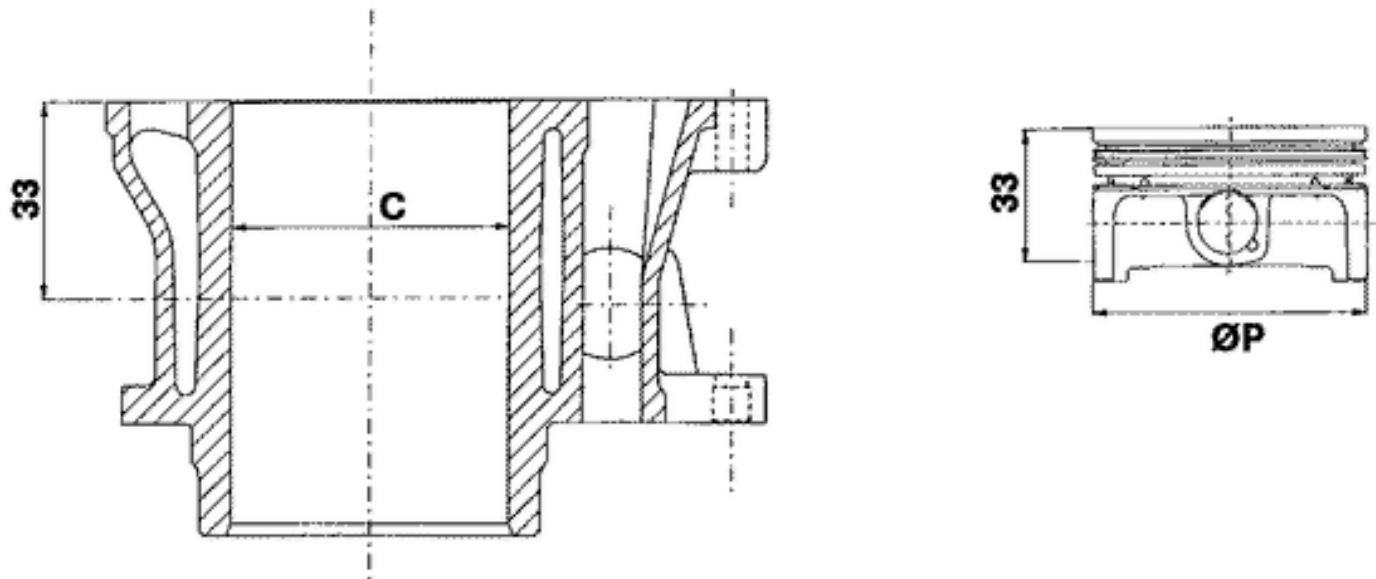
Name	Torque in Nm
Internal engine crankcase bulkhead (transmission-side half shaft) screws	4 ÷ 6
Engine-crankcase coupling screws	11 ÷ 13
Starter motor screws	11 ÷ 13
Crankcase timing cover screws	3.5 - 4.5 (Apply LOCTITE 242 medium-strength threadlock)

COOLING

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

Overhaul data**Assembly clearances**

Cylinder - piston assy.



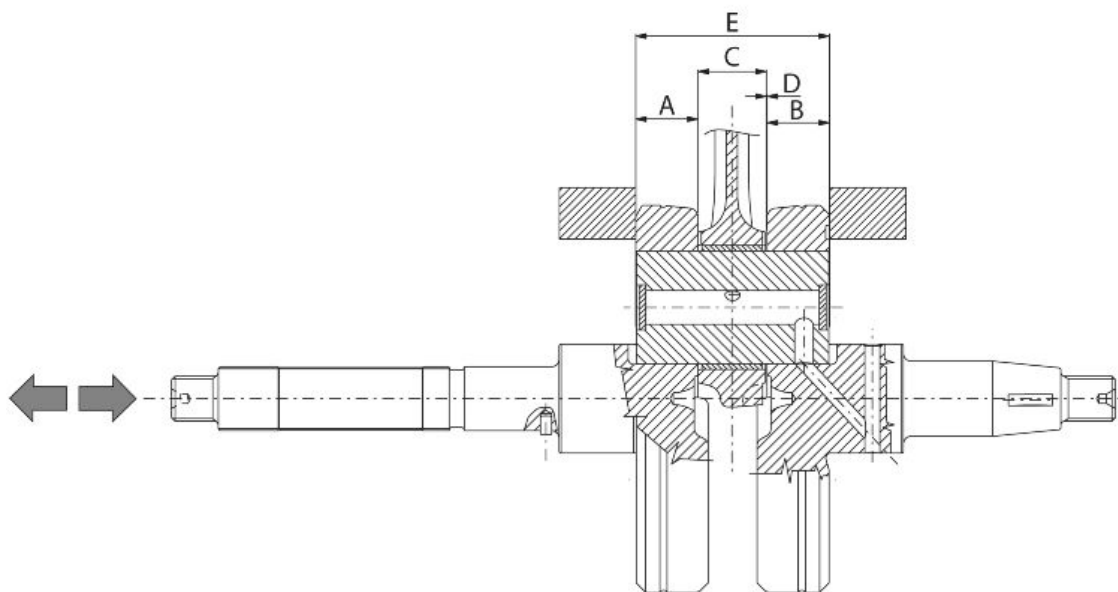
ENGINE COUPLING CATEGORY

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 crankcase axial clearance	

Crankshaft to crankcase axial clearance



CRANKSHAFT/ CRANKCASE AXIAL CLEARANCE

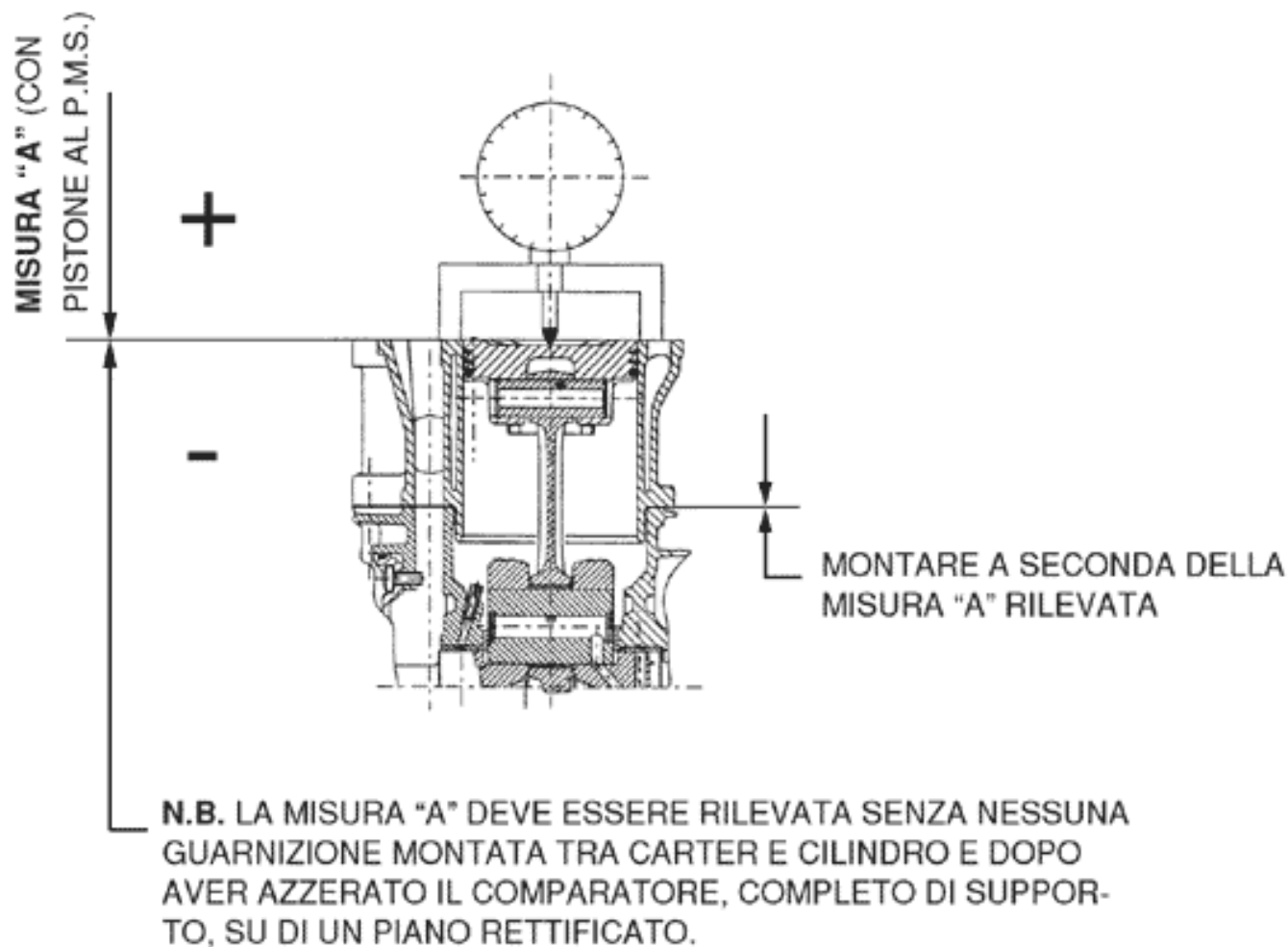
Name	Description	Dimensions	Initials	Quantity
Half-shaft, trans- mission side		16.6 +0-0.05	A	D = 0.20 - 0.50
Flywheel-side half- shaft		16.6 +0-0.05	B	D = 0.20 - 0.50
Connecting rod		18 -0.10 -0.15	C	D = 0.20 - 0.50
Spacer tool		51.4 +0.05	E	D = 0.20 - 0.50

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

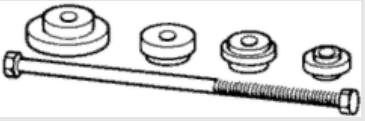

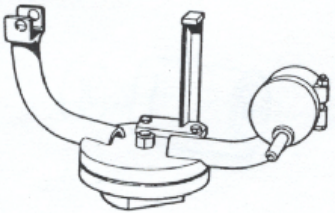

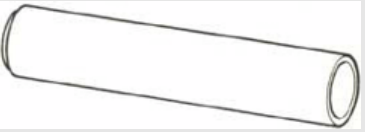


Product	Description	Specifications
AGIP ROTRA 80W-90	Rear hub oil	SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications
AGIP CITY HI TEC 4T	Oil to lubricate flexible transmissions (throttle control)	Oil for 4-stroke engines
AGIP FILTER OIL	Oil for air filter sponge	Mineral oil with specific 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 DOT4 Synthetic fluid
SPECIAL AGIP PERMANENT fluid	coolant	Monoethylene glycol-based anti-freeze fluid, CUNA NC 956-16

INDEX OF TOPICS


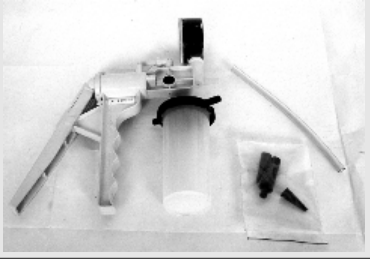



TOOLING

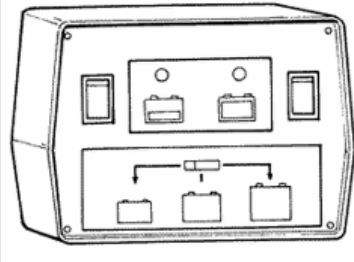



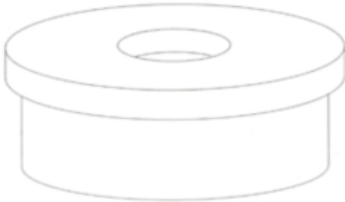
TOOL



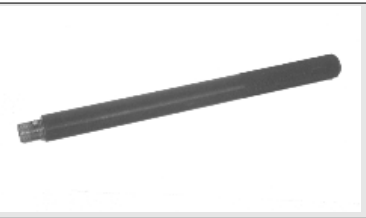


APPROPRIATE TOOL




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


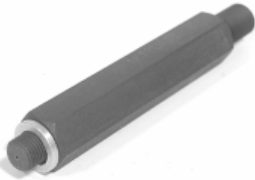

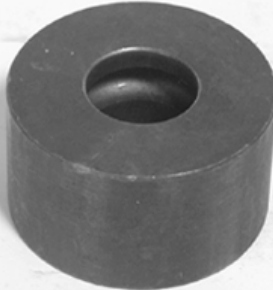

Stores code	Description	
020074Y	Support base for checking crankshaft alignment	
020150Y	Air heater support	
020151Y	Air heater	
020193Y	Oil pressure gauge	
020262Y	Crankcase splitting strip	
020263Y	Sheath for driven pulley fitting	


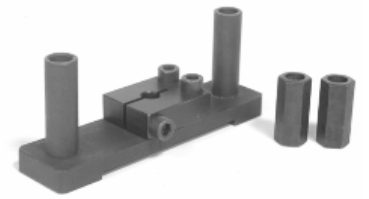




Stores code	Description	
020306Y	Punch for assembling valve seal rings	
020329Y	MityVac vacuum-operated pump	
020330Y	Stroboscopic light for timing control	
020331Y	Digital multimeter	
020332Y	Digital rev counter	






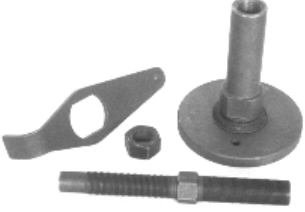
Stores code	Description	
020333Y	Single battery charger	
020334Y	Multiple battery charger	
020335Y	Magnetic support for dial gauge	
020357Y	32 x 35 mm adaptor	
020359Y	42x47-mm adaptor	
020360Y	Adaptor 52 x 55 mm	




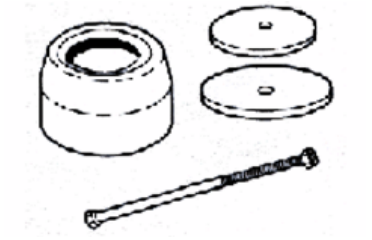

Stores code	Description	
020363Y	20 mm guide	
020375Y	Adaptor 28 x 30 mm	
020376Y	Adaptor handle	
020382Y	Valve cotters equipped with part 012 removal tool	
020382Y011	adapter for valve removal tool	




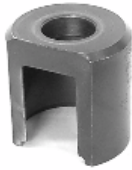

Stores code	Description	
020393Y	Piston fitting band	
020412Y	15 mm guide	
020423Y	driven pulley lock wrench	
020424Y	Driven pulley roller casing fitting punch	
020426Y	Piston fitting fork	



Stores code	Description	
020431Y	Valve oil seal extractor	
020434Y	Oil pressure control fitting	
020444Y	Tool for fitting/ removing the driven pulley clutch	
020456Y	Ø 24 mm adaptor	
020477Y	Adaptor 37 mm	
020483Y	30 mm guide	

Stores code	Description	
020489Y	Hub cover support stud bolt set	
020428Y	Piston position check support	
020460Y	Scooter diagnosis and tester	
020621Y	HV cable extraction adaptor	
020481Y	Control unit interface wiring	
001467Y035	Belle for OD 47-mm bearings	

Stores code	Description	
020626Y	Driving pulley lock wrench	
001467Y013	Pliers to extract ø 15-mm bearings	
020627Y	Flywheel lock wrench	
020467Y	Flywheel extractor	
020454Y	Tool for fitting piston pin stops (200 - 250)	
020622Y	Transmission-side oil guard punch	

Stores code	Description	
020480Y	Petrol pressure check set	
020244Y	15-mm diameter punch	
020115Y	Ø 18 punch	
020271Y	Tool for removing-fitting silent bloc	
020469Y	Reprogramming kit for scooter diagnosis tester	

Stores code	Description	
020481Y004	Parking control unit interface wiring	
020639Y	Tilt locking control unit software	
020645Y	MIU software updating with CAN lines	
001467Y017	Driver for OD 36 mm bearings	
020234y	extractor	
020441Y	26 x 28 mm adaptor	

Stores code	Description
020362Y	12 mm guide
	
020358Y	37x40-mm adaptor
001467Y002	Driver for OD 73 mm bearing
	

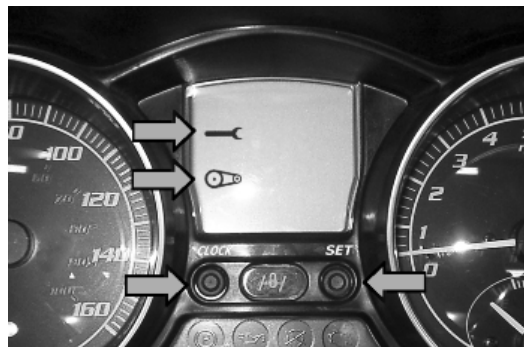
INDEX OF TOPICS

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

75'

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
Tilt locking gripper control cable - adjustment

AFTER 5,000 KM, 15,000 KM, 25,000 KM, 35000 KM, 45,000 KM, 55,000 KM, 65,000 KM, 75,000 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

115'

Action

Safety locks - check
Throttle lever - adjustment
Air filter - clean
Engine oil - change
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
Centre stand - lubrication
Tilt locking gripper control cable - adjustment

AFTER 20,000 KM, 35,000 KM, 50,000 KM, 65,000 KM, 80,000 KM

35'

Action

Driving Belt - replacement

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

165'

Action

Spark plug - 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
Tilt locking gripper control cable - adjustment

30,000 KM

155'

Action

Safety locks - check
Throttle lever - adjustment
Air filter - clean
Engine oil - change
Electrical system and battery - check

Action

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
Tilt locking gripper control cable - adjustment

60,000 KM

205'

Action

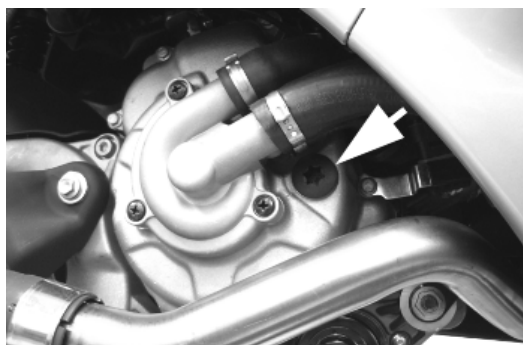
Spark plug - replacement
Throttle lever - adjustment
Air filter - clean
Engine oil - change
Valve clearance - check
Electrical system and battery - check
Coolant level - check
Brake fluid level - check
Engine oil - replacement
Hub oil - change
Brake pads - check condition and wear
Sliding block / variable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

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:

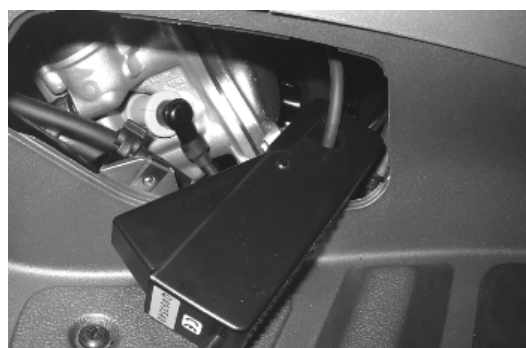
- distribution timing
- revolution-timing sensor
- Injection control unit

Specific tooling

020460Y Scooter diagnosis and tester

020330Y Stroboscopic light for timing control

020621Y HV cable extraction adaptor





Spark plug

Remove the port on the right-hand side panel of the vehicle by undoing the clamping screw and using a small screwdriver in the rear recess shown in the figure, then do the following :

1. Disconnect spark plug HV wire cap "A";
2. Unscrew the spark plug using the wrench supplied. ;
3. When refitting, place the spark plug in the hole at the due inclination and tighten it by hand until it is finger tight;
4. Only use the wrench to lock it in place;
5. Place hood«A» fully over the spark plug.
6. Refit the port making sure the rear hook is inserted.



WARNING



THE SPARK PLUG MUST BE REMOVED WHEN THE ENGINE IS COLD. THE SPARK PLUG MUST BE REPLACED EVERY 20,000 KM. USE OF ELECTRONIC CONTROL UNITS OR ELECTRONIC IGNITIONS DIFFERING FROM THOSE RECOMMENDED CAN SERIOUSLY DAMAGE THE ENGINE.

N.B.

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

Electric characteristic

Spark plug

CHAMPION RG4 PHP

Electrode gap

0.7 ÷ 0.8 mm

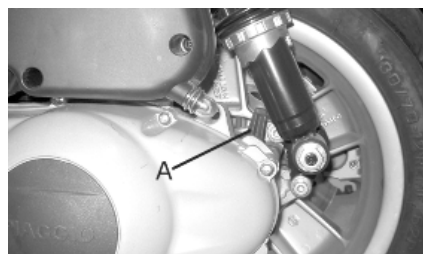
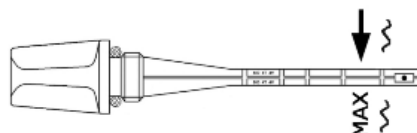
Hub oil

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**

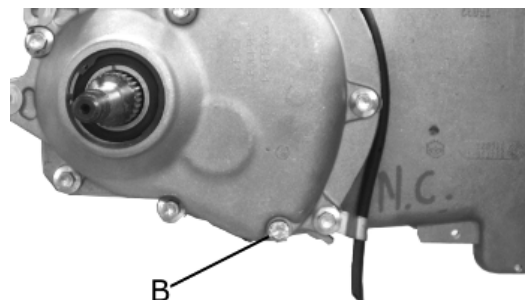
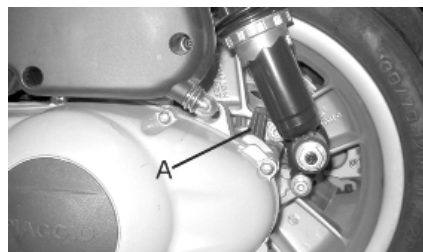
SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications

Characteristic**Rear hub oil**

Capacity approximately 250 cc

Locking torques (N*m)

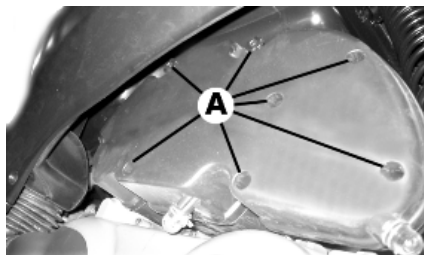
Hub oil drainage screw 15 ÷ 17 Nm



Air filter

Proceed as follows:

Undo the clamping screws «A» (two of which are on the knob-type head) and remove the air-box cover.



1. Wash the sponge with water and neutral soap.
2. Dry it with a clean cloth and small blasts of compressed air.
3. Impregnate the sponge with a mixture of 50% petrol and 50% specified oil.
4. Gently squeeze the filter element, let it drip and then refit it.

CAUTION



IF THE VEHICLE IS USED ON DUSTY ROADS IT IS NECESSARY TO CARRY OUT MAINTENANCE CONTROLS OF THE AIR FILTER TO AVOID DAMAGING THE ENGINE.

Recommended products

AGIP FILTER OIL Oil for air filter sponge

Mineral oil with specific additives for increased adhesiveness

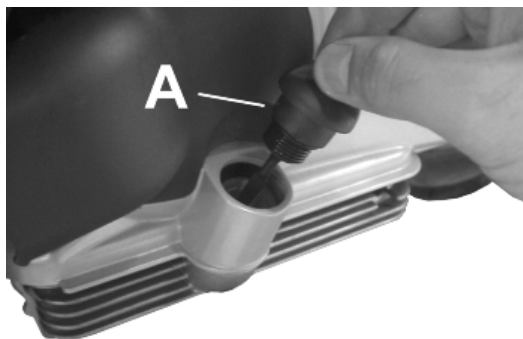
Engine oil

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

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

Replacement

At 1,000 km and after every 10,000 km, the oil and the filter must be changed. The engine must be drained by running off the oil from drainage cap "B" of the flywheel side gauze pre-filter; furthermore to facilitate oil drainage, loosen the cap/dipstick "A". Once all the oil has drained through the drainage hole, unscrew the oil cartridge filter "C" and remove it.



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

Lubricate them and refit the gauze filter and oil drainage tap, 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, oil must be filled from cap "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.

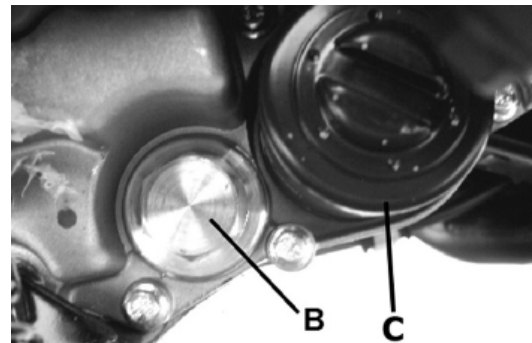
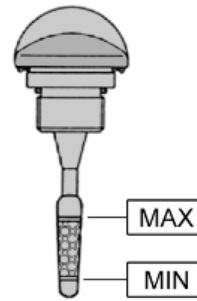
N.B.

THE ENGINE MUST BE HOT WHEN THE OIL IS CHANGED.

Recommended products

AGIP CITY HI TEC 4T Engine oil

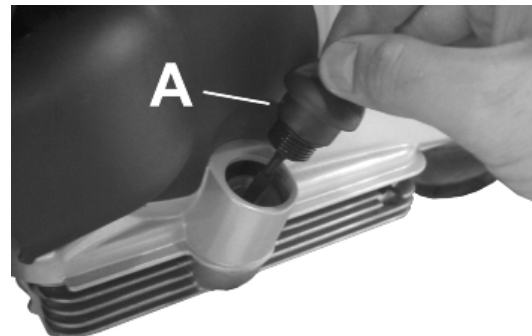
SAE 5W-40 Synthetic oil that exceed the requirements of API SL, ACEA A3, JASO MA specifications



Check

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

1. Place the vehicle on its centre stand and on flat ground.
2. Undo cap/dipstick "A", dry it off with a clean cloth and replace it, **screwing down completely**.
3. Remove the cap/dipstick again and check that the level is between the min and max. marks; top up if necessary.



The MAX level mark indicates a quantity of around 1300 cc of engine oil. 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 it is necessary to 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.**

Restoration of the level from **MIN** to **MAX** requires approximately **200 cc.**

Engine oil filter

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

Make sure the pre-filter and drainage plug O-rings are in good conditions. Lubricate them and refit the mesh filter and oil drainage plug, screwing them up to the specified torque. Refit the new cartridge filter being careful to lubricate the O-ring before the fitting. 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 caliper spanner applied to the camshaft command pulley casing.



Cooling system

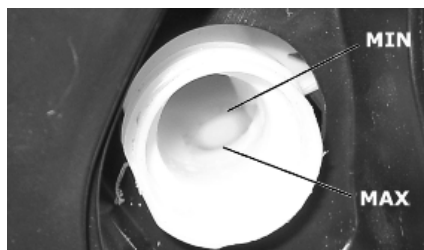
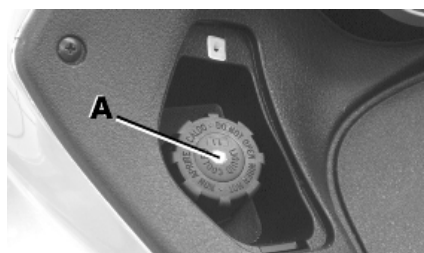
Introduction of the engine coolant.

The fluid level must be checked every 10,000 kilometres with a cold engine, in the way shown 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.
- The coolant consists of an ethylene glycol and corrosion inhibitor based 50% demineralised water- antifreeze solution mix.

CAUTION

DO NOT EXCEED THE MAX. LEVEL WHEN FILLING SO AS TO AVOID THE COOLANT ESCAPING FROM THE EXPANSION TANK WHEN THE vehicle IS IN USE.

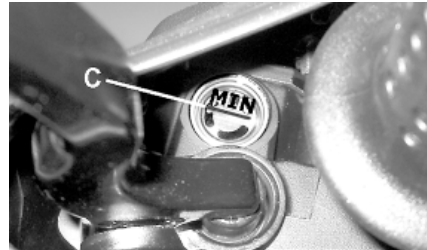


Braking system

Level check

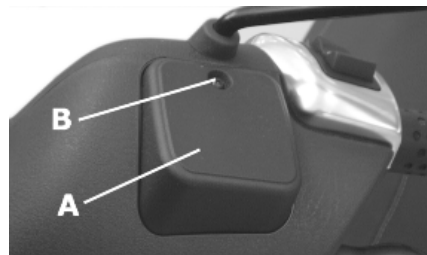
The front and rear brake fluid reservoirs are both positioned on the handlebars. Proceed as follows:

- Rest the vehicle on its centre stand with the handlebars perfectly horizontal;
- Check the fluid level through the sight glass «C». 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 normal climatic conditions, the fluid must be changed every 20,000 km or anyway every two years.

WARNING

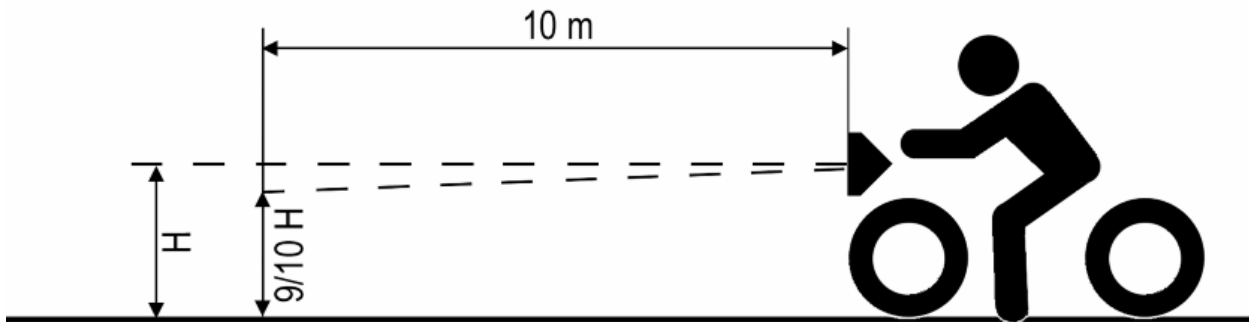
ONLY USE DOT 4 CLASS BRAKE FLUIDS. COOLING SYSTEM FLUIDS ARE HIGHLY CORROSIVE. MAKE SURE THAT IT DOES NOT COME INTO CONTACT WITH THE PAINTWORK.

CAUTION

MAKE SURE THE BRAKE FLUID DOES NOT GET INTO YOUR EYES OR ON YOUR SKIN OR CLOTHES. IF THIS HAPPENS ACCIDENTALLY, WASH WITH WATER.

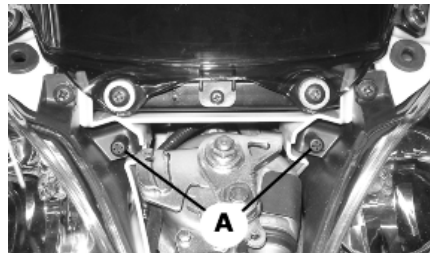


Headlight adjustment



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. Remove the headlight assembly central cover
3. Turn on the headlight and check that the limit of the projected light beam is not over 9/10 or below 7/10 of the distance from the ground to the centre of the vehicle headlight;
4. Otherwise, adjust the headlight with the screws «A» indicated in the figure



N.B.

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

INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

This section makes it possible to find what solutions to apply when troubleshooting.
For each breakdown, a list of the possible causes and respective interventions 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
Missshapen/worn valve seats	Replace the head assembly
Worn cylinder, Worn or broken piston rings	Replace the piston cylinder assembly or piston rings
Worn or broken piston rings or piston rings that have not been fitted properly	Replace the piston cylinder unit or just the piston rings
Oil leaks from the couplings or from the gaskets	Check and replace the gaskets or restore the coupling seal
Worn valve oil guard	Replace the valve oil guard
Worn valve guides	Check and replace the head unit if required

Insufficient lubrication pressure

POOR LUBRICATION PRESSURE

Possible Cause	Operation
By-Pass remains open	Check the By-Pass and replace if required. Carefully clean the By-Pass area.
Oil pump with excessive clearance	Perform the dimensional checks on the oil pump components
Oil filter too dirty	Replace the cartridge filter
Oil level too low	Restore the level using the recommended oil type (Selenia HI Scooter 4 Tech)

Transmission and brakes

Clutch grabbing or performing inadequately

IRREGULAR CLUTCH PERFORMANCE OR SLIPPAGE

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

Insufficient braking

INEFFICIENT BRAKING SYSTEM

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

Brakes overheating

BRAKES OVERHEATING

Possible Cause	Operation
Defective sliding of pistons	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 shift of the disc.
Clogged compensation holes on the pump	Clean carefully and blast with compressed air
Swollen or glued rubber gaskets	Replace gaskets.

Steering and suspensions

Heavy steering

STEERING HARDENING

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

Excessive steering play

EXCESSIVE STEERING CLEARANCE

Possible Cause	Operation
Torque not conforming	Check the tightening of the top and bottom ring nuts. If irregularities continue in turning the steering even after making the above adjustments, check the seats in which the ball bearings rotate:

Possible Cause	Operation
	if they are recessed or if the balls are squashed, replace them.

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 absorbers; 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 disk in the attachment to the hub and the steering tube.

Suspension oil leakage

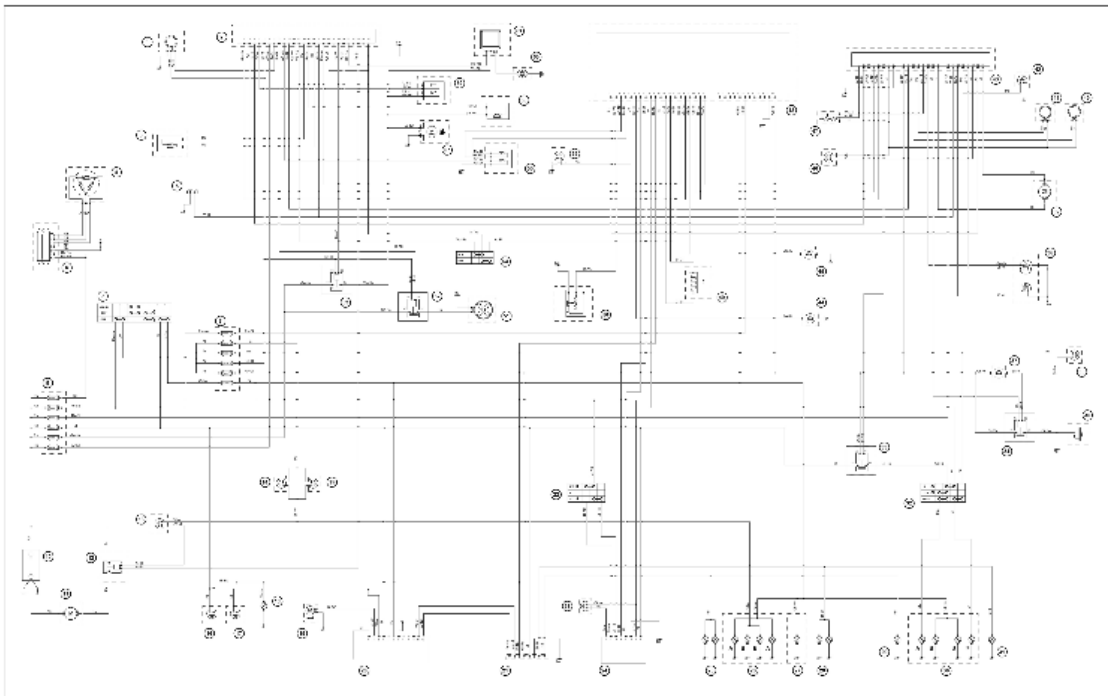
OIL LEAKAGE FROM SUSPENSION

Possible Cause	Operation
Seal fault or breakage	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. Injection ECU
3. Engine rev sensor
4. Magneto flywheel
5. Diagnostics socket
6. Voltage regulator
7. Key switch
8. Fuse-box
9. Fuse-box
10. Battery
11. Starter motor
12. Start up remote control switch
13. Starter button
14. Stop button on front brake
15. Stop button on rear brake
16. Helmet compartment light switch
17. Helmet compartment light switch
18. Helmet compartment light bulb
19. Saddle opener actuator
20. Saddle opening receiver

- 21. Preparation for anti-theft device
- 22. Turn indicator switch
- 23. Hazard switch
- 24. Turn indicator control device
- 25. Left rear turn indicator bulbs
- 26. Rear headlight assembly
 - A. Tail light
 - C. Stop light
- 27. License plate bulb
- 28. Right rear turn indicator bulbs
- 29. Left front turn indicator bulb
- 30. Front headlight assembly
 - A. Low-beam light bulb
 - B. Tail light
 - C. High-beam light bulb
- 31. Right front turn indicator bulb
- 32. Light switch
- 33. Remote control headlight
- 34. Horn remote control
- 35. Horn
- 36. Horn button
- 37. Pressure sensor
- 38. Locking/unlocking switch
- 39. Geared motor
- 40. Right tone wheel
- 41. Left tone wheel
- 42. Brake calliper sensor
- 43. Parking electronic control unit
- 44. Oil pressure sensor
- 45. Hand brake
- 46. Rider presence sensor
- 47. Potentiometer
- 48. Instrument panel
- 49. External temperature sensor
- 50. Fuel level transmitter
- 51. Electric fan
- 52. Remote control for electric fan
- 53. Injection load remote control

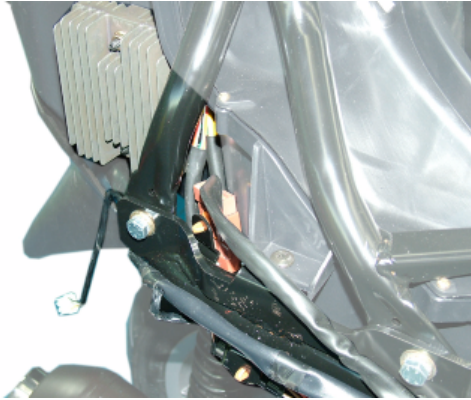
- 54. Engine stop switch
- 55. Mode button
- 56. Engine temperature sensor
- 57. Fuel pump
- 58. Fuel injector
- 59. Lambda probe
- 60. Spark plug
- 61. High voltage coil

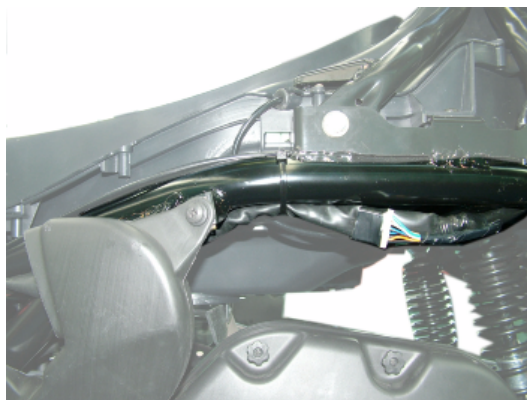
Key

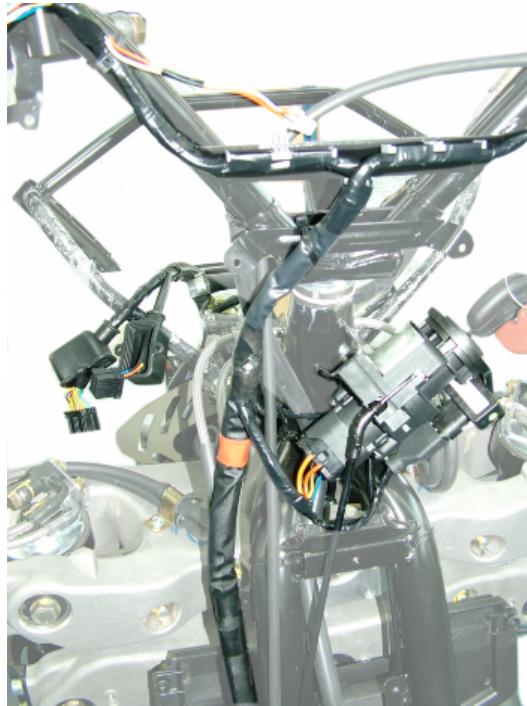
Ar: Orange **Az:** Sky blue **Bi:** White **Bl:** Blue **Gi:** Yellow **Gr:** Grey

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

Electrical system installation

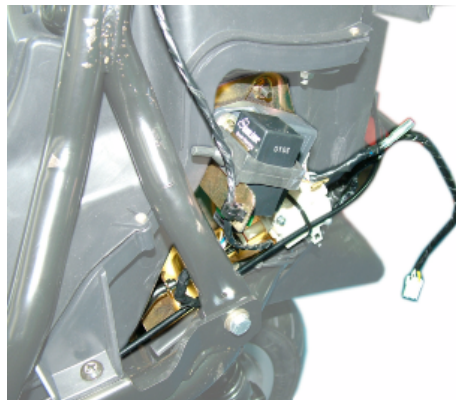






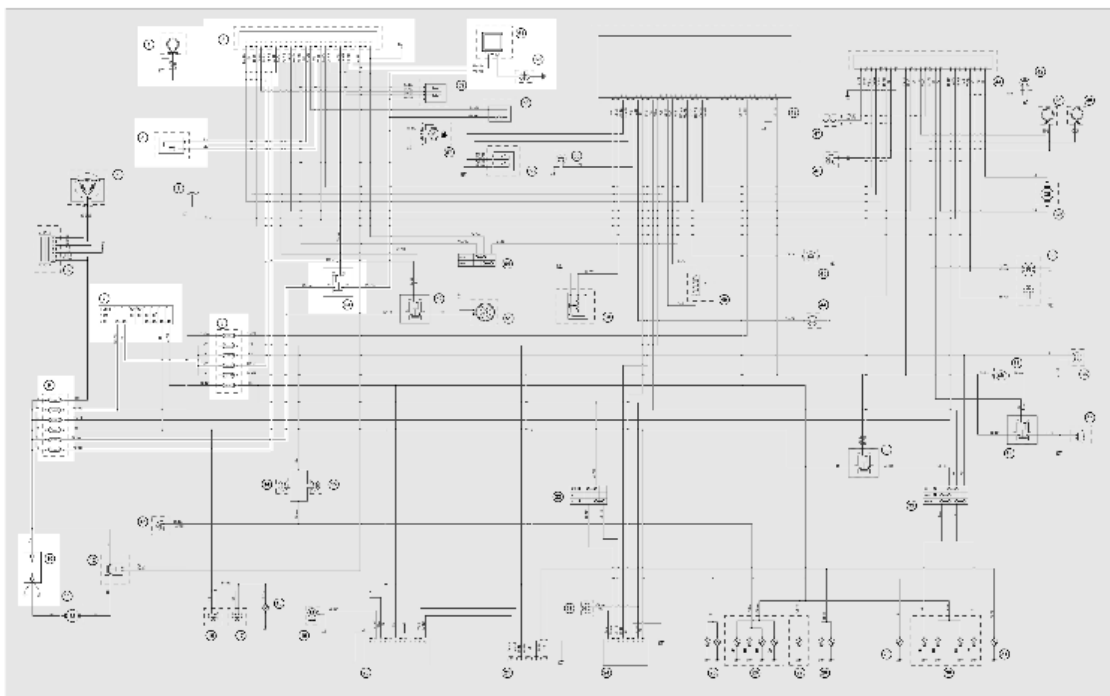






Conceptual diagrams

Ignition

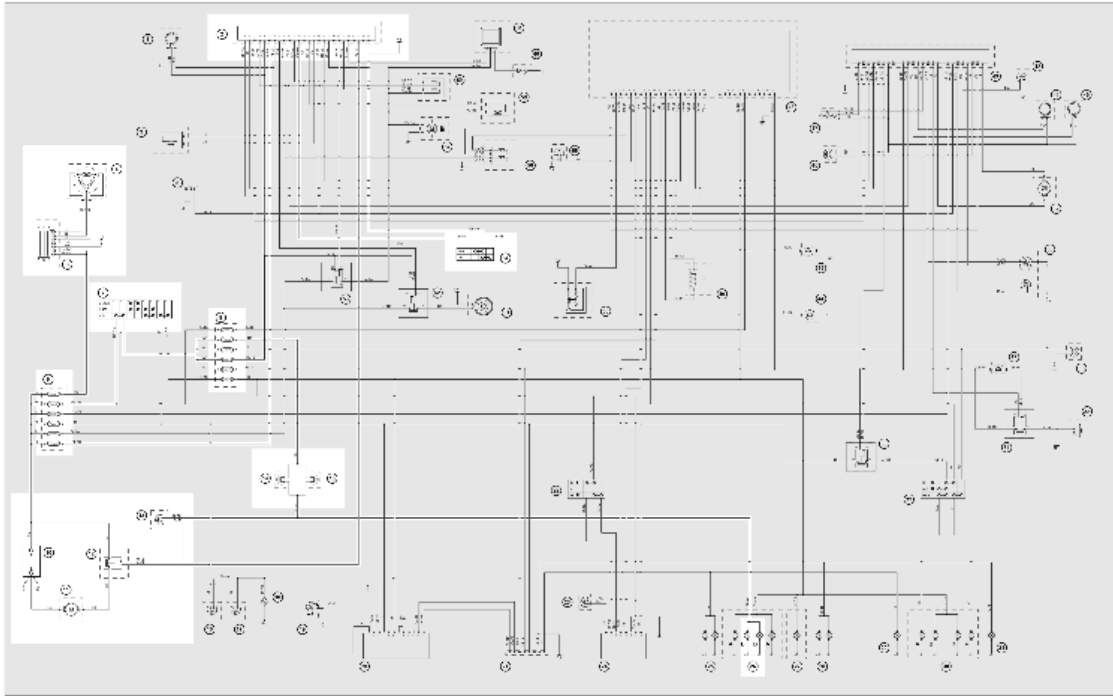


KEY

- 1. Immobilizer aerial
- 2. Injection ECU
- 3. Revolution sensor
- 7. Key switch
- 8. Fuse-box
- 9. Fuse-box
- 10. Battery

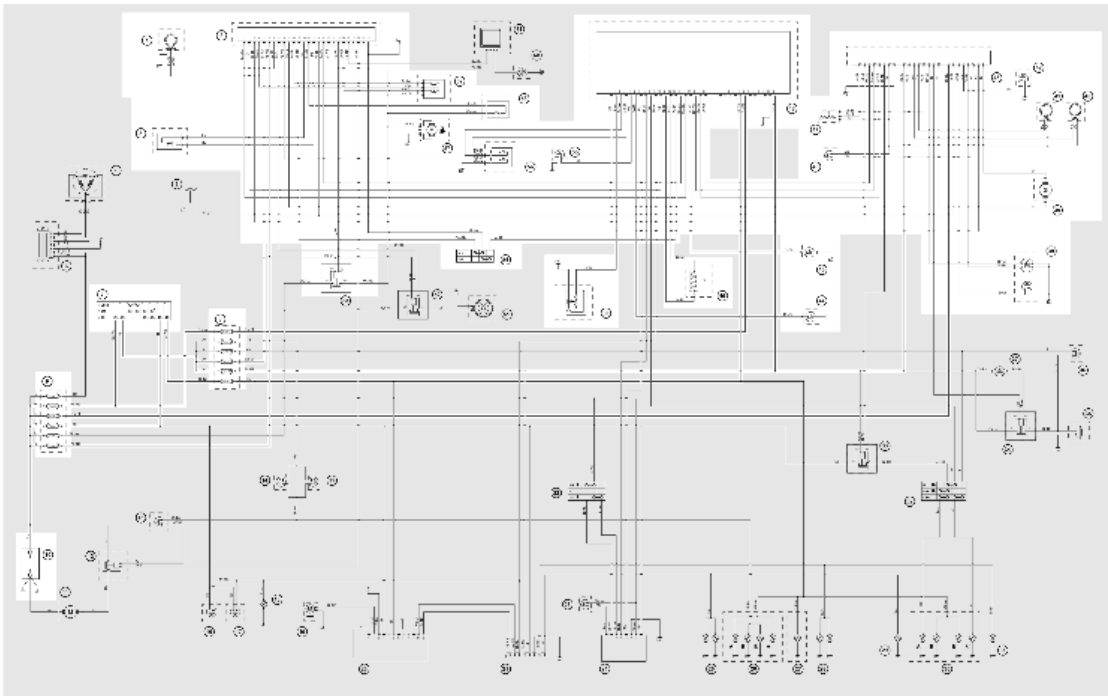
- 53. Injection load remote control
- 60. Spark plug
- 61. High voltage coil

Battery recharge and starting



KEY

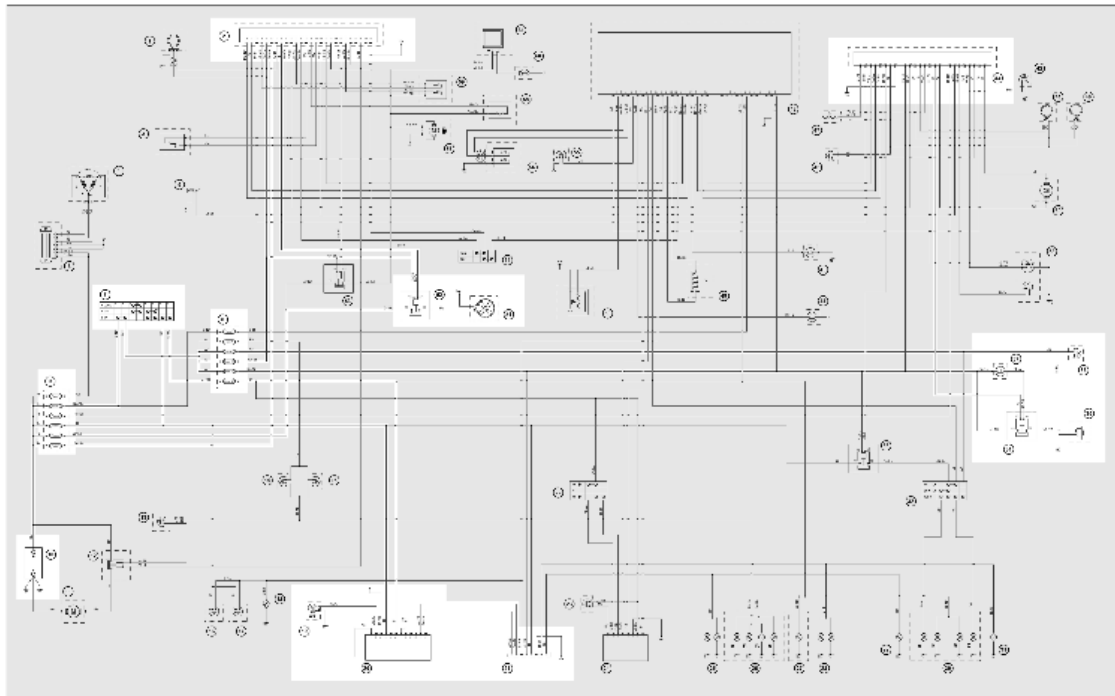
- 2. Injection ECU
- 4. Magneto flywheel
- 6. Voltage regulator
- 7. Key switch
- 8. Fuse-box
- 9. Fuse-box
- 10. Battery
- 11. Starter motor
- 12. Start up remote control switch
- 13. Starter button
- 14. Stop button on front brake
- 15. Stop button on rear brake
- 26. Rear headlight assembly
- B. Stop light
- 54. Engine stop switch

Level indicators and enable signals section**KEY**

- 1. Immobilizer aerial
- 2. Injection ECU
- 3. Revolution sensor
- 7. Key switch
- 8. Fuse-box
- 9. Fuse-box
- 10. Battery
- 38. Locking/unlocking switch
- 39. Geared motor
- 40. Right tone wheel
- 41. Left tone wheel
- 42. Brake calliper sensor
- 43. Parking electronic control unit
- 44. Oil pressure sensor
- 45. Hand brake
- 46. Rider presence sensor
- 47. Potentiometer
- 48. Instrument panel

- 49. External temperature sensor
- 50. Fuel level transmitter
- 53. Injection load remote control
- 54. Engine stop switch
- 55. Mode button
- 56. Engine temperature sensor
- 57. Fuel pump
- 58. Fuel injector
- 59. Lambda probe

Devices and accessories

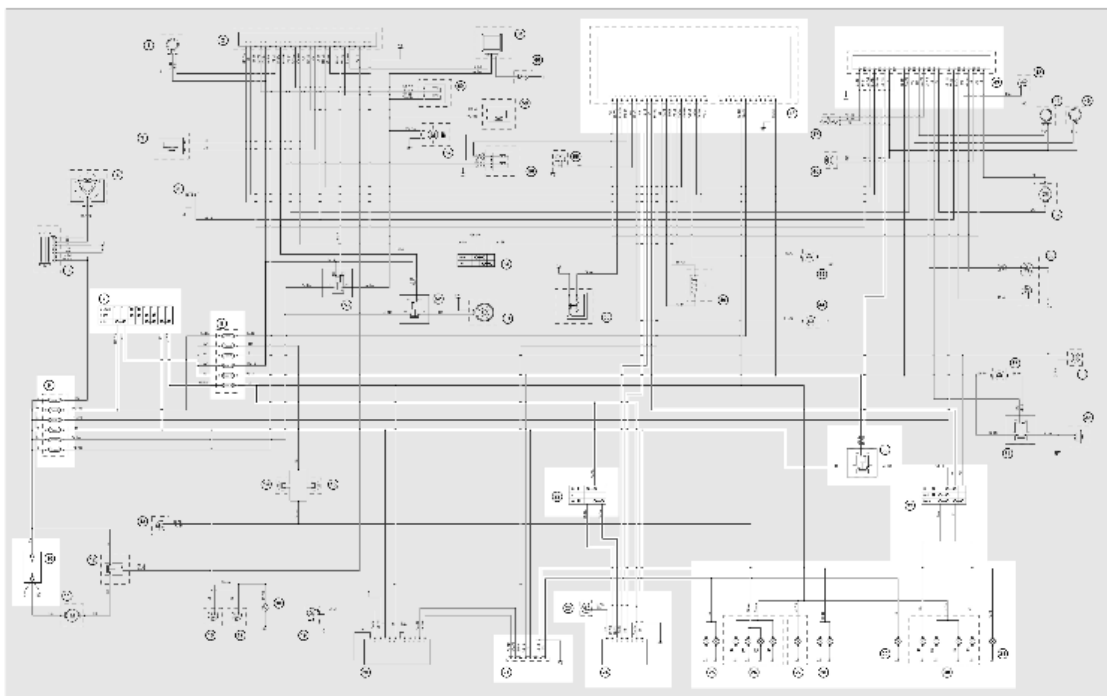


KEY

- 2. Injection ECU
- 7. Key switch
- 8. Fuse-box
- 9. Fuse-box
- 10. Battery
- 19. Saddle opening actuator
- 20. Saddle opening receiver
- 21. Wiring for antitheft device
- 34. Horn remote control

- 35. Horn
- 36. Horn button
- 37. Pressure sensor
- 43. Parking electronic control unit
- 51. Electric fan
- 52. Remote control for electric fan

Lights and turn indicators



KEY

- 7. Key switch
- 8. Fuse-box
- 9. Fuse-box
- 10. Battery
- 21. Wiring for antitheft device
- 22. Turn indicator switch
- 23. Hazard switch
- 24. Turn indicator control device
- 25. Left rear turn indicator bulbs
- 26. Rear headlight assembly
- A. Tail light
- B. Stop light

- 27. License plate bulb
 - 28. Right rear turn indicator bulbs
 - 29. Left front turn indicator bulb
 - 30. Front headlight assembly
 - A. Low-beam light bulb
 - B. Tail light
 - C. High-beam light bulb
 - 31. Right front turn indicator bulb
 - 32. Light switch
 - 33. Remote control headlight
 - 43. Parking electronic control unit
 - 48. Instrument panel
-

Checks and inspections

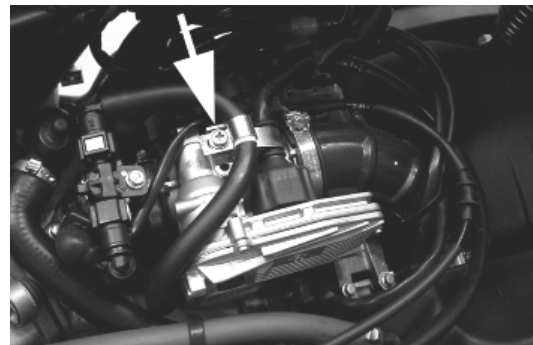
This section is devoted to the checks on the electrical system components.

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 scooter 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 incorporated transponder (red key)
- service key with incorporated transponder (black key)
- H.V. coil
- Diagnostic LED

The diagnostic LED also works as a deterring blinker. This function is activated every time the



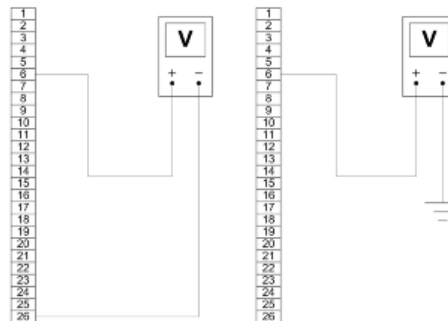
ignition switch is turned to the "OFF" position, or the emergency stop switch is turned to the "OFF" position. It remains activated for 48 hours in order not to affect the battery charge. When the ignition switch is turned to the "ON" position, the deterring blinker function is deactivated. Subsequently, 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:

- there is battery voltage
- fuses 6,7,10 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:

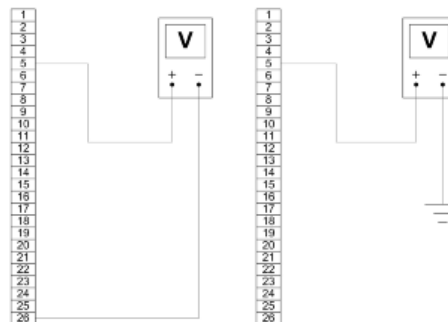
With the key switch set to OFF:

- 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.



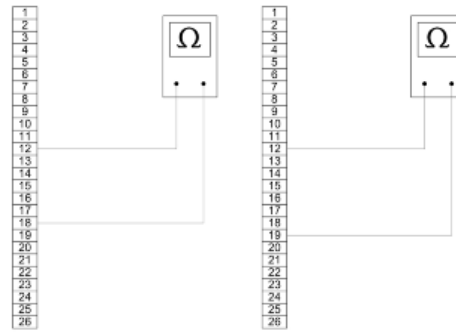
With the key switch in the OFF position:

- 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. 10 and its cable are working order.

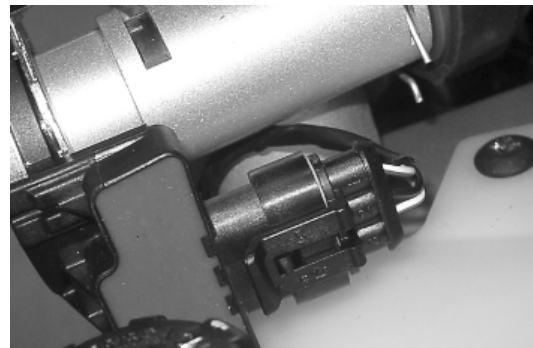


- There is continuity between terminals 12-18 and 12-19 with the emergency cut-out switch in the RUN position. If there is no continuity check the contacts of the latter.

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



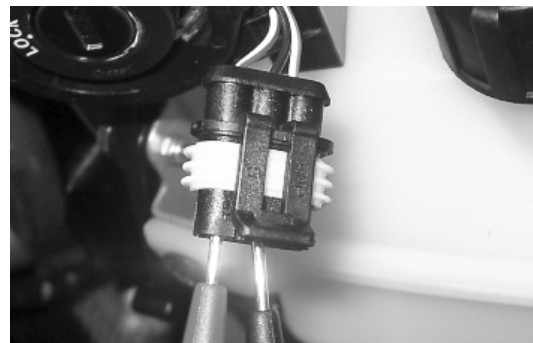
After removing the shield back plate, remove the electrical connection from the aerial as shown in the photograph



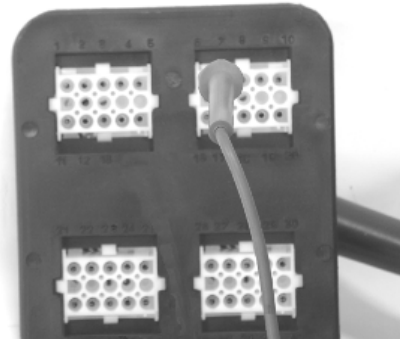
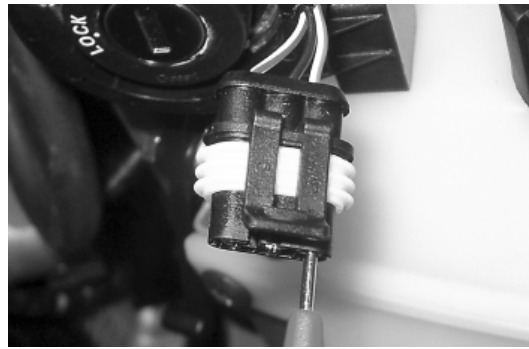
Remove the protective base from the connector.



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.

During a single data storage sequence a maximum of 7 service keys are allowed.

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, master key transponder, decoder and control unit are strictly matched. 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:**

RED KEY

SERVICE key.

BLACK KEY

Diagnostic codes

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

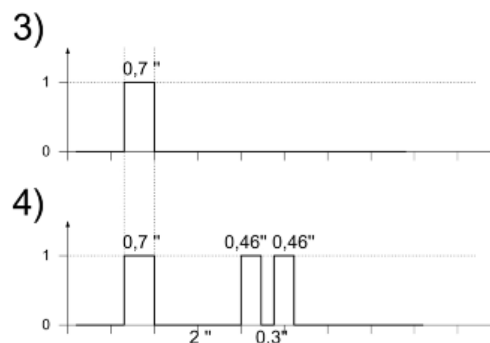
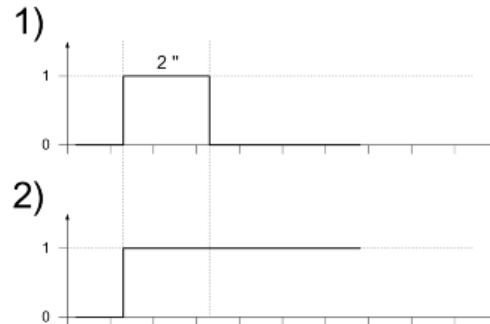
1. Previously unused control unit - key inserted:

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

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

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

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



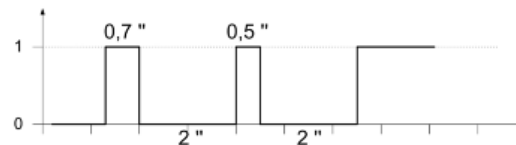
LED remains permanently OFF. The engine can be started.

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

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

Diagnostic code - 1 flash

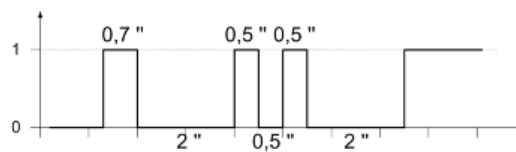
The one-flash code indicates a system where the serial line is not present or is not detected. Check the Immobiliser aerial wiring and change it if necessary.



Diagnostic code - 2 flashes

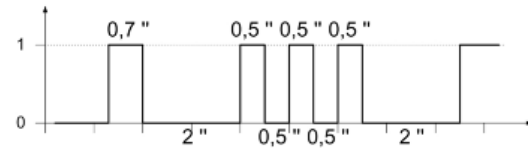
Two-flash code shows a system where the control unit does not show the transponder signal. This might depend on the inefficiency of the immobiliser aerial or the transponder.

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

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



Battery recharge circuit

The recharge system is provided with a three-phase alternator with permanent magneto flywheel.

The alternator is directly connected to the voltage regulator.

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

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

Stator check

Stator winding check-up

WARNING

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

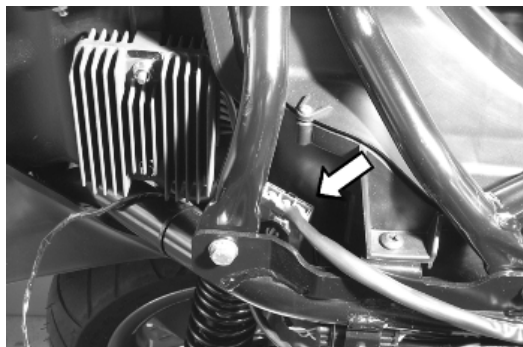
- 1 Remove the right side panel.
- 2) Disconnect the connector between stator and regulator with the three yellow cables as shown in the photograph.
- 3) Measure the resistance between each of the yellow terminals and the other two.

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 ignition key still at OFF, the reading detected by the ammeter must be ≤ 0.5 mA.

Check the charging current

WARNING

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

- 1) Place the vehicle on its centre stand
- 2) With the battery correctly connected to the circuit, place the tester terminals between the battery terminals..
- 3) Turn on the engine, increase the revs 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

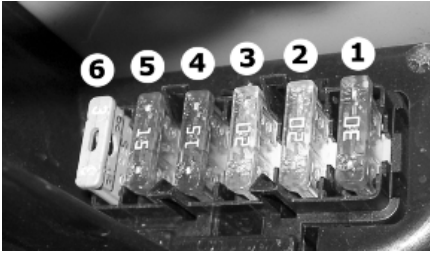
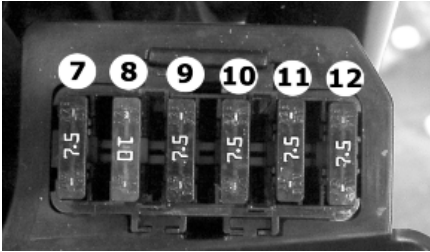
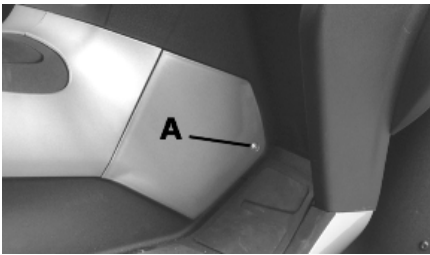
Fuses

The electrical system has twelve fuses divided in two fuse boxes to protect the different installation circuits. One of them is inside the battery compartment and the other is at the right internal side of the footrest. To be able to reach, loosen the screw "A" and remove the plastic cover. The chart shows the position and characteristics of the fuses in the vehicle.

CAUTION



BEFORE REPLACING THE 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: 30A Protected circuits: Voltage regulator Location: battery compartment
2	Fuse No. 2	Capacity: 20A Protected circuits: battery-powered fuse No. 7, live fuses No. 8 - No. 9 - No.10 - No. 11 Location: battery compartment
3	Fuse No. 3 (if present)	Capacity: 20A Protected circuits: parking control ECU Location: battery compartment
4	Fuse No. 4	Capacity: 15 A Protected circuits: Battery-powered saddle opening switch, glove-box lighting, headlight, emergency turn indicator Location: battery compartment
5	Fuse No. 5	Capacity: 15 A Protected circuits: Battery-powered injection loads, electrical fan Location: battery compartment
6	Fuse No. 6	Capacity: 3A Protected circuits: Battery-powered injection control unit Location: battery compartment

	Specification	Desc./Quantity
7	Fuse No. 7	Capacity: 7.5 A Protected circuits: Battery-powered instrument panel Location: footrest
8	Fuse No. 8	Capacity: 10A Protected circuits: Live stop and start lights Location: footrest
9	Fuse No. 9	Capacity: 7.5 A Protected circuits: live passing and horn Location: battery compartment
10	Fuse No. 10	Capacity: 7.5A Protected circuits: Live injection, electrical fan remote control antenna, injection loads remote control Location: footrest
11	Fuse No. 11	Capacity: 7.5A Protected circuits: Live ECU parking lever, antitheft device, instrument panel, headlight remote control, horn remote control Location: footrest
12	Fuse No. 12	Capacity: 7.5A Protected circuits: Live turn indicator, saddle opening switch, tail lights, panel lighting Location: footrest

Dashboard

A = Led immobilizer / anti-theft device

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

C = CLOCK switch

D = Digital display

E = Front suspension locking system warning light (if available)

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

D= Turn indicator warning light

P = Low oil pressure warning light

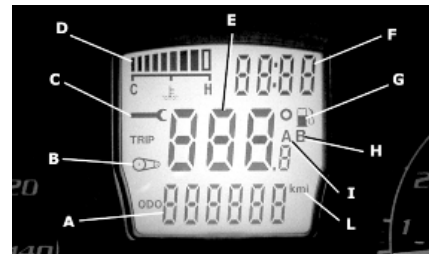
Q = Front suspension locking system failure warning light (if available)

R = Warning light for parking brake engaged

C = High-beam warning light



- A = Total odometer gauge
 B = «BELT» maintenance icon
 C = «SERVICE» maintenance icon
 D = Engine coolant temperature indicator
 E = Trip odometer gauge (A-B) and ambient temperature (selected with the MODE button)
 F = TIME-DATE indicator
 G = Low fuel warning light
 H = Trip odometer gauge (B)
 I = Trip odometer gauge (A)
 L = Kilometre - mile indicator



Sealed battery

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

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

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

INSTRUCTIONS FOR THE RENEWAL RECHARGE AFTER OPEN-CIRCUIT STORAGE

1) Voltage check up

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

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

2) Constant voltage battery charge mode

- Constant voltage charge equal to 14.40 ÷ 14.70V

-Initial charge voltage equal to $0.3 \div 0.5$ 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

Connectors

1A Alimentazione potenziometro

2A Linea CAN

3A Alimentazione spie

4A Spia blocco rollio

5A Spia warning

6A Uscita teleruttore anabbaglianti

7A Massa potenziometro

8A Massa centralina

1B Alimentazione da chiave

2B Linea CAN

3B Sensore giri ruota SX

4B Sensore giri ruota DX

5B Segnale potenziometro

6B Pulsante comando bolocco - sblocco rollio

7B Teleruttore claxon (allarme)

8B Uscita (A) motore elettro-attuatore

1C Alimentazione da batteria

2C Linea "K"

3C Pulsante comando bolocco - sblocco rollio

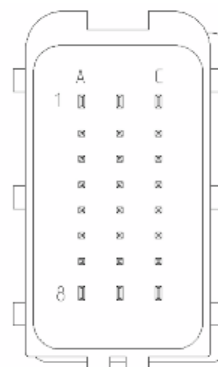
4C Pulsante pinza rollio

5C Pulsante comando bolocco - sblocco rollio

6C Sensore presenza pilota

7C Segnale di velocita per il gruppo strumenti

8C Uscita (B) motore elettro-attuatore



Dashboard



- 1/20** Sensore velocità
- 2/20** Segnale livello carburante
- 3/20** Sensore temperatura liquido di raffreddamento
- 4/20** Massa sensore temperatura liquido di raffreddamento
- 5/20** Pulsante mode remoto
- 6/20** Spia pressione olio
- 7/20** Spia lampeggiatore sinistro
- 8/20** Spia lampeggiatore destro
- 9/20** Spia luce abbagliante
- 10/20** Spia bauliera aperta
- 11/20** Sensore giri
- 12/20** Sensore temperatura ambiente
- 13/20** Massa sensore temperatura ambiente
- 14/20** Spia motore inibito
- 15/20** Spia immobilizer
- 16/20** Spia controllo motore
- 17/20** Spia freno di stazionamento
- 18/20** Spia blocco rollio attivato
- 19/20** Spia avaria sistema blocco rollio
- 20/20** Positivo sotto chiave dalla centralina comando di stazionamento
- 5/12** Illuminazione
- 6/12** Positivo batteria
- 11/12** Massa
- 12/12** Positivo sotto chiave

Remote seat opening

Zeroing

- Remove the left side fairing to access the saddle opening receiver control unit indicated in the photograph
- Remove the metal terminal and connect it to a good earth 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, turn the key back to «**OFF**» from the «**ON**» position, all within 4 seconds.
- 3 Wait 1 to 8 seconds.
4. Repeat steps 2 and 3 for 4 times without removing the key.

