PIAGGIO

MANUALE STAZIONE DI SERVIZIO

639525

Beverly 250 i.e.

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

MANUALE STAZIONE DI SERVIZIO
Beverly 250 i.e.

Questo manuale per stazioni di servizio è stato realizzato da Piaggio & C. Spa per essere utilizzato dalle officine dei concessionari e sub-agenzie Piaggio-Gilera. Si presuppone che chi utilizza questa pubblicazione per la manutenzione e la riparazione dei veicoli Piaggio, abbia una conoscenza base dei principi della meccanica e dei procedimenti inerenti la tecnica della riparazione dei veicoli. Le variazioni importanti nelle caratteristiche dei veicoli o nelle specifiche operazioni di riparazione verranno comunicate attraverso aggiornamenti di questo manuale. Non si può comunque realizzare un lavoro completamente soddisfacente se non si dispone degli impianti e delle attrezzature necessarie, ed è per questo che vi invitiamo a consultare le pagine di questo manuale riguardanti l'attrezzatura specifica e il catalogo degli attrezzi specifici.

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

INDEX OF TOPICS

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.

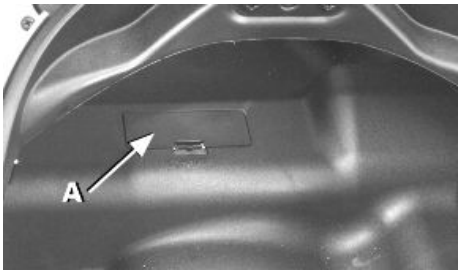
Maintenance rules

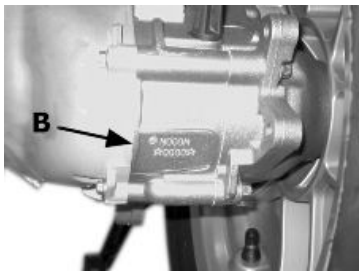
- Use original PIAGGIO spare parts and lubricants recommended by the Manufacturer. Non-original or non-conforming spares may damage the vehicle.
- Use only the appropriate tools designed for this vehicle.
- Always use new gaskets, sealing rings and split pins upon refitting.
- After removal, clean the 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

Frame prefix M36400

Engine prefix M285M

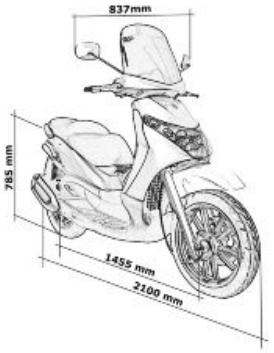




Dimensions and mass

WEIGHTS AND DIMENSIONS

Specification	Desc./Quantity
Kerb weight in running order	149 kg
Width (over mirrors)	837 mm
Length	2100 mm
Wheelbase	1455 mm
Saddle height	785 mm



Engine

DATA

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

Specification	Desc./Quantity
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)
Cooling system fluid	approx. 2.100 ÷ 2.150 l PARAFLU 11FE (Diluted)
Petrol tank	approx. 10 l (including reserve approx. 2.5 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 type	Welded tubular steel chassis with stamped sheet reinforcements
Front suspension	Hydraulic telescopic fork with advanced wheel pin and Ø 35 mm stem
Front fork max. stroke	104 mm
Rear suspension	Engine with swinging fork attached to frame by means of an arm with 2 degrees of freedomPair of double-acting hydraulic shock absorbers and co-axial springs with preloading adjustment in four positions.

Specification	Desc./Quantity
Rear shock absorber max. travel	95.5 mm

Brakes

BRAKES

Specification	Desc./Quantity
Front brake	Disc brake, diameter 260 mm and floating calliper with twin plungers and hydraulic control (lever on the far right of the handlebar)
Rear brake	Disc brake, diameter 260 mm and calliper with two counteracting plungers and hydraulic control (lever on the far left of the handlebar)

Wheels and tyres

WHEELS AND TYRES

Specification	Desc./Quantity
Front wheel rim	Light alloy, 3.00 x 16"
Rear wheel rim	Light alloy, 3.50 x 16"
Front tyre	110/70-16" M/C 52P Tubeless
Rear tyre	140/70-16" M/C 65P Tubeless
Front wheel tyre pressure (when cold)	2.1 bar
Rear wheel tyre pressure (when cold)	2.3 bar
Rear wheel tyre pressure (with driver and passenger) (when cold)	2.5 bar

N.B.

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

Tightening Torques

STEERING

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

CHASSIS

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

FRONT SUSPENSION

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

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
Fixing screw for wheel rim to hub	34 ÷ 38
Muffler arm clamping screws	27 ÷ 30

FRONT BRAKE

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

REAR BRAKE

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

MUFFLER

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

LUBRICATION

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

Name	Torque in Nm
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)

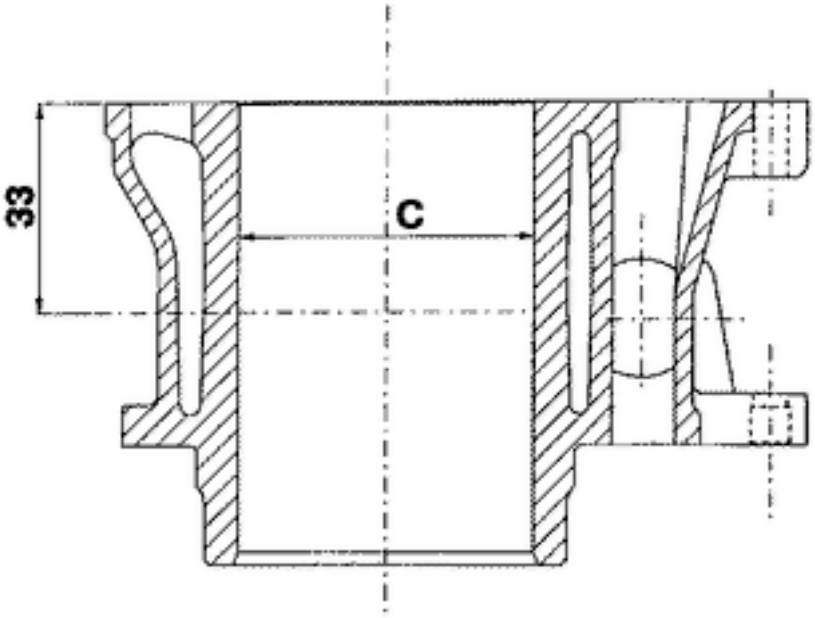
COOLING

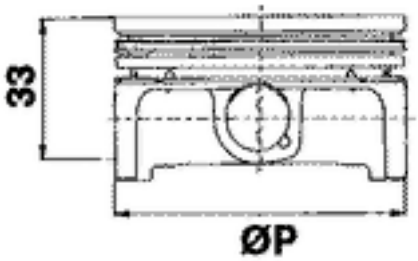
Name	Torque in Nm
Water pump rotor cover	3 ÷ 4
Screws of the water pump rotor driving link	3 ÷ 4
Thermostat cover screws	3 ÷ 4
Bleed screw:	3

Overhaul data

Assembly clearances

Cylinder - piston assy.





ENGINE COUPLING CATEGORY

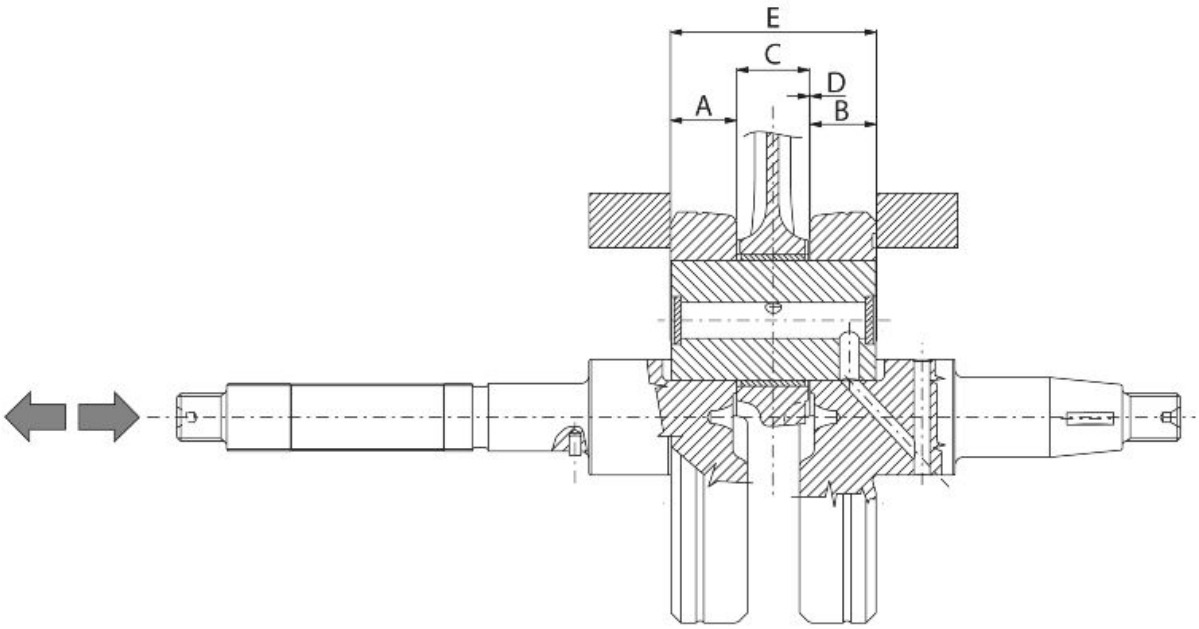
Name	Initials	Cylinder	Piston	Play on fitting
Cylinder	M	72.01 ÷ 72.017	71.953 ÷ 71.960	0.050 - 0.064
Cylinder	N	72.017 ÷ 72.024	71.960 ÷ 71.967	0.050 - 0.064
Piston	O	72.024 ÷ 72.031	71.967 ÷ 71.974	0.050 - 0.064
Piston	P	72.031 ÷ 72.038	71.974 ÷ 71.981	0.050 - 0.064

Crankcase - crankshaft - connecting rod

CRANKSHAFT

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

Crankshaft to crankcase axial clearance

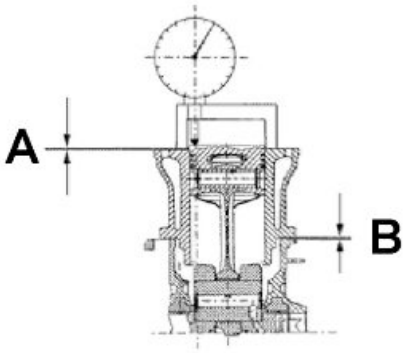


CRANKSHAFT/ CRANKCASE AXIAL CLEARANCE

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

Slot packing system

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



Characteristic

Compression ratio

10.5 ÷ 11.5 : 1

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

N.B.

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

ENGINE 250 SHIMMING

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

Products

RECOMMENDED PRODUCTS TABLE

Product	Description	Specifications
AGIP ROTRA 80W-90	Rear hub oil	SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications
AGIP CITY HI TEC 4T	Oil to lubricate flexible transmissions (throttle control)	Oil for 4-stroke engines
AGIP FILTER OIL	Oil for air filter sponge	Mineral oil with specific additives for increased adhesiveness
AGIP GP 330	Grease for brake levers, throttle	White calcium complex soap-based spray grease with NLGI 2; ISO-L-XBCIB2
AGIP CITY HI TEC 4T	Engine oil	SAE 5W-40, API SL, ACEA A3, JASO MA Synthetic oil
AGIP BRAKE 4	Brake fluid	FMVSS DOT4 Synthetic fluid
SPECIAL AGIP PERMANENT fluid	coolant	Monoethylene glycol-based antifreeze fluid, CUNA NC 956-16

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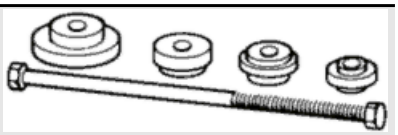
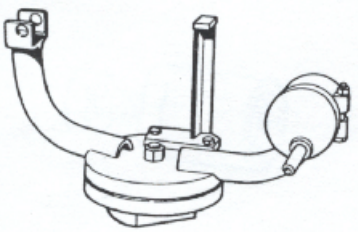
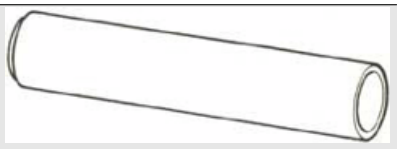
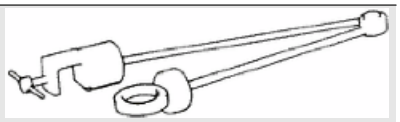
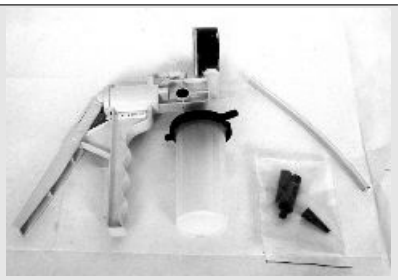
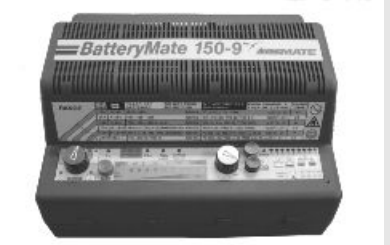
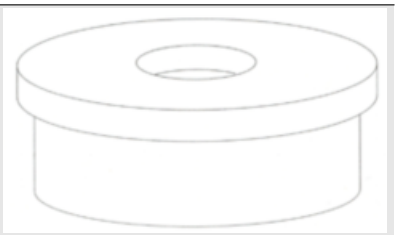
APPROPRIATE TOOLS

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

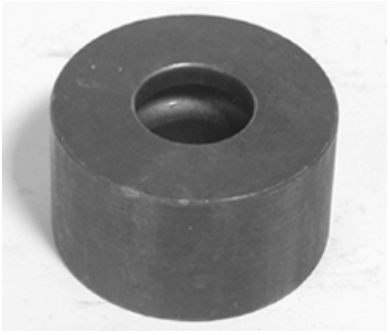
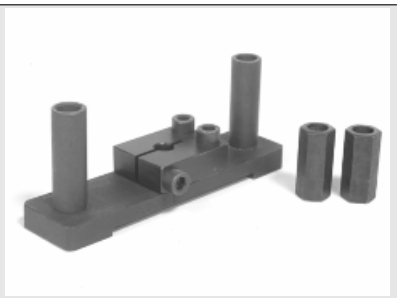
Stores code	Description	
020074Y	Support base for checking crank-shaft alignment	
020150Y	Air heater support	
020151Y	Air heater	
020193Y	Oil pressure gauge	
020262Y	Crankcase splitting strip	
020263Y	Sheath for driven pulley fitting	

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	
020648Y	Single battery charger	
020335Y	Magnetic support for dial gauge	
020357Y	32 x 35 mm adaptor	
020359Y	42x47-mm adaptor	
020360Y	Adaptor 52 x 55 mm	
020363Y	20 mm guide	

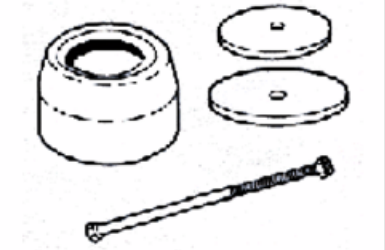
Stores code	Description	
020375Y	Adaptor 28 x 30 mm	
020376Y	Adaptor handle	
020382Y	Valve cotters equipped with part 012 removal tool	
020382Y011	adapter for valve removal tool	
020393Y	Piston fitting band	
020412Y	15 mm guide	

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

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

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

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

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

INDEX OF TOPICS

Maintenance chart

EVERY 2 YEARS

60'

Action
Coolant - change
Brake fluid - change

AFTER 1,000 KM

60'

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

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

10'

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

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

45'

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

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

150'

Action
Spark plug - replacement
Driving belt - replacement
Throttle lever - adjustment
Air filter - clean
Engine oil - change
Valve clearance - check
Electrical system and battery - check
Coolant level - check
Brake fluid level - check
Engine oil - replacement
Brake pads - check condition and wear

Action
Sliding block / variable speed rollers - change
Tyre pressure and wear - check
Vehicle and brake test - road test
Hub oil - change
Suspensions - check
Steering - Check

30,000 KM

140'

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

60,000 KM

190'

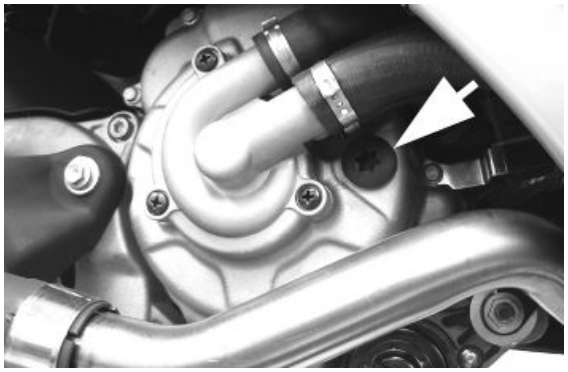
Action
Spark plug - replacement
Driving belt - replacement
Throttle lever - adjustment
Air filter - clean
Engine oil - change
Valve clearance - check
Electrical system and battery - check
Coolant level - check
Brake fluid level - check
Engine oil - replacement
Hub oil - change
Brake pads - check condition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

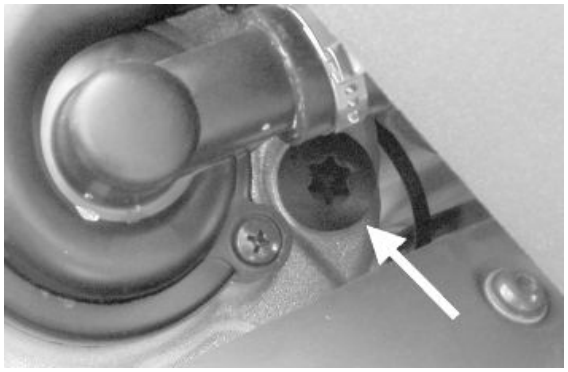
Checking the spark advance

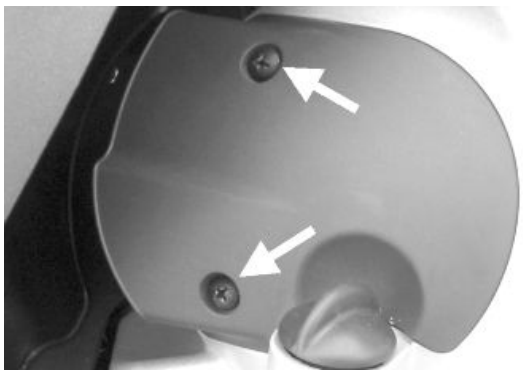
The ignition advance is determined electronically on the basis of parameters known by the control unit. For this reason it is not possible to declare the reference values based on the engine rpm. The ignition timing value is detectable any time using the diagnostic tester. It is possible to check whether the ignition advance determined by the system does in fact correspond with the value actually activated on the engine, by means of the stroboscopic light.

Proceed as follows:

- Remove the spark plug.
- Remove the plastic cover on the flywheel cover shown in the photograph.
- Remove the transmission compartment air intake cover shown in the photograph.
- Rotate the driving pulley fan using a screwdriver until the reference marks between the flywheel and flywheel cover coincide as shown in the photograph.
- Bring the reference mark onto the transmission side between the fan and the transmission cover as shown in the photograph.
- Refit the spark plug.
- Refit the plastic cap on the flywheel cover.
- Adjust the spark gap to the contact position (no reference mark visible) and install it on engine between the spark plug and spark plug cap
- Connect the induction 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 menu on the "parameter" function.







- 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

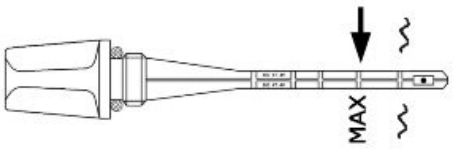
Hub oil

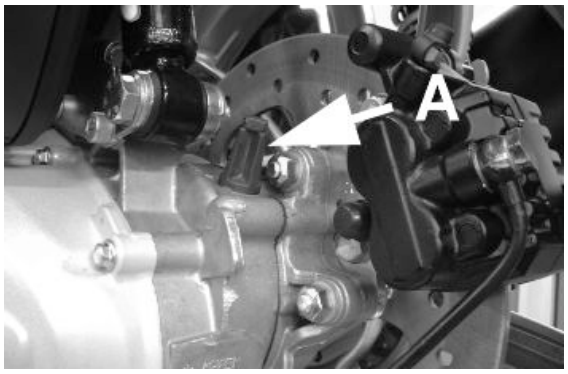
Check

- 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.

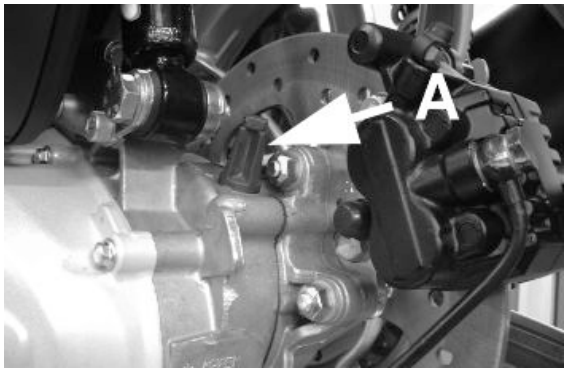




Replacement

-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

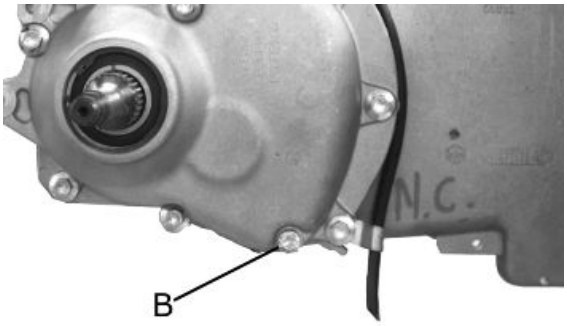
Characteristic

Rear hub oil

Capacity approximately 250 cc

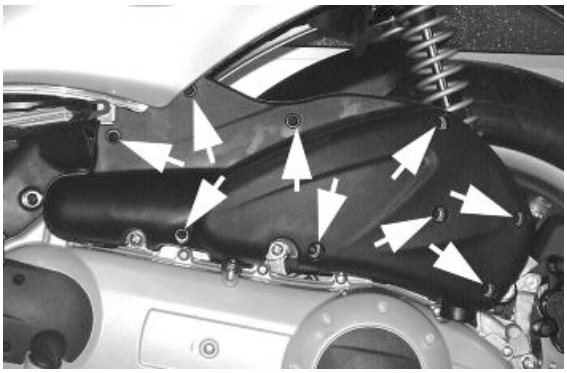
Locking torques (N*m)

Hub oil drainage screw 15 ÷ 17 Nm



Air filter

- Remove the left-hand footrest.
- Remove the air cleaner cap after undoing the clamping screws, then extract the filter element.
- Wash with water and neutral soap.
-Dry with a clean cloth and short blasts of compressed air.
- Impregnate with a 50 % mixture of petrol and recommended oil.
- Drip dry the filtering element and then squeeze it with your hands without wringing.



CAUTION

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

CAUTION

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

Recommended products

AGIP FILTER OIL Oil for air filter sponge

Mineral oil with specific additives for increased adhesiveness

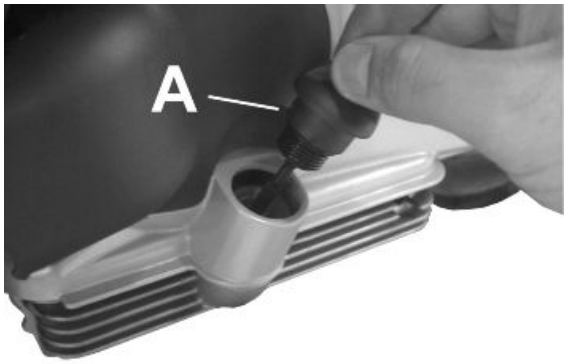
Engine oil

In 4T engines, 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.

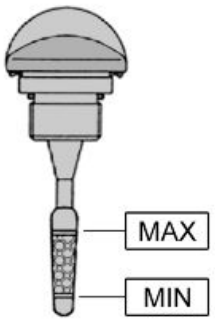


Make sure the pre-filter and discharge tap O-rings are in good condition.

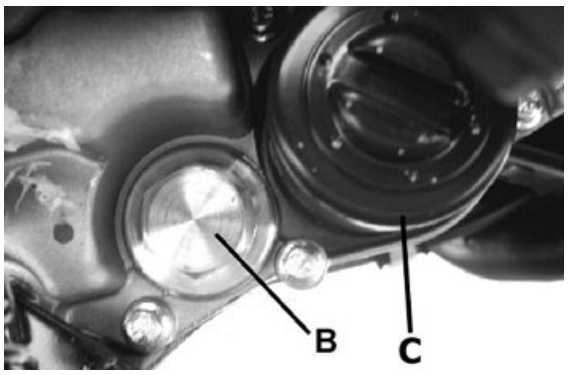
Lubricate them and refit the gauze filter and oil drainage tap, screwing them up to the specified torque.

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.

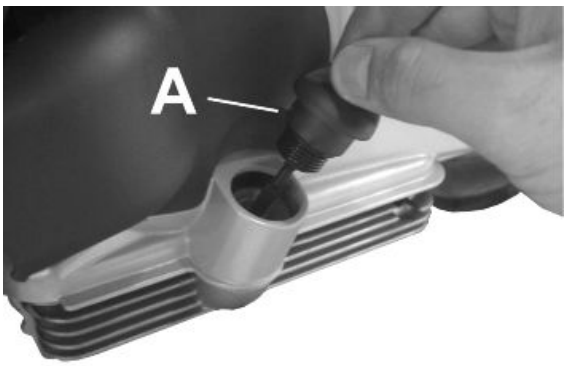
THE ENGINE MUST BE HOT WHEN THE OIL IS CHANGED.

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

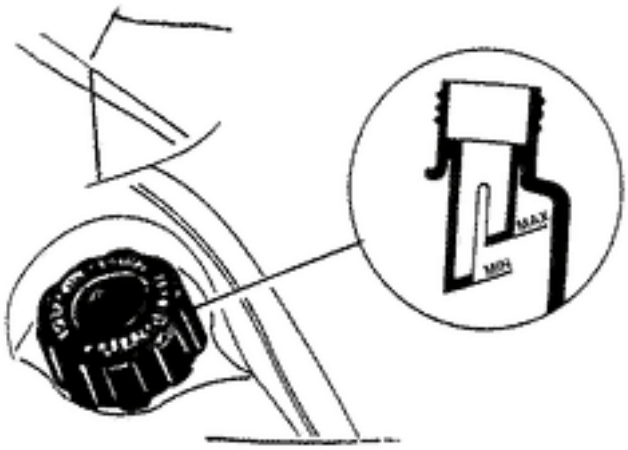
-Turn the flywheel until the reference mark «**T**» on the rotor matches the reference mark on the flywheel cover as shown in the figure (TDC). Make sure that the 4V reference point on the camshaft control pulley is aligned with the reference point on the head as shown in the second figure. If the reference 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 calliper spanner applied to the camshaft command pulley casing.

Cooling system

Level check

- To check the level, it is necessary to look inside the expansion tank: a mark on the side of the filler indicates MIN and MAX levels.



Top-up

The fluid level inspection should be carried out every 6,000 km when the motor is cold, following the methods indicated 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.

- Remove the cap of the expansion tank and top up the fluid level if it is near or below the MIN mark inside the tank. The coolant level must always be between MIN and MAX. level.

-The coolant consists of an ethylene glycol and corrosion inhibitor based 50% de-ionised water- anti-freeze 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

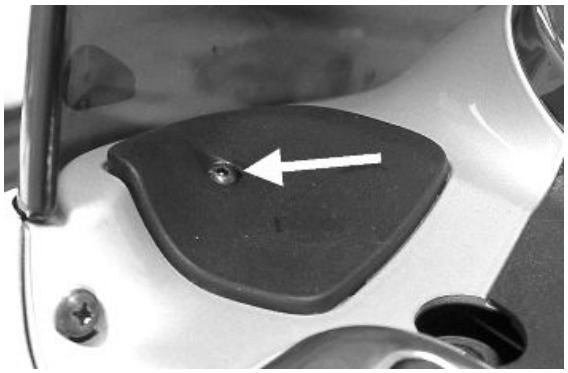
The brake fluid tanks for the front and rear brakes are located on the pumps under the handlebar cover. Proceed as follows:

- Bring the scooter onto the centre stand and with the handlebar centred; - check the fluid level at the sight glass as shown in the figure.

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

Top-up

- Remove the cap on the handlebar cover as shown in the photograph.



- Remove the tank cap by loosening the two screws, remove the gasket and top up using only the liquid specified without exceeding the maximum level.

CAUTION

ONLY USE DOT 4-CLASSIFIED BRAKE FLUID.

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.

CAUTION

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

CAUTION

THE BRAKE FLUID IS HYGROSCOPIC, IN OTHER WORDS, IT ABSORBS MOISTURE FROM THE SURROUNDING AIR. IF THE CONTENT OF MOISTURE IN THE BRAKING FLUID EXCEEDS A CERTAIN VALUE, BRAKING WILL BE INEFFICIENT.
NEVER USE BRAKE LIQUID IN OPEN OR PARTIALLY USED CONTAINERS.

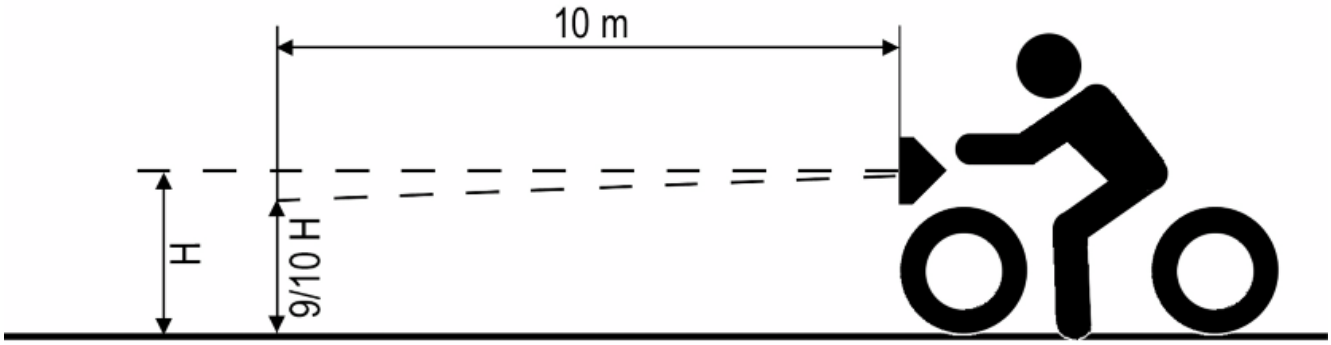
UNDER NORMAL CLIMATIC CONDITIONS, THE FLUID MUST BE CHANGED EVERY 20,000 KM OR ANYWAY EVERY TWO YEARS.

Recommended products

AGIP BRAKE 4 Brake fluid

FMVSS DOT4 Synthetic fluid

Headlight adjustment

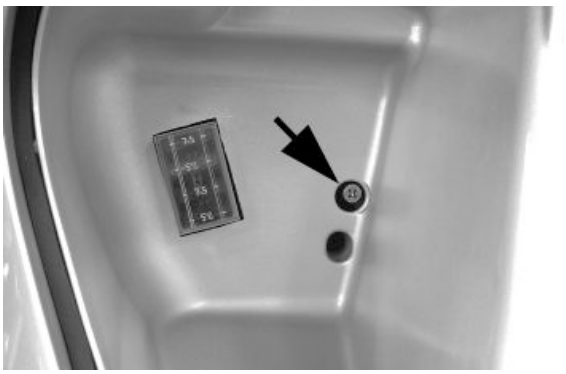


Proceed as follows:

1. Position the unloaded scooter, 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 scooter is perpendicular to the screen;

2. Turn on the headlight and check that the borderline of the projected light beam should be lower than 9/10 of the distance from the ground to the centre of the vehicle's headlight, and higher than 7/10;

3. If not, adjust the projection by turning the central screw **«A»** set inside the glove box.



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

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

Insufficient lubrication pressure

POOR LUBRICATION PRESSURE

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

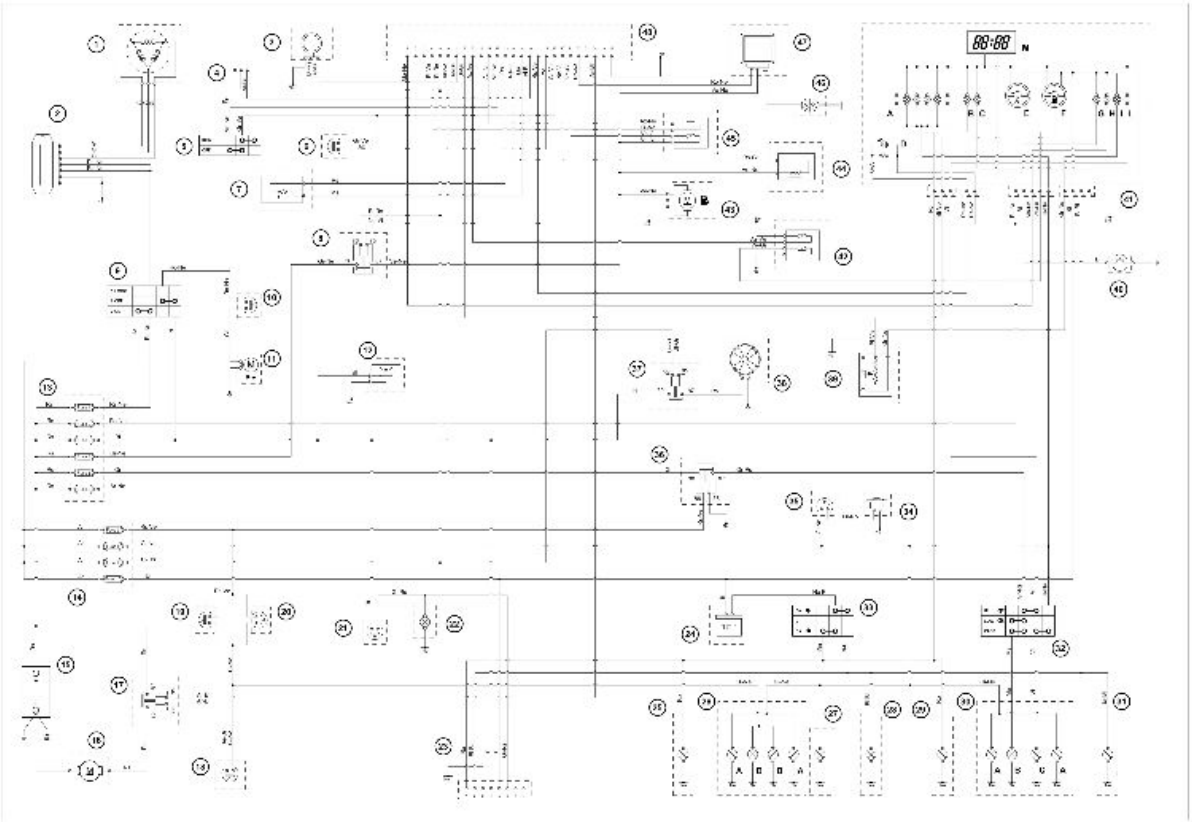
Possible Cause	Operation
Malfunctions in the suspension system	If the front suspension is noisy, check: the efficiency of the front shock absorbers; the condition of the ball bearings and relevant lock-nuts, the limit switch rubber buffers and the movement bushings. In conclusion, check the tightening 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



LEGEND:

1. Flywheel

2. Voltage regulator

3. Immobilizer aerial

4. Diagnostics socket

5. Engine stop switch

6. Side stand switch

7. Revolution sensor

8. Injection load remote control

9. Key switch

10. Saddle opening button

11. Saddle opening actuator

12. 12V - 180W socket

13. Fuse box on rear right fairing

14. Fuse box in front glove box

15. Battery

16. Starter motor

17. Start-up remote control switch

18. Start-up button

19. STOP button on left brake lever

20. STOP button on right brake lever
21. Helmet compartment light switch
22. Helmet compartment light bulb
23. Wiring for antitheft device
24. Turn signal device
25. Rear left turn indicator
26. Rear headlight assembly
A. Tail light bulb
B. STOP light bulb
27. License plate light
28. Rear right turn indicator
29. Front left turn indicator
30. Front headlight assembly
A. Tail light bulbs
B. Low beam bulb
C. High beam bulb
31. Front right turn indicator
32. Light switch
33. Turn indicator switch
34. Horn
35. Horn button
36. Light remote control switch
37. Remote control for electric fan
38. Electric fan
39. Fuel level transmitter
40. Oil pressure sensor
41. Instrument panel
A. Instrument panel lighting
B. Left turn indicator warning light
C. Right turn indicator warning light
D. Immobilizer LED
E. Temperature gauge
F. Fuel gauge
G. Oil pressure warning light
H. Engine warning light
I. Low fuel warning light
L. High beam warning light
M. Clock

42. Engine temperature sensor

43. Fuel pump

44. Fuel injector

45. Lambda probe

46. Spark plug

47. High voltage coil

48. Electronic control unit

Key

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

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

Components arrangement

Connectors and preparation

Diagnostic socket

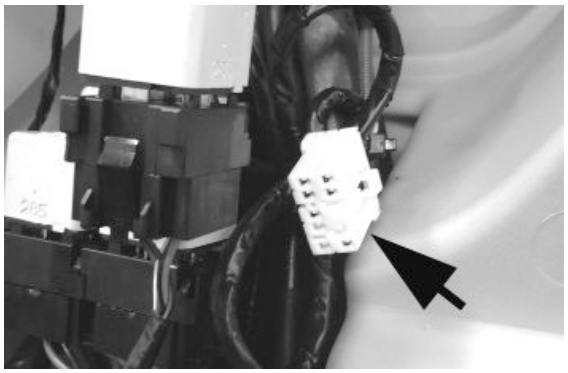
To access the diagnostic socket, remove the cover on the lower right side panel by loosening the screw.

The connector is attached to the cover.

Antitheft connector

To access the connector for the antitheft system, remove the front shield.

The connector is located next to the remote control switch.



Turn indicator device

In order to access the device, remove the front cover.

Component layout

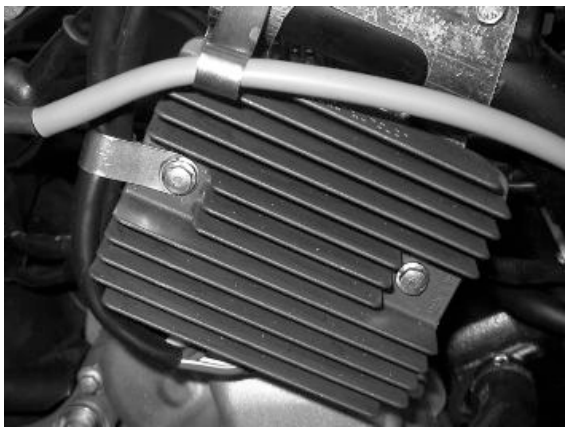
Electronic control unit

In order to access the electronic control unit it is necessary to:

Remove the cover of the motor compartment inside the helmet compartment. The control unit is integrated into the throttle body.

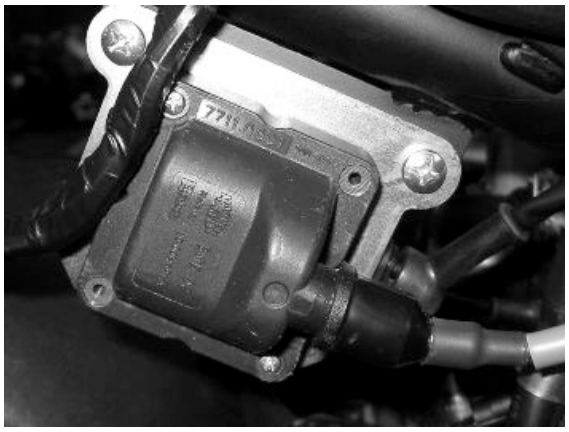
Voltage regulator

In order to access the voltage regulator, remove the right side fairing.