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

WARNING



TO STORE THE OTHER REMOTE CONTROLS TO MEMORY, (MAXIMUM 8), 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

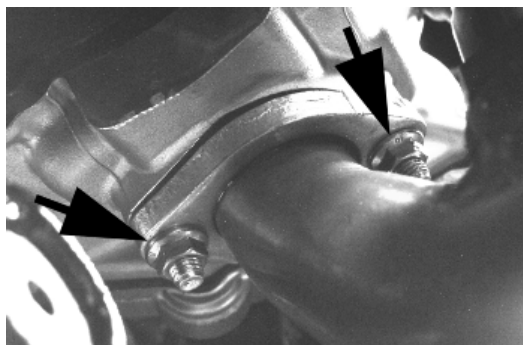
This section describes the operations to carry out when removing the engine from the vehicle.

Exhaust assy. Removal

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



- Undo the two exhaust manifold fixings on the head. To undo the nuts fixing the muffler flange to the head properly, you must use a jointed wrench that enables you to get at the right nut as well, according to the direction of travel, that is difficult to get at with a traditional straight wrench.



- Undo the three screws fixing the muffler to the support arm.

Remove the full muffler unit.



Remove the lambda probe from the manifold.



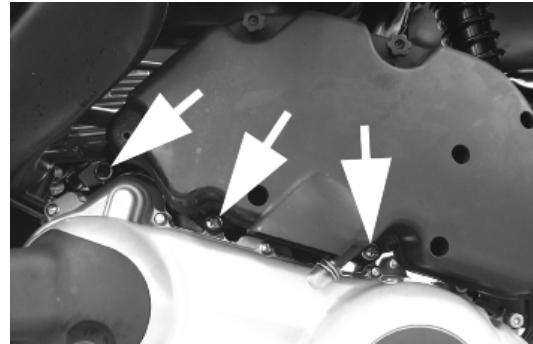
CAUTION: SHOULD IT BE NECESSARY TO REMOVE ONLY THE MUFFLER TIP, ALWAYS REPLACE THE GRAPHITE GASKET BETWEEN STUB AND TIP.

Removal of the engine from the vehicle

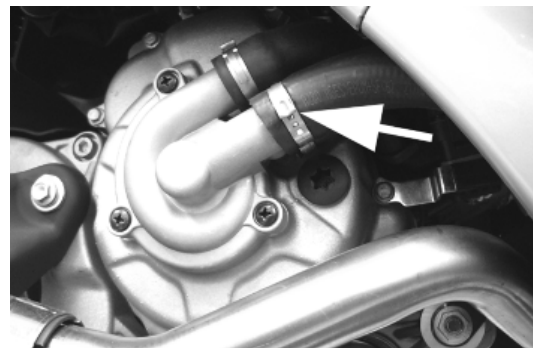
- Disconnect the battery
 - Remove the engine cover inside the helmet compartment
 - Remove the side panels
- Remove the full muffler assembly.

CAUTION

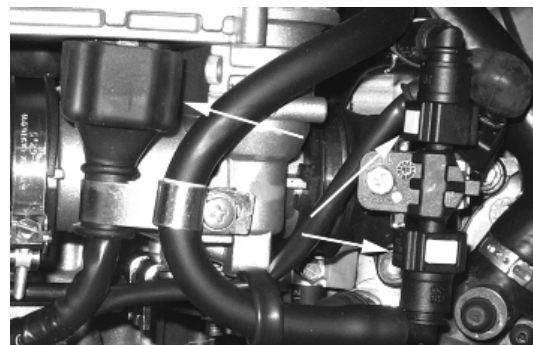
THIS OPERATION MUST BE CARRIED OUT WHEN THE ENGINE IS COLD.



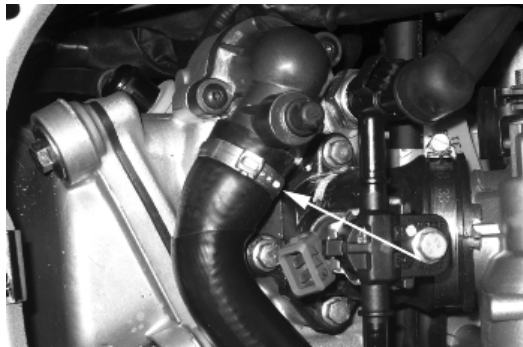
- Remove the rear wheel.
- Remove the pipe feeding coolant into the pump as shown in the photograph and then empty the system.
- Remove the engine coolant outlet pipe as indicated.



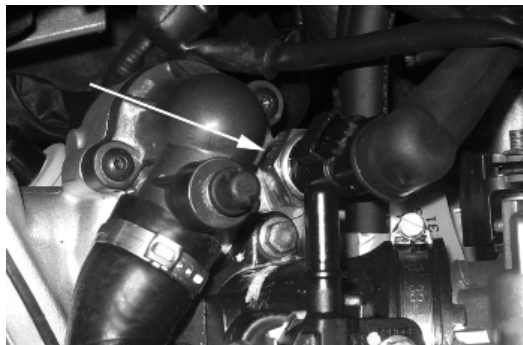
- Disconnect the fuel delivery and return pipes from the injector by removing the screw locking the retaining clip.
- Disconnect the injector wiring and the throttle body control unit wiring.



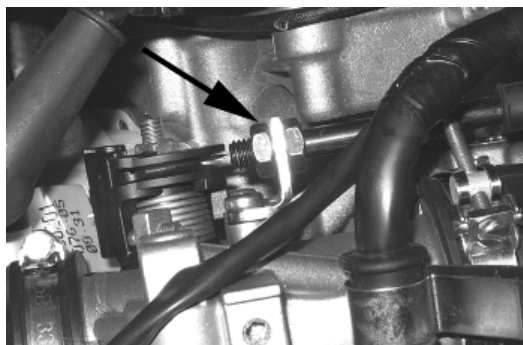
- Remove the coolant outlet pipe from the motor as indicated.



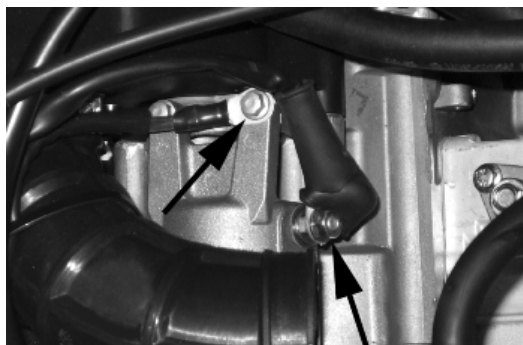
- Remove the spark plug caps.
- Remove the coolant temperature sensor connector indicated in the photo.



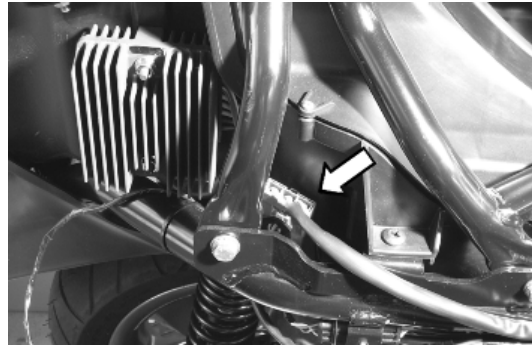
- Remove the throttle cable from the throttle body by undoing the nut shown in the photo.



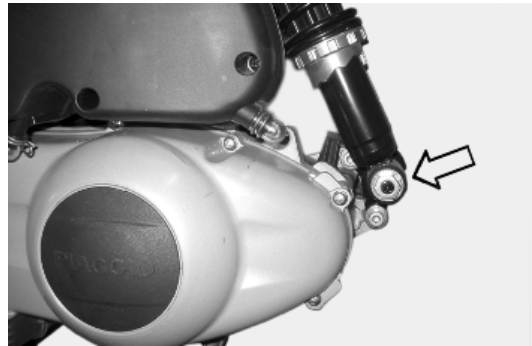
- Remove the positive and negative wiring from the starter motor as shown in the photo.



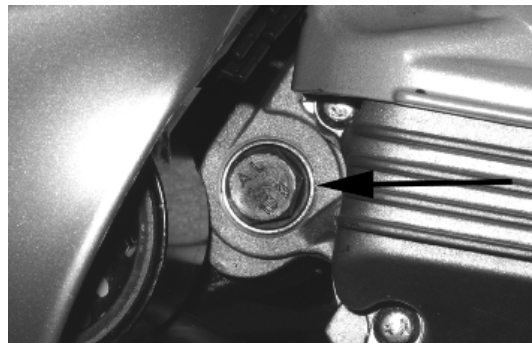
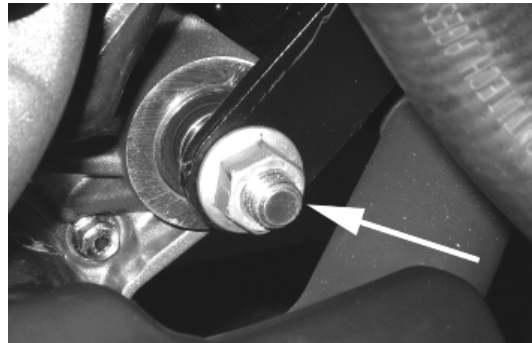
- Disconnect the connectors from the flywheel wiring as shown in the photo.
- Remove the cable from the retaining clip on the flywheel cover.



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



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



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

- Check the engine oil level and if necessary top it up with the recommended type.
- Fill and bleed the cooling circuit.
- Check the functioning of the accelerator and the electrical devices.

CAUTION

PAY PARTICULAR ATTENTION TO POSITIONING THE THROTTLE COMMAND TRANSMISSION PROPERLY.

INDEX OF TOPICS

ENGINE

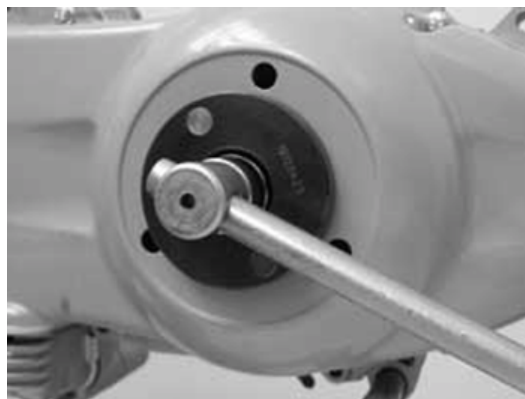
ENG

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

Automatic transmission

Transmission cover

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



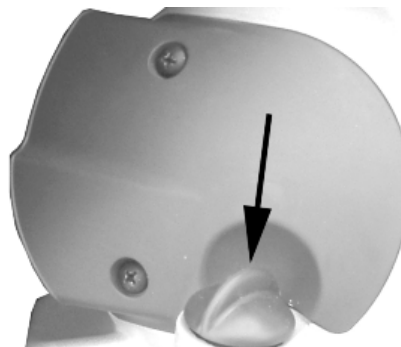
Specific tooling

020423Y driven pulley lock wrench

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

N.B.

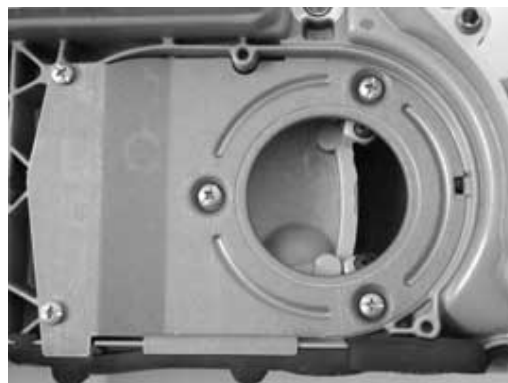
WHEN YOU ARE REMOVING THE TRANSMISSION COVER YOU MUST BE CAREFUL NOT TO DROP THE CLUTCH BELL.



Air duct

Versione 250

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



- To remove the intake throat on the transmission cover, just remove the 2 fixing screws indicated in the figure.



Removing the driven pulley shaft bearing

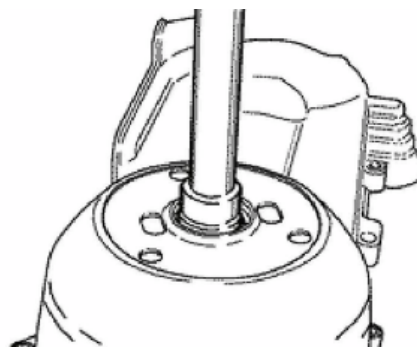
- Remove the clip from the inside of the cover.
- Remove the bearing from the crankcase by means of:

Specific tooling

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm

020412Y 15 mm guide



Refitting the driven pulley shaft bearing

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

CAUTION

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

N.B.

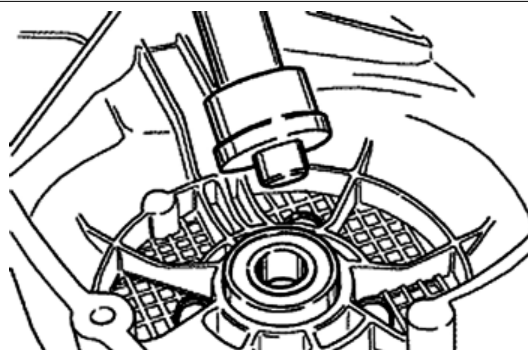
ALWAYS REPLACE THE BEARING WITH A NEW ONE UPON REFITTING.

Specific tooling

020376Y Adaptor handle

020357Y 32 x 35 mm adaptor

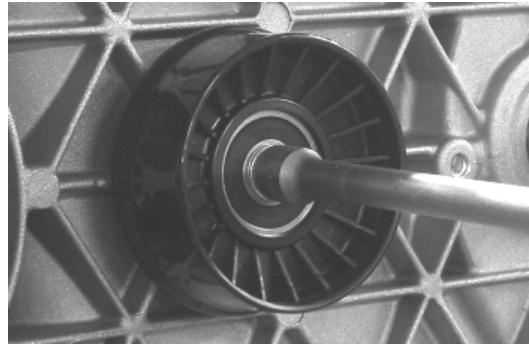
020412Y 15 mm guide



Baffle roller

Plastic roller

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



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



Locking torques (N*m)

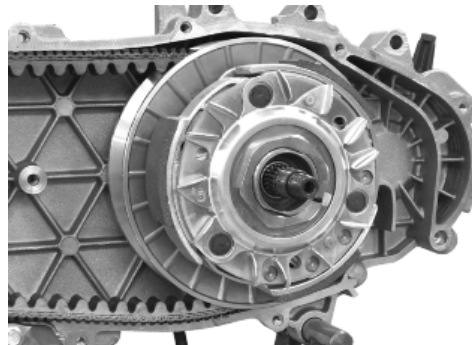
Anti-flapping roller 12 - 16

Removing the driven pulley

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

N.B.

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



Inspecting the clutch drum

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

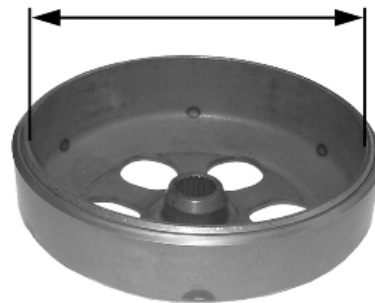
Characteristic

Max. value clutch bell

Max. value: \varnothing 134.5 mm

Clutch bell standard value

Standard value: \varnothing 134 - 134.2 mm



Checking the bell working surface eccentricity

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



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

Specific tooling

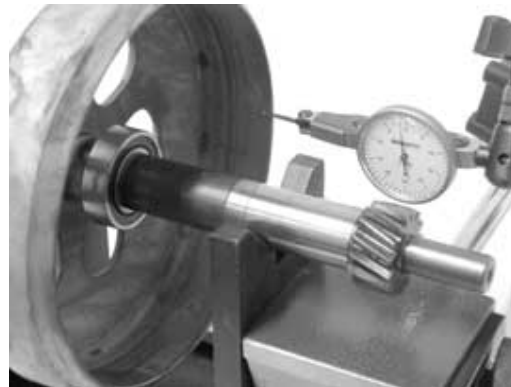
020074Y Support base for checking crankshaft alignment

020335Y Magnetic support for dial gauge

Characteristic

clutch bell inspection: Limit eccentricity.

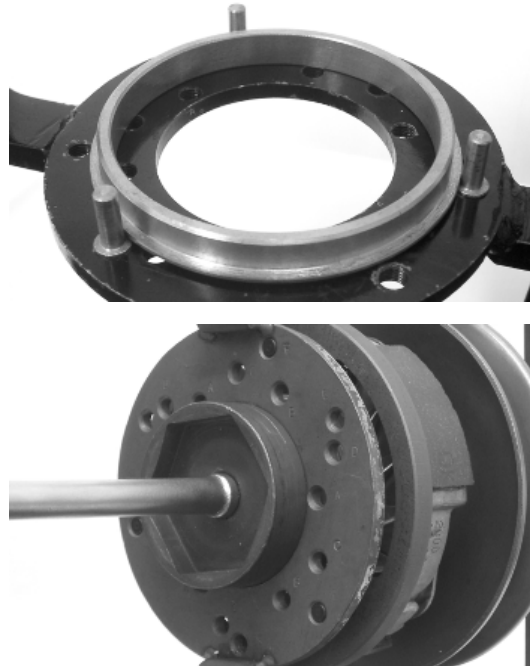
Admissible limit eccentricity: 0.15 mm



Removing the clutch

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

- Introduce the adapter ring No. 11 with the chamfering facing the inside of the tool.
- Fit the driven pulley unit on the tool with the insertion of the 3 pins in the ventilation holes in the mass holder support.
- Make sure that the clutch is perfectly inserted into the adapter ring before proceeding to loosen/tighten the clutch nut.
- Use the special 46x55 wrench component No. 9 to remove the nut fixing the clutch in place.
- Dismantle the driven pulley components (Clutch and spring with its plastic holder)



CAUTION

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

Specific tooling

020444Y011 adapter ring

020444Y009 46x55 Wrench

020444Y Tool for fitting/ removing the driven pulley clutch

Inspecting the clutch

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

N.B.

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

CAUTION



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

Characteristic

Check minimum thickness

1 mm

Pin retaining collar

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

N.B.

USE TWO SCREWDRIVERS IF YOU HAVE DIFFICULTY.

N.B.

BE CAREFUL NOT TO PUSH THE SCREW DRIVERS IN TOO FAR TO AVOID DAMAGE THAT COULD ENDANGER THE O-RING SEAL.

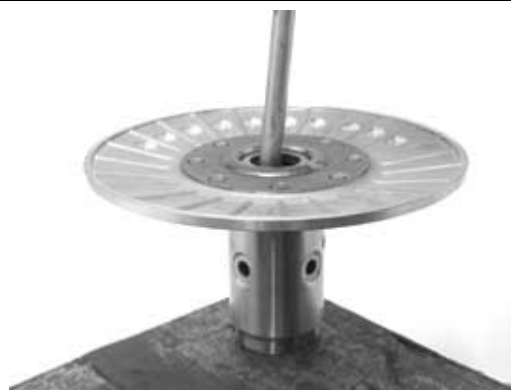


- Remove the four torque server pins and pull the pulley halves apart.



Removing the driven half-pulley bearing

- Check there are no signs of wear and/or 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 Belle for OD 47-mm bearings



- Remove the roller bearing using the modular punch.

Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020363Y 20 mm guide

Inspecting the driven fixed half-pulley

Version 250

- Measure the 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 Ø 40.96 mm

Half-pulley standard diameter

Standard diameter: Ø 40.985 mm

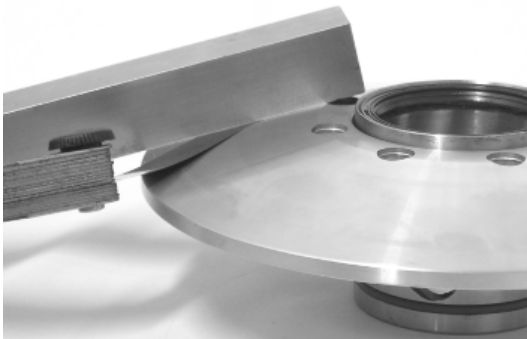
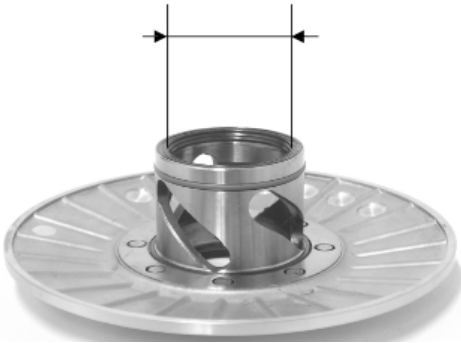
Wear limit

0.3 mm



Inspecting the driven sliding half-pulley

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



MOVABLE DRIVEN HALF-PULLEY DIMENSIONS

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

Refitting the driven half-pulley bearing

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

WARNING

N.B.

FIT THE BALL BEARING WITH THE VISIBLE SHIELD

Specific tooling

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm

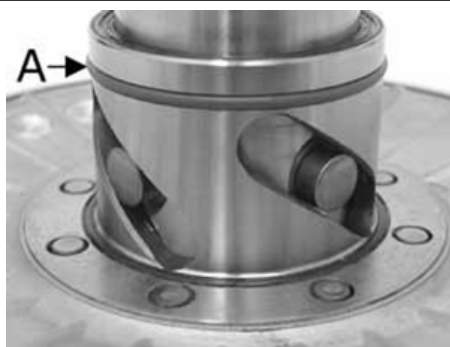
020424Y Driven pulley roller casing fitting punch





Refitting the driven pulley

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



N.B.

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

Specific tooling

020263Y Sheath for driven pulley fitting

Recommended products

AGIP GREASE SM 2 Grease for the tone wheel revolving ring

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

Inspecting the clutch spring

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

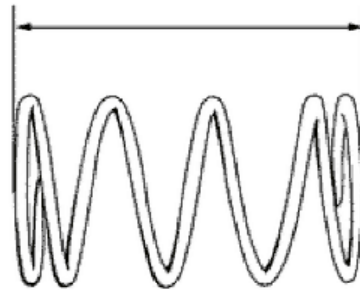
Characteristic

Standard length

123 mm

acceptable limit after use:

118 mm



Refitting the clutch

- Support the driven pulley spring compressor appropriate tool with the control screw in vertical axis.
- Arrange the tool with the medium length pins screwed in position "C" on the inside.
- Introduce the adapter ring No. 11 with the chamfering facing upwards.
- Insert the clutch on the adapter ring.
- Lubricate the end of the spring that abuts against the servo-system closing collar.
- Insert the spring with its plastic holder in contact with the clutch.
- Insert the driving belt into the pulley unit according to their direction of rotation.
- Insert the pulley unit with the belt into the tool.
- Slightly preload the spring.
- Make sure that the clutch is perfectly inserted into the adapter ring before proceeding to tighten the clutch nut.
- Place the tool in the clamp with the control screw on the horizontal axis.
- Fully preload the spring.



- Apply the clutch fixing nut and tighten it to the prescribed torque using the special 46x55 wrench.
- Loosen the tool clamp and insert the belt according to its direction of rotation.
- Lock the driven pulley again using the specific tool.
- Preload the clutch return spring with a traction/rotation combined action and place the belt in the smaller diameter rolling position.
- Remove the driven pulley /belt unit from the tool.

N.B.

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

N.B.

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

Specific tooling

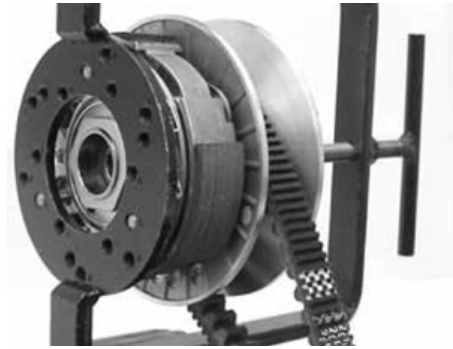
020444Y Tool for fitting/ removing the driven pulley clutch

020444Y011 adapter ring

020444Y009 46x55 Wrench

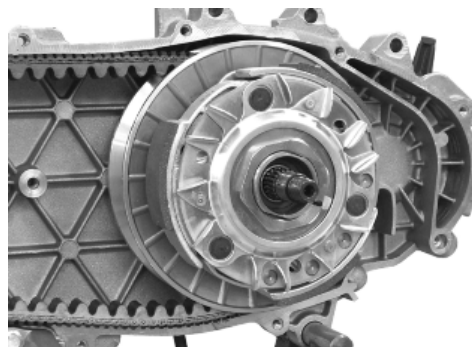
Locking torques (N*m)

Clutch unit nut on driven pulley 45 ÷ 50



Refitting the driven pulley

- Refit the clutch bell.



Drive-belt

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

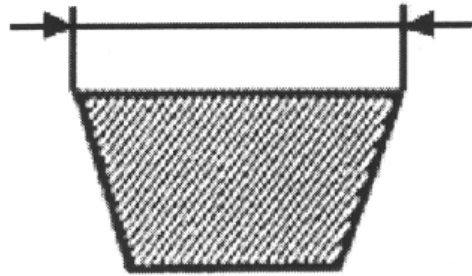
Characteristic

250 4T Transmission belt/minimum width

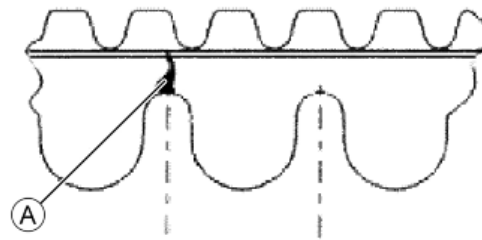
19.5 mm

250 4T Transmission belt/standard width

21.3 ± 0.2 mm



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

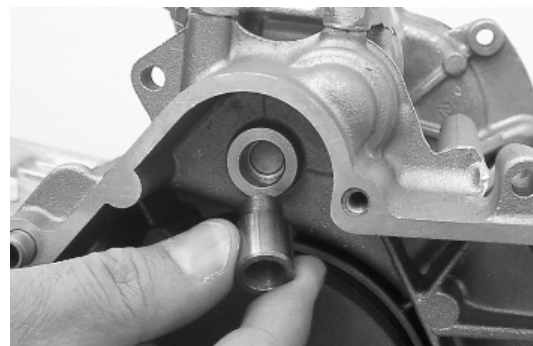


Removing the driving pulley

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



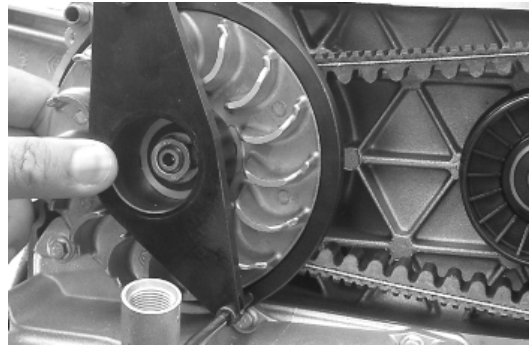
- Insert the adaptor sleeve of the appropriate tool in the hole shown in the photograph



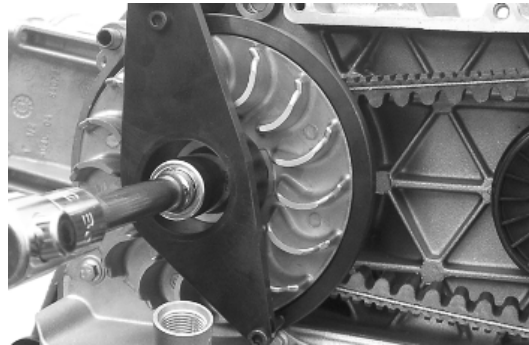
- Insert the tool in the hollows and apply the retention ring
- Bring in the ring's clamping screws while keeping the tool to support the pulley

Specific tooling

020626Y Driving pulley lock wrench



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



Inspecting the rollers case

- Check that the internal bushing shown in the figure is not abnormally worn and measure 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 contact surfaces on both pulley halves.
- Check that stationary driving pulley does not show signs of abnormal wear on the grooved edge and on the surface in contact with the belt.
- Check that the O-ring is not pushed out of shape.



CAUTION

DO NOT LUBRICATE OR CLEAN SINTERED BUSHINGS

Characteristic

Movable driving half-pulley bushing: Standard Diameter

26.000 - 26.021 mm

Movable driving half-pulley bushing: Maximum allowable diameter

Ø 26.12 mm

Sliding bushing: Standard Diameter

Ø 25.959 ÷ 25.98 mm

Sliding bushing: Minimum admissible diameter

Ø 25.95 mm

Roller: Standard Diameter

Diameter 20.5 - 20.7 mm

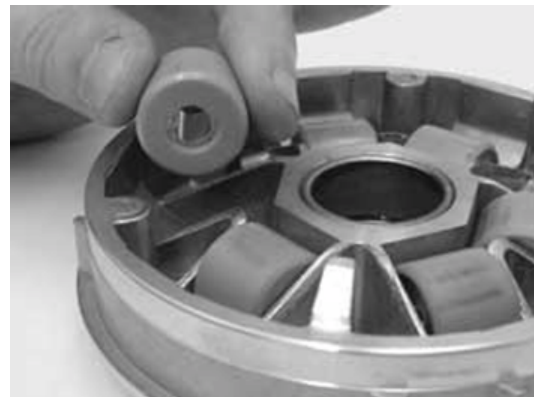
Roller: Minimum diameter permitted

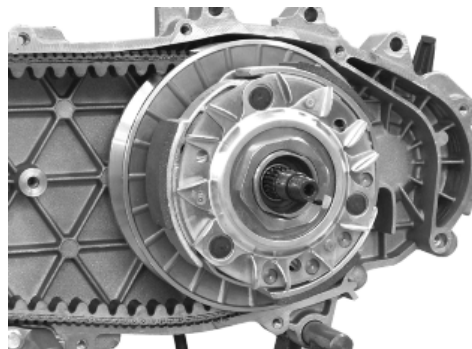
Ø 20 mm



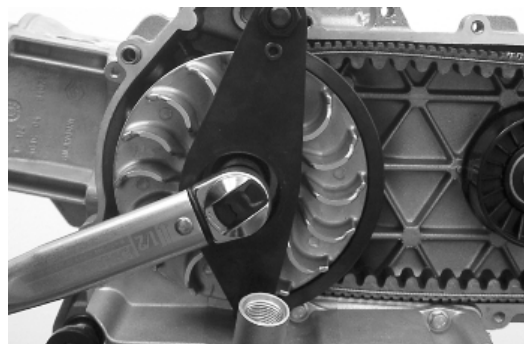
Refitting the driving pulley

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



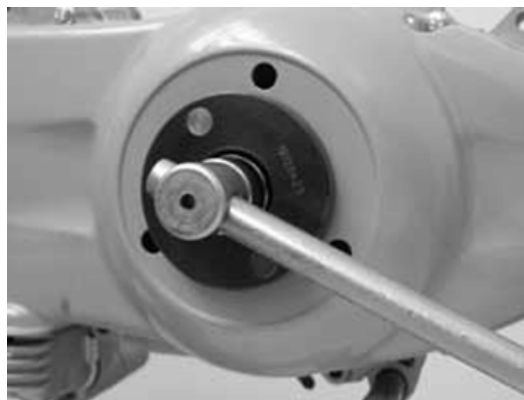


- Fit the steel shim in contact with the bushing and the stationary drive pulley.
- Install the appropriate tool as described in the removal phase.
- Tighten the nut with washer to the prescribed torque.

**Specific tooling****020626Y Driving pulley lock wrench****Locking torques (N*m)****Drive pulley nut 75 ÷ 83**

Refitting the transmission cover

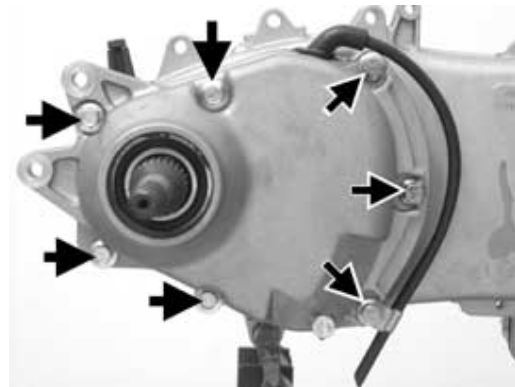
- Check the presence of the 2 centring dowels and the correct installation of the sealing gasket for the oil sump on the transmission cover.
- Replace the cover tightening the 10 screws at the specified torque.
- Refit the oil loading cap/bar.
- refit the steel washer and the driven pulley nut.
- Tighten the nut to the prescribed torque using the lock wrench and the torque wrench tools.
- Replace the plastic cover.

**Specific tooling****020423Y driven pulley lock wrench****Locking torques (N*m)****Transmission cover screws 11 ÷ 13 Driven pulley shaft nut 54 ÷ 60**

End gear

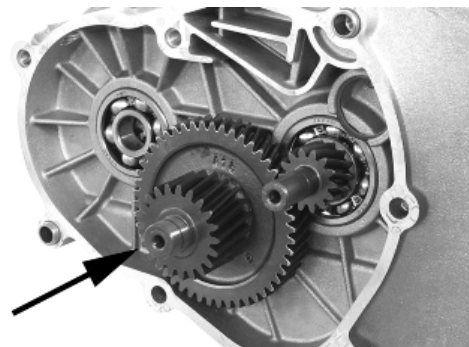
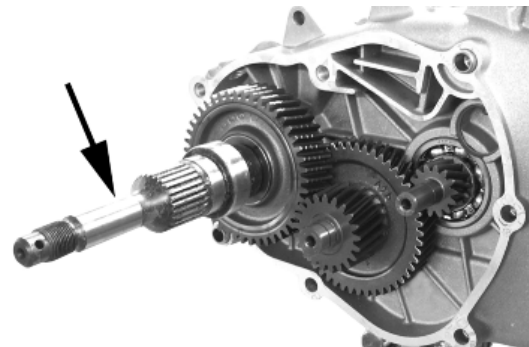
Removing the hub cover

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



Removing the wheel axle

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



Removing the hub bearings

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

Specific tooling

001467Y013 Pliers to extract 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 Adaptor 37 mm

020483Y 30 mm guide

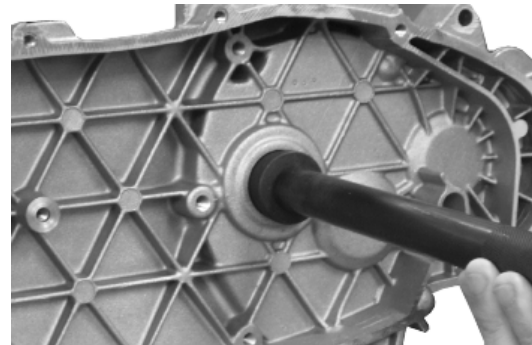
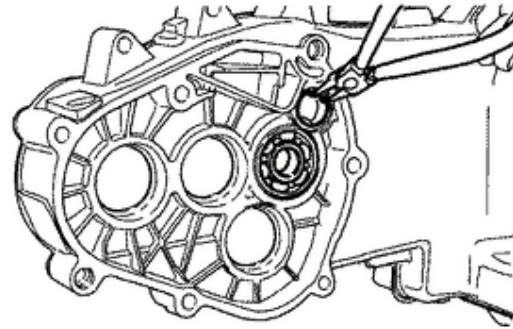
020359Y 42x47-mm adaptor

020489Y Hub cover support stud bolt set



Removing the driven pulley shaft bearing

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



Specific tooling

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm

020363Y 20 mm guide

Inspecting the hub shaft

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



Inspecting the hub cover

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

Refitting the wheel axle bearing

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

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

Specific tooling

020376Y Adaptor handle

020360Y Adaptor 52 x 55 mm

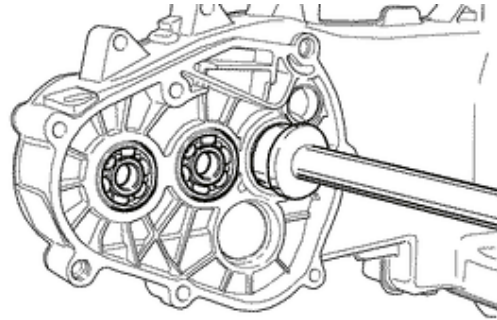
020483Y 30 mm guide



Refitting the hub cover bearings

For the fitting of the hub box bearings the engine crankcase and the cover must be heated with the special heat gun.

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



Specific tooling

020150Y Air heater support

020151Y Air heater

020376Y Adaptor handle

020359Y 42x47-mm adaptor

020412Y 15 mm guide



N.B.

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

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

N.B.

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

Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm adaptor

020363Y 20 mm guide



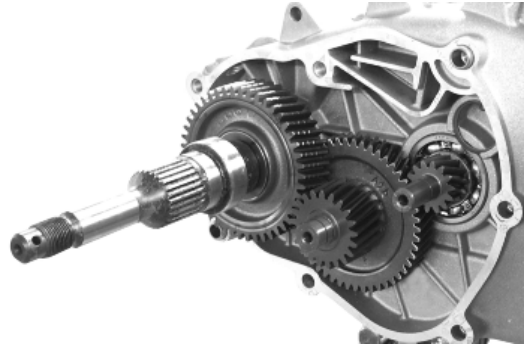
N.B.

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

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

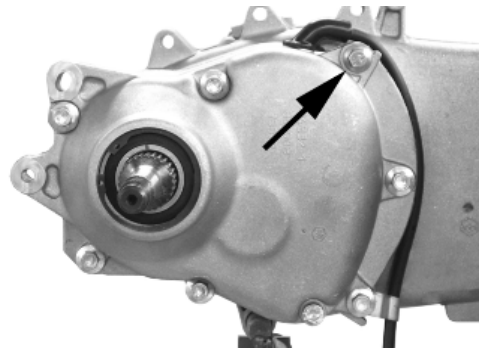
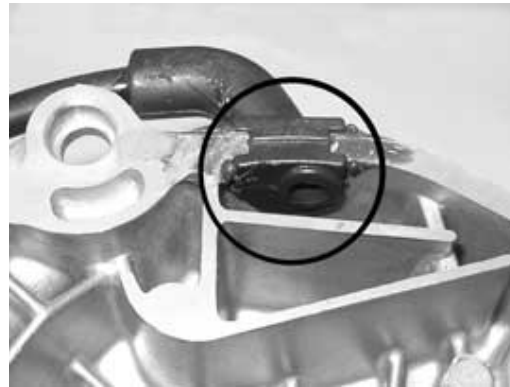
Refitting the hub bearings

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



Refitting the ub cover

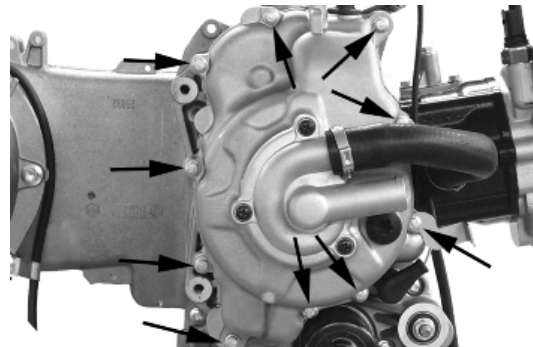
- Fit a new gasket together with the centring dowels.
- Seal the gasket of the breather pipe using black silicone sealant.
- Fit the gearbox cover, making sure the breather pipe is in the correct position.
- Position the shorter screw that can also be recognised from the different colour as shown in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



Flywheel cover

Removing the hub cover

- Remove the clip fixing the hose to the cylinder.
- Remove the ten fixings
- Remove the flywheel cover.



Removing the stator

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



Refitting the stator

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

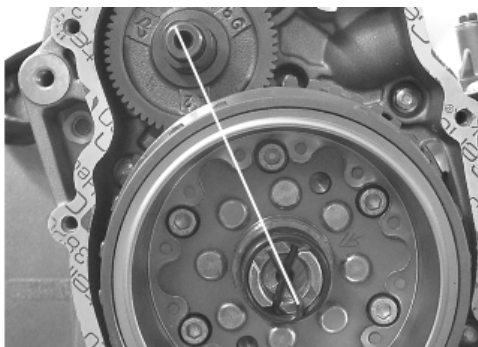
Locking torques (N*m)

Stator assembly screws (°) 3 ÷ 4

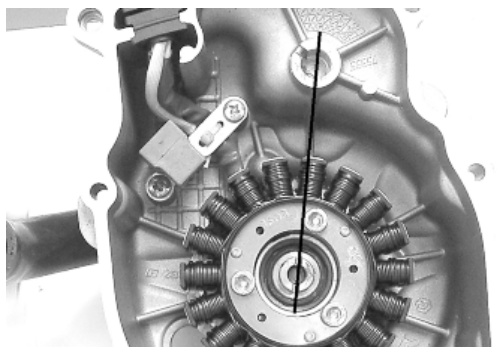


Refitting the flywheel cover

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



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



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

CAUTION

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

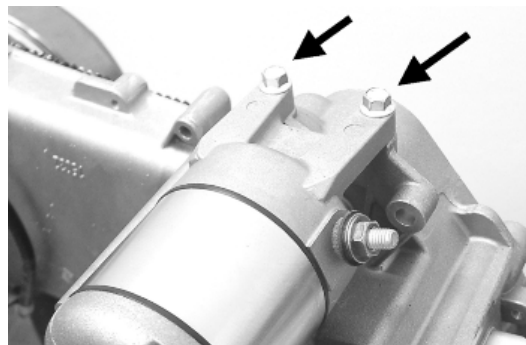
Locking torques (N*m)

Flywheel cover screws 11 - 13

Flywheel and starting

Removing the starter motor

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

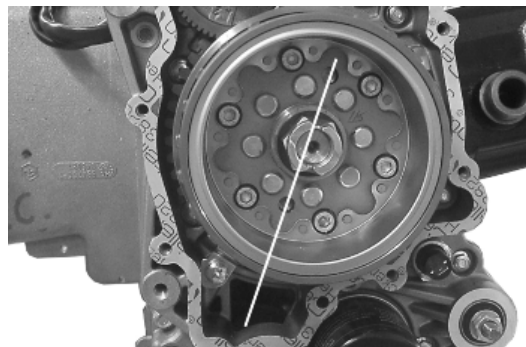


Removing the flywheel magneto

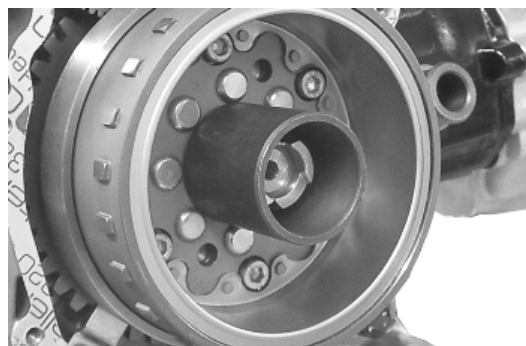
- Remove the water pump shaft and crankshaft spline clip



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



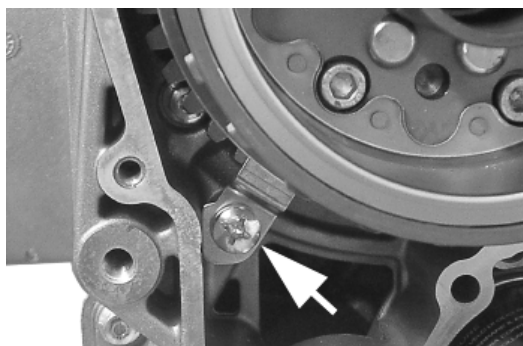
- Screw in the guide bushing that is part of the special flywheel stop tool on the flywheel as shown in the photo.



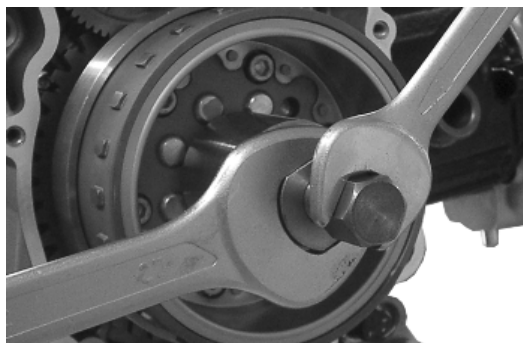
-
- Insert the special flywheel stop tool on the flywheel as shown in the photo

Specific tooling**020627Y Flywheel lock wrench**

-
- Remove the plate indicated in the photo.



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

Specific tooling**020467Y Flywheel extractor**

Inspecting the flywheel components

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

Refitting the free wheel

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

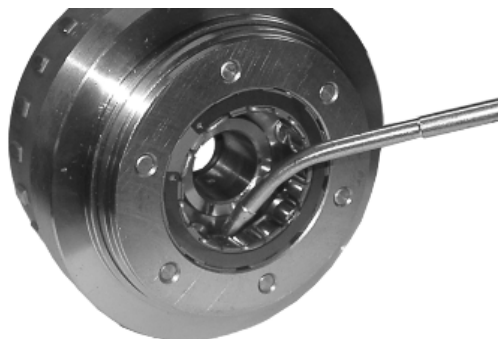
Recommended products**Loctite 243 Medium strength threadlock**

Loctite 243 medium-strength threadlock

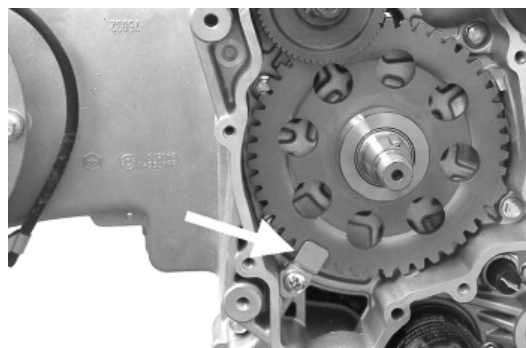
- Fit the freewheel on the magneto flywheel making sure that the ground side is in contact with the flywheel itself, i.e. with wheel seeger ring visible.
- Lock the six clamping screws in criss-cross fashion to the prescribed torque.

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

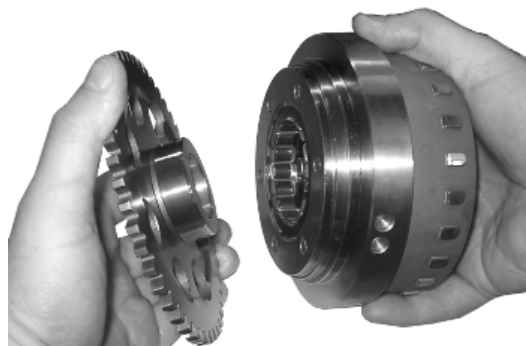
- Oil the free wheel "rollers".

**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



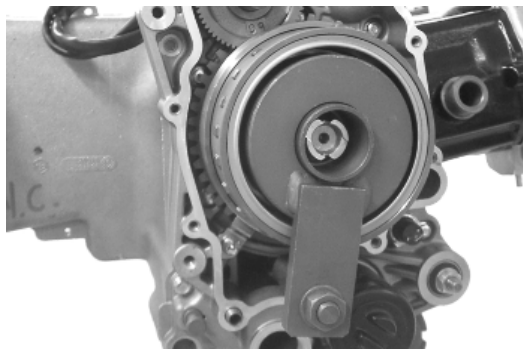
- Using the special flywheel stop tool, tighten up the flywheel fixing nut to the prescribed torque
- Refit the retention plate

Specific tooling

020627Y Flywheel lock wrench

Locking torques (N*m)

Flywheel nut $94 \div 102$

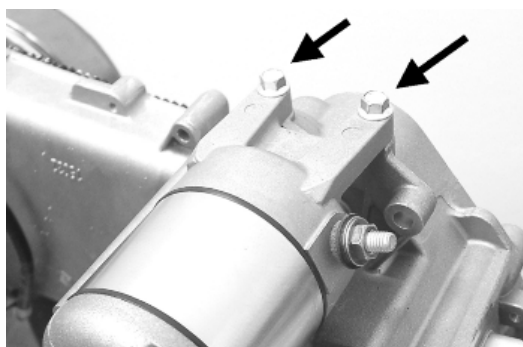


Refitting the starter motor

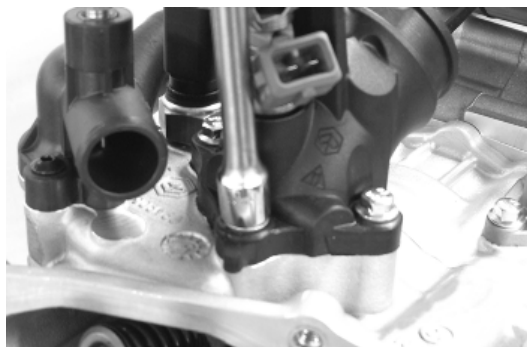
- Fit a new O-ring on the starter motor and lubricate it.
- Fit the starter on the crankcase, locking the two screws to the prescribed torque.

Locking torques (N*m)

Starter motor screws $11 \div 13$



Cylinder assy. and timing system

Removing the intake manifold

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

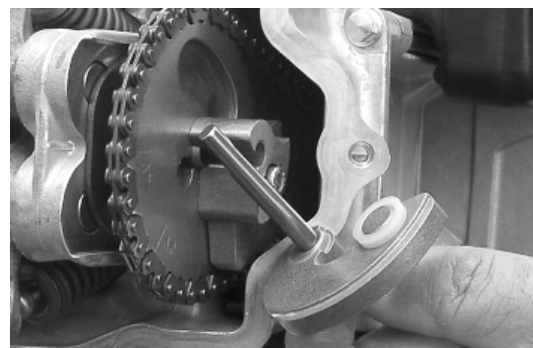
Removing the rocker-arms cover

- Remove the 5 screws indicated in the figure

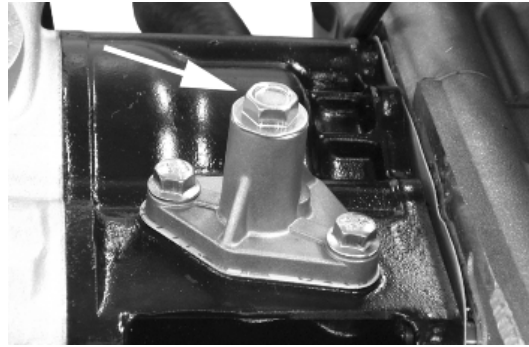


Removing the timing system drive

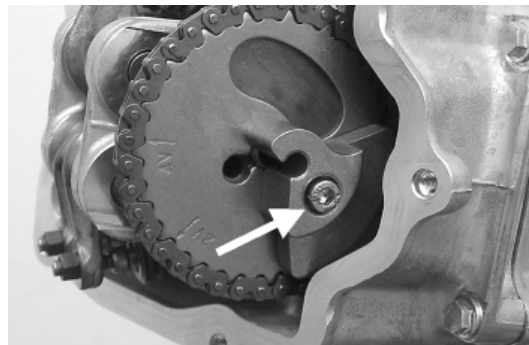
- Remove the parts listed below first: transmission cover, drive pulley with belt, oil sump with spring and by-pass piston, oil pump pulley cover, O-ring on the crankshaft and the sprocket wheel separation washer.
- Remove the tappet cover.
- Remove the central screw fastener and the automatic valve-lifter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



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



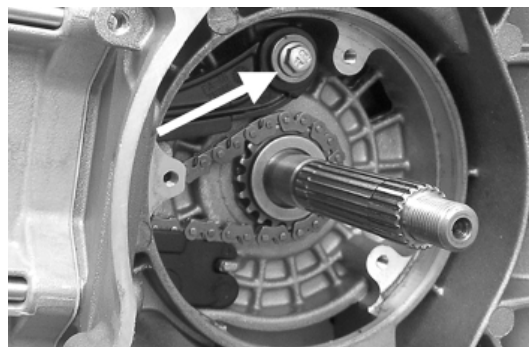
- Remove the internal hex screw and the counterweight shown in the figure.



- Remove the camshaft control pulley with its washer.



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



N.B.

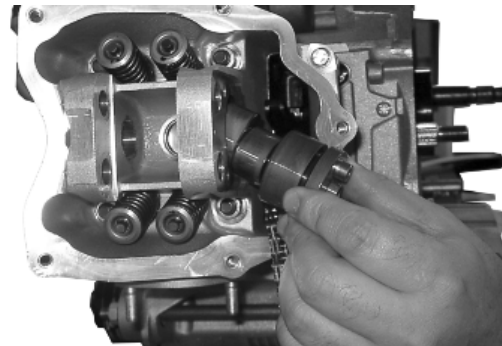
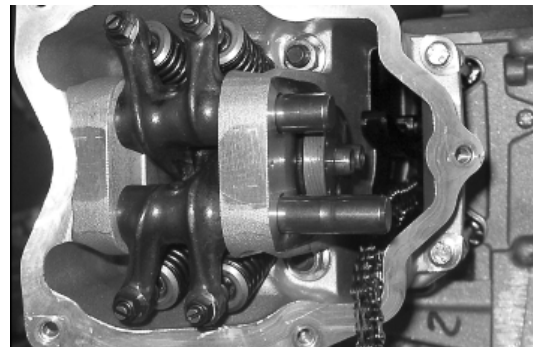
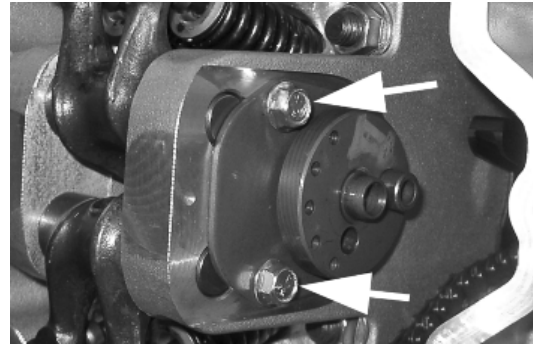
IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.

Removing the cam shaft

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

N.B.

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

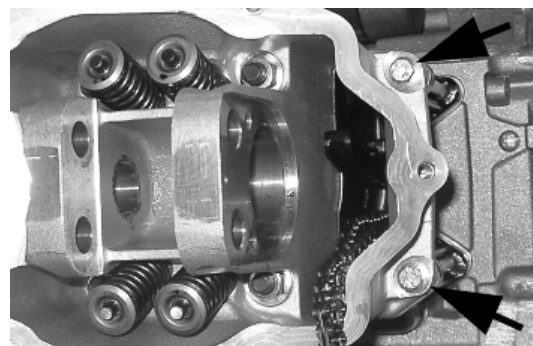


Removing the cylinder head

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

N.B.

IN CASE OF NEED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, PINS, ROCKING LEVERS AND FIXING BRACKET. THE HEAD CAN ALSO BE REMOVED WITHOUT RE-



**MOVING 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 adapter for valve removal tool

020382Y Valve cotters equipped with part 012
removal tool

020431Y Valve oil seal extractor



Removing the cylinder - piston assy.

Removing cylinder and piston

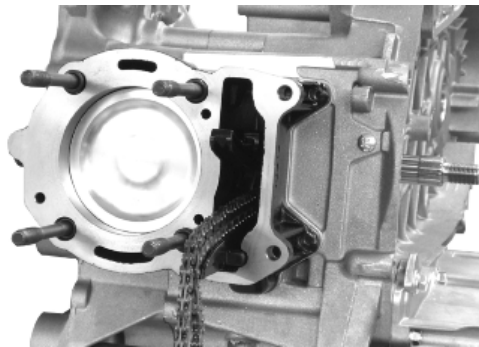
- Remove the chain guide pad.
- Remove the 4 O-rings on the stud bolts.
- Pull out the cylinder.
- Remove the cylinder base gasket.
- Remove the two stop rings, the wrist pin and the piston.
- Remove the piston seals.

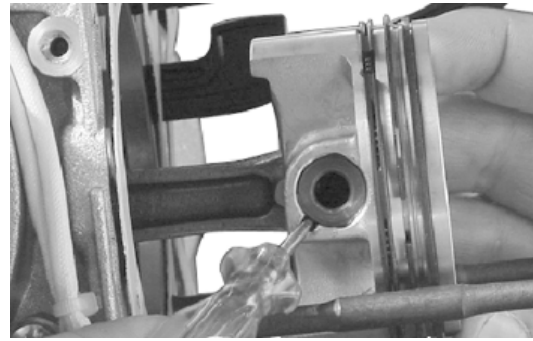
CAUTION

**TO AVOID DAMAGING THE PISTON, SUP-
PORT 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.

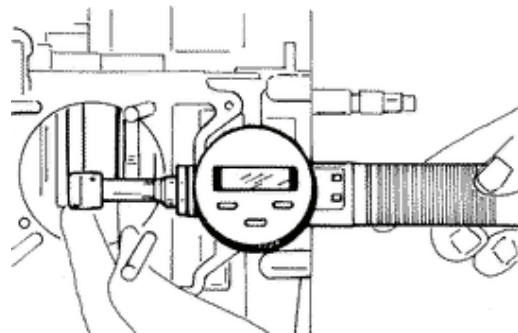
Characteristic

Checking the connecting rod small end: Maximum diameter

15.030 mm

Checking the connecting rod small end: 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.

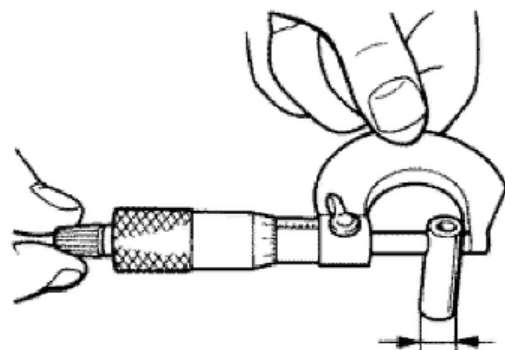
Characteristic

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 seal 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 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**

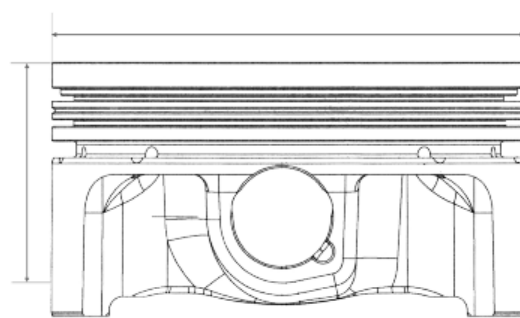
piston ring - standard coupling clearance 0.015

- 0.06 mm **Middle piston ring - maximum clear-**

ance allowed after use 0.07 mm **oil scraper ring**

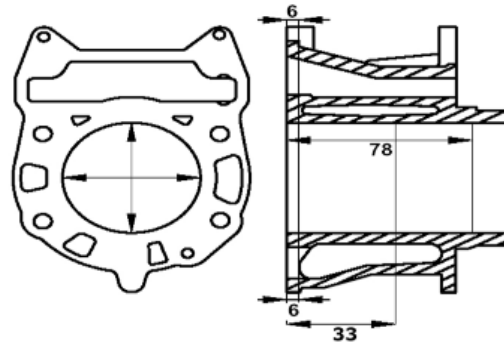
- standard coupling clearance 0.015 - 0.06 mm

**oil scraper ring - maximum clearance allowed
after use** 0.07 mm



Inspecting the cylinder

- Using a bore meter, measure the inner cylinder diameter at three different points according to the directions shown in the figure.
- Check that the head coupling surface is not worn or misshapen.
- Pistons and cylinders are classified according to diameter. The coupling must be made with those of the same type (M-M, N-N, O-O, P-P).



Characteristic

cylinder: standard diameter

71.990 - 72.018 mm (at 33 mm)

Maximum allowable run-out:

0.05 mm

Inspecting the piston rings

- 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.

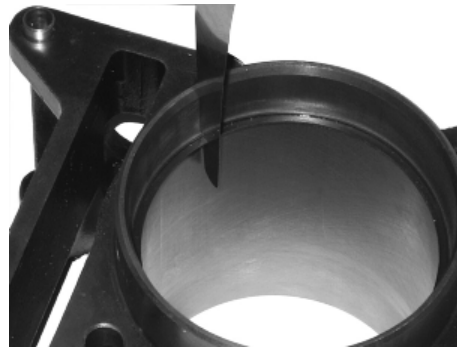
N.B.

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.



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 stop 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 stop using the plug as shown in the figure



N.B.

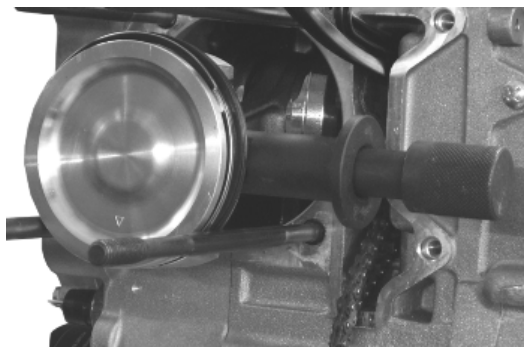
THE TOOL FOR INSTALLING THE STOP RINGS MUST BE USED MANUALLY.

CAUTION

USING A HAMMER MIGHT DAMAGE THE STOPS' HOUSING.

Specific tooling

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

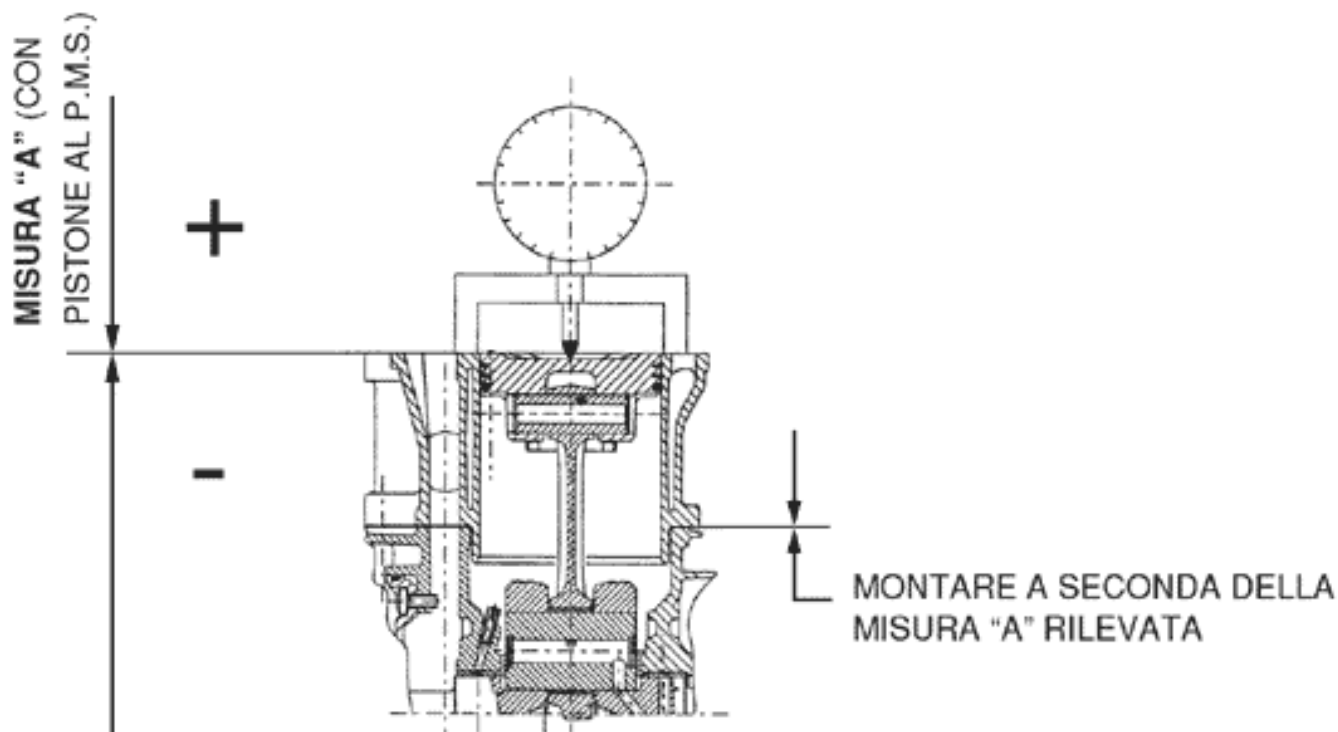


Choosing the gasket

Characteristic

Compression ratio 250 version

CR: 10.5 ÷ 11.5 : 1



N.B. LA MISURA "A" DEVE ESSERE RILEVATA SENZA NESSUNA GUARNIZIONE MONTATA TRA CARTER E CILINDRO E DOPO AVER AZZERATO IL COMPARATORE, COMPLETO DI SUPPORTO, SU DI UN PIANO RETTIFICATO.

N.B.

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 IS TO BE APPLIED (TO RECOVER THE COMPRESSION RATIO) AND VICE VERSA.

ENGINE 250 SHIMMING

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

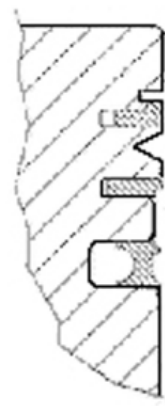
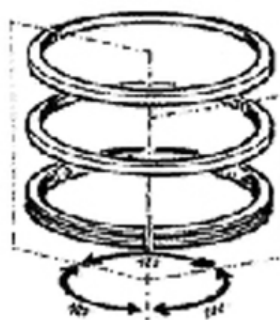
Refitting the piston rings

Fitting the sealing rings

- Place the oil scraper spring on the piston.
- Refit the oil scraper ring with the join of spring ends on the opposite side from the ring gap and the word 'TOP' towards the crown of the piston. The chamfered side of the oil scraper ring should always be facing the piston crown.
- Fit the middle piston ring with the identification letter facing the crown of the piston. In any case, the step must be facing opposite the piston top.
- Fit the top piston ring with the word 'TOP' or the reference mark facing the crown of the piston.
- Offset the piston ring gaps on the three rings by 120° to each other as shown in the figure.
- Lubricate the components with engine oil.
- The top piston ring on the 250 engine has an L cross section.

N.B.

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



Refitting the cylinder

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

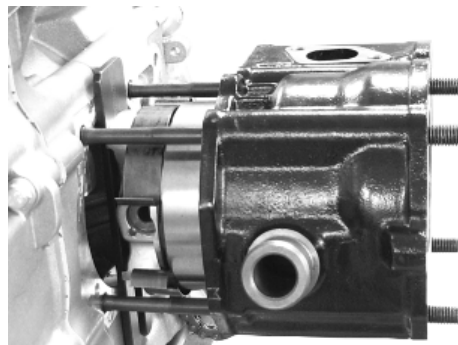
N.B.

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

Specific tooling

020426Y Piston fitting fork

020393Y Piston fitting band



Inspecting the cylinder head

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

Maximum allowable run-out: 0.05 mm

- Check that the camshaft and the rocker pin capacities exhibit no wear.
- Check that the cylinder head cover surface, the intake manifold and the exhaust manifold are not worn.



Characteristic

bearing «A»

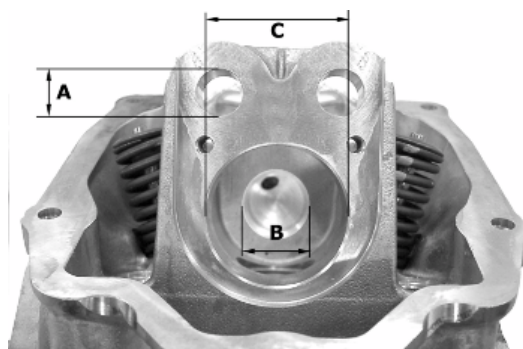
Ø 12.000 - 12.018 mm

bearing «B»

Ø 20.000 ÷ 20.021 mm

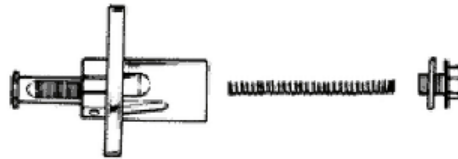
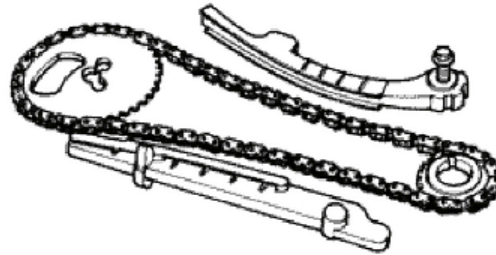
bearing «C»

Ø 37.000 - 37.025 mm



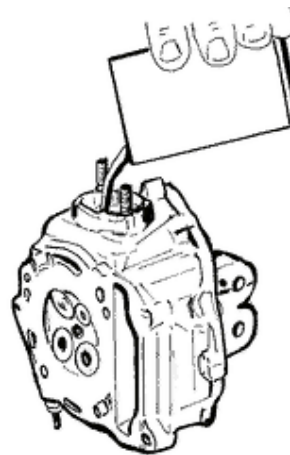
Inspecting the timing system components

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



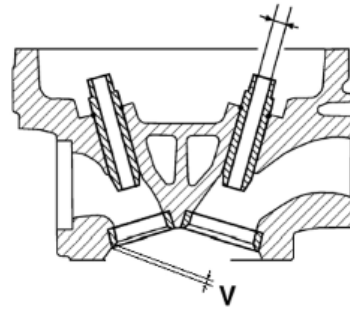
Inspecting the valve sealings

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



Inspecting the valve housings

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



Characteristic

Valve seat wear Intake guide

limit accepted: 5.022

Valve seat wear Intake guide

Standard diameter: 5.000 ÷ 5.012 mm

Valve seat wear Exhaust guide

Accepted limit 5.022

Valve seat wear Exhaust guide

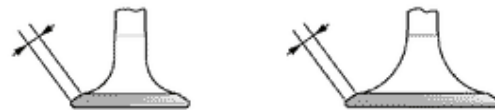
Standard diameter: 5.000 ÷ 5.012 mm

Inspecting the valves

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

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

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



CAUTION

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

Characteristic

Valve wear check Standard: Intake and exhaust:

0.99 - 1.27 mm

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

- Calculate the clearance between valve and valve guide.
- Check that there are no signs of wear on the surface of contact with the articulated register terminal.
- If the checks above give no failures, you can use the same valves. For best sealing results, it is advisable to grind the valves. Grind the valves gently with a fine-grained lapping compound. During the grinding, keep the cylinder head with the valve axes in a horizontal position. This will prevent the lapping compound residues from penetrating between the valve stem and the guide (see figure).

CAUTION

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

N.B.

DO NOT CHANGE THE POSITIONS THE VALVES ARE FITTED IN

Characteristic**Valve check standard length**

Outlet: 94.4 mm

Valve check standard length

Inlet: 94.6 mm

Valve check Maximum admissible clearance

Outlet: 0.072 mm

Valve check Maximum admissible clearance

Inlet: 0.062 mm

Valve check standard clearance

Outlet: $0.025 \div 0.052$ mm

Valve check standard clearance

Inlet: $0.013 \div 0.040$ mm

Valve check Minimum admissible diameter

Outlet: 4.95 mm

Valve check Minimum admissible diameter

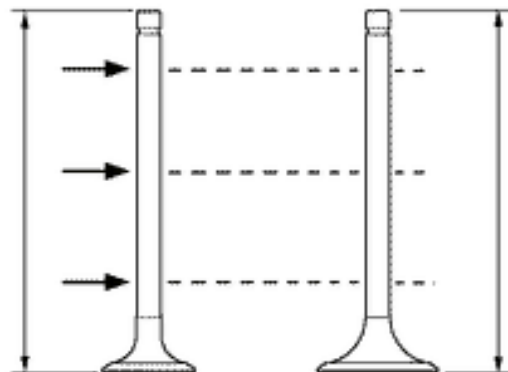
Inlet: 4.96 mm

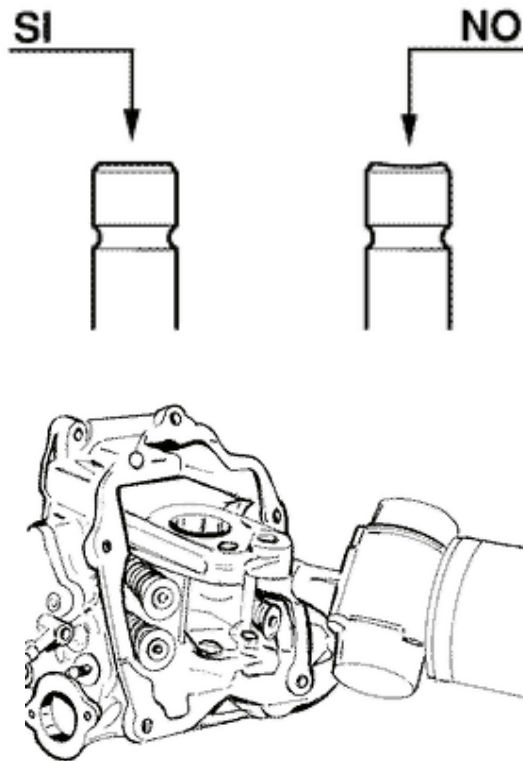
Valve check Standard diameter:

Inlet: $4.972 \div 4.987$ mm

Valve check Standard diameter:

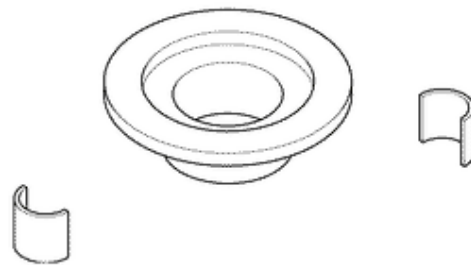
Outlet: $4.96 \div 4.975$ mm





Inspecting the springs and half-cones

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



Refitting the valves

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

N.B.

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

Specific tooling

020306Y Punch for assembling valve seal rings

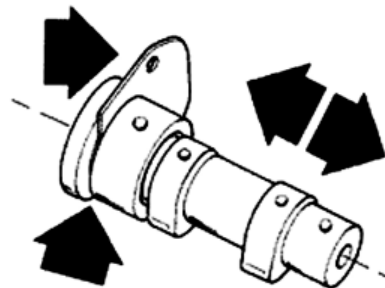
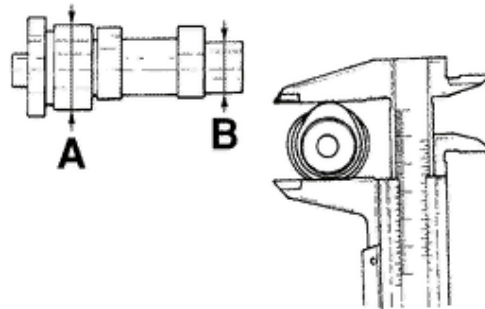
020382Y Valve cotters equipped with part 012 removal tool

020382Y011 adapter for valve removal tool



Inspecting the cam shaft

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



- Measure the internal diameter of each rocker arm.

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

Characteristic

Internal rocker arm diameter: Standard diameter

Diameter 12.000 - 12.011 mm

Rocker arm pin diameter: Standard diameter

Diameter 11.977 - 11.985 mm

Cam shaft check: Maximum admissible axial clearance

0.42 mm

Cam shaft check: Standard axial clearance:

0.11 - 0.41 mm

Cam shaft check: Standard height

Outlet: 29.209 mm

Cam shaft check: Standard height

Inlet: 30.285 mm

Cam shaft check: Minimum admissible diameter

Bearing B diameter: 19.950 mm

Cam shaft check: Minimum admissible diameter

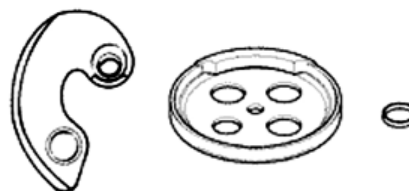
Bearing A Ø: 36.94 mm

Cam shaft check: Standard diameter

Bearing B diameter: 19.959 ÷ 19.98 mm

Cam shaft check: Standard diameter

Bearing A Ø: 36.95 ÷ 36.975 mm



Refitting the head and timing system components

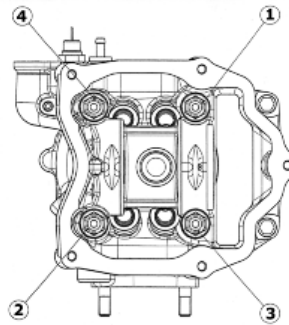
- Fit the timing chain guide pad.
- Insert the centring dowel between the cylinder head to the cylinder, fit the cylinder head gasket and the cylinder head.
- Lubricate the stud bolt threading.
- Tighten up the nuts to an initial pre-torque of 7 ± 1 N·m
- Tighten up the nuts to a second pre-torque of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

N.B.

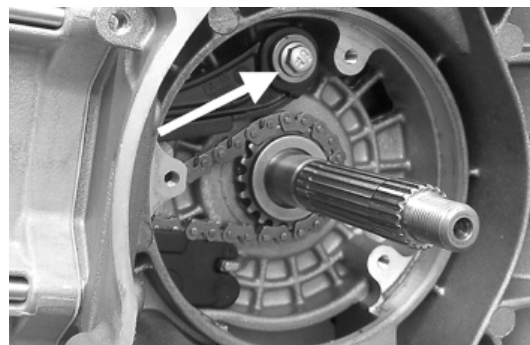
BEFORE INSTALLING THE HEAD, MAKE SURE THAT THE LUBRICATION CHANNEL IS CLEAN USING A COMPRESSED AIR JET.

Locking torques (N*m)

Timing chain tensioner support screw $11 \div 13$



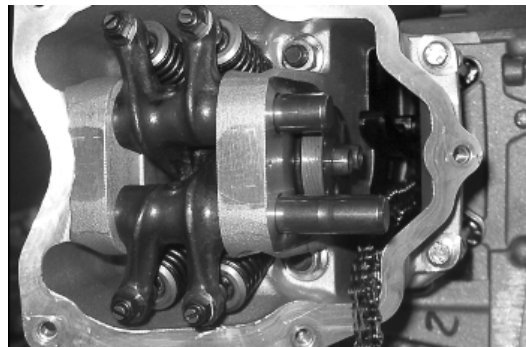
- Refit the lower timing chain sprocket wheel on the crankshaft, with the chamfer facing the insertion side.
- Loop the timing chain around the sprocket on the crankshaft.
- Fit the chain tensioner slider from the cylinder head side.
- Fit the spacer and the screw fastener.
- Tighten the screws to the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



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

Electrode distance 0.8 mm

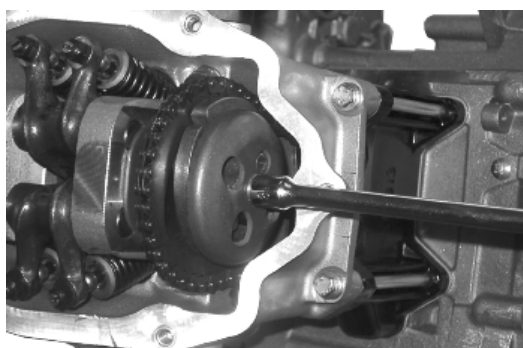
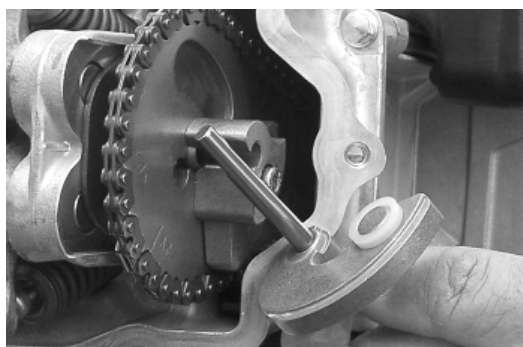
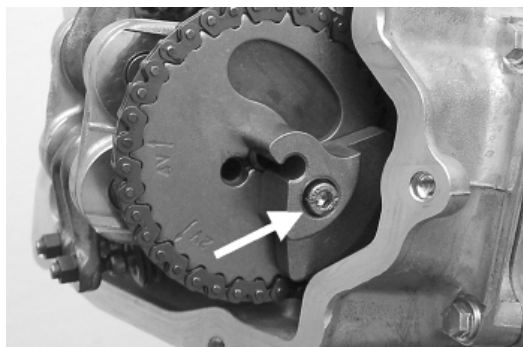
N.B.



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

Locking torques (N*m)

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



Refitting the rocker-arms cover

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

Locking torques (N*m)

Tappet cover screws 6 - 7 Nm

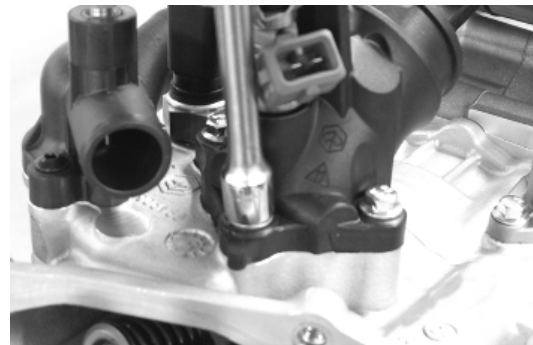


Refitting the intake manifold

Fit the intake manifold and do up the three screws.

Locking torques (N*m)

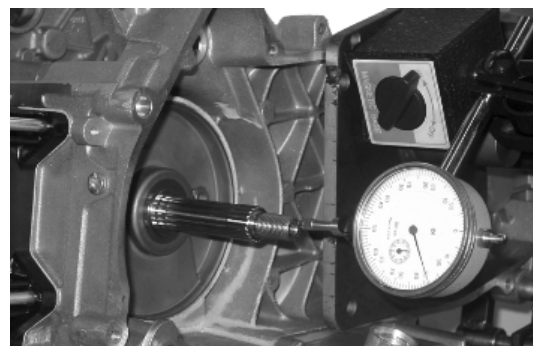
Inlet manifold screws 11 ÷ 13



Crankcase - crankshaft

Splitting the crankcase halves

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



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

CAUTION

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

CAUTION

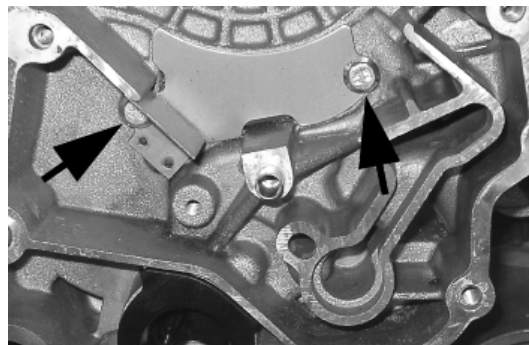
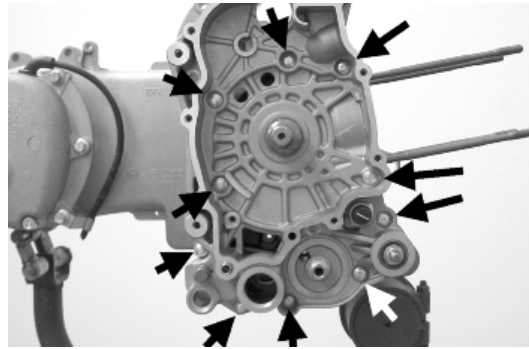
WHILE OPENING THE CRANKCASES AND REMOVING THE DRIVING SHAFT, CHECK THAT THE THREADED SHAFT ENDS DO NOT INTERFERE WITH THE MAIN BUSHINGS. FAILURE TO OBSERVE THIS PRECAUTION CAN DAMAGE THE MAIN BUSHINGS.

CAUTION

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

N.B.

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

Specific tooling

020262Y Crankcase splitting strip

020335Y Magnetic support for dial gauge

Characteristic

Axial crankshaft/crankcase clearance: Standard clearance

0.15 - 0.40 mm (when cold)

**Axial connecting rod - crankshaft clearance
Standard clearance**

0.20 ÷ 0.50 mm

**Radial connecting rod - crankshaft clearance
Standard clearance**

0.036 ÷ 0.054 mm

**Width of crankshaft with integral washers:
standard measurements**

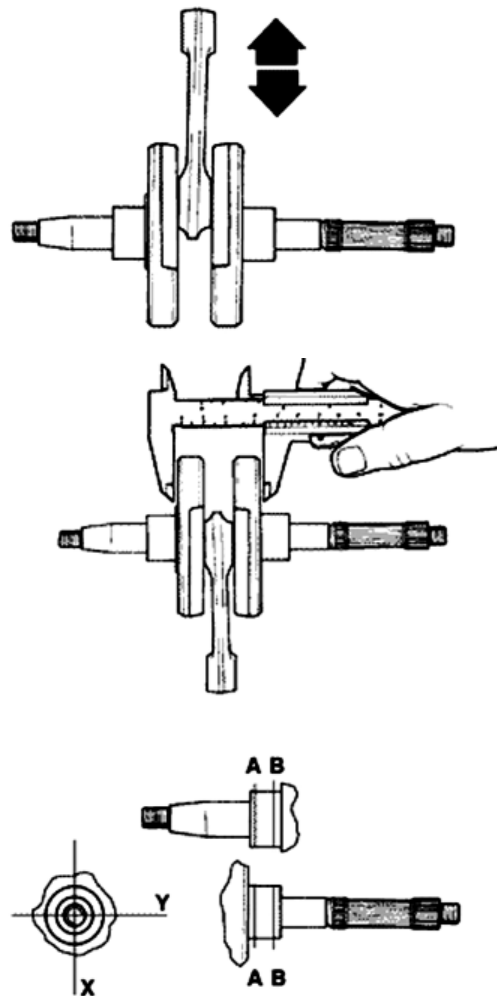
55.67 ÷ 55.85 mm

**Crankshaft bearings: Standard diameter: Cat.
1**

28.994 ÷ 29.000

**Crankshaft bearings: Standard diameter: Cat.
2**

29.000 ÷ 29.006

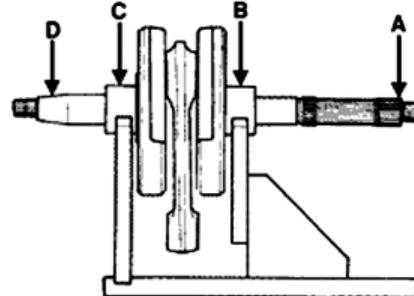


Inspecting the crankshaft alignment

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

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

The connecting rod head bushings cannot be replaced. For the same reason, the connecting rod may not be replaced and, when cleaning the



crankshaft, be very careful that no impurities get in through the shaft's lubrication holes.

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

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

N.B.

THE MAIN BEARINGS ARE NOT GRINDABLE

Specific tooling

020074Y Support base for checking crankshaft alignment

Characteristic

Off-line maximum admitted

A = 0.15 mm

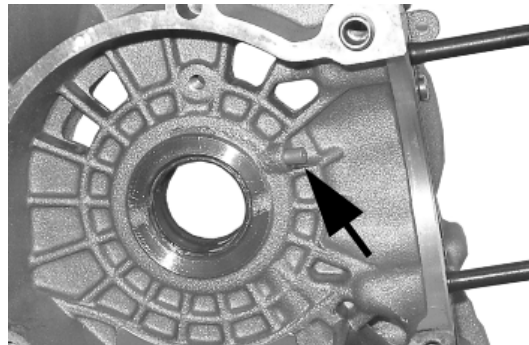
B = 0.01 mm

C = 0.01 mm

D = 0.10 mm

Inspecting the crankcase halves

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



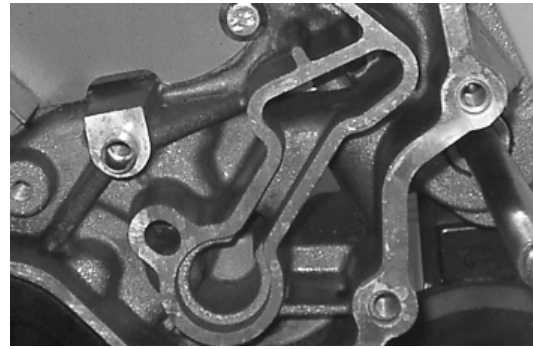
- Inspect the coupling surfaces on the crankcase halves for scratches or deformation, taking particular care with the cylinder/crankcase surfaces and the crankcase halves surfaces.
- Defects in the crankcase coupling gasket between the crankcase halves or the mating surfaces shown in the diagram, could cause a drop in the oil pressure lubricating the main bearings and connection rod.
- Check the main bearing seats that limit axial clearance in the crankshaft show no signs of wear. The dimension between these seats is measured by way of the procedure described previously for measuring the crankshaft axial clearance and dimensions.

N.B.

THE JET IS FED THROUGH THE MAIN BUSHINGS. PROPER OPERATION OF THIS COMPONENT IMPROVES THE PISTON TOP COOLING. CLOGGING HAS EFFECTS THAT ARE DIFFICULT TO DETECT (PISTON TEMPERATURE INCREASE). FAILURE OR LEAK CAN CONSIDERABLY DECREASE THE MAIN BUSHING AND CONNECTING ROD LUBRICATION PRESSURE.

N.B.

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



Inspecting the crankshaft plain bearings

- T

o obtain a good bushing lubrication it is necessary to have both an optimal lubricating pressure (3,2 bar) and a good oil flow rate; the bushings must be correctly positioned so as not to obstruct the oil supply channels.

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

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

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

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

- 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.

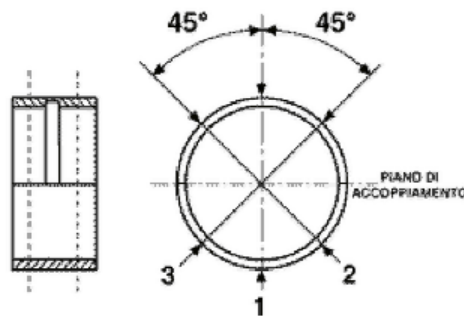
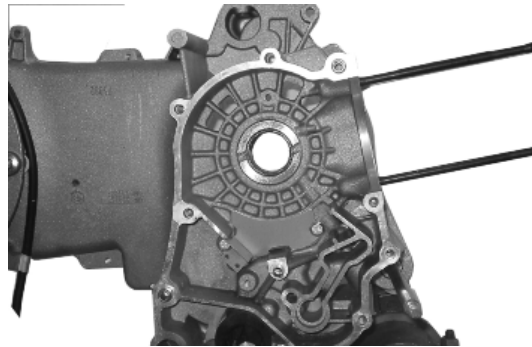
- There are three crankcase versions: with RED main bushings, with BLUE main bushings and with YELLOW main bushings.

- 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" - YEL- LOW	
Main half-bearing		1.970 ÷ 1.973	1.9703 ÷ 1.976
			1.976 ÷ 1.979
Bush- ing cat- egory	Crank- case halves category	Internal bush- ing diameter after fitting	Possible fitting
A	1	29.025 ÷ 29.040	Original
B	1	29.019 ÷ 29.034	Original and spare
	2	29.028 ÷ 29.043	
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 replacement crankcase cannot be matched with a crankshaft with mixed categories. The replacement 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.

TO KEEP THIS POSITION OF THE BUSHINGS ON THE CRANKCASE, FITTING IS FORCED ON STEEL RINGS INSERTED IN THE CASTING OF BOTH CRANKCASE HALVES.

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

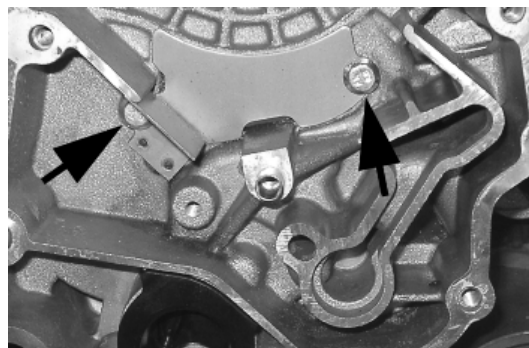
1.35 ÷ 1.6

Diameter of crankcase without bushing

32.953 ÷ 32.963

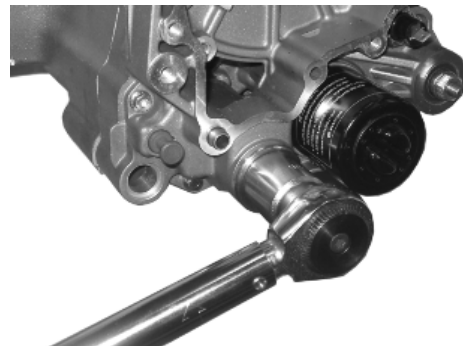
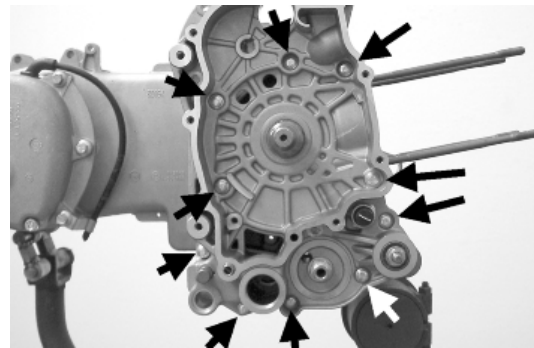
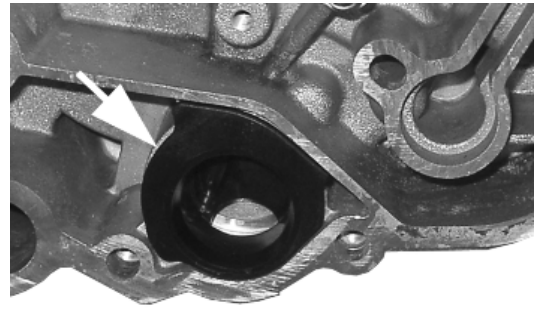
Refitting the crankcase halves

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



Locking torques (N*m)

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

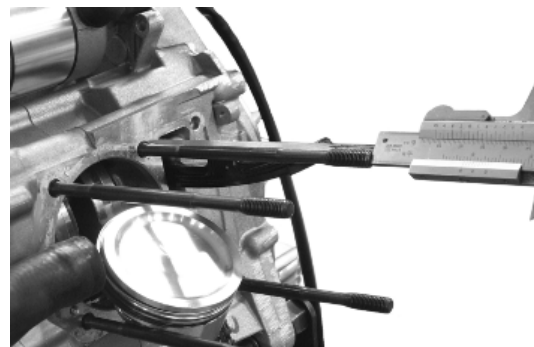


Studs

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

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

In this case, replace it.



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

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

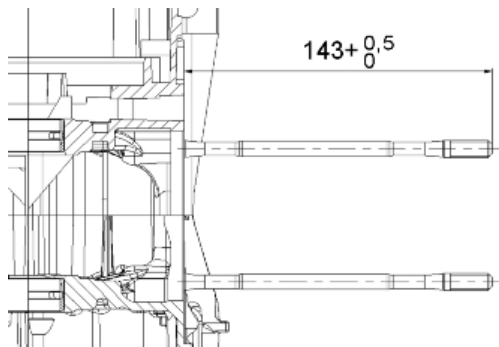
Tighten up to the depth of the driving indicated.



Recommended products

Loctite 'Quick Set' Strong 270 threadlock

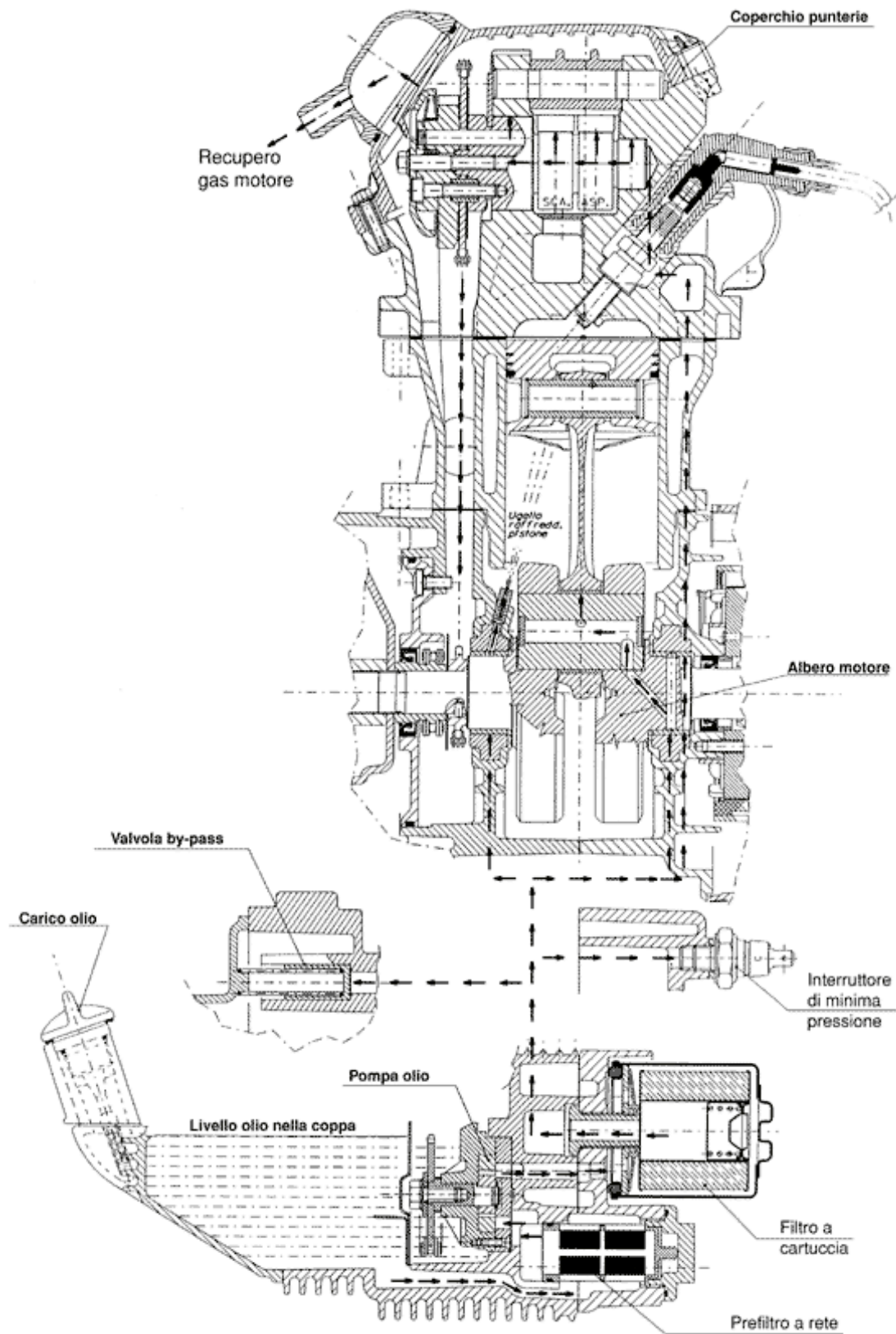
Strong 270 threadlock



Lubrication

Conceptual diagrams

LUBRICATION CIRCUIT



Oil pressure check

- Remove the electrical minimum oil pressure switch connection and remove the switch.
- Check the oil pressure reading is between 0.5 and 1.2 atm with the engine idling at 1650 rpm and the oil at the required temperature (wait for at least one electric ventilation).
- Check the oil pressure is between 3.2 and 4.2 atm with the engine running at a speed 6000 rpm and the oil at the required temperature.
- Remove the appropriate tools once the measurement is complete, refit the oil pressure switch and washer, tightening it to the specified torque and fit the fan cover.
- If the oil pressure is outside the specified limits, in the following order, check: the oil filter, the oil by-pass valve, the oil pump and the crankshaft seals.

N.B.

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

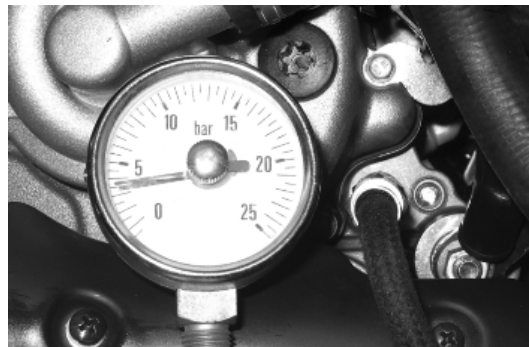
Characteristic

Oil pressure

Minimum pressure admitted at 6000 rpm: 3.2 atm.

Locking torques (N*m)

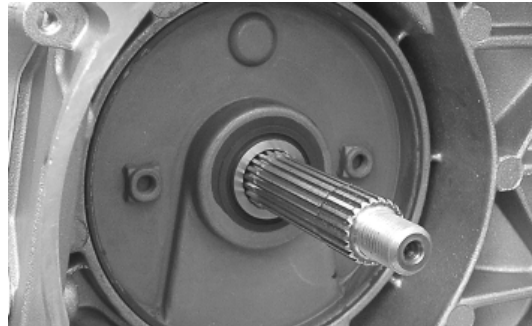
Minimum oil pressure sensor 12 ÷ 14



Crankshaft oil seals

Removal

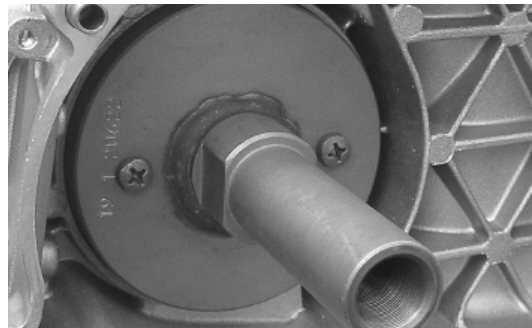
- Remove the transmission cover and the complete driving pulley beforehand



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

Specific tooling

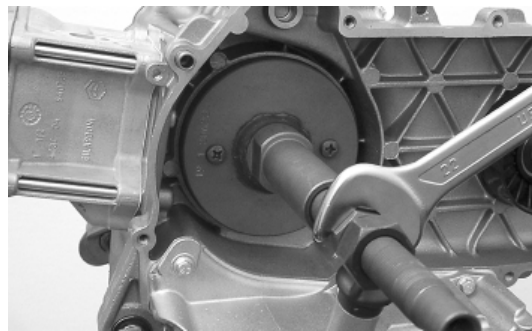
020622Y Transmission-side oil guard punch



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

Specific tooling

020622Y Transmission-side oil guard punch



Refitting

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



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

CAUTION

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

CAUTION

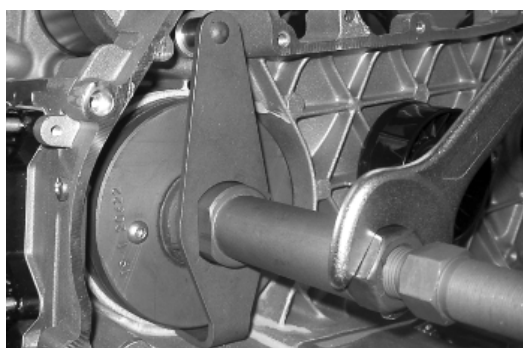
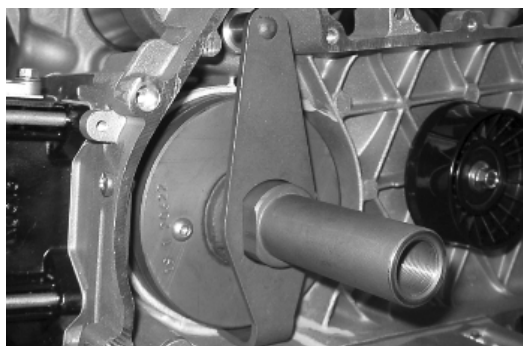
ORIENT THE OIL GUARD BY POSITIONING THE CHAIN HOUSING CHANNEL FACING DOWNWARDS. WHEN THE POSITION IS REACHED, DO NOT RETRACT THE OIL GUARD. FAILURE TO COMPLY WITH THIS RULE CAN CAUSE A WRONG POSITIONING OF THE OIL GUARD SHEATH.

CAUTION

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

Specific tooling

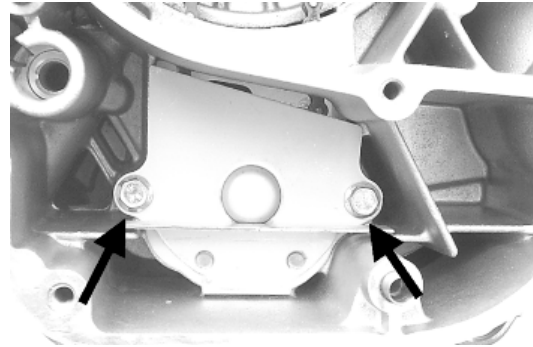
020622Y Transmission-side oil guard punch



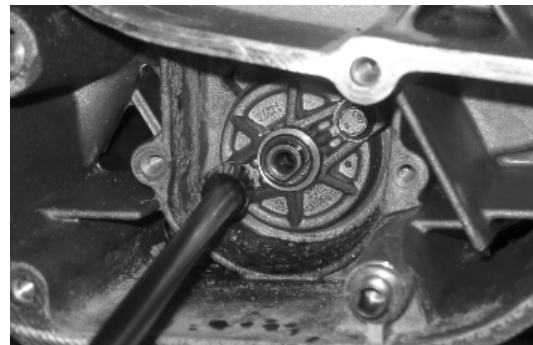
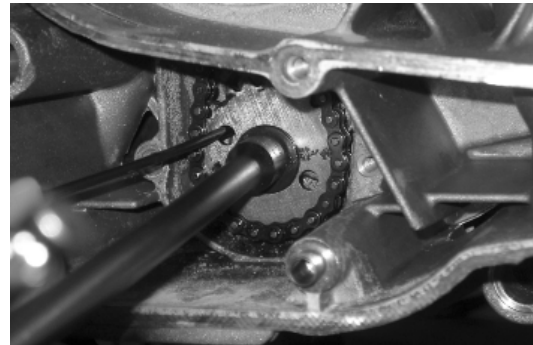
Oil pump

Removal

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



- Block the rotation of the oil pump control pulley with a screwdriver inserted through one of its two holes.
- Remove the central screw with Belleville washer, as shown in the diagram.
- Remove the chain with the crown.
- Remove the control sprocket with relative O-ring.
- Remove the oil pump by unscrewing the two screws in the figure.
- Remove the oil pump seal.

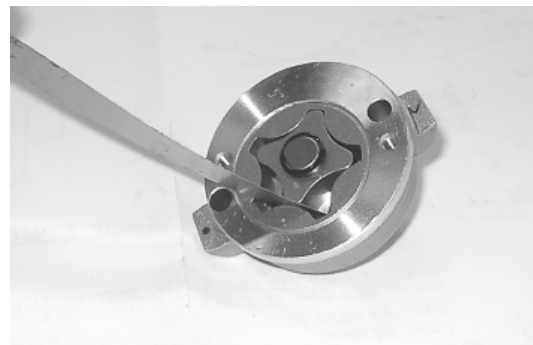


N.B.

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 clip.
- Check the clearance between the rotors in the position shown in the diagram.



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

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

Characteristic

Axial rotor clearance

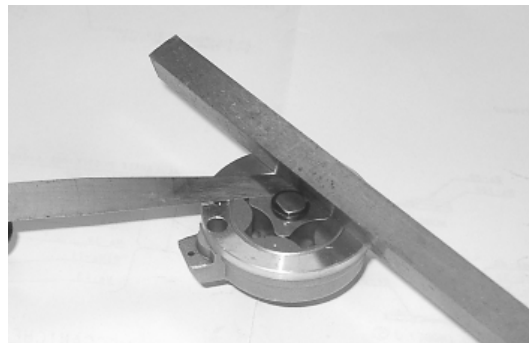
Limit values admitted: 0.09 mm

Distance between the outer rotor and the pump body

Admissible limit clearance: 0.20 mm

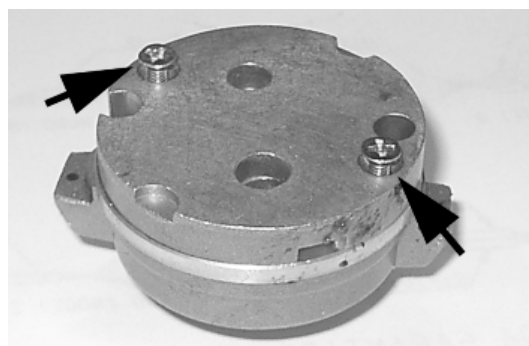
Distance between the rotors

Admissible limit clearance: 0.12 mm



Refitting

- Check there are no signs of wear on the oil pump shaft or body.
- Check there are no signs of scoring or wear on the oil pump cover.
- If you detect non-conforming measurements or scoring, replace the faulty parts or the unit.
- Fit the pump cover in the position that permits the crankcase fixing screws to be aligned.
- Make sure the gasket is positioned properly and refit the pump on the engine crankcase. The pump can only be fitted in one position. - Tighten the screws to the prescribed torque.



- Fit the sprocket wheel with a new O-ring.
 - Fit the chain.
 - Fit the central screw and the belleville washer.
- Tighten to the prescribed torque.
- Fit the oil pump cover by tightening the two screws to the prescribed torque.

N.B.

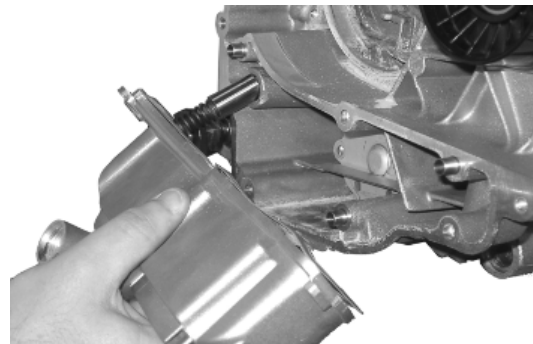
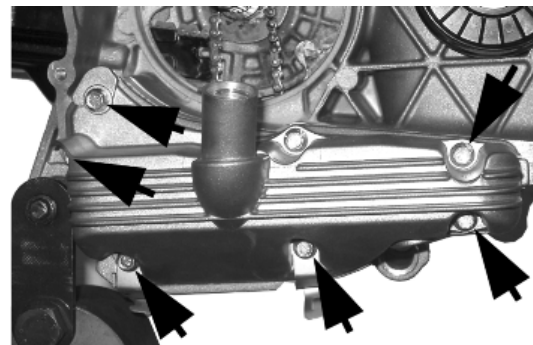
FIT THE BELLEVILLE WASHER SO THAT ITS OUTER RIM TOUCHES THE PULLEY. MAKE SURE THAT THE PUMP TURNS FREELY.

Locking torques (N*m)

Screws fixing oil pump to the crankcase 5 - 6
Oil pump control crown screw 10 ÷ 14 Oil pump
cover screws 0.7 ÷ 0.9

Removing the oil sump

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



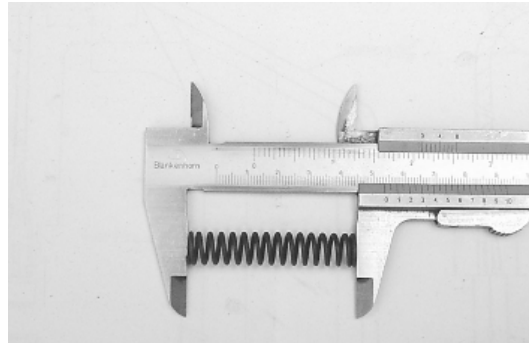
Inspecting the by-pass valve

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

Characteristic

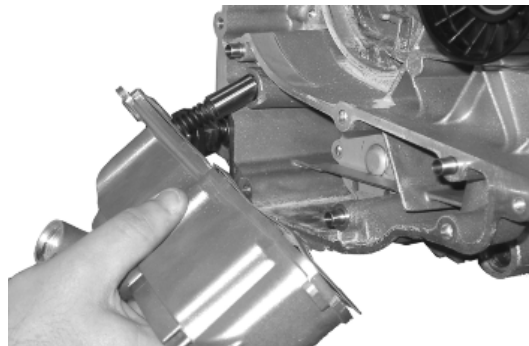
By-pass check up: Standard length

54.2 mm



Refitting the oil sump

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



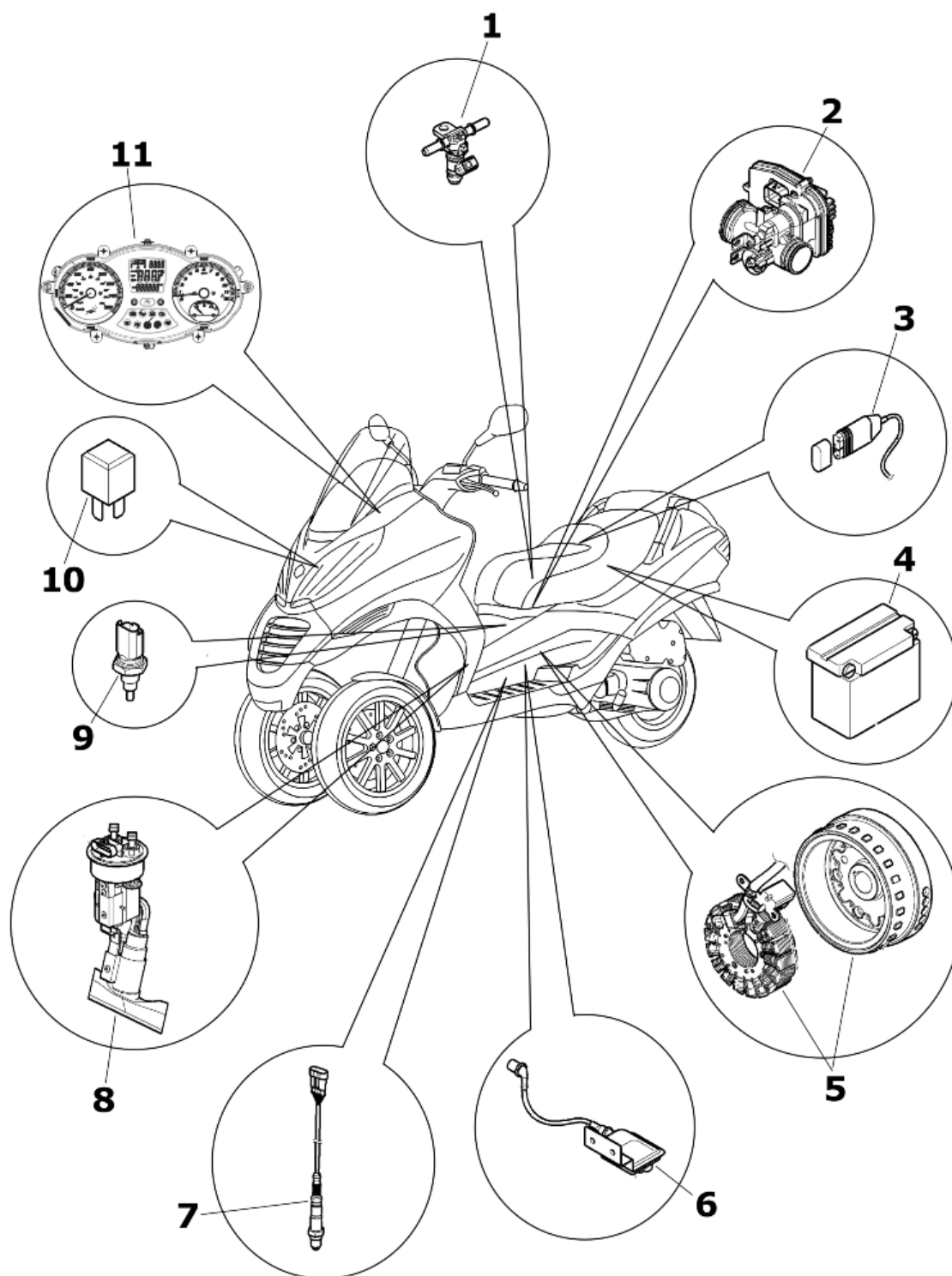
Locking torques (N*m)

Oil sump screws 10 ÷ 14

INDEX OF TOPICS

INJECTION

INJEC



TRANSPARENCY

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

MIU injection system

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

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

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

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

- Coolant temperature.
- Intake air temperature
- Lambda probe strength

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

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

The fuel supply pressure is kept constant based on the ambient pressure.

The **feed circuit** consists of:

- Fuel pump
- Fuel filter
- Injector
- Pressure regulator

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

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

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

The **ignition circuit** consists of:

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

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

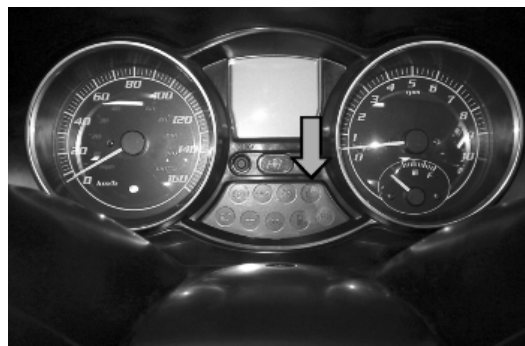
The MIU injection-ignition system controls engine functions by means of a pre-set program.

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

Of course, this cannot happen when the rev counter 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.



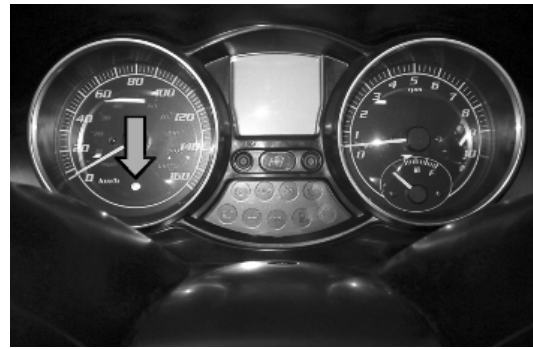
Specific tooling

020460Y Scooter diagnosis and tester

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

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

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 fault in the MIU system could most likely be due to the connections and not the components.

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

A: Electrical power supply

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

B: Chassis earthing

C: Fuel supply

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

D: Ignition system

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

E: Intake circuit

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

F: Other

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

2 MIU system faults may be caused by loose connectors. Make sure that all connections have been correctly made.

Check the connections as follows:

A check that the terminals are not bent.

B check that the connectors have been properly connected.

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

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

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

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

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

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

4. When functional checks are performed, check that the battery voltage is more than 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 battery

Failure to respect this norm may damage the control unit.

10. Do not invert the polarity when fitting the battery.

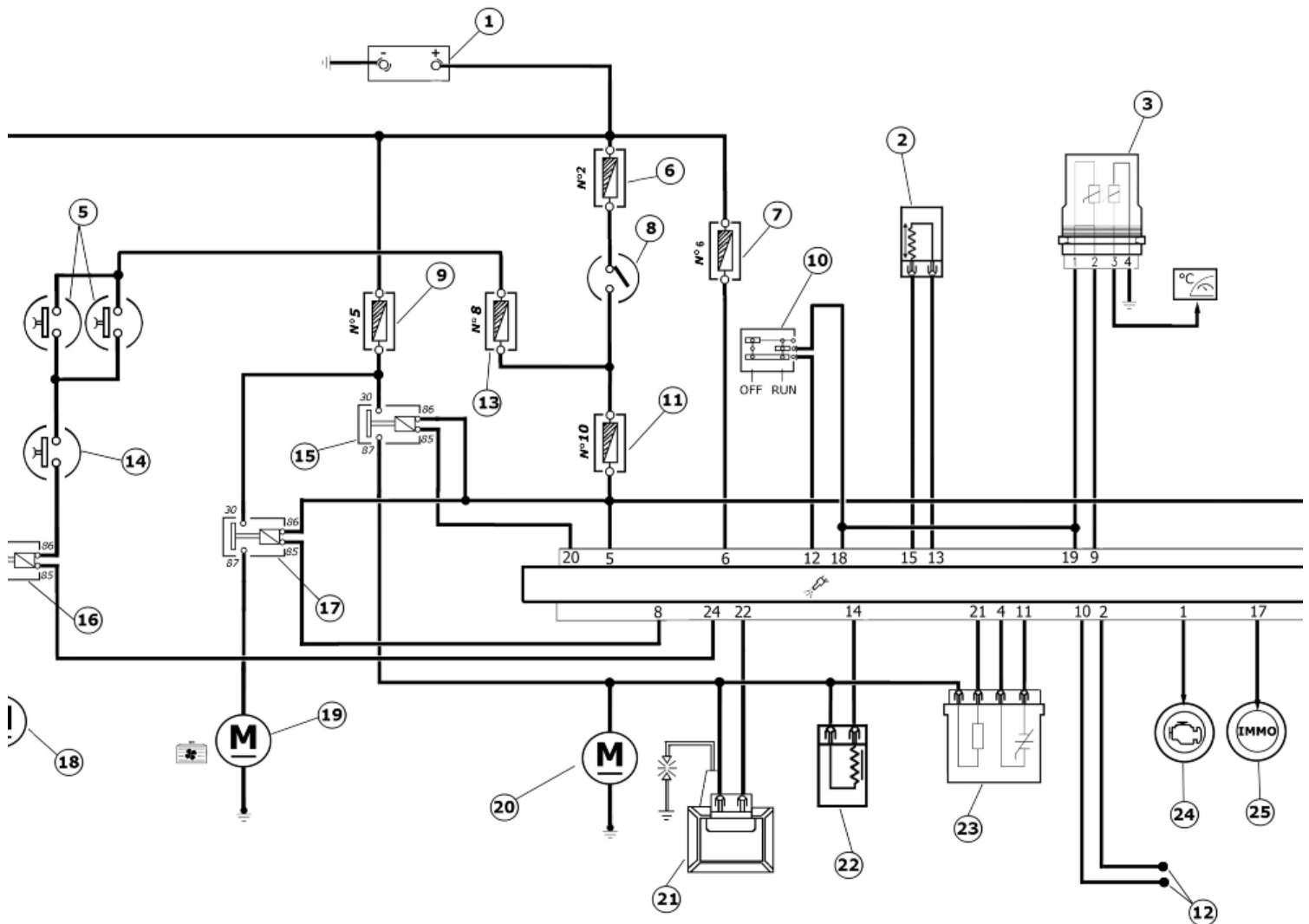
11. To avoid damage, only disconnect and reconnect the MIU system connectors if required. Before reconnecting, check that the connectors are dry.

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.

EMS circuit diagram



1. Battery 12V - 12 Ah
2. Engine rpm sensor
3. coolant temperature sensor:
4. Immobilizer aerial
5. Stop switches
6. Fuse No. 2 **20A**
7. Fuse No. 6 **3A**
8. Key switch contacts
9. Fuse No. 5 **15A**
- 10.Engine stop switch

-
- 11.Fuse No. 10 **7.5A**
 - 12.CAN line connection with tilt locking electric control unit
 - 13.Fuse No. 8 **10A**
 - 14.Starter button
 - 15.Injection load remote control
 - 16.Starter remote control
 - 17.Electric fan starter
 - 18.Starter motor
 - 19.Electric fan motor
 - 20.Fuel pump
 - 21.H.V. coil
 - 22.Fuel injector
 - 23.Lambda sensor
 - 24.Engine "WARNING" light
 - 25.Immobilizer LED
 - 26.Diagnostics 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 Injector revolution timing sensor Air temperature Coolant temperature
Start-up speed	Starter motor and remote control Battery Ground connections
End of compression pressure	End of compression pressure
Power to the spark plug	Spark plug Shielded cap HV coil Revolution timing sensor Ignition advance
Fuel supply	Fuel pressure (low) Injector capacity (low) Injector sealing (poor)
Correctness of the parameters	Coolant temperature Stepper throttle valve position intake air temperature (steps and actual opening) Cleaning of the auxiliary air pipe and throttle valve; air filter efficiency

Engine stops at idle

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

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

Possible Cause	Operation
	Fuel filter Injector capacity

Engine does not rev down

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

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

Exhaust backfires in deceleration

EXHAUST BACKFIRES WHEN DECELERATING

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

Possible Cause	Operation
	Muffler welding

Engine revs irregularly

ENGINE IRREGULAR PROGRESS WITH VALVE SLIGHTLY OPEN

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

Poor performance at full throttle

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

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

Engine knocking

PRESENCE OF KNOCKING (HEAD KNOCKING)

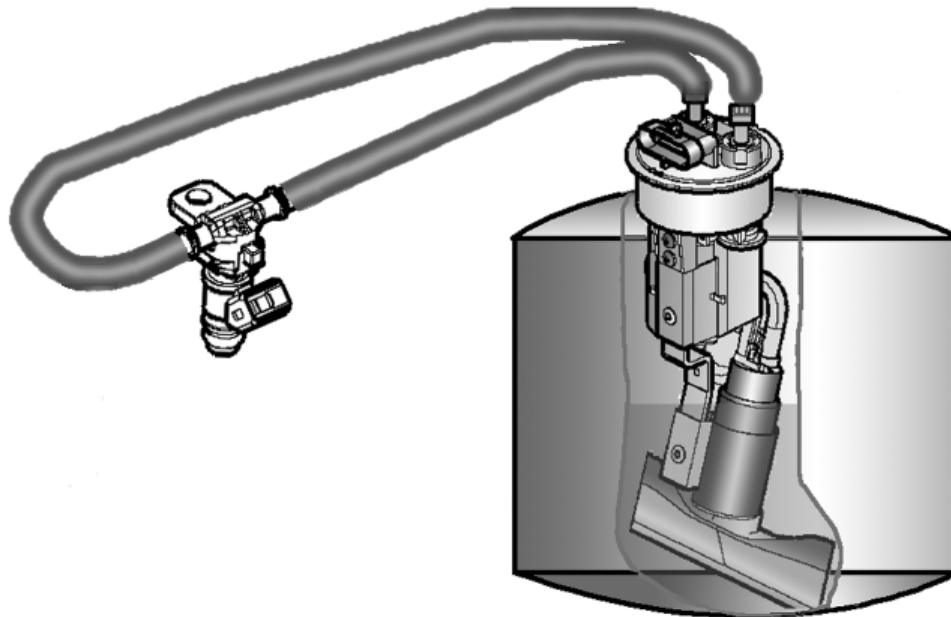
Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector revolution timing sensor Air temperature Coolant temperature Lambda sensor
Ignition efficiency	Spark plug
Parameter reliability	Throttle valve position signal Coolant temperature indicator Intake air temperature indicator Ignition advance
Intake system seal	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 delivery and return 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.

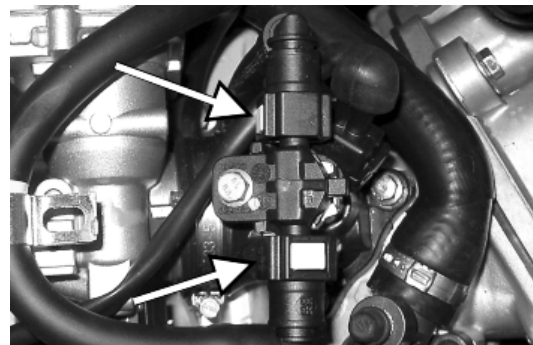


Removing the butterfly valve

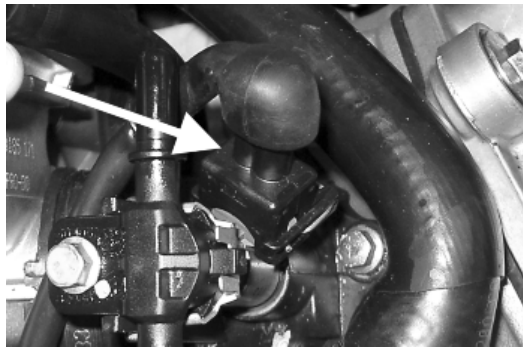
Remove the fuel piping clamping screw indicated in the figure.



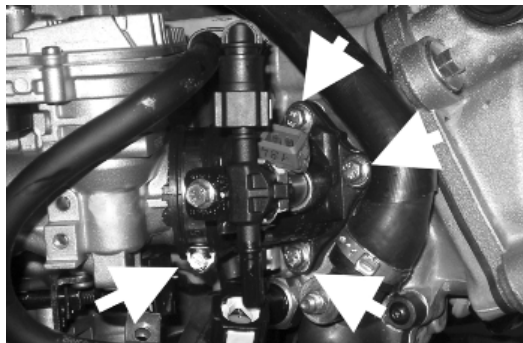
Remove the snap-on fittings from the injector support



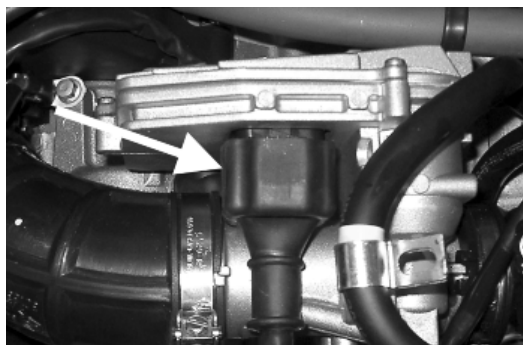
Remove the injector connector



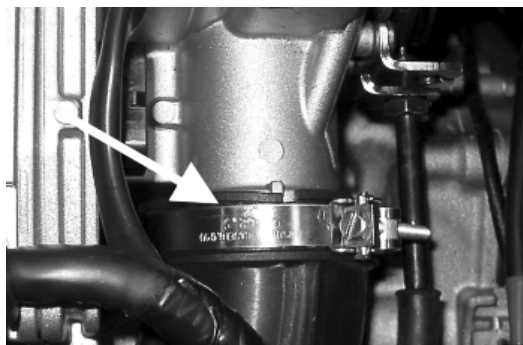
Remove the three screws fixing the manifold to the cylinder head and the clip fixing the throttle body to the manifold.



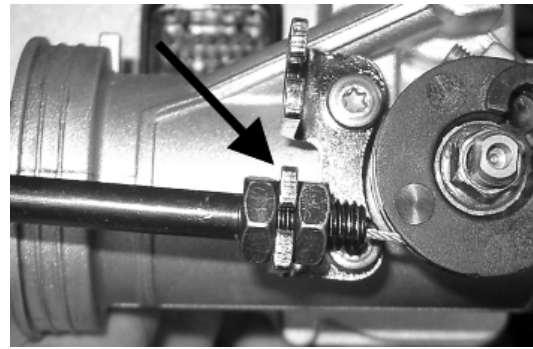
Remove the MIU connector



Remove the clip fixing the throttle body to the purifier bellows

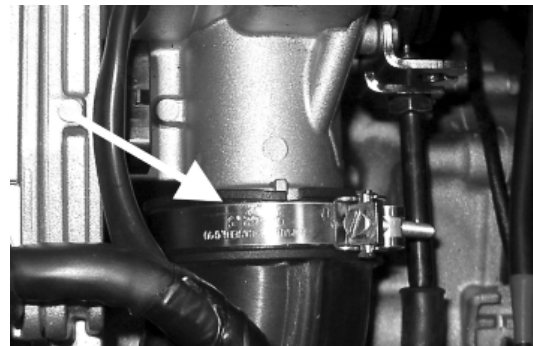


Remove the gas command fitting as indicated in the photograph

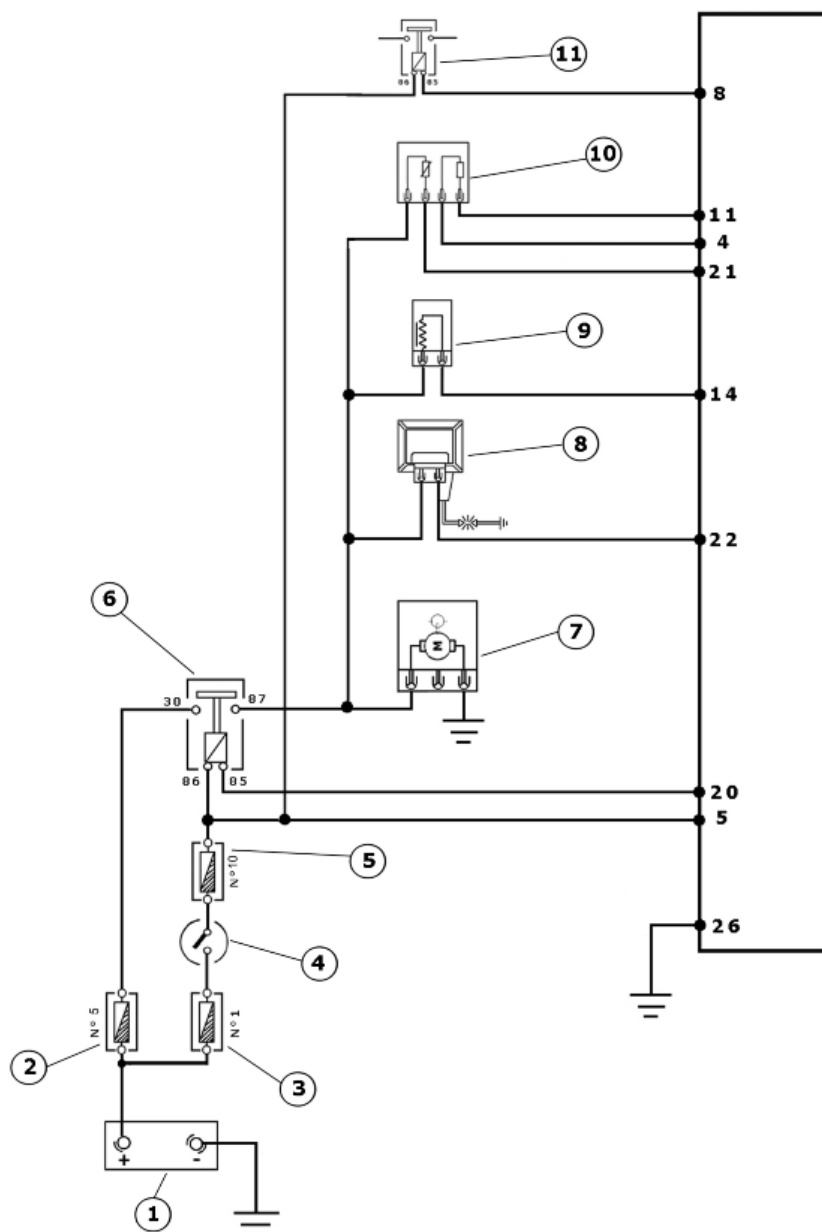


Refitting the butterfly valve

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



Pump supply circuit



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	15A
3	Fuse	20A
4	Key switch contacts	
5	Fuse	7.5 A
6	Injection load remote control	
7	Fuel pump	
8	HV coil	

	Specification	Desc./Quantity
9	Fuel injector	
10	Lambda sensor	
11	Electric fan starter	

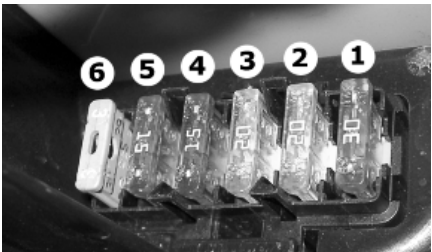
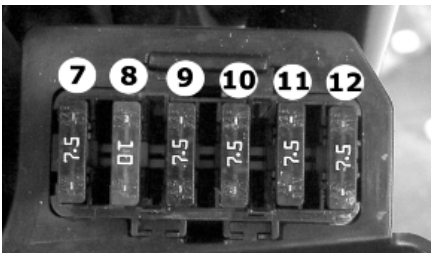
When switched to "ON", the fuel pump starts to rotate for two seconds and then stops. When the engine starts up, in the presence of rpm timing signal the pump is continuously supplied.