H.V. coil

In order to access the high-voltage coil, remove the right side fairing.



Stand switch

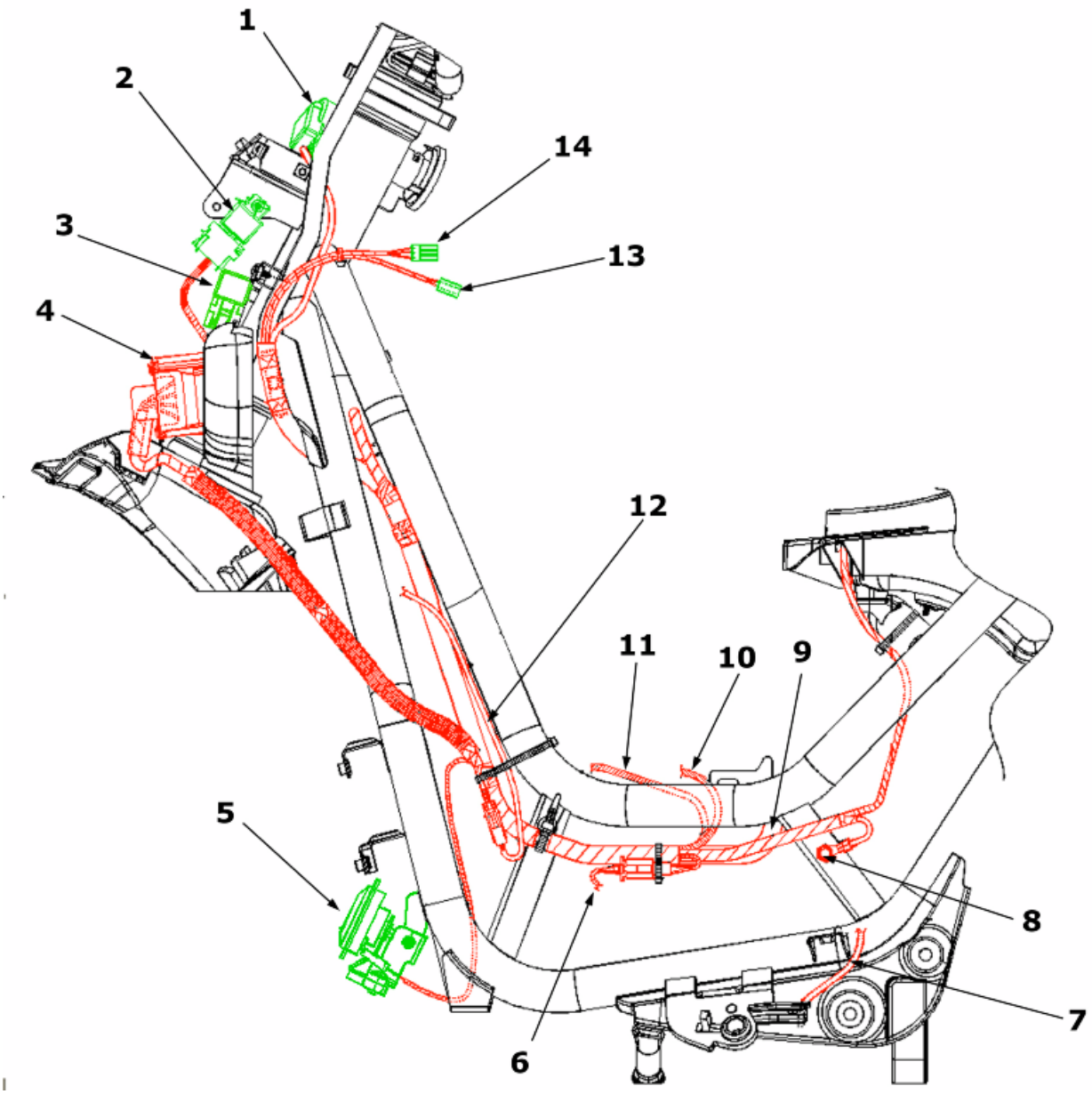
To access the stand switch, remove the footrest on the left-hand side.

Lambda probe

The lambda probe is mounted on the exhaust manifold

Electrical system installation

Front side



1. Contatti del commutatore a chiave
2. Teleruttore carichi iniezione
3. Teleruttori
4. Scatola portafusibili
5. Claxon
6. Al deviatore cavalletto
7. Tubo sfiato batteria
8. Fissaggio massa al telaio
9. Cablaggio diretto verso la fiancata destra

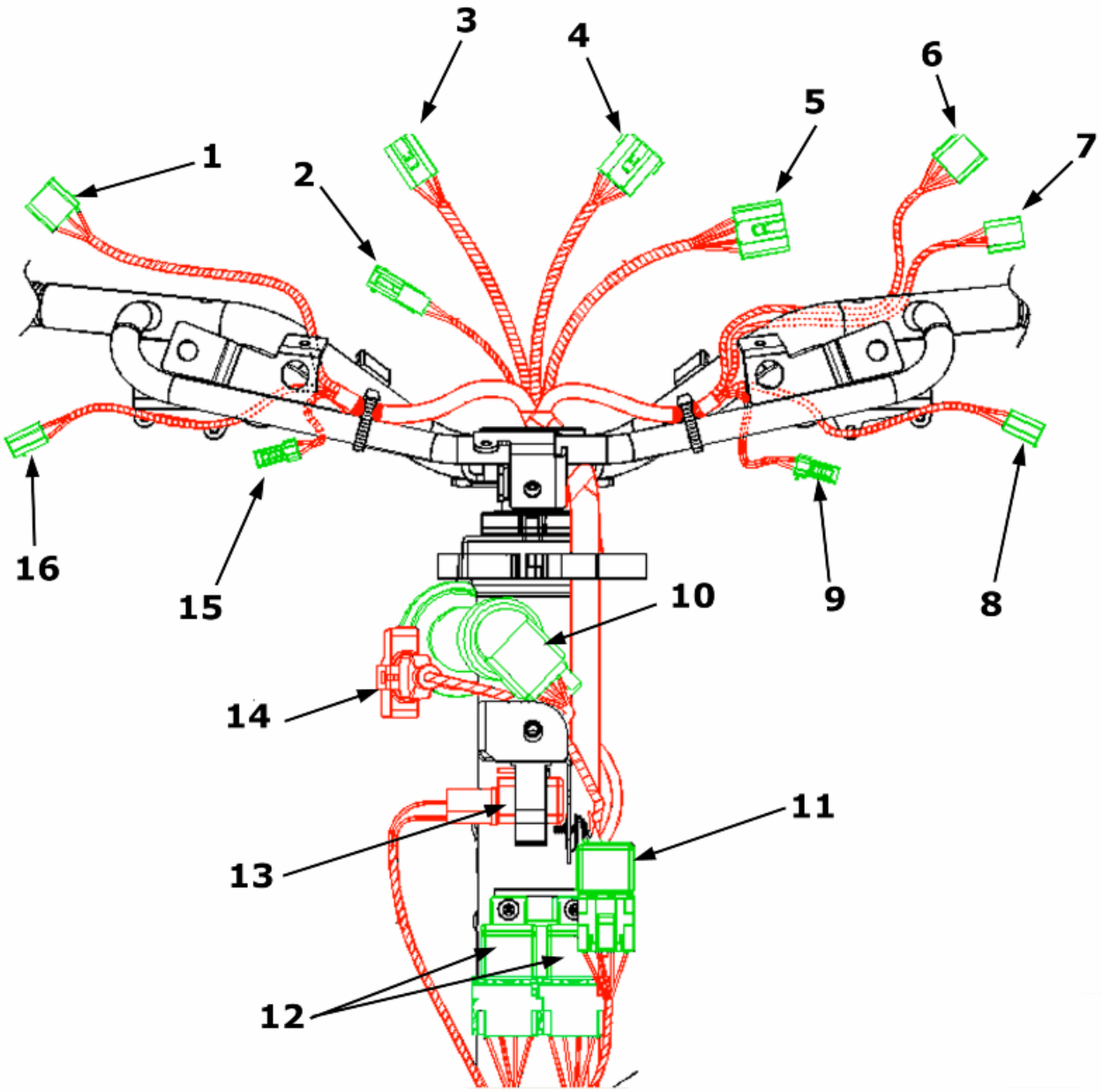
10.Alla pompa carburante

11.All'indicatore livello carburante

12.All'elettroventola

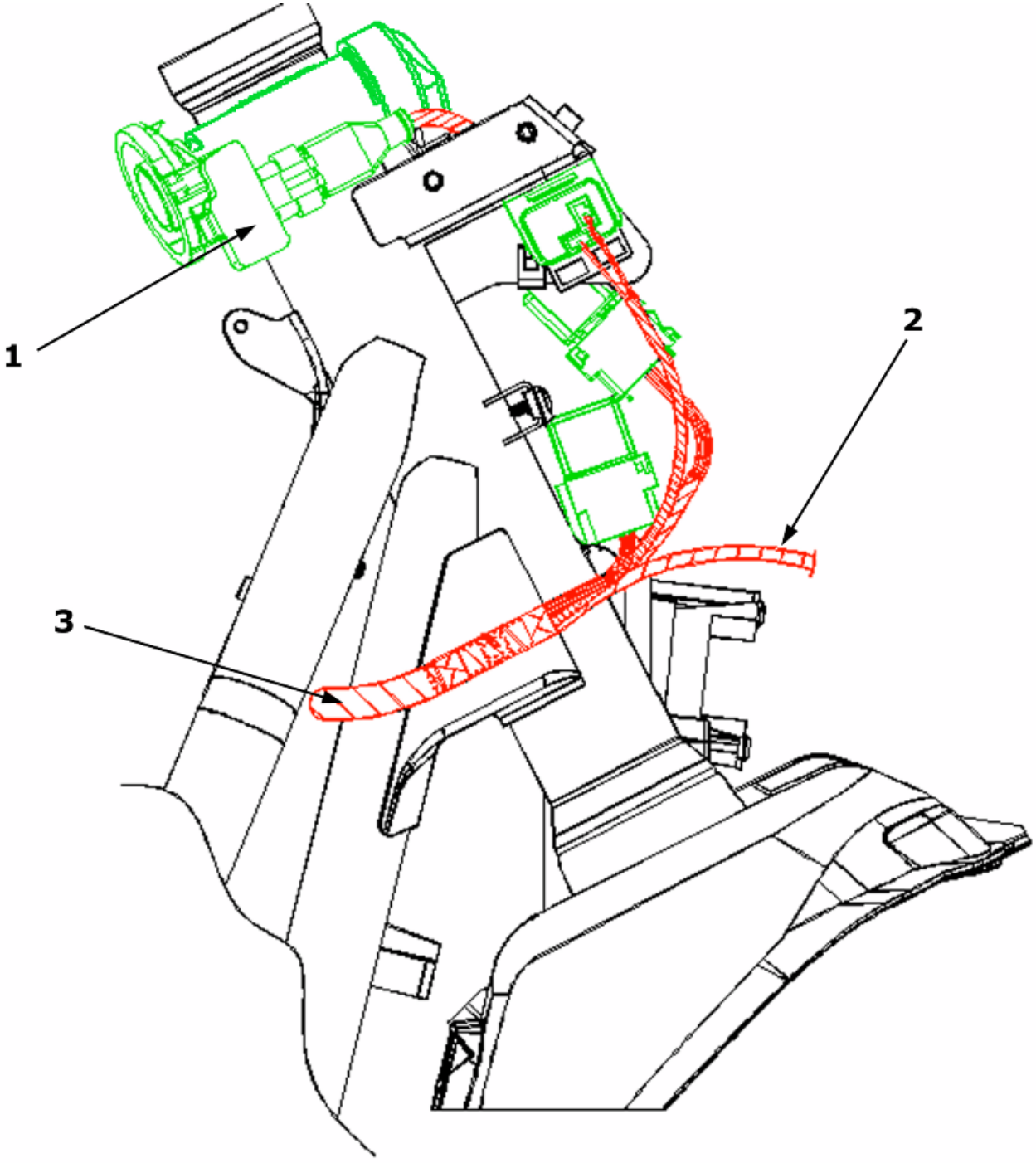
13.Al pulsante aprisella

14.Predisposizione centralina interfono



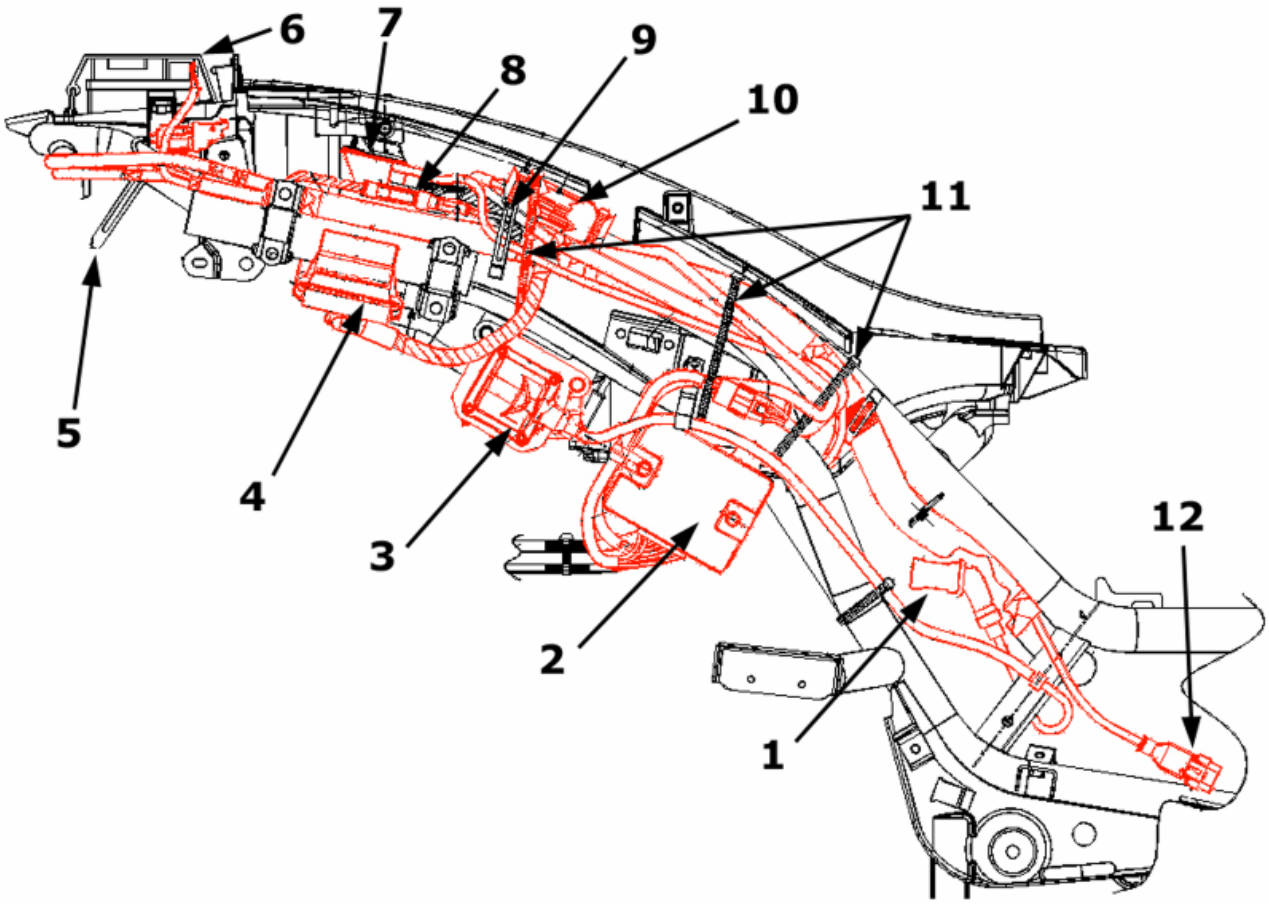
1. Al deviatore arresto motore
2. Al gruppo strumenti
3. Al gruppo strumenti
4. Al gruppo strumenti

5. Al gruppo strumenti
6. Al devio luci
7. Al commutatore lampeggiatori
8. Al pulsante claxon
9. Al pulsante stop sinistro
10. Contatti del commutatore a chiave
11. Teleruttore carichi iniezione
12. Teleruttori
13. Dispositivo lampeggiatori
14. Antenna immobilizer
15. Al pulsante stop destro
16. Al pulsante avviamento

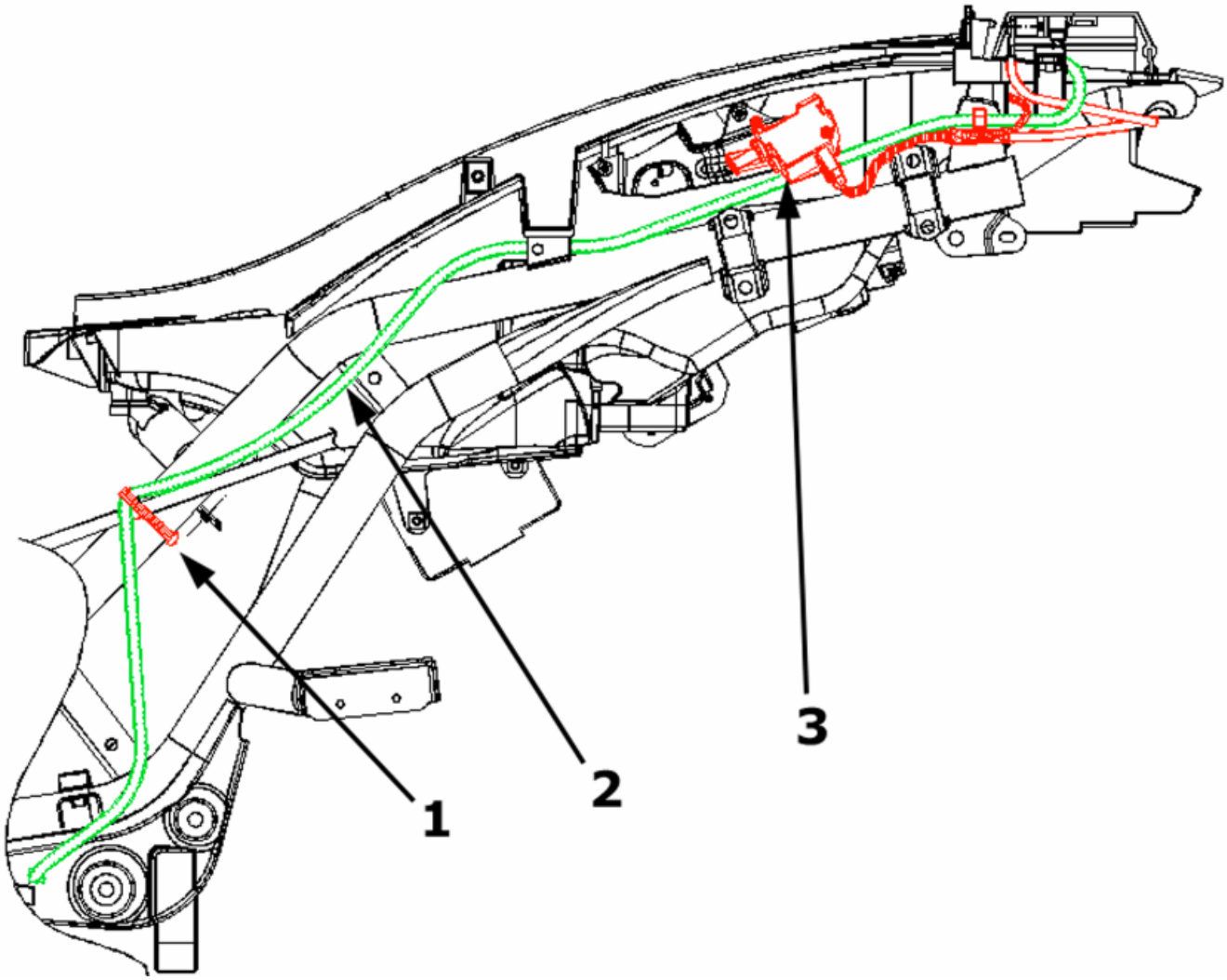


1. Antenna immobilizer
2. Al proiettore
3. Dal lato sinistro del cablaggio

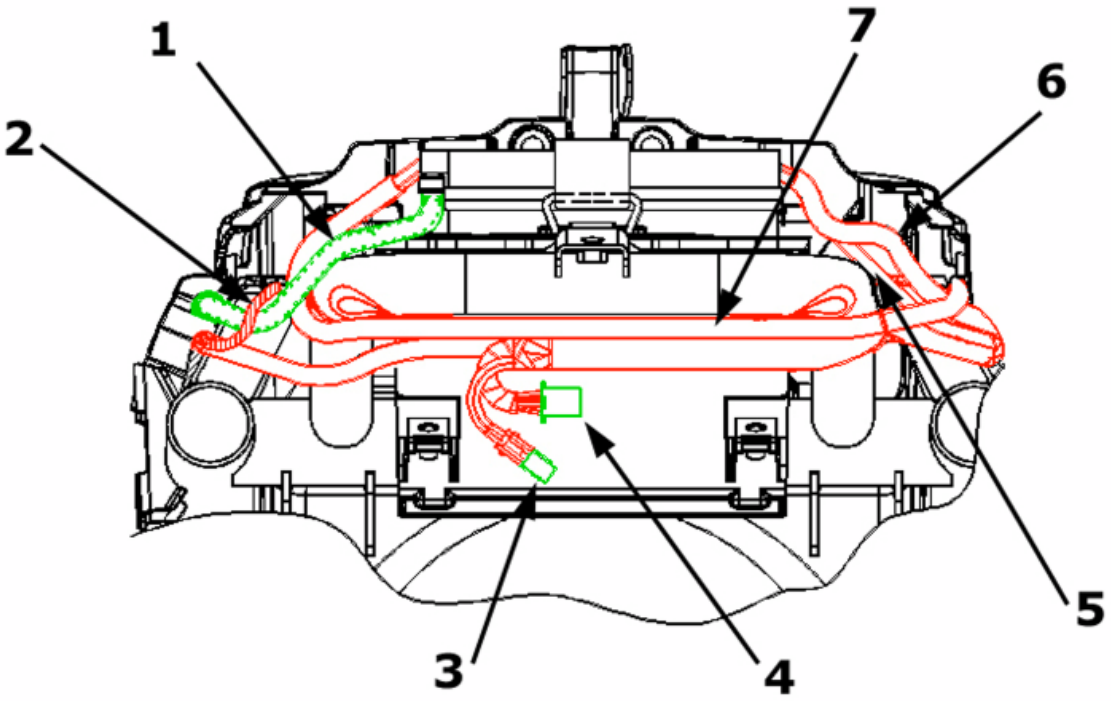
Back side



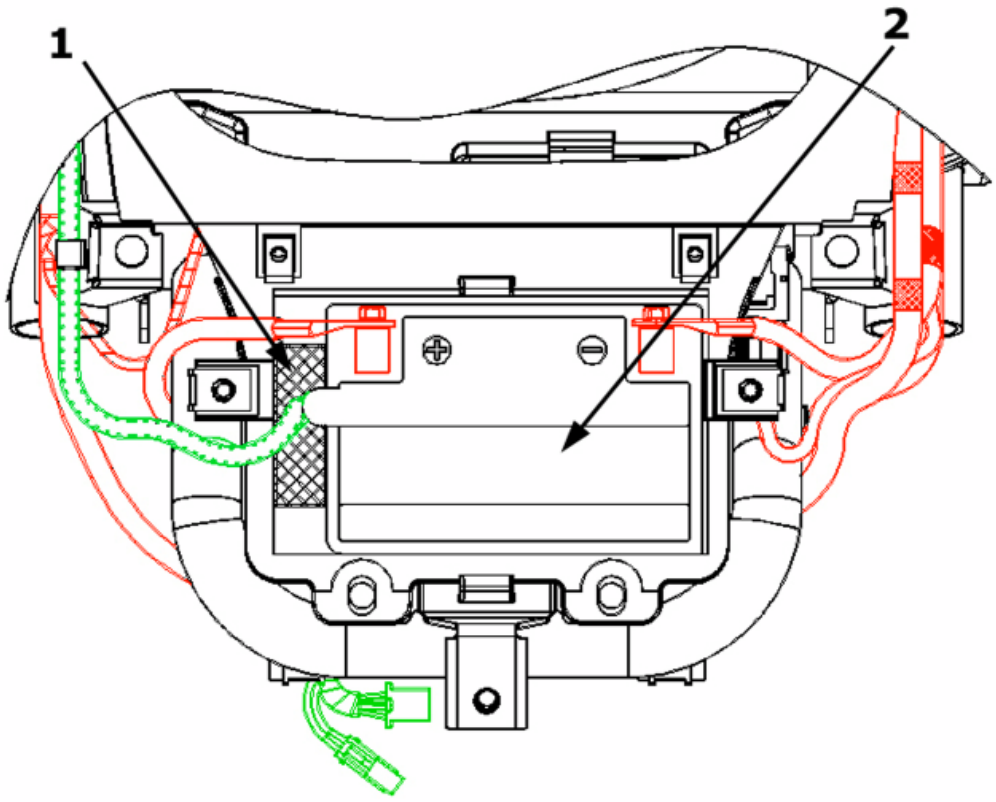
1. Cappucio candela
2. Regolatore di tensione
3. Bobina A.T.
4. Scatola portafusibili
5. Mancetta da ripiegare
6. Cinghia per batteria
7. Teleruttore di avviamento
8. Connessione pick-up
9. Mancetta da ripiegare
10. Connessione volano-regolatore
11. Fascetta
12. Presa di diagnosi



1. Fascetta
2. Tubo sfiato batteria
3. Attuatore aprisella



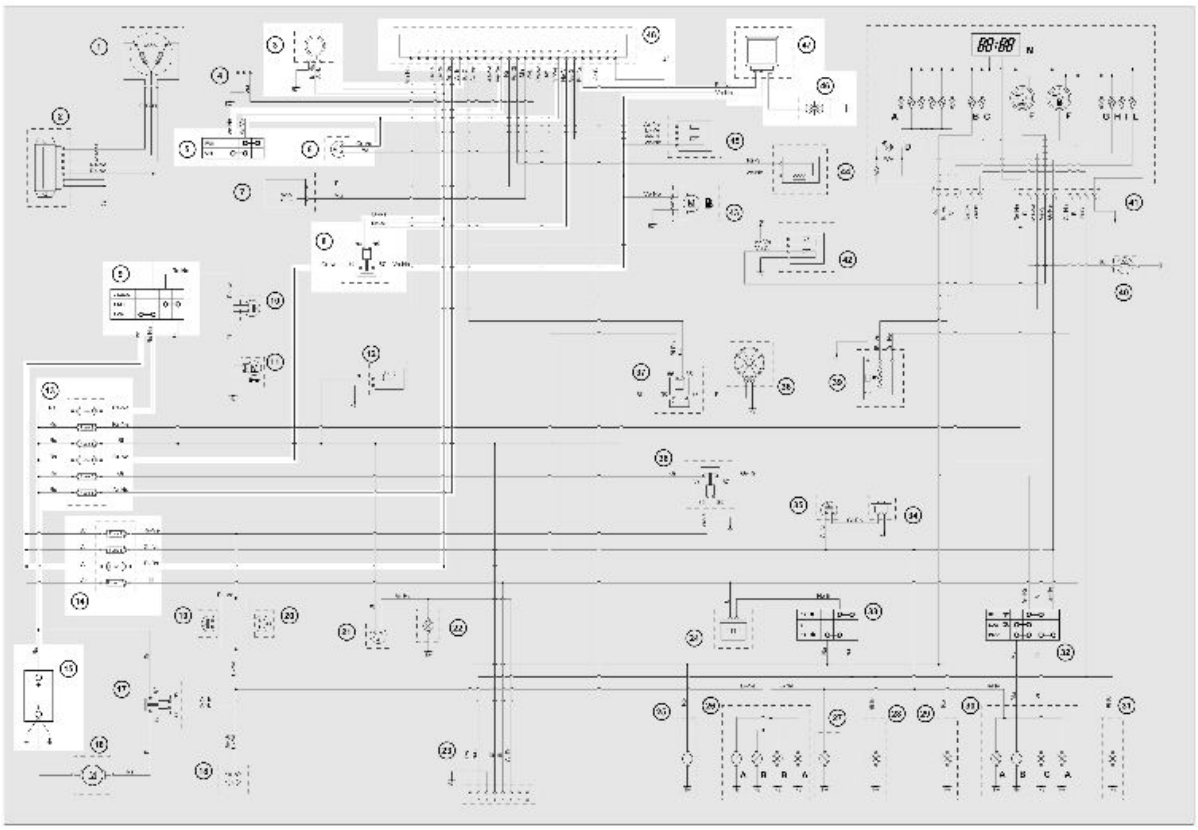
1. Tubo sfiato batteria
2. Alla plafoniera
3. Al fanalino illuminazione targa
4. Al fanale posteriore
5. All'accendisigari
6. Al negativo (-) batteria
7. Al positivo (+) batteria



1. Tampone di scontro batteria
2. Batteria 12V - 12Ah

Conceptual diagrams

Ignition



LEGEND:

3. Immobilizer aerial

5. Engine stop switch

6. Side stand switch

8. Injection load remote control

9. Key switch

13. Fuse box on rear right fairing

14. Fuse box in front glove box

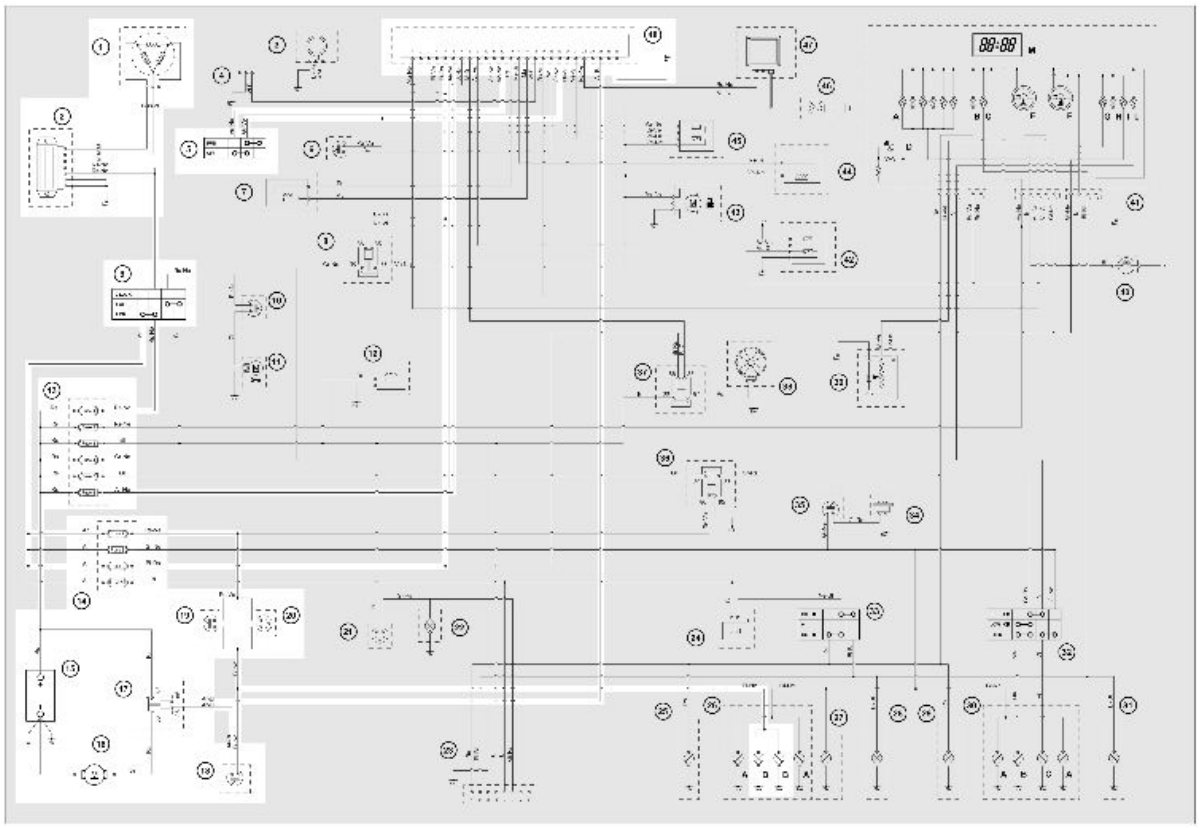
15. Battery

46. Spark plug

47. High voltage coil

48. Electronic control unit

Battery recharge and starting



LEGEND:

1. Flywheel

2. Voltage regulator

5. Engine stop switch

9. Key switch

13. Fuse box on rear right fairing

14. Fuse box in front glove box

15. Battery

16. Starter motor

17. Start-up remote control switch

18. Start-up button

19. STOP button on left brake lever

20. STOP button on right brake lever

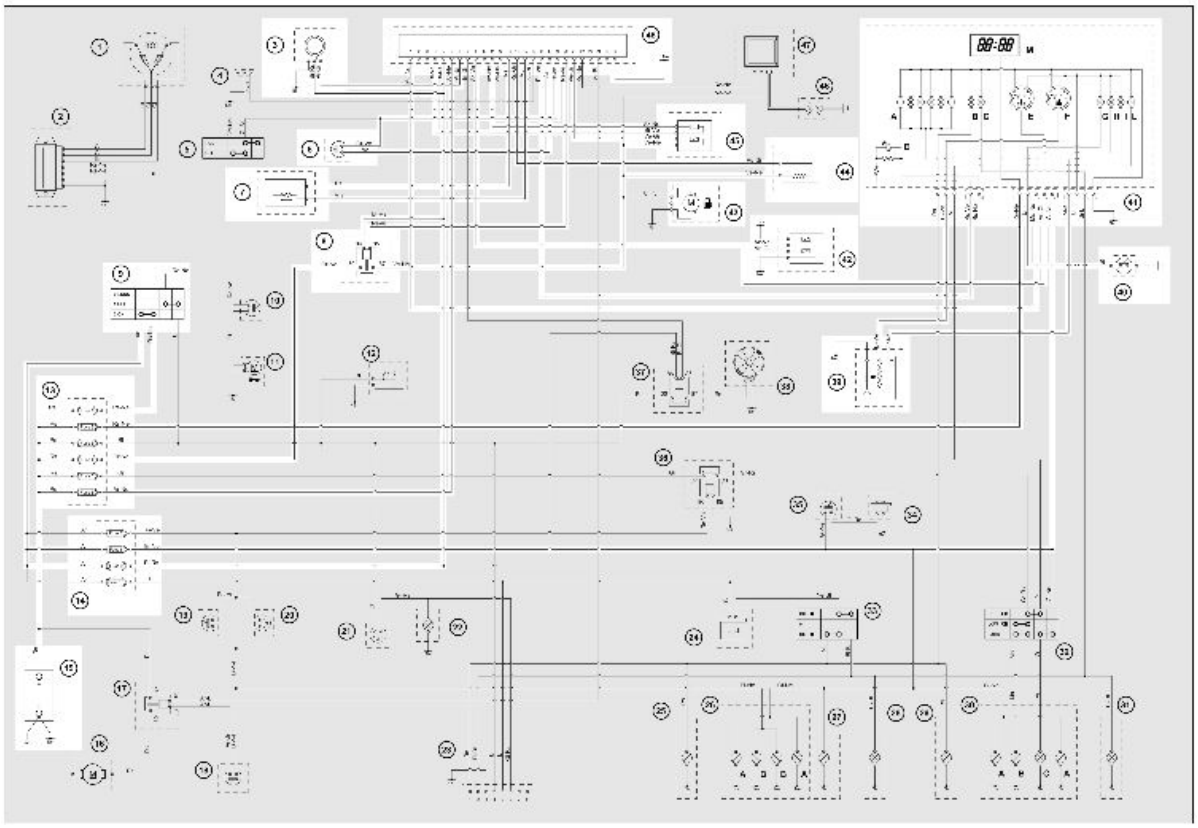
26. Rear headlight assembly

A. Tail light bulbs

B. STOP light bulbs

48. Electronic control unit

Level indicators and enable signals section



KEY:

3. Immobilizer aerial

6. Side stand switch

7. Revolution sensor

8. Injection load remote control

9. Key switch

13. Fuse box on rear right fairing

14. Fuse box in front glove box

15. Battery

39. Fuel level transmitter

40. Oil pressure sensor

41. Instrument panel

A. Instrument panel lighting

B. Left turn indicator warning light

C: Right turn indicator warning light

D. Immobilizer LED

E. Temperature gauge

F. Fuel gauge

G. Oil pressure warning light

H. Engine warning light

I. Low fuel warning light

L. High beam warning light

M. Clock

42. Engine temperature sensor

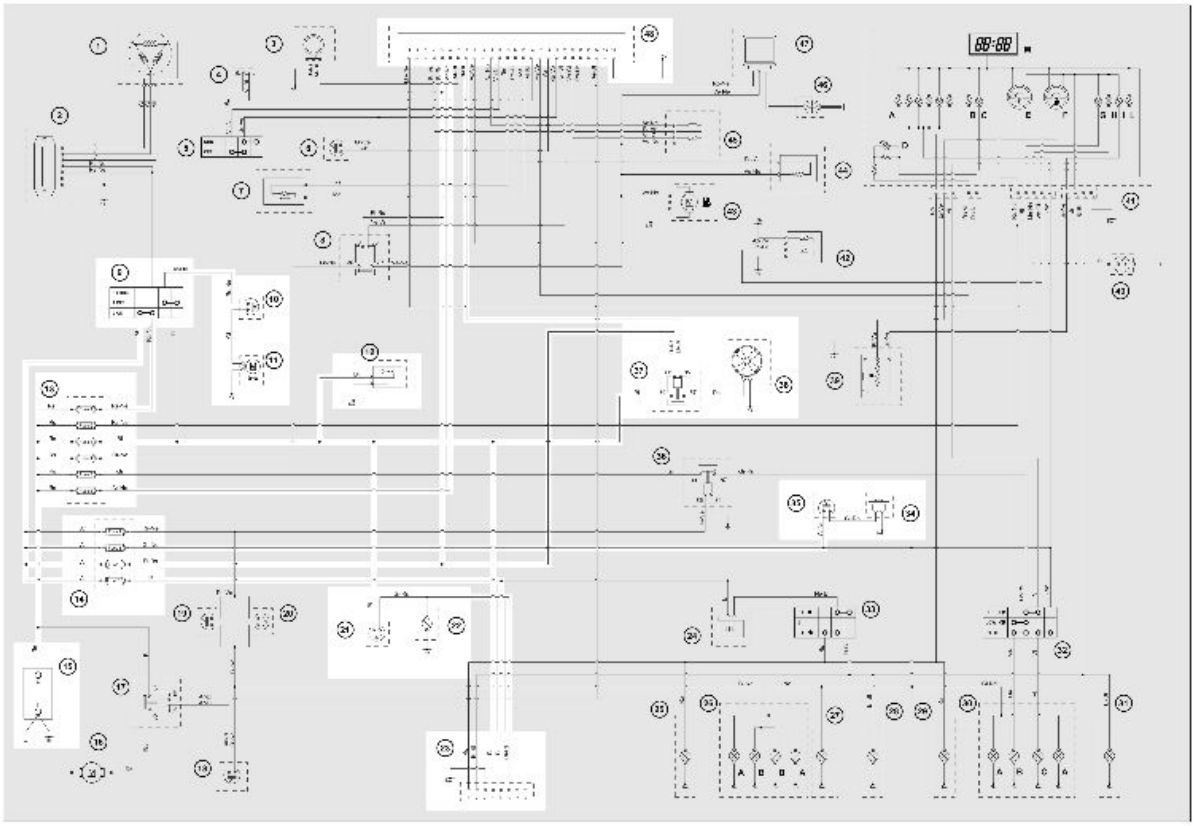
43. Fuel pump

44. Fuel injector

45. Lambda probe

48. Electronic control unit

Devices and accessories



LEGEND:

9. Key switch

10. Saddle opening button

11. Saddle opening actuator

12. 12V - 180W socket

13. Fuse box on rear right fairing

14. Fuse box in front glove box

15. Battery

21. Helmet compartment light switch

22. Helmet compartment light bulb

23. Wiring for antitheft device

34. Horn

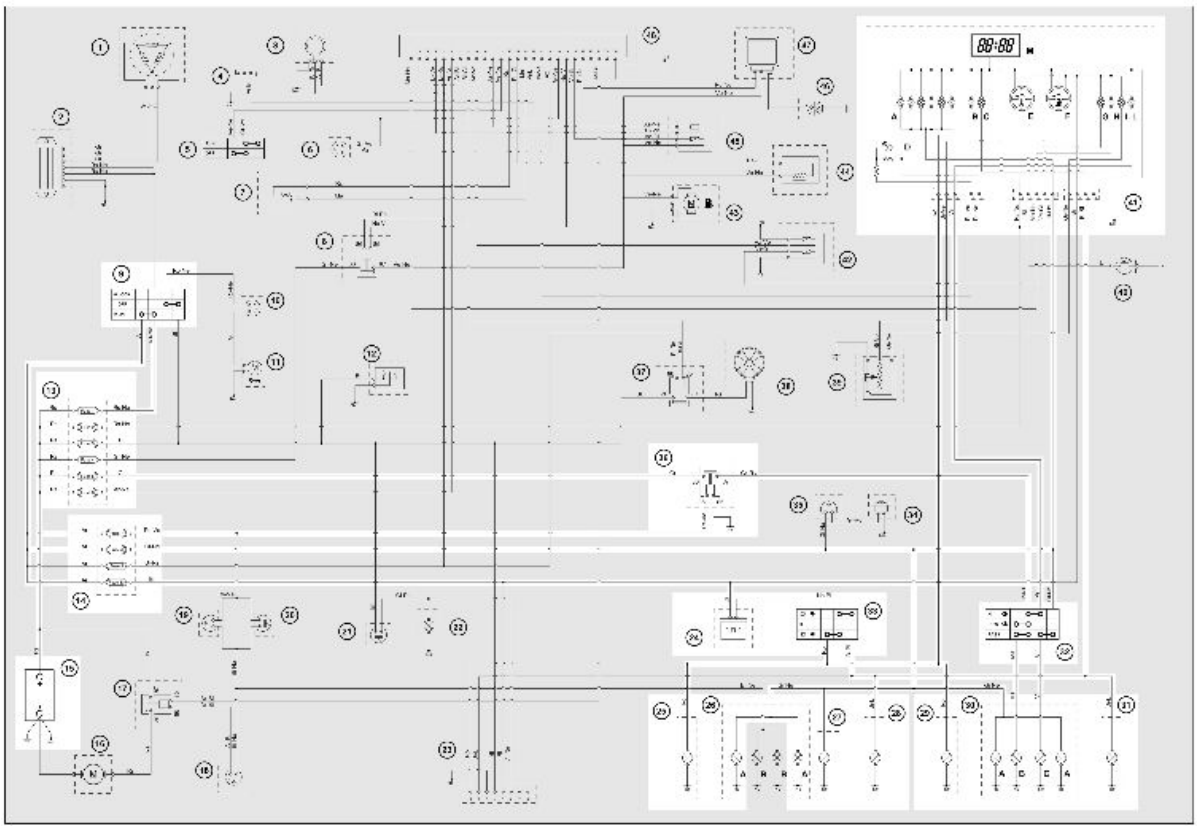
35. Horn button

37. Remote control for electric fan

38. Electric fan

48. Electronic control unit

Lights and turn indicators



LEGEND:

10. Saddle opening button

13. Fuse box on rear right fairing

14. Fuse box in front glove box

15. Battery

24. Turn indicator device

25. Rear left turn indicator

26. Rear headlight assembly

A. Tail light bulbs

B. STOP light bulbs

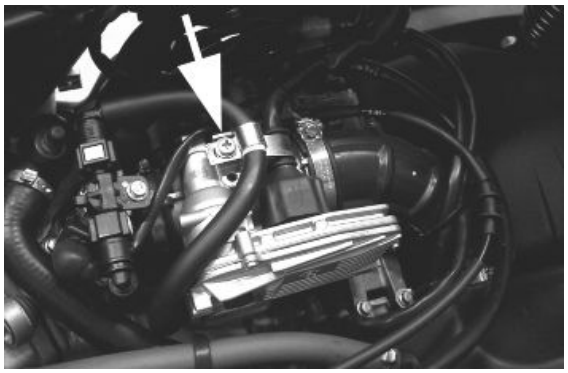
27. License plate light

28. Rear right turn indicator
29. Front left turn indicator
30. Front headlight assembly
A. Tail light bulbs
B. Low beam bulb
C. High beam bulb
31. Front right turn indicator
32. Light switch
33. Turn indicator switch
36. Light remote control switch
41. Instrument panel
A. Instrument panel lighting
B. Left turn indicator warning light
C: Right turn indicator warning light
D. Immobilizer LED
E. Temperature gauge
F. Fuel gauge
G. Oil pressure warning light
H. Engine warning light
I. Low fuel warning light
L. High beam warning light
M. Clock

Checks and inspections

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

Immobiliser



The electronic ignition system is managed by the control unit in which the immobiliser system is integrated. The immobiliser is an antitheft system which allows the scooter to function only if it is activated by means of the coded keys that the control unit recognises. The code is integrated in a transponder in the key block. This allows the driver clear operation without having to do anything other than just turning the key. The Immobilizer system consists of the following components:

- Electronic control unit
- Immobilizer aerial
- Master key with incorporated transponder (red key)
- service key with incorporated transponder (black key)
- H.V. coil
- Diagnostic LED

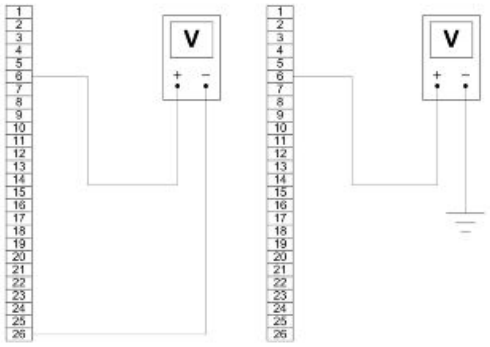
The diagnostic LED also works as a deterring blinker. This function is activated every time the ignition switch is turned to the "OFF" position, or the emergency stop switch is turned to the "OFF" position. It remains activated for 48 hours in order not to affect the battery charge. When the ignition 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 2,6,9 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:

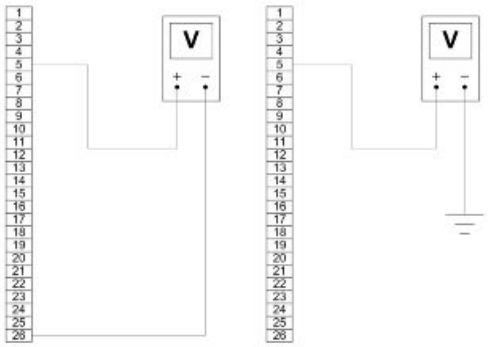
With the key switch set to OFF:

- 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.



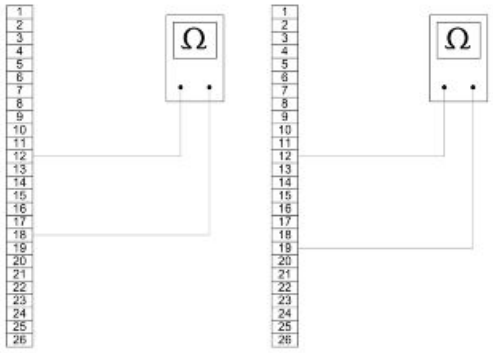
With the key switch in the OFF position:

- 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. 9 and its cable are working order.

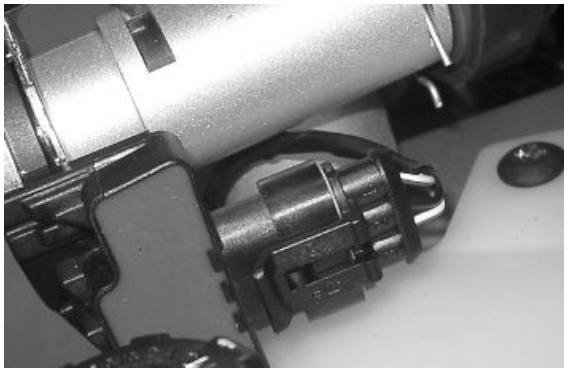


- There is continuity between terminals 12-18 and 12-19 with the emergency cut-out switch in the RUN position and the side stand raised. If there is no continuity check the contacts of the latter.

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

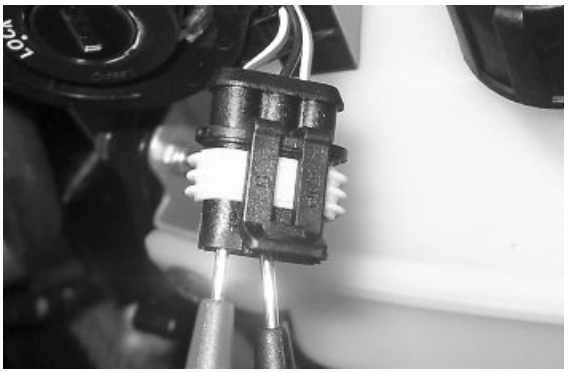


After removing the shield back plate, remove the electrical connection from the aerial as shown in the photograph



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

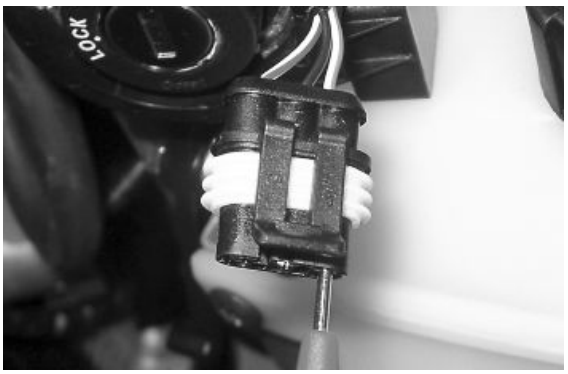


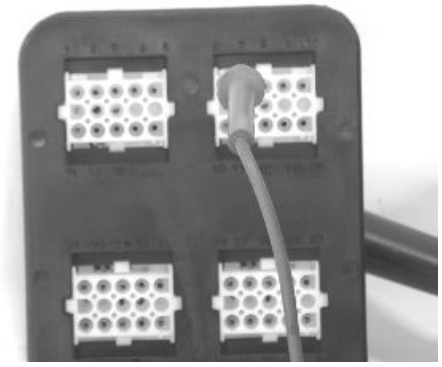
With MIU connector disconnected check the continuity between the Orange-White cable and pin 7 of the interface wiring .

Specific tooling

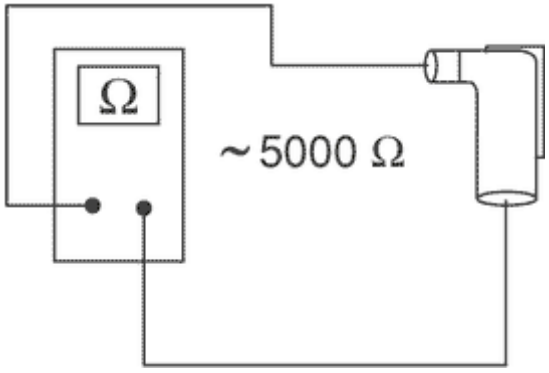
020481Y Control unit interface wiring

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:

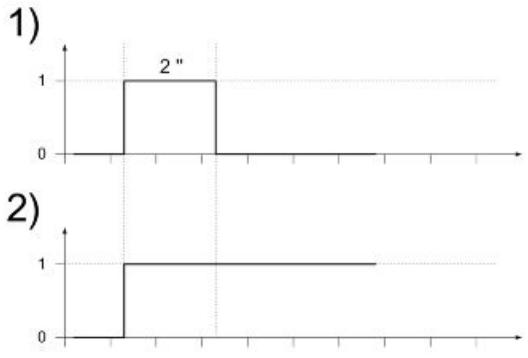
RED KEY

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:

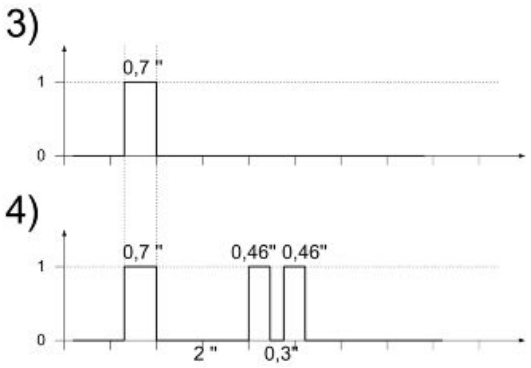


1. Previously unused control unit - key inserted: a single 2 second flash is displayed, after which the LED remains off permanently. The keys can be stored to memory, the vehicle can be star-

ted 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.



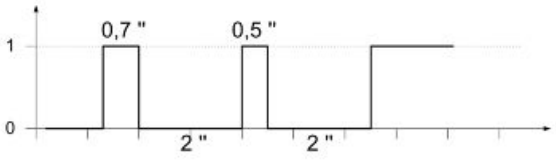
4. **Programmed control unit - Master key in**: a 0.7 sec. flash is displayed followed by the LED remaining off for 2 sec. and then by short 0.46 sec. flashes the same number of times as there are keys stored in the memory including the Master key. When the diagnosis has been completed, the LED remains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

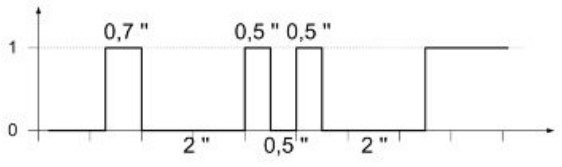
The one-flash code indicates a system where the serial line is not present or is not detected. Check the Immobiliser aerial wiring and change it if necessary.



Diagnostic code - 2 flashes

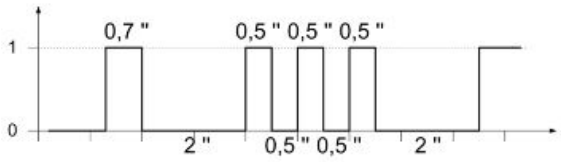
Two-flash code shows a system where the control unit does not show the transponder signal. This might depend on the inefficiency of the immobiliser aerial or the transponder.

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.

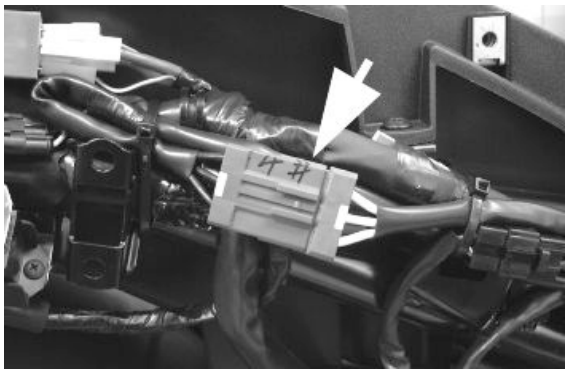
Electric characteristic

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

Specification	Desc./Quantity
Voltage	14 ÷ 15V at 5000 rpm with lights off

Turn signals system check

In the case it does not work, it is necessary to:

1. check light bulb efficiency,
2. check the efficiency of fuse n° 10 with the ignition switch key at ON,
    - check the presence of voltage on the indicator command device;
    - if this is powered, check the continuity of the wiring, with the turn indicator switch on, between the black-blue indicator control output cable and the pink and white-blue cables of the turn indicator bulbs. If there is no continuity, check the wiring and the efficiency of the turn indicator switch, otherwise replace the turn indicator control device because it is certainly defective.

Lights list

The light system is supplied by two separate sections of the circuit:

1. Tail light, instrument panel lights and high beam headlight is passing mode (PASS), protected by fuse No. 8 and by the main remote control switch.
2. High beam/low beam headlights, front headlight assembly line, protected by fuses No. 5 and 7 and by the light remote control switch.

Tail light, instrument panel light, high-beam headlight in passing mode (PASS)

In the event of a malfunction, check:

- Efficiency of the bulbs
- Efficiency of fuse No. 8
- With the main switch in position "ON", check for voltage on the orange cable of fuse No. 8. Then check the wiring of the light socket.

High beam/low beam headlight line

In the event of a malfunction, check:

- Efficiency of the twin-filament bulb

- Efficiency of fuse No. 5
- Efficiency of the light switch in HI and LOW mode
- Efficiency of the light remote control switch

With the main switch in position "ON", check:

- For voltage on the orange and red/green cables of the light remote control switch
- For voltage on the grey/red cable of the light remote control switch
- The switch wiring harness and the contacts of the light socket

Fuses

The electrica
equipped wit

- S
  fu
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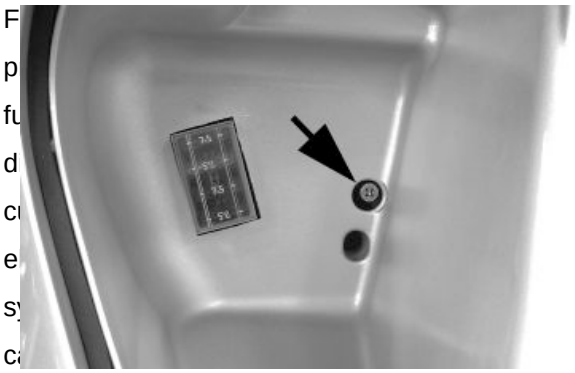
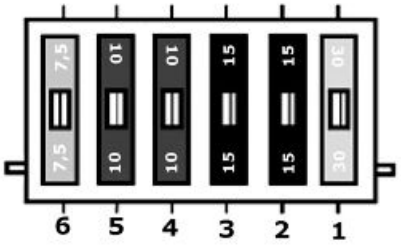
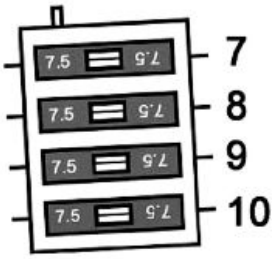
  the glove-box on the top left-hand side of the helmet compart-ment.







Never try to replace a blown fuse with a fuse of a different rating than that specified or using other material (for example, a piece of electrical wire).

The tables show the position and characteristics of the fuses on the scooter.

CAUTION

BEFORE REPLACING THE BLOWN FUSE, SEARCH AND SOLVE THE PROBLEM THAT CAUSED IT TO BLOW.
NEVER TRY TO REPLACE A BLOWN FUSE WITH A FUSE OF A DIFFERENT RATING THAN THAT SPECIFIED OR USING OTHER MATERIAL (FOR EXAMPLE, A PIECE OF ELECTRICAL WIRE).

FUSES

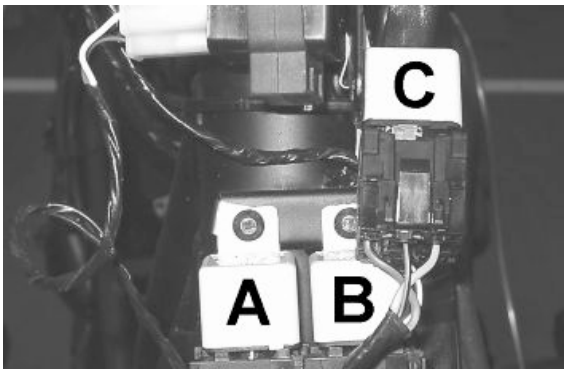
Specification	Desc./Quantity
1	(30 A) General
2	(15 A) Clock, immobilizer LED
3	(15 A) Accessories: 12V-180W plug socket, helmet compartment light button, contacts for key switch, button and switch for seat opening, antitheft system
4	(10 A) Fuel injection remote control
5	(10 A) Light remote control
6	(3 A) Direct power supply to control unit

FUSE 2

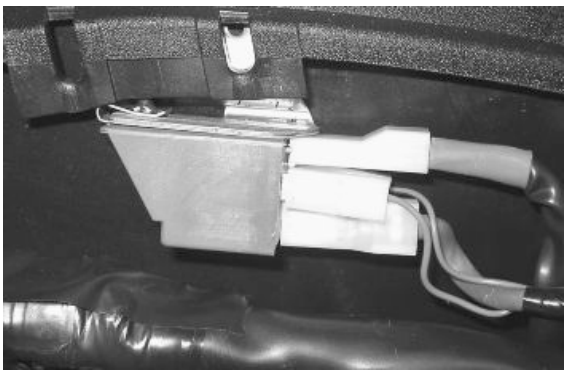
Specification	Desc./Quantity
7	(7.5 A) Stop light, starter, light remote control
8	(7.5 A) Horn, tail light, instrument panel light, high-beam headlight (in "Passing" mode)
9	(7.5 A) Direct power supply to control unit, remote control for electric fan
10	(7.5 A) Antitheft device, turn indicator light, direct power supply to instrument panel

Remote control switches

The electrical system has four remote control switches, three located under the front cover and one under the right-hand fairing of the scooter:
In order to access the three remote control switches at the front of the scooter, it is necessary to remove the front shield.



In order to access the remote control switch at the rear of the scooter, it is necessary to remove the right side fairing.

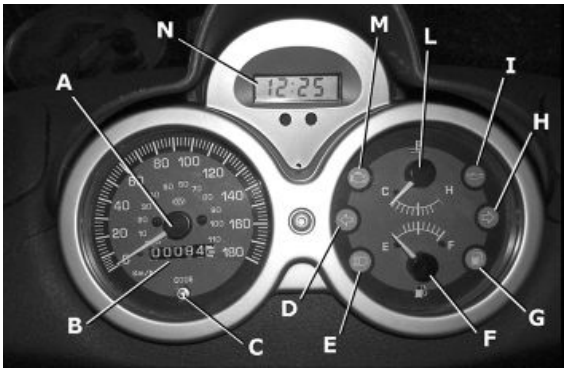


The following table shows the functions of each remote control switch:

Remote control switch	Description
A	Electric fan starter
B	Light remote control
C	Injection load remote control
D	Starter remote control

Dashboard

A = Speedometer
B = Odometer
C = Immobiliser LED
D = Left turn indicator warning light
E = High-beam warning light
F = Fuel gauge
G = Low fuel warning light
H = Right turn warning light
I = Low oil pressure warning light
L = Coolant temperature gauge
M = Motor management indicator light and injection system warning light



N = Digital clock

Sealed battery

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

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

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

INSTRUCTIONS FOR THE RENEWAL RECHARGE AFTER OPEN-CIRCUIT STORAGE

1) Voltage check up

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

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

2) Constant voltage battery charge mode

- Constant voltage charge equal to 14.40 ÷ 14.70V

-Initial charge voltage equal to 0.3 ÷ 0.5 for Nominal capacity

- Charge time:

10 to 12 h recommended

Minimum 6 h

Maximum 24 h

3) Constant current battery charge mode

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

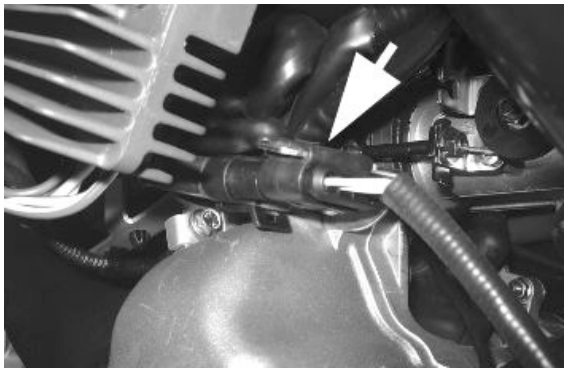
Remote seat opening

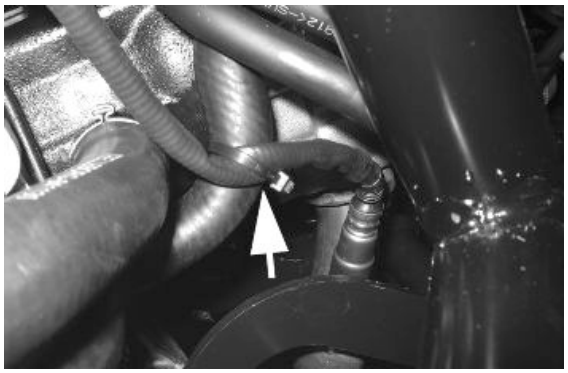
INDEX OF TOPICS

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

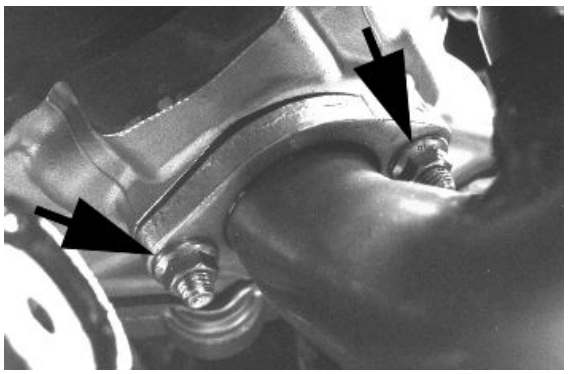
Exhaust assy. Removal

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





- Undo the two exhaust manifold fixings on the head. To 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.

Removal of the engine from the vehicle

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

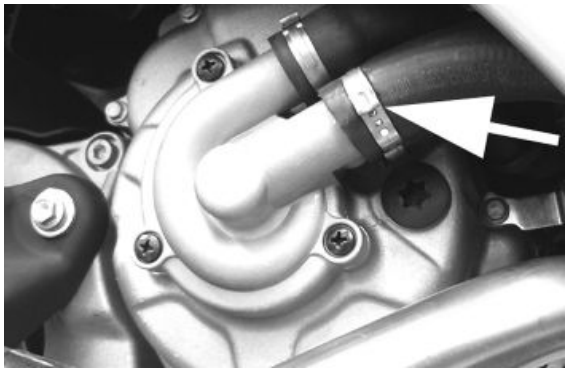
Remove the full muffler assembly.

CAUTION

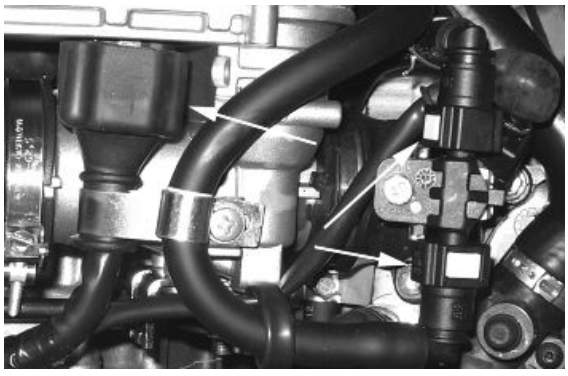
THIS OPERATION MUST BE CARRIED OUT WHEN THE ENGINE IS COLD.

- Remove the rear wheel.

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



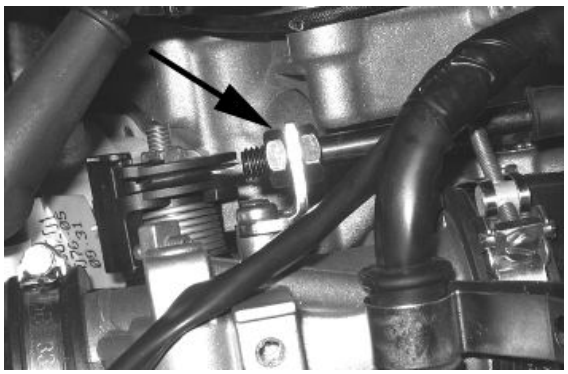
- Disconnect the fuel delivery and return pipes from the injector by removing the screw locking the retaining clip.
- Disconnect the injector wiring and the throttle body control unit wiring.



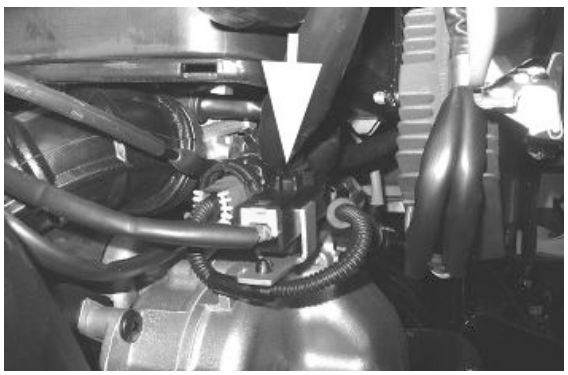
- Remove the coolant outlet pipe from the motor as indicated.

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

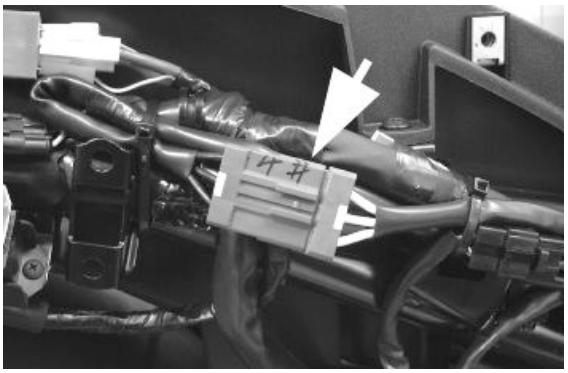
- Remove the throttle cable from the throttle body by undoing the nut shown in the photo.



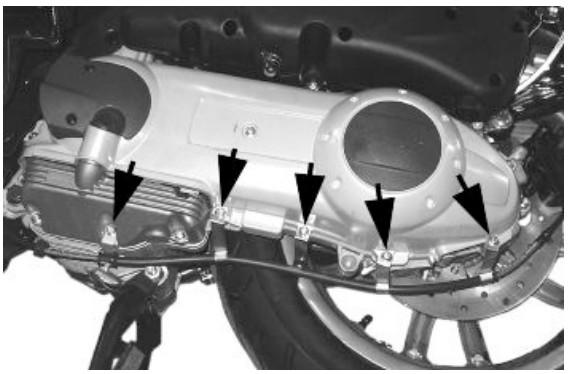
- Disconnect the positive and negative connectors from the starter motor as shown in the photo.



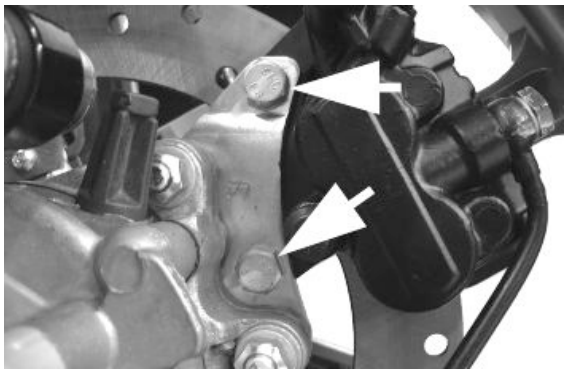
- Disconnect the connectors from the flywheel wiring harness.
- Disconnect the relevant cable from the retaining clamps.



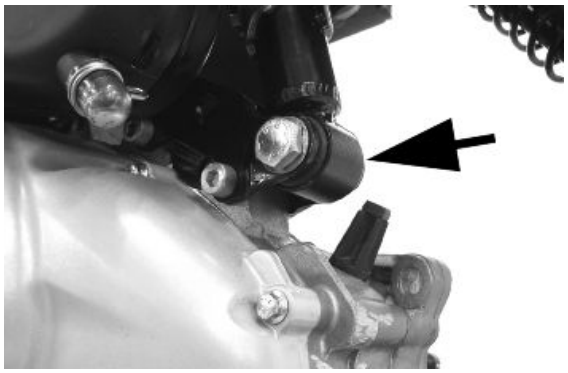
- Remove the screws indicated in the figure.



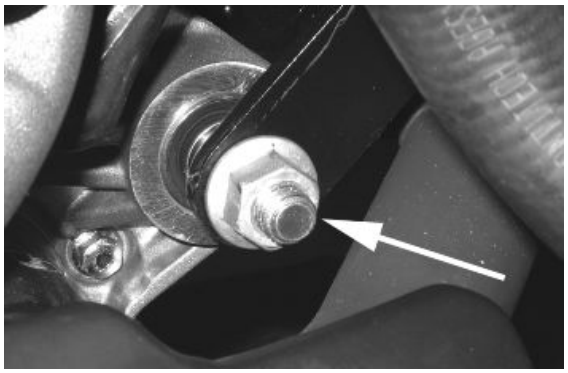
Remove the retaining bolts of the rear brake caliper.

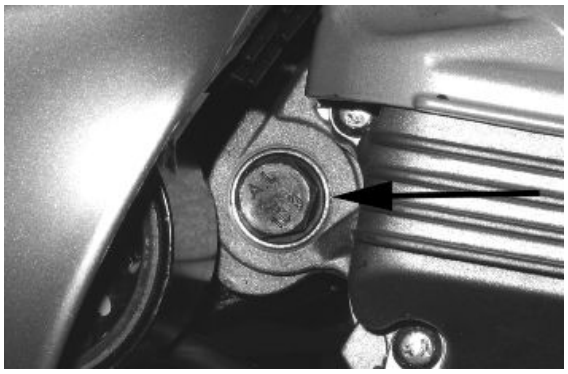


Remove the lower screw of the left-hand shock absorber.



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





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

-Check the engine oil level and if necessary top it up with the recommended type.

- Fill and bleed the cooling circuit.

- Check the functioning of the accelerator and the electrical devices.

CAUTION

PAY PARTICULAR ATTENTION TO POSITIONING THE THROTTLE COMMAND TRANSMISSION PROPERLY.

INDEX OF TOPICS

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

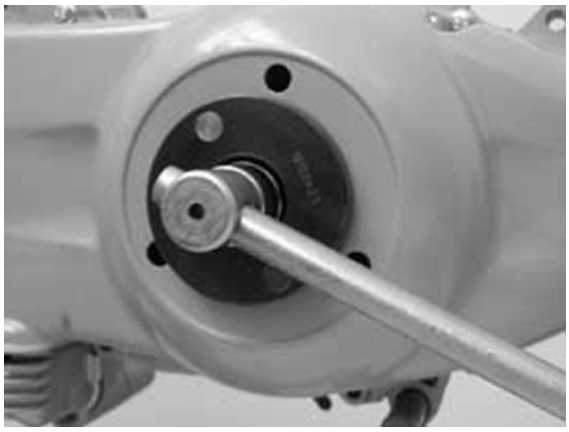
Automatic transmission

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

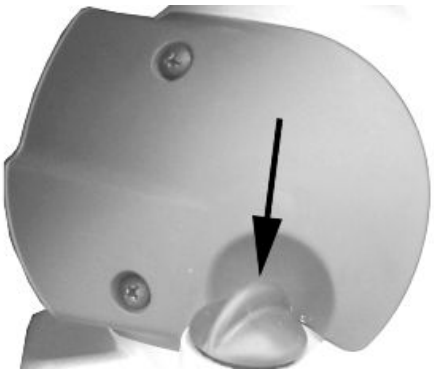
020423Y driven pulley lock wrench



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

N.B.

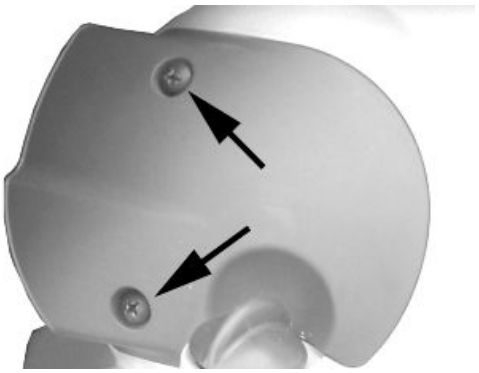
WHEN YOU ARE REMOVING THE TRANSMISSION COVER YOU MUST BE CAREFUL NOT TO DROP THE CLUTCH BELL.



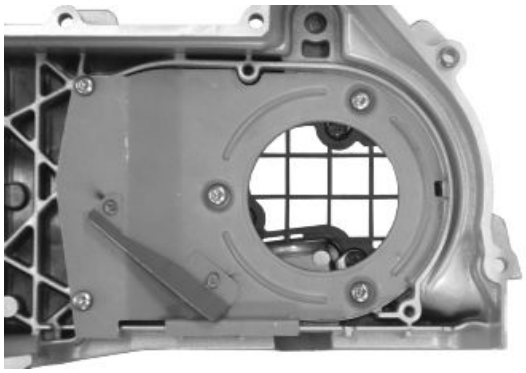
Air duct

Version 250

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



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



Removing the driven pulley shaft bearing

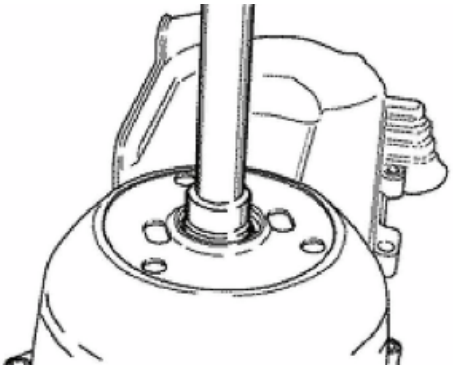
- Remove the clip from the inside of the cover.
- Remove the bearing from the crankcase by means of:

Specific tooling

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm

020412Y 15 mm guide



Refitting the driven pulley shaft bearing

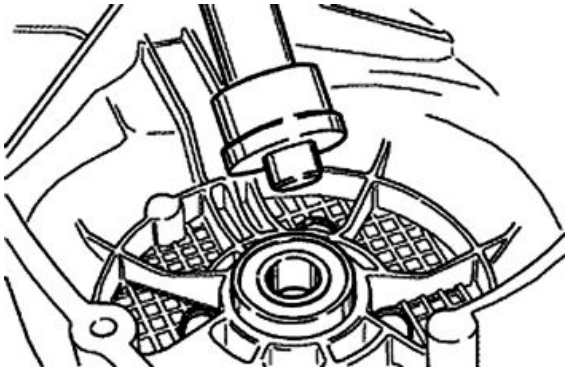
- Slightly heat the crankcase from the inside so as not to damage the painted surface.
- Insert the bearing in its seat.
- Refit the seeger ring.

CAUTION

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

N.B.

ALWAYS REPLACE THE BEARING WITH A NEW ONE UPON REFITTING.



Specific tooling

020376Y Adaptor handle

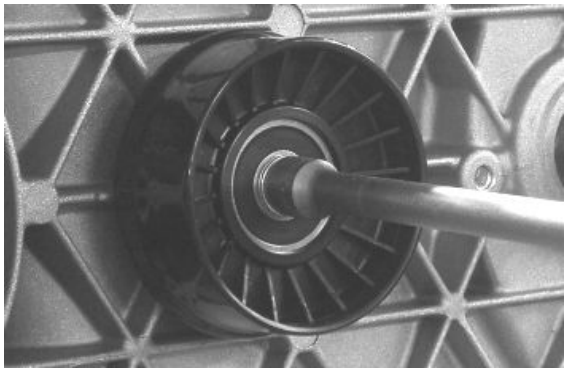
020357Y 32 x 35 mm adaptor

020412Y 15 mm guide

Baffle roller

Plastic roller

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



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

Locking torques (N*m)

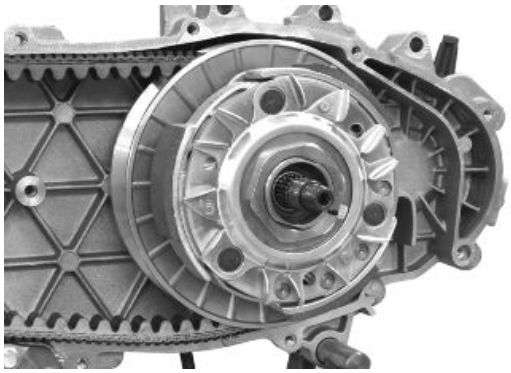
Anti-flapping roller 12 - 16

Removing the driven pulley

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

N.B.

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



Inspecting the clutch drum

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

Characteristic

Max. value clutch bell

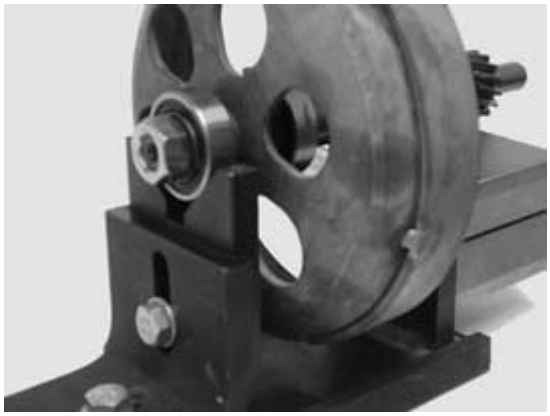
Max. value: Ø 134.5 mm

Clutch bell standard value

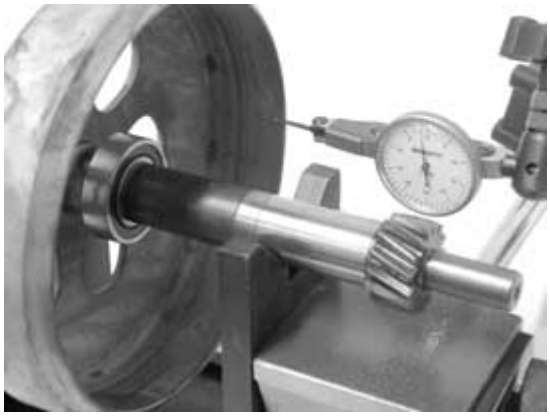
Standard value: Ø 134 - 134.2 mm

Checking the bell working surface eccentricity

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



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



Specific tooling

020074Y Support base for checking crankshaft alignment

020335Y Magnetic support for dial gauge

Characteristic

clutch bell inspection: Limit eccentricity.

Admissible limit eccentricity: 0.15 mm

Removing the clutch

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

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

CAUTION

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

Specific tooling

020444Y011 adapter ring

020444Y009 46x55 Wrench

020444Y Tool for fitting/ removing the driven pulley clutch

Inspecting the clutch

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

N.B.

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

CAUTION

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

Characteristic

Check minimum thickness

1 mm

Pin retaining collar

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

N.B.

USE TWO SCREWDRIVERS IF YOU HAVE DIFFICULTY.

N.B.

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

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

Removing the driven half-pulley bearing

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

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

Specific tooling

001467Y035 Belle for OD 47-mm bearings

- Remove the roller bearing using the modular punch.

Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020363Y 20 mm guide

Inspecting the driven fixed half-pulley

Version 250

- Measure the 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

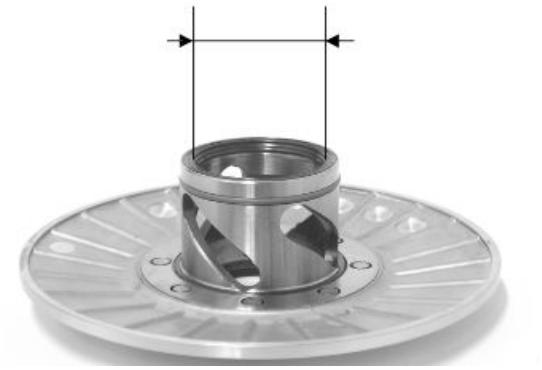
Standard diameter: Ø 40.985 mm

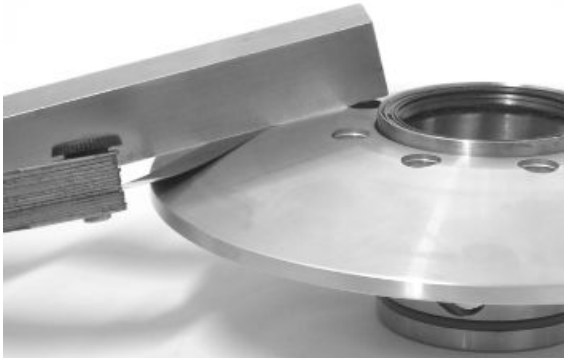
Wear limit

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

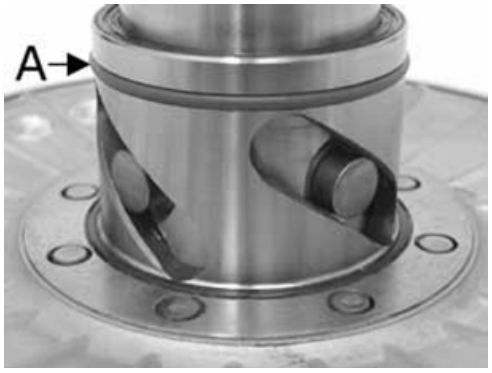
020376Y Adaptor handle

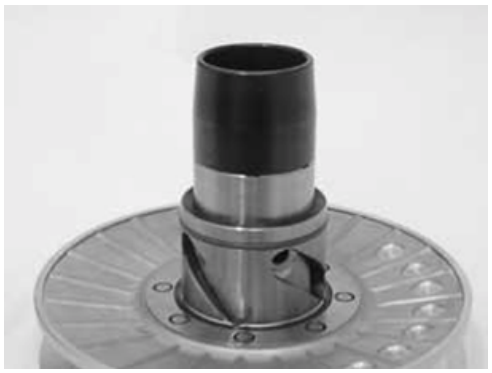
020375Y Adaptor 28 x 30 mm

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

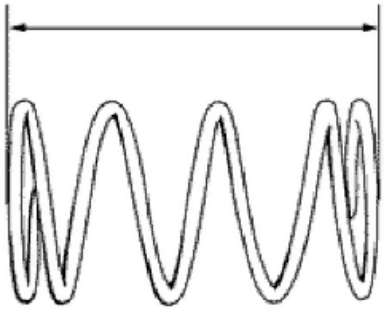
Recommended products

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

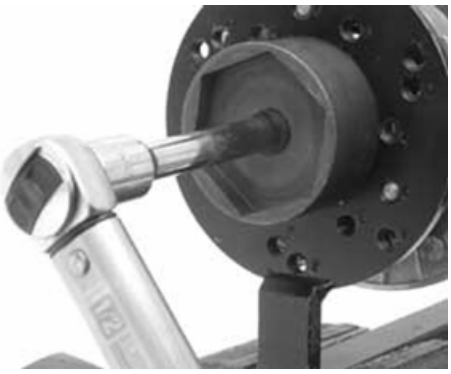
123 mm

acceptable limit after use:

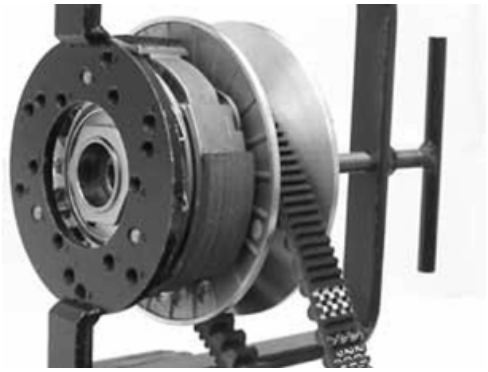
118 mm

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

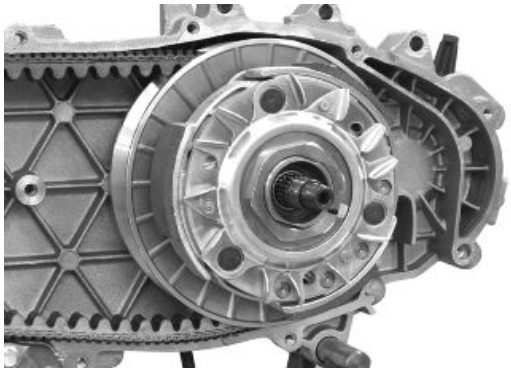
020444Y009 46x55 Wrench

Locking torques (N*m)

Clutch unit nut on driven pulley 45 ÷ 50

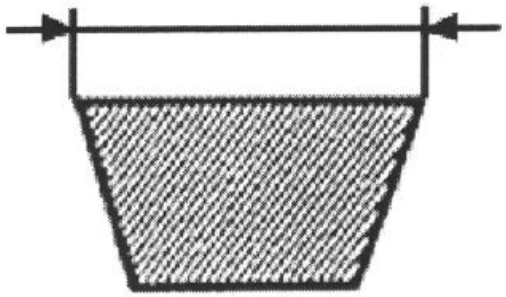
Refitting the driven pulley

- Refit the clutch bell.



Drive-belt

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



Characteristic

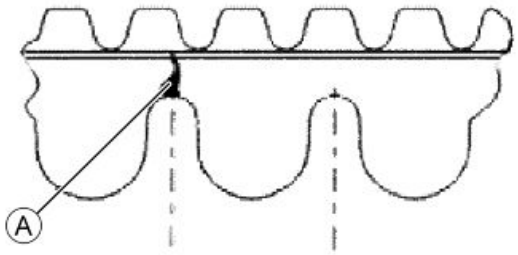
250 4T Transmission belt/minimum width

19.5 mm

250 4T Transmission belt/standard width

21.3 ± 0.2 mm

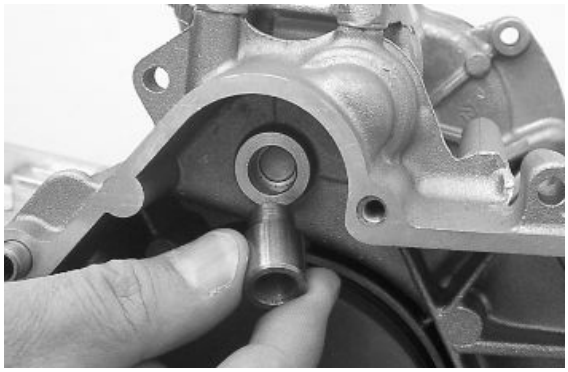
During the wear checks in the scheduled servicing programme, you are advised to check the rim bottom of the toothing does not show signs of incisions or cracking (see figure): The rim bottom of the tooth must not have incisions or cracking; if it does, change the belt.



Removing the driving pulley

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

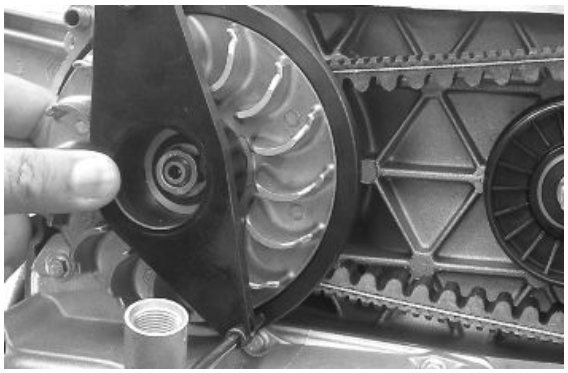
- Insert the adaptor sleeve of the appropriate tool in the hole shown in the photograph



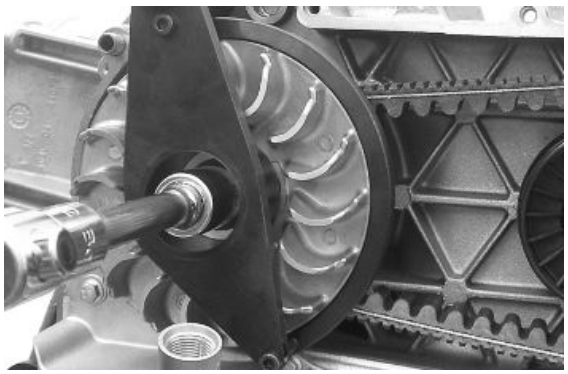
- Insert the tool in the hollows and apply the retention ring
- Bring in the ring's clamping screws while keeping the tool to support the pulley

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

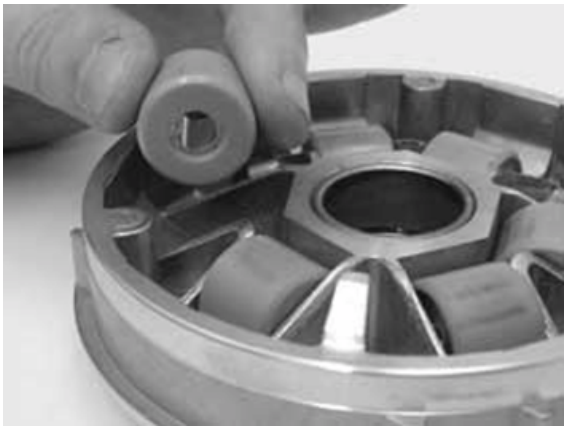
Diameter 20.5 - 20.7 mm

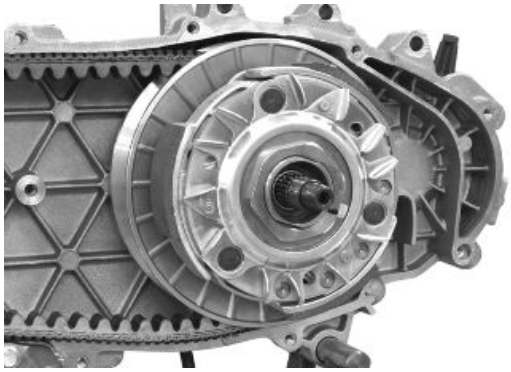
Roller: Minimum diameter permitted

Ø 20 mm

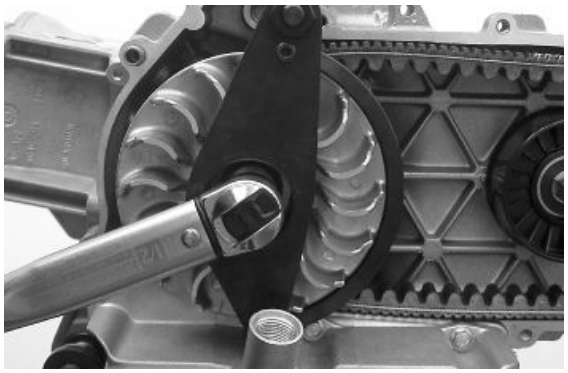
Refitting the driving pulley

- 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

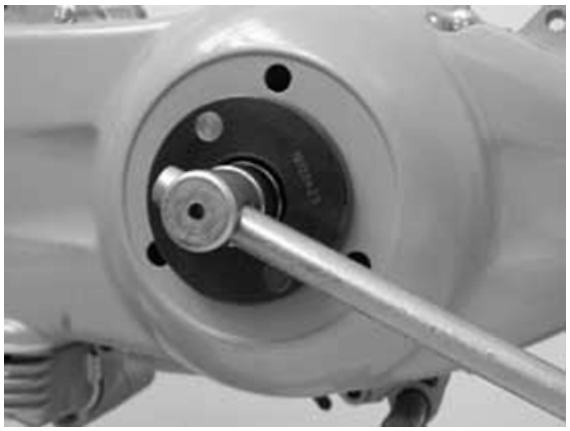
020626Y Driving pulley lock wrench

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

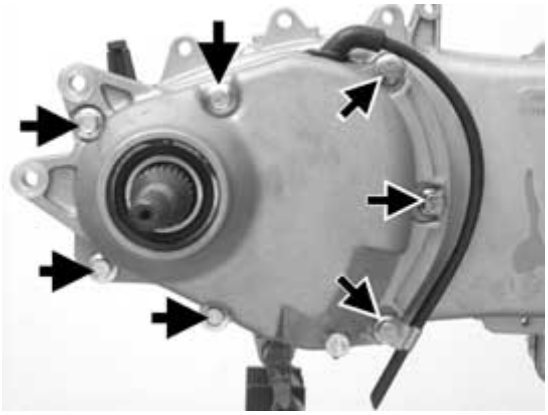
Locking torques (N*m)

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

End gear

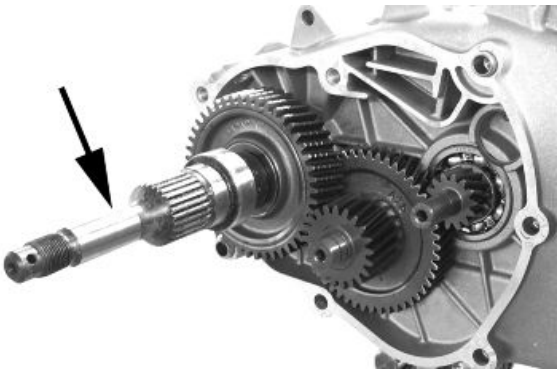
Removing the hub cover

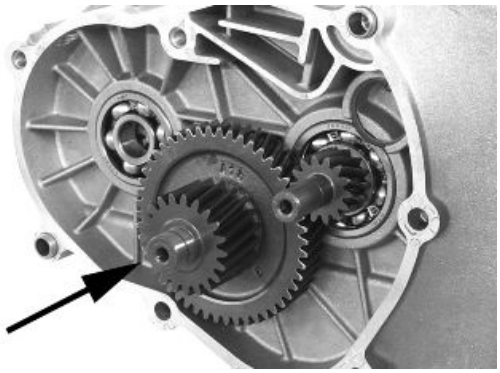
- Empty the rear hub through the oil drainage plug.
- Remove the 7 flanged screws indicated in the figure.
- Remove the hub cover and its gasket.



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).

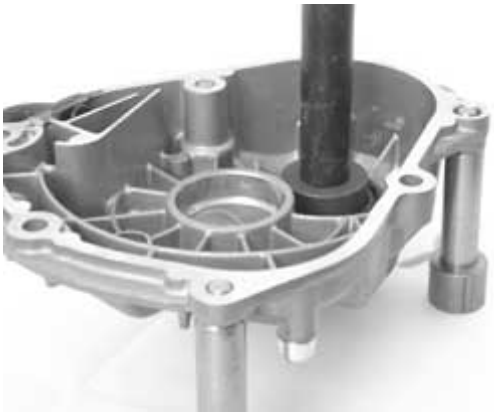
Specific tooling

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

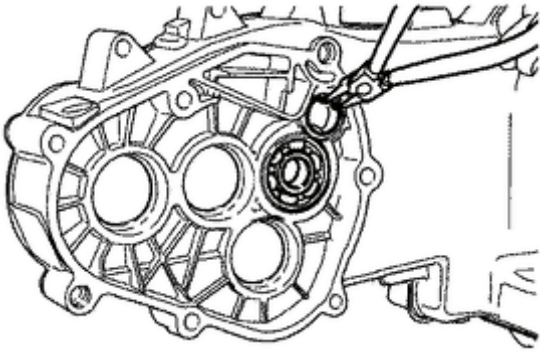
020483Y 30 mm guide

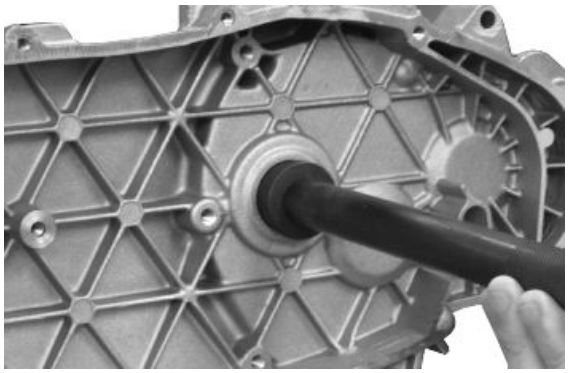
020359Y 42x47-mm adaptor

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.

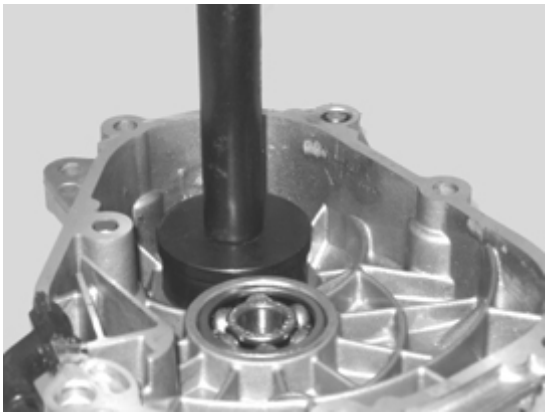
Inspecting the hub cover

- 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

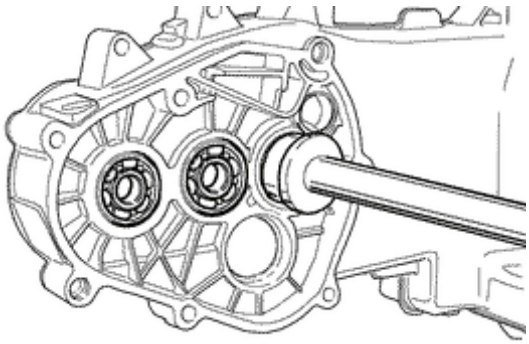
020360Y Adaptor 52 x 55 mm

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 adapter 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.

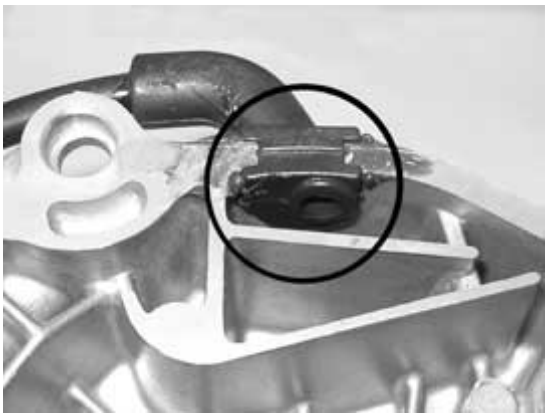
- Refit the seeger ring with the opening facing the bearing and fit a new oil guard flush with the crankcase from the pulley side.

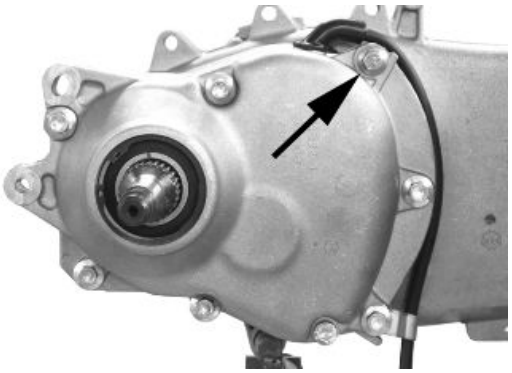
Refitting the hub bearings

- 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.

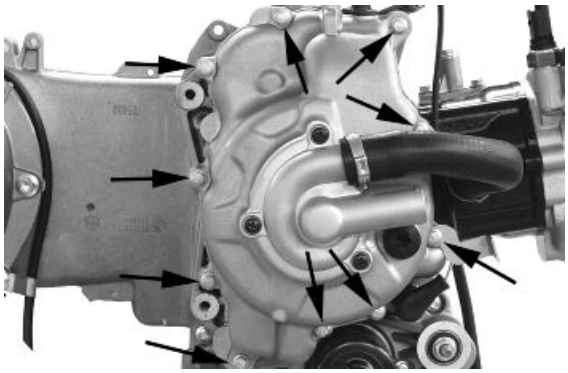




Flywheel cover

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

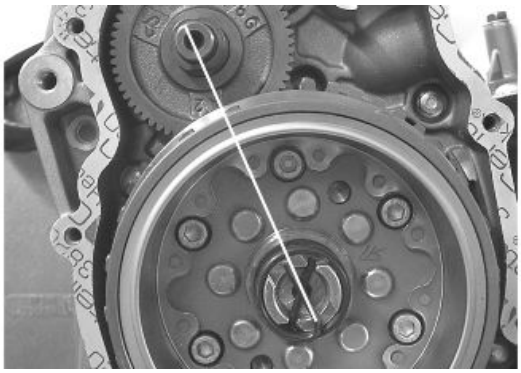
- Refit the stator and flywheel carrying out the removal procedure in reverse, tightening the retainers to the specified torque.

Locking torques (N*m)

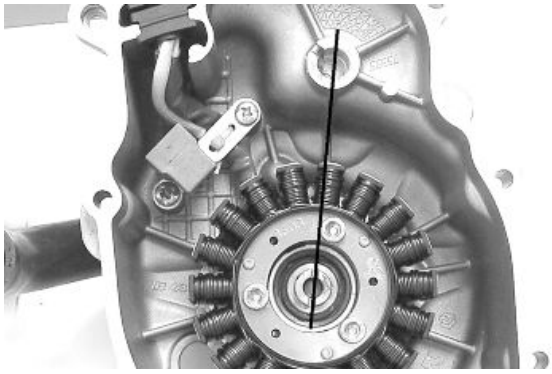
Stator assembly screws (°) 3 ÷ 4

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.

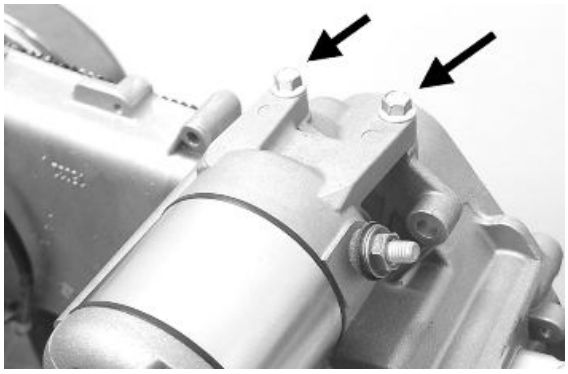
Locking torques (N*m)

Flywheel cover screws 11 - 13

Flywheel and starting

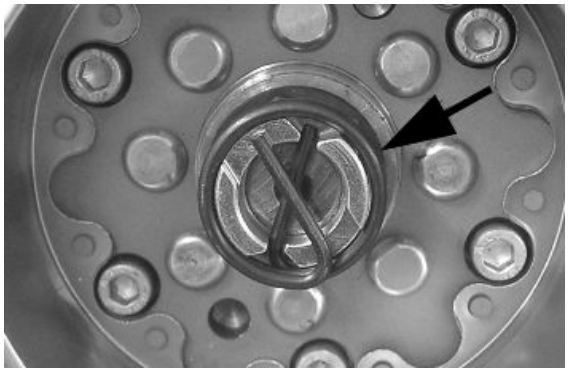
Removing the starter motor

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

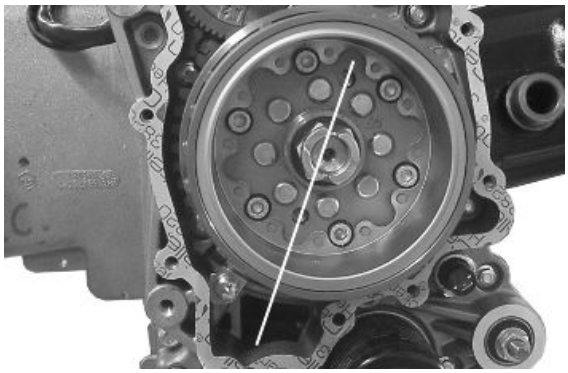


Removing the flywheel magneto

- Remove the water pump shaft and crankshaft spline clip



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



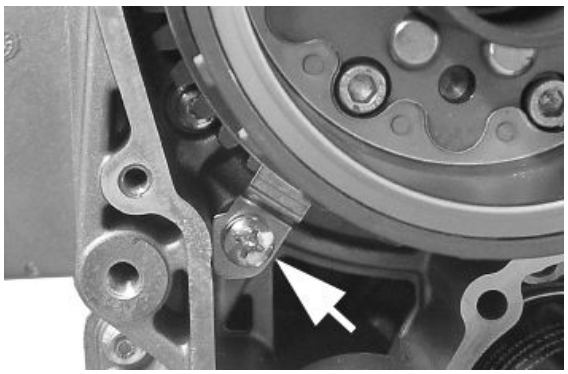
- Screw in the guide bushing that is part of the special flywheel stop tool on the flywheel as shown in the photo.

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

Specific tooling

020627Y Flywheel lock wrench

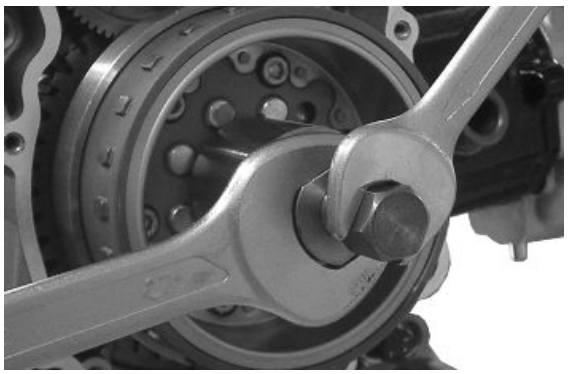
- Remove the plate indicated in the photo.



- 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 ÷ 15

- Oil the free wheel "rollers".

Refitting the flywheel magneto

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

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

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

Specific tooling

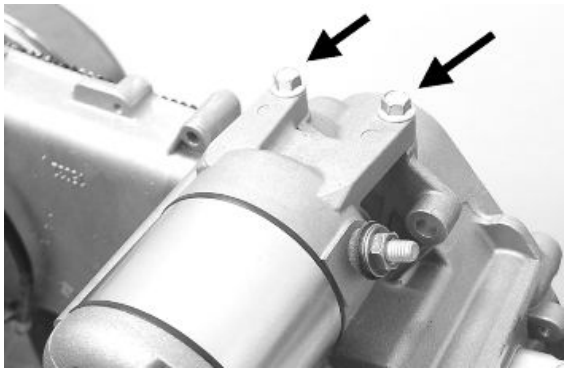
020627Y Flywheel lock wrench

Locking torques (N*m)

Flywheel nut 94 ÷ 102

Refitting the starter motor

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



Locking torques (N*m)

Starter motor screws 11 ÷ 13

Cylinder assy. and timing system

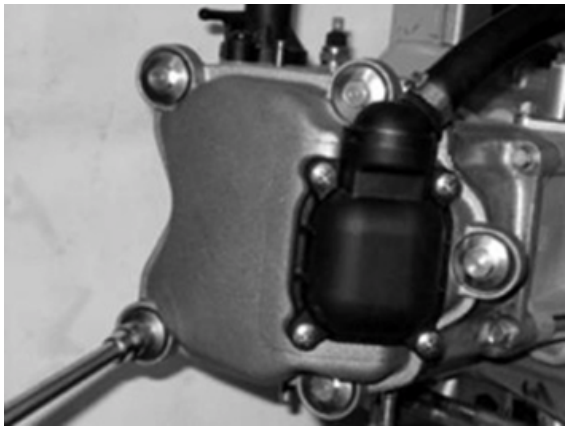
Removing the intake manifold

Loosen the three screws and remove the air intake manifold.

- When refitting, secure to the specified torque.

Removing the rocker-arms cover

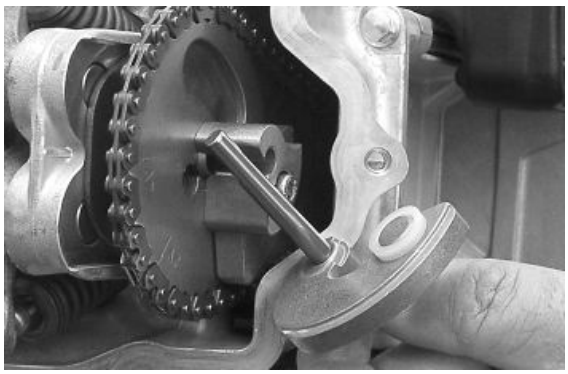
- Remove the 5 screws indicated in the figure



Removing the timing system drive

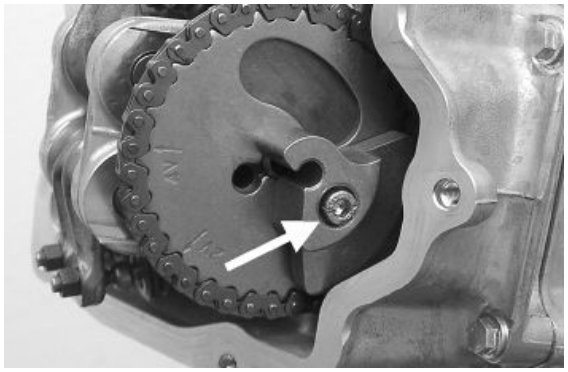
- Remove the parts listed below first: transmission cover, drive pulley with belt, oil sump with spring and by-pass piston, oil pump pulley cover, O-ring on the crankshaft and the sprocket wheel separation washer.
- Remove the tappet cover.
- Remove the central screw fastener and the automatic valve-lifter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

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



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

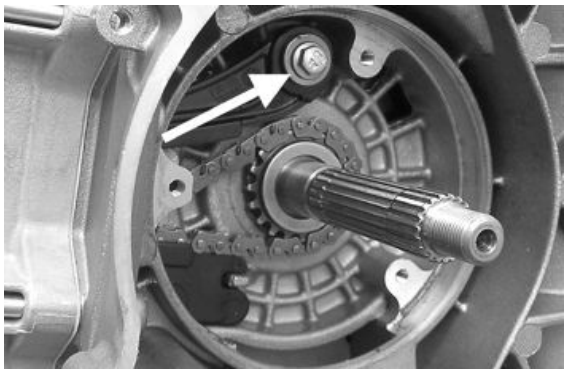
- Remove the internal hex screw and the counter-weight shown in the figure.



- 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.

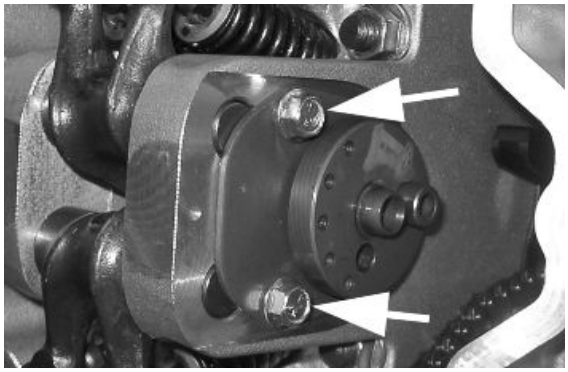
IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.

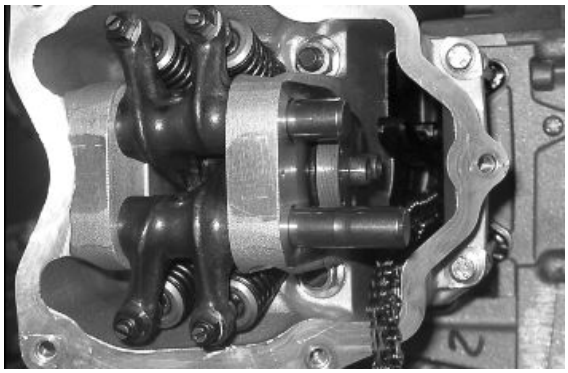
Removing the cam shaft

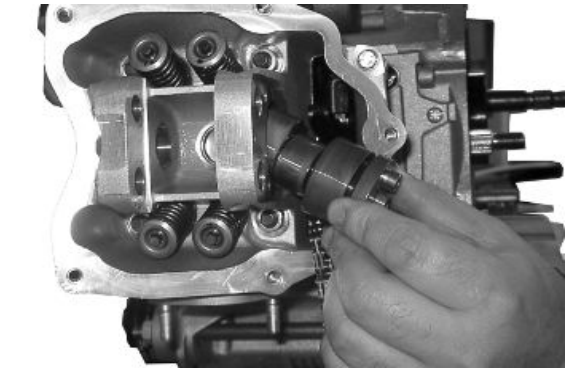
- Remove the two screws and the cam shaft retainer shown in the diagram.
- Remove the cam shaft.
- Remove the pins and the rocker arms from the flywheel side holes.

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.





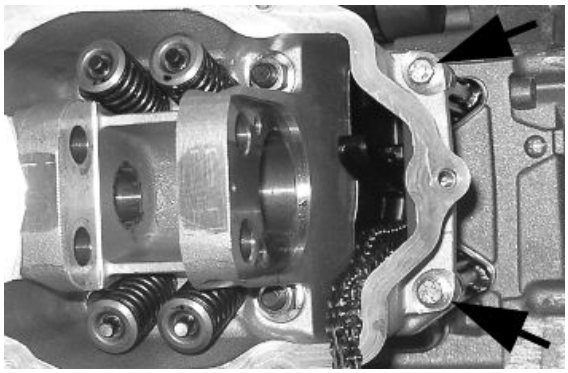


Removing the cylinder head

- 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

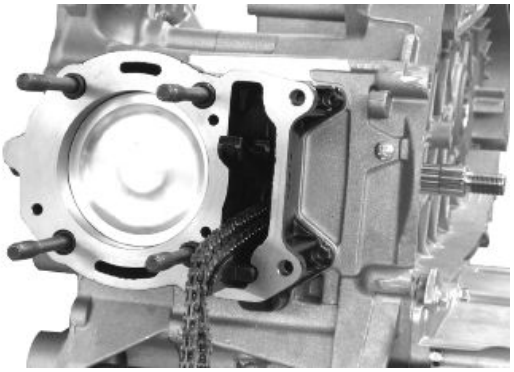
020382Y Valve cotters equipped with part 012 removal tool

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.

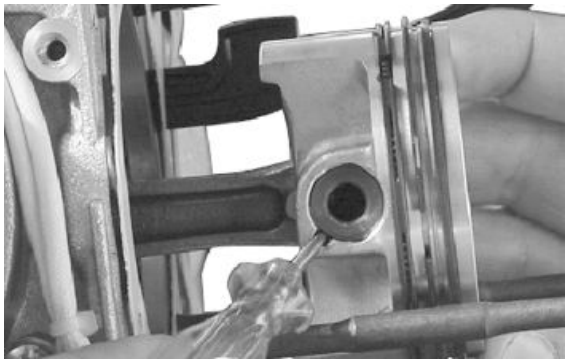


CAUTION

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

N.B.

BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.

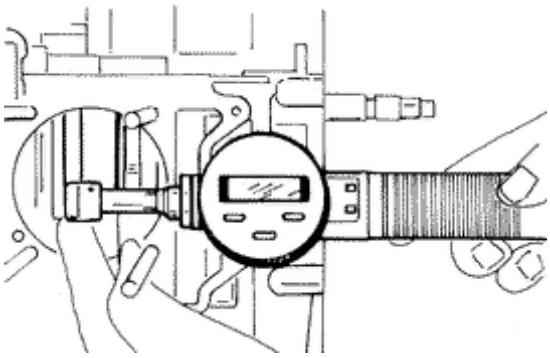


Inspecting the small end

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

N.B.

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



Characteristic

Checking the connecting rod small end: Maximum diameter

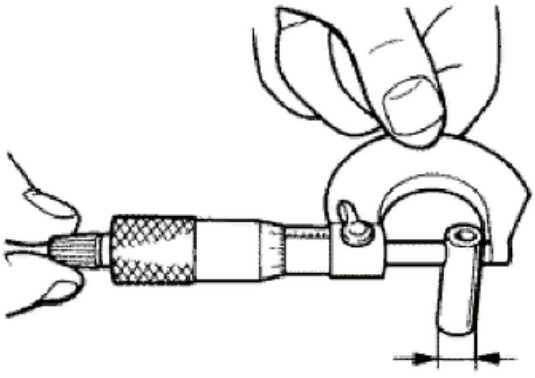
15.030 mm

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

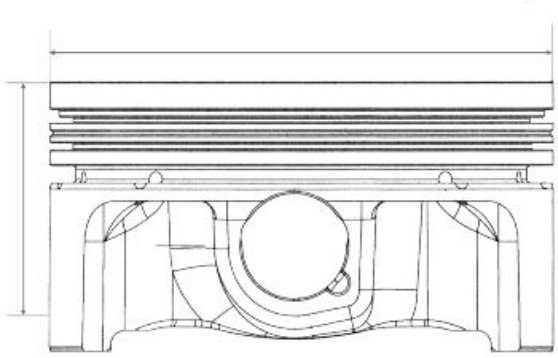
0.015 ÷ 0.029 mm

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

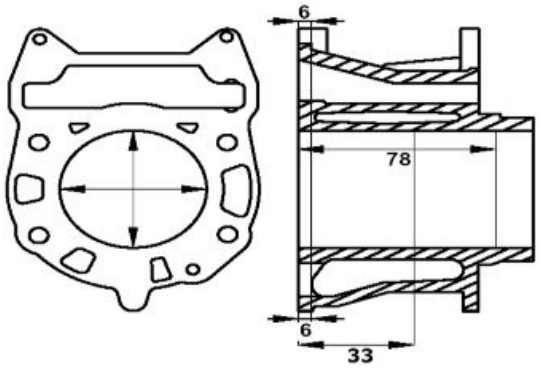
71.953 - 71.981 mm

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

Inspecting the cylinder

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



Characteristic

cylinder: standard diameter

71.990 - 72.018 mm (at 33 mm)

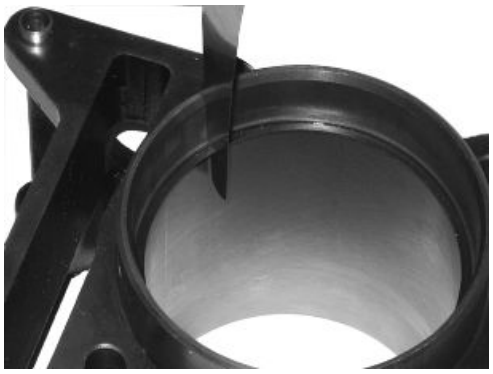
Maximum allowable run-out:

0.05 mm

Inspecting the piston rings

Sealing rings

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



N.B.