ELECTRICAL DATA

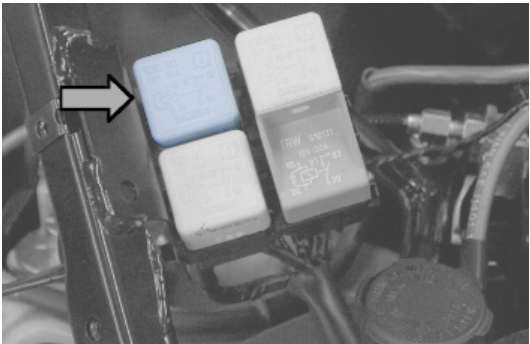
- Pump winding resistance ~ 1.5 Ohm
- Input current during normal functioning $1.4 \div 1.8$ A
- Input current to the closed hydraulic circuit ~ 2 A (to be checked with specific tool for fuel pressure control, choking the circuit on the return pipe)

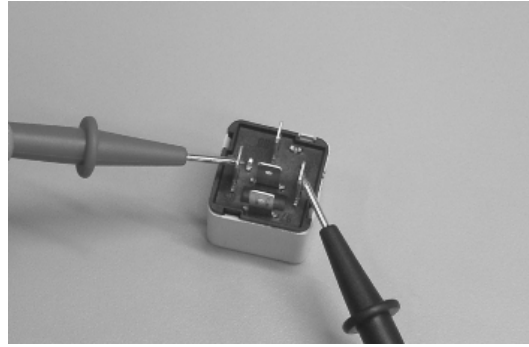
Check the efficiency of injection load 15 A fuse No. 5.

Check the efficiency of live control unit power supply 7.5A fuse No. 10 .



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.

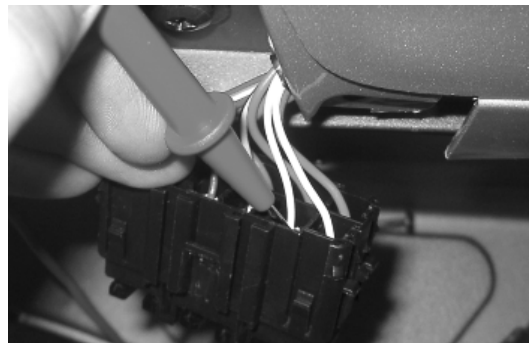
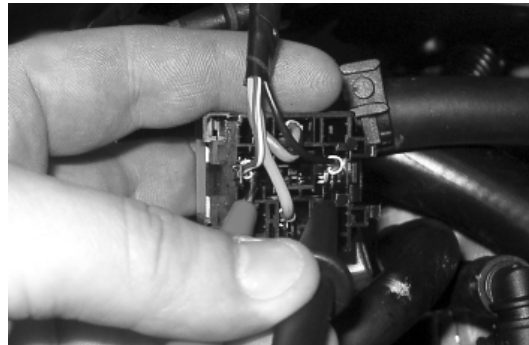


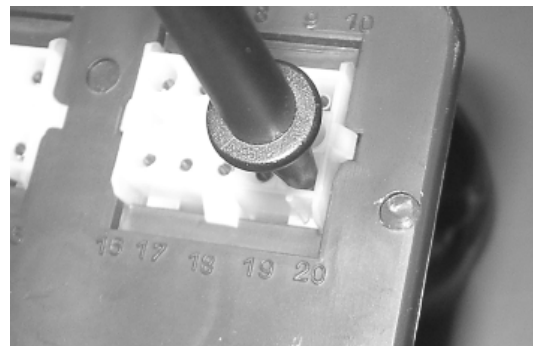
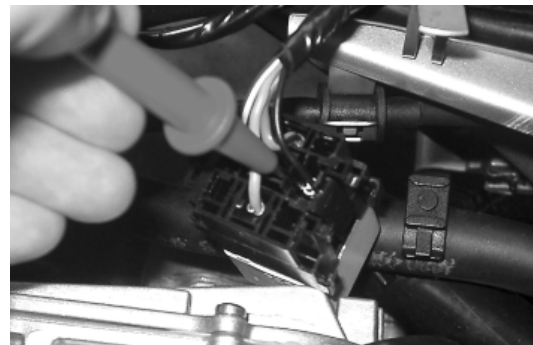
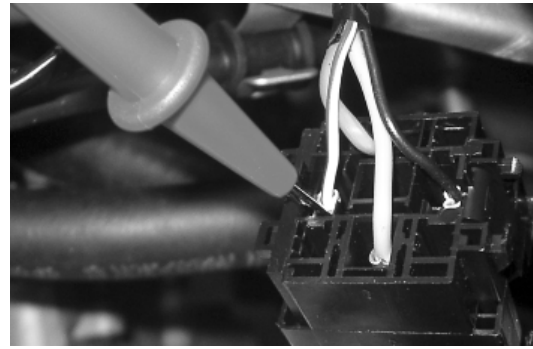


Check the power supply line of the injection load remote control energising coil: after switching to "ON", make sure there is battery voltage, for two seconds, between the Red-White cable and Black-Violet cable of the remote control base. If there is not, check the continuity of the Red-White cable between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

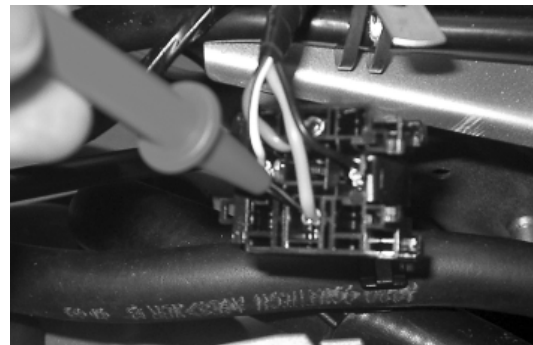


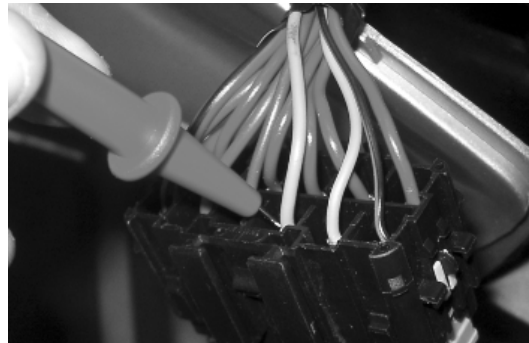
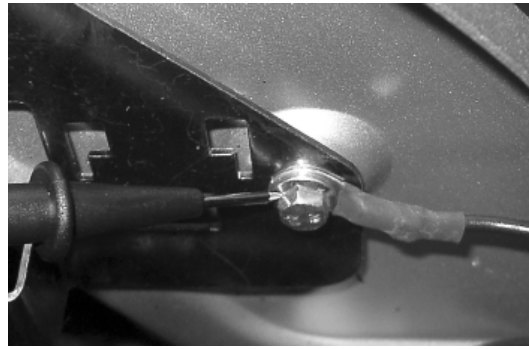


Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 5 15 A) and the remote control base.

N.B.

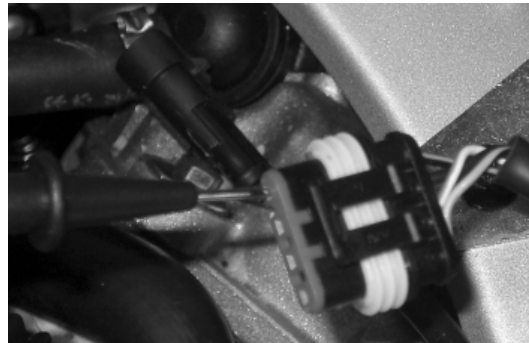
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).



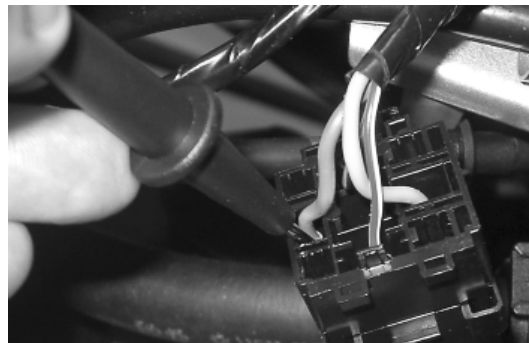


pump circuit 6

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-Grey cable between the pump connector and the base of the remote control.



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.



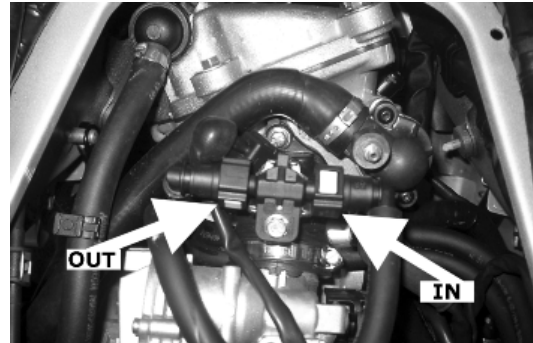
If, when switching to "ON", the pump continues to turn after two seconds of activation, check, with the control unit disconnected and the injection load remote control disconnected, that the Black-Purple cable (pin 20 on the interface wiring) is insulated from the earth.

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



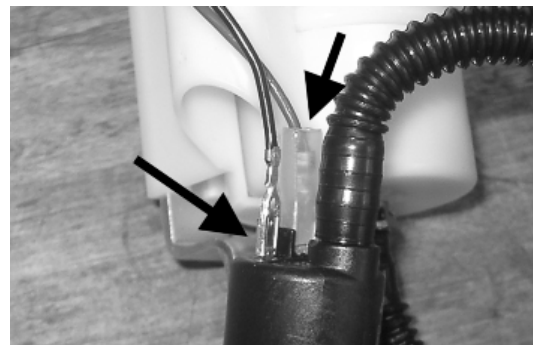
With the battery voltage > 12 V, check the pump flow rate by disconnecting from the injector the pipe equipped with the pressure gauge of the appropriate tool. Make a graded burette available with a flow rate of approximately 1 L. Rotate the pump using the active diagnosis of the palm top computer. Using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

Specific tooling

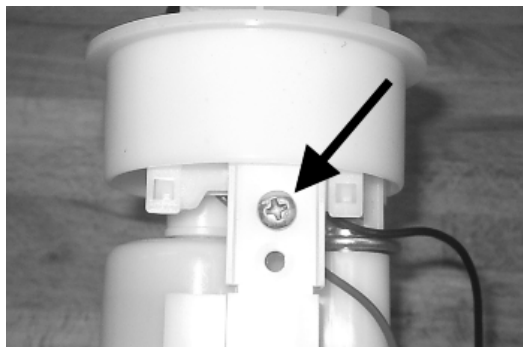
020480Y Petrol pressure check set

Fuel filter check

Disconnect the terminals from the electric pump



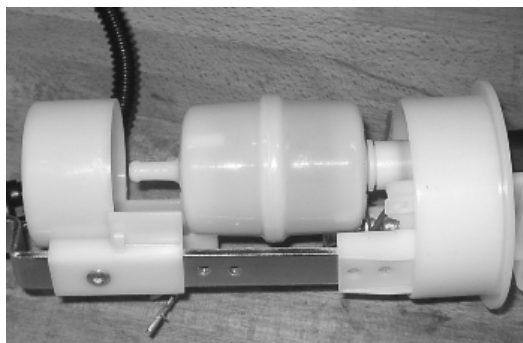
Remove the screw shown in the photograph



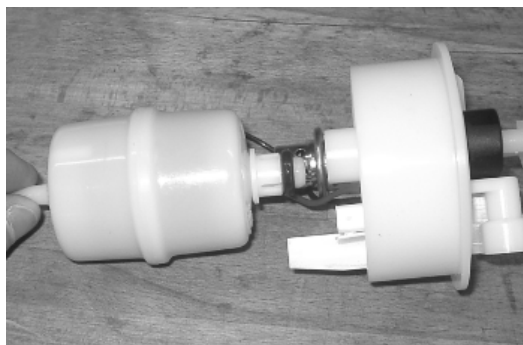
Remove the clip fixing the piping to the filter shown in the photograph



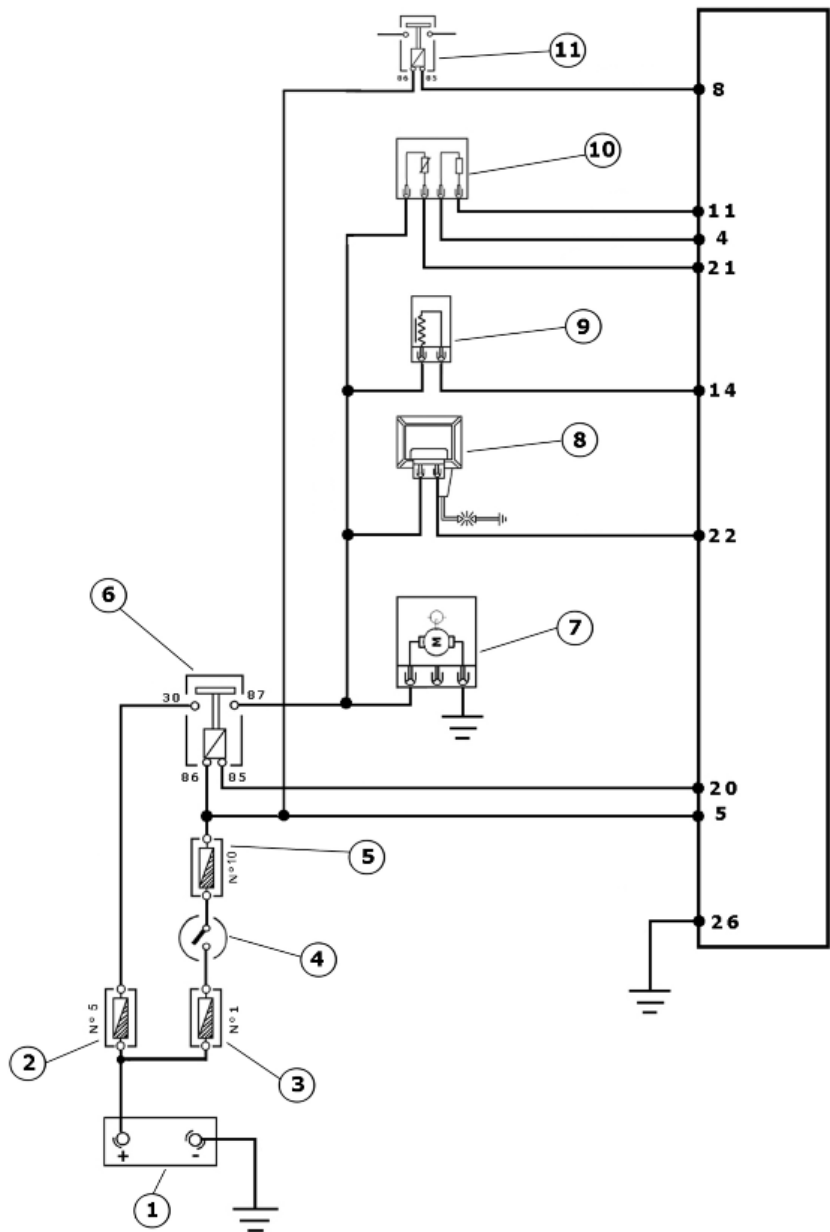
Separate the lower part of the pump support as shown in the photograph.



Remove the filter from the pump support



Inspecting the injector circuit



INJECTION LOADS

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	15A
3	Fuse	20A
4	Key switch contacts	
5	Fuse	7.5 A
6	Injection load remote control	
7	Fuel pump	
8	HV coil	

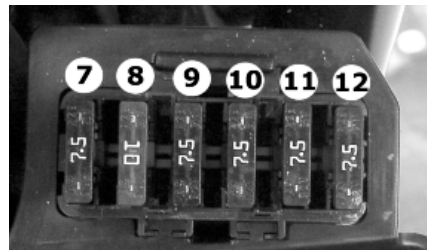
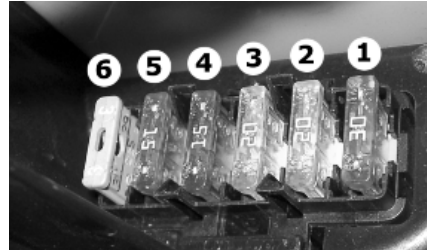
	Specification	Desc./Quantity
9	Fuel injector	
10	Lambda sensor	
11	Electric fan starter	

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

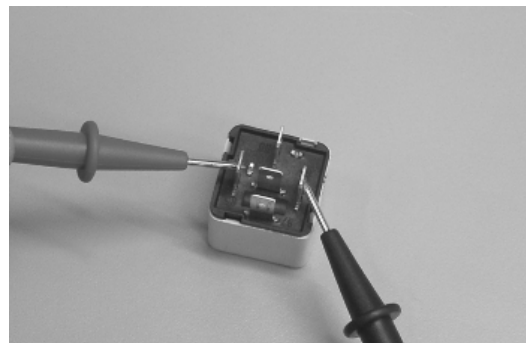
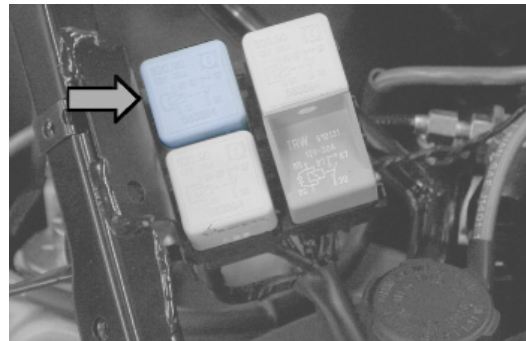
Check the efficiency of injection load 15 A fuse No.

5.

Check the efficiency of live control unit power supply 7.5A fuse No. 10 .



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.

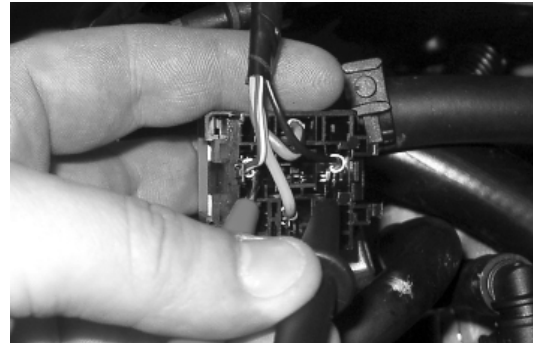




Check the power supply line of the injection load remote control energising coil: after switching to "ON", make sure there is battery voltage, for two seconds, between the Red-White cable and Black-Violet cable of the remote control base. If there is not, check the continuity of the Red-White cable between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

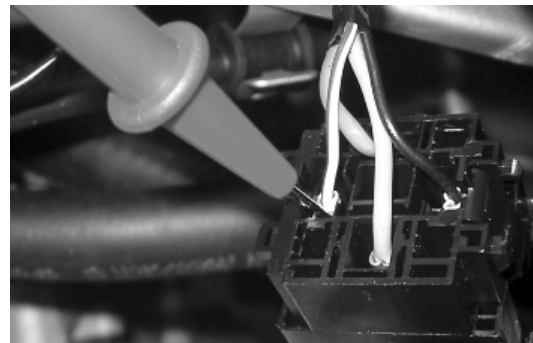
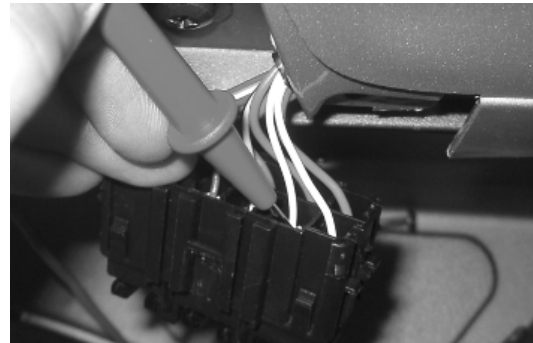
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).

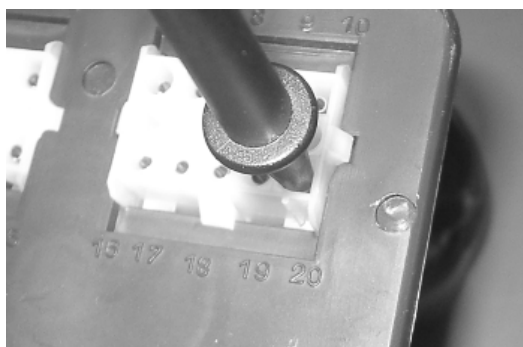
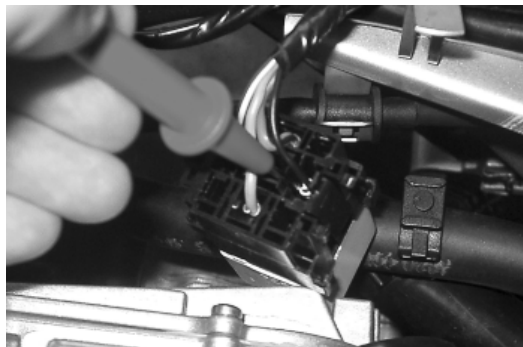


Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 5 15 A) and the remote control base.

N.B.

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

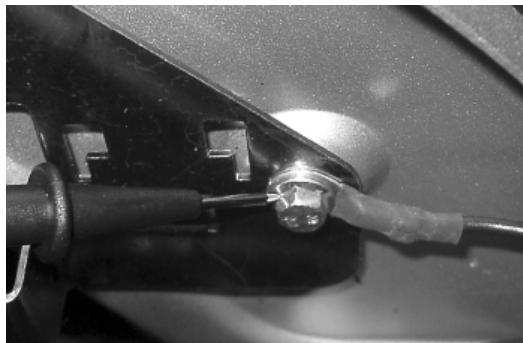
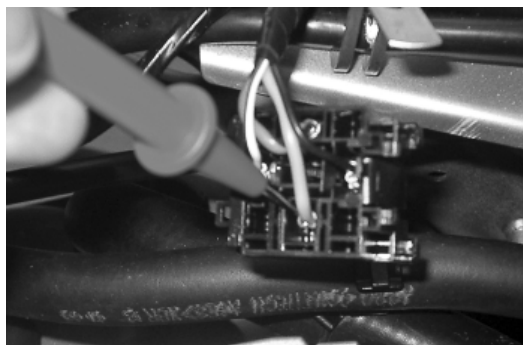


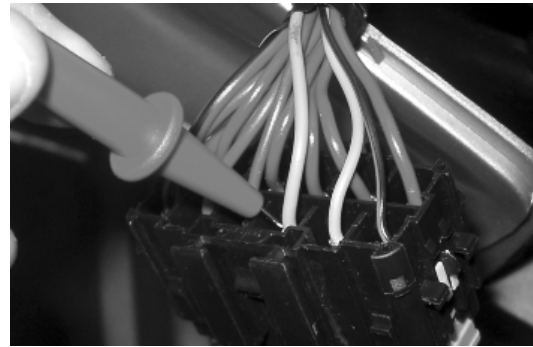


Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.

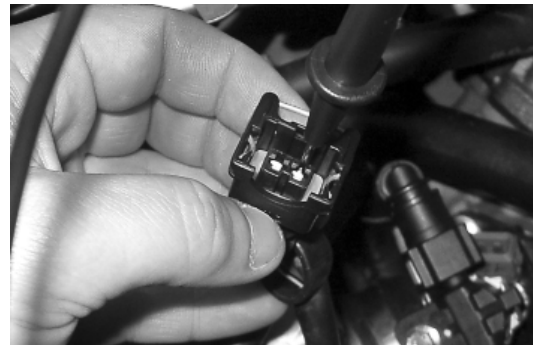
N.B.

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

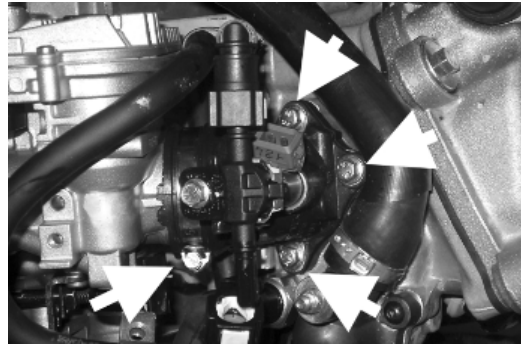


With injector disconnected and the injector load remote control disconnected, check the continuity of the Black-Green cable between the injector connector and remote control base.



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, in fifteen seconds, approximately 40 cc of fuel is dispensed with a regulation pressure of approximately 2.5 BAR.



Specific tooling

020480Y Petrol pressure check set



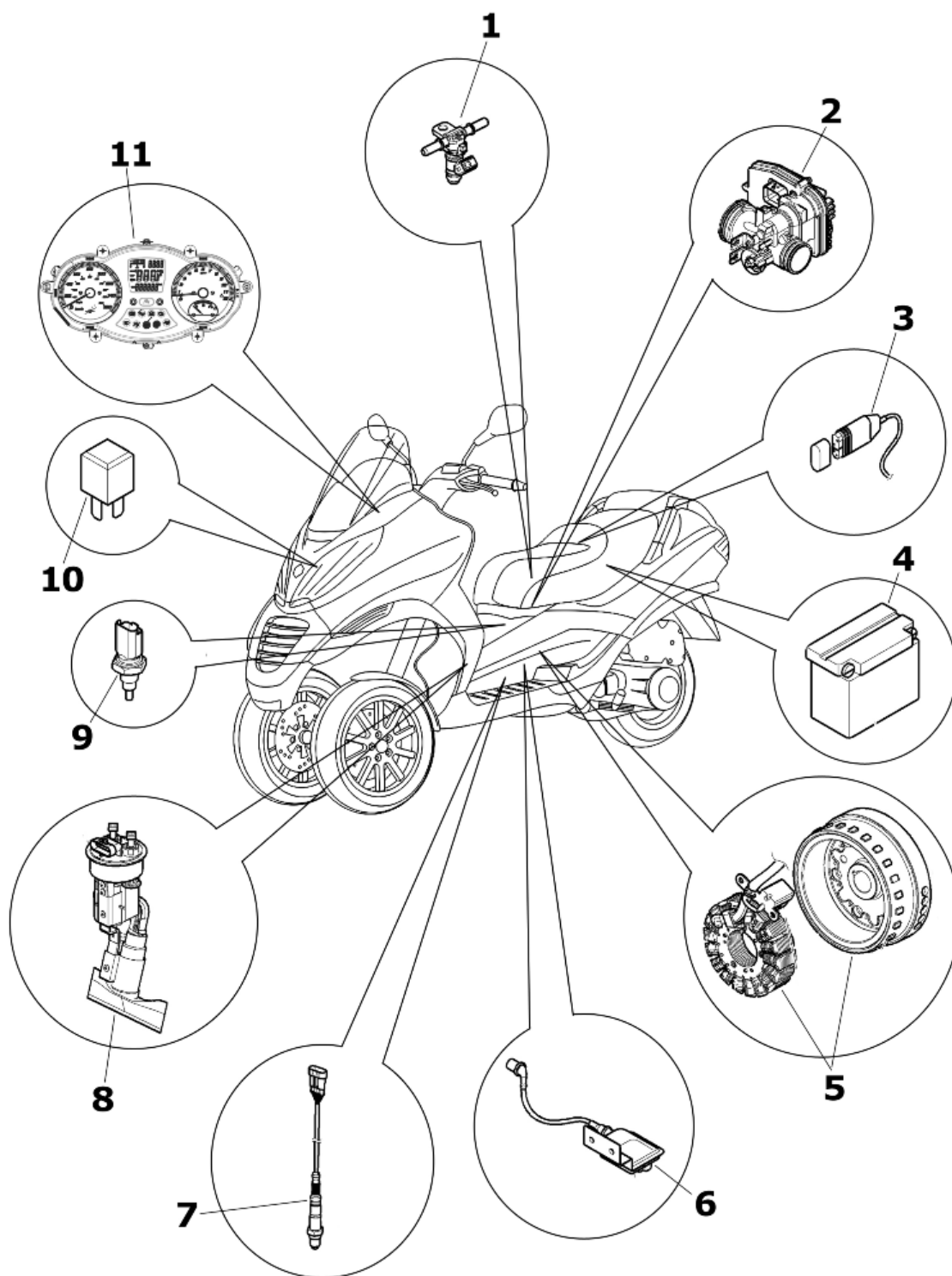
Proceed with the injector seal test.

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

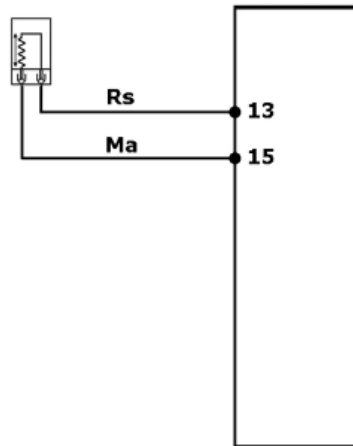


Components location

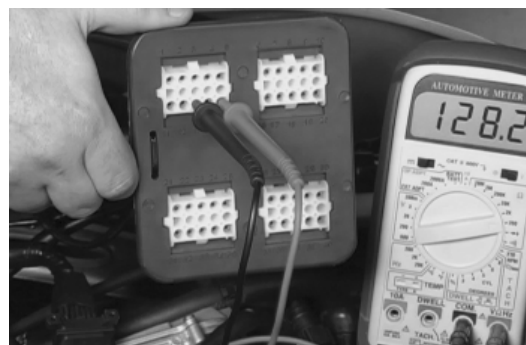


TRANSPARENCY

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

Tachometer

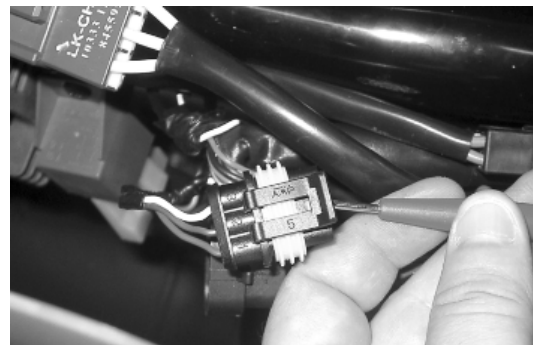
With wiring disconnected from the control unit and connected to the system, check that the sensor resistance between pins 13 - 15 is between 100 and 150 Ohm at an engine temperature of approximately 20°



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

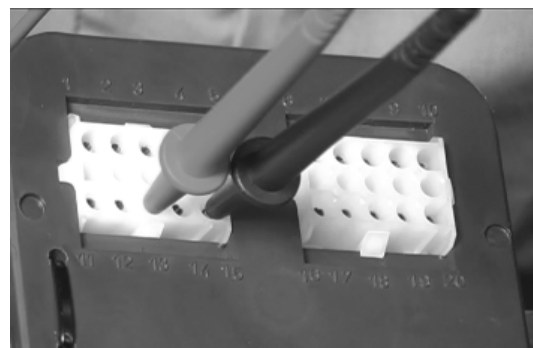


With the interface wiring disconnected from the control unit and rpm sensor connector, check that the red and brown cables (pin 13 - 15) are isolated from each other and insulated from the earth.

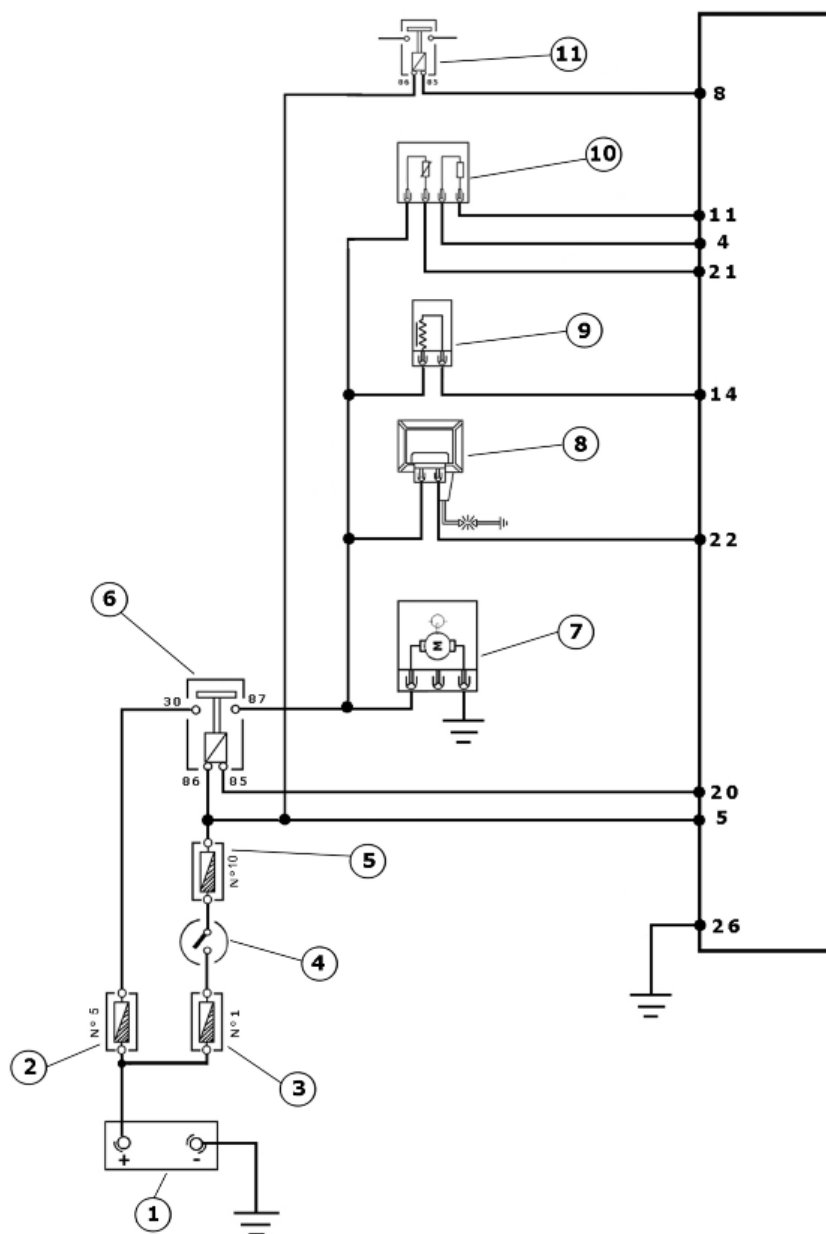
Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter



HT coil

**INJECTION LOADS**

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	15A
3	Fuse	20A
4	Key switch contacts	
5	Fuse	7.5 A
6	Injection load remote control	
7	Fuel pump	
8	HV coil	

	Specification	Desc./Quantity
9	Fuel injector	
10	Lambda sensor	
11	Electric fan starter	

The ignition system is integrated with the injection and is of the inductive high efficiency type.

The control unit manages two important parameters:

- Ignition advance

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

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

- Magnetisation time

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

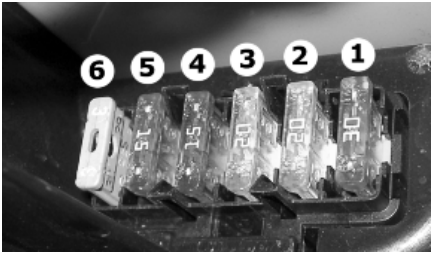
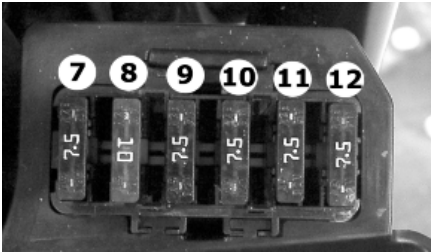
The injection system recognises the 4-stroke cycle and therefore, ignition is only controlled during compression.

Specific tooling

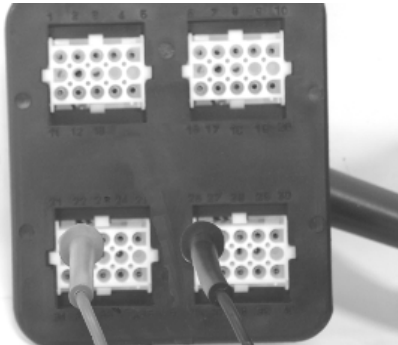
020331Y Digital multimeter

Check the efficiency of injection load 15 A fuse No. 5.

Check the efficiency of live control unit power supply 7.5A fuse No. 10 .

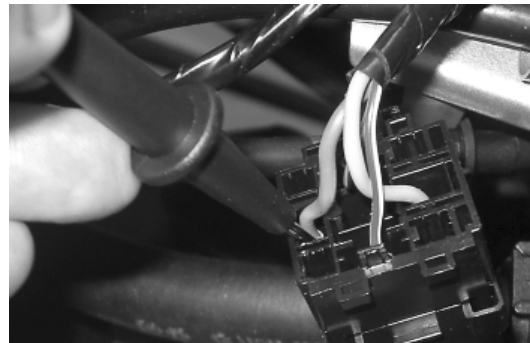
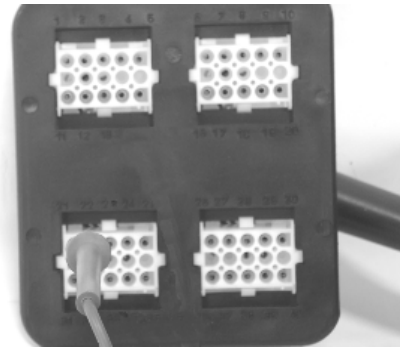


Check there is voltage between pins 22 and 26 of the interface wiring for around two seconds when switching to «ON».

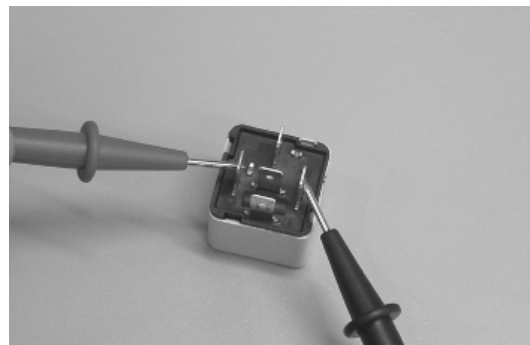
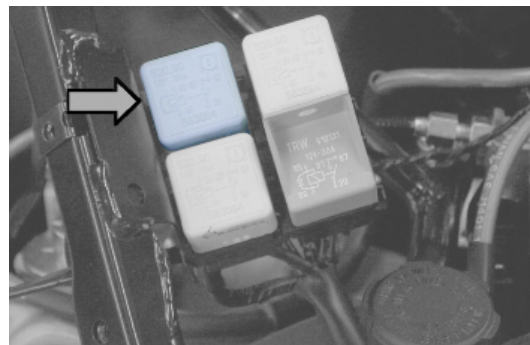


Check the resistance of the primary coil between pin 22 of the interface wiring and the green black cable of the injection load remote control base with the control unit disconnected and the remote control disconnected.

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.

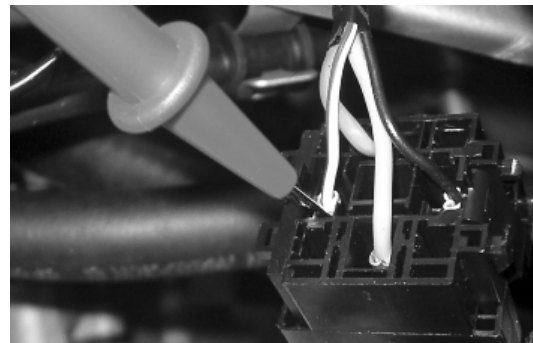
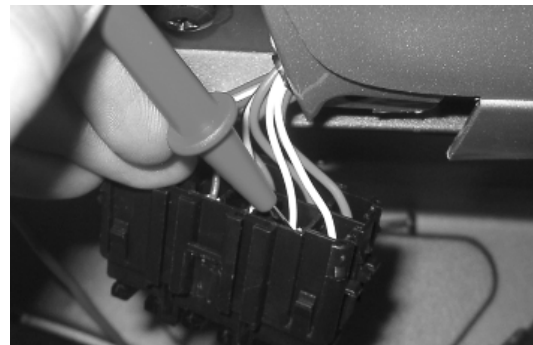
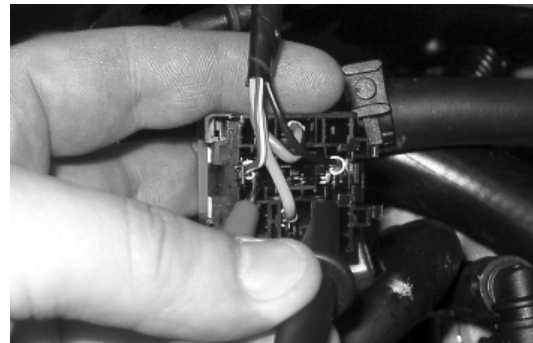


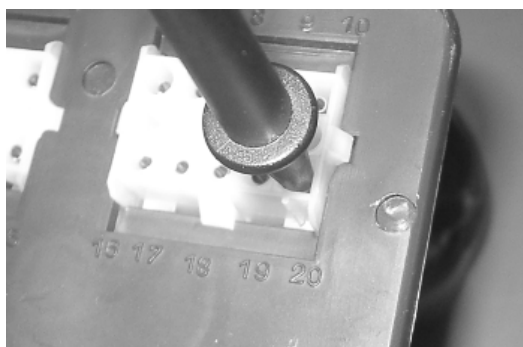
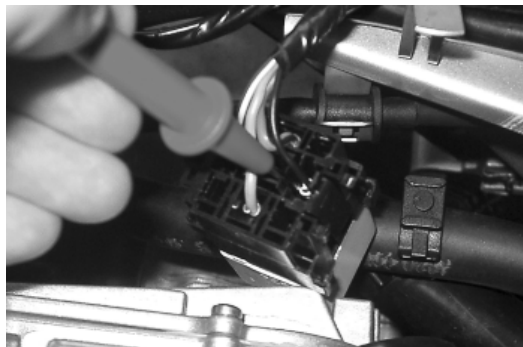


Check the power supply line of the injection load remote control energising coil: after switching to "ON", make sure there is battery voltage, for two seconds, between the Red-White cable and Black-Violet cable of the remote control base. If there is not, check the continuity of the Red-White cable between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

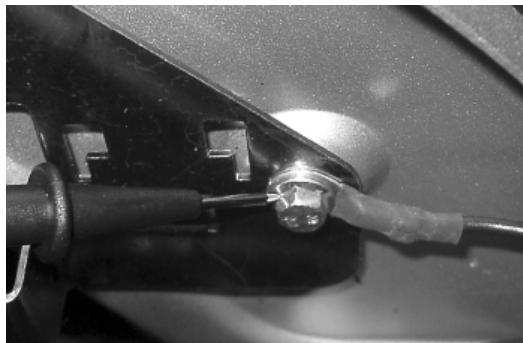
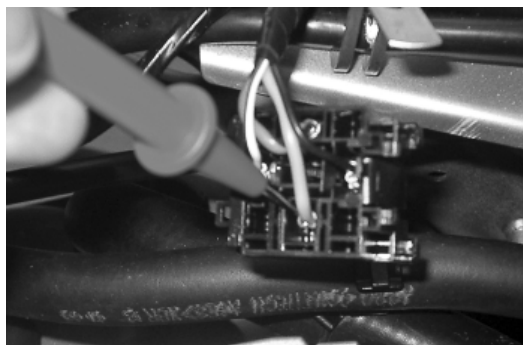




Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 5 15 A) and the remote control base.

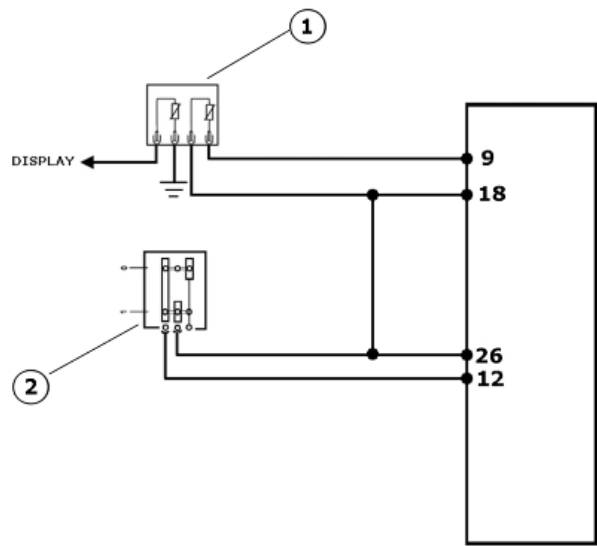
N.B.

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





Coolant temperature sensor



TEMPERATURE SENSOR 1

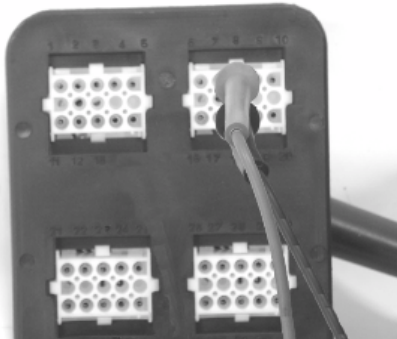
	Specification	Desc./Quantity
1	Water temperature sensor	
2	Engine stop switch	

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° = 2500 ± 100 Ω

80° = 308 ± 6 Ω

With the control unit side connector disconnected and the coolant temperature connector disconnected,



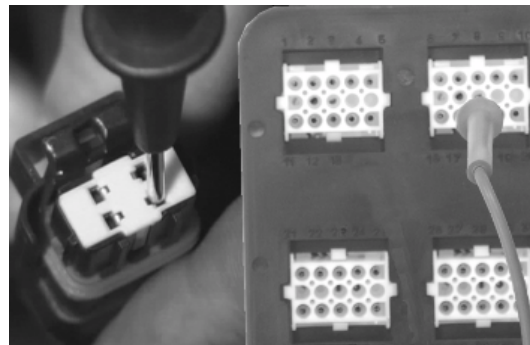
ected, check the insulation between the two light blue-green and grey-green cables

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.

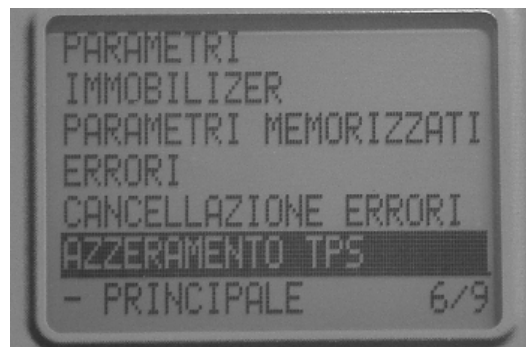
Connect the diagnostic tester.

Switch to «ON».

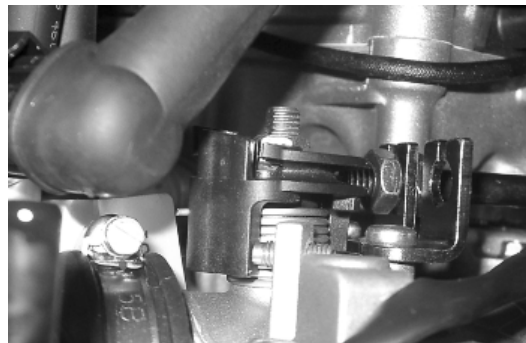
Select the functions of the diagnostic tester on
«TPS RESET».

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

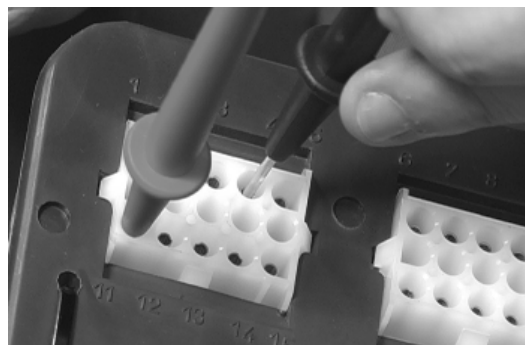
Given that the TPS resetting is also done when the control unit is replaced, place the control unit - filter box bellows at 45° during the refitting operation as shown in the photograph.



Lambda probe

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 (+)

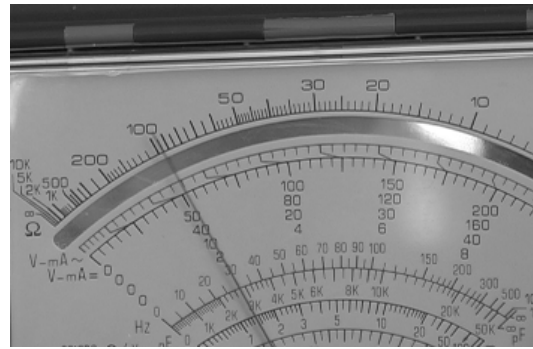


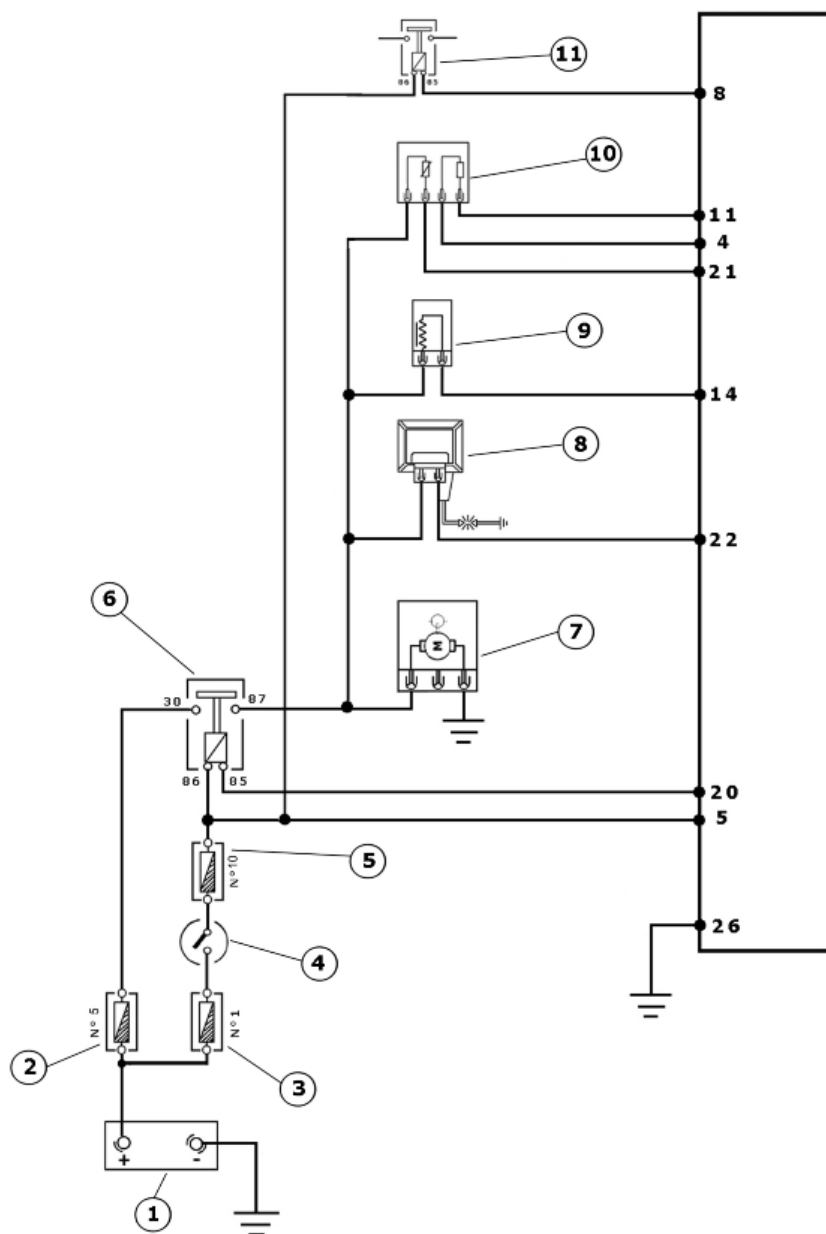
With the engine running at idle speed, check that the voltage oscillates between 0V and 1V

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	15A
3	Fuse	20A
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 starter	

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.

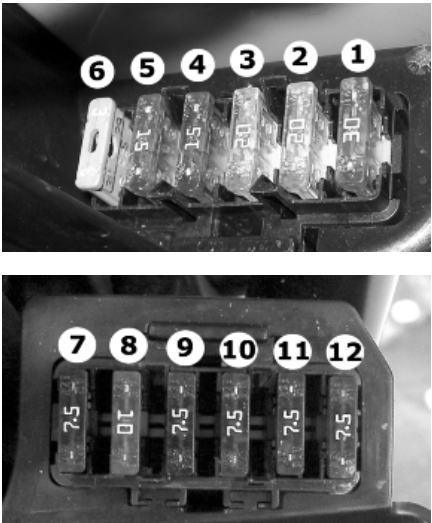
Specific tooling

020481Y Control unit interface wiring

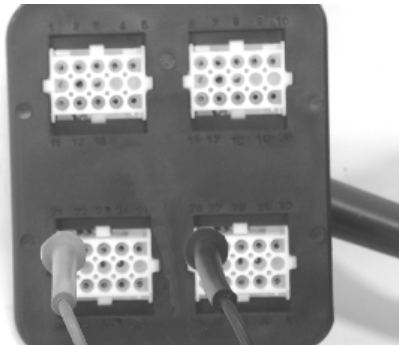
020331Y Digital multimeter

Check the efficiency of injection load 15 A fuse No. 5.

Check the efficiency of live control unit power supply 7.5A fuse No. 10 .

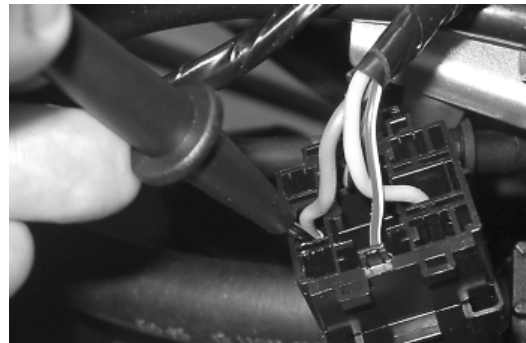
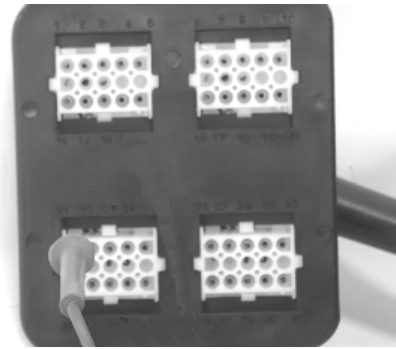


Check there is voltage between pins 21 and 26 of the interface wiring, for around two seconds, when switching to «ON».

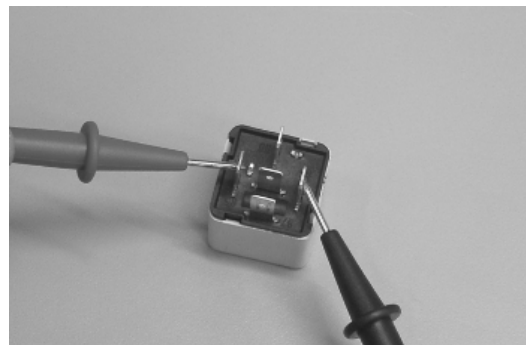


With the engine cold, check the resistance of the Lambda sensor heater between pin 21 of the interface wiring and the black green cable of the injection load remote control base, with the control unit disconnected and the remote control disconnected.

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.

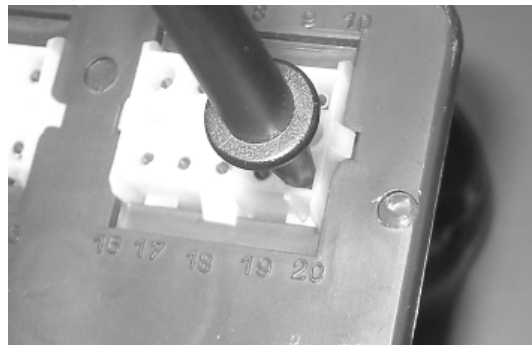
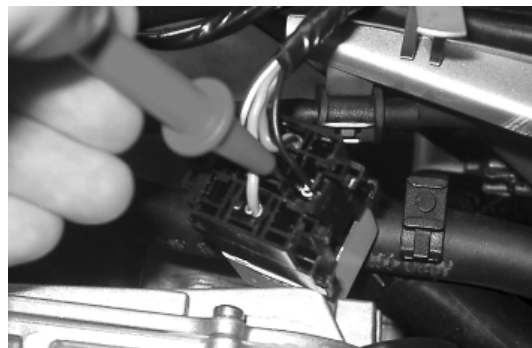
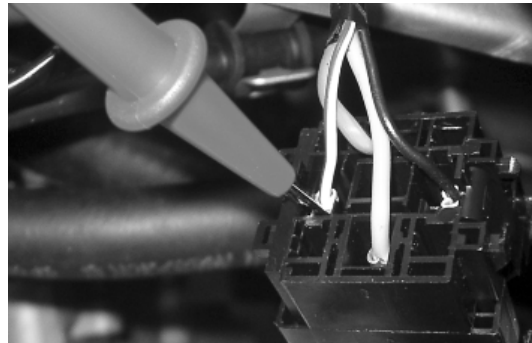
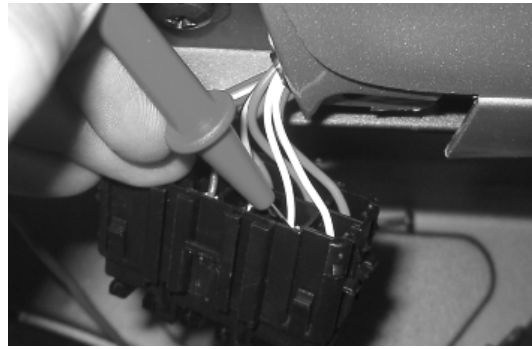


Check the power supply line of the injection load remote control energising coil: after switching to "ON", make sure there is battery voltage, for two seconds, between the Red-White cable and Black-Violet cable of the remote control base. If there is not, check the continuity of the Red-White cable between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

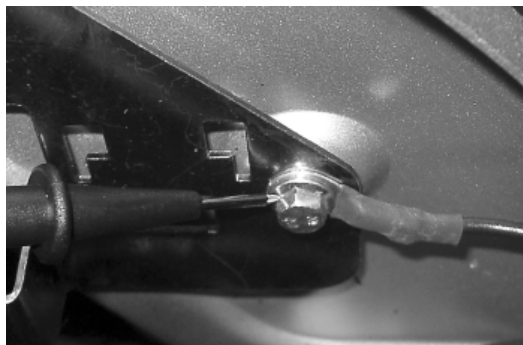
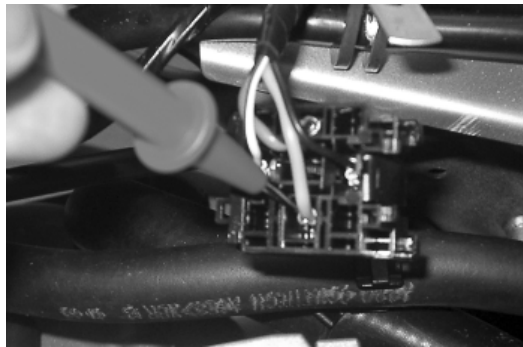
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).



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

SSUSPENSIONS

SUSP

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

Front

Removing the front wheel

- Remove the 5 fixing screws indicated in the photograph.

Locking torques (N*m)

Wheel fixing screw $20 \div 25$



Front wheel hub overhaul

- Remove the ball bearing seeger ring indicated in the photograph



Extract the ball bearing using the specific tool

Specific tooling

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

001467Y017 Bell for bearings, outside $\varnothing 39$ mm



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



- Remove the roller bearing using the specific tool

Specific tooling**020376Y Adaptor handle****020456Y Ø 24 mm adaptor****020363Y 20 mm guide**

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

Specific tooling**020151Y Air heater****020376Y Adaptor handle****020359Y 42x47-mm adaptor****020412Y 15 mm guide**

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

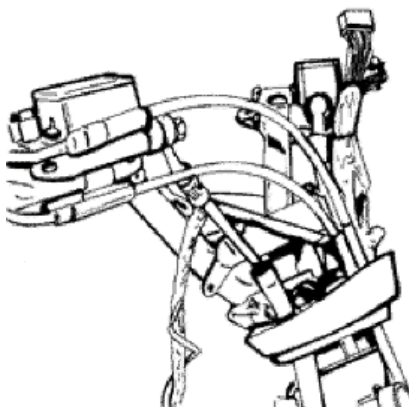
Specific tooling**020038Y Punch****Recommended products****AGIP GREASE MU3 Grease for odometer transmission gear case**

Soap-based lithium grease with NLGI 3; ISO-L-XBCHA3, DIN K3K-20

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.

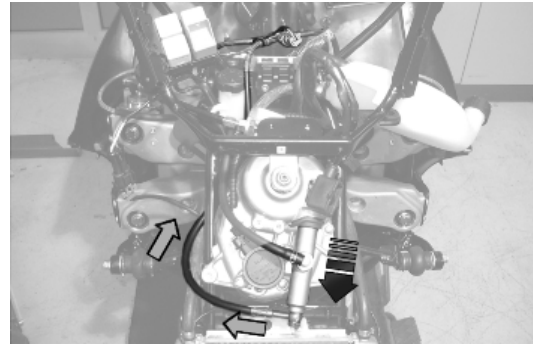
Locking torques (N*m)

Handlebar fixing screw 50 ÷ 55

The tilt mechanism

Hydraulic system layout

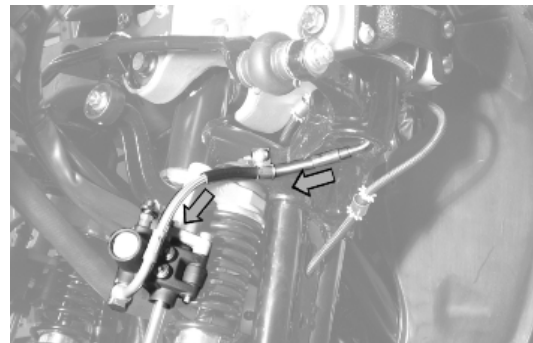
When tilting is locked, the geared motor activates the hydraulic pump indicated in the photograph and pressurises the circuit.



The pressurised oil reaches the distribution frame "T" and the pressure sensor "A". Then, the pipes branch out to reach the upper joints on the side steering tubes.

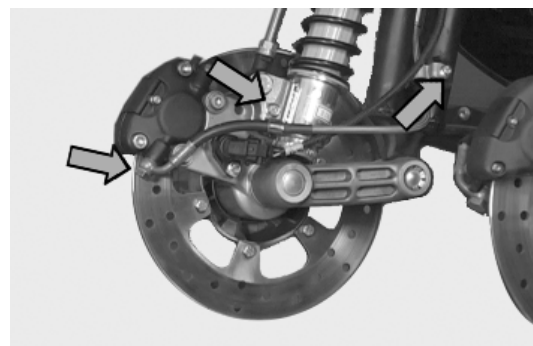


Through the rigid-flexible pipes inside the side steering tubes, the oil reaches the stem sliding locking device placed parallel to the shock absorber.

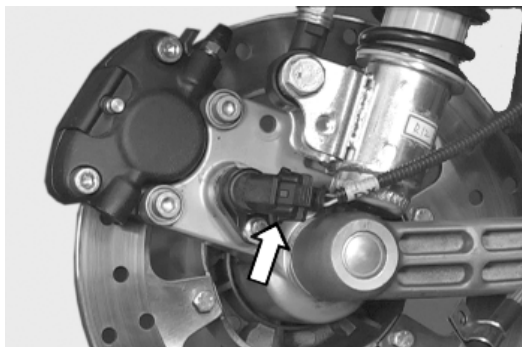


Steering tubes

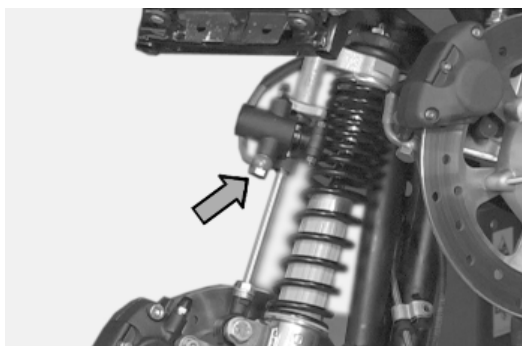
Remove the brake calliper pipe retainers and the hydraulic pipe fitting from the brake calliper making sure there is a container to collect the brake fluid.



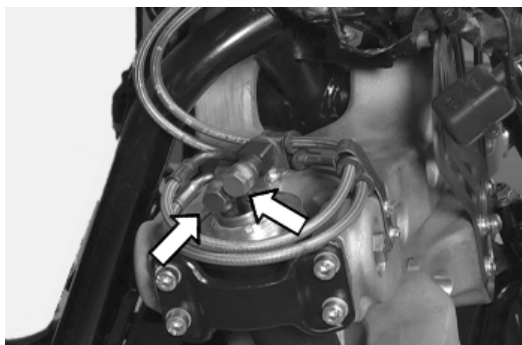
Disconnect the tone wheel connector indicated in the photograph.



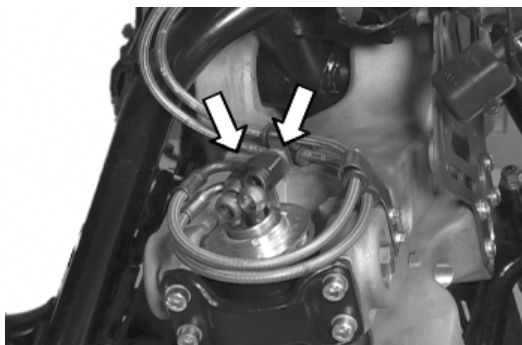
Remove the hydraulic pipe fitting from the sliding locking device, making sure again that the liquid drained is collected.



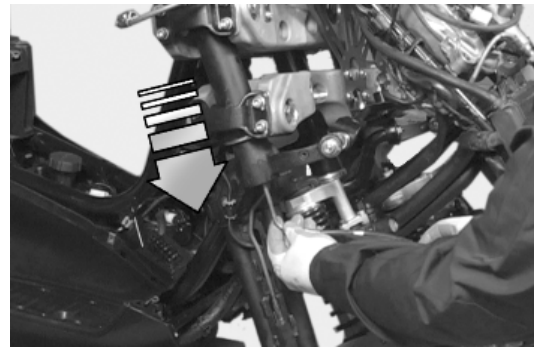
Remove the upper fittings, on the parallelogram, of the brake hydraulic pipes and the suspension lock indicated in the photograph.



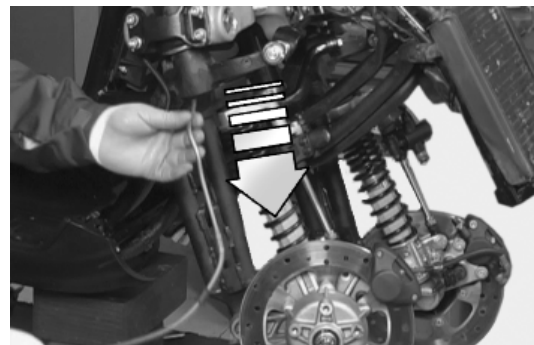
Remove the hydraulic pipe fitting fixing nuts indicated in the figure from the support bracket.



Remove the suspension tilt locking device pipes from the headstock.

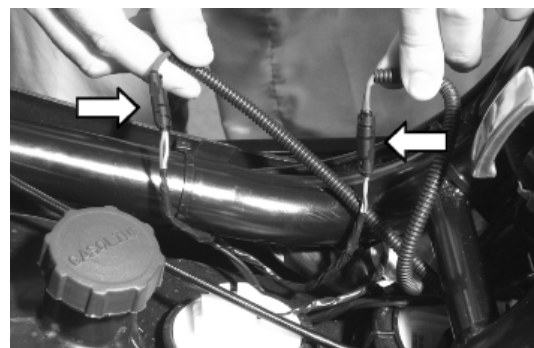


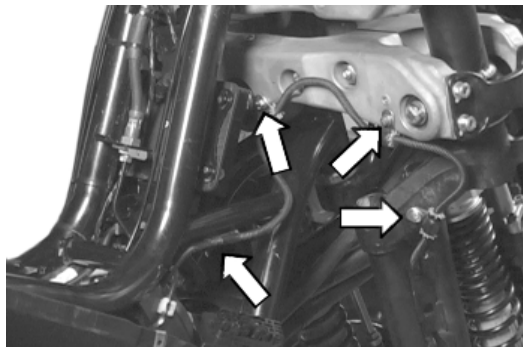
Remove first the flexible part of the calliper from the steering tube as shown in the photograph, and then remove the rigid part.



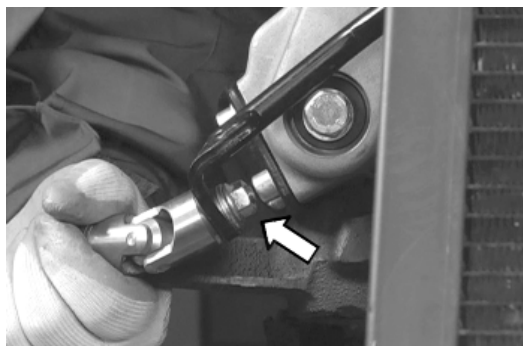
Remove the tone wheel wiring by disconnecting the connector on the fuel tank after removing the chassis central cover.

After that, remove the retainers indicated in the figure.





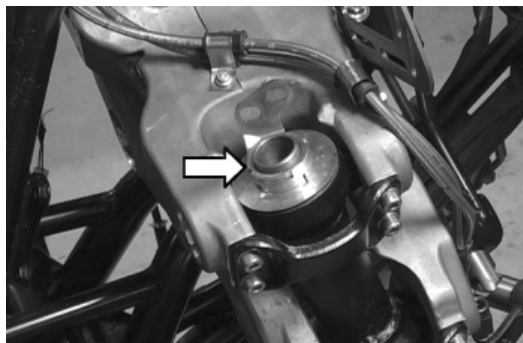
Remove the constant-velocity universal joint from the steering bar by undoing the nut indicated in the photograph.



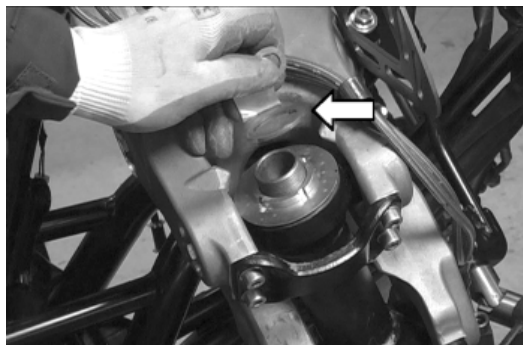
Use a specific tool to remove the upper tightening ring nut of the steering tube.

Specific tooling

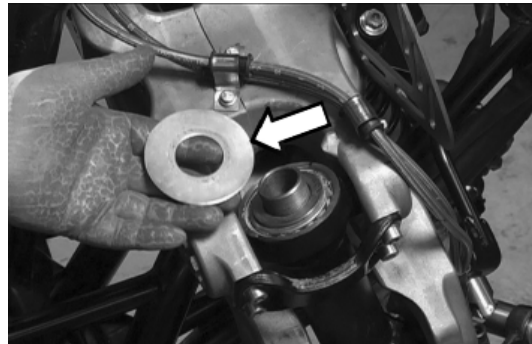
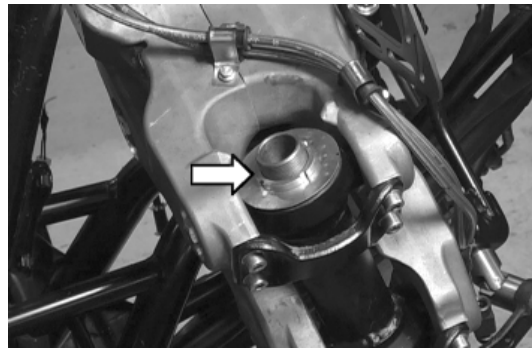
020055Y Wrench for steering tube ring nut



Remove the hydraulic pipe support bracket.



Remove the steering tube lower ring nut and the protection cap indicated in the photograph.



Now, it is possible to remove the steering tube.

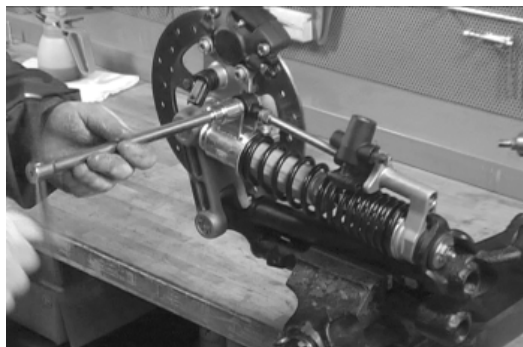


Check that the roller tapered bearing does not show signs of abnormal wear. If it is, replace it.

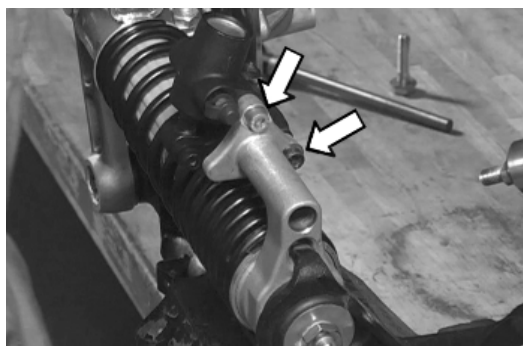


THE OPERATIONS DESCRIBED BELOW CAN ALSO BE CARRIED OUT EVEN WHEN THE SUSPENSION IS FITTED

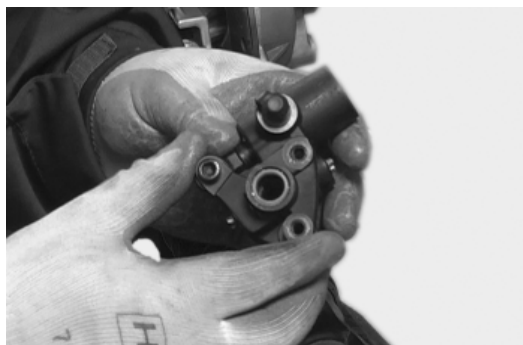
Remove the lower retainer of the sliding stem shown in the photograph.



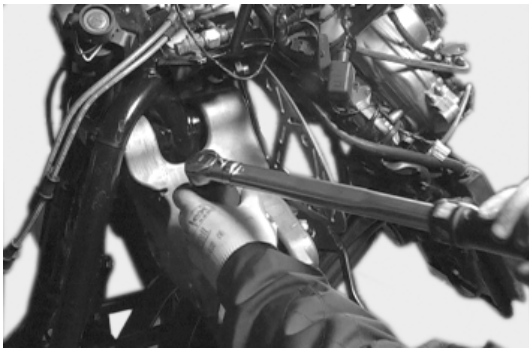
Remove the sliding stem locking device retainers indicated in the photograph.



Check that the sliding stem locking device does not show signs of abnormal wear.



For refitting, follow the operations for removal but in reverse order, observing the prescribed torques and greasing the bearings and their seats.

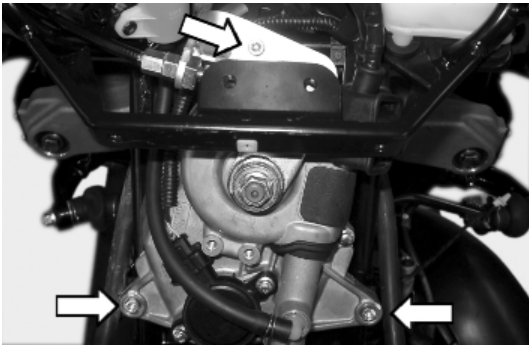


STEERING TUBES

Name	Torque in Nm
Side headstock upper ring nut	20 - 24
Side headstock lower ring nut	12 ÷ 15
Screw fixing sliding stem to shock absorber	45 ÷ 50
Clamp for sliding stem locking device	6.5 ÷ 10.5
Fixing nuts for constant-velocity universal joints	18 ÷ 20

Parallelogram device

Remove the steering tubes.
To facilitate removal operations of the brake disc sector, loosen the 3 fixing screws in the hydraulic electro-actuator indicated in the photograph.

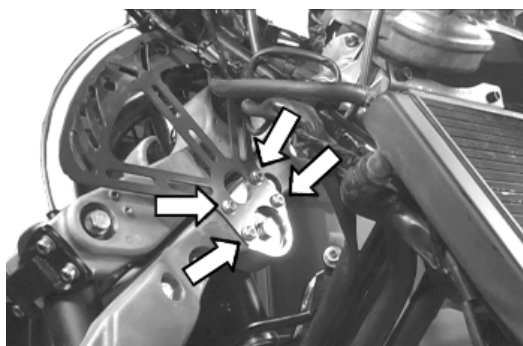


Remove the hydraulic pipe retainers from the parallelogram.

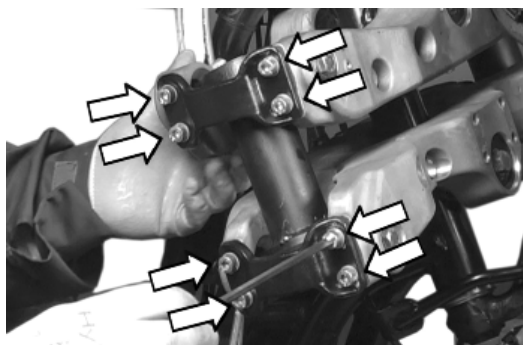




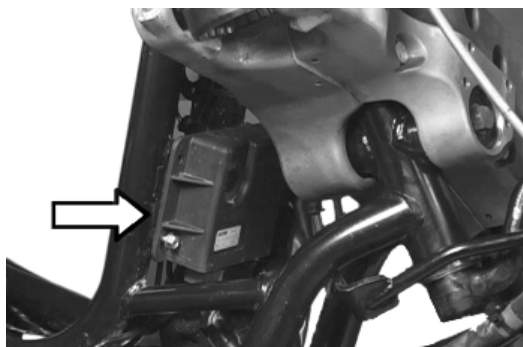
Remove the 4 screws fixing the tilt brake disc sector indicated in the photograph.



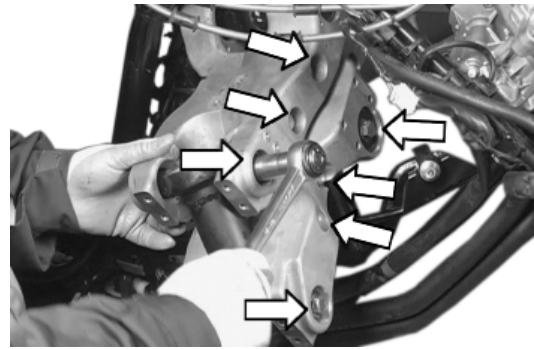
Remove the retainers indicated in photograph of the half-arms joint flange.



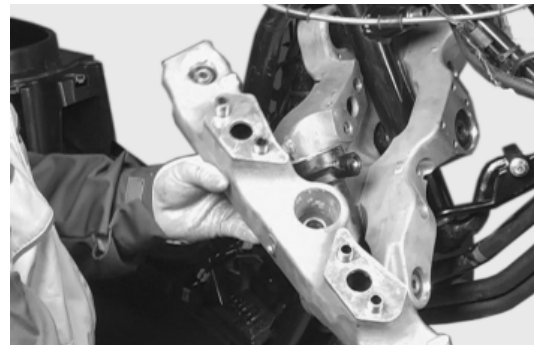
To facilitate the operations indicated below, remove the suspension locking electronic control unit indicated in the photograph.



Remove the arm coupling retainers from the parallelogram by loosening the retainers indicated. For easy refitting operations, remember to take note of the positions of the components.



Separate the half-arms by hitting slightly with a wooden mallet where possible alternatively to the left and right side of the parallelogram.



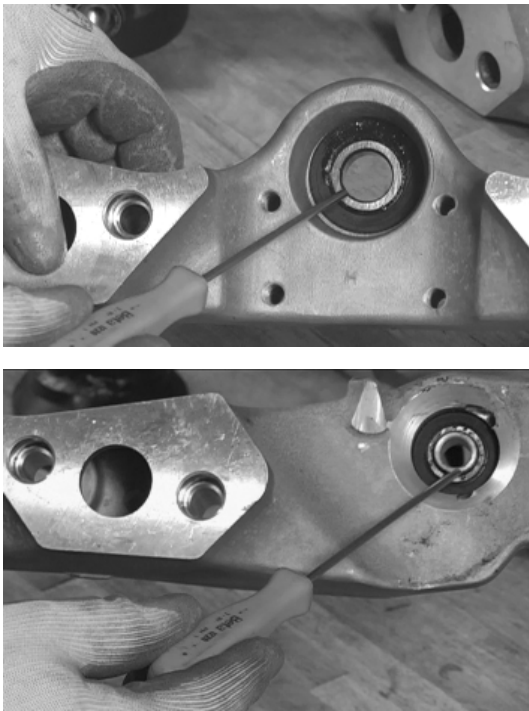
Remove the headstocks.



Carry out a visual check of the upper and lower bearings on the headstocks and their seats. Replace them in case of signs of abnormal wear.



Check the ball bearings on the parallelogram arms. Replace them in case of signs of abnormal wear.



Check the inside tracks of the parallelogram bearings on the chassis.



For refitting, follow the operations for removal but in reverse order, lubricating the locking pins on the parallelogram half-arms and observing the prescribed torques.



PARALLELOGRAM DEVICE

Name	Torque in Nm
Arm coupling screws	45 ÷ 50
Screws fixing arms to side headstocks	45 ÷ 50
Screws fixing arms to central headstock	45 ÷ 50
Screws fixing the half-arm coupling flange	20 ÷ 25

Name	Torque in Nm
Fixing screws for tilt locking disc section	20 ÷ 25

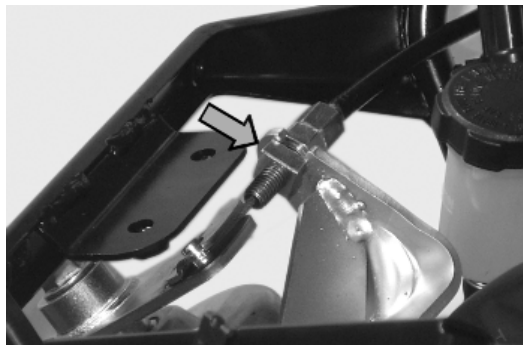
Geared motor and Suspension locking system

Before removing the geared motor:

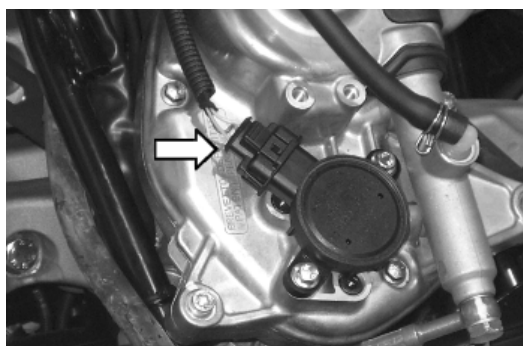
Disable the suspension lock.

- Remove the front shield.

With the set nut indicated in the photograph, remove the tensioning cable of the suspension locking mechanical calliper.



Remove the electrical connection of the geared motor position potentiometer.



Remove the electrical connection of the geared motor electric motor.



Disconnect the hydraulic pipes between the pump and the sliding stem locking clamps. Empty the system and use a container to collect the brake fluid.

CAUTION

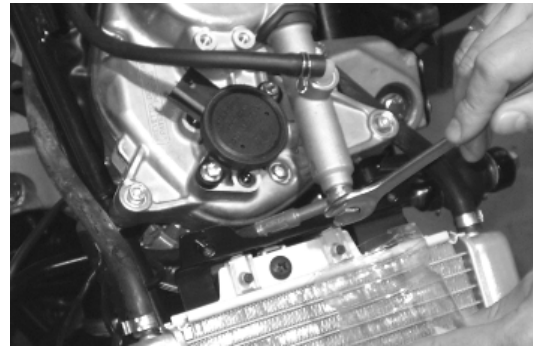
ELIMINATE ANY REMAINING BRAKE FLUID SPILLS.



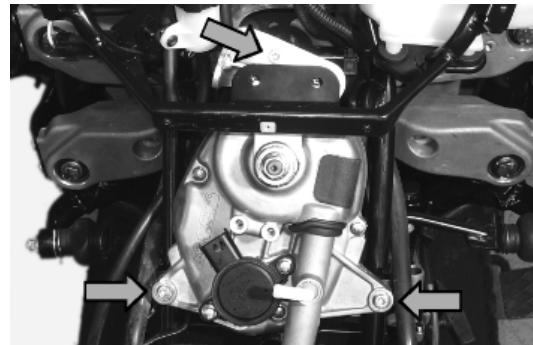
WARNING: BRAKE FLUID IS HIGHLY POISONOUS. DO NOT INGEST OR SWALLOW. IF ACCIDENTALLY SWALLOWED, DRINK LARGE



QUANTITIES OF MILK OR WATER AND SEEK MEDICAL ADVICE IMMEDIATELY. BRAKE FLUID DESTROYS SKIN AND OCULAR TISSUE. IF YOU ACCIDENTALLY SPILL BRAKE FLUID ON YOURSELF, TAKE OFF YOUR CLOTHES, WASH WITH HOT WATER AND SOAP AND SEEK MEDICAL ADVICE IMMEDIATELY. IF BRAKE LIQUID GETS ACCIDENTALLY IN CONTACT WITH YOUR EYES, RINSE WITH ABUNDANT FRESH WATER AND SEEK MEDICAL ADVICE IMMEDIATELY. KEEP BRAKE FLUID OUT OF THE REACH OF CHILDREN.



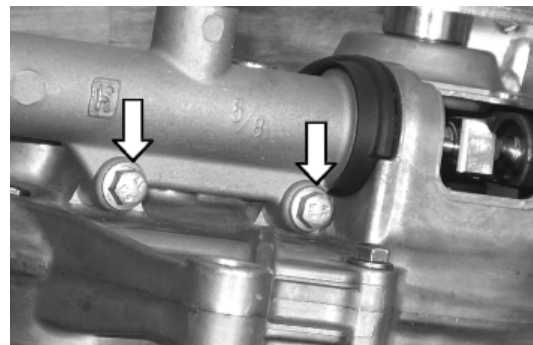
Remove the 3 fixing screws indicated and remove the whole geared motor.



Use a screwdriver to remove the plastic access cover to the pump joint/geared motor

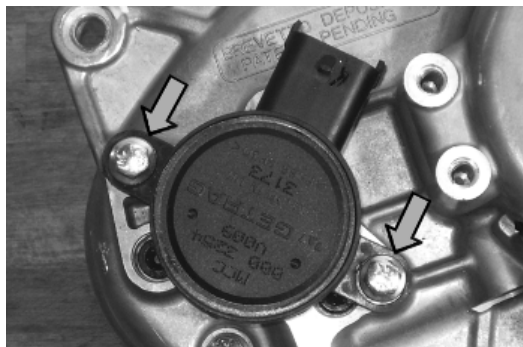
Unscrew the pump joint screw.

Unscrew the two geared motor pump locking screws.



Unscrew the two potentiometer screws.

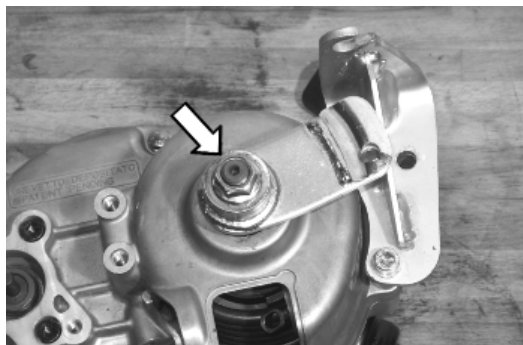
When refitting, plug the potentiometer in D-type connector, afterwards place it with its electric connection directed to the opposite side of the pump.



Remove the nut indicated in the figure, if necessary lock the lever with a vice making sure not to spoil the surface.

In case of difficulties when removing the lever, use the specific tool.

Remove the tongue and then, the moulded washer.

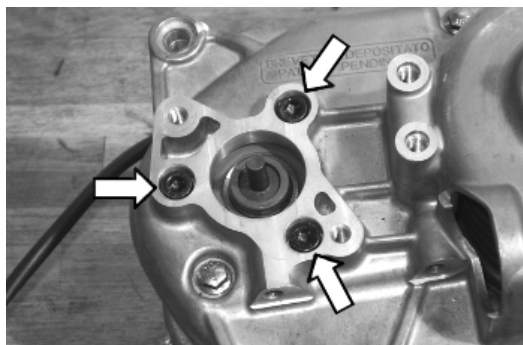


Specific tooling

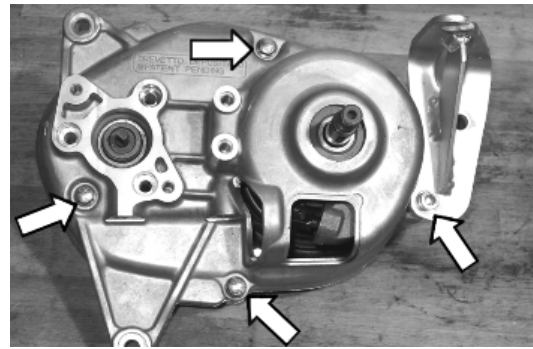
020234y extractor

Remove the three fixing screws of the electric motor.

It is important to mark the direction of the electric motor position in order to refit it correctly.



Remove the four screws indicated in the figure, remove the flexible transmission supporting bracket, separate the two crankcase halves, if necessary, use a rubber mallet to hit the flexible transmission lever in order to separate the two crankcases.



Remove the retaining seeger ring of the bearing of the flexible transmission lever control shaft bearing.

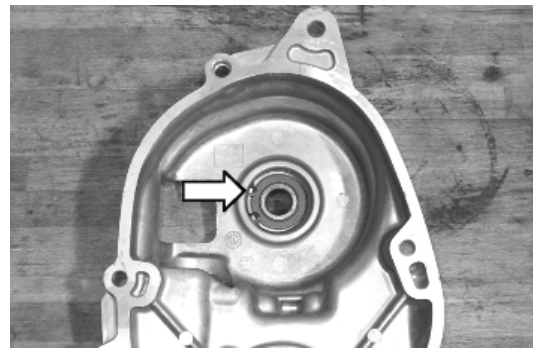
Remove the bearing with the specific tool.

Specific tooling

020376Y Adaptor handle

020441Y 26 x 28 mm adaptor

020362Y 12 mm guide



Extract the electric motor bearing with the specific tool.

Specific tooling

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm

020363Y 20 mm guide



Hold the crankcase in a perfectly horizontal position, heat it with a heat gun at a temperature of about 120 °C, use the specific tool to fit the bearing of the flexible transmission lever control shaft. Hit slightly with a mallet if necessary.
Refit the bearing check seeger ring.

Specific tooling**020151Y Air heater****020376Y Adaptor handle****020362Y 12 mm guide****020357Y 32 x 35 mm adaptor**

Hold the crankcase in a perfectly horizontal position, heat it with a heat gun at a temperature of about 120 °C, use the specific tool to fit the bearing of the electric motor. Hit slightly with a mallet if necessary.

Specific tooling**020363Y 20 mm guide****020358Y 37x40-mm adaptor****020151Y Air heater****020376Y Adaptor handle**

Remove the spring/toothed sector unit from its fitting, slightly hit with a mallet if necessary to release the unit.



Extract the bearing of the spring/toothed sector unit with the specific tool.

Specific tooling

001467Y002 Driver for OD 73 mm bearing



Extract the bearing of the electric motor with the specific tool.



Hold the crankcase in a perfectly horizontal position, heat it with a heat gun at a temperature of about 120 °C, use the specific tool to fit the bearing of the spring/toothed sector unit. Hit slightly with a mallet if necessary.

Specific tooling

020360Y Adaptor 52 x 55 mm

020151Y Air heater

020376Y Adaptor handle



Hold the crankcase in a perfectly horizontal position, heat it with a specific heat gun at a temperature of about 120 °C, use the specific tool to fit the bearing of the electric motor. Hit slightly with a mallet if necessary.

Specific tooling

020363Y 20 mm guide

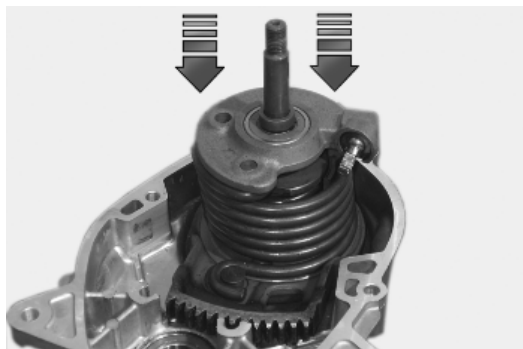
020151Y Air heater

020376Y Adaptor handle

020477Y Adaptor 37 mm



Refit the spring/toothed sector unit, hold the crankcase in a perfectly horizontal and stable position, place the spring/toothed sector unit keeping it perfectly perpendicular to the bearing already fitted on the crankcase; if necessary, slightly hit the unit shaft end with a mallet and protect the thread by screwing in a nut.



Fit the pinion and align the reference on the pinion teeth with the reference indicated on the second slot of the toothed sector.

Grease the pinion and the toothed sector with specific grease.

Refit the toothed sector spacer.

Recommended products

**MONTBLANC MOLYBDENUM GREASE MON-
TBLANC MOLYBDENUM GREASE**

Molybdenum disulphide grease

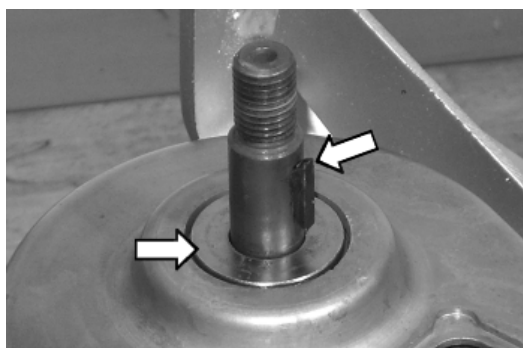


Lubricate the interference areas, match the crankcase halves with slight hits of a mallet to get them into contact.

Place the flexible transmission supporting bracket, refit the four screws, screw them to the prescribed torque.

Locking torques (N*m)

**Geared motor crankcase halves coupling
screws $11 \div 13$**



Refit the electric motor; check the position is correct by means of the reference indicated during removal.

The motor should be so positioned that it does not protrude from the reduction unit mould, see figure. Tighten the screws to the prescribed torque.

Locking torques (N*m)

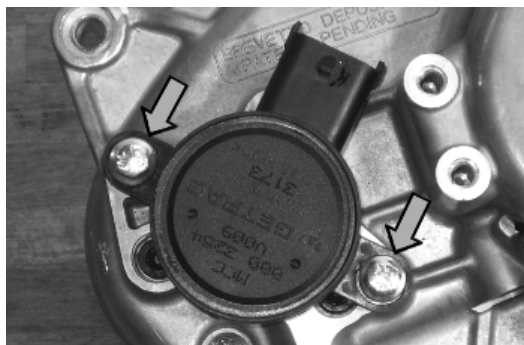
Electric motor coupling screws 11 ÷ 13

Place the moulded washer of the flexible transmission control lever shaft and the tongue.

Refit the flexible transmission control lever as shown in the figure.



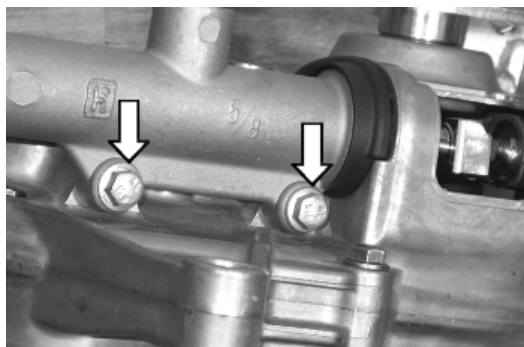
Refit the potentiometer (not forcing in the D-type connector ensures a sole position) with the connector directed to the opposite side of the hydraulic pump.



Refit the hydraulic pump on the geared motor body and tighten the screws to the prescribed torque. Fit but not tighten the pump stem coupling screw and refit the plastic protection cap. The synchronisation procedure should be complete when the installation is finished.

Locking torques (N*m)

Geared motor hydraulic pump tightening screws 11 ÷ 13



Remove the two bracket screws after releasing the spring and freeing the flexible transmission adjustment.

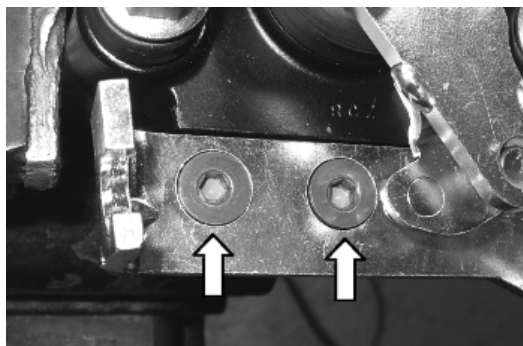
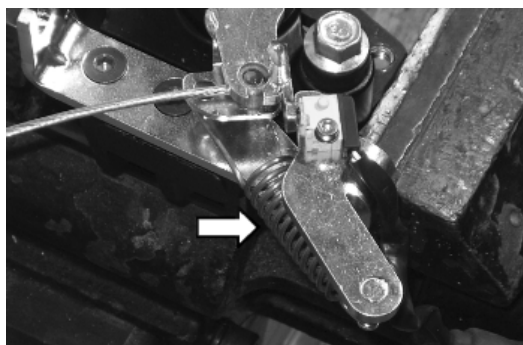
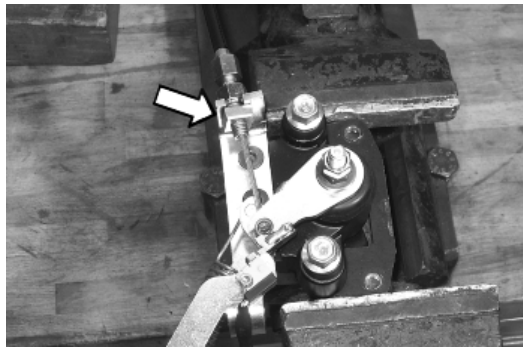
CAUTION: A FIRST PRODUCTION BATCH WILL BE EQUIPPED WITH DOUBLE COAXIAL SPRING.

It is very important to remove the flexible transmission from its fitting only for replacement.

When refitting, tighten the two bracket screws and the flexible transmission lever nut to the prescribed torque.

Locking torques (N*m)

Bracket tightening screws $8 \div 12$



Unscrew the Allen screw and remove the switch. When refitting, place the switch with the button oriented to the stop indicated on the calliper lever; observing the reference indicated on the switch supporting bracket.

After refitting, check in detail that the switch is regularly activated by the stop on the lever.

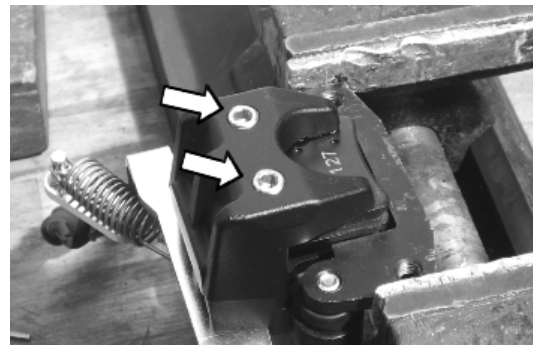




Unscrew the two pad pin screws, remove the pads with the spring.

When refitting, tighten the two screws to the prescribed torque and use Threadlock.

When refitting, adjust the cable properly so that the switch is pushed when the system is unlocked.



Select the SYSTEM RESET option from the main menu

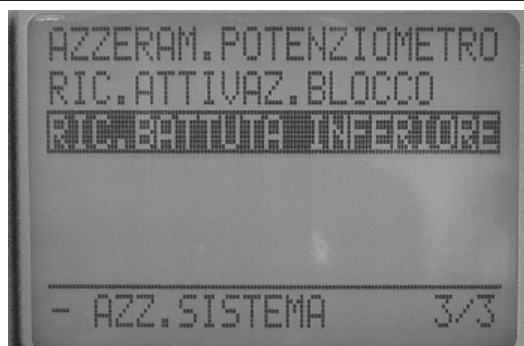


Turn the key switch to ON

Select the LOWER STOP SEARCH option from the SYSTEM RESET menu

WAIT

PROCEDURE IN PROGRESS



The hand-held computer indicates the outcome of the stop search operation:

POSSIBLE LIMIT STOP VALUES. TO EXIT, PRESS A KEY AND TURN OFF AND ON. SELECT PARAMETERS TO ADJUST AT 12°.

Check the geared motor if the hand-held computer does not indicate this.



Select the PARAMETERS option from the main menu



The hand-held computer displays the option: RELATIVE POTENTIOMETER ANGLE

This function is active coming from the LOWER STOP SEARCH procedure.

NOTE: a slight oscillation of the angle value between 0.00° and 0.50° is considered normal

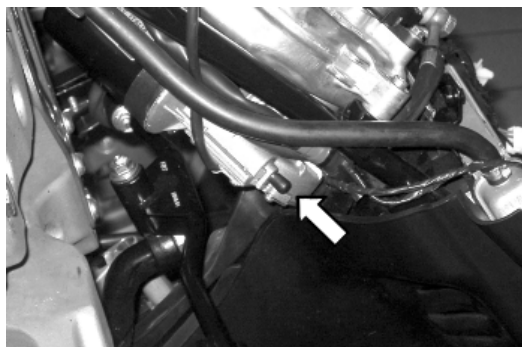


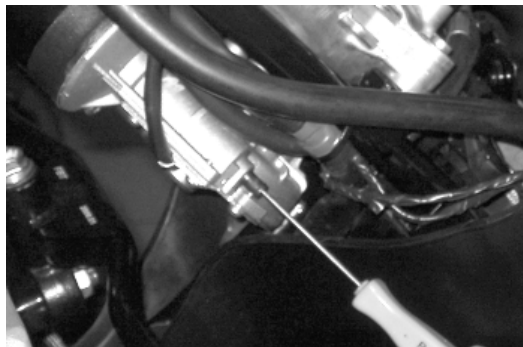
Remove the protection cap of the geared motor set screw

Use a plain slot screwdriver to turn the set screw anticlockwise until replicating the 12° condition on the hand-held computer

RELATIVE POTENTIOMETER ANGLE 12° (a slight value oscillation is considered normal)

Refit the protection cap

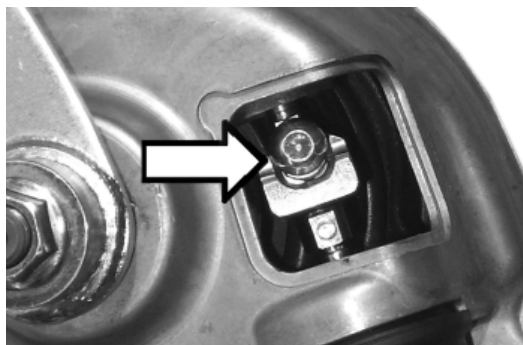




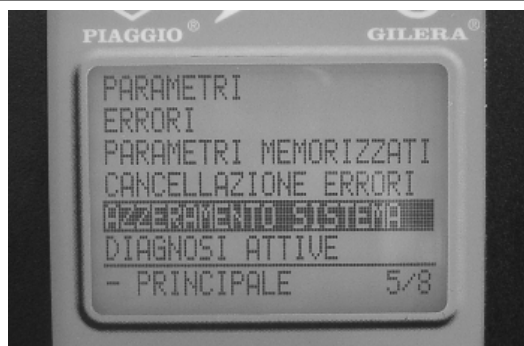
Remove the protection cap, align the pump control and lock the screw to the prescribed torque

Locking torques (N*m)

Clamp fixing pump bolt to anti-tilting device 11 ÷ 13



Select the SYSTEM RESET option from the MAIN menu



Select the POTENTIOMETER RESET option from the SYSTEM RESET menu and press OK.

WAIT....

PROCEDURE IN PROGRESS



The hand-held computer displays the words: CHECK THAT THE CONTROL IS SET AT 12° FROM THE LOWER STOP. PRESS OK TO CONTINUE

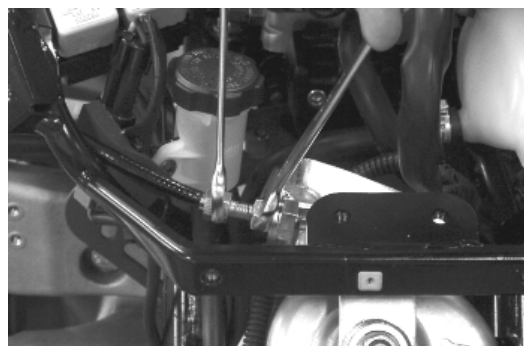
Press OK

The hand-held computer displays the words: POSSIBLE LIMIT STOP VALUES. PRESS A KEY AND SHIFT OFF AND ON

If this is not successful, the tilt locking mechanism remains locked for safety.

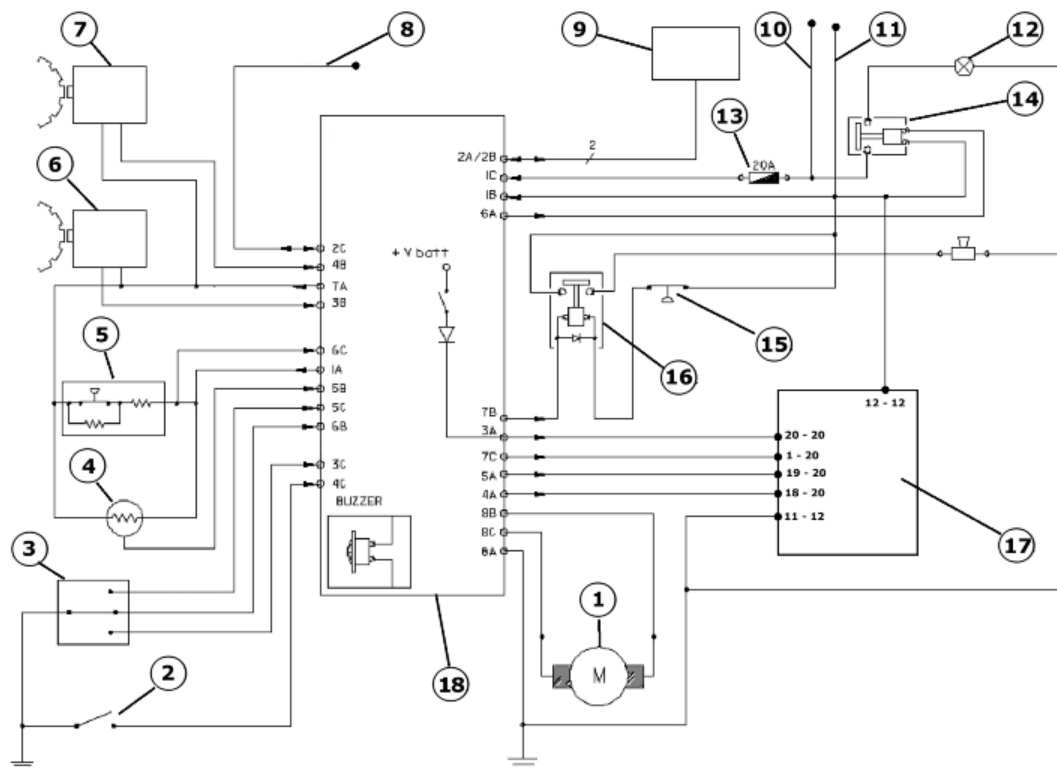


Adjust the flexible transmission so that a small clearance is left to guarantee switch activation on the tilt locking calliper



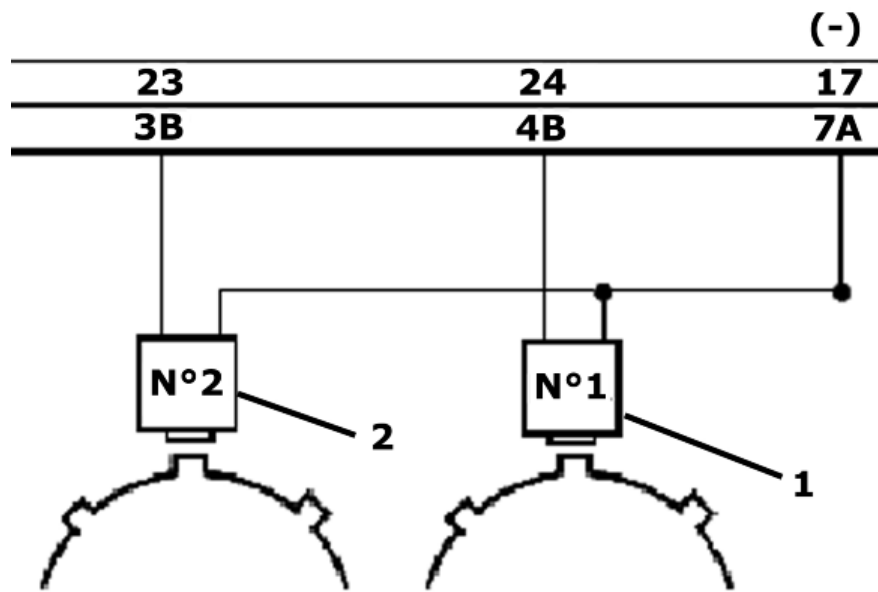
Electrical devices test

PRINCIPLE DIAGRAM FOR TILT LOCKING ELECTRICAL SYSTEM



1. GEARED MOTOR
2. TILT LOCKING CALLIPER SWITCH
3. TILT UNLOCKING-LOCKING CONTROL SWITCH
4. POTENTIOMETER
5. RIDER PRESENCE SENSOR
6. LEFT SPEED SENSOR
7. RIGHT SPEED SENSOR
8. DIAGNOSTIC TESTER SERIAL LINE
9. ENGINE CONTROL UNIT
- 10.+ DIRECT BATTERY
- 11.+ LIVE BATTERY
- 12.LOW-BEAM LIGHT
- 13.FUSE No. 3, 20A
- 14.LOW-BEAM LIGHT REMOTE CONTROL
- 15.PRESSURE SWITCH
- 16.HORN REMOTE CONTROL
- 17.INSTRUMENT PANEL
- 18.TILT LOCKING SYSTEM CONTROL UNIT

TONE WHEEL SENSOR



1: Right tone wheel

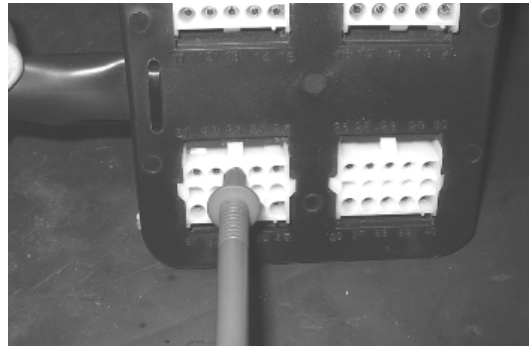
2: Left tone wheel

With interface wiring disconnected from the parking electrical control unit and connected to the system, check that the sensor resistance between pins 23 - 17 and 24 - 17 is between 774 and 946 Ohm at a temperature of approximately 20°



With interface wiring disconnected from the control unit, check the continuity between pin 23 and the brown cable of the LEFT wheel revolution sensor connector; between pin 17 and the red cables of the LEFT wheel revolution sensor and brown cable of the RIGHT sensor; between pin 24 and the red cable of the RIGHT wheel revolution sensor

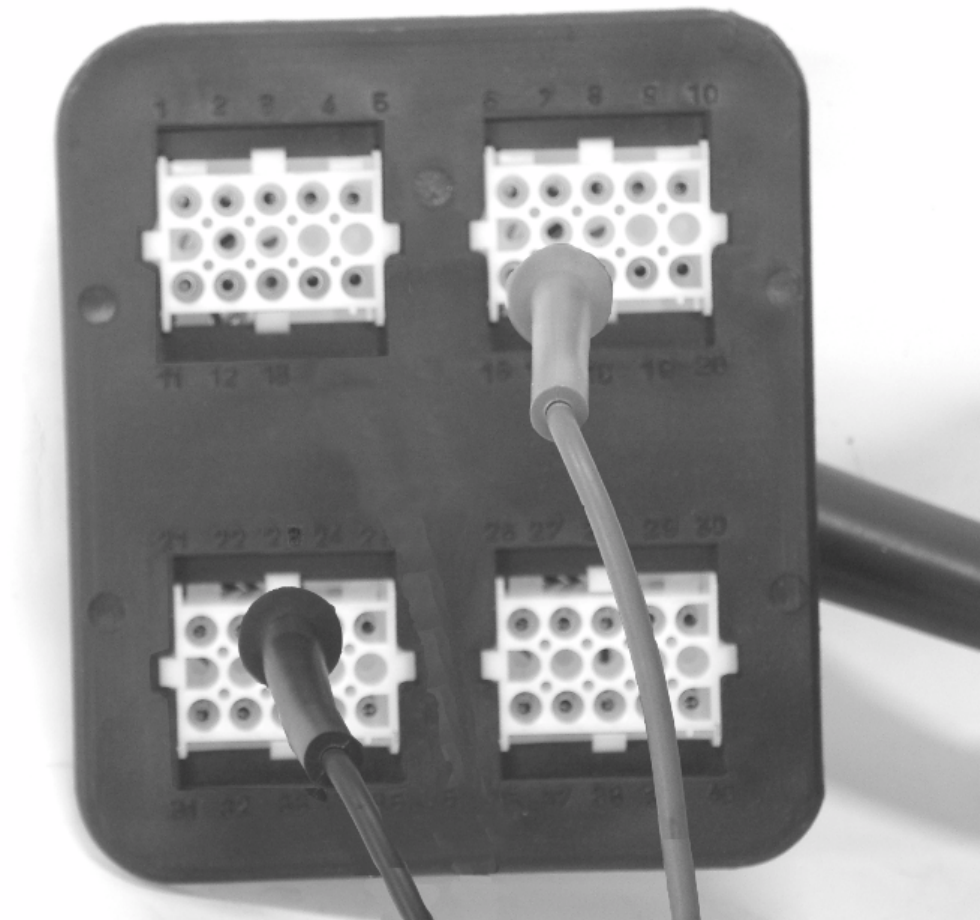




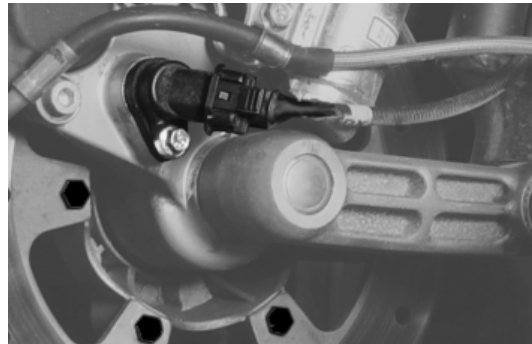
In case of failures, check the continuity between pin 23 and the connector green cable on the fuel tank after removing the chassis central cover; between pin 17 and the yellow cables on both connectors; between pin 24 and the red cable on the connector.



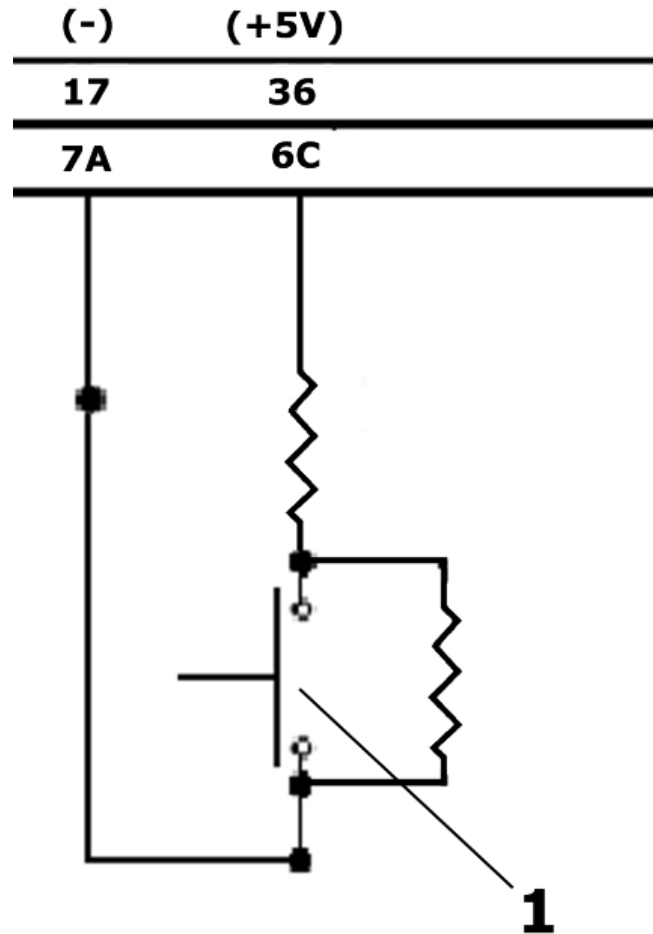
With interface wiring disconnected from the control unit and the connectors disconnected from wheel turning sensors, check that pin 23 - 17 and 24 - 17 are insulated from each other and from earth.



With a thickness gauge, check that the air gap between the screw head and the sensor is between 0.35 and 1 mm



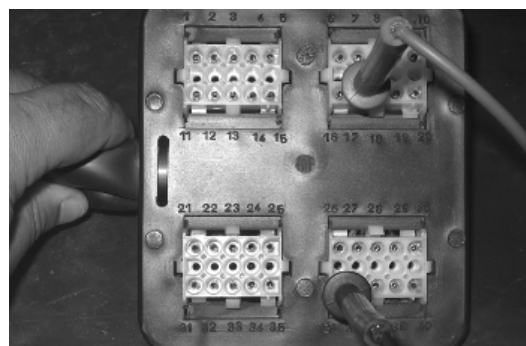
RIDER PRESENCE SENSOR



1: RIDER PRESENCE SENSOR

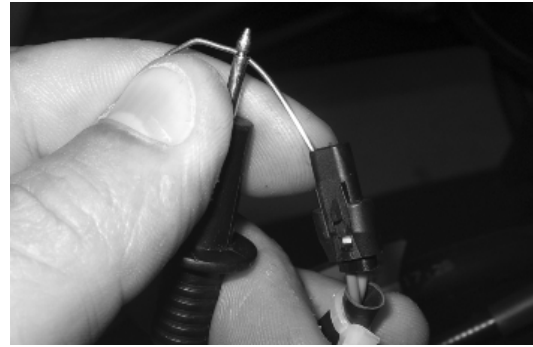
With interface wiring disconnected from the control unit and connected to the system, check the following conditions:

- pin 17 - 36: resistance $15 \div 18$ kOhm when the rider is not seated on the saddle.
- pin 17 - 36: resistance of about 3 kOhm when the rider is seated on the saddle

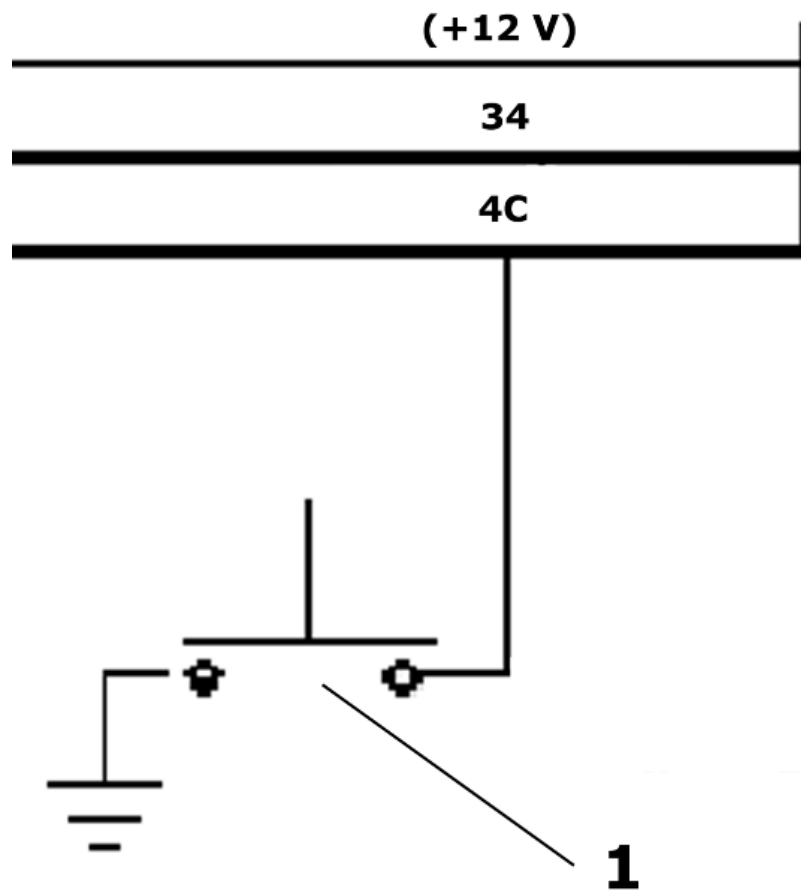


Check the continuity between the interface wiring pin 17 and the yellow cable of the rider presence connector.

Check the continuity between the interface wiring pin 36 and violet cable of the rider presence connector.

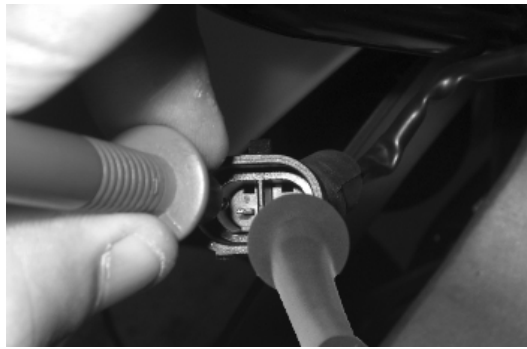


TILT LOCKING GRIPPER SENSOR



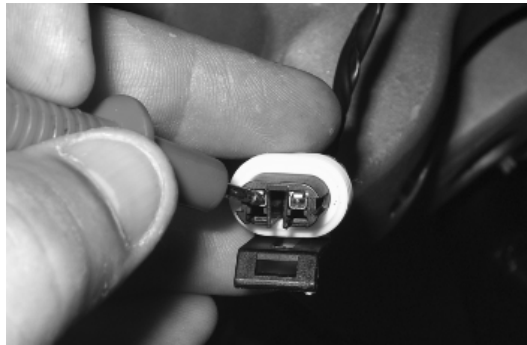
1: TILT LOCKING CALLIPER SENSOR

The tilt locking calliper sensor is a normally opened switch. Check its correct operation with a multi-meter.

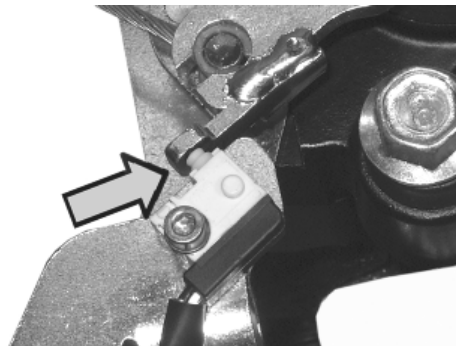


With interface wiring disconnected from the control unit, check the continuity between pin 34 and the brown cable of the tilt locking gripper sensor connector on the system side.

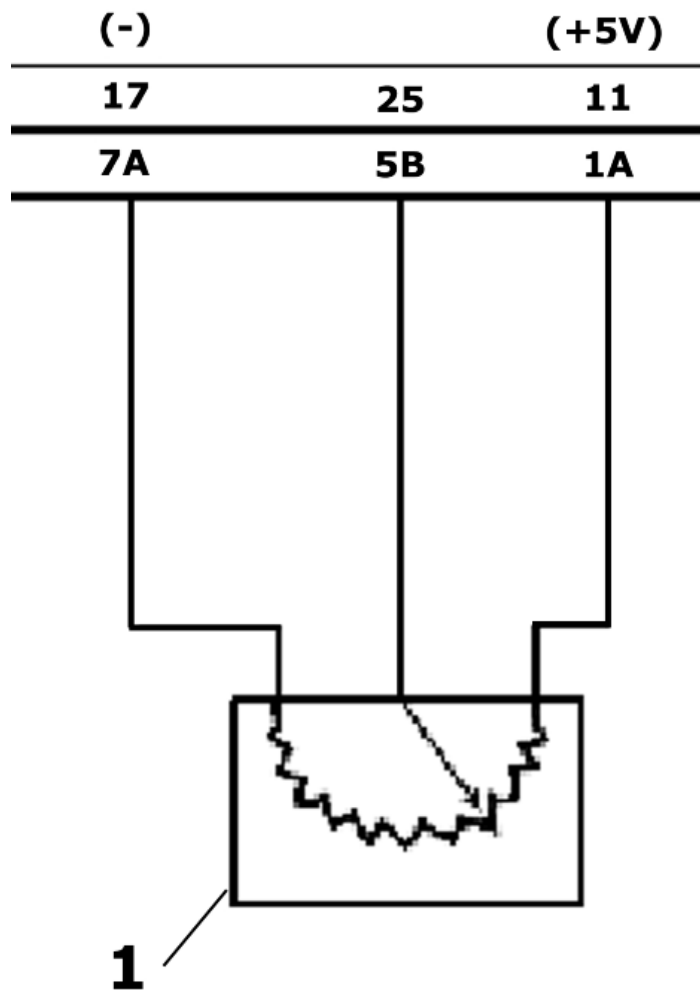
Check the continuity of the connector black cable and an earth point on the chassis



Also check that the flexible transmission control lever activates the limit stop switch properly.

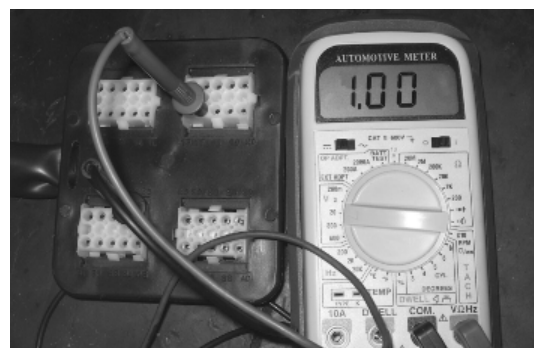


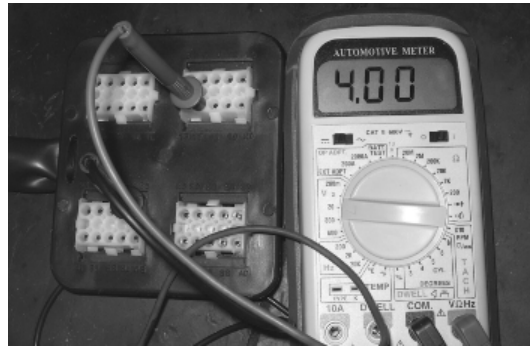
POTENTIOMETER



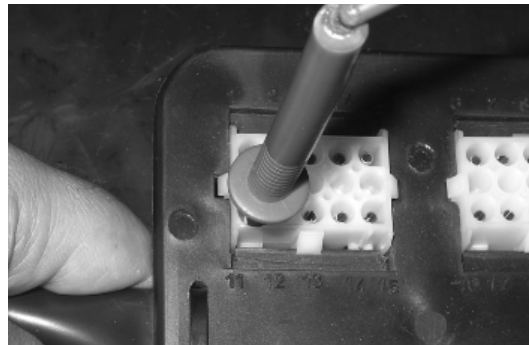
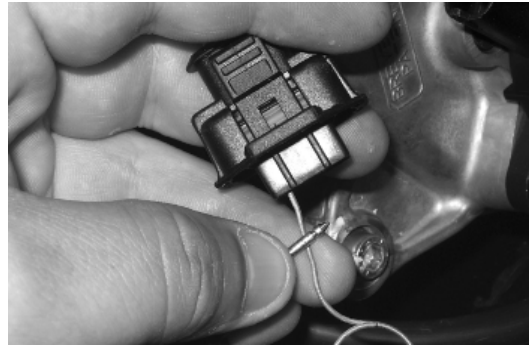
1: POTENTIOMETER

With interface wiring connected to the control unit, secure the vehicle on its centre stand and switch to "ON". Select the reading scale on 20 V. Insert the multimeter probes on pins 17 (black) and 25 (red). Check that the voltage in the activated locking condition is 4V and 1V in the locking rest condition.

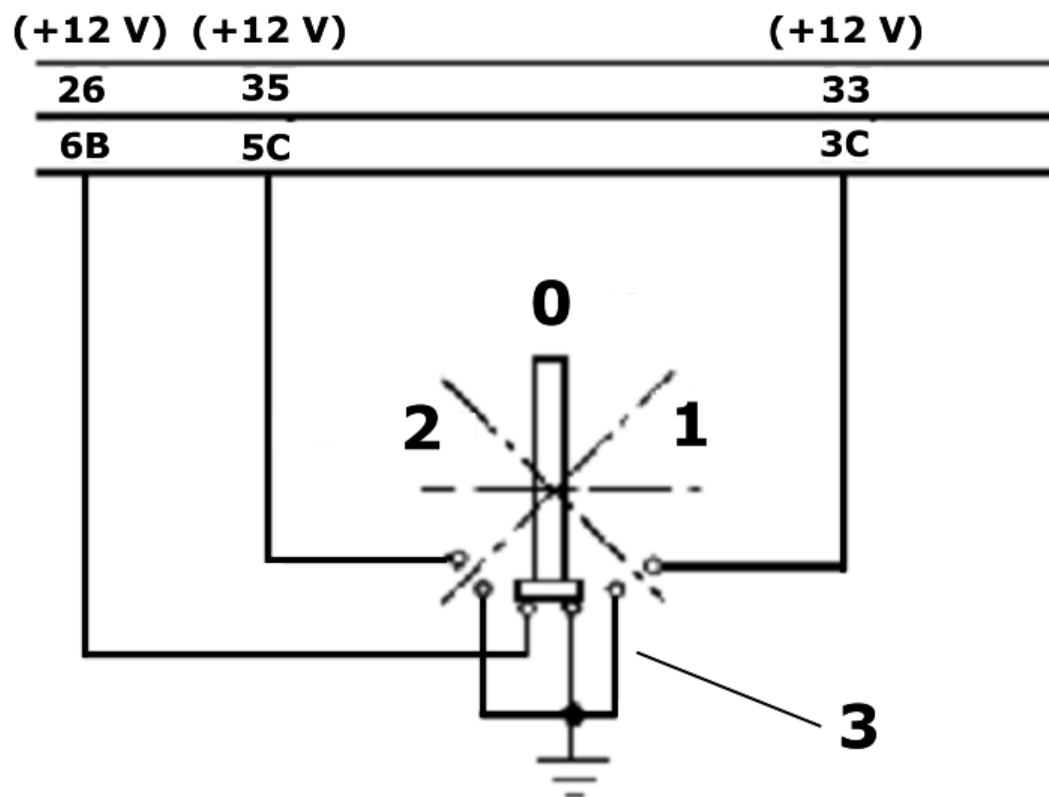




With the interface wiring disconnected from the control unit, check the continuity between pin 17 and the yellow cable of the potentiometer connector, between pin 25 and the green-blue cable, between pin 11 and the orange-blue cable. Also check that these lines are insulated from each other and earth.



TILT LOCKING-UNLOCKING SWITCH



0: REST POSITION

1: LOCKING POSITION

2: UNLOCKING POSITION

3: TILT LOCKING-UNLOCKING SWITCH

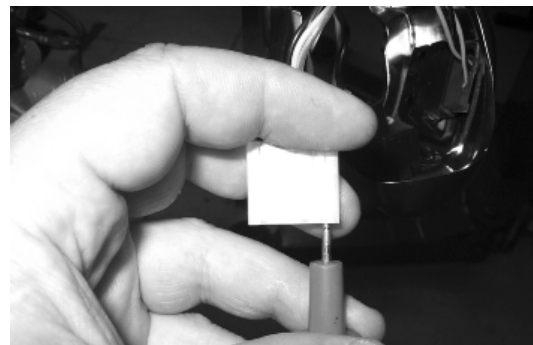
With interface wiring disconnected from the control unit, check the continuity of the electrical lines between the interface wiring and the tilt locking-unlocking switch:

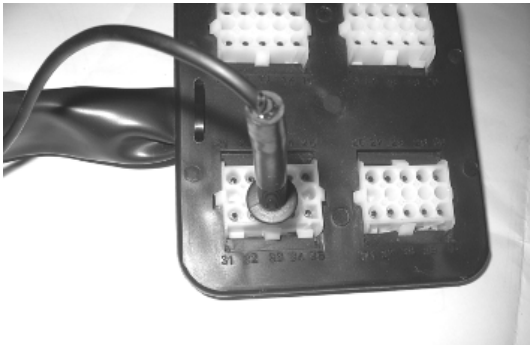
Pin 26 and green - grey cable

Pin 35 and violet - black cable

Pin 33 and yellow - blue cable

Also check that the above indicated electrical lines are insulated from the earth.



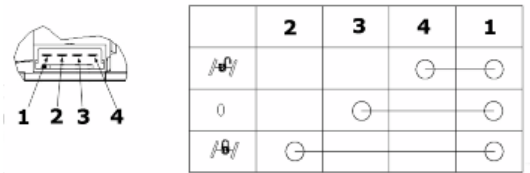


Check the continuity between the black cable on the connector and an earth point on the chassis.

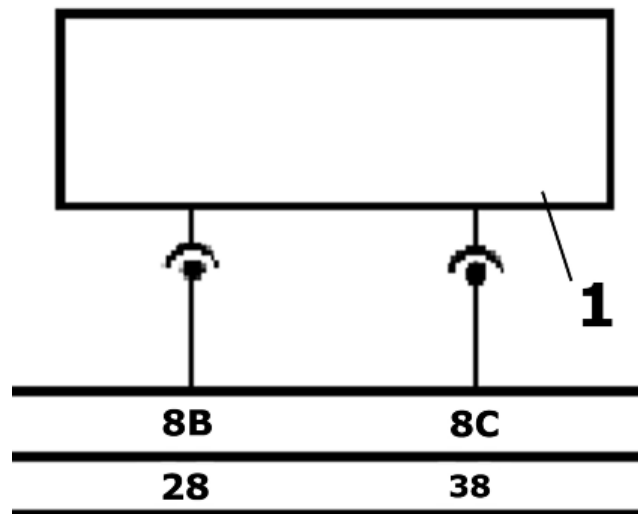


With a multimeter, check the operation of the tilt locking-unlocking switch referring to the diagram indicated in the figure.

- 1. EARTH
- 2. LOCK
- 3. REST
- 4. UNLOCK

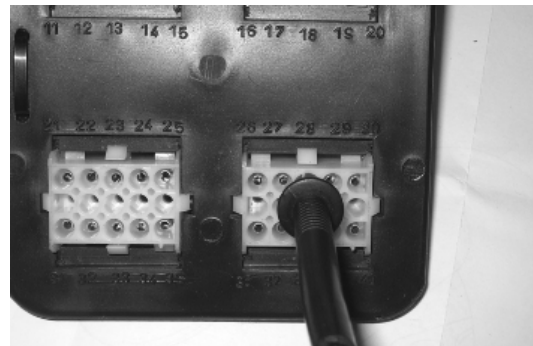
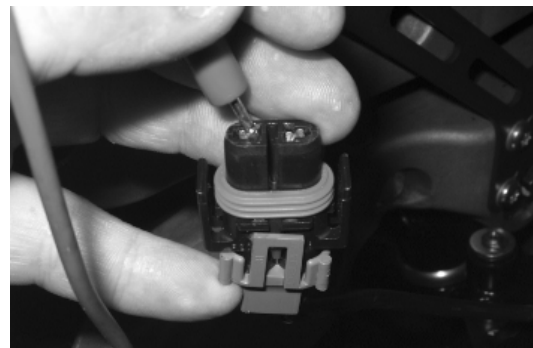


GEARED MOTOR

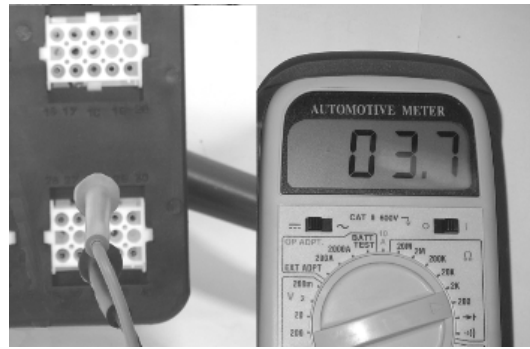


1: GEARED MOTOR

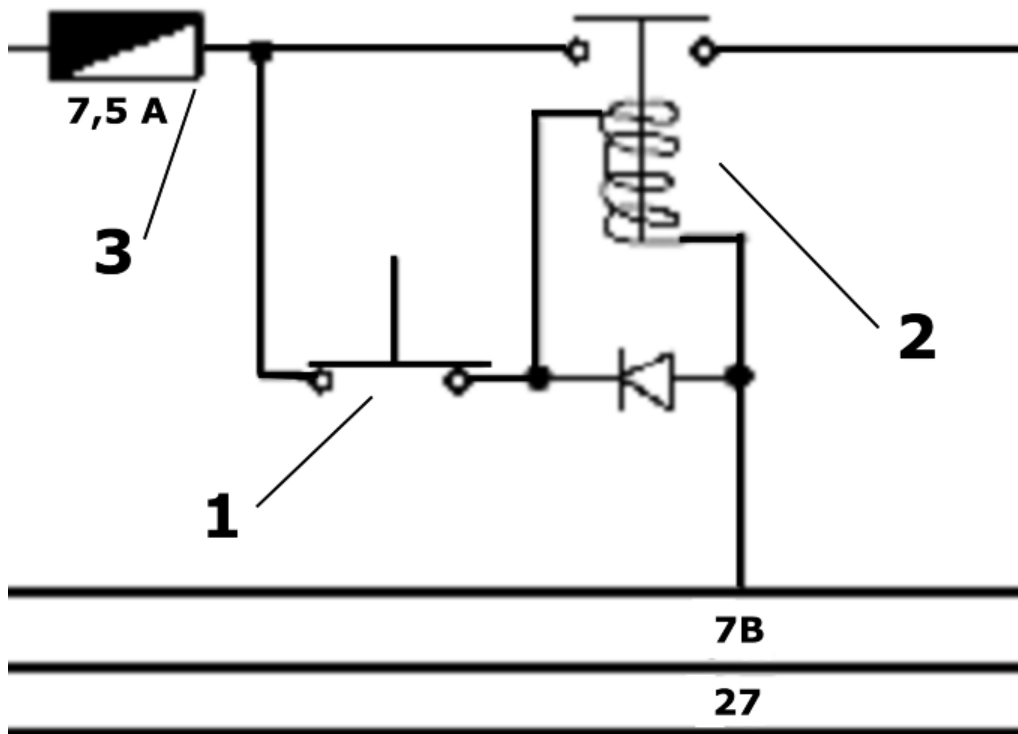
With the interface wiring disconnected from the control unit, check the continuity between pin 28 and the yellow cable, between pin 38 and the blue cable on the geared motor connector



With the interface wiring disconnected from the control unit, check the continuity of the geared motor winding placing the multimeter probes on pins 28 and 38 as indicated in the figure

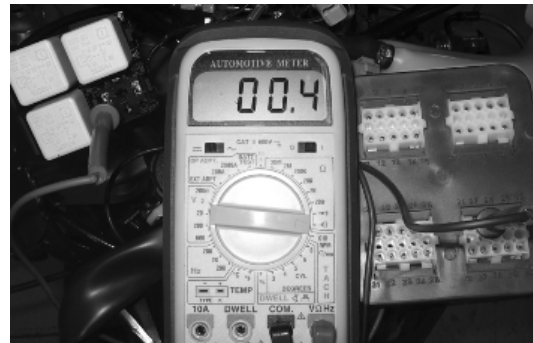


PRESSURE SWITCH



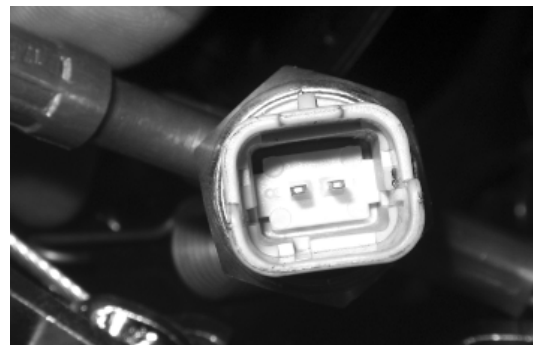
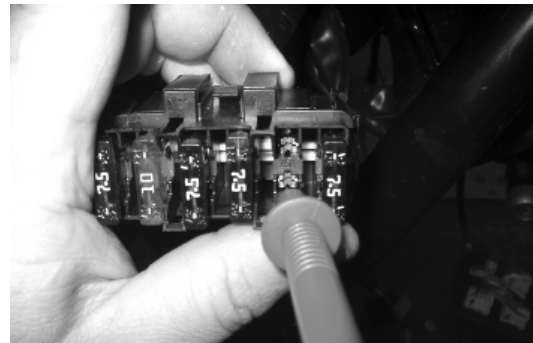
- 1: PRESSURE SWITCH
- 2: HORN REMOTE CONTROL
- 3: FUSE No. 11, 7.5A

Check 7.5 A fuse No. 11 for efficiency. With interface wiring disconnected from the control unit, check the continuity of the blue - black cable between pressure sensor connector and the horn remote control base as indicated in the photograph. Check the continuity between pin 27 and the remote control base white cable.