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

Characteristic

Top piston ring

Standard opening: 0.15 ÷ 0.30 mm

Middle piston ring

Standard opening: 0.20 ÷ 0.40 mm

scraper ring

Standard opening: 0.20 ÷ 0.40 mm

Removing the piston

- Install piston and wrist pin onto the connecting rod, aligning the piston arrow the arrow facing towards the exhaust.
- Fit the wrist pin 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

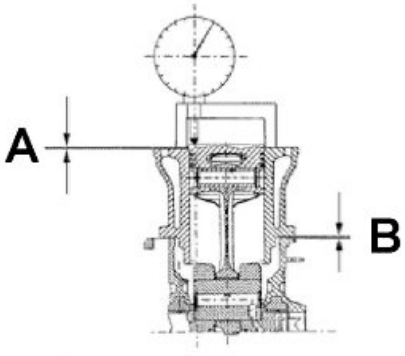
USING A HAMMER MIGHT DAMAGE THE STOPS' HOUSING.

Specific tooling

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

Choosing the gasket

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



Characteristic

Compression ratio

10.5 ÷ 11.5 : 1

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

N.B.

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

ENGINE 250 SHIMMING

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

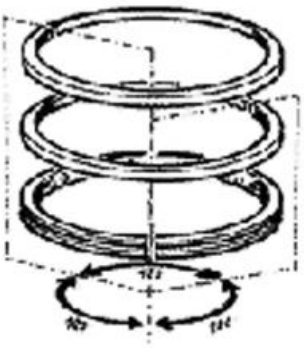
Refitting the piston rings

Fitting the sealing rings

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

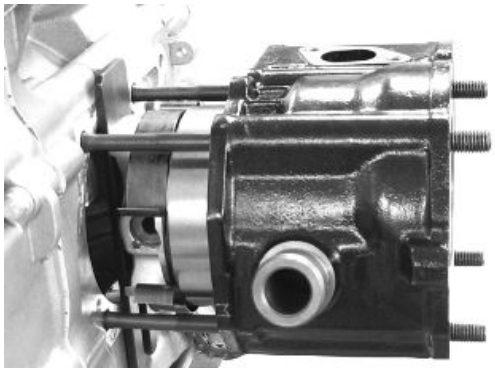
N.B.

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



Refitting the cylinder

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



N.B.

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

Specific tooling

020426Y Piston fitting fork

020393Y Piston fitting band

Inspecting the cylinder head

- Using a trued bar and feeler gauge check that the cylinder head surface is not worn or distorted. Maximum allowable run-out: 0.05 mm
- Check that the camshaft and the rocker pin capacities exhibit no wear.
- Check that the cylinder head cover surface, the intake manifold and the exhaust manifold are not worn.

Characteristic

bearing «A»

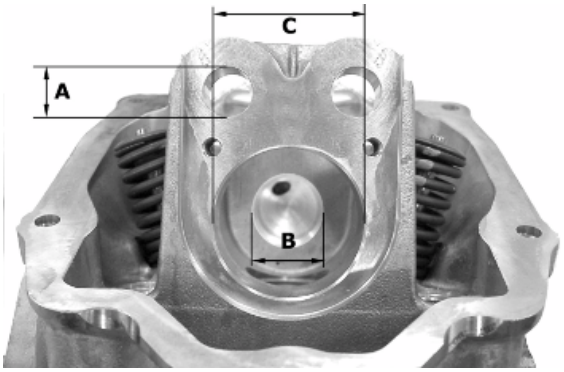
Ø 12.000 - 12.018 mm

bearing «B»

Ø 20.000 ÷ 20.021 mm

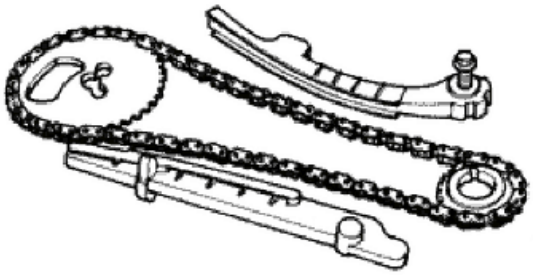
bearing «C»

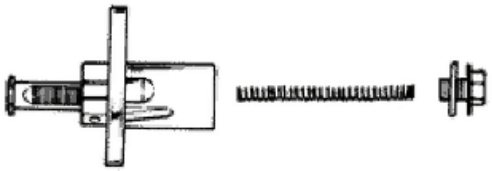
Ø 37.000 - 37.025 mm



Inspecting the timing system components

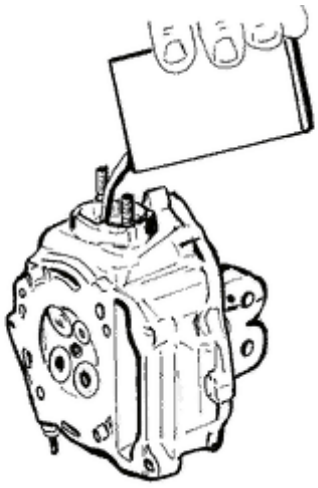
- Check that the guide shoe and the tensioner shoe are not worn out.
- Ensure that the camshaft control pulley chain assembly and the sprocket wheel are not worn.
- If you encounter wear, replace the parts or, if the chain, sprocket wheel and pulley are worn replace the whole assembly.
- Remove the centre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





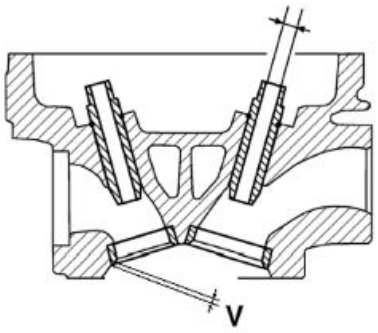
Inspecting the valve sealings

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



Inspecting the valve housings

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



Characteristic

Valve seat wear Intake guide

limit accepted: 5.022

Valve seat wear Intake guide

Standard diameter: 5.000 ÷ 5.012 mm

Valve seat wear Exhaust guide

Accepted limit 5.022

Valve seat wear Exhaust guide

Standard diameter: 5.000 ÷ 5.012 mm

Inspecting the valves

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

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

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

CAUTION

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

Characteristic

Valve wear check Standard: Intake and exhaust:

0.99 - 1.27 mm

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

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

CAUTION

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

N.B.

DO NOT CHANGE THE POSITIONS THE VALVES ARE FITTED IN

Characteristic

Valve check standard length

Outlet: 94.4 mm

Valve check standard length

Inlet: 94.6 mm

Valve check Maximum admissible clearance

Outlet: 0.072 mm

Valve check Maximum admissible clearance

Inlet: 0.062 mm

Valve check standard clearance

Outlet: 0.025 ÷ 0.052 mm

Valve check standard clearance

Inlet: 0.013 ÷ 0.040 mm

Valve check Minimum admissible diameter

Outlet: 4.95 mm

Valve check Minimum admissible diameter

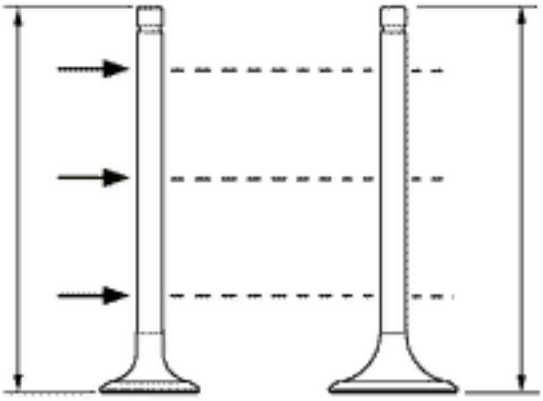
Inlet: 4.96 mm

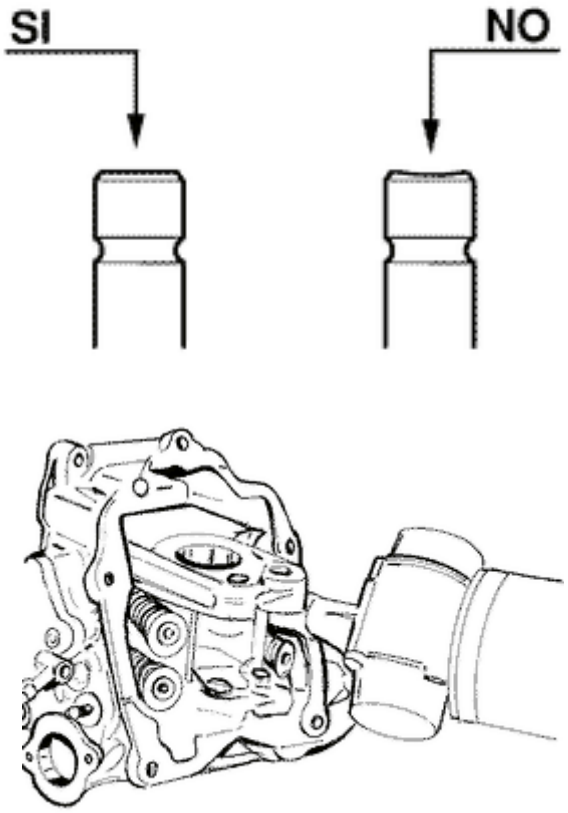
Valve check Standard diameter:

Inlet: 4.972 ÷ 4.987 mm

Valve check Standard diameter:

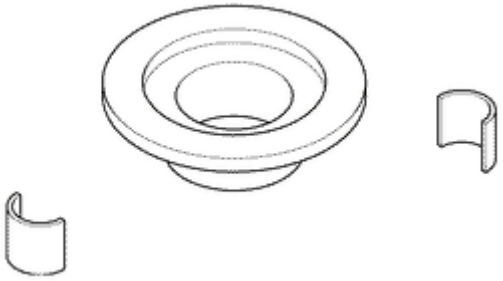
Outlet: 4.96 ÷ 4.975 mm





Inspecting the springs and half-cones

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



Refitting the valves

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

N.B.

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

Specific tooling

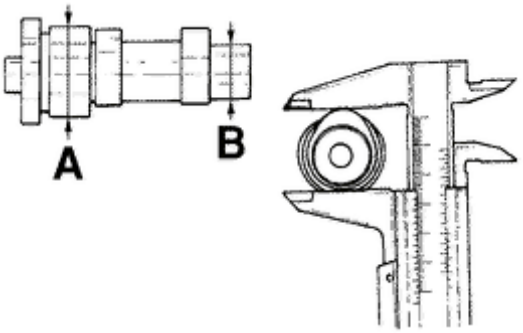
020306Y Punch for assembling valve seal rings

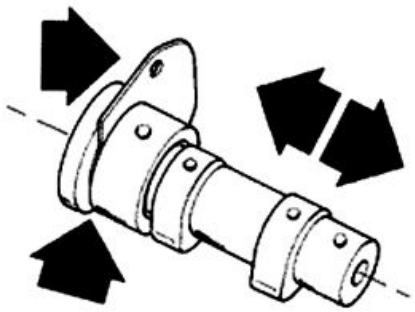
020382Y Valve cotters equipped with part 012 removal tool

020382Y011 adapter for valve removal tool

Inspecting the cam shaft

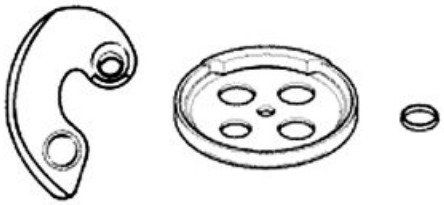
- Inspect the cam shaft for signs of abnormal wear on the cams.
- Check the cam height.
- Check there is no wear on the cam shaft retaining plate and its associated groove on the cam shaft.
- If any of the above dimensions are outside the specified limits, or there are signs of excessive wear, replace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





- Measure the internal diameter of each rocker arm.

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



Characteristic

Internal rocker arm diameter: Standard diameter

Diameter 12.000 - 12.011 mm

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

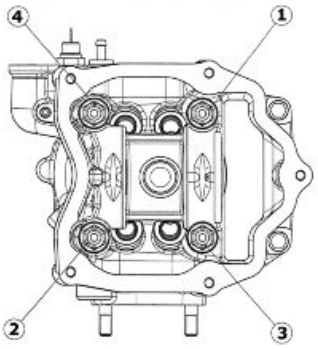
Bearing B diameter: 19.959 ÷ 19.98 mm

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.



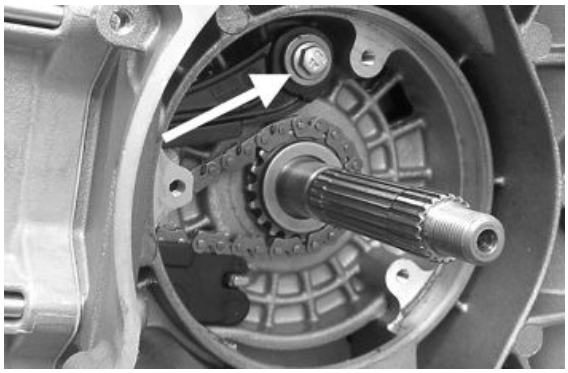
N.B.

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 ÷ 13

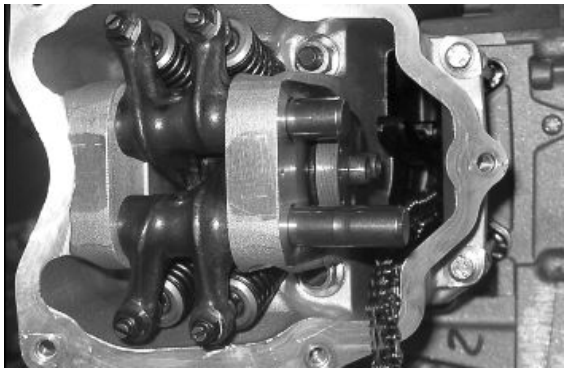
- Refit the lower timing chain sprocket wheel on the crankshaft, with the chamfer facing the insertion side.
- Loop the timing chain around the sprocket on the crankshaft.
- Fit the chain tensioner slider from the cylinder head side.
- Fit the spacer and the screw fastener.
- Tighten the screws to the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

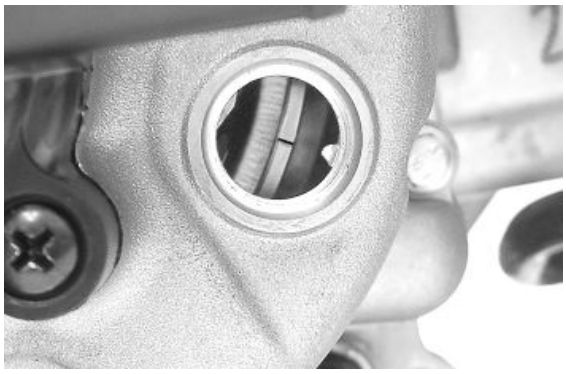


- Lubricate the 2 bearings and insert the cam shaft in the cylinder head with the cams corresponding to the rockers.
- Insert the retention plate and tighten the two screws shown in the figure to the prescribed torque.
- Refit the spacer on the cam shaft.
- Rotate the engine so that the piston is at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

Electrode distance 0.8 mm

N.B.

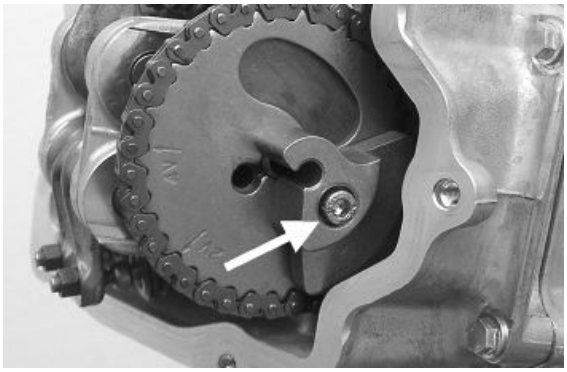


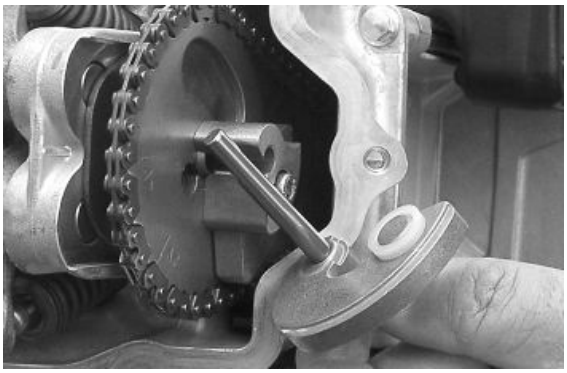


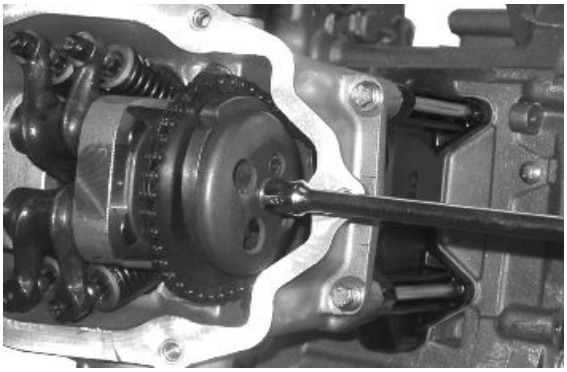
GREASE THE END STOP RING TO PREVENT IT COMING OUT AND FALLING INTO THE ENGINE.

Locking torques (N*m)

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





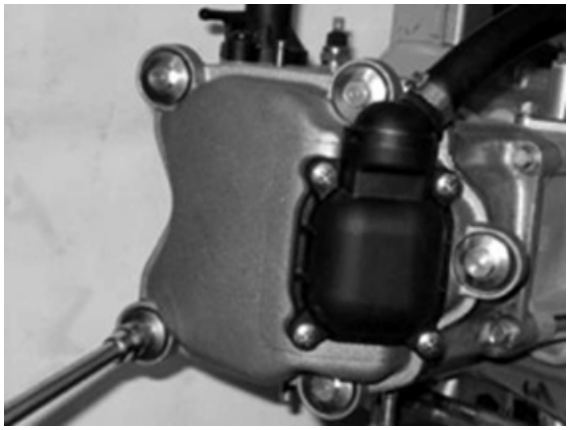


Refitting the rocker-arms cover

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

Locking torques (N*m)

Tappet cover screws 6 - 7 Nm



Refitting the intake manifold

Fit the intake manifold and do up the three screws.

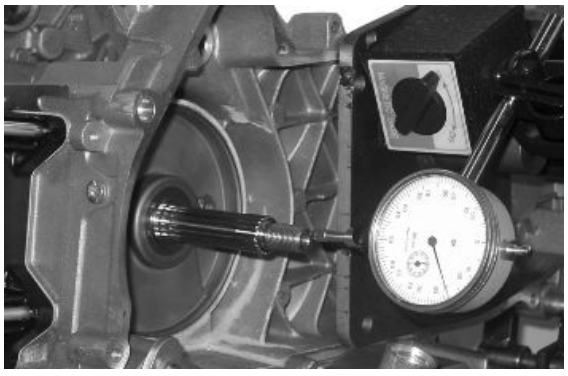
Locking torques (N*m)

Inlet manifold screws 11 ÷ 13

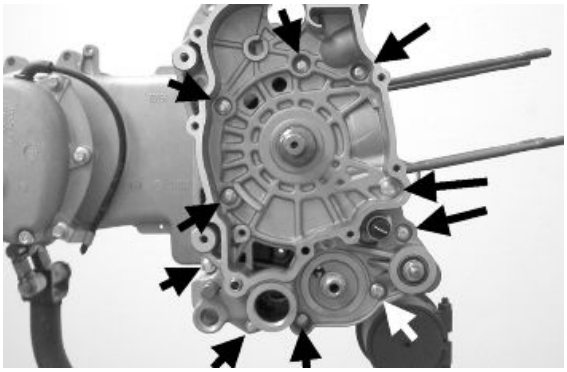
Crankcase - crankshaft

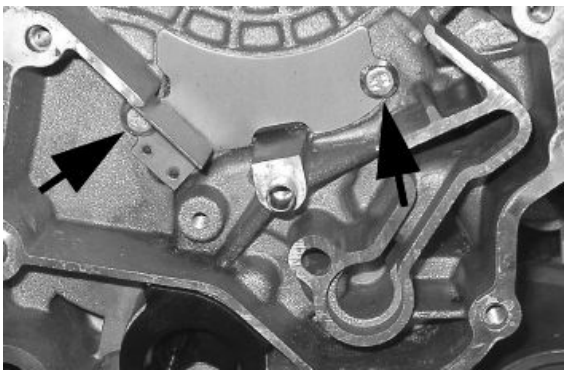
Splitting the crankcase halves

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



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





CAUTION

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

CAUTION

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

CAUTION

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

N.B.

WHEN MEASURING THE WIDTH OF THE CRANKSHAFT, MAKE SURE THAT THE MEASUREMENTS ARE NOT MODIFIED BY THE RADIUSES 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

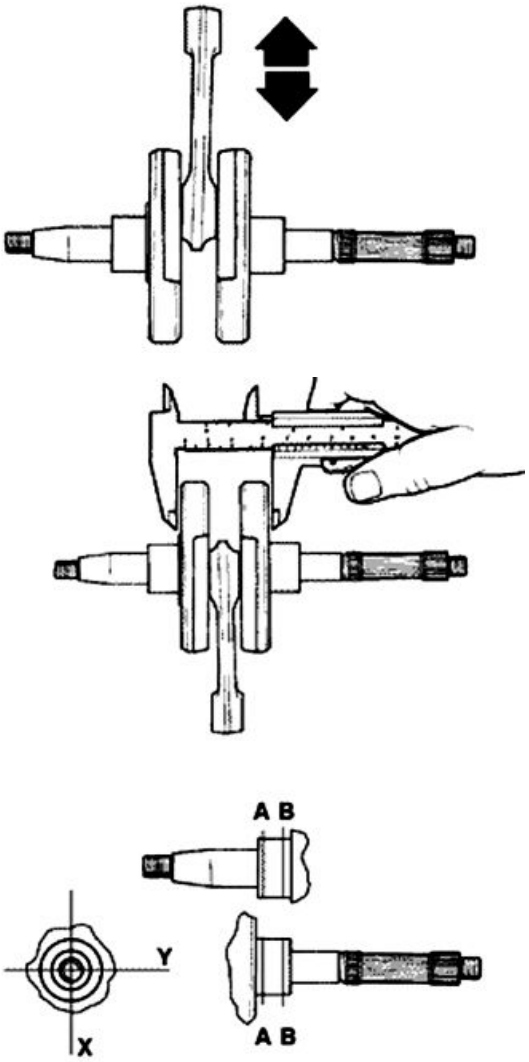
55.67 ÷ 55.85 mm

Crankshaft bearings: Standard diameter: Cat. 1

28.994 ÷ 29.000

Crankshaft bearings: Standard diameter: Cat. 2

29.000 ÷ 29.006

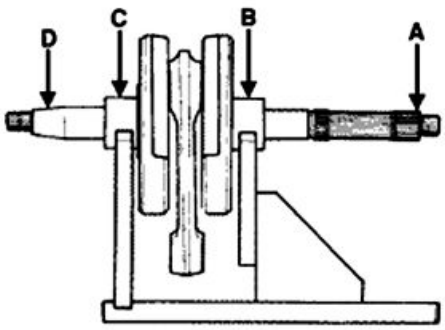


Inspecting the crankshaft alignment

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

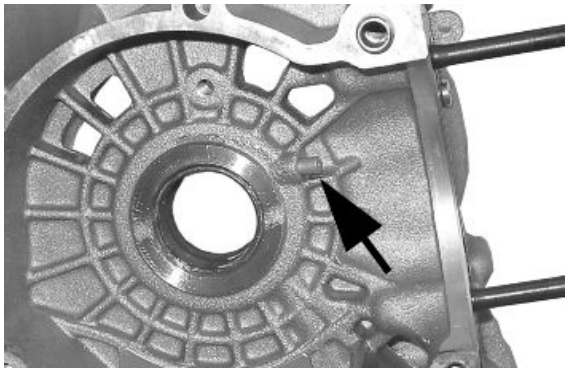
Off-line maximum admitted

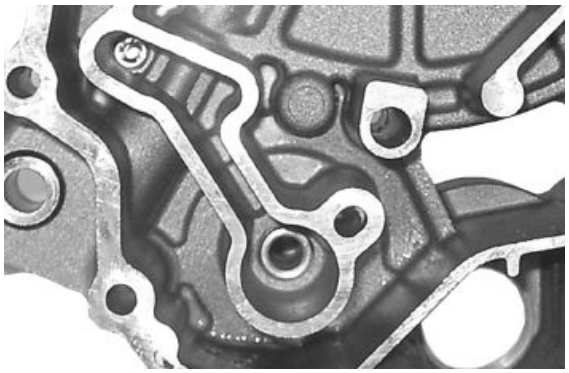
A = 0.15 mm

B = 0.01 mm
C = 0.01 mm
D = 0.10 mm

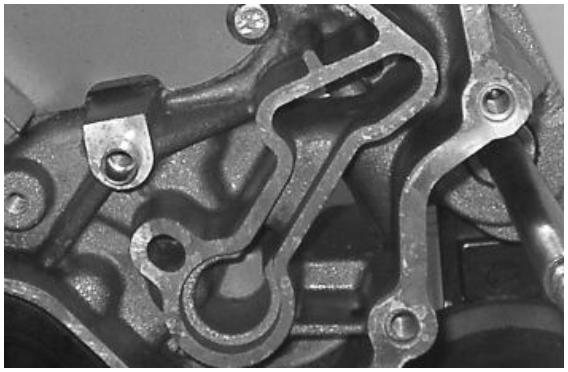
Inspecting the crankcase halves

- 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

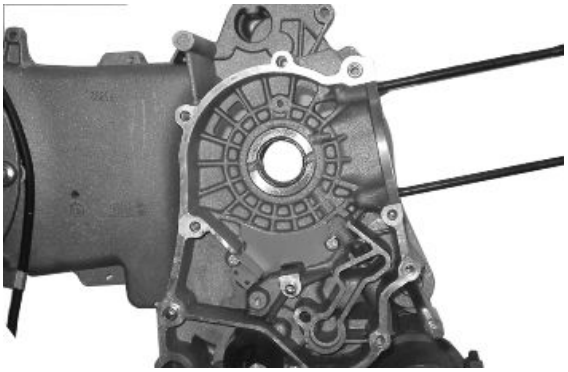
- T

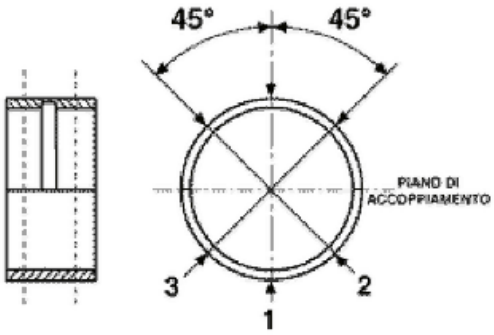
o obtain a good bushing lubrication it is necessary to have both an optimal lubricating pressure (3,2 bar) and a good oil flow rate; the bushings must be correctly positioned so as not to obstruct the oil supply channels.

- 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" - YELLOW
Main half-bearing	1.970 ÷ 1.973	1.9703 ÷ 1.976	1.976 ÷ 1.979

Bushing category	Crankcase halves category	Internal bushing diameter after fitting	Possible fitting
A	1	29.025 ÷ 29.040	Original
B	1	29.019 ÷ 29.034	Original and 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

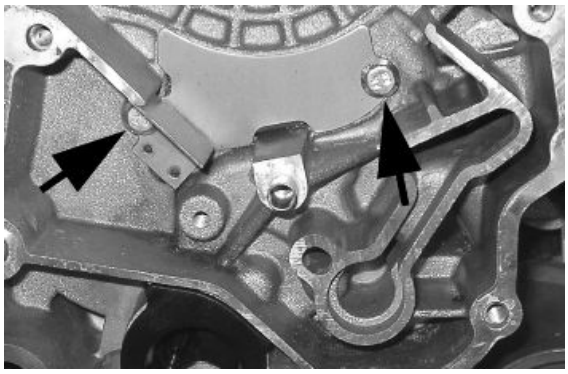
1.35 ÷ 1.6

Diameter of crankcase without bushing

32.953 ÷ 32.963

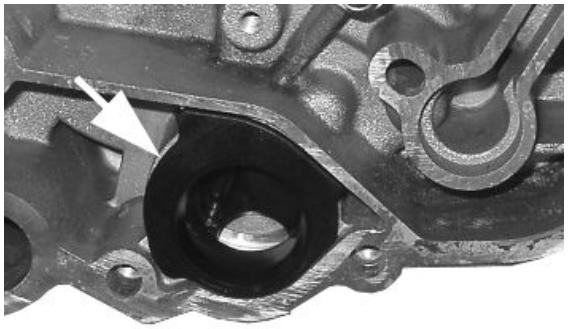
Refitting the crankcase halves

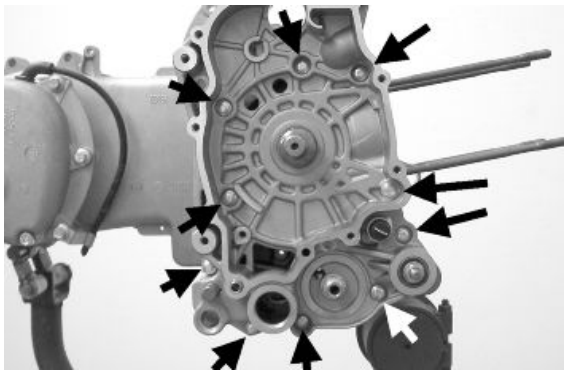
- Fit the internal bulkhead by locking the two screws to the prescribed torque.
- Fit the oil filter fitting and tighten it to the specified torque.
- Position the oil pre-filter element as shown in the photograph.
- Place a new gasket on one of the crankcase halves, preferably on the transmission side, 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)

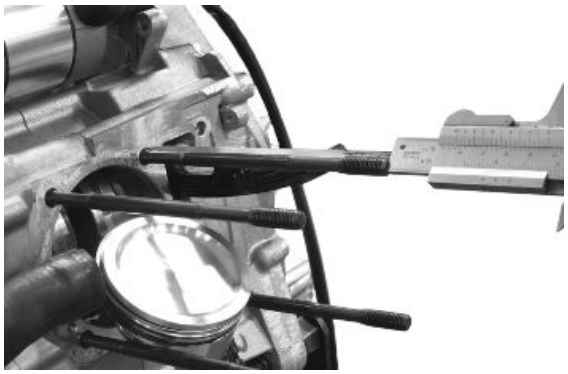
Internal engine crankcase bulkhead (transmission-side half shaft) screws 4 ÷ 6 Engine-crankcase coupling screws 11 ÷ 13 Oil filter on crankcase fitting 27 ÷ 33 Engine oil drainage plug/mesh filter 24 ÷ 30





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.

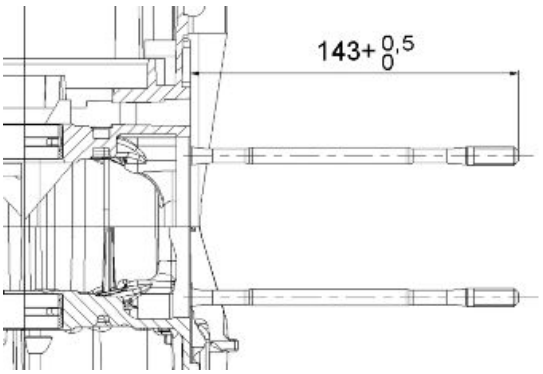


By working on two fitted cylinder head fixing nuts, nut and lock nut, as shown in the photograph, remove the stud bolt from its seat.

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

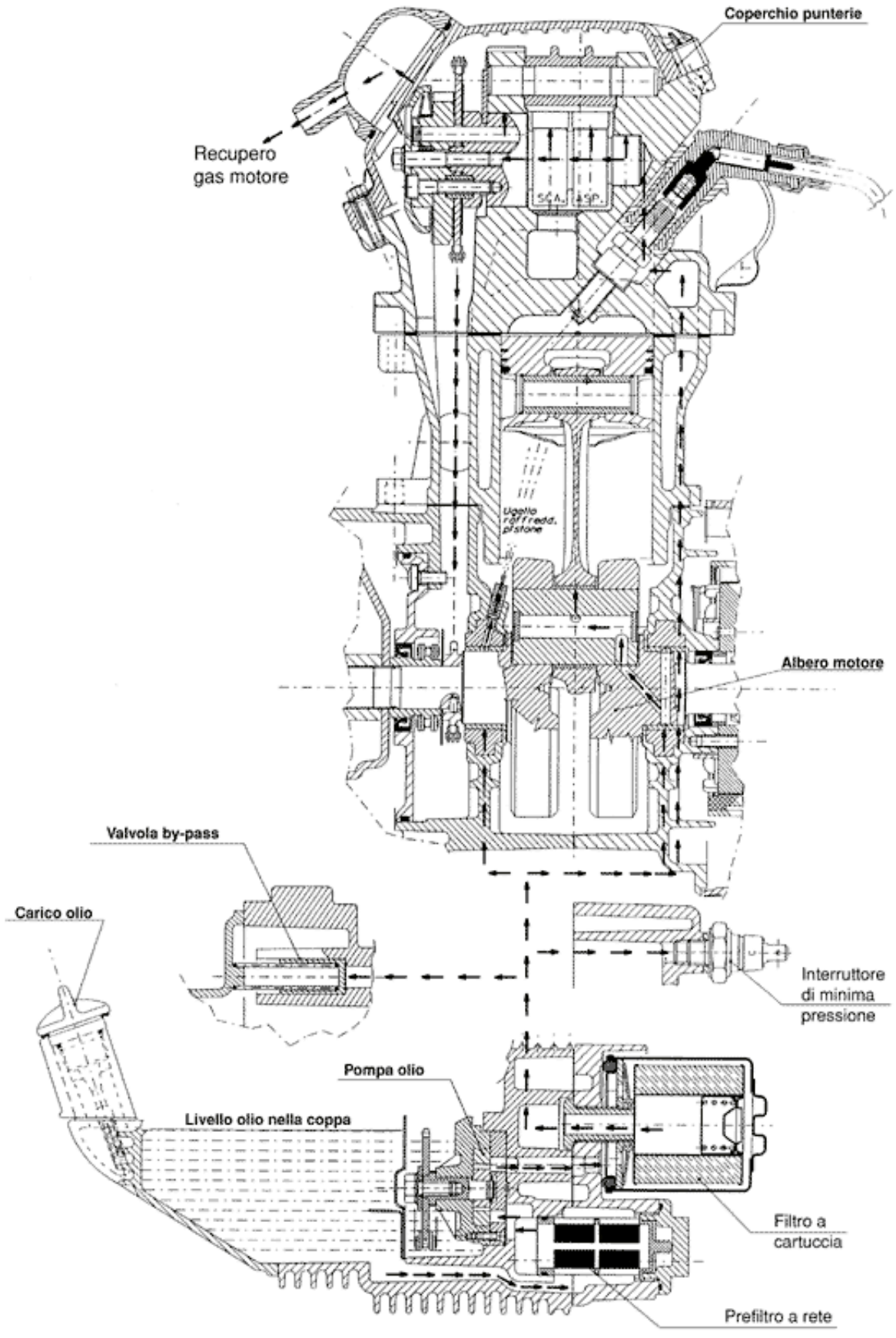
Loctite 'Quick Set' Strong 270 threadlock

Strong 270 threadlock

Lubrication

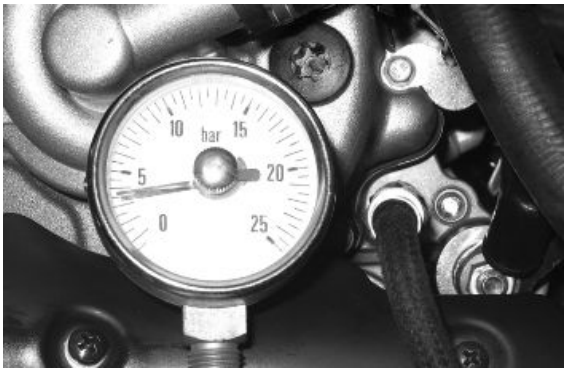
Conceptual diagrams

LUBRICATION CIRCUIT


Coperchio punterie
Recupero
gas motore
Albero motore
Valvola by-pass
Carico olio
Interruttore
di minima
pressione
Pompa olio
Livello olio nella coppa
Filtro a
cartuccia
Prefiltro a rete

Oil pressure check

- Disconnect the electrical minimum oil pressure connection and remove the switch.
- Check the oil pressure reading is between 0.5 and 1.2 atm with the engine idling at 1650 rpm and the oil at the required temperature (wait for at least one electric ventilation).
- Check the oil pressure is between 3.2 and 4.2 atm with the engine running at a speed 6000 rpm and the oil at the required temperature.
- Remove the appropriate tools once the measurement is complete, refit the oil pressure switch and washer, tightening it to the specified torque and fit the fan cover.
- If the oil pressure is 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.