Check the continuity of the yellow - red cable between the pressure switch connector and the fuse-box and between the remote control base and the fuse-box.

With a multimeter, also check the pressure switch operation as well as the continuity at rest as this is normally closed switch.



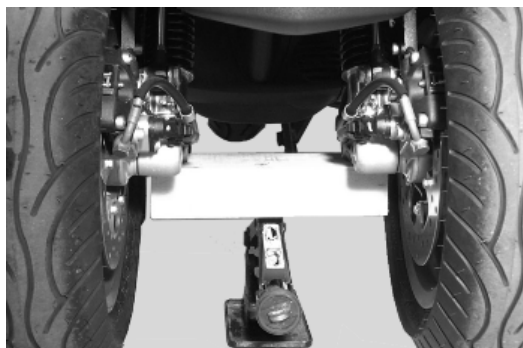
Wheel alignment

Tool fitting



Metodo di utilizzo dell'attrezzatura

- Verificare che la pressione pneumatici sia corretta.
- Posizionare il veicolo su un pavimento piano privo di asperità e irregolarità .
- Posizionare il veicolo sul cavalletto centrale.
- Assicurarsi che il sistema di stazionamento sia sbloccato.
- Sollevare le ruote anteriori come mostrato in foto
- Verificare la regolarità di rotazione dei cerchi ruota e l'eventuale presenza di giochi anomali dei cuscinetti e delle sospensioni.
- Verificare che il comando dello sterzo non presenti giochi anomali su giunti e cuscinetti. In caso contrario procedere con le necessarie riparazioni e successive regolazioni.



Characteristic

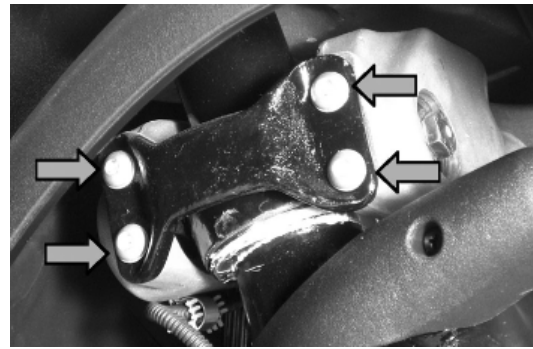
Front tyre pressure (rider)

Front tyre pressure (rider): 1.6 bar

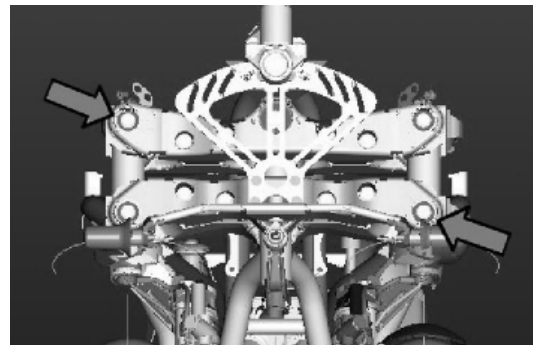
Rear tyre pressure (rider)

Rear tyre pressure (rider): 2 bar

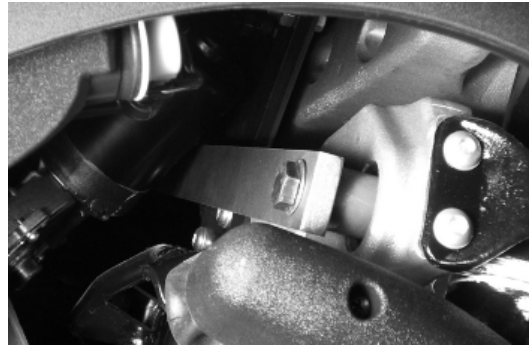
- Get the vehicle off the stand, back on the ground.
- Remove the right lower coupling plate of the half-arm by undoing the screws indicated in the photograph.



- Remove the right upper screw and the left bottom screw of the parallelogram unit .



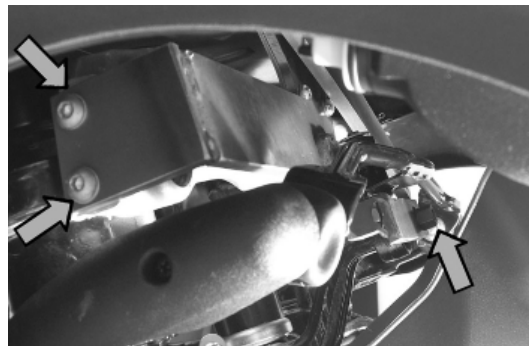
- Fit the bracket locking the parallelogram in the holes of the previously removed screws; use the screws supplied with the tool and be careful to correctly centre the spacer in the bearing.



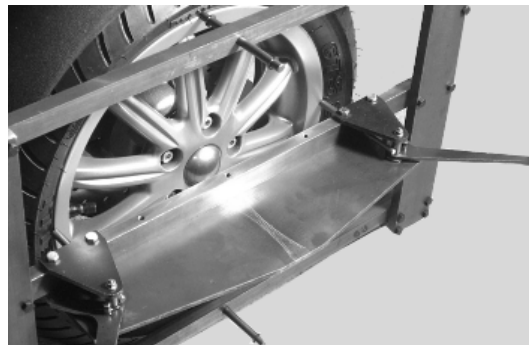
- Remove the nut fixing the steering control arm and keep the original washer in position.



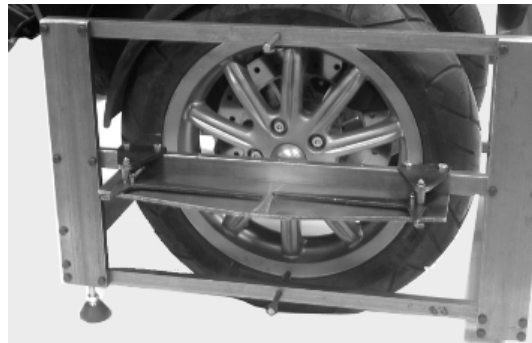
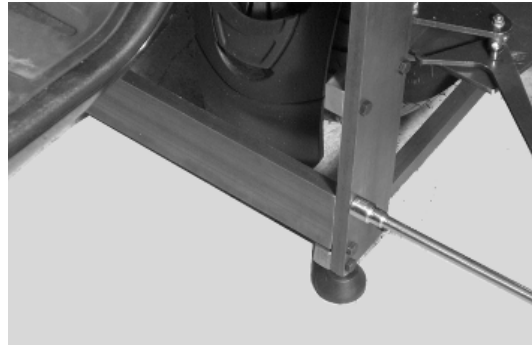
- Fit the steering guiding bracket in a straight riding position, fix one end to the attachment of the half-arm coupling flange and the other end to the screw fixing the steering control arm.



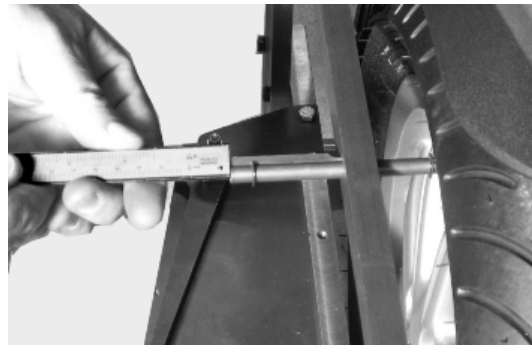
- Place the frame so that the sliders come into contact with the rim maximum diameter but without interfering with the tyre. If required, reposition the frame by operating the 3 adjustable support feet.



- Fit the frame locking bracket

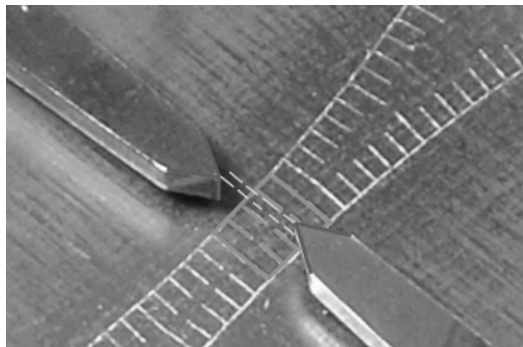


- Make sure the frame is adequately centred by checking with a gauge that the lugs along the vertical axis show the standard protrusion.



- Check that the pointers of both tyres are correctly aligned, as shown in the photograph. Maximum misalignment allowed: 4 notches



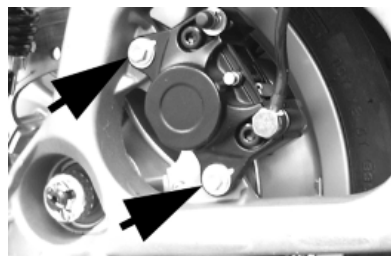


Rear

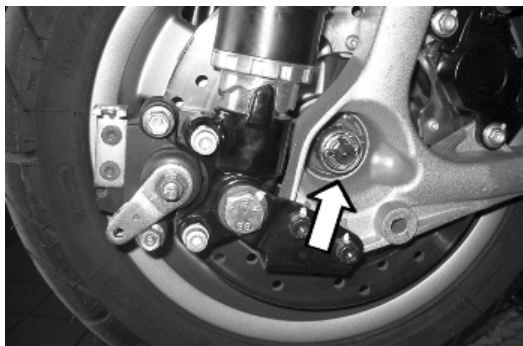
Removing the rear wheel

Remove the full muffler assembly.

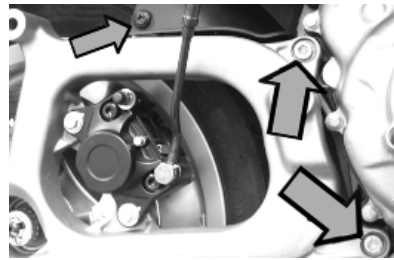
- Remove the screw fixing the right-hand shock absorber to the bracket
- Remove the two screws supporting the brake calliper on the bracket



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



- Remove the mud guard clamping screw
- Remove the two screws fixing the bracket to the engine



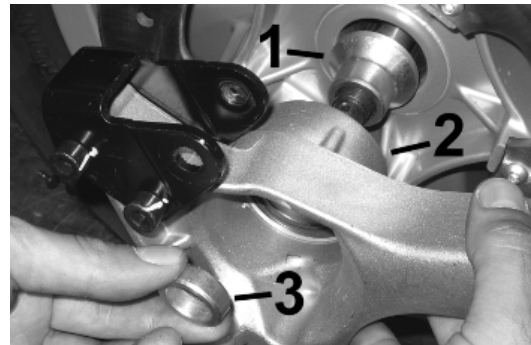
- Undo the wheel axle bracket, using the heat gun if necessary.

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 photograph.

Locking torques (N*m)

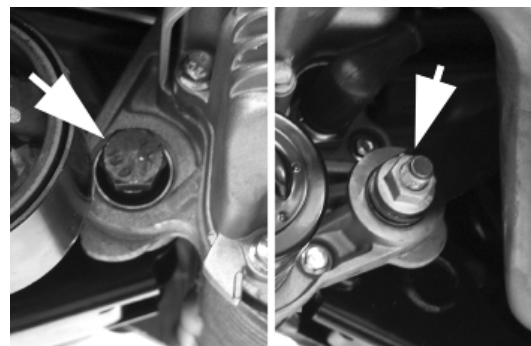
Muffler arm clamping screws 27 ÷ 30 Rear wheel axle nut 104 ÷ 126 Shock absorber-crankcase attachment bracket 20 ÷ 25 Lower shock absorber clamping screw 33 ÷ 41 Nm Rear brake calliper fixing screws 25 ÷ 30 Nm



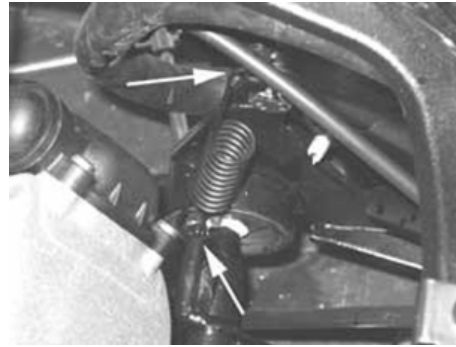
Swing-arm

Removal

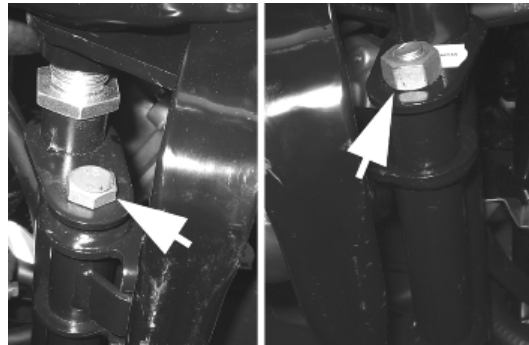
- Place the scooter on its centre stand;
- Remove the swinging arm/engine fitting shown in the photo
- Move the engine back



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



- 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.

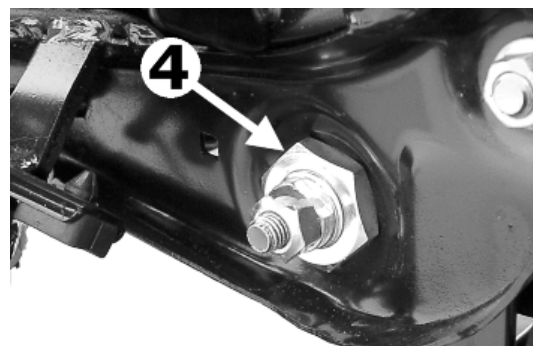
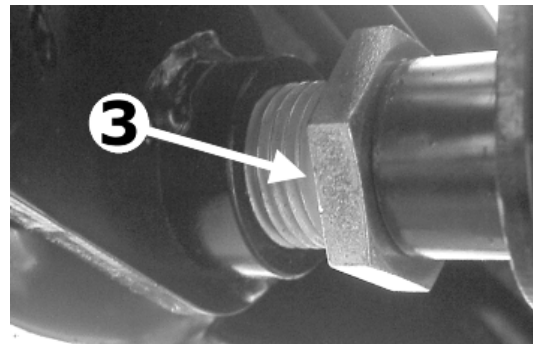
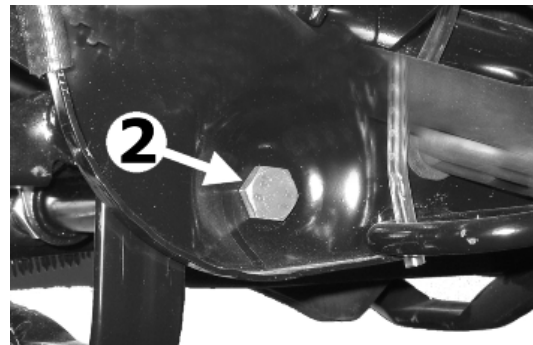
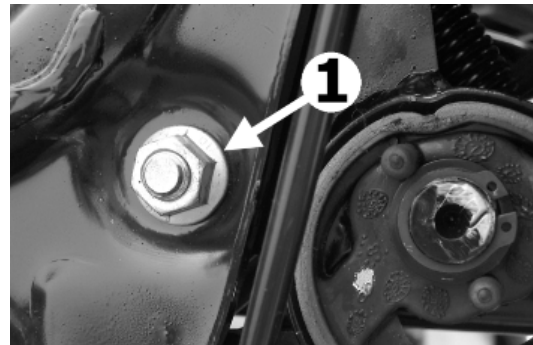


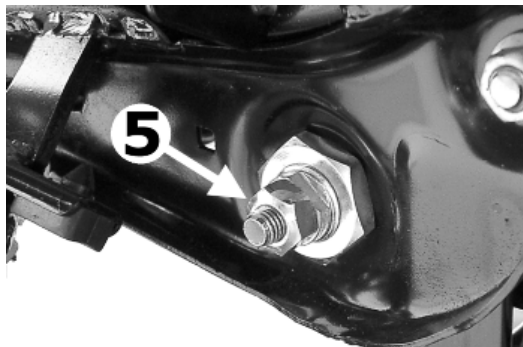
Refitting

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

1. Position the silent block supporting clamp with part **3** inserted, and slightly tighten part **1**
2. Position the swinging arm, inserting part **2**
3. Tighten part **3** to the prescribed torque
4. Screw on and tighten part **4** to the prescribed torque
5. Screw on and tighten part **5** to the prescribed torque
6. Tighten part **1** to the prescribed torque

Insert the swinging arm - engine bolt and tighten to the prescribed torque



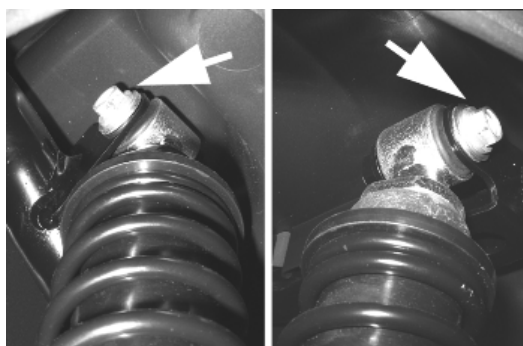
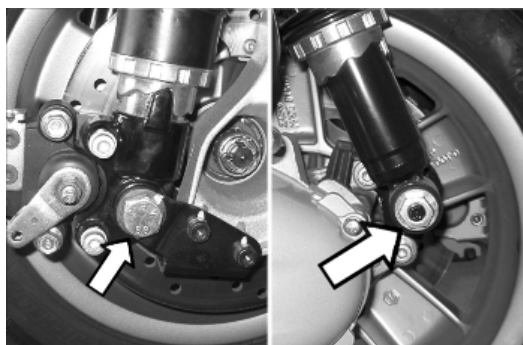
**SWINGING ARM FITTING**

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

Shock absorbers**Removal**

Proceed as follows:

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

**Refitting**

Carry out the previous operations but in reverse order.

Locking torques (N*m)

Shock absorber lower 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 31 ÷ 39

INDEX OF TOPICS

BRAKING SYSTEM

BRAK SYS

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

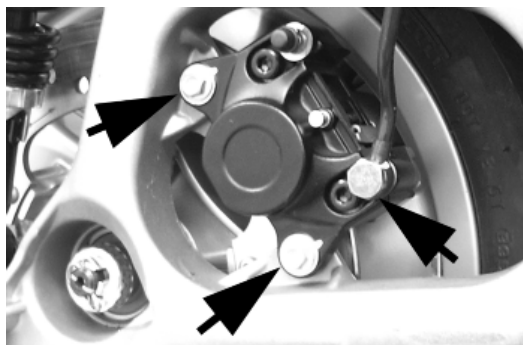
Rear brake calliper

Removal

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

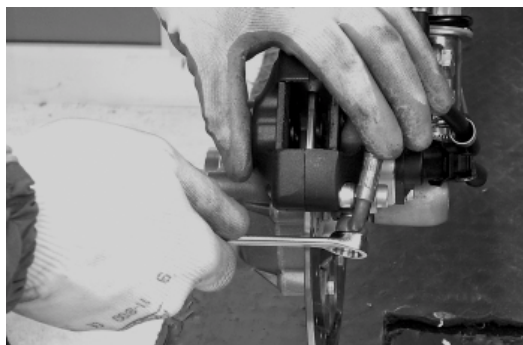
N.B.

IF IT IS NECESSARY TO REPLACE OR SERVICE THE BRAKE CALLIPER, BEFORE REMOVING THE FITTINGS FIXING THE CALLIPER TO THE SUPPORT BRACKET, FIRST LOOSEN THE OIL HOSE FITTING AFTER HAVING EMP-TIED THE SYSTEM OF THE CIRCUIT BEING EXAMINED.



Removal

Place a container under the calliper, unscrew the tube-calliper joint and empty the braking system. For easy draining of the braking system fluid, open the pump reservoir cap.

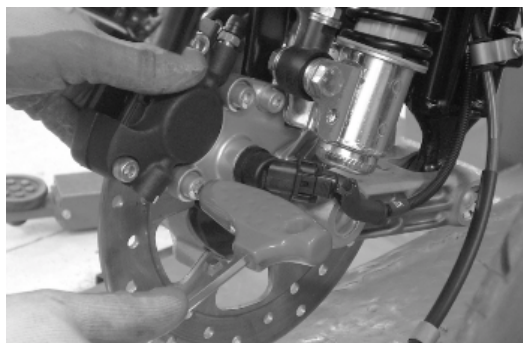


Loosen the two screws indicated in the figure and remove the calliper from the support.

When refitting, tighten the two calliper retainers to the prescribed torque.

Locking torques (N*m)

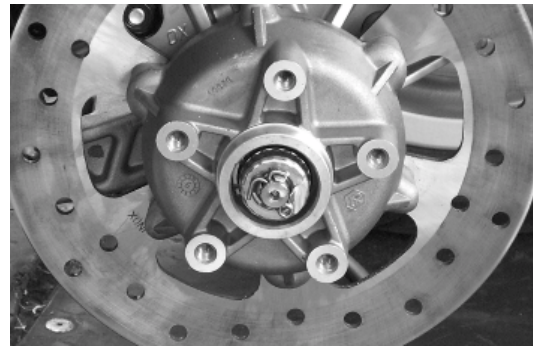
Screw tightening calliper to the support $24 \div 27$



Removal

Remove the split pin.

Use new split pins when refitting.

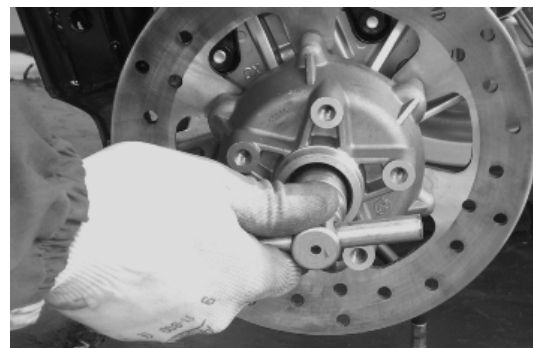


Undo the wheel hub nut.

- When refitting, secure to the specified torque.

Locking torques (N*m)

Wheel axle nut 74 ÷ 88



Remove the seeger ring, after that, remove the hub with the help of a rubber mallet slightly hitting on the brake disc side, turning the wheel hub at the same time.



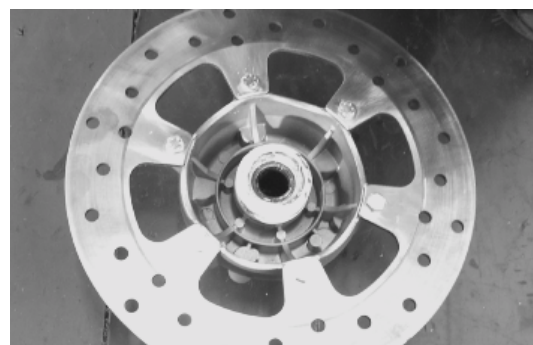
Loosen the 6 screws indicated in the figure and remove the brake disc from the wheel hub.

- When refitting, secure to the specified torque.

Recommended products

Loctite 242 product description

Apply LOCTITE medium type 242 threadlock



Removal

Rest the vehicle on its centre stand and use the corresponding jack to lift the two front wheels; unscrew the five Allen screws indicated in the figure



Remove the pad upper closing cap.

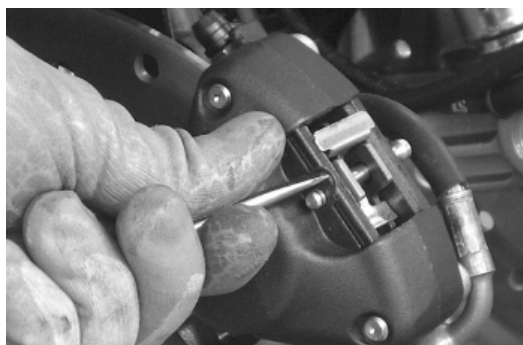


Remove the pad pin lock with a screwdriver, paying attention not to spoil the calliper surface treatment.

Use a corresponding measuring punch to extract the pad pin, if necessary move the brake pipes manually to release the pin.

Then, remove the spring and the pads.

Fit a new pad kit following the procedure but in reverse order.



Locking torques (N*m)

Wheel fixing screw 20 ÷ 25

Brake pipes

Front brake pipes removal

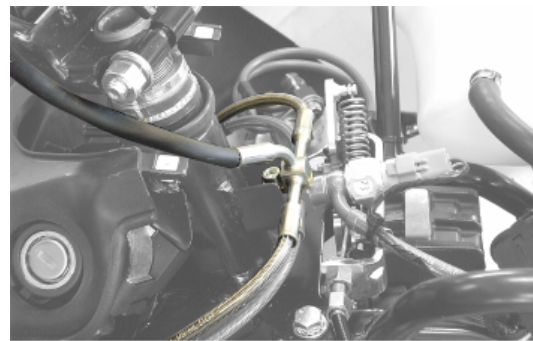
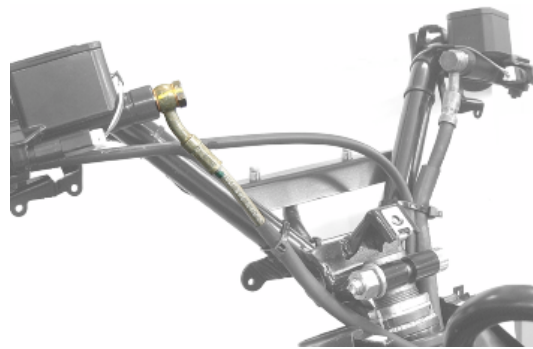
Remove front Shield.

Remove front wheel and mudguard.

Disconnect the brake pipes from the calliper and drain the brake fluid.

Then, remove the plastic and metallic straps.

Unscrew the brake pump pipes as indicated in the figure.

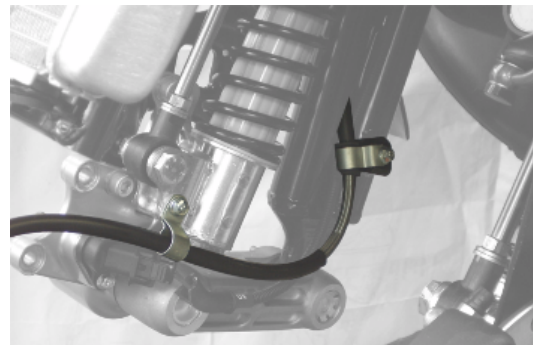
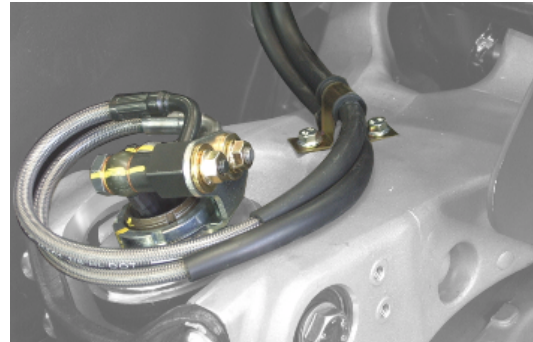


Front brake pipes removal

Unscrew the braking splitter screw.

Disconnect the brake pipes removing the two metallic straps indicated in the figure.

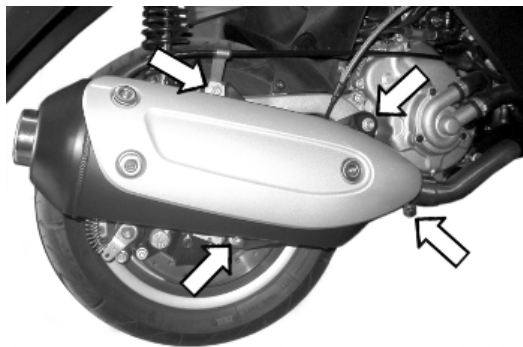
Remove the brake oil tube fitting from the rigid pipe inside the front suspension arm and loosen the hydraulic joint fixing nut of the suspension locking to release the brake pipes.



Parking brake

Remove the muffler loosening the 3 screws and the strap on the drainage tube indicated in the photograph.

When refitting, place the parking brake flexible transmission retaining strap correctly.



Loosen the transmission set screw and release the cable from the calliper.

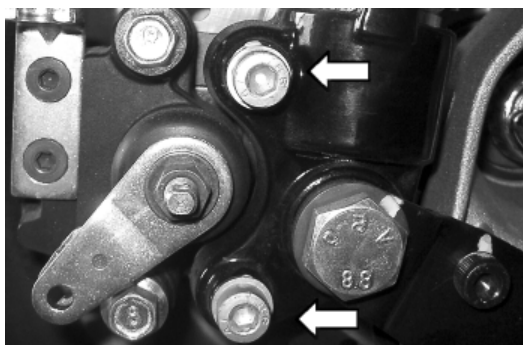


Remove the two fixing screws of the mechanic calliper and remove the calliper. To check calliper components, refer to the chapter on the tilt locking calliper.

When refitting, secure to the specified torque.

Locking torques (N*m)

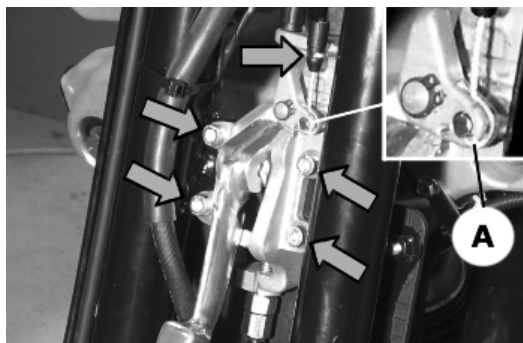
Screw tightening calliper to the support 20 ÷ 25



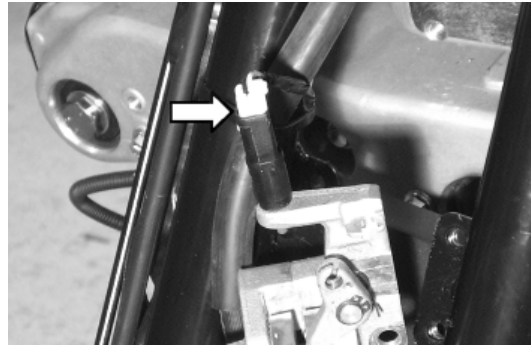
After removing the shield back plate, remove the engaging cable for the safety mechanism removing it from its fitting.

Remove the 4 screws shown in the figure.

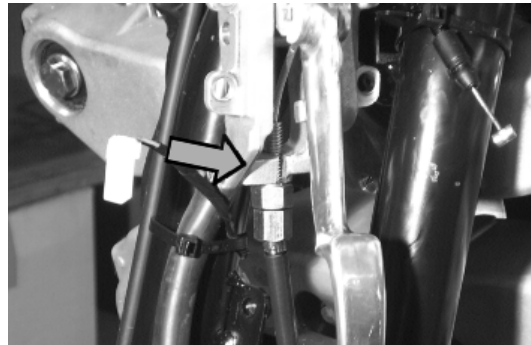
When refitting, pay attention to insert the metallic cable peg in the fitting marked «A» as indicated in the enlarged photograph.



Remove the electric connection from the engaged parking brake warning light switch.



Remove the parking brake cable from the lever by operating the set screw indicated in the photograph.



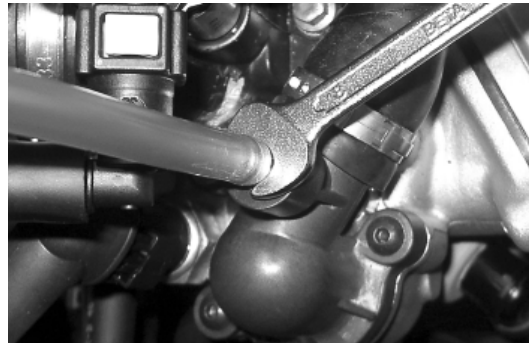
INDEX OF TOPICS

COOLING SYSTEM

COOL SYS

System bleed

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



Locking torques (N*m)

Bleed screw: 3

INDEX OF TOPICS

CHASSIS

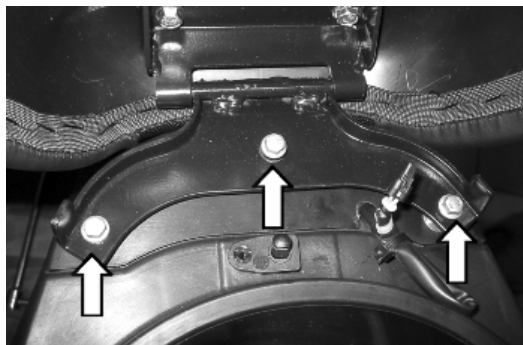
CHAS

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

Seat

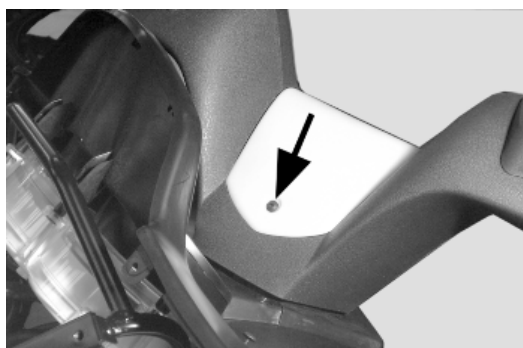
Lift the saddle and disconnect the rider presence sensor.

Remove the three fixing screws.



Front handlebar cover

Remove the upper cap by operating on the Allen screw indicated in the figure.



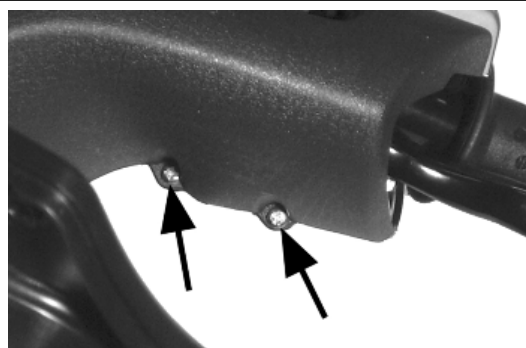
Remove the two brake pump caps.



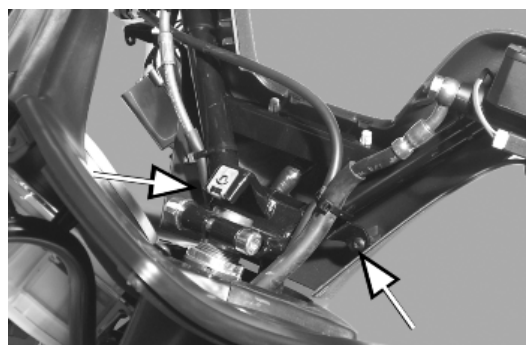
Remove the two screws under the brake pump caps previously removed.



Unscrew the two pairs of screws in the lower part of the half-handlebar.



After removing the front part of the handlebar cover, access the two screws fixing the rear part to the handlebar, as indicated in the photograph.



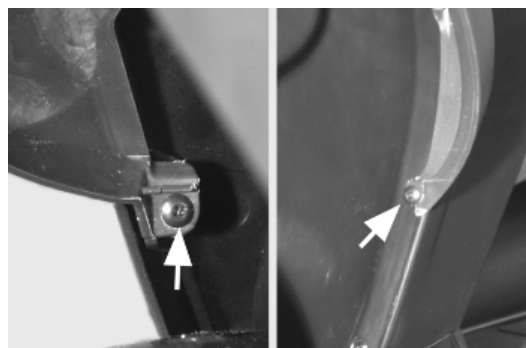
Headlight assy.

Remove the radiator cover.

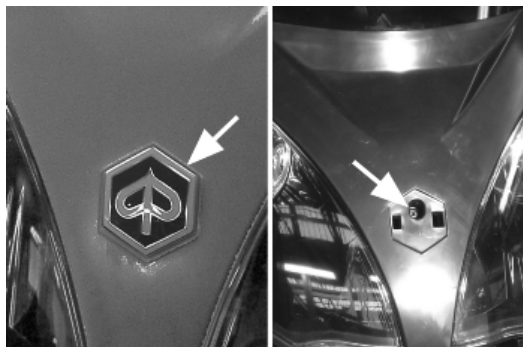
Remove the two wheelhouses with the turn indicator.

Unscrew the two screws fixing the wheelhouse to the shield.

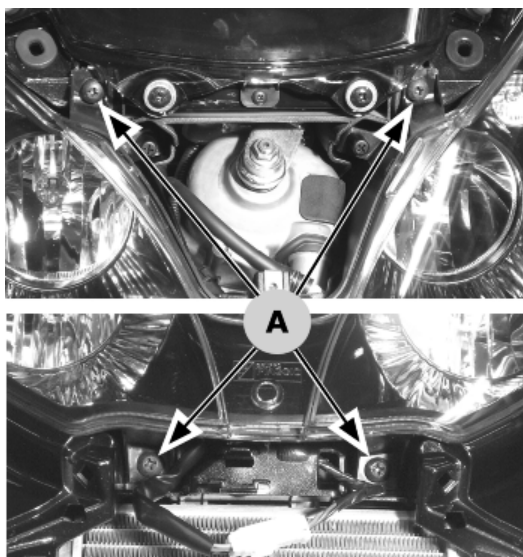
Disconnect the cable guide; after that, turn the wheelhouse anticlockwise (inwards) to release it from the shield supports.



To remove the shield central finishing, remove the PIAGGIO clip-on badge paying attention not to spoil the paint, unscrew the screw underneath and remove the finish carefully.



Remove the four screws "A" and disconnect the wiring.



See also

[Radiator cover](#)

Frame central cover

Remove the three screws on the right and the left side.

Open the refuelling compartment and remove the tank cap so as to remove the central cover.

Disconnect the cable, refuelling compartment opening.



See also

[Seat](#)

[Knee-guard](#)

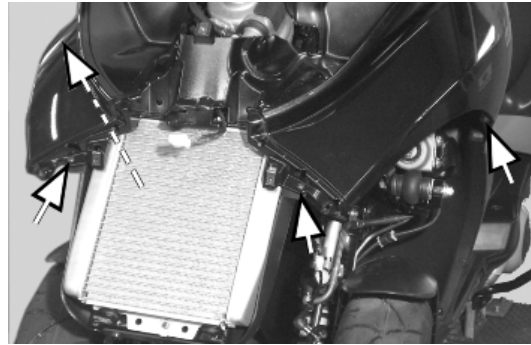
[Handles and top side fairings](#)

Legshield

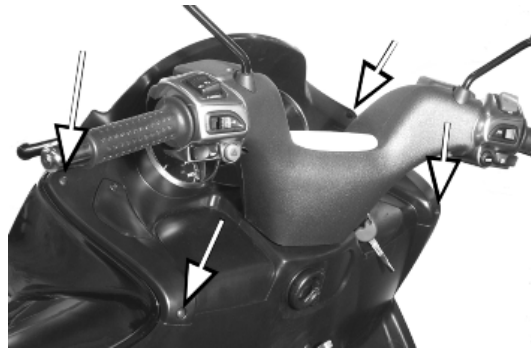
Remove the front headlight assembly.

Remove the spoiler.

Remove the two front screws and the two screws under the wheelhouse.



Remove the four screws on the shield back plate.

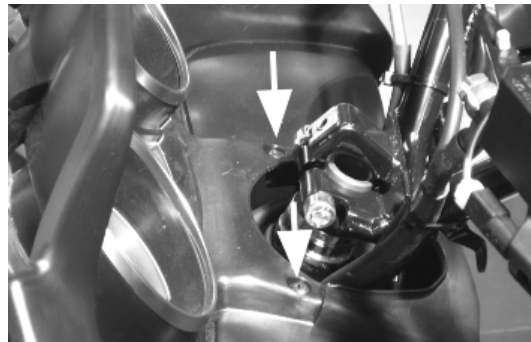


See also

[spoiler](#)
[Headlight assy.](#)

Knee-guard

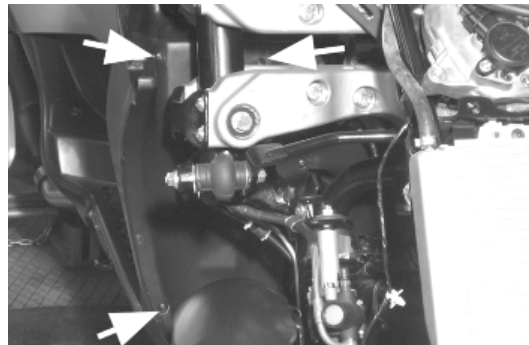
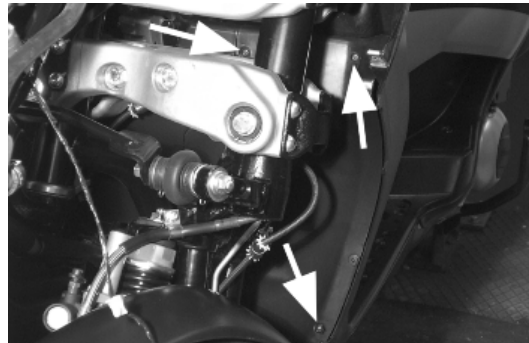
- Remove the front shield.
- Remove the spoiler.
- Remove the two central screws and the coolant cap cover screw.



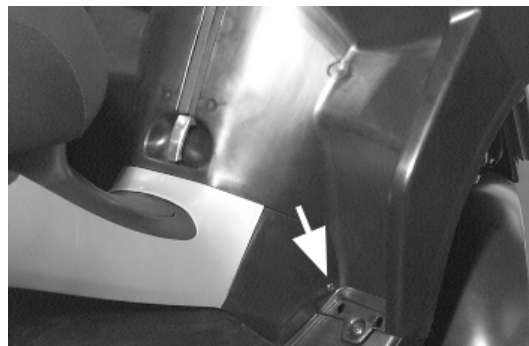
- Remove the expansion tank fixing screw and the frame from the instrument panel and manually release the unions with the shield back plate.
- Unhook the instrument panel wiring.



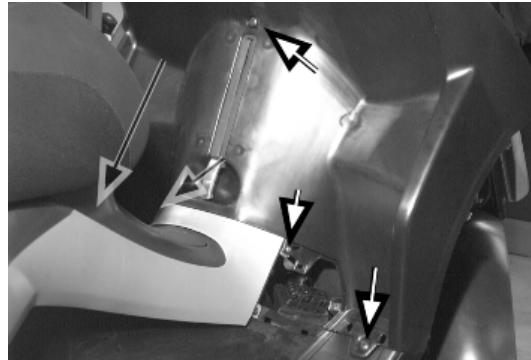
- Remove the six screws and the cable guide strap in the front part of the shield back plate.



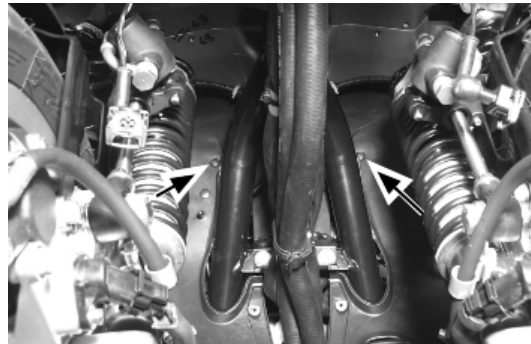
- Remove the key switch plastic ring and the two plastic covers near the footrest.



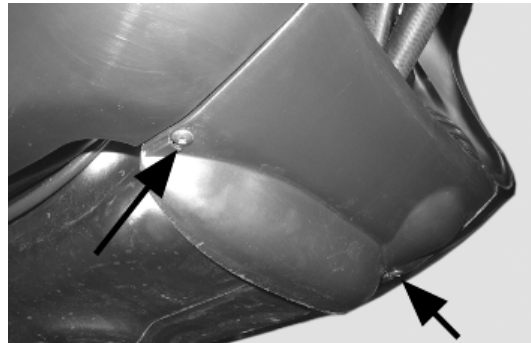
- Remove the five screws on the shield back plate rear part.



- Remove the two shield back plate front screws, see figure.



- Remove the two shield back plate lower screws.
- Remove the external temperature sensor connection.

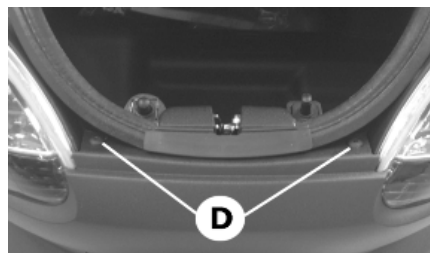


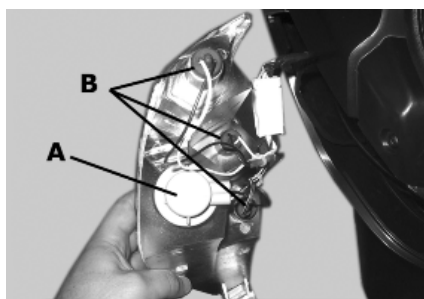
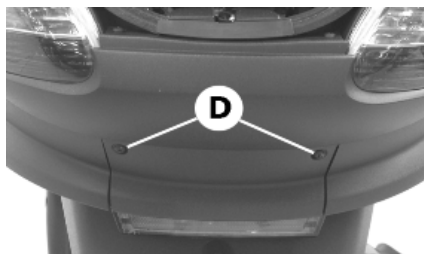
See also

[Legshield spoiler](#)

Taillight assy.

Open the rear case cover, remove the two screws «D», and then, the other four fixing screws «D» to pull out the headlight assembly from its fitting. Follow this procedure to remove the bulbs: Remove the snap-on bulbs «B». Remove the bulbs «A» on the bayonet by turning them 30° clockwise.





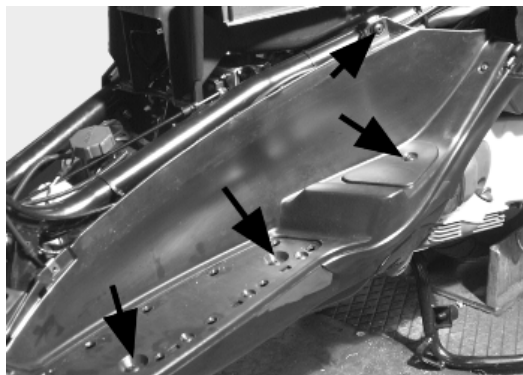
Footrest

Remove the central cover.

Remove the four screws and extract the half-footrest.

Follow the same procedure for both half-footrests.

Release the fuse-box

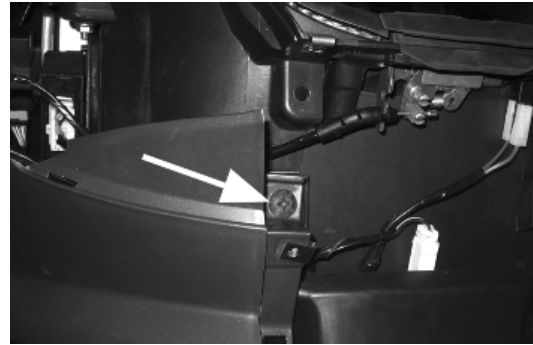


See also

[Frame central cover](#)

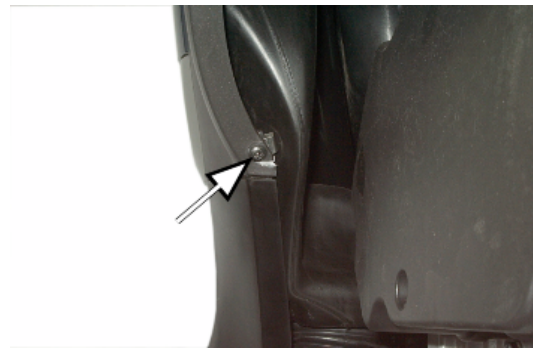
Side fairings

Remove the rear screw under the rear cover.

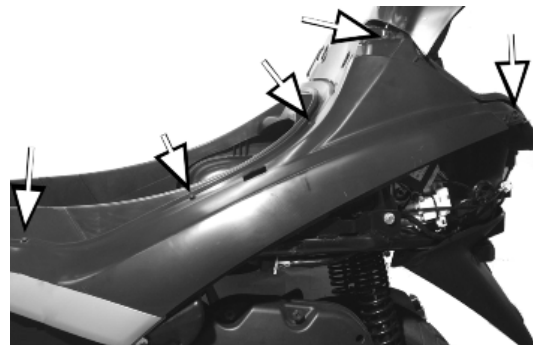


Remove the screw on the fairing front part, pull the fairing to release the hooks.

Follow the same procedure for both fairings.



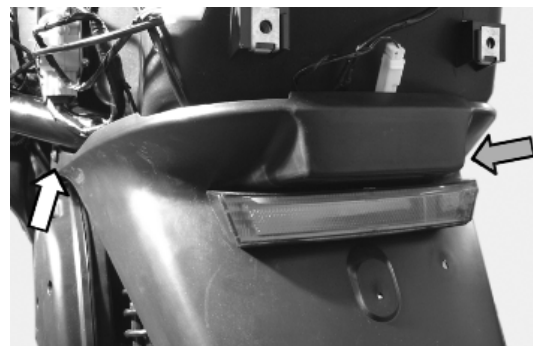
Remove the five screws on the right side and the five on the left side, indicated in the figure.

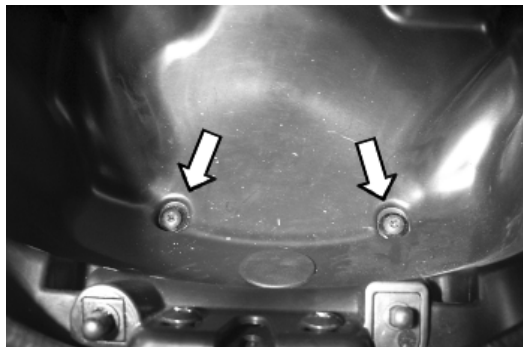


License plate holder

Remove the two lateral screws and the two screws inside the rear case.

Operate a slight upwards thrust on the case to release license plate support from the chassis.

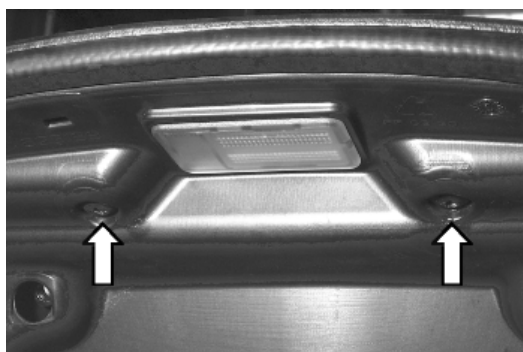




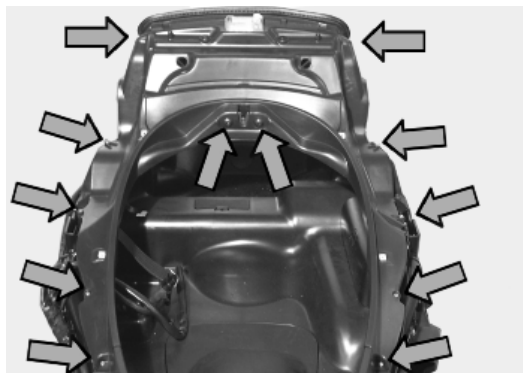
Helmet bay

Remove the chassis central cover.

Remove the four external screws and the two screws inside the rear case to remove the frame.



Remove the upper frame, unscrewing the ten upper screws, the two saddle closing screws and the case light wiring.

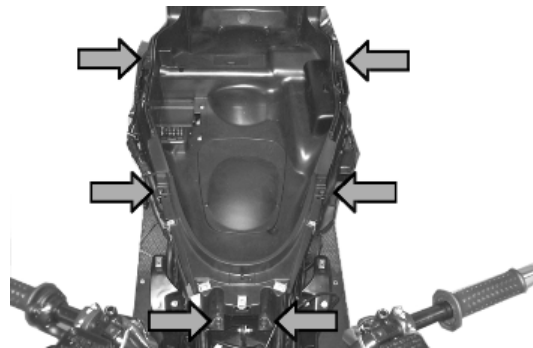
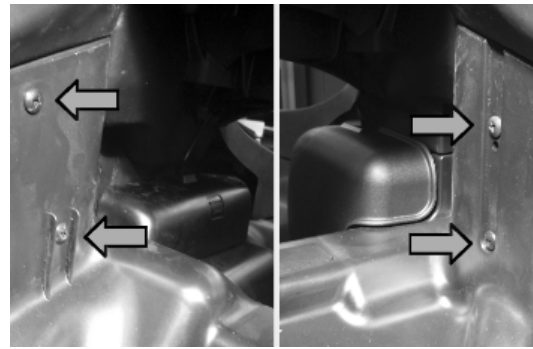


Remove the rear case internal screws indicated in the photograph, to detach the supporting plates of the voltage regulator on one side and the saddle opening switch on the other.

Remove the six upper screws.

Release the case latch.

Remove the case light front and rear switch connections, the HV coil, the battery leads and the fuse-box.

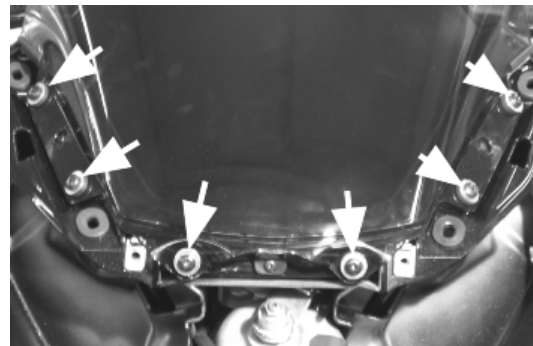


See also

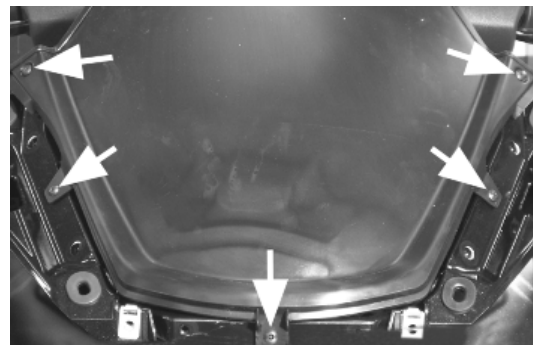
[Frame central cover](#)

spoiler

Remove the shield central finish; then, screw the six screws indicated in the figure.



Remove the five screws indicated in the figure.



See also

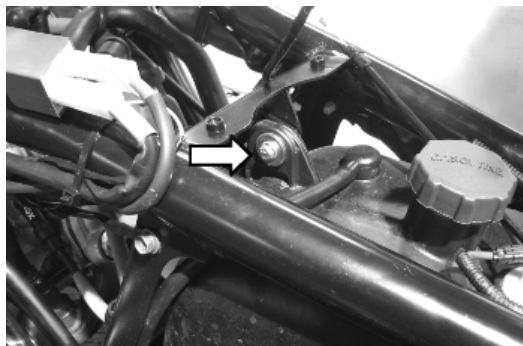
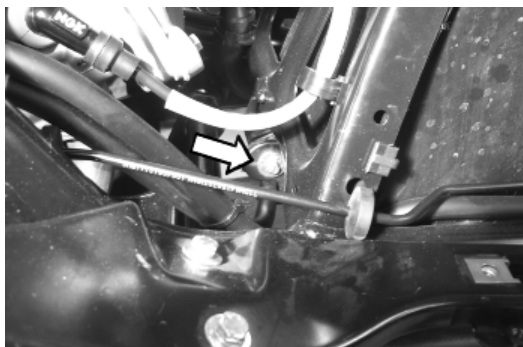
[Headlight assy.](#)

Fuel tank

Remove the chassis central cover.

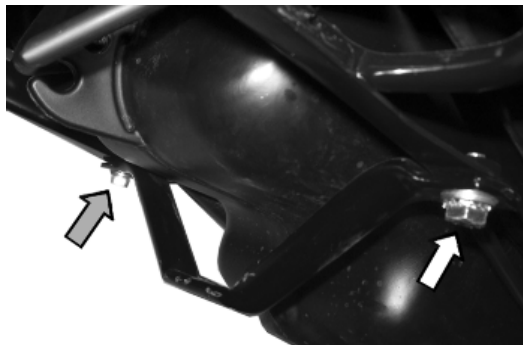
Remove the footrest.

Remove the three tank retainers.



Remove the two lower bracket retainers indicated in the figure.

Disconnect the electric wiring and the fuel pipes.



See also

[Footrest](#)

Top-case

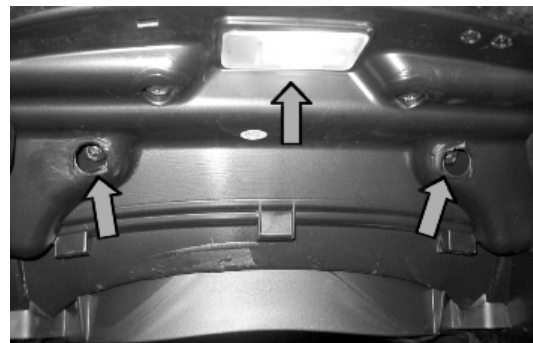
Rear

Remove the four fixing screws of the cover and release it from the two leverages.

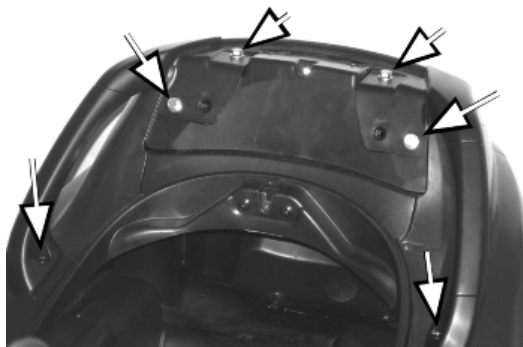


Handles and top side fairings

- Operating from the rear case remove the two screws indicated in the figure.
- Remove the ceiling fitting indicated in the photograph and remove the internal screw indicated in the photograph.
- Remove the backrest cushion

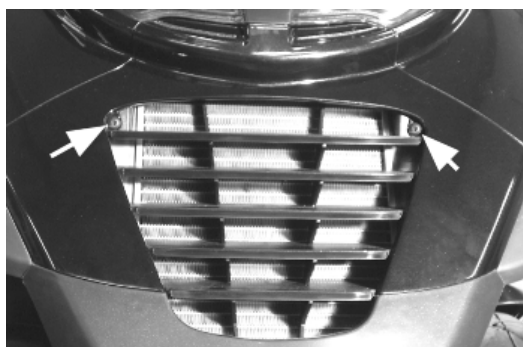


Remove the six screws indicated in the figure.

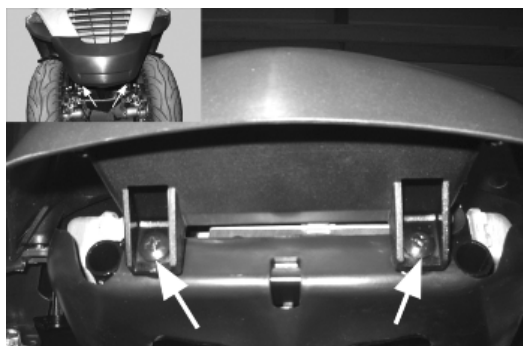


Radiator cover

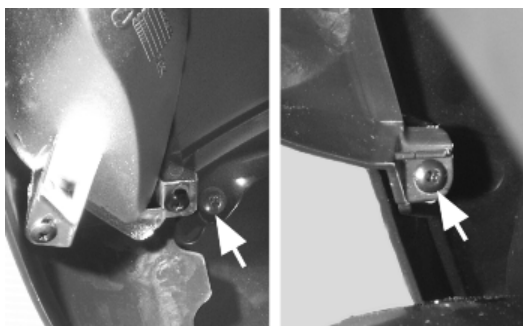
Remove the two front screws indicated in the photograph



Remove the two lower retainers with the bushing

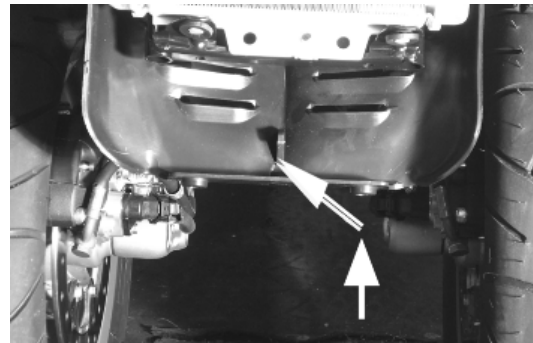
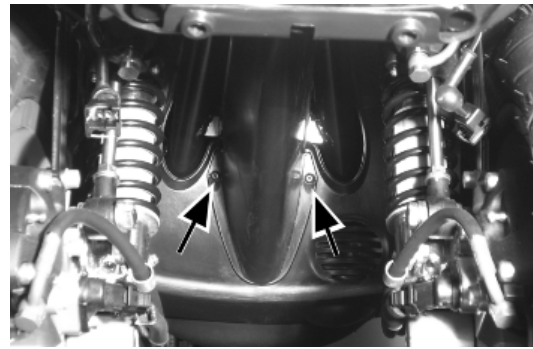


Remove the two rear retainers and then, the two wheelhouse front retainers.



Remove the two screws fixing the radiator lower protection to the shield back plate.

After that, press up and pull the protection front part so as to release it from the radiator frame.



INDEX OF TOPICS

PRE-DELIVERY

PRE DE

Carry out the listed tests before delivering the vehicle.

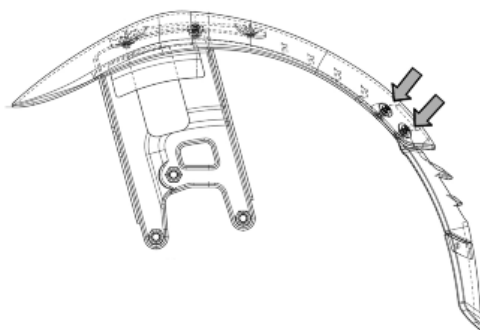
Warning- be very careful when handling fuel.

Position the plastic cover supplied with the coupling on the steering tube as shown in the figure.



If a customer wishes to have mudflaps installed, proceed as follows:

- Place the flap in the mudguard inner side as shown in the figure, making the 4 securing holes coincide.
- Fit the 4 washers on the mudguard outer side and, always on the same side, insert the 4 screws and tighten to the prescribed torque.



Locking torques (N*m)

mudflap insert fixing screws 2 ÷ 3

Aesthetic inspection

Appearance checks:

- 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

- Front shock absorber upper fixing
- Front shock absorber lower fixing
- Sliding stems fixing
- Break callipers fixing
- Front wheels fixing screws
- Front wheels axle nut
- Rear wheel axle nut
- Chassis - engine swinging arm fixing
- Handlebar lock nut
- Lower ring nut for side steering tubes
- Upper ring nut for side steering tubes
- Lower ring nut for central steering tube
- Upper ring nut for central steering tubes
- Constant-velocity universal joints

Electrical system

- Battery
- 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 bulb
- Turn indicators and their warning lights
- Instrument lighting
- instruments: fuel and temperature indicator
- Instrument panel lights
- Horn
- electric start up
- Engine stopping with emergency stop switch
- Electric opening of saddle with remote control
- Tilting system locking - unlocking 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 LEAD.

WARNING

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

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

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

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

KEEP OUT OF THE REACH OF CHILDREN

CAUTION

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

Levels check

Level check:

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

Road test

Test ride

- Cold start
- Instrument operations
- Response to the gas command
- Stability on acceleration and braking
- Rear and front brake efficiency
- Parking brake efficiency
- Rear and front suspension efficiency
- Abnormal noise
- Tilting system locking - unlocking efficiency

Static test

Static control after the test ride:

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

CAUTION

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

CAUTION

NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES OR TYRES MAY BURST.