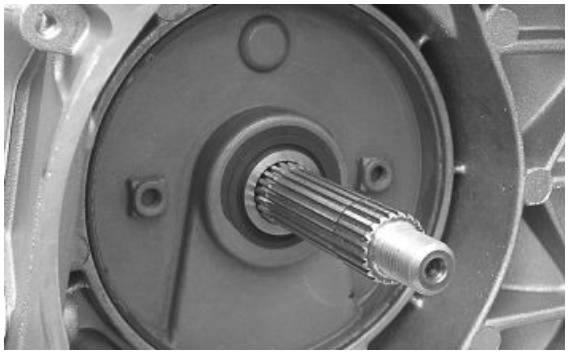
Locking torques (N*m)

Minimum oil pressure sensor 12 ÷ 14

Crankshaft oil seals

Removal

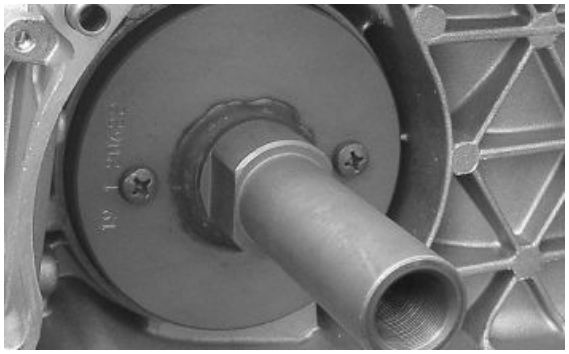
- Remove the transmission cover and the complete driving pulley beforehand



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

Specific tooling

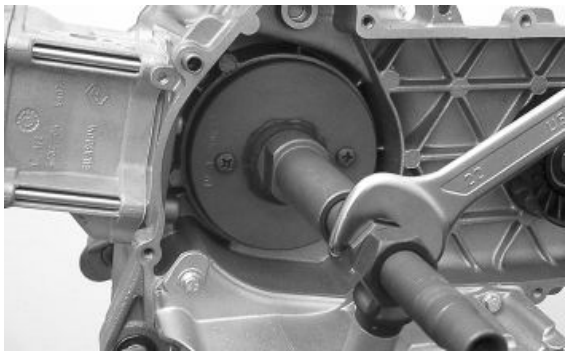
020622Y Transmission-side oil guard punch



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

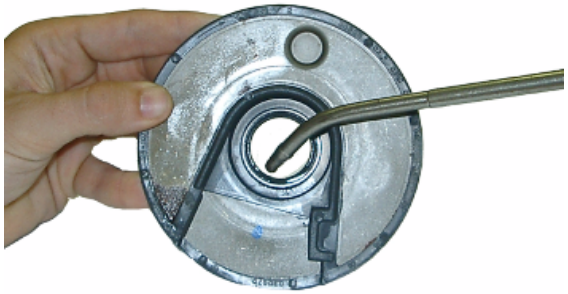
Specific tooling

020622Y Transmission-side oil guard punch

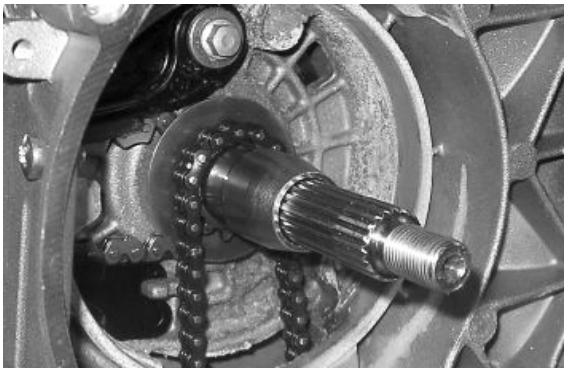


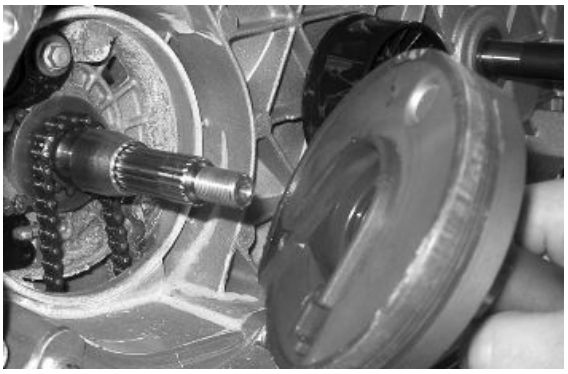
Refitting

- 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



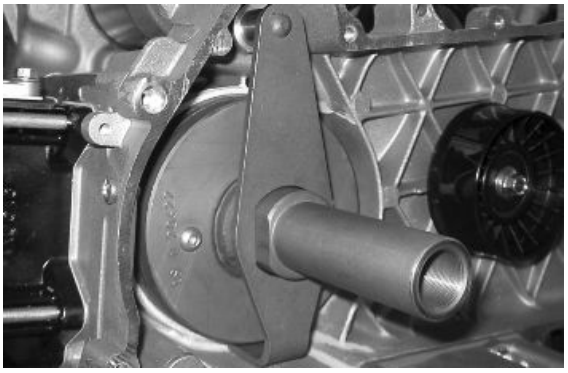


CAUTION

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.

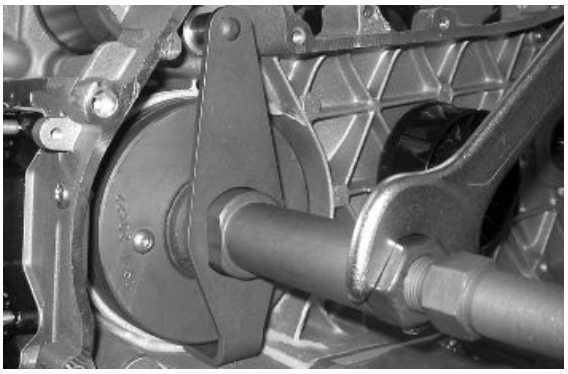


CAUTION

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

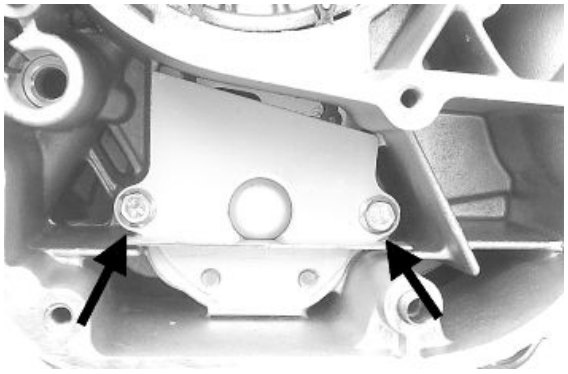
020622Y Transmission-side oil guard punch



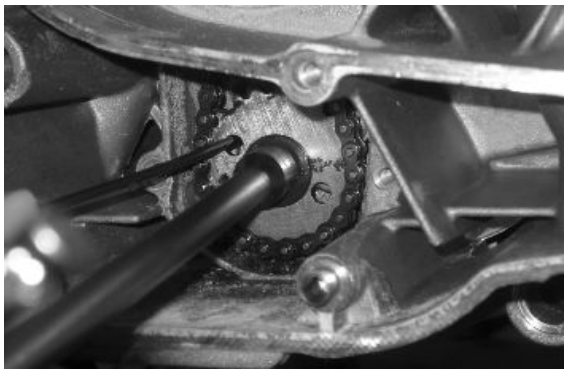
Oil pump

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.

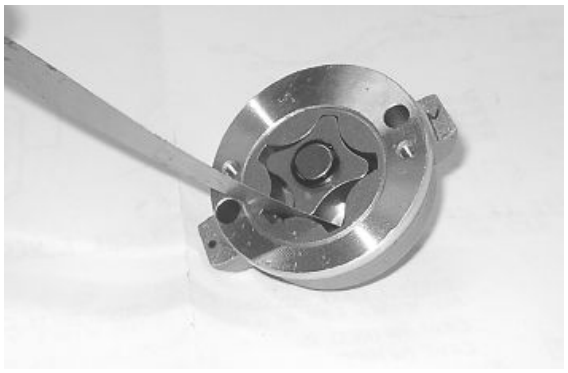


N.B.

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.

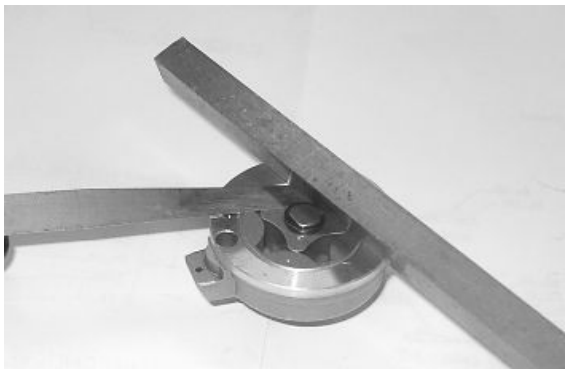
Characteristic

Axial rotor clearance

Limit values admitted: 0.09 mm

Distance between the outer rotor and the pump body

Admissible limit clearance: 0.20 mm

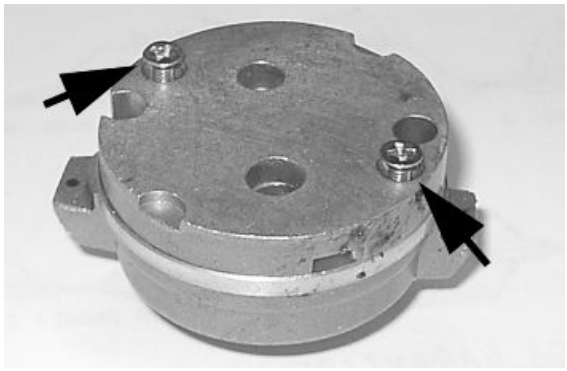


Distance between the rotors

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.

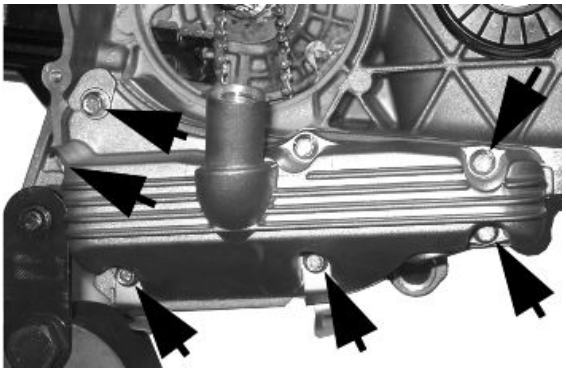
FIT THE BELLEVILLE WASHER SO THAT ITS OUTER RIM TOUCHES THE PULLEY. MAKE SURE THAT THE PUMP TURNS FREELY.

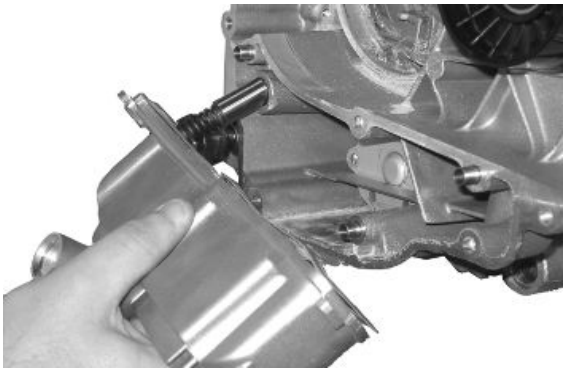
Locking torques (N*m)

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

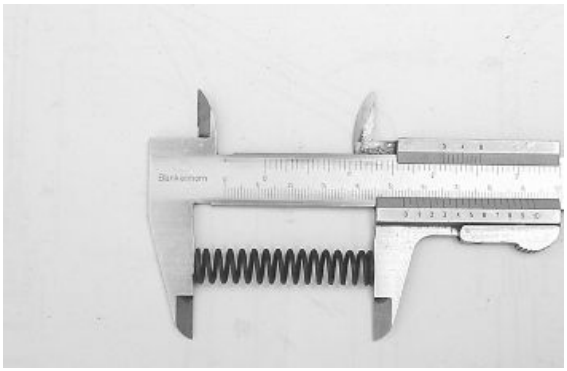
- Remove the oil filler plug, the transmission cover, the complete driving pulley assembly with belt and the sprocket wheel, as described in the "Transmission" chapter.
- Drain the oil as described previously.
- Remove the seven screws, shown in the diagram, and the two rear brake fluid pipe fixing brackets.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

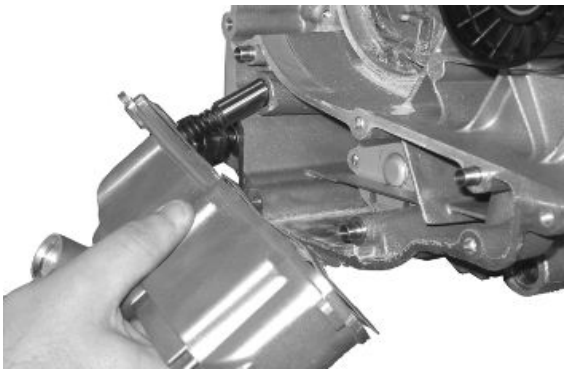
By-pass check up: Standard length

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.

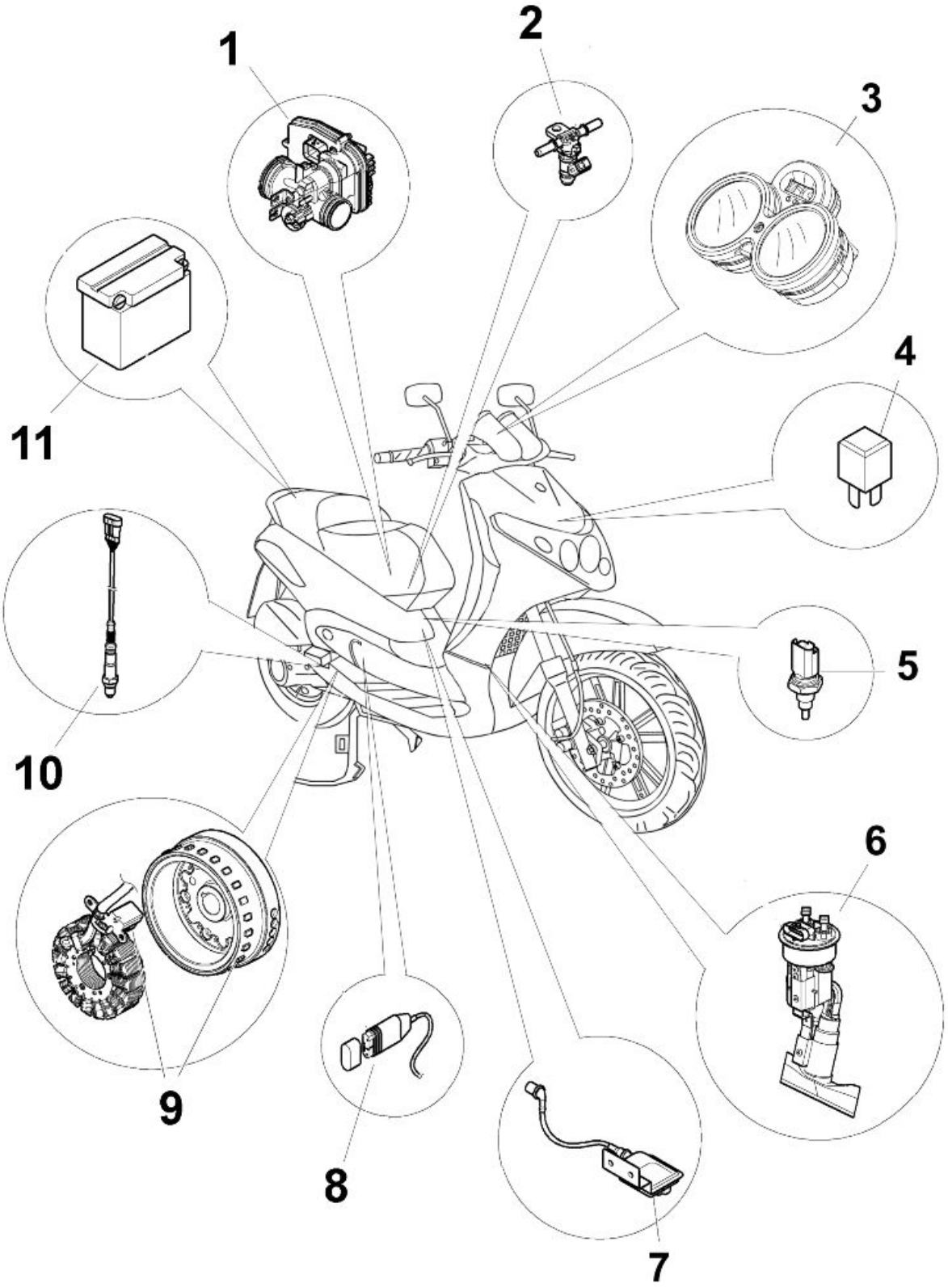
- When testing the lubrication system, refer to chapter "Crankcase and Crankshaft", regarding lubrication of the crankshaft and connecting rod



Locking torques (N*m)

Oil sump screws 10 ÷ 14

INDEX OF TOPICS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TRANSPARENCY1

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

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 MIUIf 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%.

---

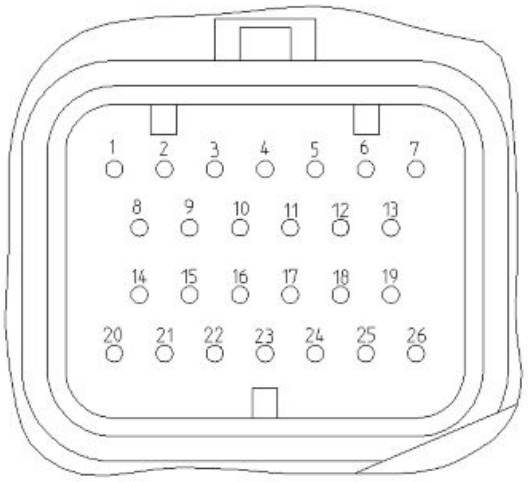
1. Before fixing any part of the injection system, check to see if there are any registered faults. Do not disconnect the battery before checking for faults.
2. The fuel feed system is pressurised at 250 kPa (2.5 BAR). Before disconnecting the quick coupler of a pipe in the fuel supply system, check 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.

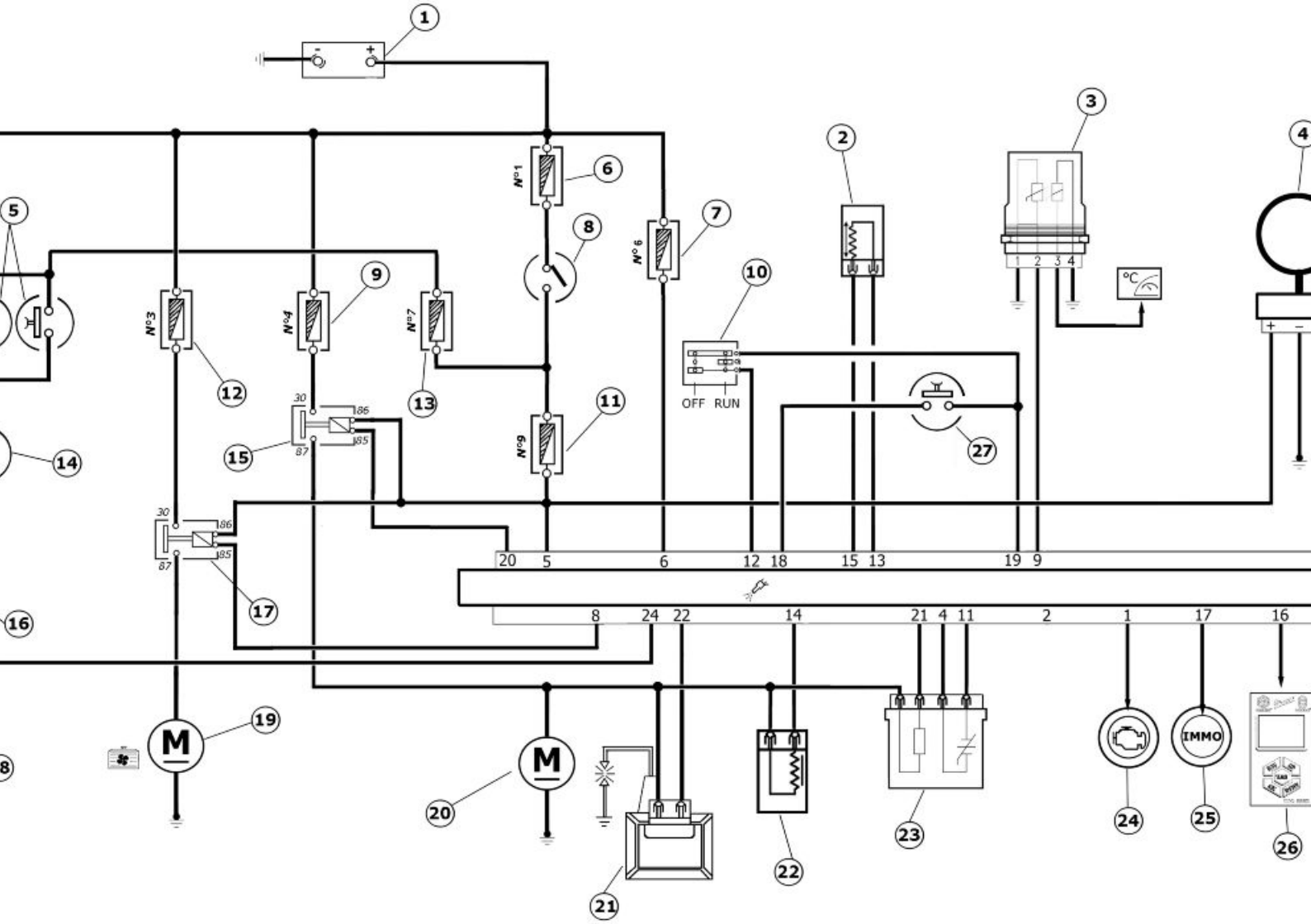
Terminals setup



TERMINAL LAYOUT

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

EMS circuit diagram



SYSTEM SCHEMATIC

	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Engine rpm sensor	
3	Water temperature sensor	
4	Immobilizer aerial	
5	Stop button	
6	Fuse	30 A
7	Fuse	3 A
8	Key switch contacts	
9	Fuse	10 A
10	Engine stop switch	
11	Fuse	7.5 A
12	Fuse	15A

	Specification	Desc./Quantity
13	Fuse	7.5 A
14	Starter button	
15	Injection load remote control	
16	Starter remote control	
17	Electric fan starter	
18	Starter motor	
19	Electric fan	
20	Fuel pump	
21	HV coil	
22	Fuel injector	
23	Lambda sensor	
24	"WARNING" light	
25	Immobilizer LED	
26	Diagnostics socket connector	
27	Stand switch	

Troubleshooting procedure

Engine does not start

ENGINE DOES NOT START IF ONLY PULLED

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

Possible Cause	Operation
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 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

Possible Cause	Operation
	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 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

Possible Cause	Operation
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

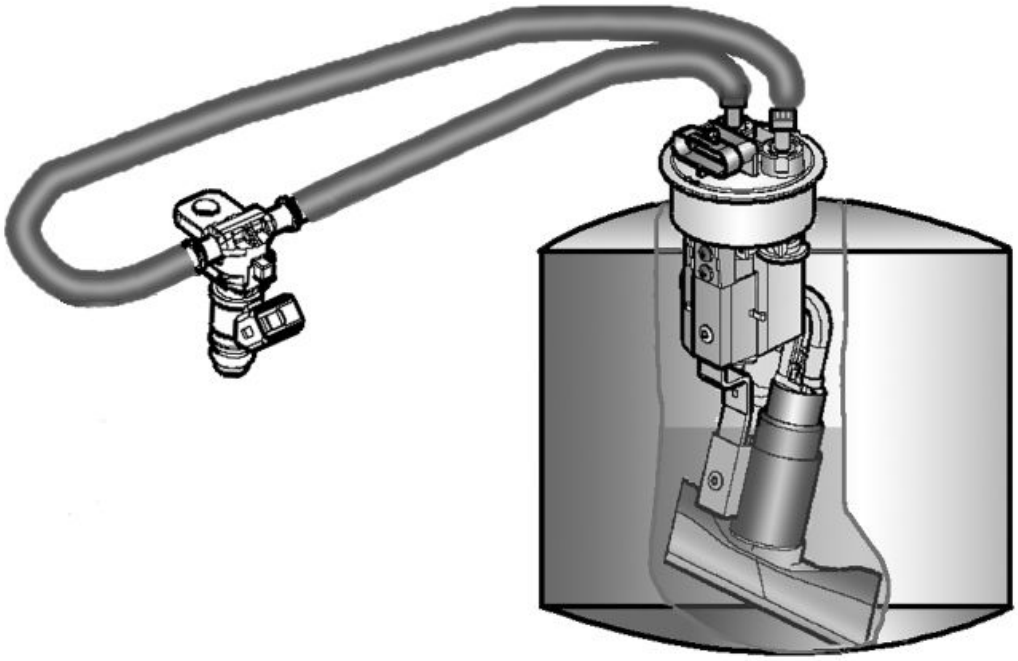
Possible Cause	Operation
	Air temperature Coolant temperature Lambda sensor
Ignition efficiency	Spark plug
Parameter reliability	Throttle valve position signal Coolant temperature indicator Intake air temperature indicator Ignition advance
Intake system seal	Intake sleeve Filter box
TPS reset successful	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.

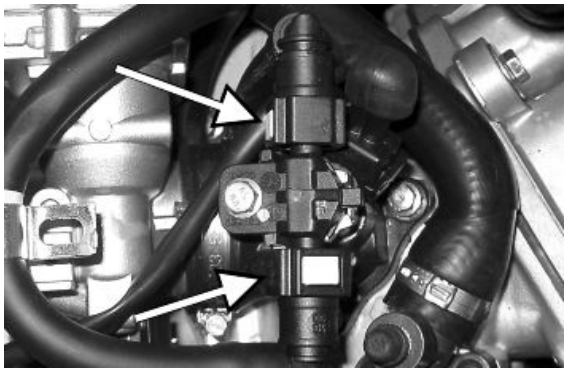
The pressure is controlled by the pressure regulator situated in the pump assembly in the tank.



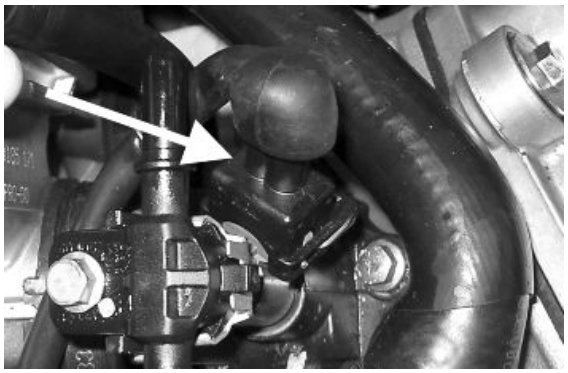
Removing the butterfly valve

Remove the fuel piping clamping screw indicated in the figure.

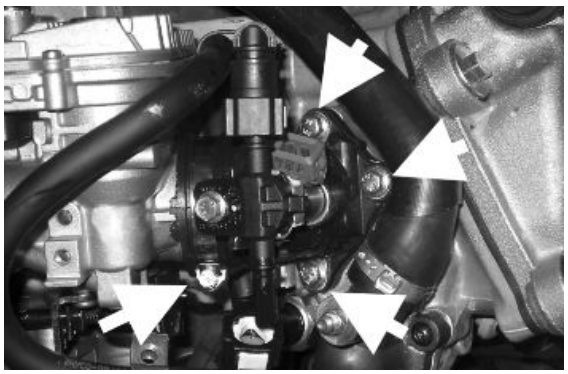
Remove the snap-on fittings from the injector support



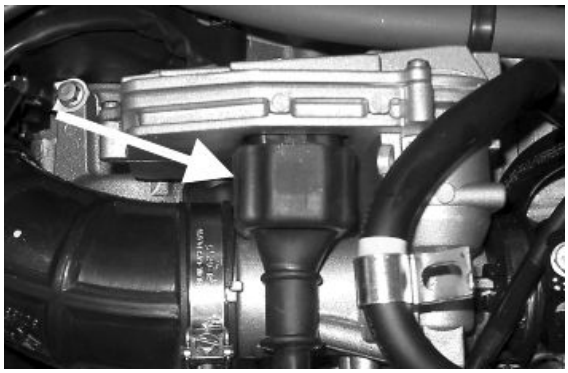
Remove the injector connector



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

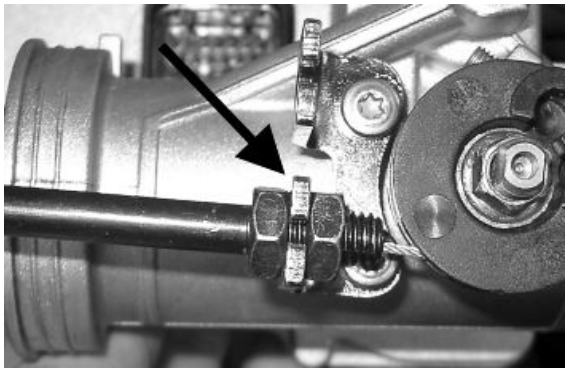


Remove the MIU connector



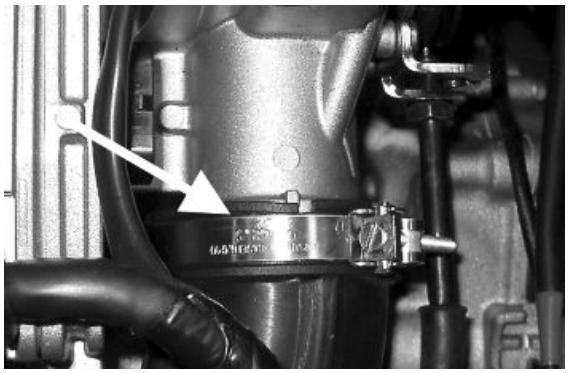
Remove the clip fixing the throttle body to the purifier bellows

Remove the gas command fitting as indicated in the photograph

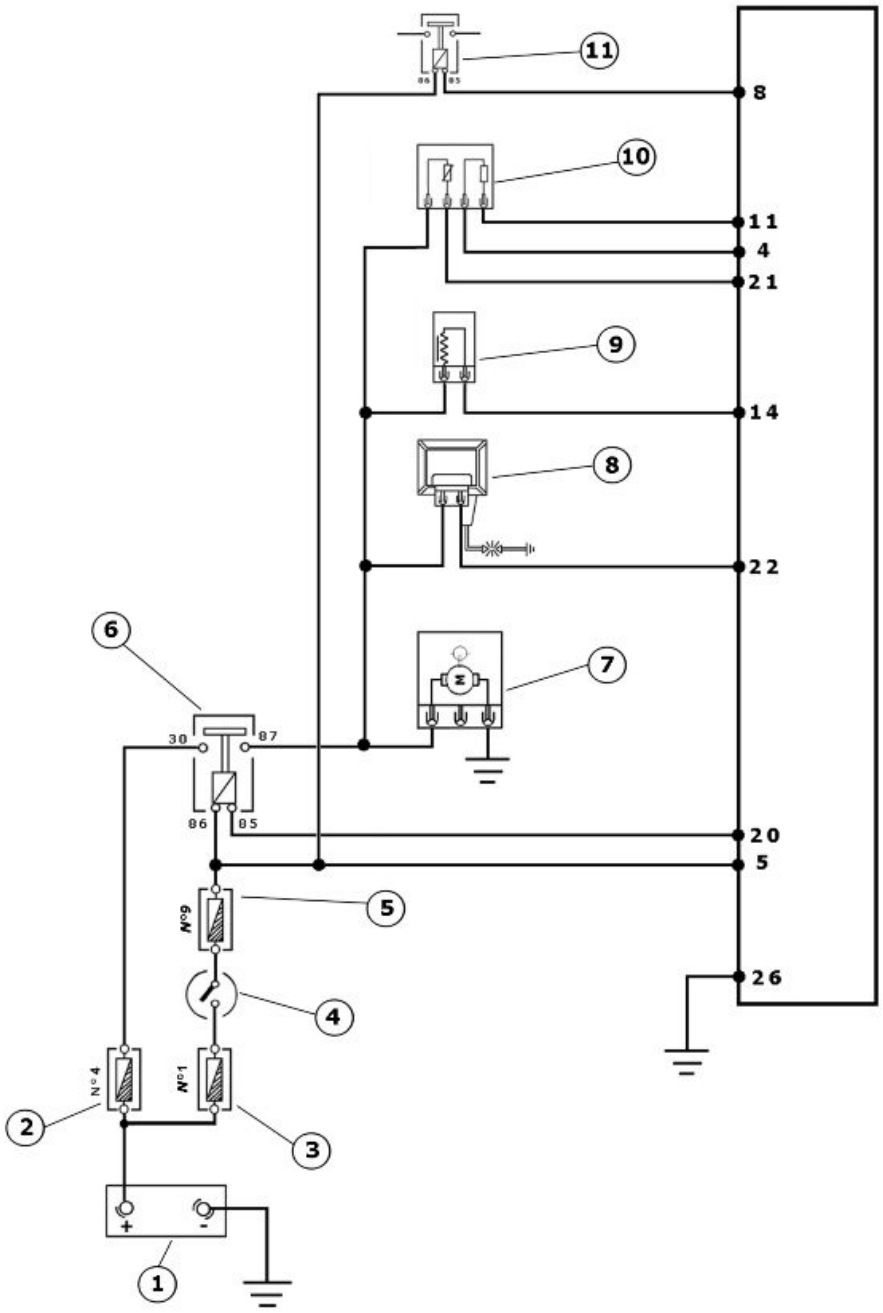


Refitting the butterfly valve

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	10 A
3	Fuse	30 A
4	Key switch contacts	
5	Fuse	7.5 A
6	Injection load remote control	
7	Fuel pump	
8	HV coil	

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

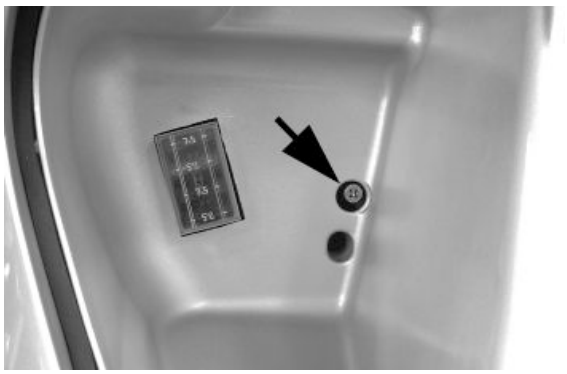
When switched to "ON", the fuel pump starts to rotate for two seconds and then stops. When the engine starts up, in the presence of rpm timing signal the pump is continuously supplied.

ELECTRICAL DATA

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

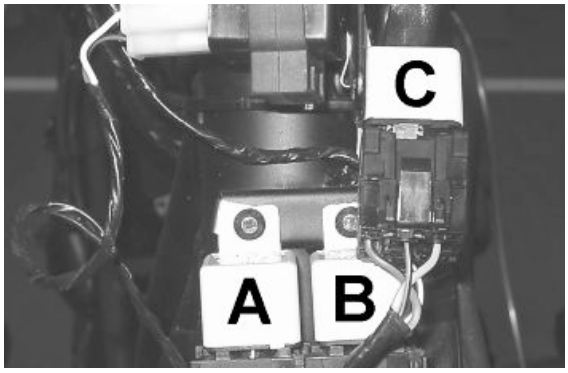
Check the efficiency of 10 A fuse N° 4 injection load .

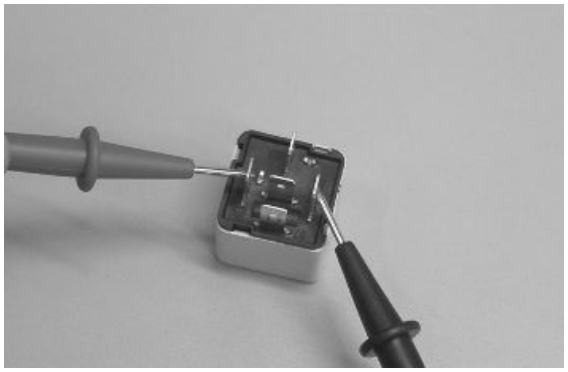
Check the efficiency of 7.5 A fuse No. 9 key-controlled control unit power supply.



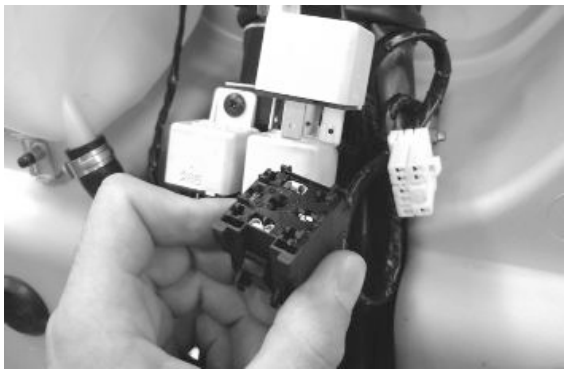
Check the efficiency of the injection load remote control: Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm

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



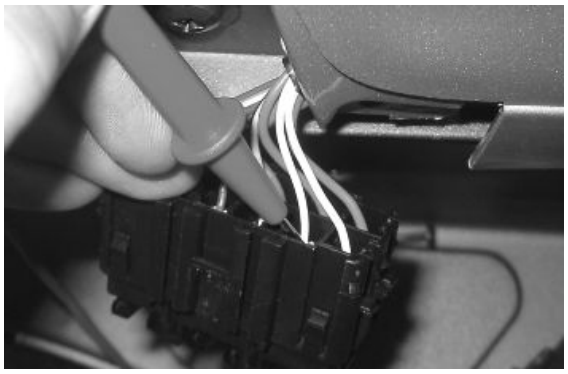


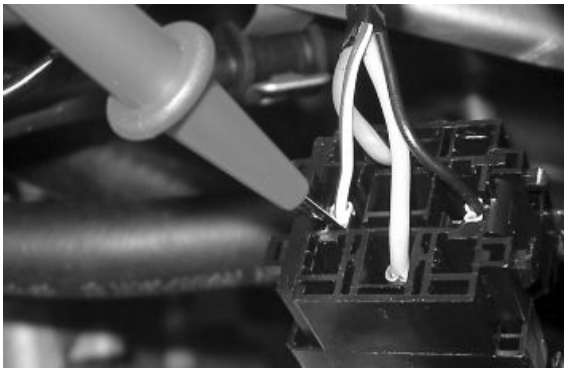
Check the power supply line of the injection load remote control energising coil: after switching to "ON", make sure there is battery voltage, for two seconds, between the Red-White cable and Black-Violet cable of the remote control base. If there is not, check the continuity of the Red-White cable between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

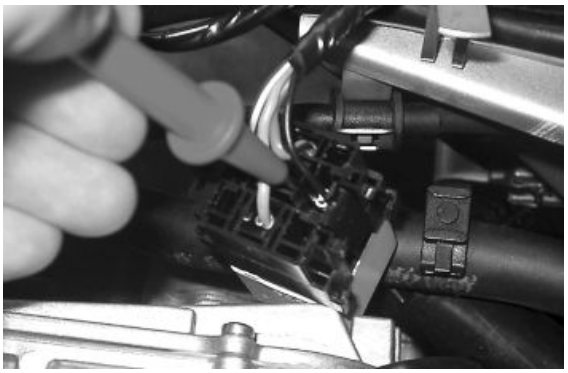


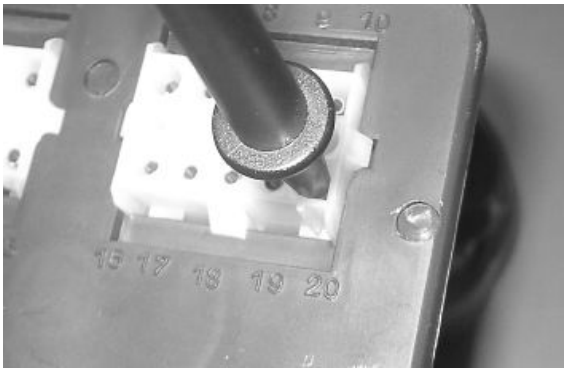
N.B.

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





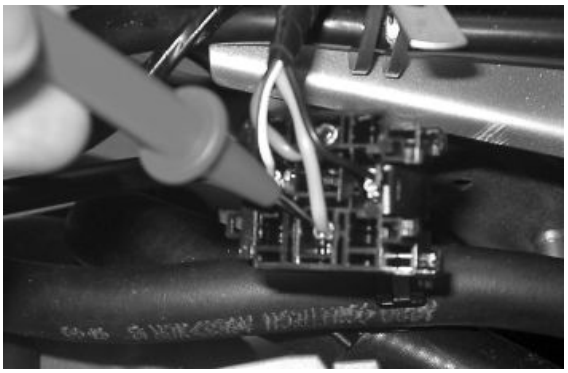


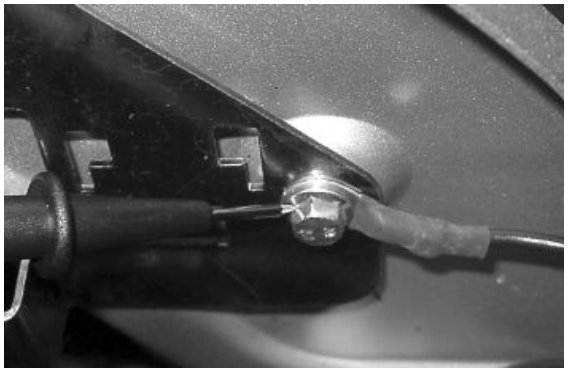


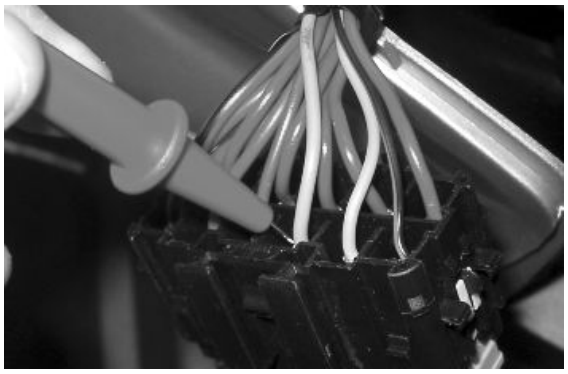
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.