Functional inspection

Functional check up:

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

INDEX OF TOPICS

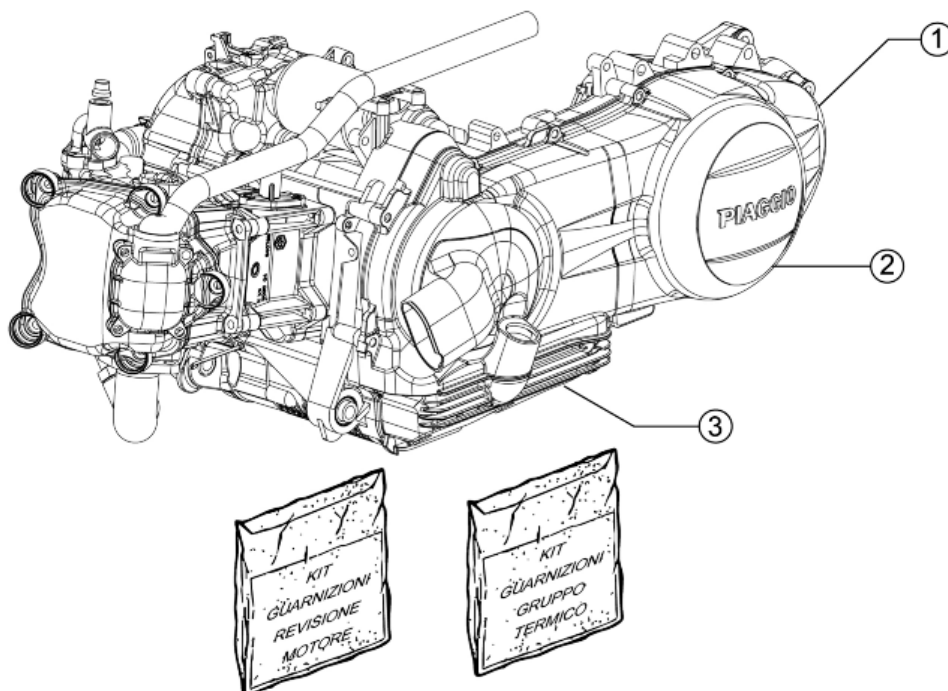
TIME

TIME

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

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

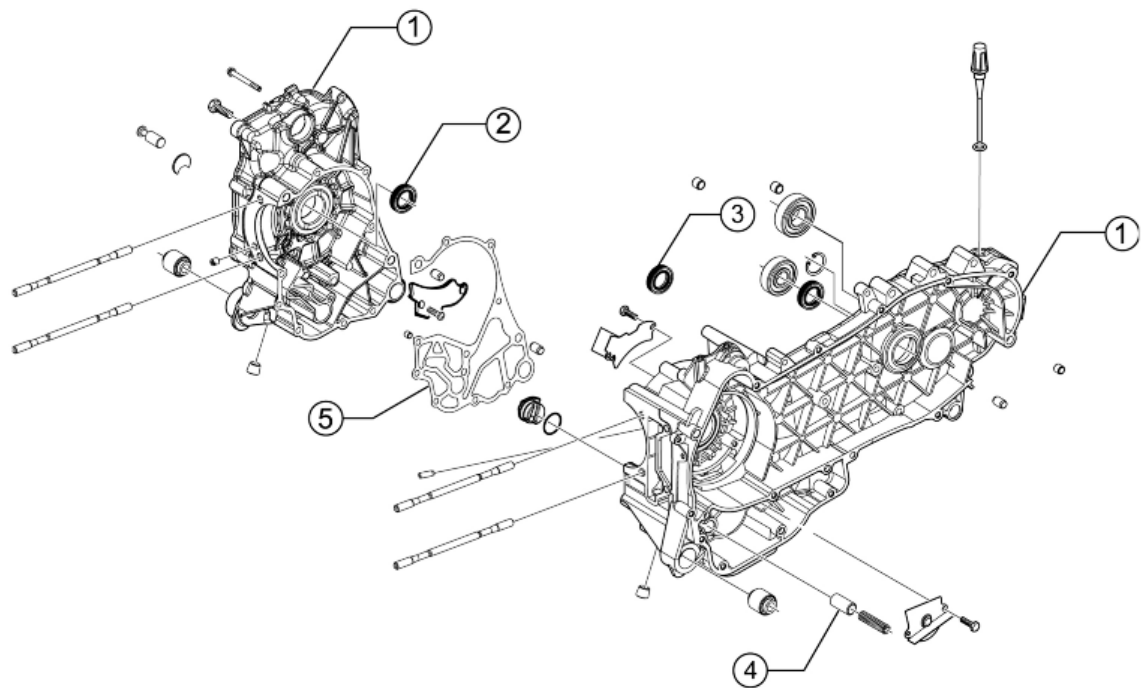
Engine



ENGINE

	Code	Action	Duration
1	001001	Engine from frame - Removal and refit.	
2	001127	Engine - Complete service	
3	003064	Engine oil - change	

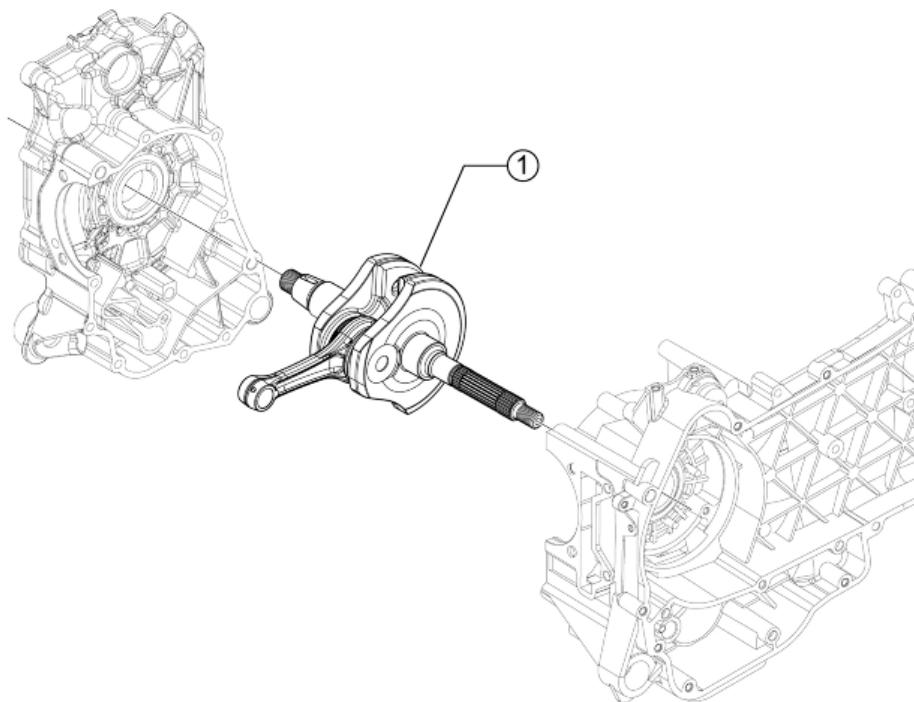
Crankcase



CRANKCASE

	Code	Action	Duration
1	001133	Engine crankcase- Replace- ment	
2	001099	Oil seal, flywheel side - Re- placement	
3	001100	Oil seal, clutch side - Re- placement	
4	001124	Lubrication by-pass - Re- placement	
5	001153	Crankcase halves gasket - Replacement	

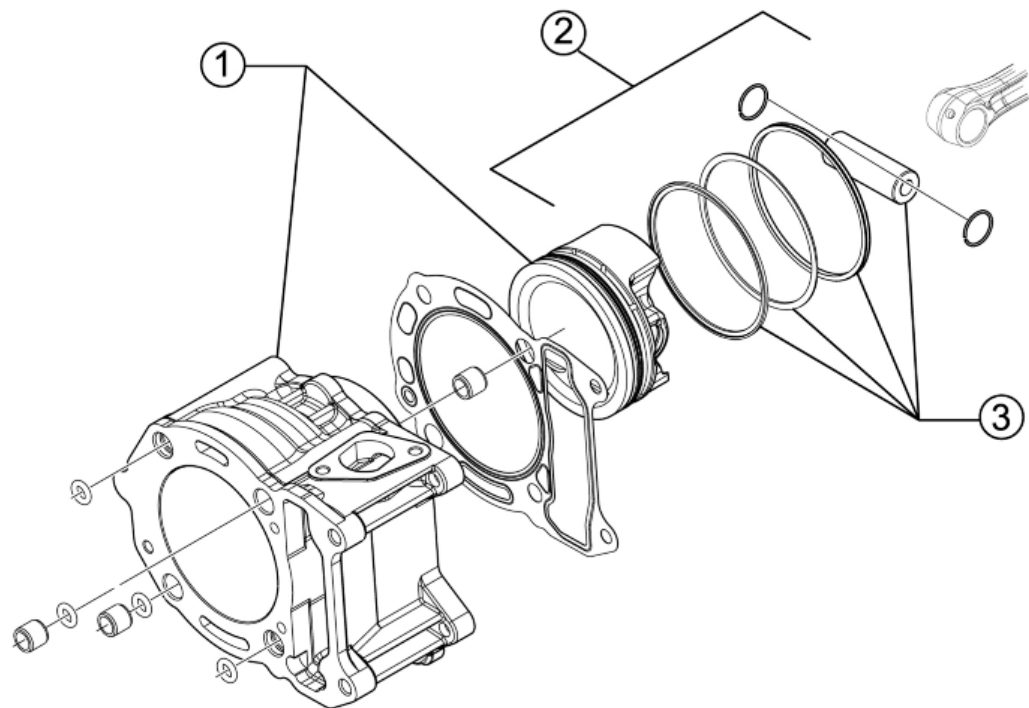
Crankshaft



CRANKSHAFT

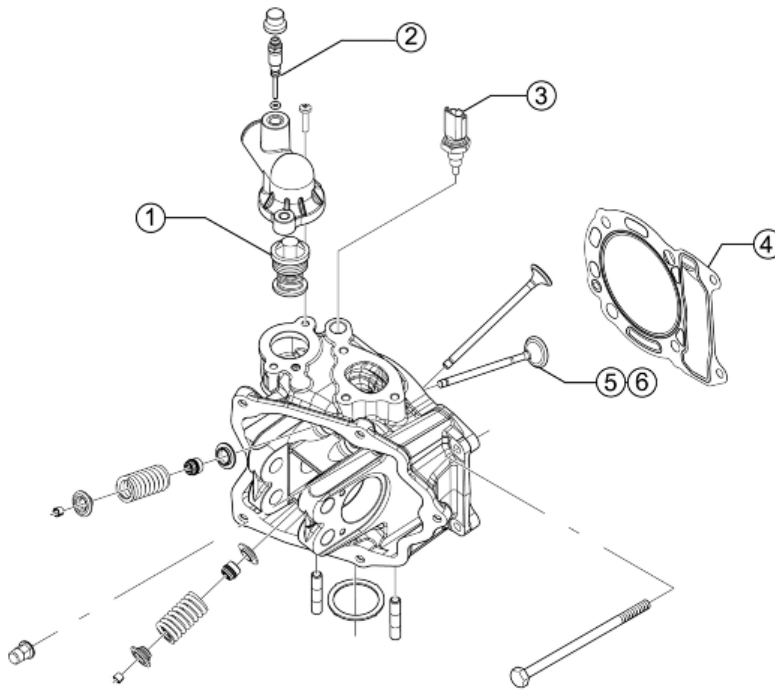
	Code	Action	Duration
1	001117	Crankshaft - Replacement	

Cylinder assy.



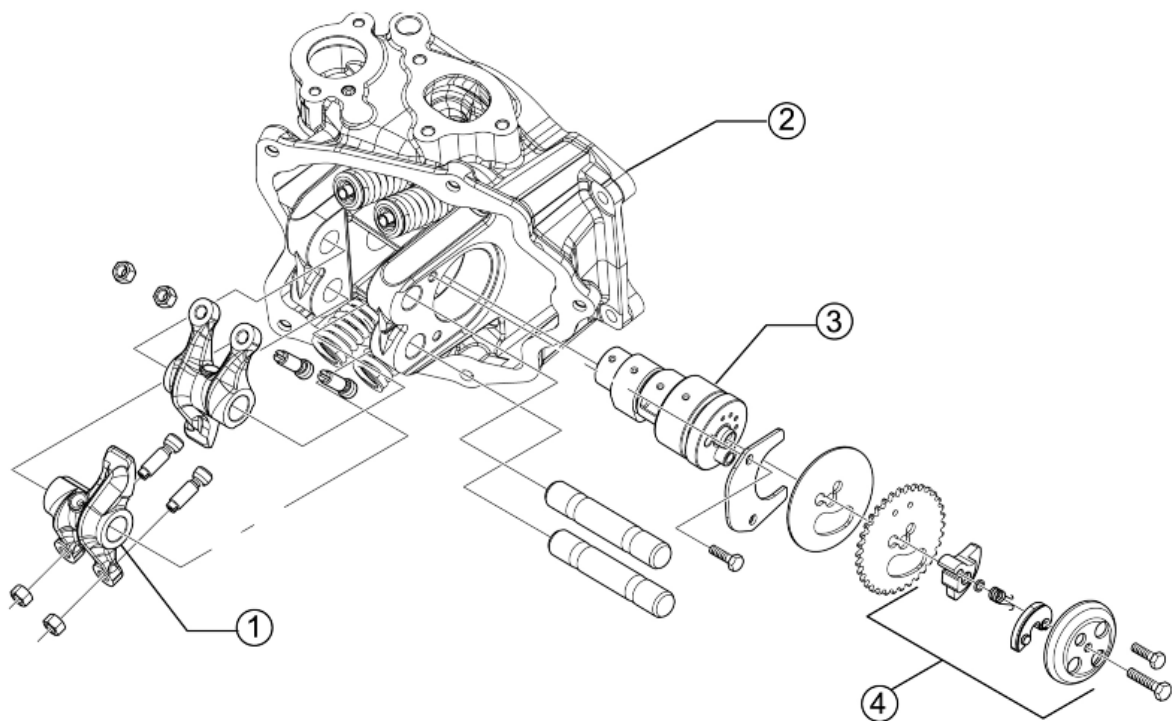
CYLINDER GROUP

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

Cylinder head assy.**HEAD UNIT**

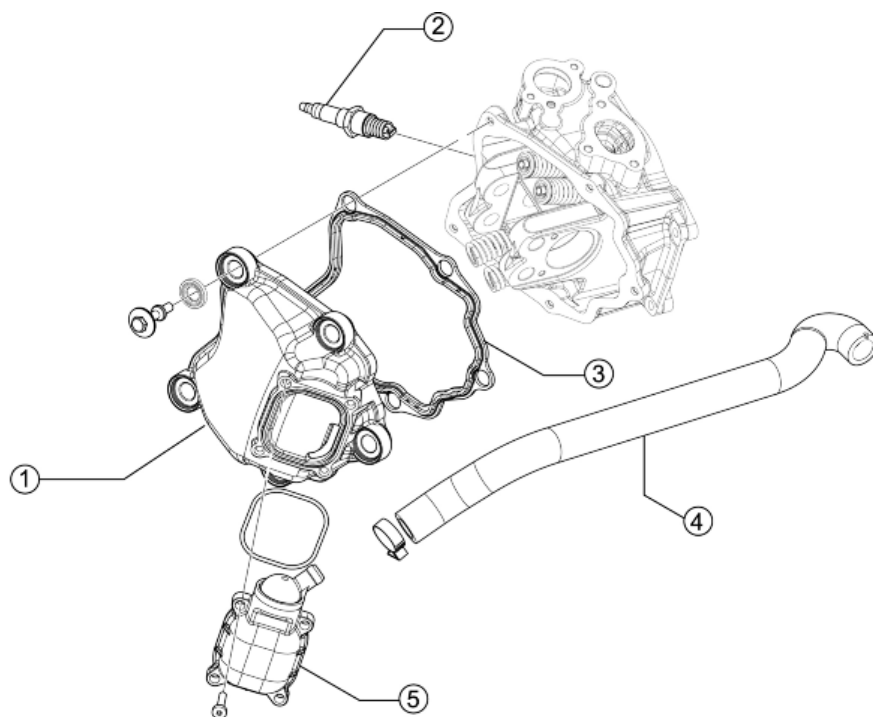
	Code	Action	Duration
1	001057	Thermostat - Replacement	
2	007012	Coolant bleed valve - Replacement	
3	001083	Thermistor - Replacement	
4	001056	Head gasket - Replacement	
5	001045	Valves - Replacement	
6	001049	Valves - Adjustment	

Rocker arms support assy.



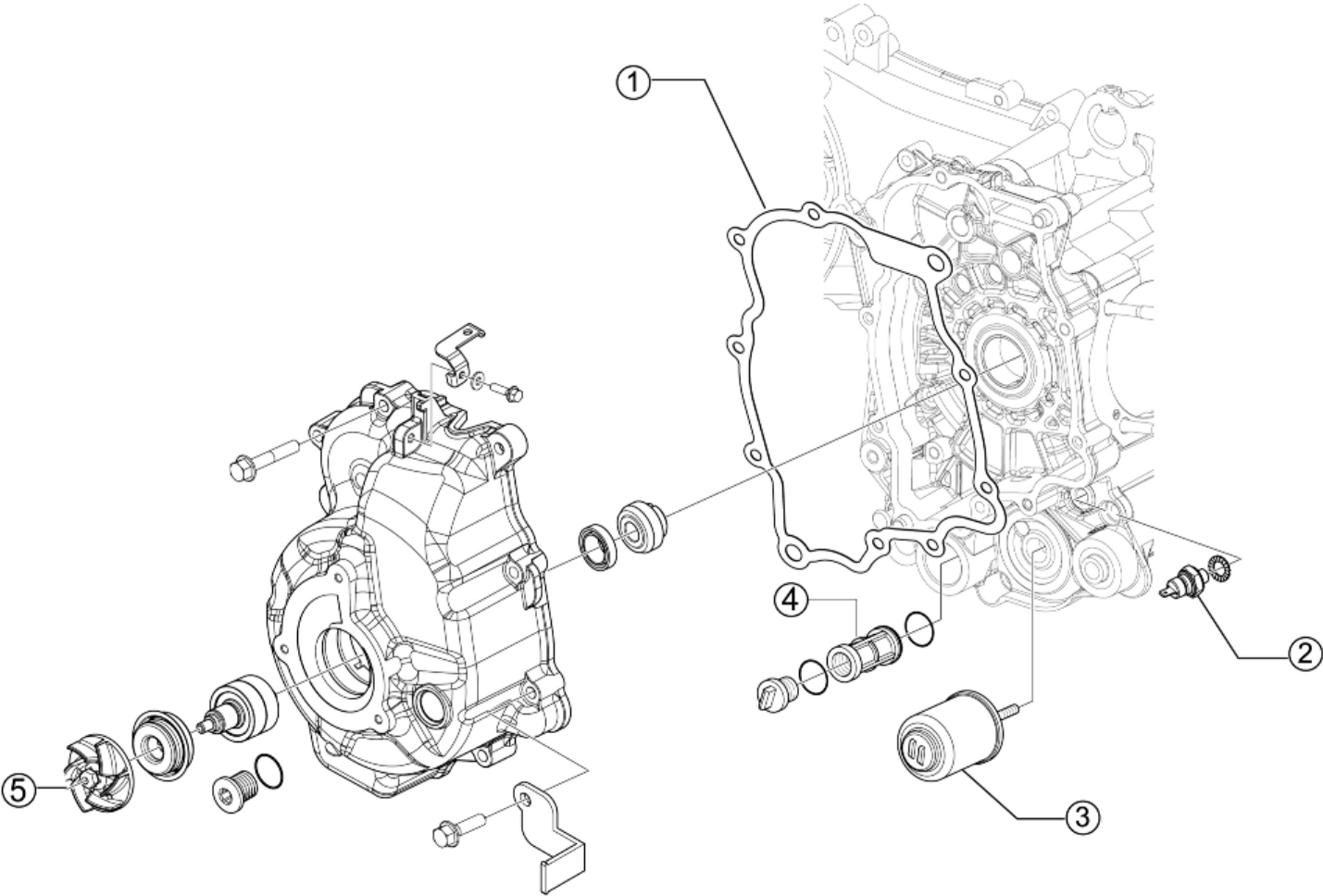
ROCKING LEVER UNIT

	Code	Action	Duration
1	001148	Rocking lever valve - Replacement	
2	001126	Head - Replacement	
3	001044	Camshaft - Replacement	
4	001169	Decompressor - Replacement	

Cylinder head cover**HEAD COVER**

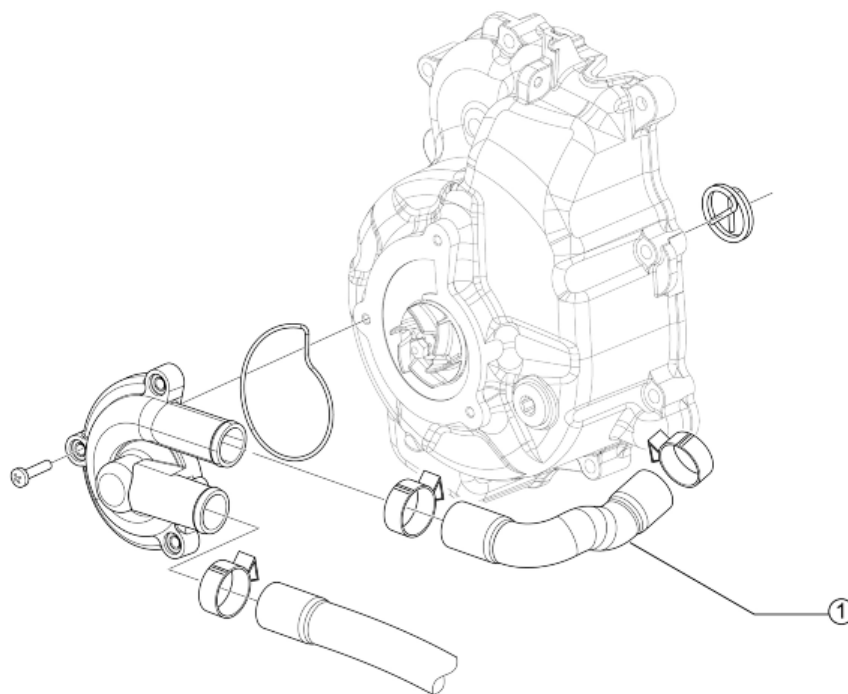
	Code	Action	Duration
1	001089	Head cover - Replacement	
2	001093	Spark plug - Replacement	
3	001088	Head cover gasket - Replacement	
4	001074	Oil vapour recovery pipe - Replacement	
5	001159	Oil vapour recovery tank - Service	

Oil filter



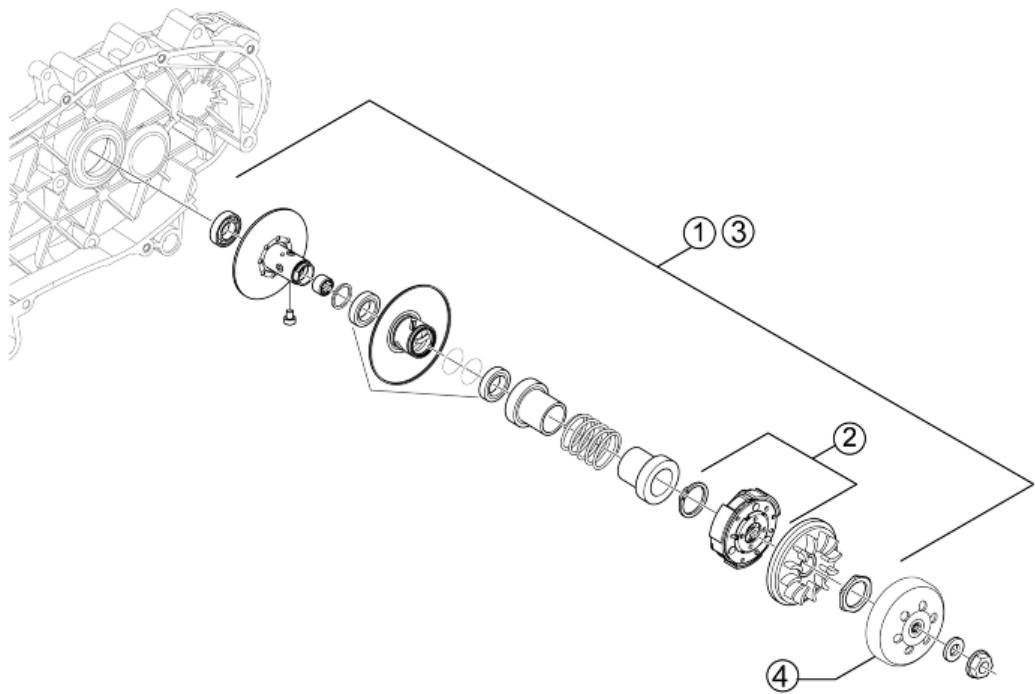
OIL FILTER

	Code	Action	Duration
1	001150	Flywheel cover gasket - Replacement	
2	001160	Oil pressure sensor - Replacement	
3	001123	Oil filter -Replacement	
4	001102	Net oil filter - Replacement / Cleaning	
5	001113	Water pump / Pump rotor - Replacement	

Flywheel cover**FLYWHEEL COVER**

	Code	Action	Duration
1	007009	Head-pump by-pass rubber coupling - Replacement	

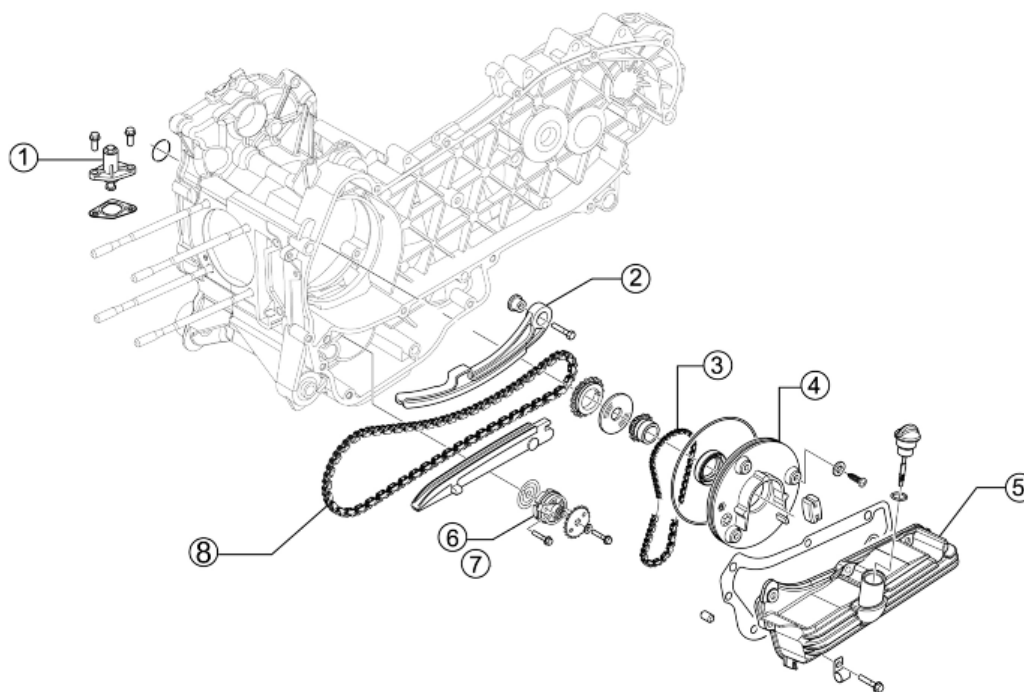
Driven pulley



DRIVEN PULLEY

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

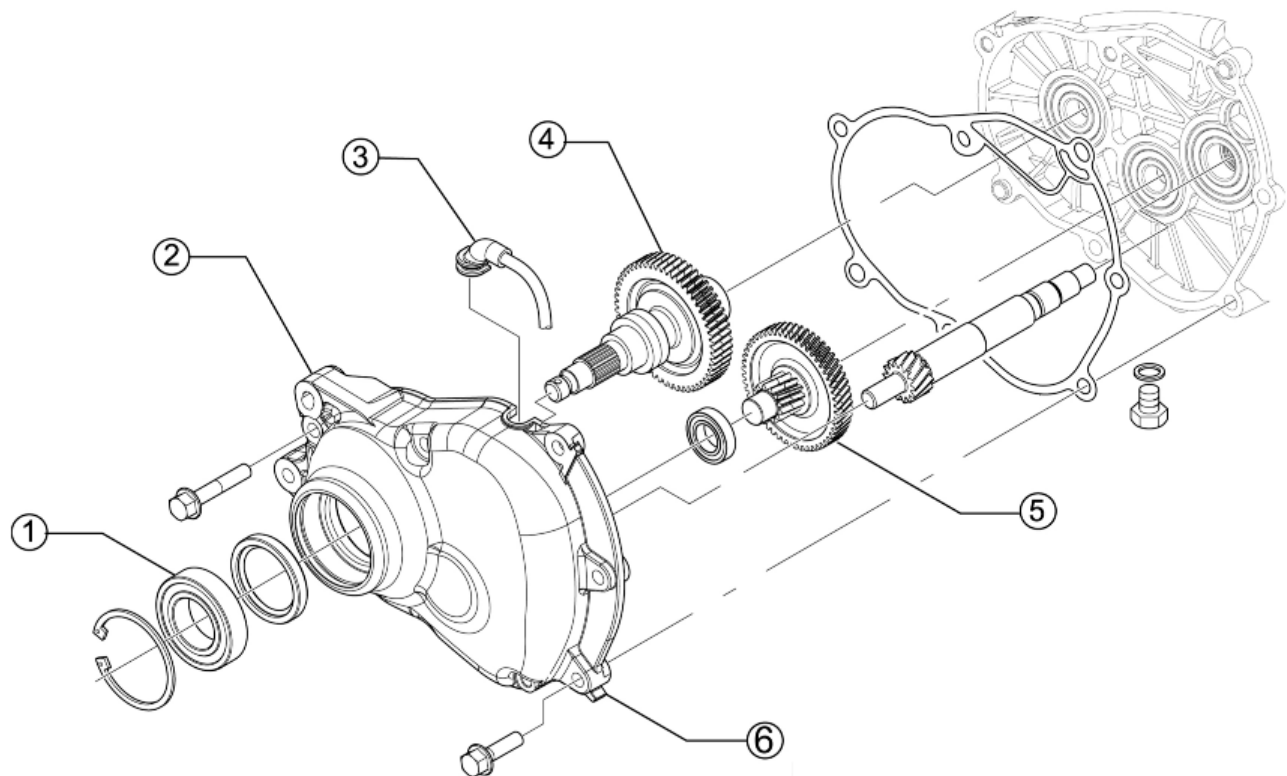
Oil pump



OIL PUMP

	Code	Action	Duration
1	001129	Chain tightener - Overhaul and replacement	
2	001125	Chain guide pads - Replacement	
3	001122	Oil pump chain - Replacement	
4	001172	Chain cover flap - change	
5	001130	Oil sump - Replacement	
6	001042	Oil pump - Service	
7	001112	Oil pump - change	
8	001051	Belt/Timing chain - Change	

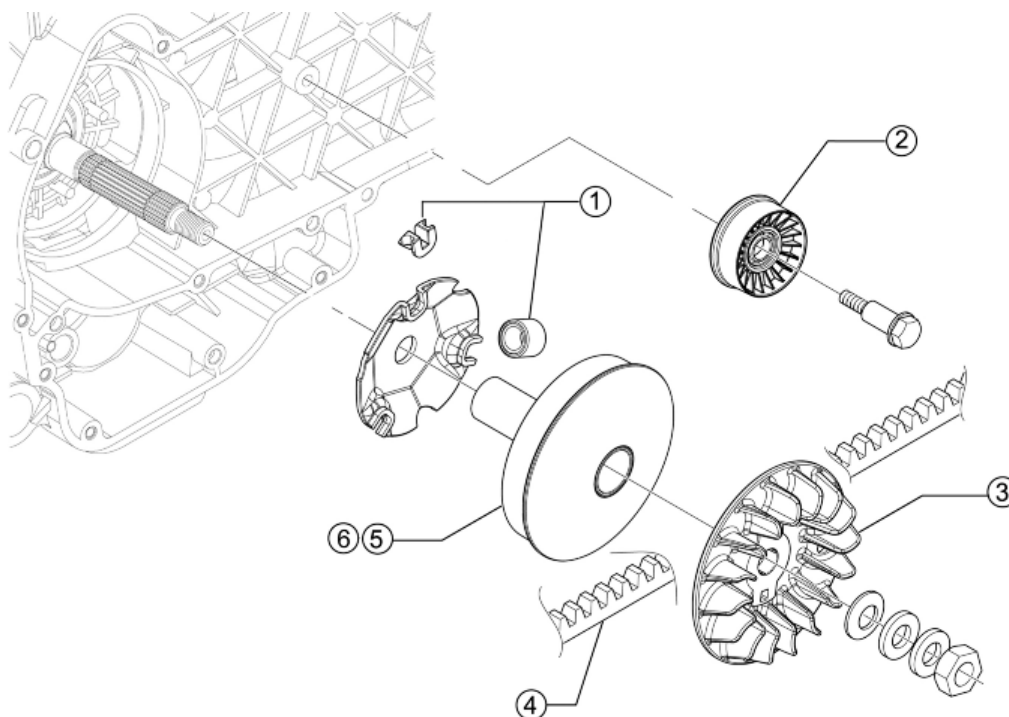
Final gear assy.



FINAL REDUCTION GEAR ASSEMBLY

	Code	Action	Duration
1	002031	Rear wheel hub bearings - Replacement	
2	003065	Gear box oil - Replacement	
3	004180	Reduction gear pipe - Replacement	
4	004125	Rear wheel axle - Replacement	
5	001179	Hub drive shaft -replacement	
6	001156	Gear reduction unit cover - Replacement	

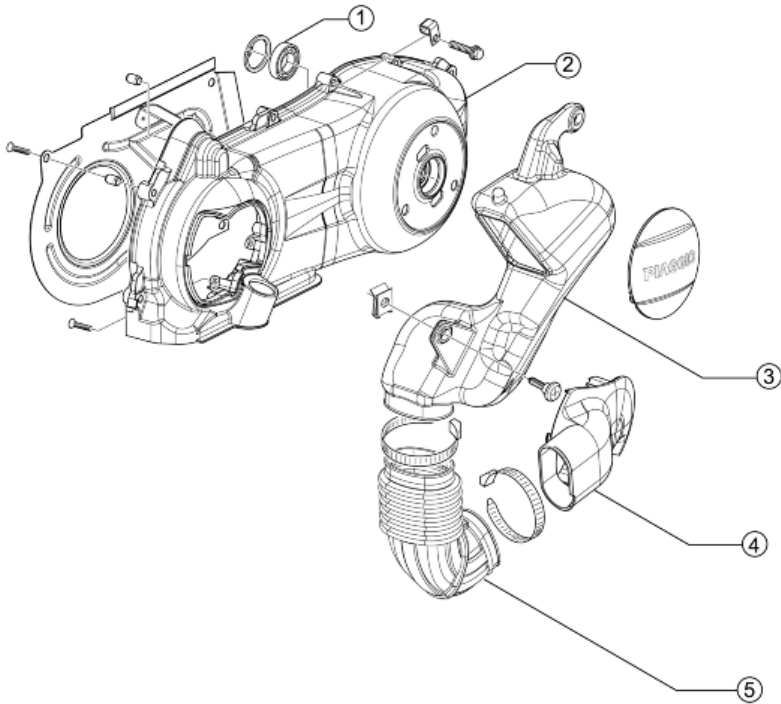
Driving pulley



DRIVE PULLEY

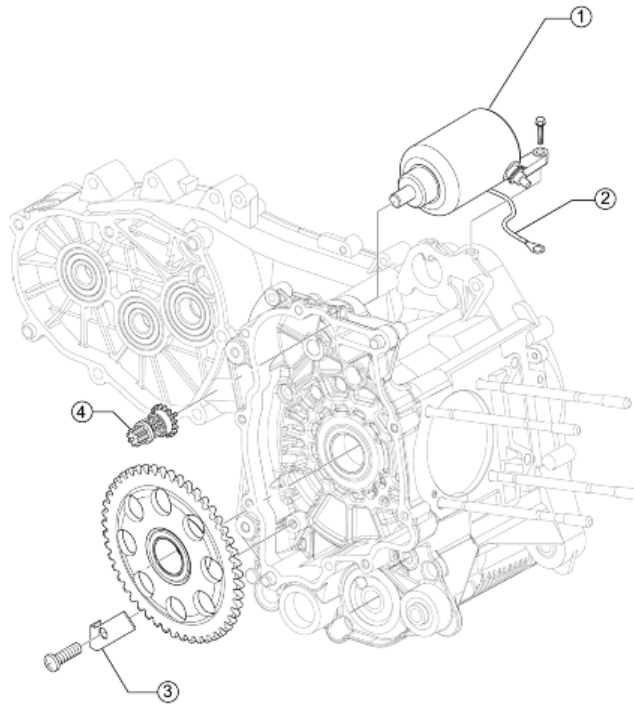
	Code	Action	Duration
1	001177	Variator rollers / shoes - Replacement	
2	001141	Belt anti-flapping roller - Replacement	
3	001086	Driving half-pulley - Replacement	
4	001011	Driving belt - Replacement	
5	001066	Driving pulley - Removal and Refitting	
6	001006	driving pulley - Service	

Transmission cover



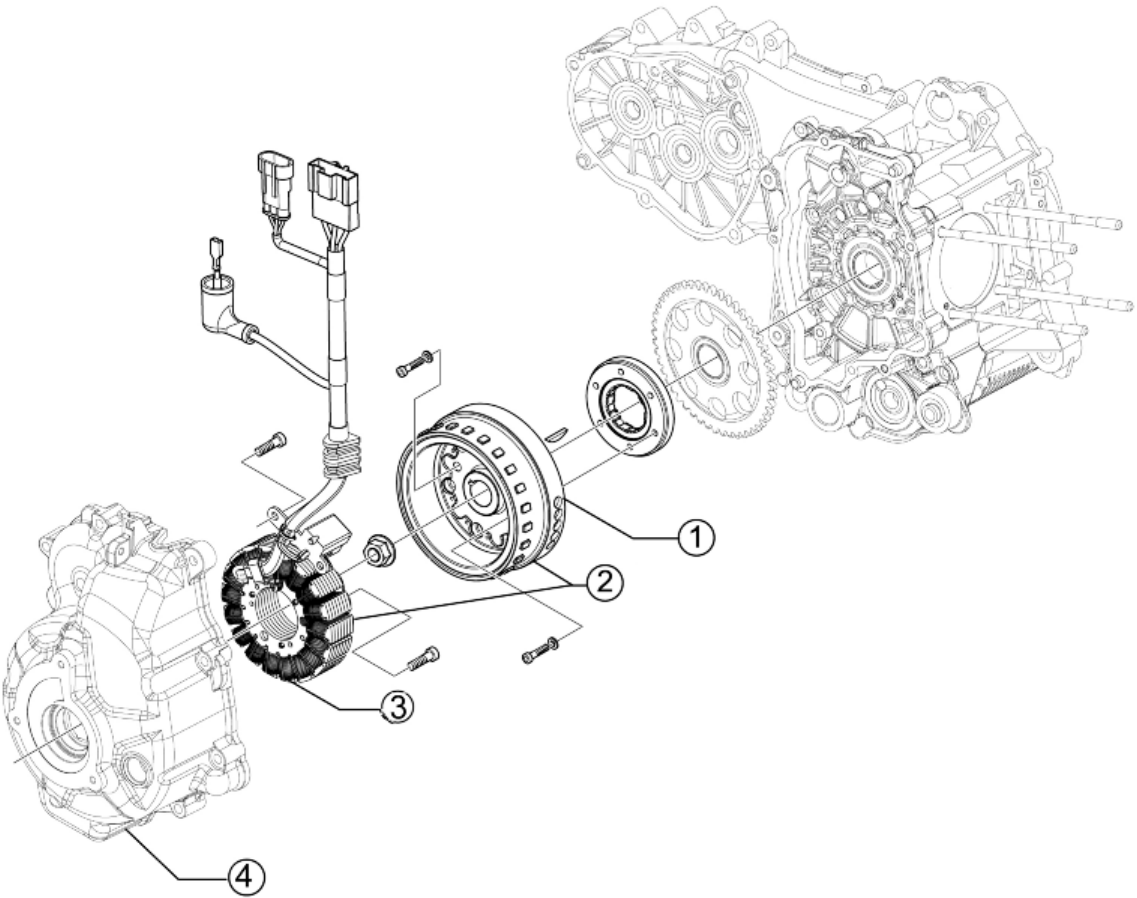
TRANSMISSION COVER

	Code	Action	Duration
1	001135	Transmission cover bearing - Replacement	
2	001096	Transmission crankcase cover - Replacement	
3	001131	Transmission air intake - Replacement	
4	001170	Air duct - Replacement	
5	001132	Transmission air inlet pipe - Replacement	

Starter motor**ELECTRICAL START UP**

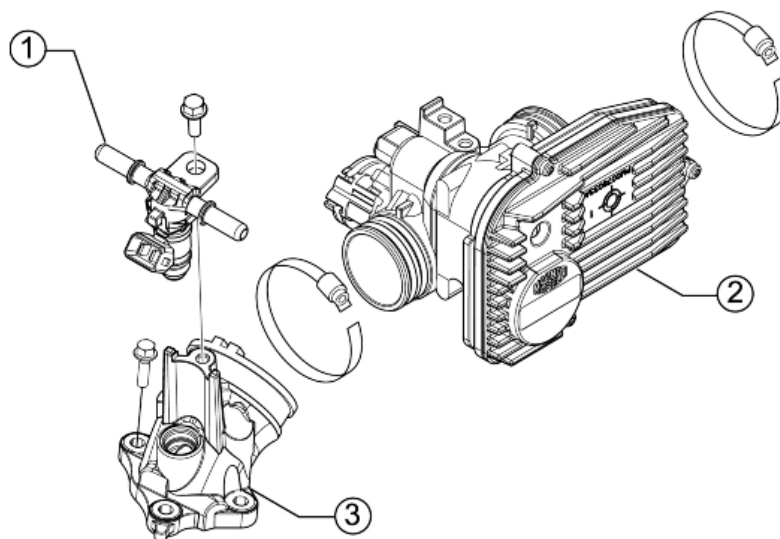
	Code	Action	Duration
1	001020	Starter motor - Replacement	
2	005045	Starter motor cable harness - Replacement	
3	001151	Start-up driven gearing - Replacement	
4	001017	Start-up pinion - Replacement	

Flywheel magneto

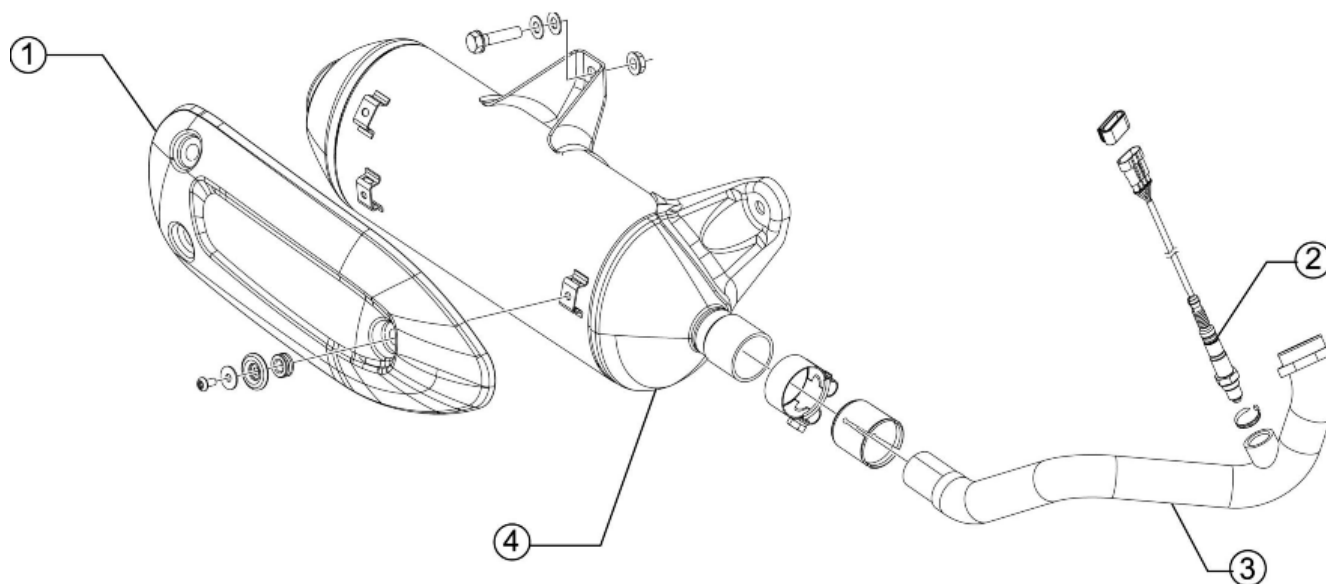


FLYWHEEL

	Code	Action	Duration
1	001173	Rotor - Replacement	
2	001058	Complete flywheel - Replacement	
3	001067	Stator - Removal and Refitting	
4	001087	Flywheel cover - replace	

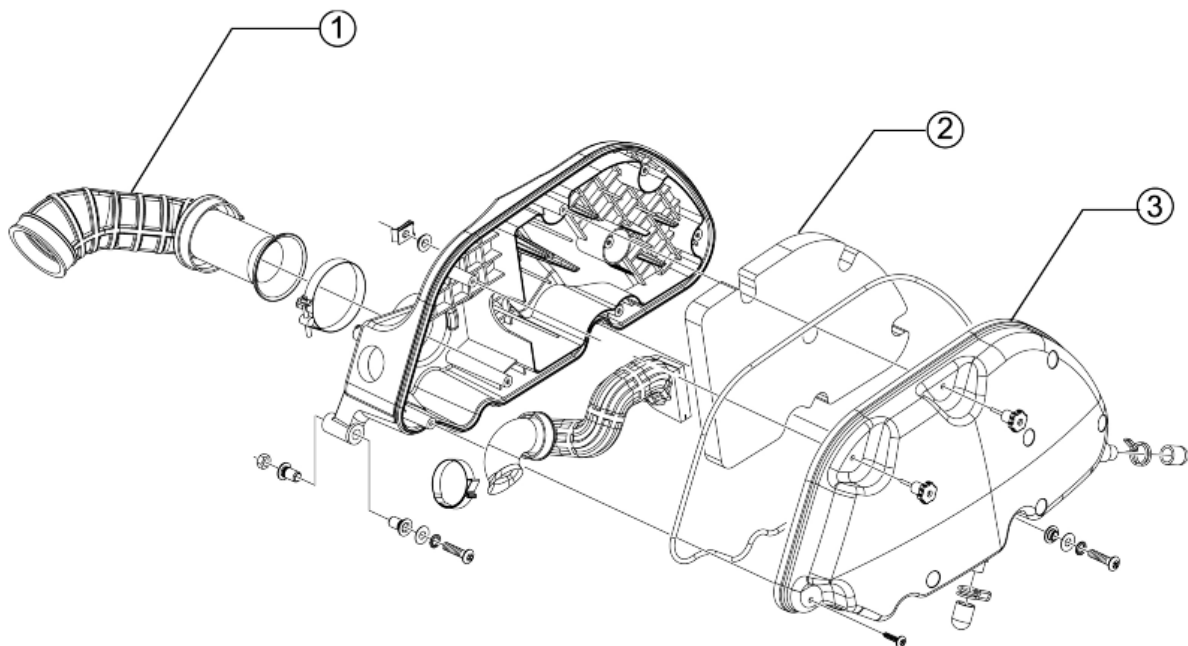
Butterfly valve**THROTTLE BODY**

	Code	Action	Duration
1	001047	Injector - Replacement	
2	001023	Control unit - Replacement	
3	001013	Intake manifold - change	

Exhaust pipe

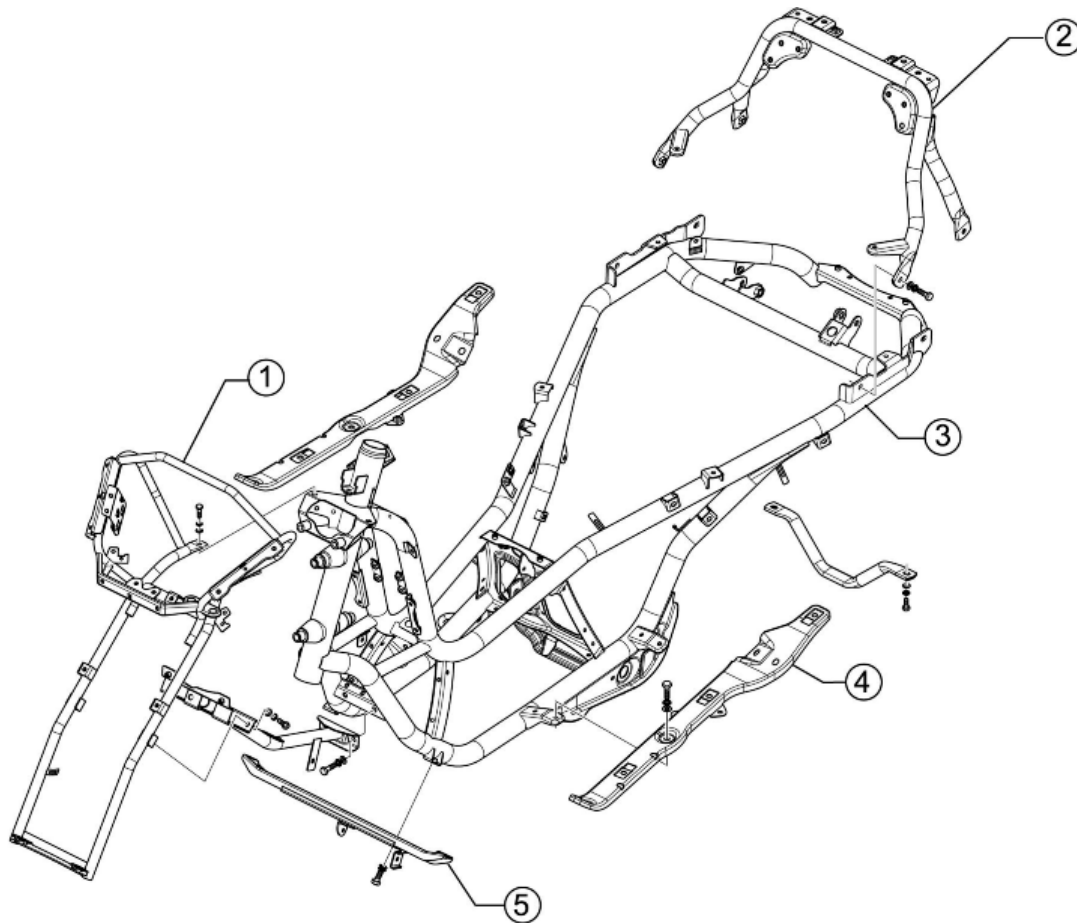
MUFFLER

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

Air cleaner**AIR CLEANER**

	Code	Action	Duration
1	004122	Air cleaner carburettor fitting - Replacement	
2	001014	Air filter - Replacement / cleaning	
3	001015	Air filter box - Replacement	

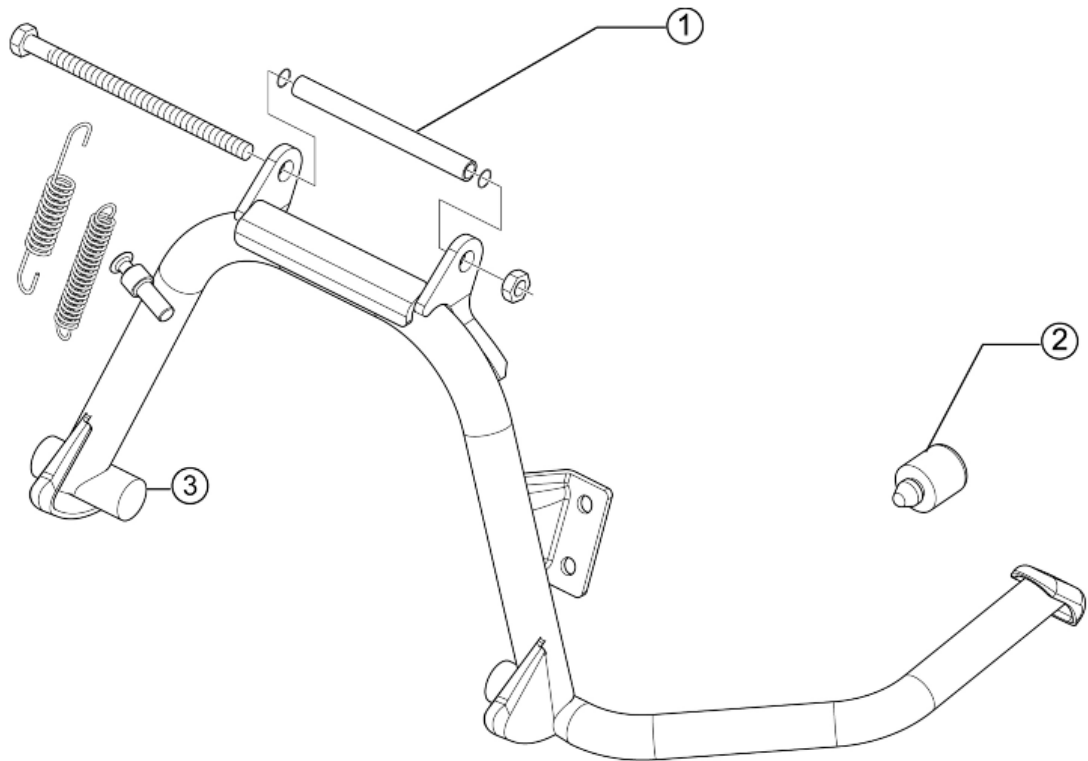
Frame



CHASSIS

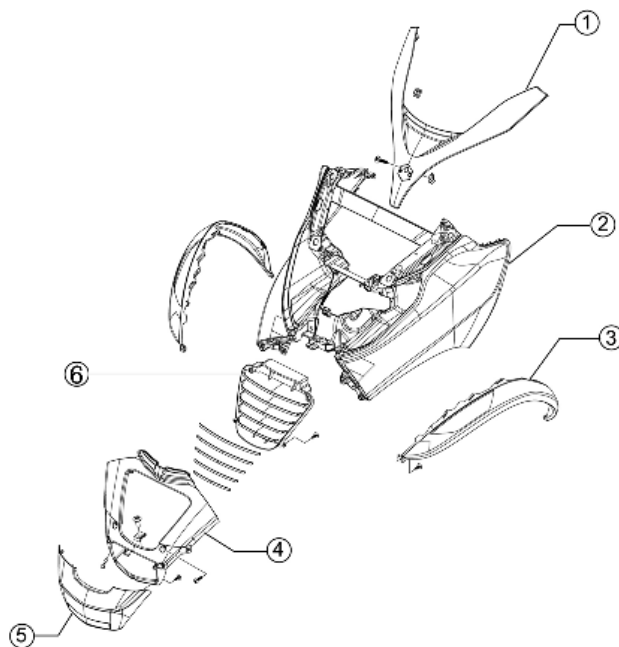
	Code	Action	Duration
1	004146	Front frame - Replacement	
2	004116	Rear frame - Replacement	
3	004001	Frame - replace	
4	004147	footboard support bracket one side - Replacement	
5	004143	Footrest support - replace	

Centre-stand



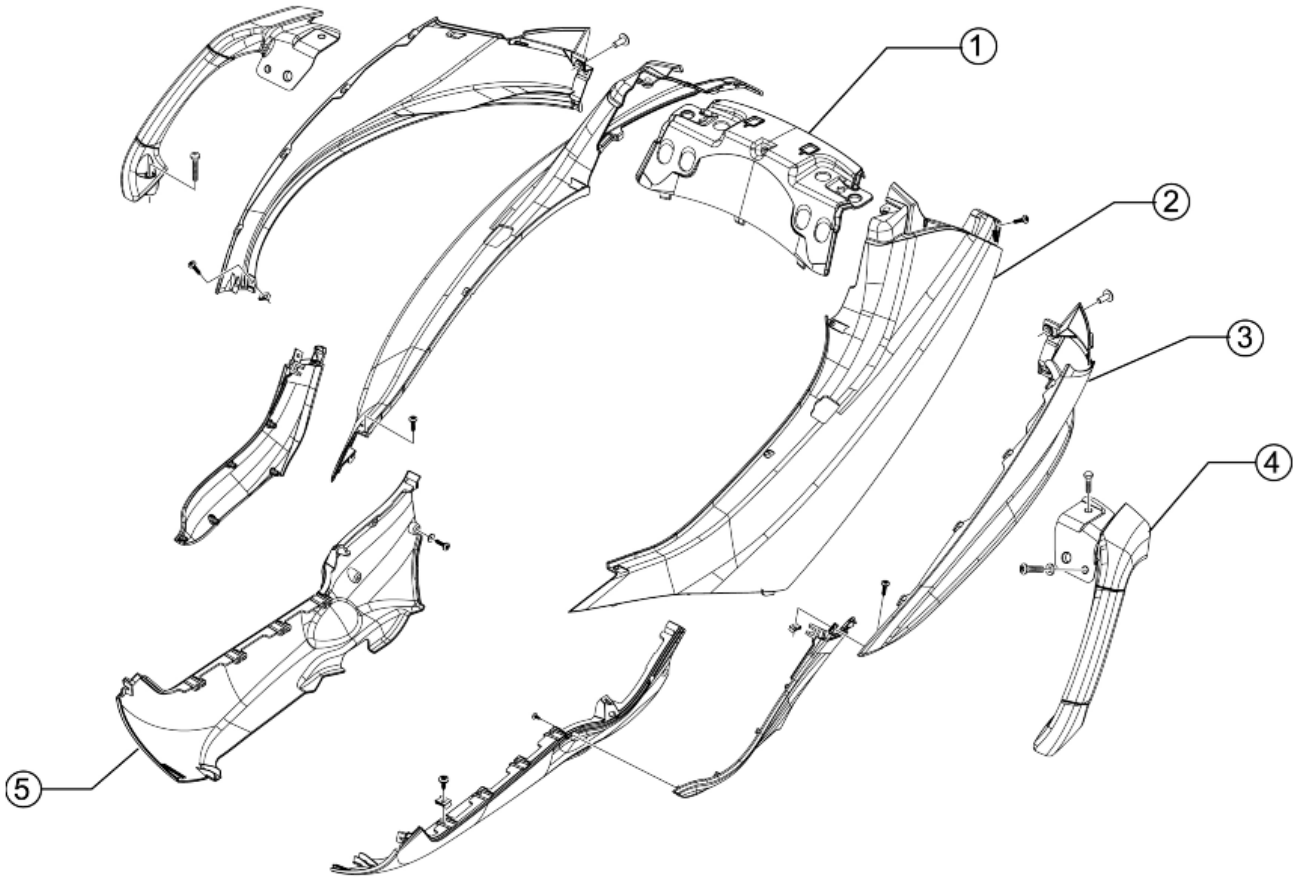
STAND

	Code	Action	Duration
1	001053	Stand bolt - Replacement	
2	004179	Stand buffer - Replacement	
3	004004	Stand - Replacement	

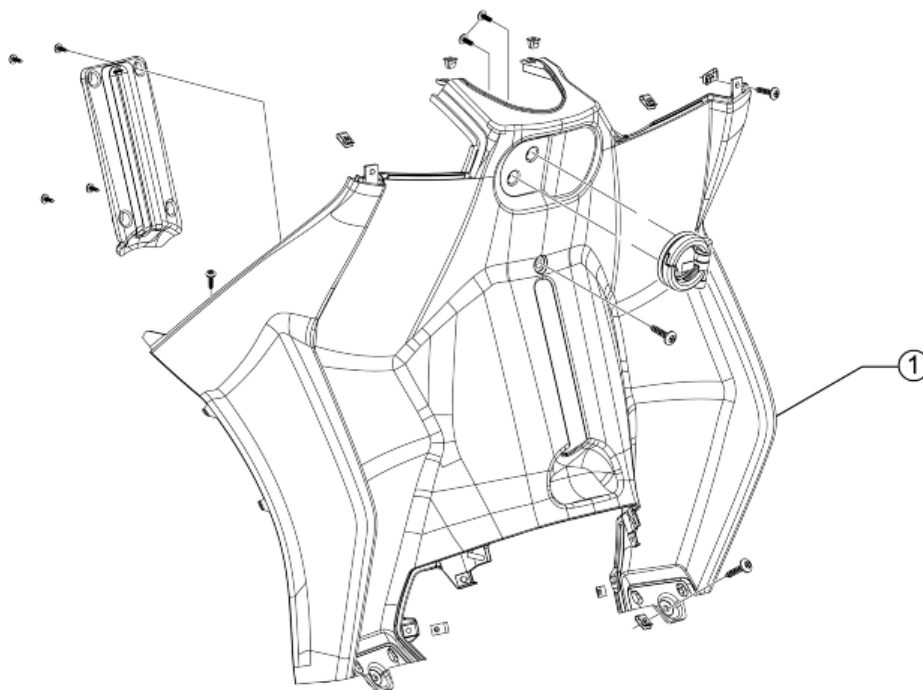
Legshield spoiler**FRONT SHIELD**

	Code	Action	Duration
1	004020	Headlight frame - Replacement	
2	004064	Front shield - Replacement	
3	004055	Turn indicator frame - Replacement	
4	004149	Shield central cover - Replacement	
5	004022	Shield lower section - Replacement	
6	004167	Grill / radiator cover - Replacement	

Side fairings

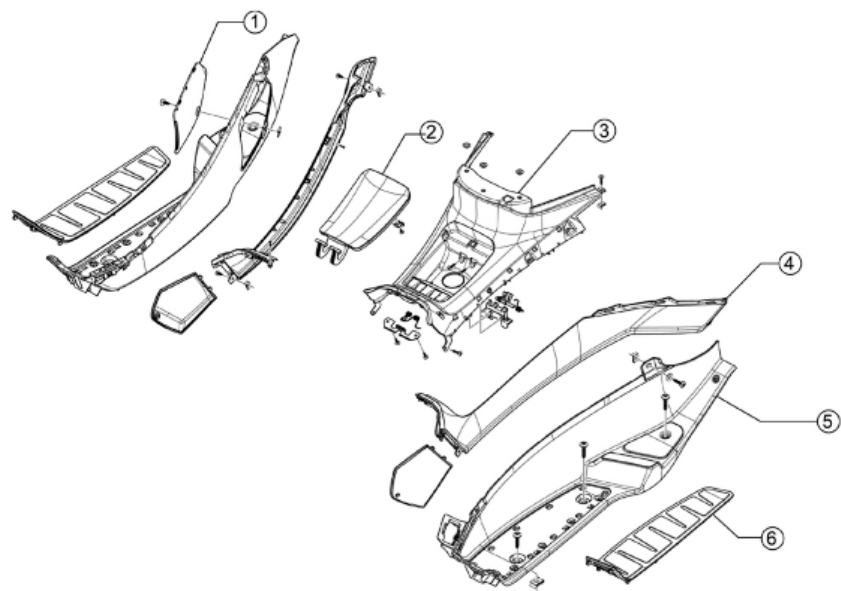


SIDE COVERS			
	Code	Action	Duration
1	004036	Lower chassis cover - Replacement	
2	004129	Rear fairing - Replacement	
3	004085	Fairing (1) - Replacement	
4	004068	Passenger handgrip - Replacement	
5	004037	Side aprons-Replacement	

Rear cover**REAR SHIELD**

	Code	Action	Duration
1	004065	Front shield, rear part - Removal and refitting	

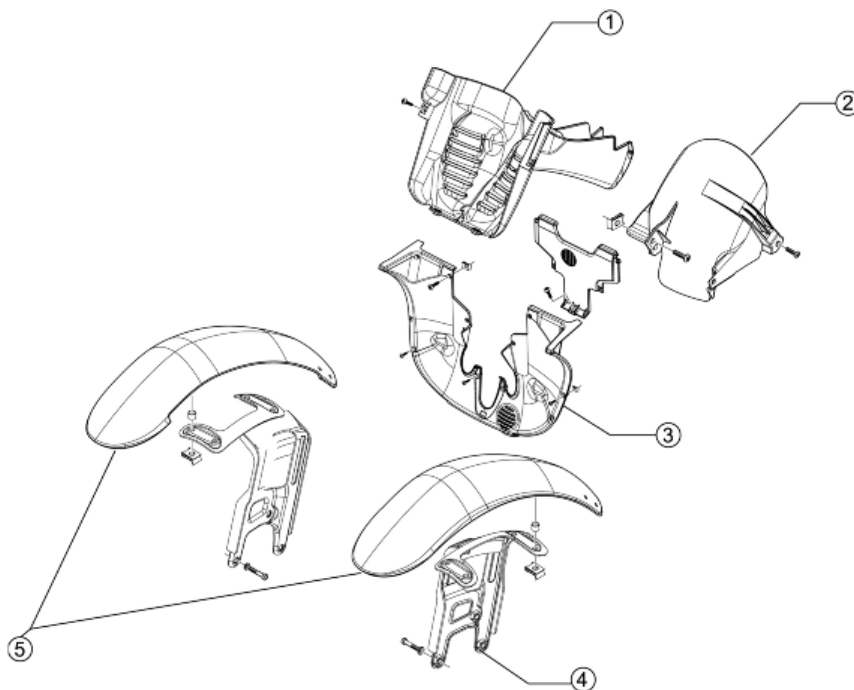
Central cover



CENTRAL COVER

	Code	Action	Duration
1	004059	Spark plug inspection flap - Replacement	
2	004135	Fuel tank port - Replacement	
3	004011	Central chassis cover - Replacement	
4	004012	Rear fairings - Removal and refitting	
5	004015	Footrest - Removal and Re-fitting	
6	004075	Front mat - Replacement	

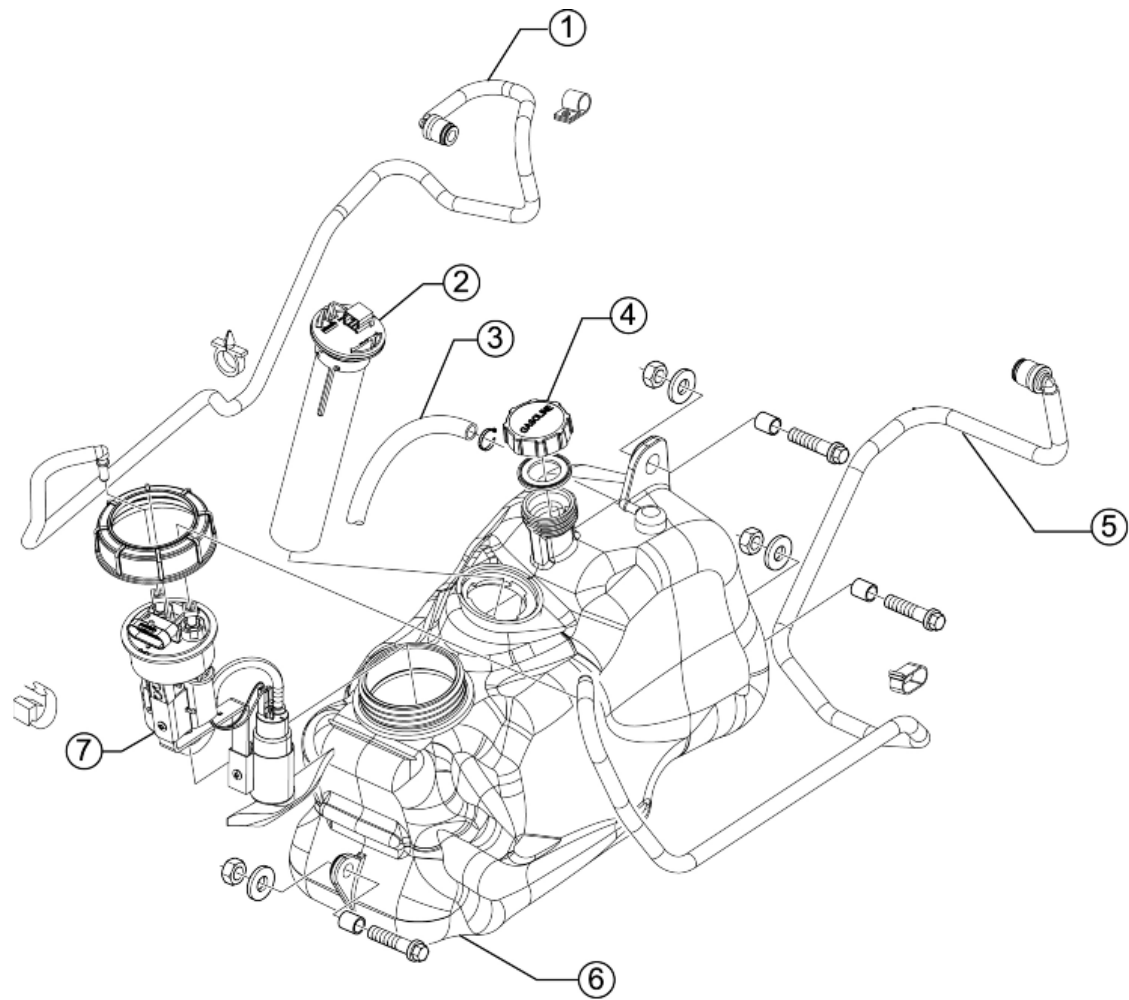
Mudguard



MUDGUARDS

	Code	Action	Duration
1	007015	Radiator air intake - Replacement	
2	004009	Rear mudguard - Replacement	
3	004181	Lower cover - Replacement	
4	004184	Front mudguard support - replacement	
5	004002	Front mudguard - Replacement	

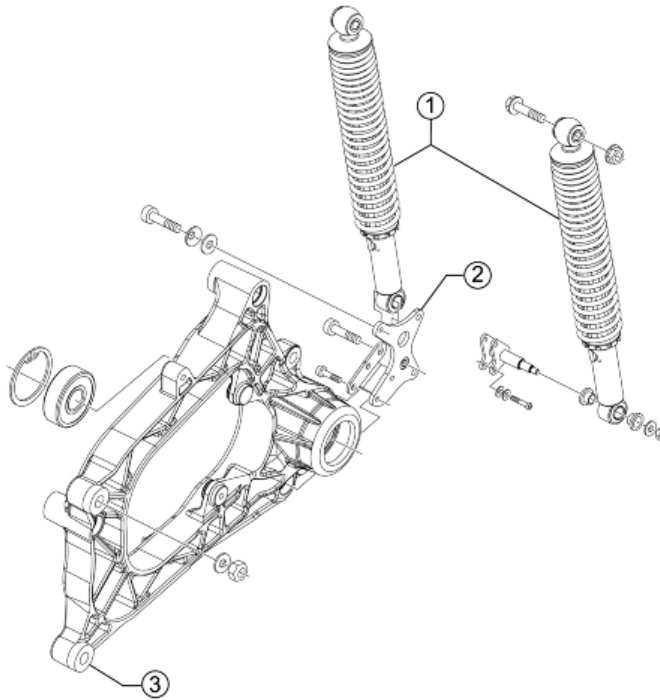
Fuel tank



FUEL TANK

	Code	Action	Duration
1	004137	Injector pump pipe - Replacement	
2	005010	Tank float - Replacement	
3	004109	Fuel tank breather - Replacement	
4	004168	Fuel tank cap - Replacement	
5	004138	Fuel reverse pipe - Replacement	
6	004005	Fuel tank - Replacement	
7	004073	Fuel pump - Replacement	

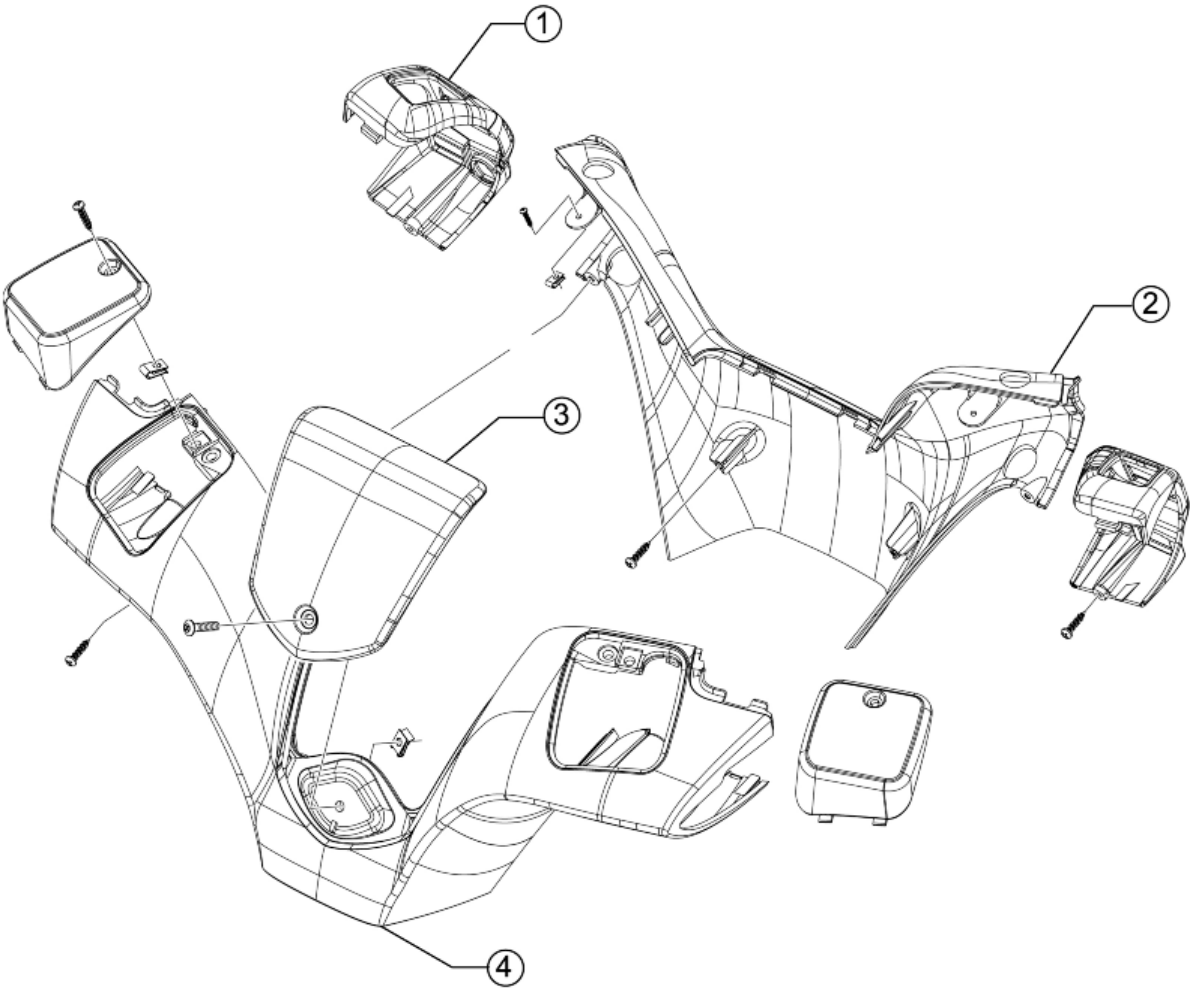
Rear shock-absorber



REAR SHOCK ABSORBERS

	Code	Action	Duration
1	003007	Rear shock absorber - Removal and Refitting	
2	003035	Shock absorber support and brake calliper - Replacement	
3	003077	muffler/rear shock absorber support arm - Service	

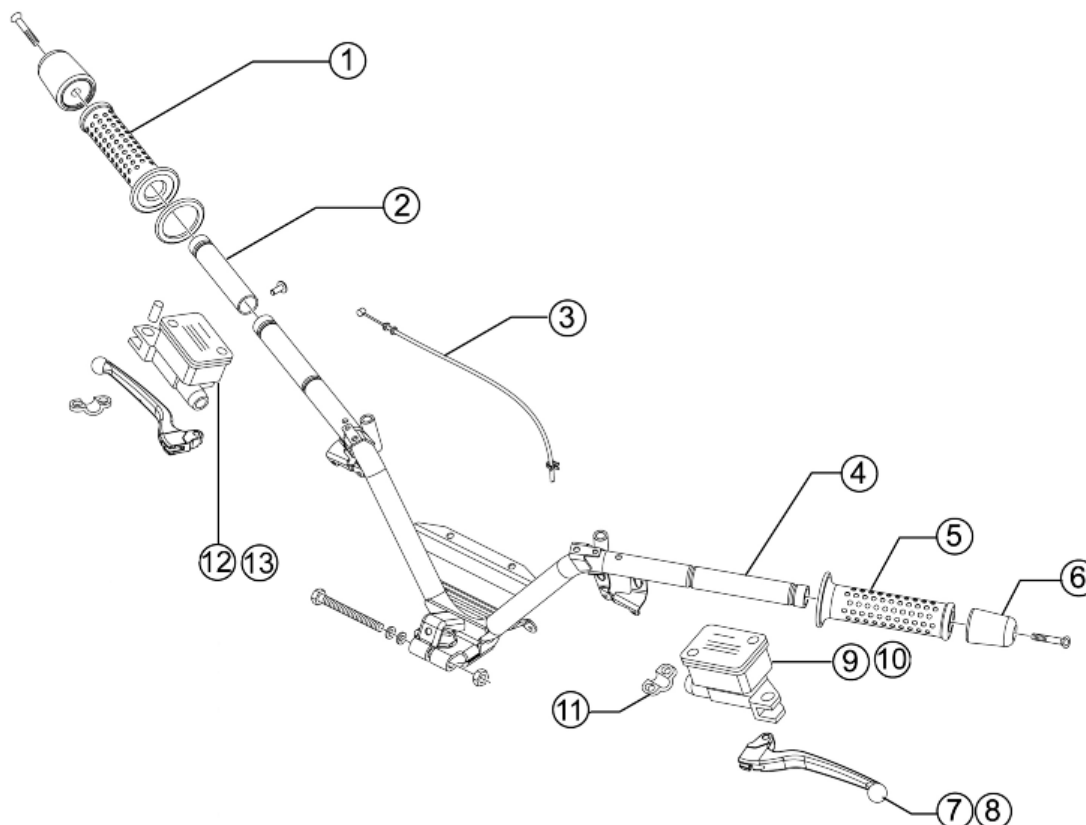
Handlebar covers



HANDLEBAR COVERS

	Code	Action	Duration
1	000307	RIGHT OR LEFT CONTROL ASSEMBLY REPLACEMENT	
2	004019	Rear handlebar covers - Replacement	
3	004026	Handlebar cover - Replacement	
4	004018	Front handlebar covers - Replacement	

Handlebar components

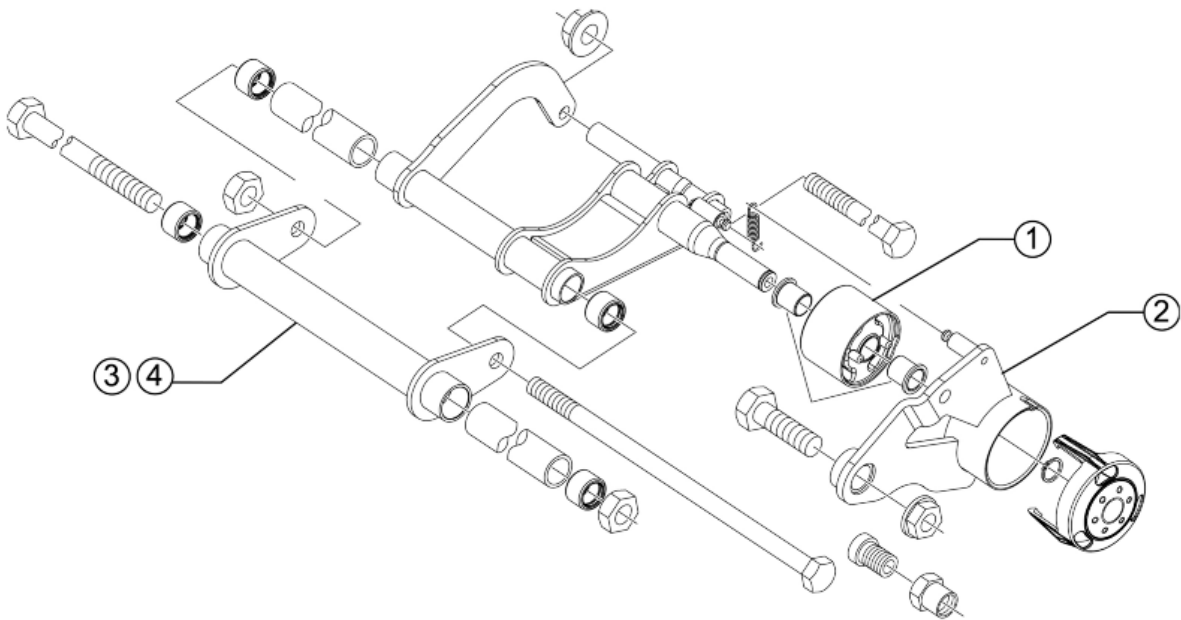


HANDLEBAR COMPONENTS

	Code	Action	Duration
1	002059	Right-hand knob - change	
2	002060	Complete throttle control - Replacement	
3	002063	Complete throttle control - Replacement	
4	003001	Handlebar - Replacement	
5	002071	Left knob - Replacement	
6	003059	Counterweight - Replacement	
7	002037	Brake lever - Replacement	
8	002048	Rear brake calliper - Replacement	
9	002067	Rear brake pump - Replacement	
10	002080	Rear brake oil bleeding system - Replacement	
11	004162	Mirror support and/or brake pump fitting U-bolt - Replacement	
12	002024	Front brake pump - replace	
13	002047	Front brake fluid and air bleeding system - Replacement	

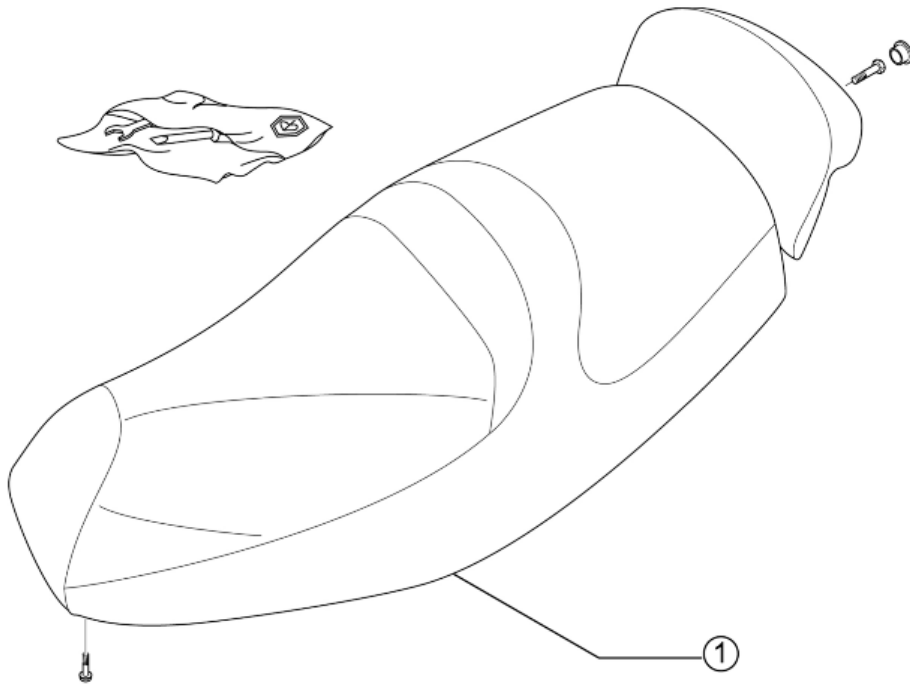
TIME - 30

Swing-arm



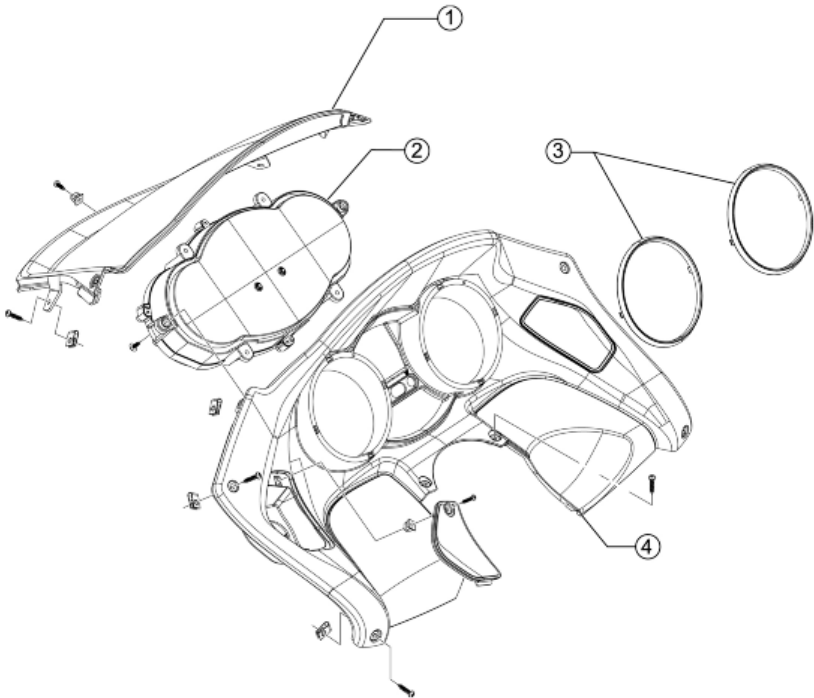
SWINGING ARM

	Code	Action	Duration
1	004058	Silent block - Replacement	
2	003081	Swinging arm support flange - replace	
3	001072	Swinging arm - Engine-chas- sis connection - Replacement	
4	003080	Swinging arm on frame - Re- placement	

Seat**SADDLE**

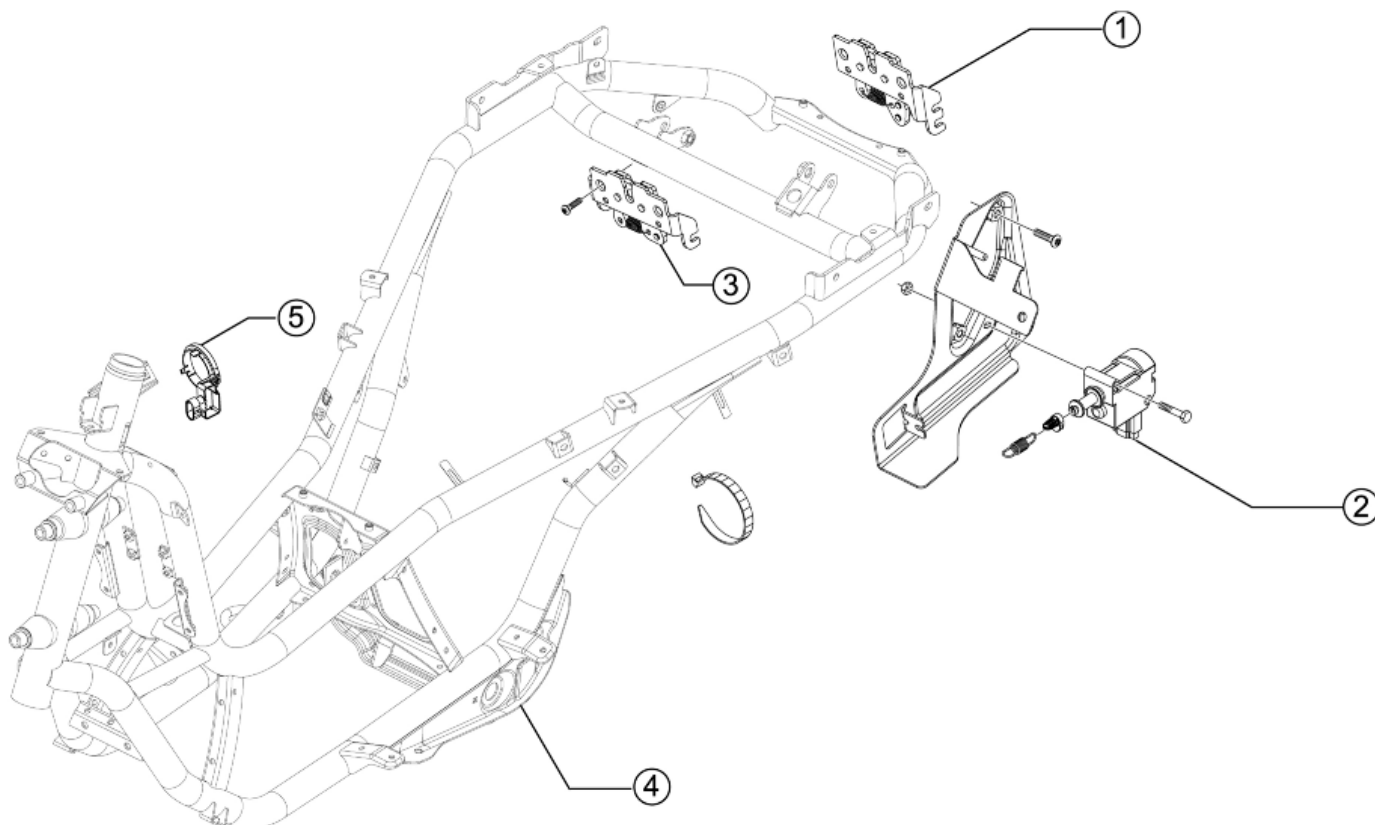
	Code	Action	Duration
1	004003	Saddle - Replacement	

Instrument panel



INSTRUMENT PANEL			
	Code	Action	Duration
1	004021	Shield upper section - Replacement	
2	005014	Odometer - Replacement	
3	004099	Odometer housing - Replacement	
4	004035	Instrument panel - Replacement	

Locks

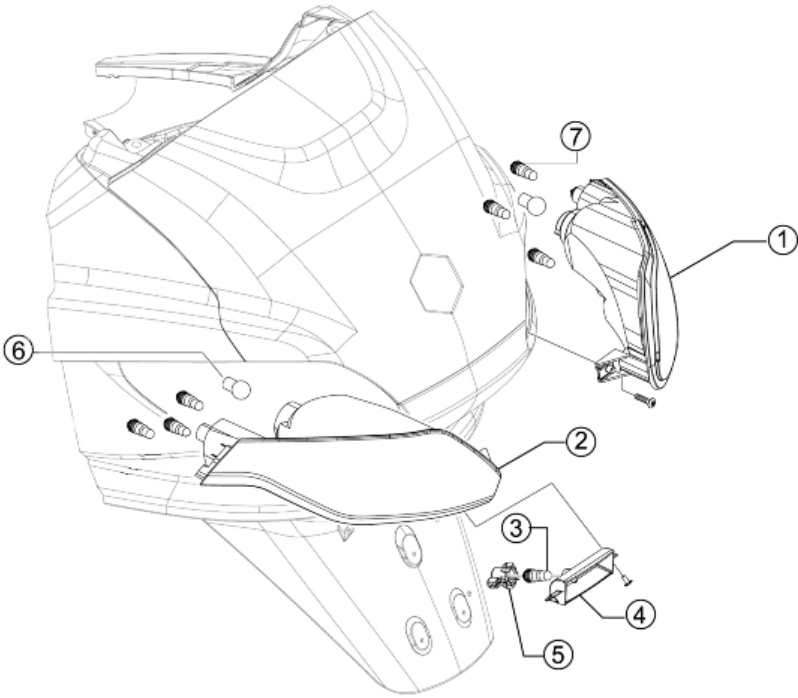


Locks

	Code	Action	Duration
1	004172	Rear case closure hook - Replacement	
2	005099	Electric saddle opening activator - Replacement	
3	004054	Saddle lock catch - Replacement	
4	004001	Chassis - Replacement	
5	005072	Immobilizer aerial - Replacement	

Turn signal lights

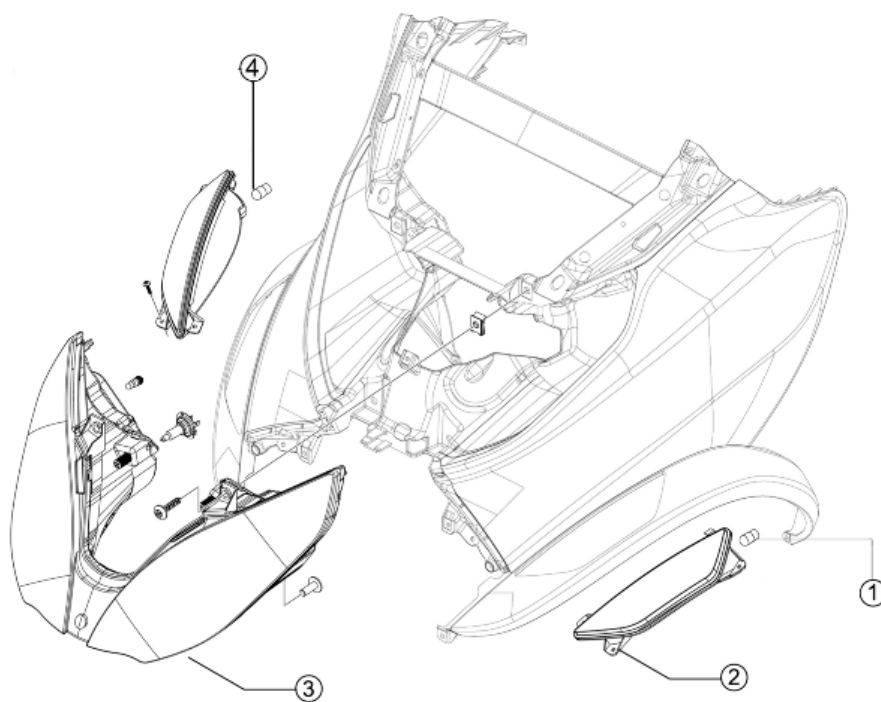
Rear lights



REAR TURN INDICATORS INDICATOR LIGHTS

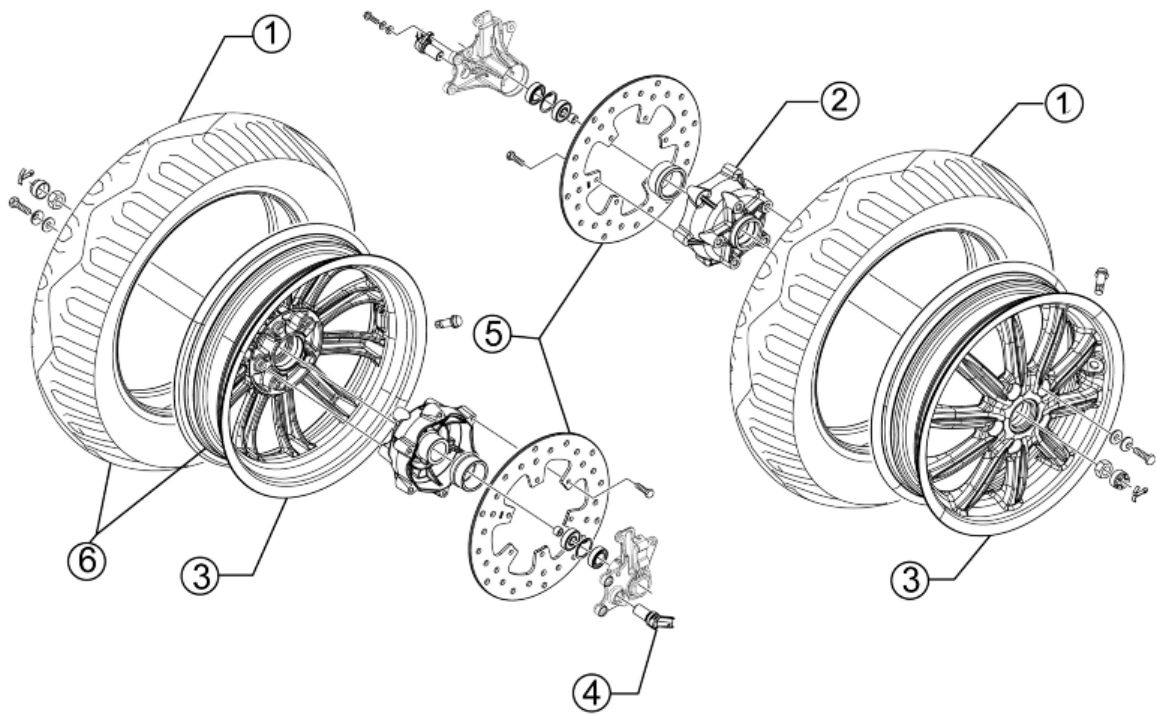
	Code	Action	Duration
1	005005	Taillight - Replacement	
2	005022	Rear turn indicators - Replacement	
3	005031	Licence plate light bulb - Replacement	
4	005032	Transparent licence plate cover - replace	
5	005131	Licence plate light support - Replacement	
6	005066	Rear light bulbs - Replacement	
7	005068	Rear turn indicator bulb - Replacement	

Front lights

**FRONT TURN INDICATORS INDICATOR LIGHTS**

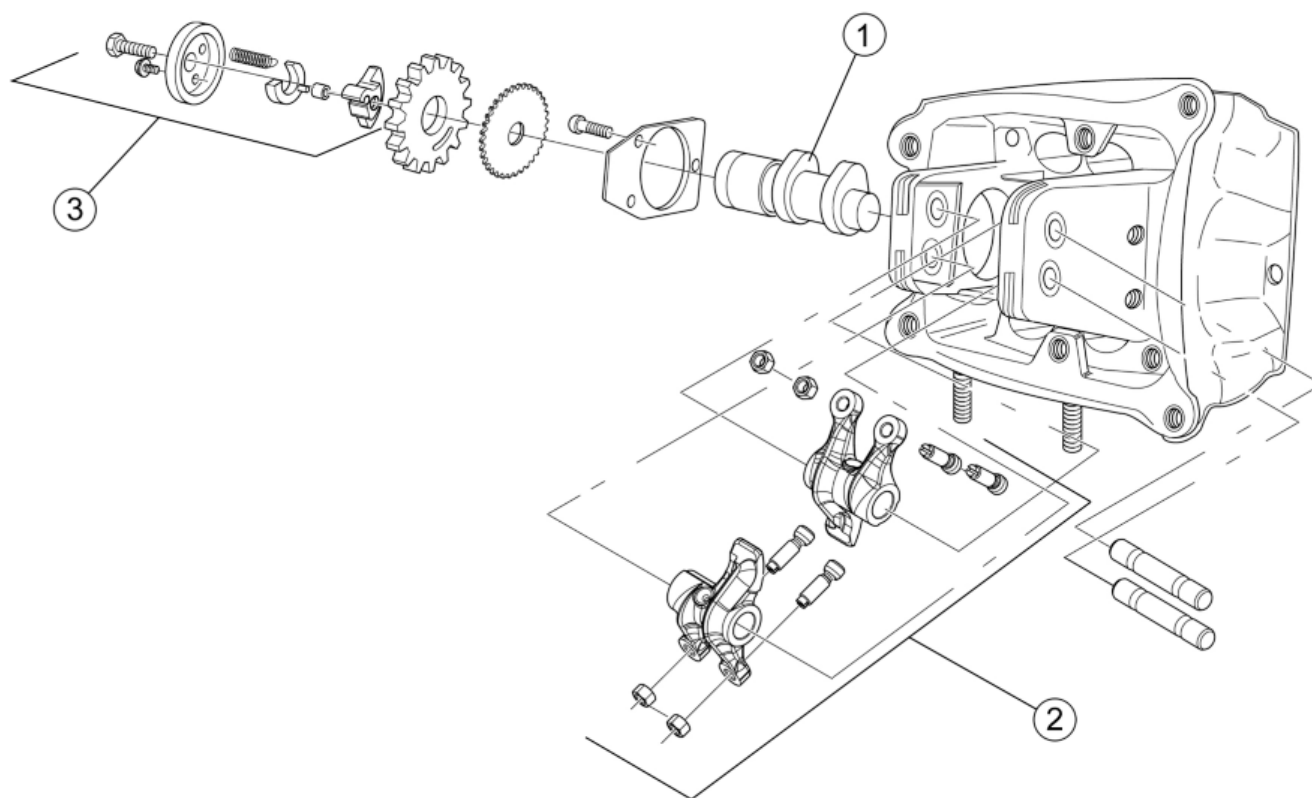
	Code	Action	Duration
1	005067	Front direction indicator bulb - Replacement	
2	005012	Front direction indicators - Replacement	
3	005002	Front light - Replacement	
4	005008	Light bulbs - Replacement	

Front wheel



FRONT WHEELS			
	Code	Action	Duration
1	003047	Front tyre - Replacement	
2	003033	Front wheel hub- Replacement	
3	003037	Front wheel rim- Replacement	
4	005089	Tone wheel - Replacement	
5	002041	Front brake disc - Replacement	
6	004123	Front wheel - Replacement	

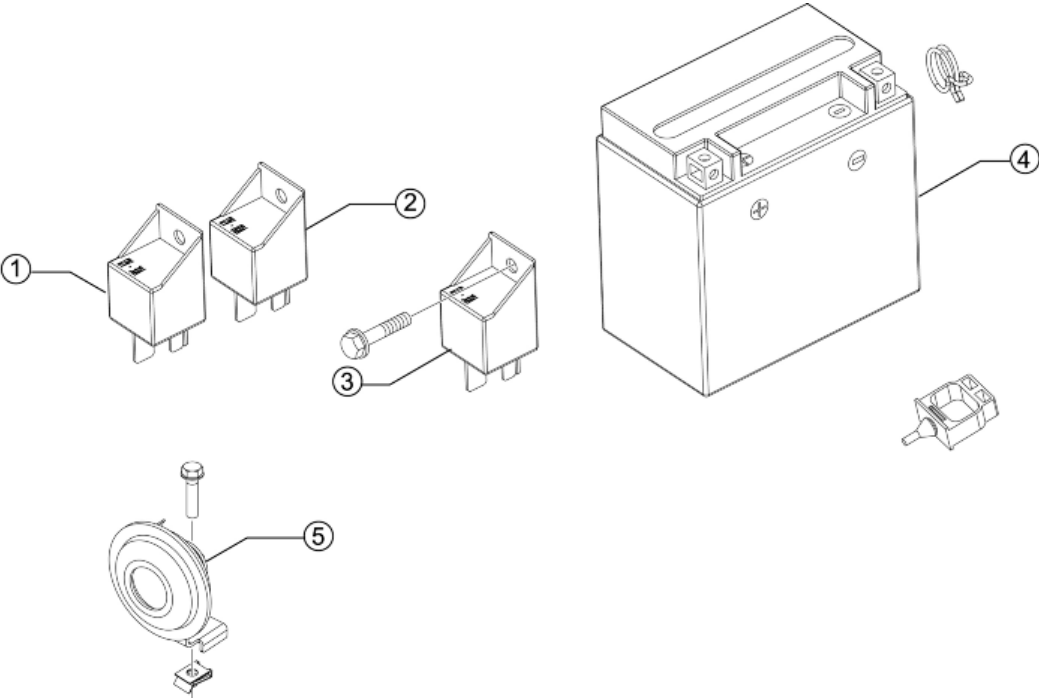
Rear wheel



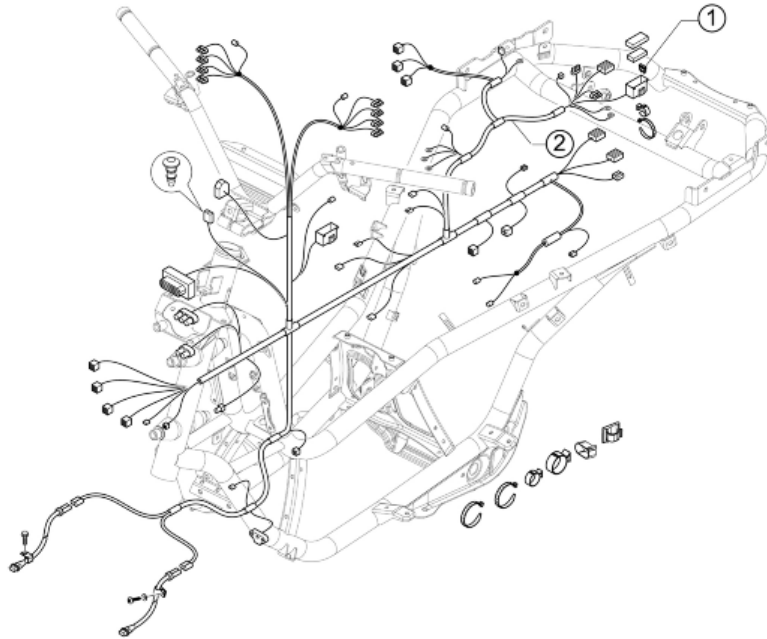
REAR WHEEL

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

Electric devices

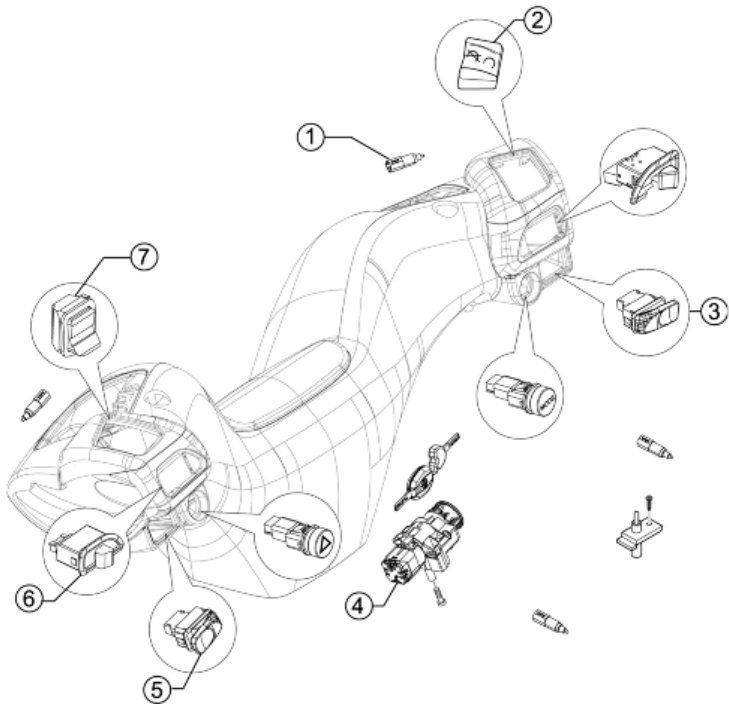


ELECTRICAL DEVICES			
	Code	Action	Duration
1	005075	Stop remote control - Replacement	
2	005035	Headlight remote control - Replacement	
3	005011	Start-up remote control switch - Replacement	
4	005007	Battery - Replacement	
5	005003	Horn - Replacement	

**CABLE HARNESS**

	Code	Action	Duration
1	005001	Electrical system - Replacement	
2	005114	Electrical system - Service	

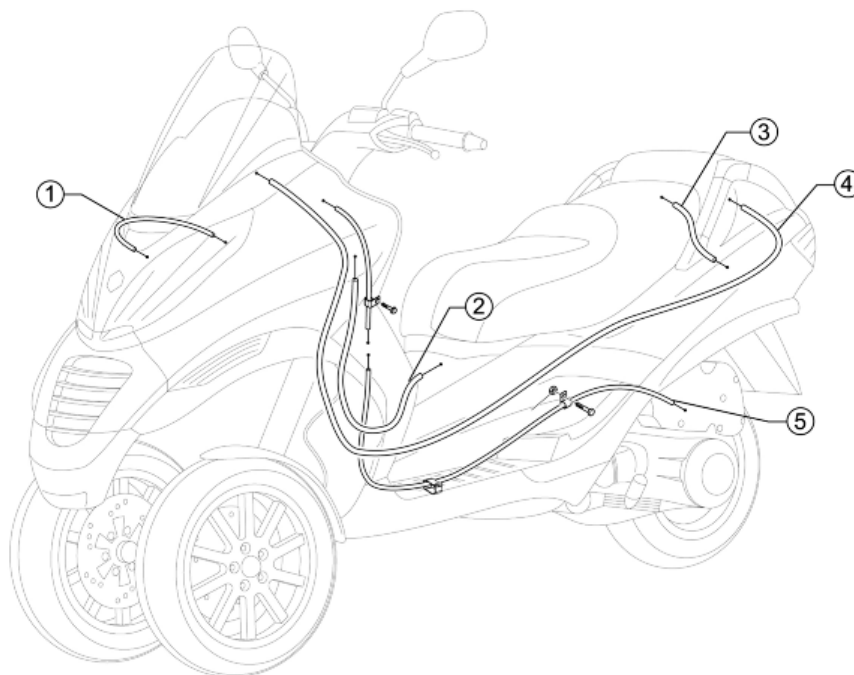
Electronic controls



HANDLEBAR CONTROLS

	Code	Action	Duration
1	005017	Stop switch - Replacement	
2	005077	Emergency stop switch - Replacement	
3	005041	Starter button - Replacement	
4	004010	Anti-theft lock - Replacement	
5	005040	Horn button - Replacement	
6	005006	Light switch or turn indicators - Replacement	
7	005039	Headlight switch - replace	

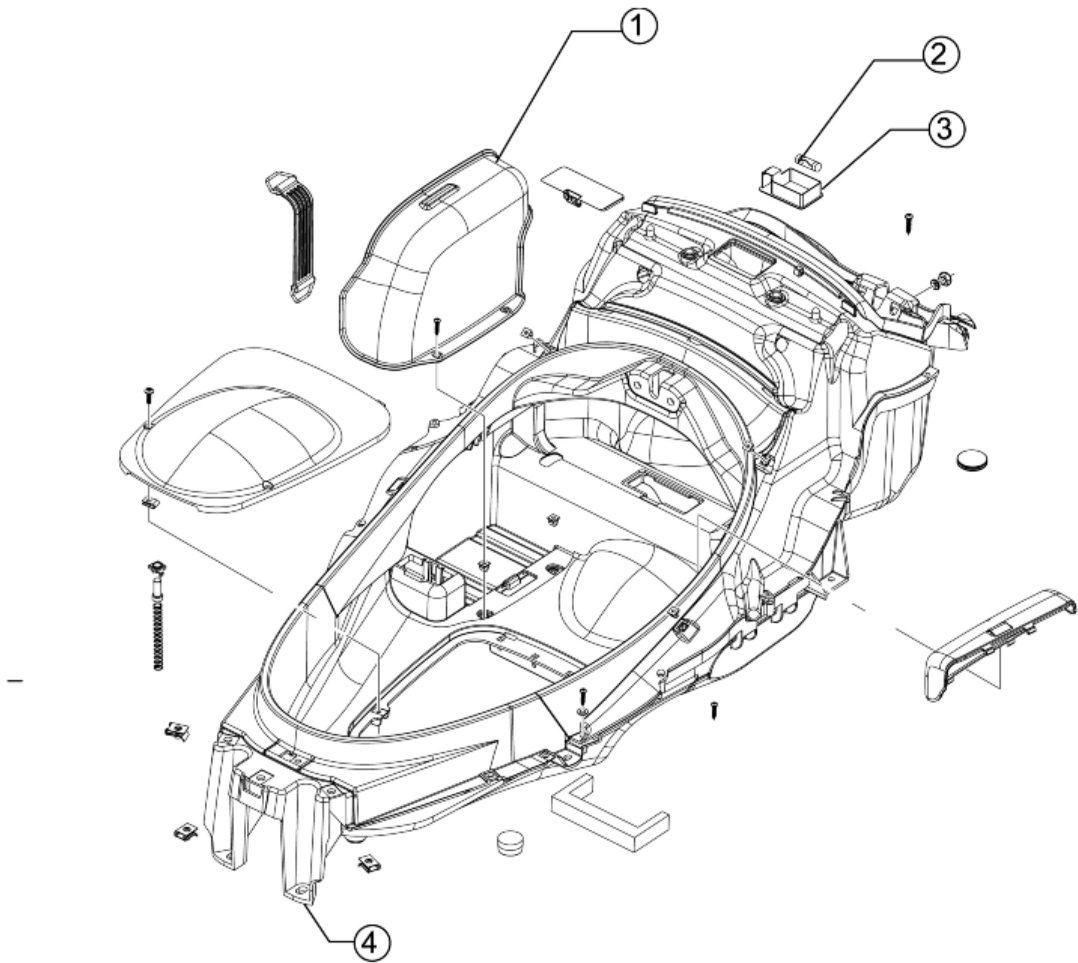
Transmissions



LOCKS TRANSMISSIONS

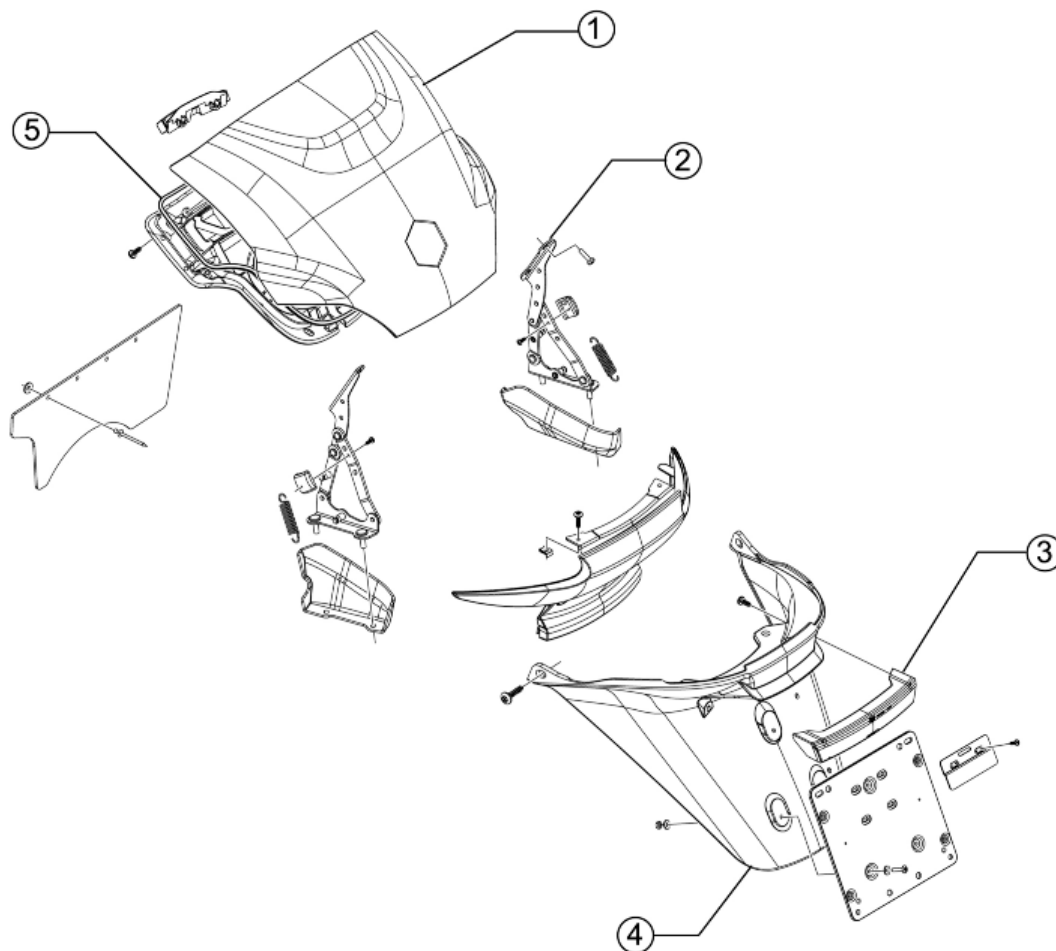
	Code	Action	Duration
1	003094	Tilt locking calliper control cable - replacement	
2	002082	Fuel tank cap opening drive - Replacement	
3	002083	Saddle opening transmission - Replacement	
4	002093	Trunk opening transmission - Replacement	
5	003061	Accelerator transmission - Adjustment	

Helmet bay



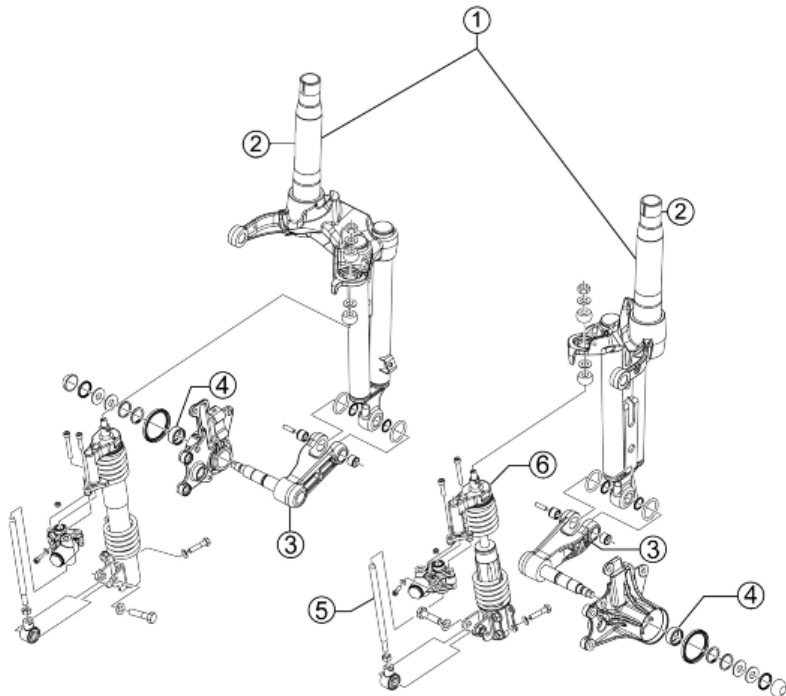
HELMET COMPARTMENT

	Code	Action	Duration
1	005046	Battery cover - change	
2	005026	Helmet compartment bulb - Replacement	
3	005027	Helmet compartment bulb support - Replacement	
4	004016	Helmet compartment - Replacement	

Rear side fairings**REAR COVERS**

	Code	Action	Duration
1	004081	Glove box door - Replacement	
2	004174	Trunk leverage	
3	004141	Cat's eye - Replacement	
4	005048	Licence plate holder - Replacement	
5	004082	Trunk gasket - Replacement	

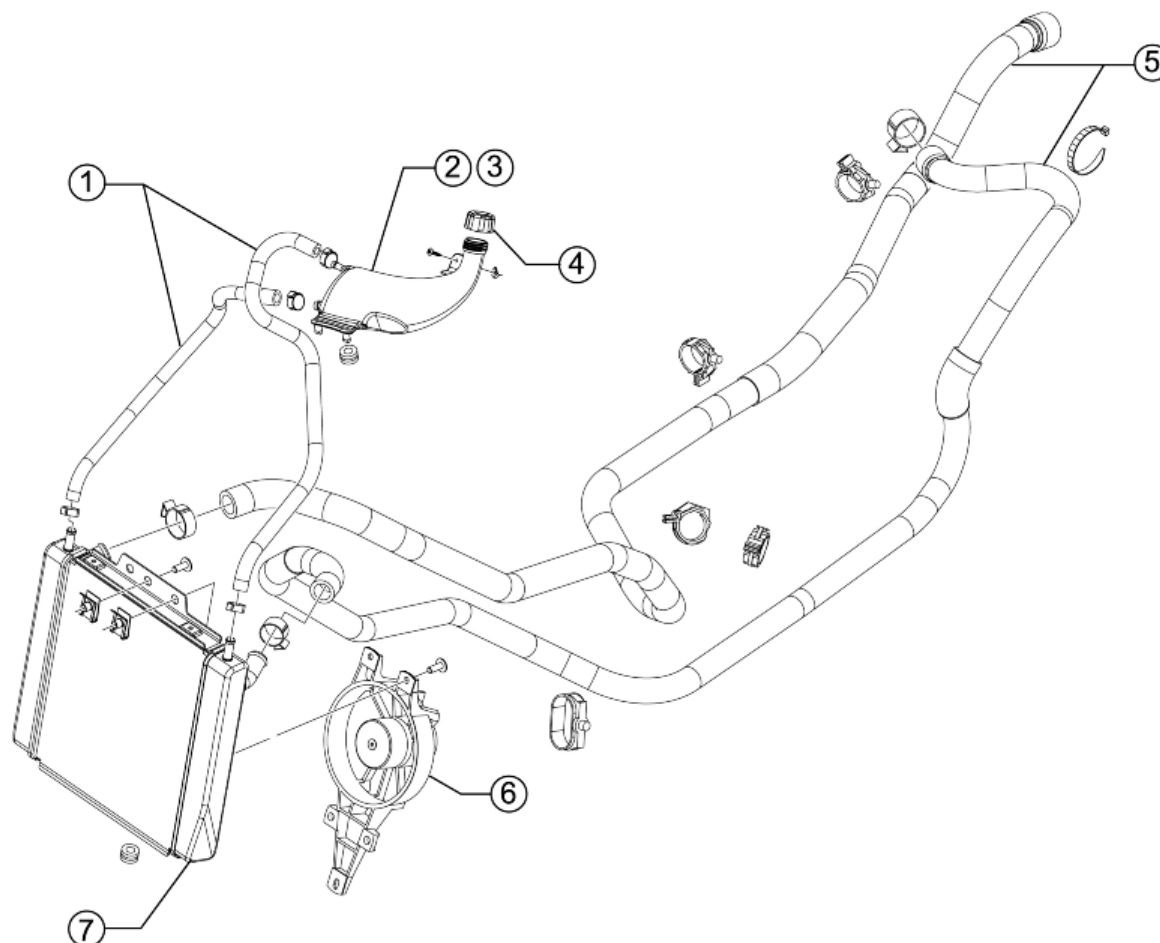
Front suspension



FRONT SUSPENSION

	Code	Action	Duration
1	003010	Front suspension - Service	
2	003111	Side steering tube - replacement	
3	003038	Front wheel axle - Removal and Refit.	
4	003040	Front wheel bearings - Replacement	
5	003107	Sliding stems - replacement	
6	003113	Front shock absorber - replacement	

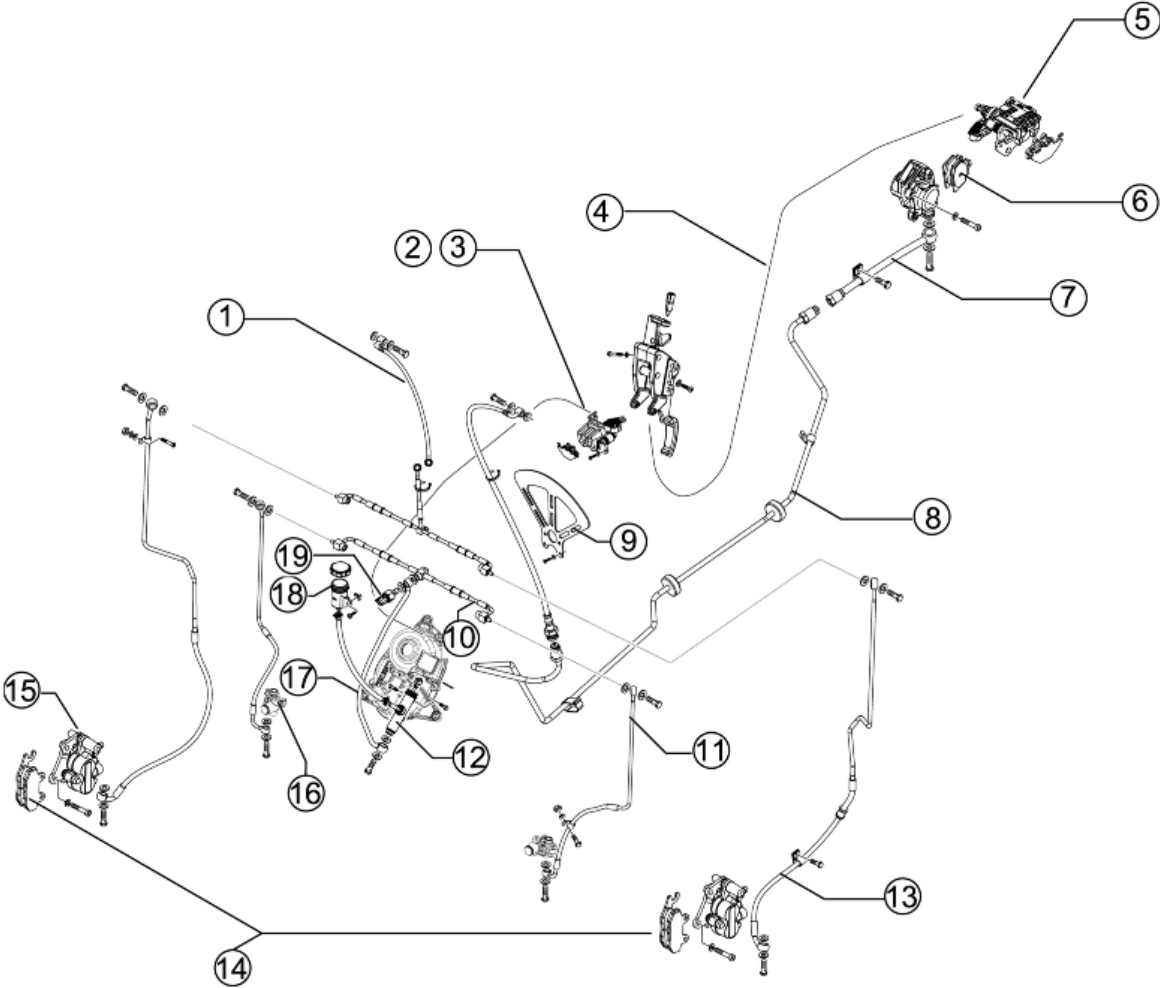
Cooling system



COOLING SYSTEM

	Code	Action	Duration
1	007013	Radiator expansion tank connection pipe - Replacement	
2	001052	Coolant and air bleed - Replacement	
3	007001	Expansion tank - Replacement	
4	007024	Expansion tank cap - Replacement	
5	007003	Coolant delivery and return pipe - Replacement	
6	007016	Fan with support - Replacement	
7	007002	Water radiator - replacement	

Braking system

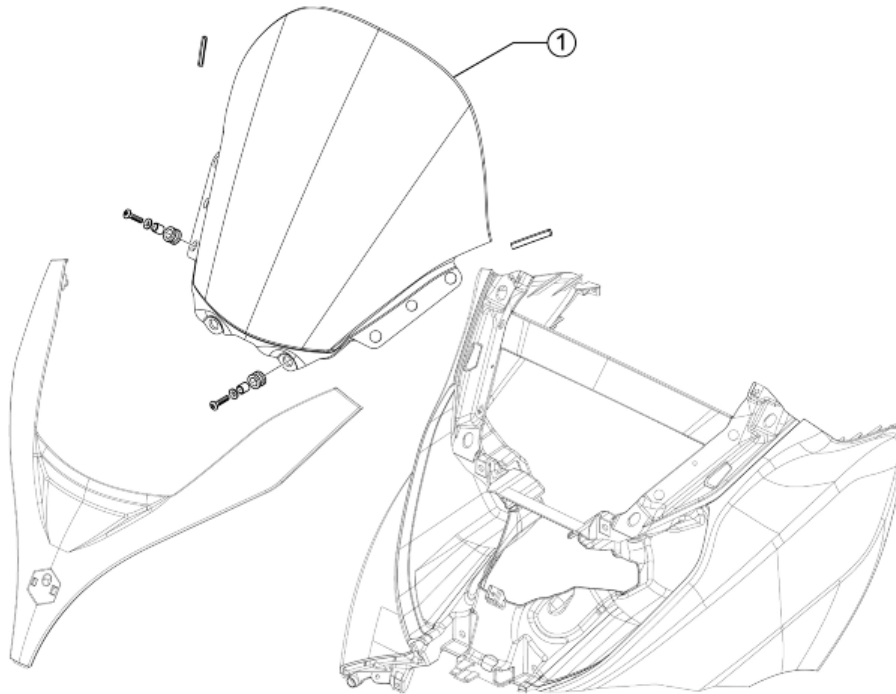


BRAKE SYSTEM

	Code	Action	Duration
1	002025	Brake piping - Replacement	
2	003096	Tilt locking calliper- replacement	
3	003100	Tilt locking calliper pads - replacement	
4	003108	Parking brake flexible transmission - replacement	
5	003109	Parking brake mechanical calliper - replacement	
6	002002	Shoes - Rear brake pads - Replacement	
7	002020	Rear brake pipes - Removal and refitting	
8	002081	Rear brake disc piping - Replacement	
9	003118	Tilt locking disc section - replacement	

	Code	Action	Duration
10	003103	Splitter for suspension locking system hoses- replacement	
11	003102	Hoses for the splitter-calliper suspension locking system - replacement	
12	003088	Tilt locking hydraulic pump - replacement	
13	002021	Front brake piping - Replacement	
14	002007	Front brake pads - Replacement	
15	002039	Front brake calliper - Replacement	
16	003104	Suspension system locking calliper- replacement	
17	003119	Hoses for the pump-splitter suspension locking system - replacement	
18	003105	Suspension locking system brake fluid - repl.	
19	003106	Suspension locking system pressure sensor- Replacement	

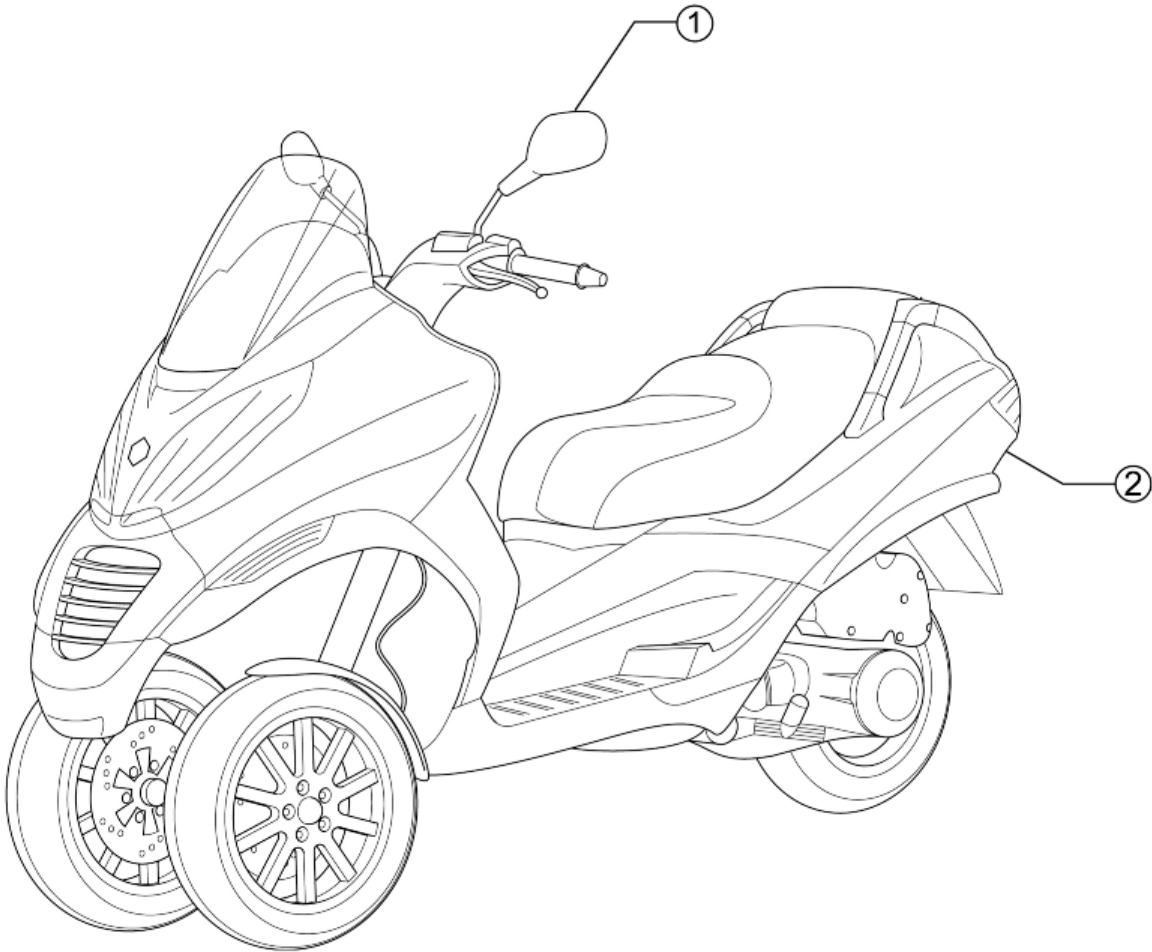
Windscreen



WINDSHIELD

	Code	Action	Duration
1	004101	Windshield - Replacement	

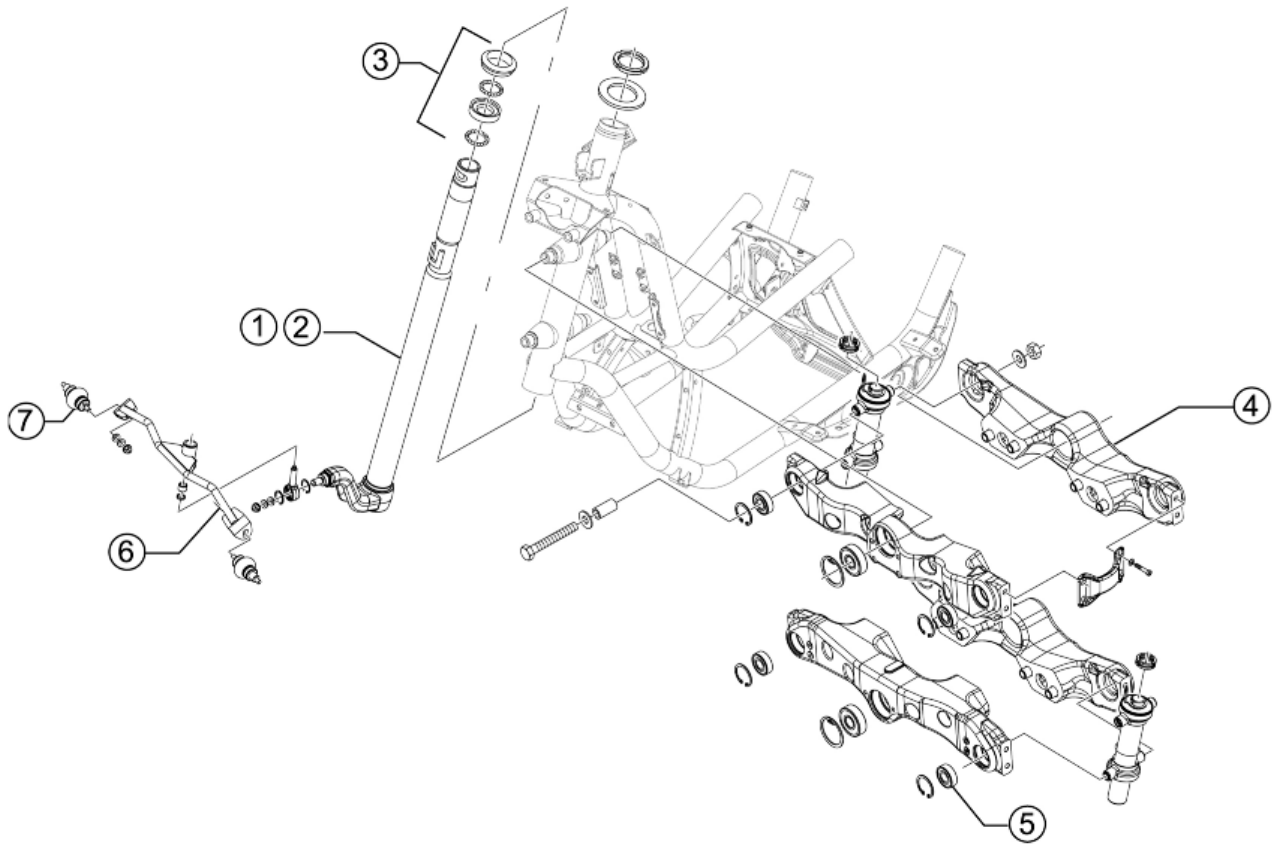
Stickers



TRANSFERS

	Code	Action	Duration
1	004066	Driving mirror - Replacement	
2	004159	Plates / Stickers - Replacement	

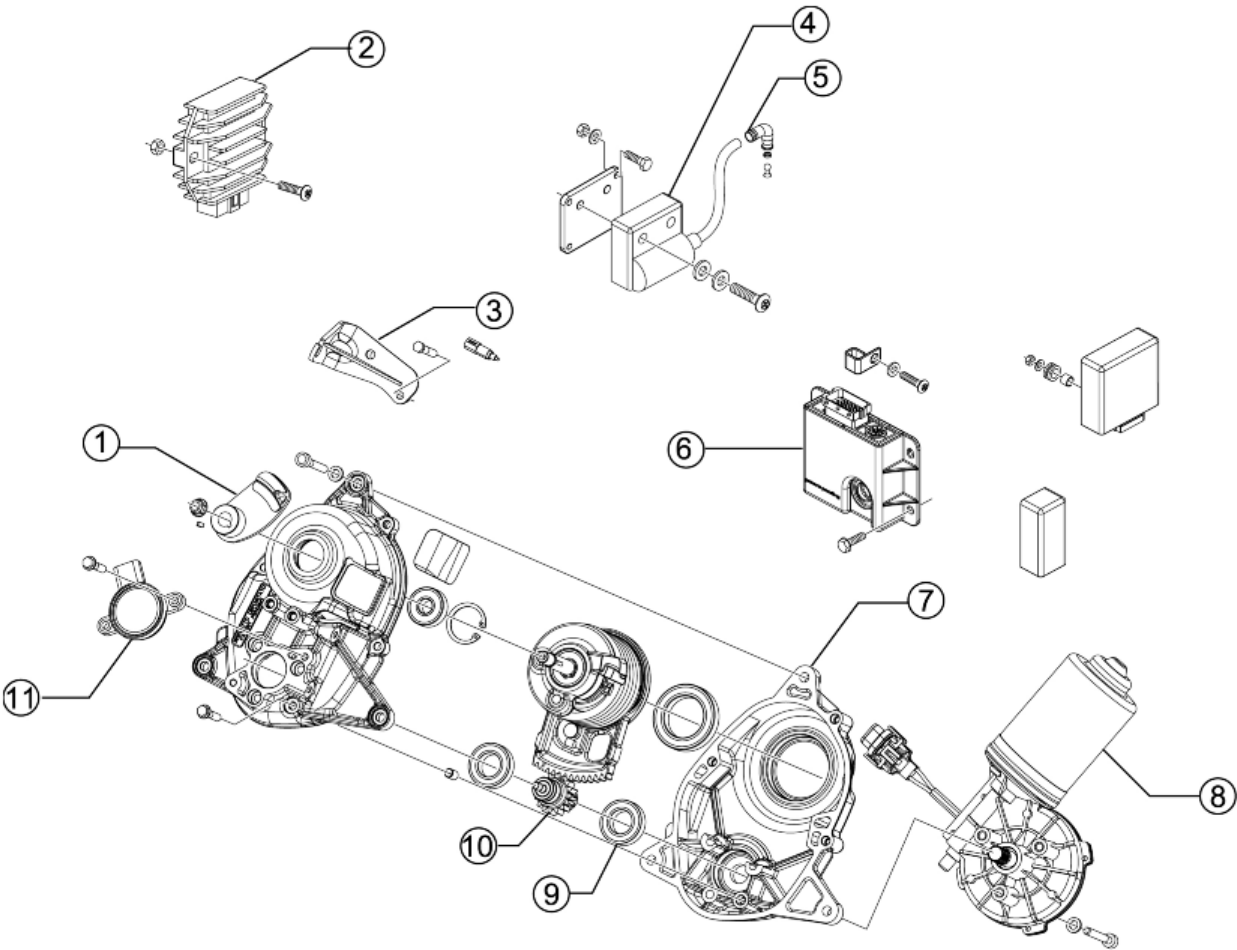
The tilt mechanism



TILT MECHANISM

	Code	Action	Duration
1	003073	Steering clearance - Adjustment	
2	003112	Central steering tube - replacement	
3	003002	Steering fifth wheel - Replacement	
4	003115	Parallelogram arms - replacement	
5	003114	Parallelogram bearings - replacement	
6	003116	Steering rod - replacement	
7	003117	Constant-velocity universal joint - replacement	

Geared motor



GEARED MOTOR

	Code	Action	Duration
1	003101	Tilt locking calliper control lever - replacement	
2	005009	Voltage regulator - replace	
3	003095	Tilt locking calliper support bracket - replacement	
4	001069	HV coil - replace	
5	001094	Spark plug cap - Replacement	
6	003120	Tilt locking control unit - replacement	
7	003093	Geared motor crankcase - replacement	
8	003090	Geared electric motor - replacement	
9	003092	Geared motor bearings - replacement	
10	003091	Geared motor pinion - replacement	

	Code	Action	Duration
11	003089	Geared motor potentiometer - replacement	