N.B.

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

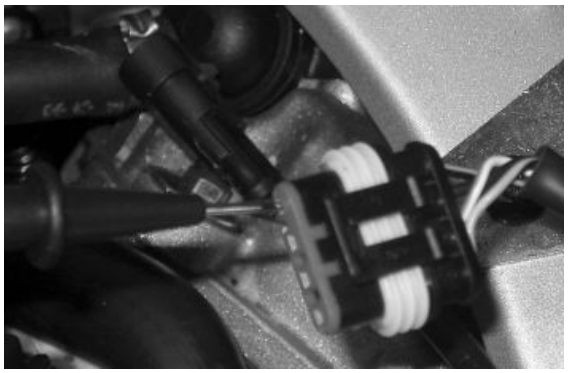






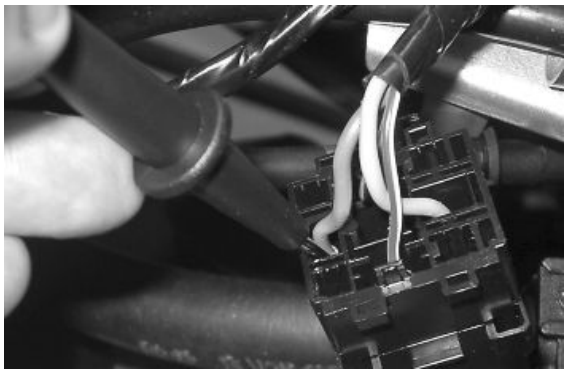
pump circuit 6

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

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

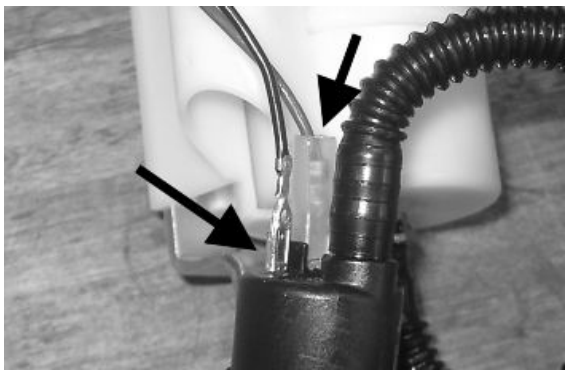
With the battery voltage > 12 V, check the pump flow rate by disconnecting from the injector the pipe equipped with the pressure gauge of the appropriate tool. Make a graded burette available with a flow rate of approximately 1 L. Rotate the pump using the active diagnosis of the palm top computer. Using a pair of long flat needle-nose pliers, choke the fuel pipe making the pressure stabilise at approx. 2.5 BAR. Check that, in fifteen seconds, the pump has a flow rate of around 110 cm^3.

Specific tooling

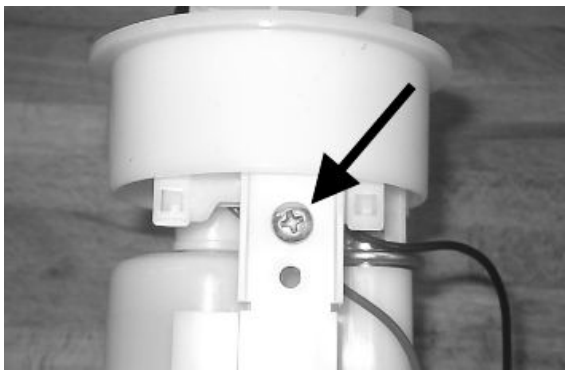
020480Y Petrol pressure check set

Fuel filter check

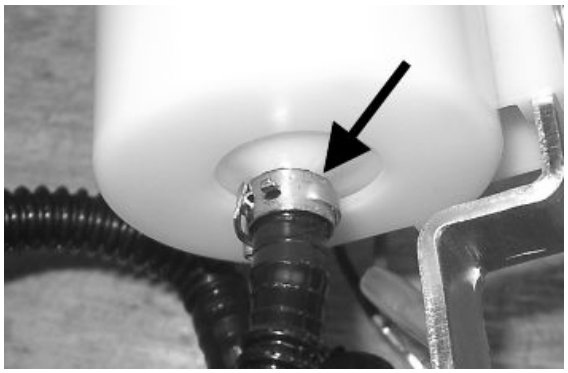
Disconnect the terminals from the electric pump



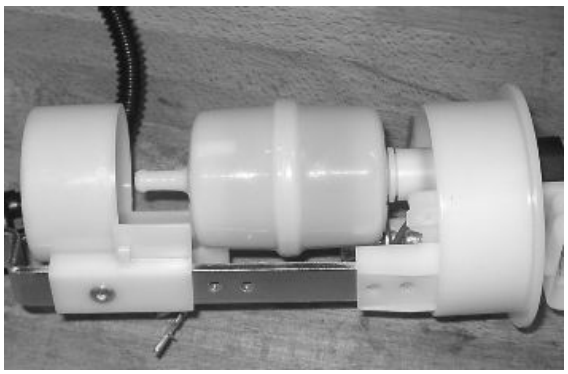
Remove the screw shown in the photograph



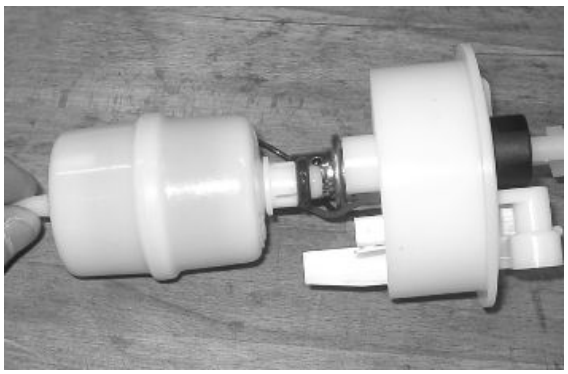
Remove the clip fixing the piping to the filter shown in the photograph



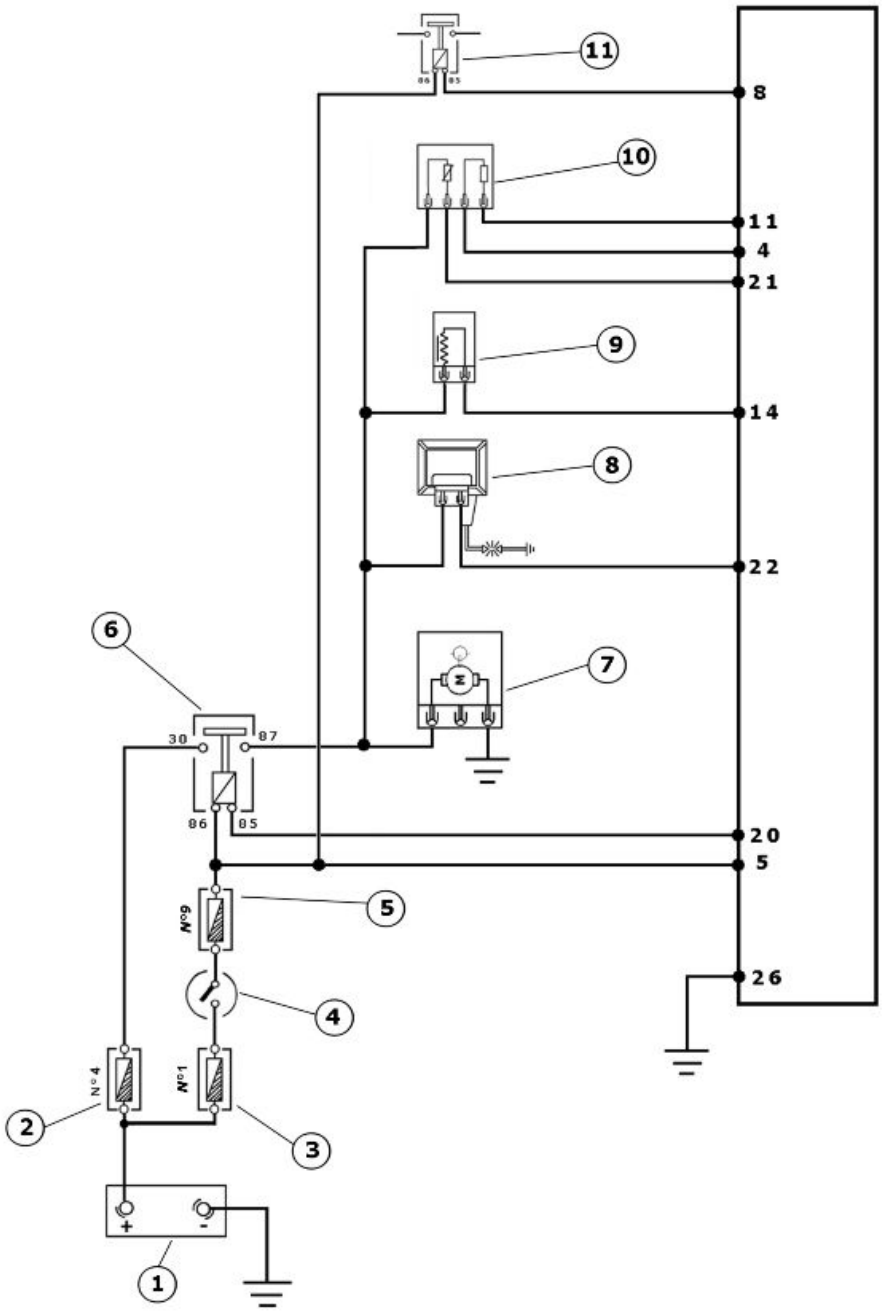
Separate the lower part of the pump support as shown in the photograph.



Remove the filter from the pump support



Inspecting the injector circuit



INJECTION LOADS

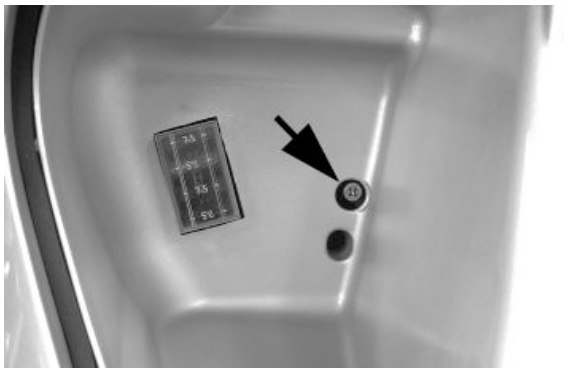
	Specification	Desc./Quantity
1	Battery	12V - 12 Ah
2	Fuse	10 A
3	Fuse	30 A
4	Key switch contacts	
5	Fuse	7.5 A
6	Injection load remote control	
7	Fuel pump	
8	HV coil	

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

Check the resistance at the injector ends: 14.5 ± 5% Ohm

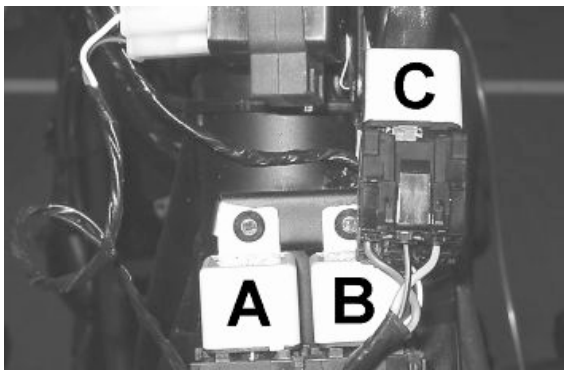
Check the efficiency of 10 A fuse N° 4 injection load .

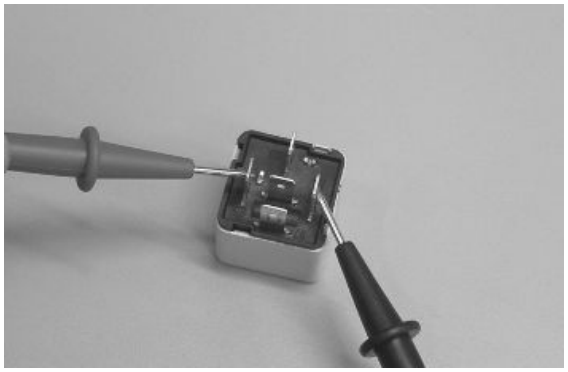
Check the efficiency of 7.5 A fuse No. 9 key-controlled control unit power supply.



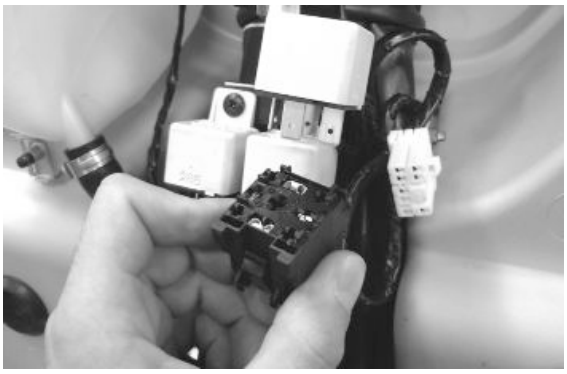
Check the efficiency of the injection load remote control: Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm

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



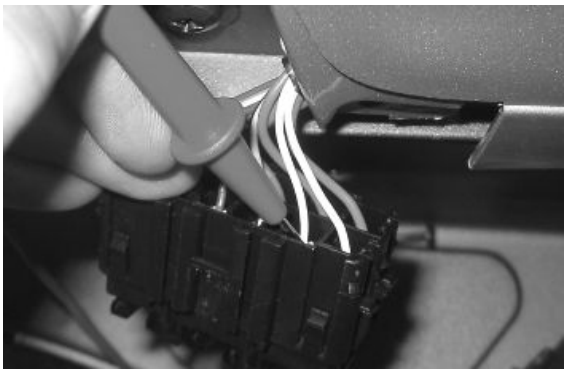


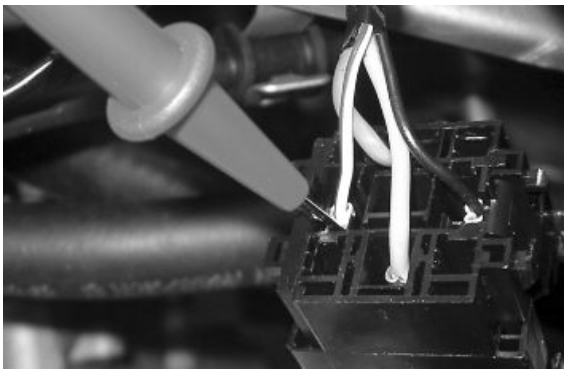
Check the power supply line of the injection load remote control energising coil: after switching to "ON", make sure there is battery voltage, for two seconds, between the Red-White cable and Black-Violet cable of the remote control base. If there is not, check the continuity of the Red-White cable between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

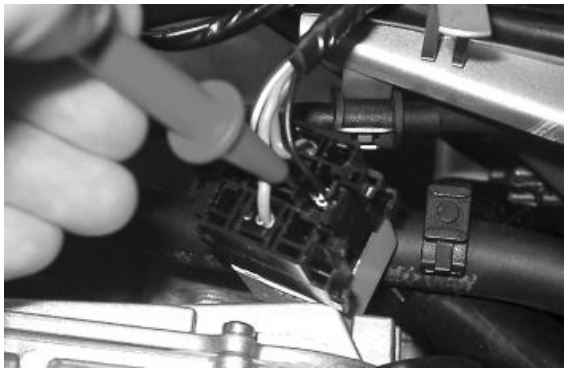


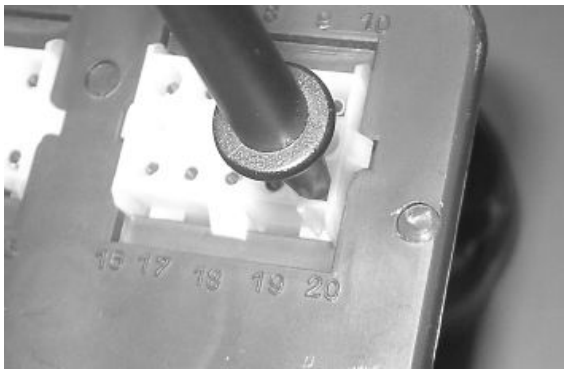
N.B.

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





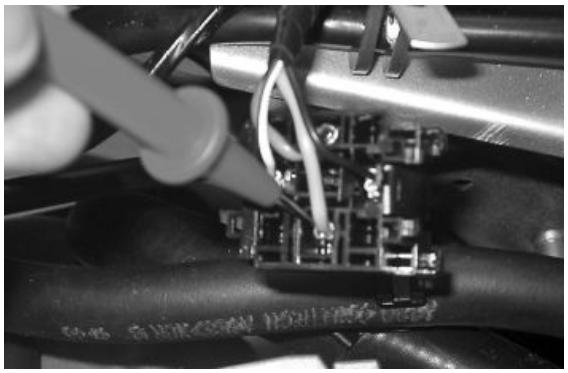


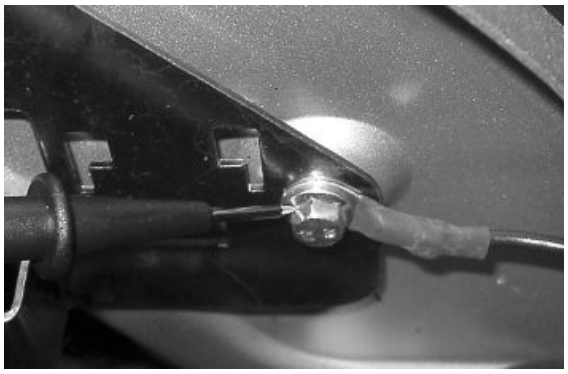


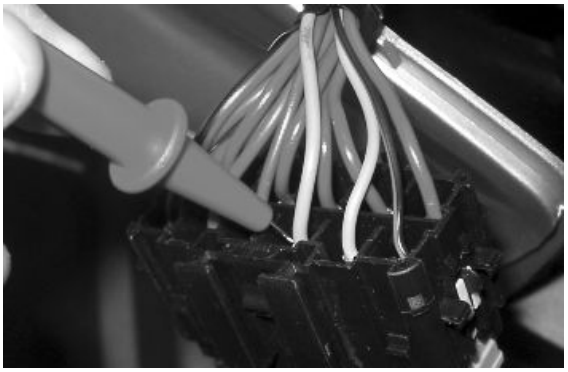
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.

N.B.

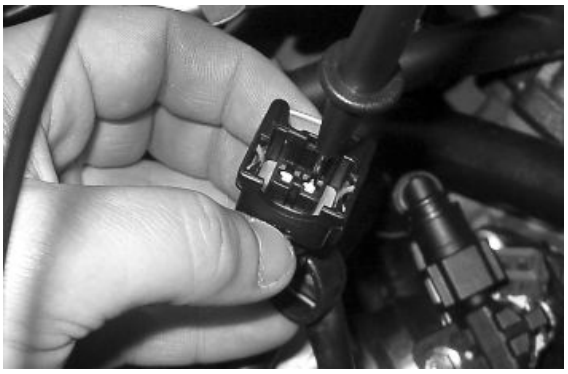
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).







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

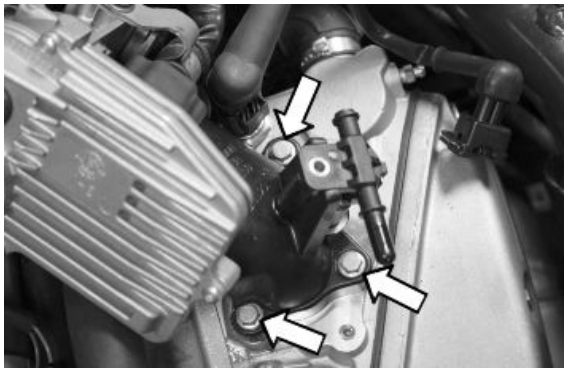


Switch to "ON" and check if there is voltage, with injector disconnected and control unit connected, between the Black-Green cable of the injector connector and the ground lead

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.



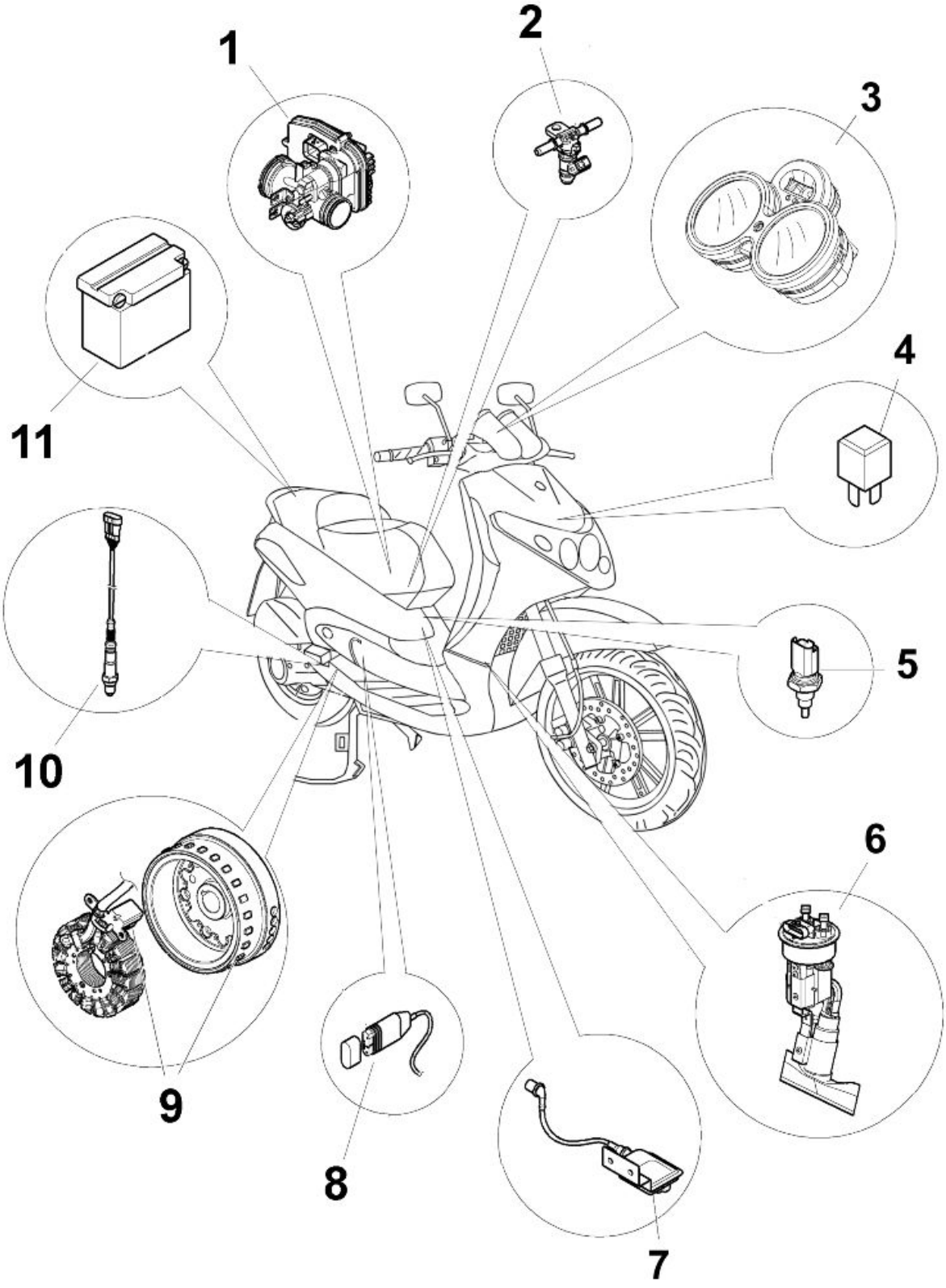
Install the appropriate tool for checking fuel pressure and position the manifold over a container graduated by at least 100 cm³. Connect the injector with the cable making up part of the supply for the injection tester. Connect the clamps of the cable to an auxiliary battery. Activate the fuel pump 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

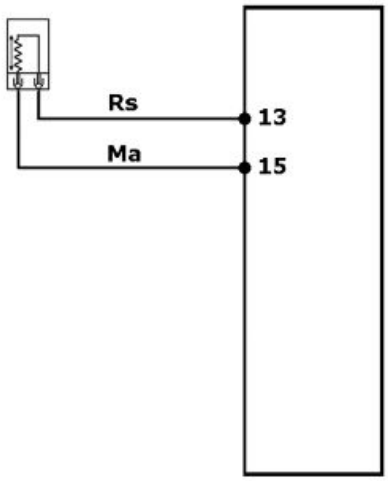
Components location



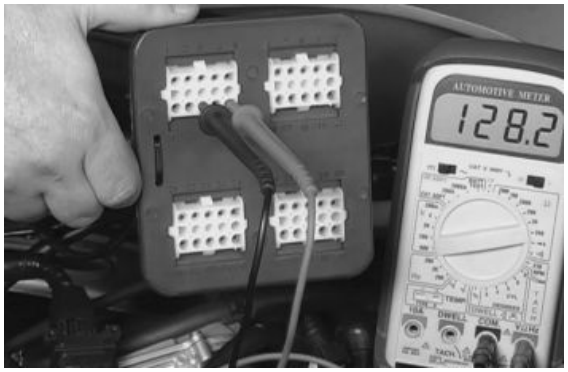
TRANSPARENCY1

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

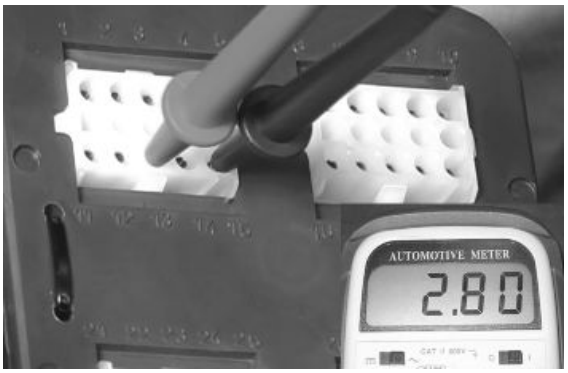
Tachometer



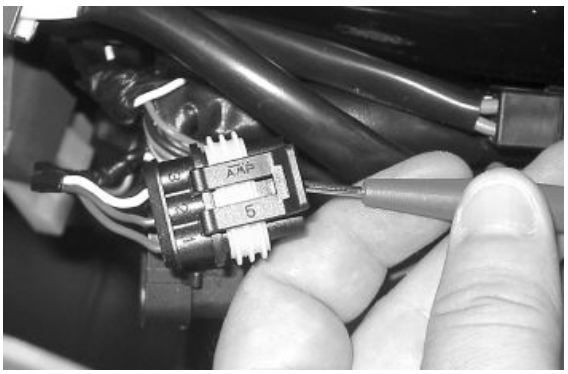
With wiring disconnected from the control unit and connected to the system, check that the sensor resistance between pins 13 - 15 is between 100 and 150 Ohm at an engine temperature of approximately 20°



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



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

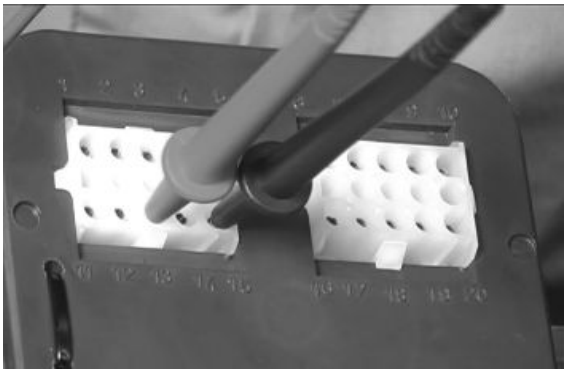


With the interface wiring disconnected from the control unit and rpm sensor connector, check that the red and brown cables (pin 13 - 15) are isolated from each other and insulated from the earth.

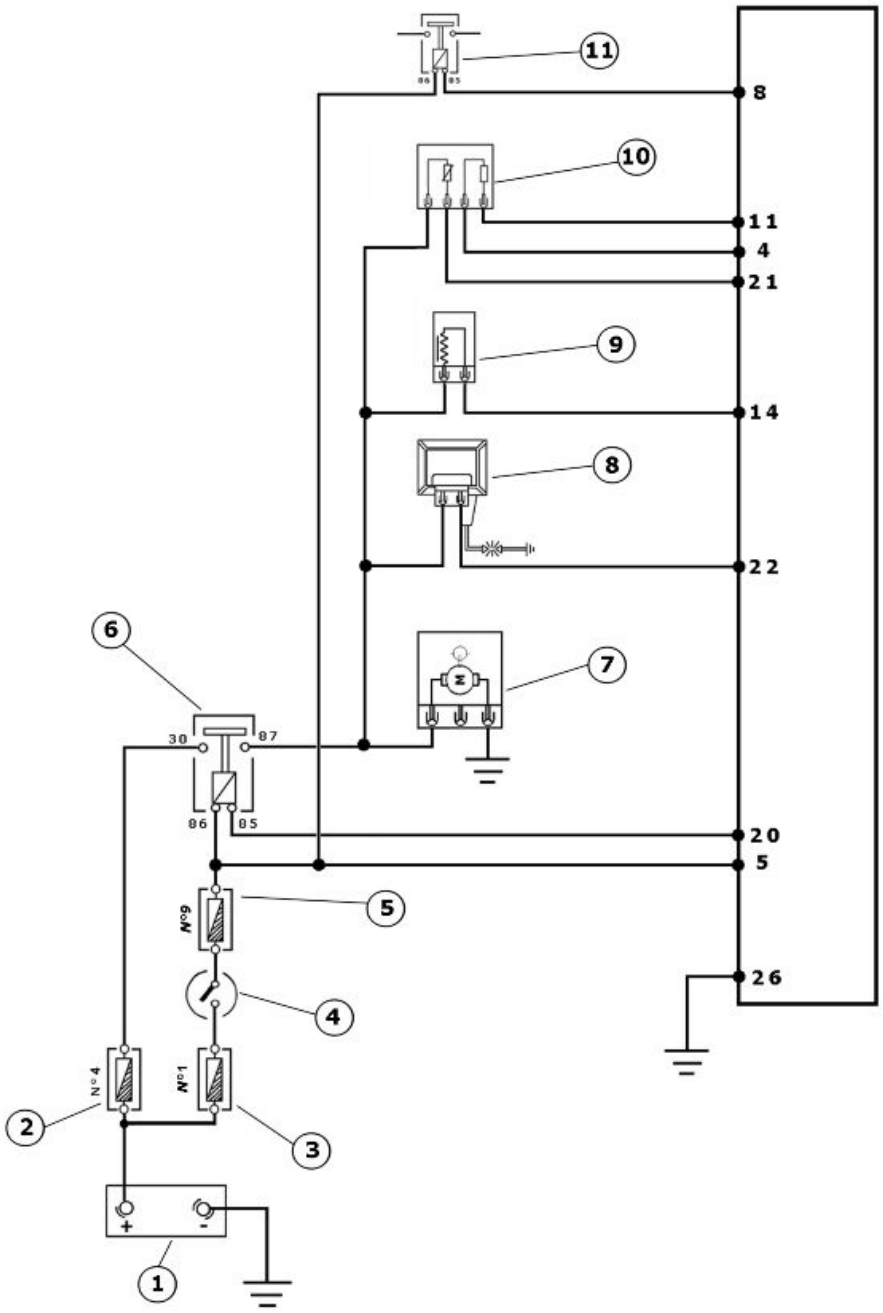
Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter



HT coil



INJECTION LOADS

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

	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.

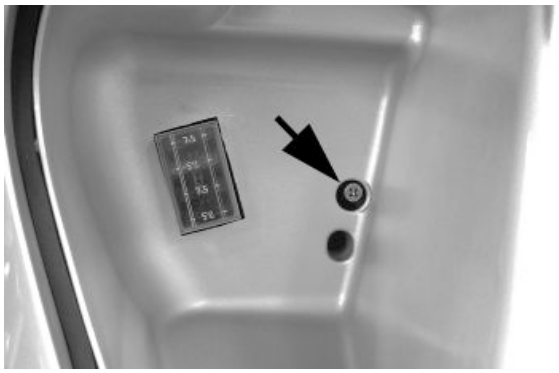
The injection system recognises the 4-stroke cycle and therefore, ignition is only controlled during compression.

Specific tooling

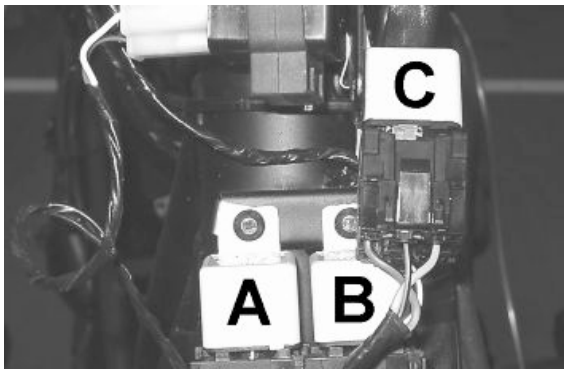
020331Y Digital multimeter

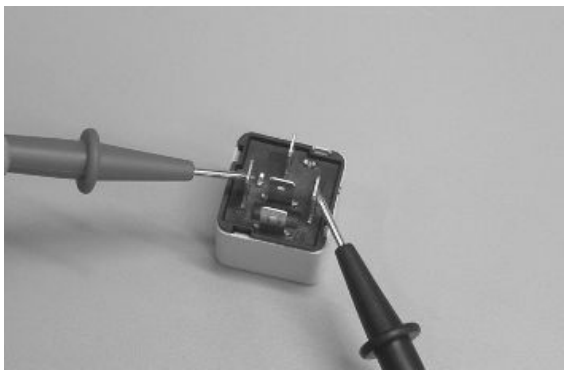
Check the efficiency of 10 A fuse N° 4 injection load .

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

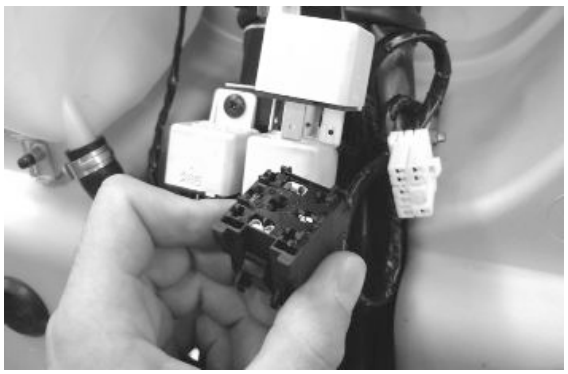


Check the efficiency of the injection load remote control: Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm
Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the remote control.



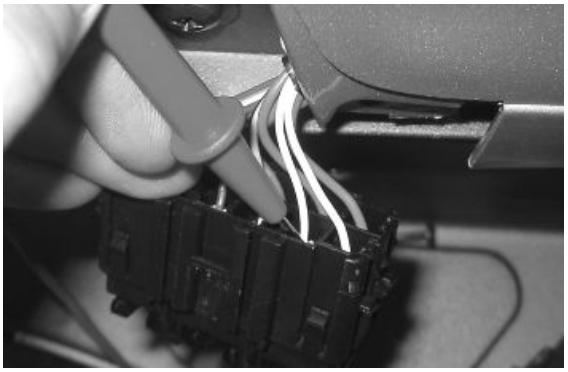


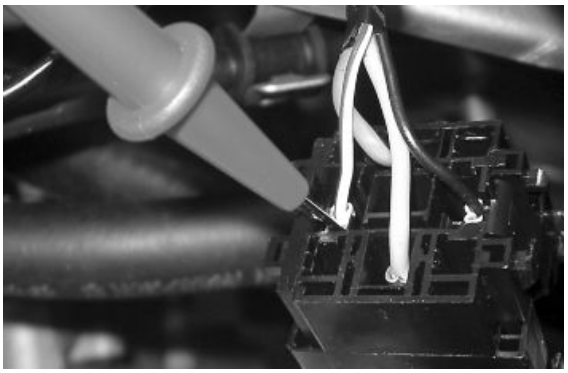
Check the power supply line of the injection load remote control energising coil: after switching to "ON", make sure there is battery voltage, for two seconds, between the Red-White cable and Black-Violet cable of the remote control base. If there is not, check the continuity of the Red-White cable between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

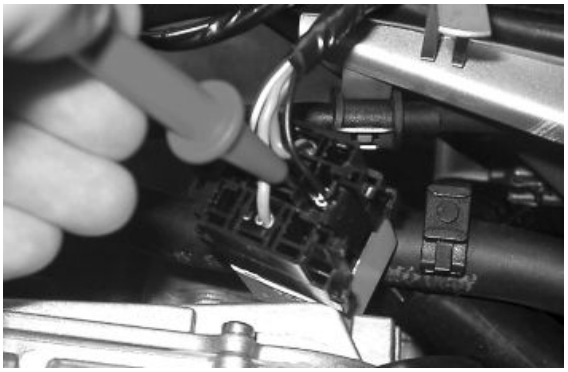


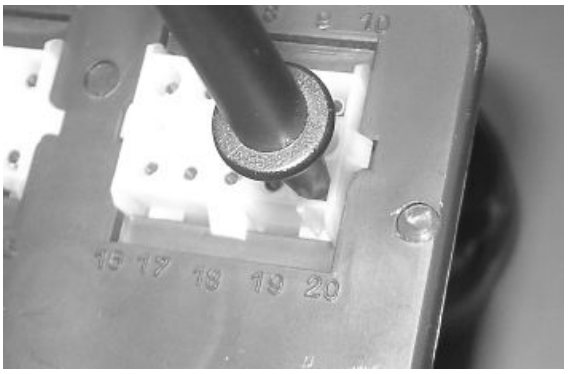
N.B.

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





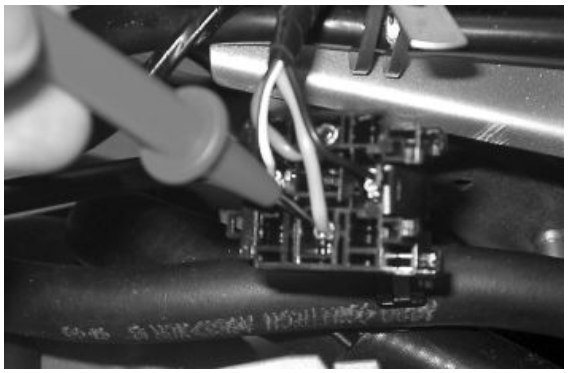


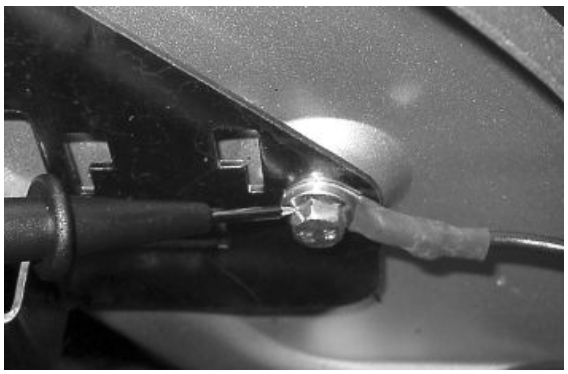

16 17 18 19 20

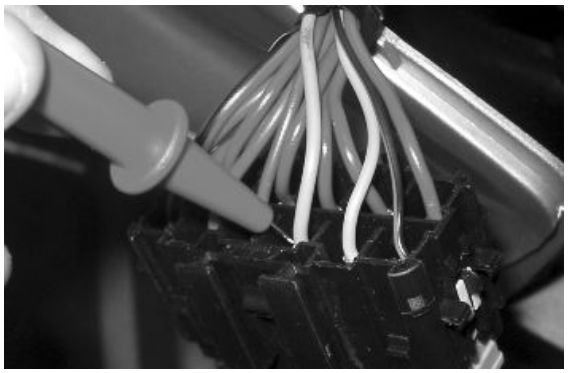
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.

N.B.

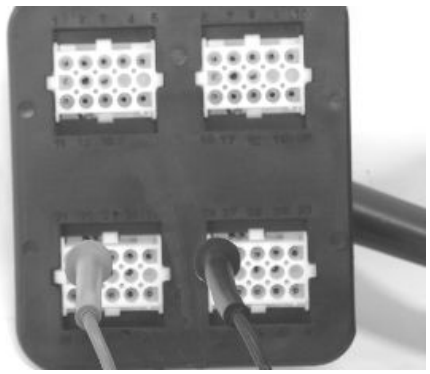
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).





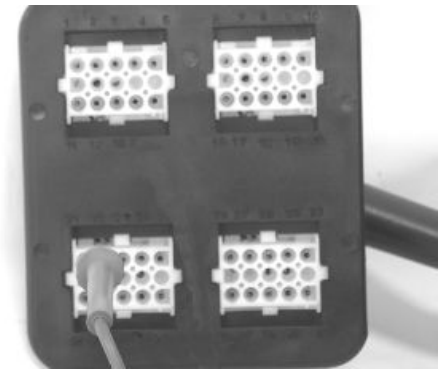


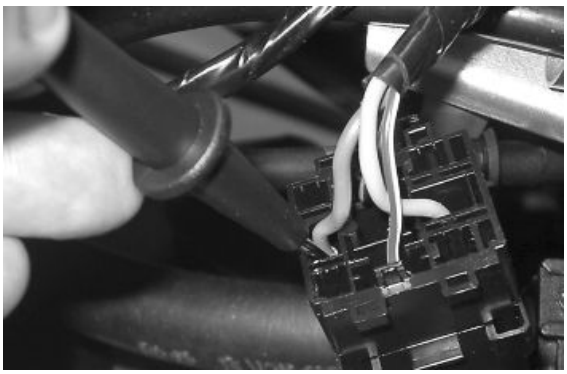
Check there is voltage between pins 22 and 26 of the interface wiring for around two seconds when switching to «**ON**».



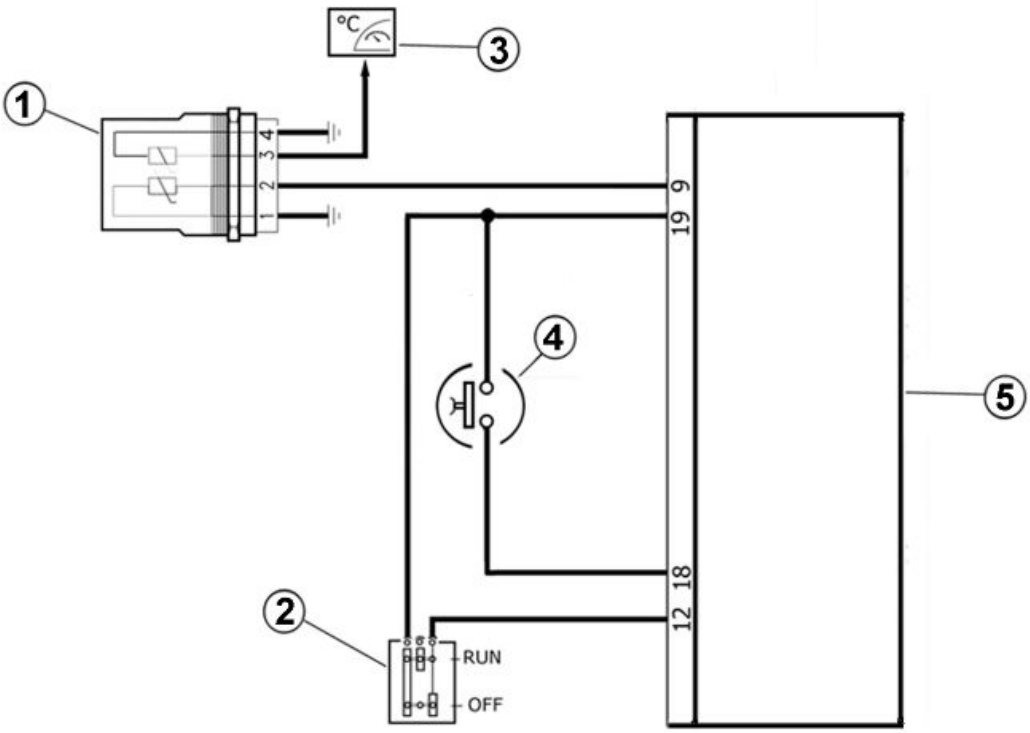
Check the resistance of the primary coil between pin 22 of the interface wiring and the green black cable of the injection load remote control base with the control unit disconnected and the remote control disconnected.

Resistance of the primary = 0.5 ± 8% Ohm





Coolant temperature sensor



TEMPERATURE SENSOR 1

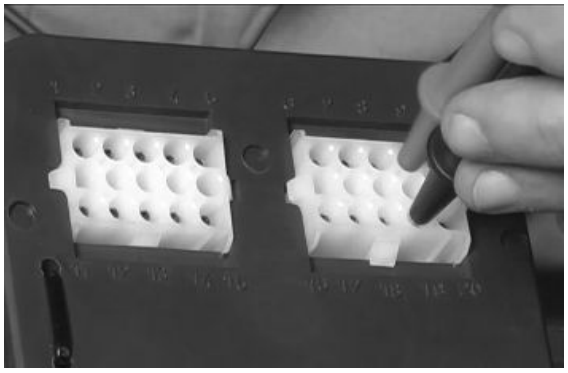
	Specification	Desc./Quantity
1	Water temperature sensor	

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

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

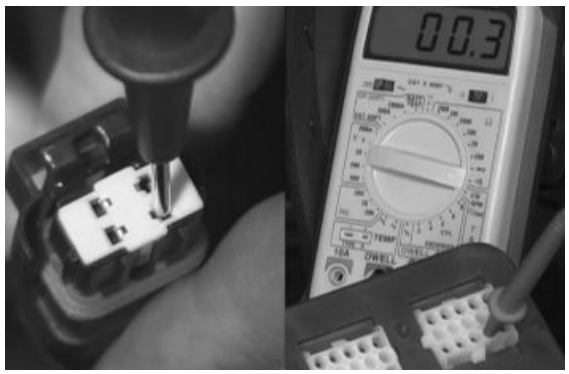
20° = 2500 ± 100 Ω

80° = 308 ± 6 Ω



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

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



Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter

Zeroing the throttle

Resetting the throttle valve position signal (TPS reset)

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

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

Pre-calibration ensures optimal air flow to control idling.

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

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

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

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

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

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

To reset, proceed as follows.

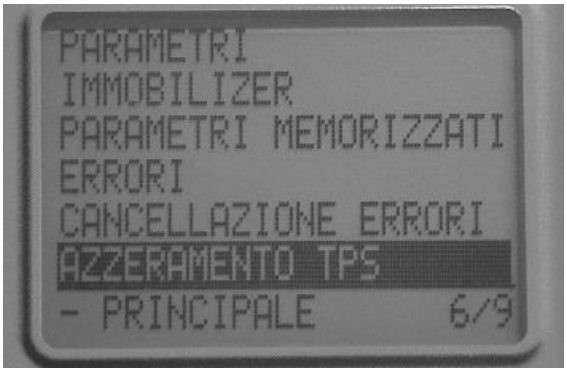
Connect the diagnostic tester.

Switch to «**ON**».

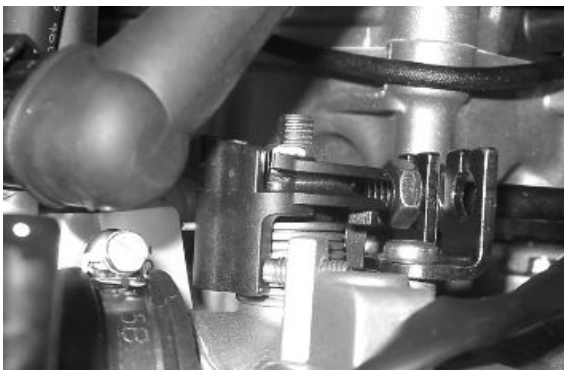
Select the functions of the diagnostic tester on «**TPS RESET**».

Specific tooling

020460Y Scooter diagnosis and tester



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



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

Reset should be performed in the following cases:

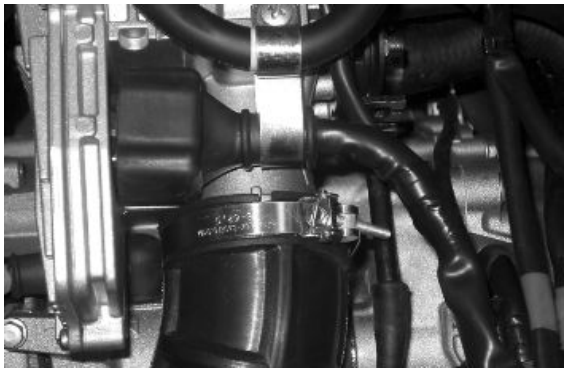
- on first fitting.

- if the injection control unit is replaced.

N.B.

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

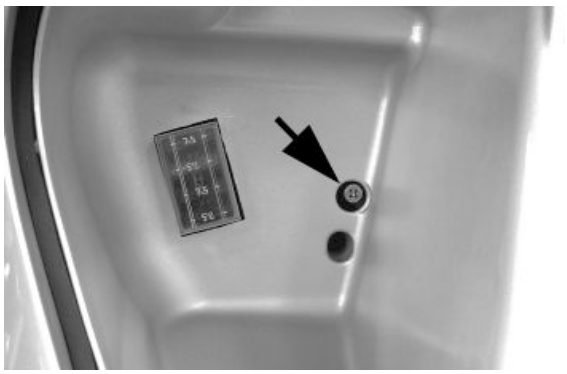
Given that the TPS resetting is also done when the control unit is replaced, place the control unit - filter box bellows at 45° during the refitting operation as shown in the photograph.



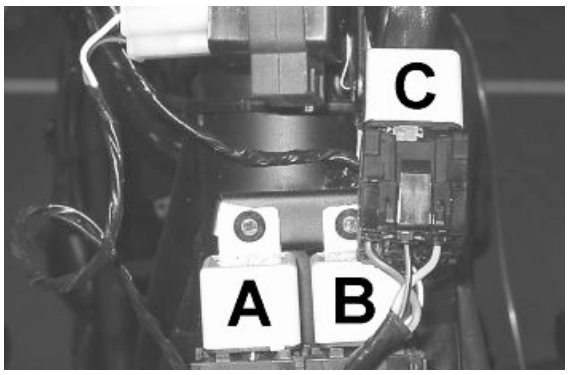
Lambda probe

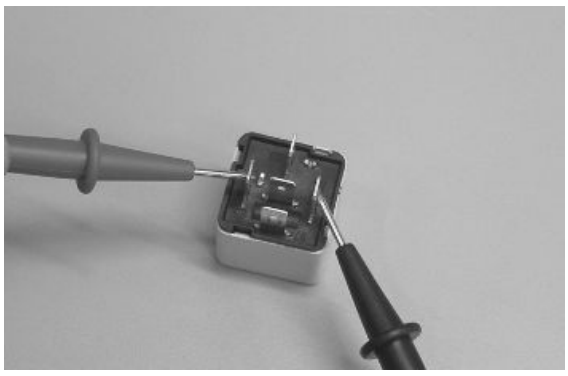
SIGNAL CONTROL

Check the efficiency of 10 A fuse N° 4 injection load .
Check the efficiency of 7.5 A fuse No. 9 key-controlled control unit power supply.

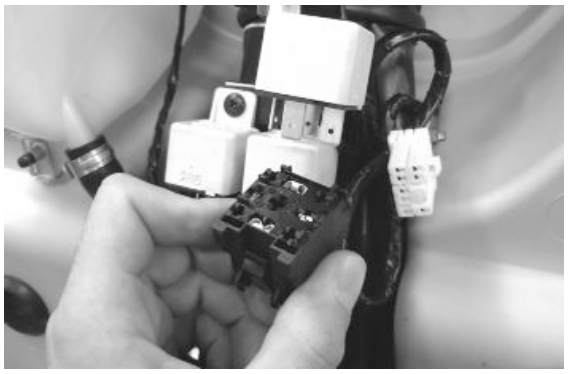


Check the efficiency of the injection load remote control: Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm
Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the remote control.





Check the power supply line of the injection load remote control energising coil: after switching to "ON", make sure there is battery voltage, for 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.



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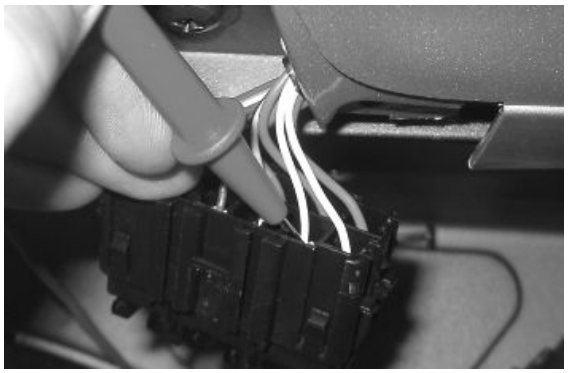
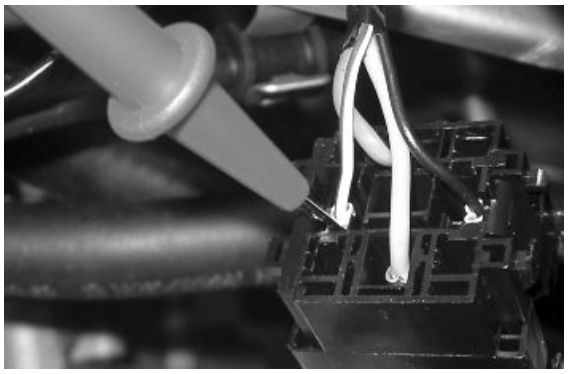
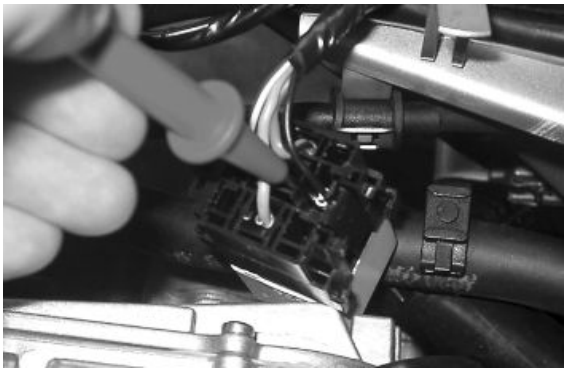
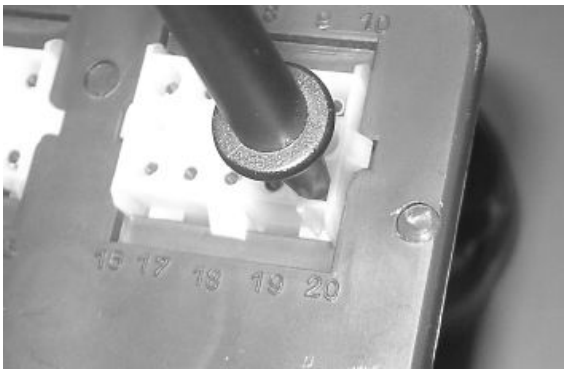
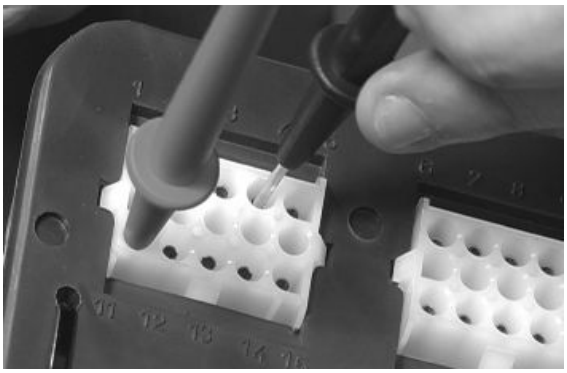




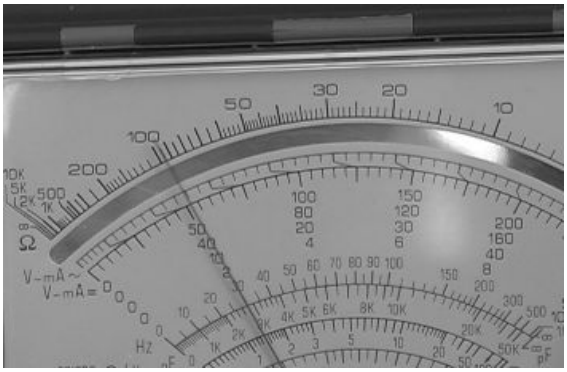


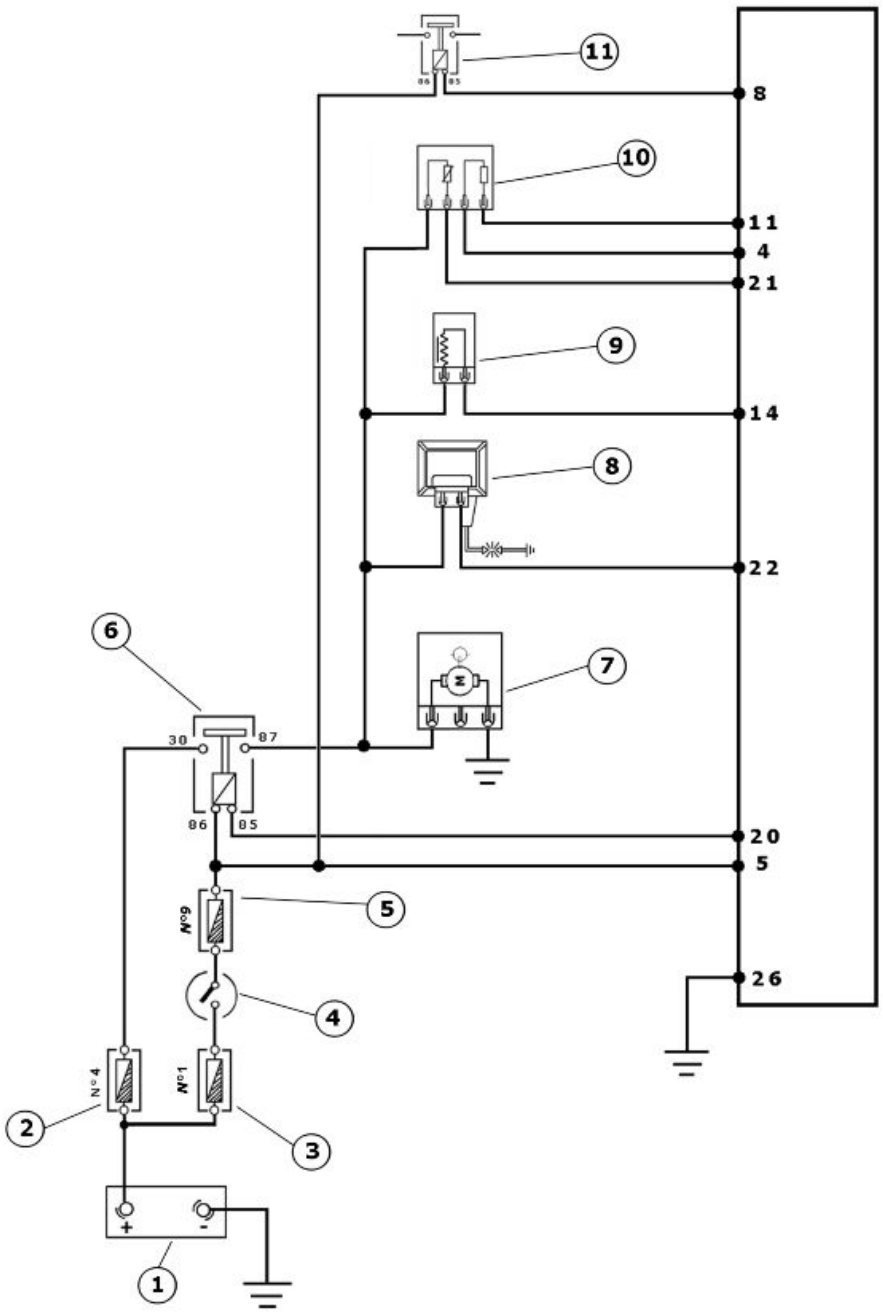


Install the electronic control unit interface wiring.
Start the engine and warm up until the electric fan switches on.
Use an analogue multimeter with a direct voltage scale measuring down to 2 V.
Place the tips of the multimeter between pins 4 (-) and 11 (+)



With the engine running at idle speed, check that the voltage oscillates between 0V and 1V
With the throttle valve completely open, the voltage is approx. 1V.
During the closing phase, the voltage is approx. 0V.
If the voltage remains constant, the sensor may be damaged. Remove the sensor and check that there are no oil or carbon deposits inside it..





INJECTION LOADS

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

	Specification	Desc./Quantity
11	Electric fan 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.

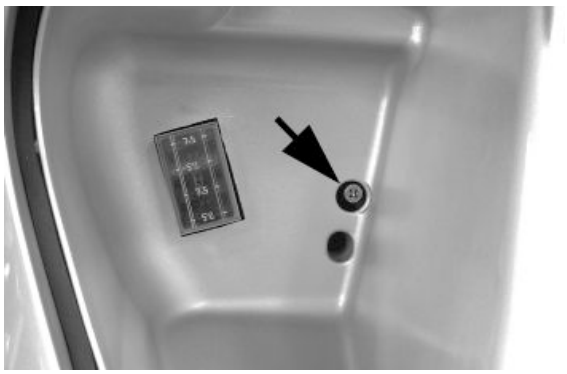
Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter

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

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



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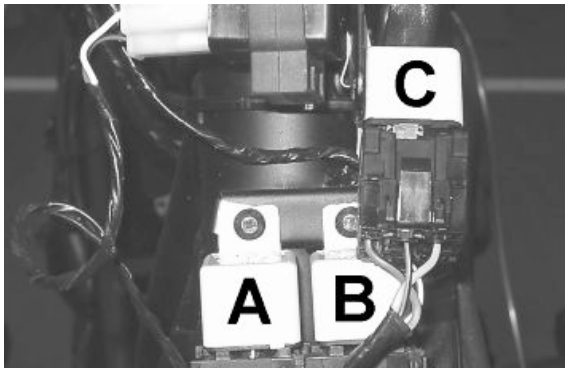
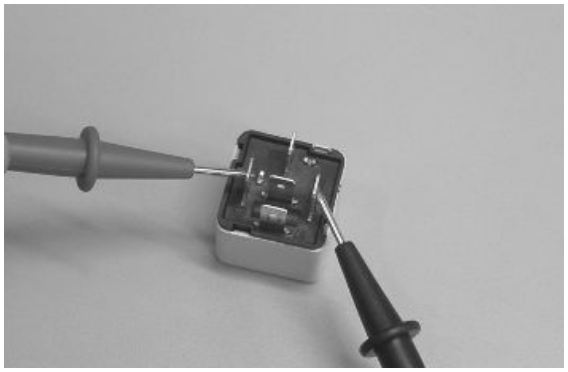
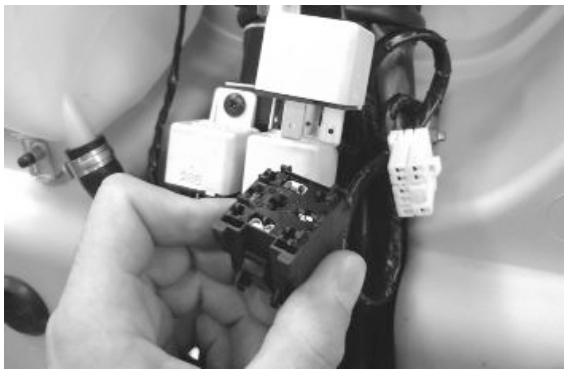
Apply a voltage of 12V to pins 86 and 85; make sure that there is continuity between pins 30 and 87 of the remote control.





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.



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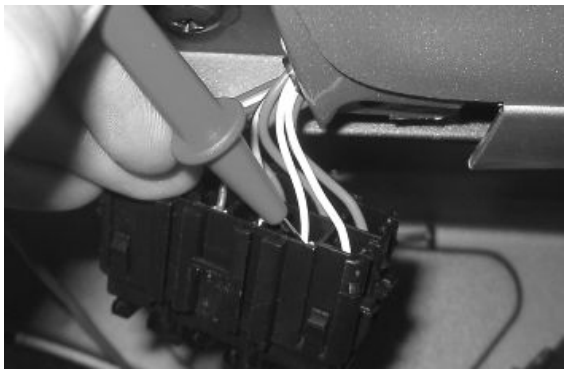
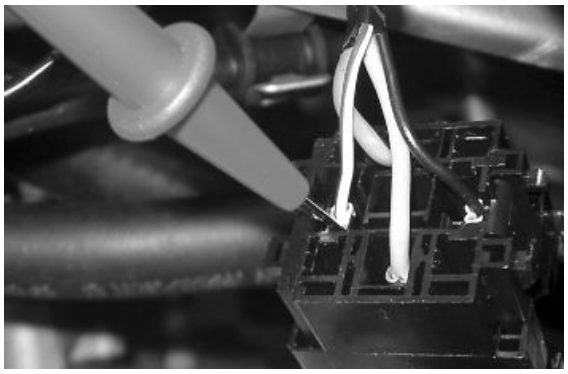
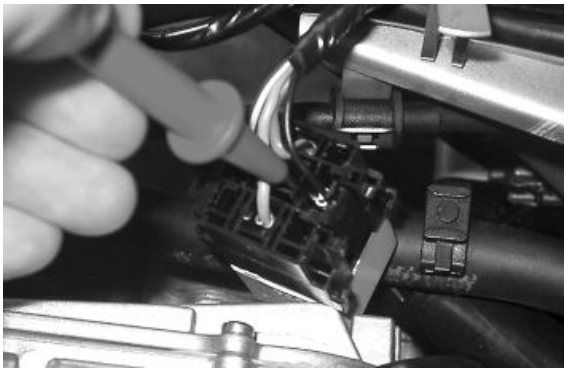
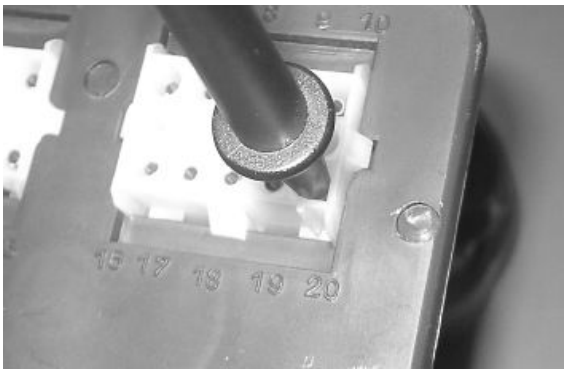




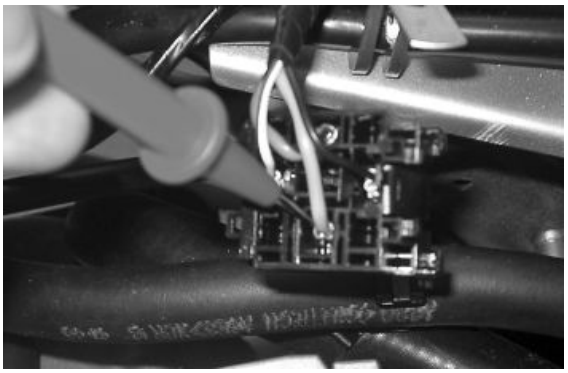


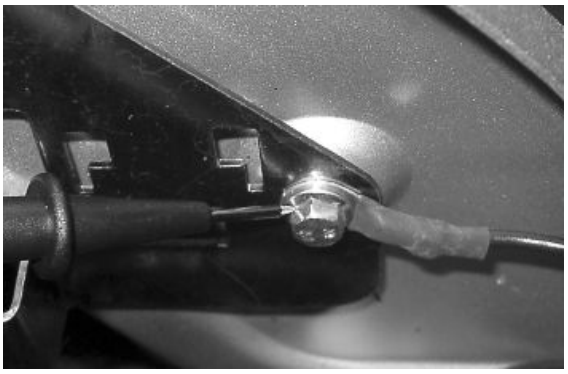


Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.

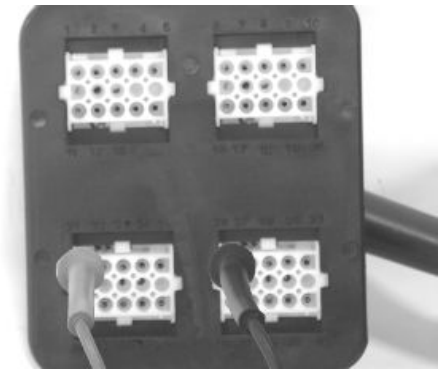
N.B.

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

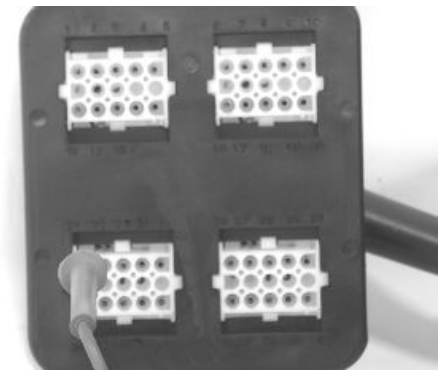


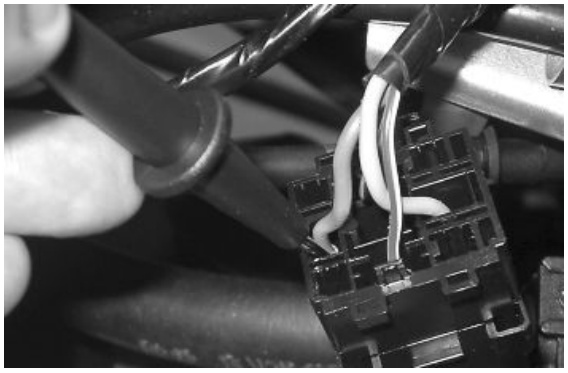


Check there is voltage between pins 21 and 26 of the interface wiring, for around two seconds, when switching to «**ON**».



With the engine cold, check the resistance of the Lambda sensor heater between pin 21 of the interface wiring and the black green cable of the injection load remote control base, with the control unit disconnected and the remote control disconnected.
Resistance of the heater at approximately 20° = 9 Ohm ± 20%





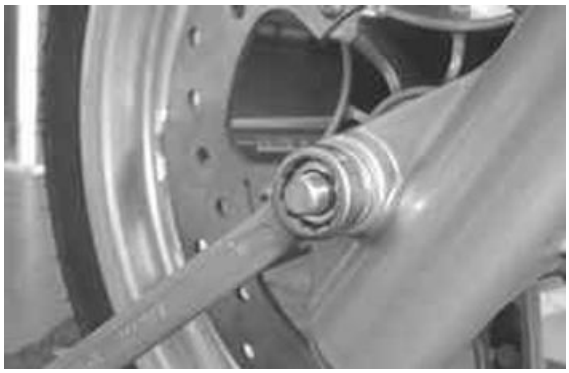
INDEX OF TOPICS

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

Front

Removing the front wheel

- Loosen the wheel axle lock-nut.



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

- Pull out the wheel axle.

See also

Removal
Removal

Front wheel hub overhaul

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

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

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

*** Either tool can be used.**

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

Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020412Y 15 mm guide

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

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

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

Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm adaptor

020412Y 15 mm guide

020201Y Spacer bushing driving tube

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

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

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

Specific tooling

020376Y Adaptor handle

020357Y 32 x 35 mm adaptor

020412Y 15 mm guide

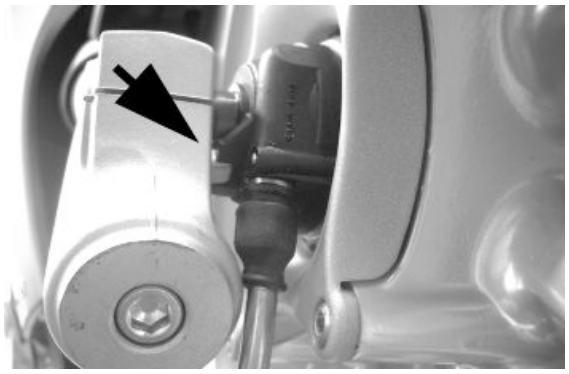
- Refit the cap and tighten the five fixing screws.

Refitting the front wheel

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

N.B.

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



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

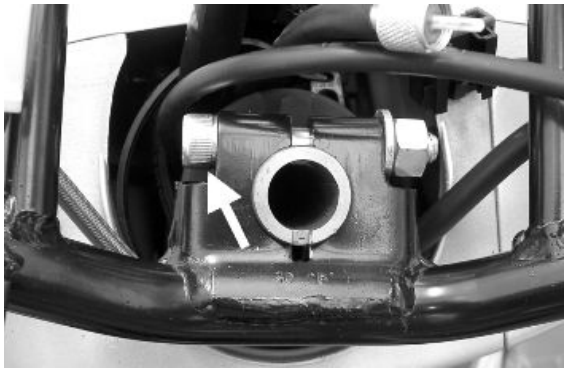
Locking torques (N*m)

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

Handlebar

Removal

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



See also

Rear handlebar cover

Refitting

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

Locking torques (N*m)

Handlebar fixing screw (*) 45 ÷ 50

(*) Lubricate the nuts with engine oil before installation

Front fork

Removal

- Remove the front wheel.
- Remove the handlebar.
- Using the appropriate tool, loosen and remove the upper ring nut, the distancing washer, the counter ring nut and the spacer ring.
- Extract the fork.

N.B.

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

Specific tooling

020055Y Wrench for steering tube ring nut

See also

Removing the front wheel
Removal

Overhaul

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

In case of replacement, proceed as follows:

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

N.B.

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

- Insert the special tool as shown in the figure.

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

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

Specific tooling

020458Y Puller for lower bearing on steering tube

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

Specific tooling

006029Y Punch for fitting fifth wheel seat on steering tube

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

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

- Remove the first spring consisting of 15 windings.
- Remove the spring support plate.
- Remove the second spring consisting of 21 windings.
- Drain the oil.
- Separate the stem from the leg by removing the screws with copper washer shown in the figure. To prevent the rotation of the pumping insert a 12 mm hexagonal wrench for internal parts in the stem.

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

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

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

Specific tooling

020487Y Fork oil seal extractor

- Check the length of the springs.

SPRING LENGTH CHECK

Specification	Desc./Quantity
Standard length	15 winding spring: 116.3 + 2-1 mm
Standard length	21 winding spring: 175.7 + 2-1 mm
Allowable limit after use:	15 winding spring: 114.3 mm
Allowable limit after use:	21 winding spring: 173.7 mm

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

Characteristic

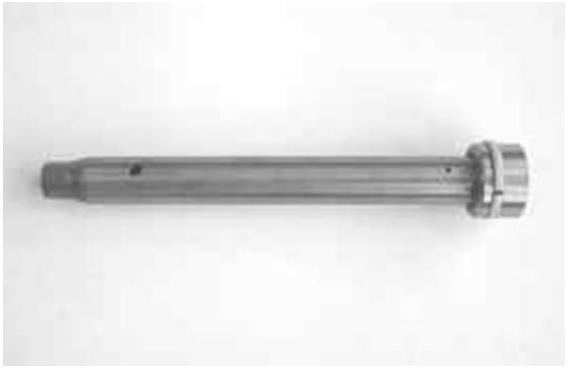
Maximum leg diameter

35.10 mm

Minimum stem diameter

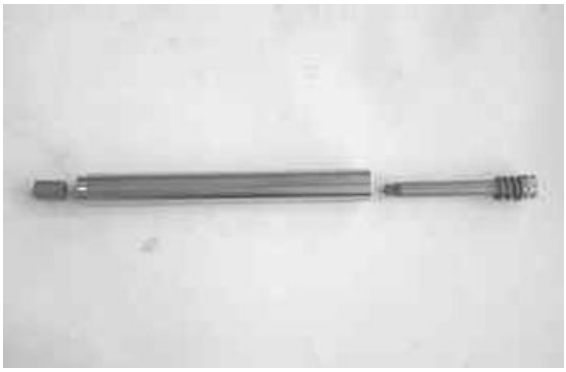
34.90 mm

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



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

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



- Inset and screw up the copper washer to the prescribed torque. To prevent the pumping member from rotating, insert a 12 mm Allen key into the stem.
- Pour 102 ± 1 cm^3 of oil into the stem.

Recommended products

AGIP FORK 7.5 W Fork oil

Grade 7.5 W

- Insert the 21 winding springs, the support plate with the chamfer facing downwards and then the 15 winding spring.

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

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

Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm adaptor

Locking torques (N*m)

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

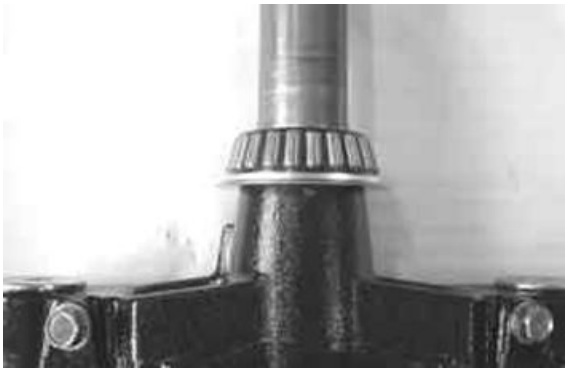
Refitting

- Grease using lithium soap grease on the roller bearings.

Recommended products

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

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



- Insert the fork into the headstock.
- Insert the spacer ring.
- Using an appropriate tool do up the first ring nut in the steering tube (upper steering ball bearing). Tighten to the prescribed torque.
- Install the space washer.
- Using the special tool, tighten the second locking ring nut in the steering tube to the prescribed torque.

Specific tooling

020055Y Wrench for steering tube ring nut

Locking torques (N*m)

Steering lower ring nut 10 ÷ 13 then loosen by 90° Upper steering ring nut 30 ÷ 36

Steering bearing

Removal

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

In case of replacement, proceed as follows:

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

N.B.

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

Specific tooling

020004Y Punch for removing fifth wheels from headstock

See also

Removal

Refitting

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

- Place a new ball bearing on the headstock and a roller bearing seat on the lower part.
- Insert the tie rod screw of the appropriate tool fitted out with the adaptors for planting the bearing and seat it in the headstock as in the photograph.

- Using two 24 mm wrenches, tighten the screw until the seat and the bearing are fully set in place.

N.B.

ALWAYS USE A NEW BEARING AND A NEW SEAT.

Specific tooling

001330Y Tool for fitting steering seats

Rear

Removing the rear wheel

- Remove the muffler
- Remove the muffler support bracket
- Remove the 5 screws shown in the photograph

Refitting the rear wheel

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

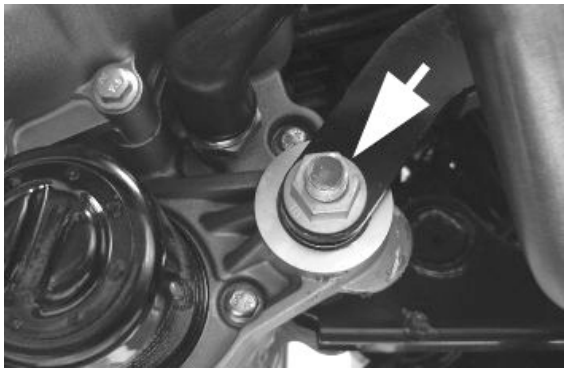
Locking torques (N*m)

Fixing screw for wheel rim to hub 34 ÷ 38

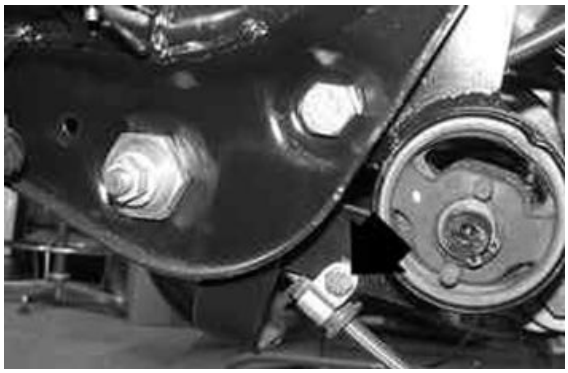
Swing-arm

Removal

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



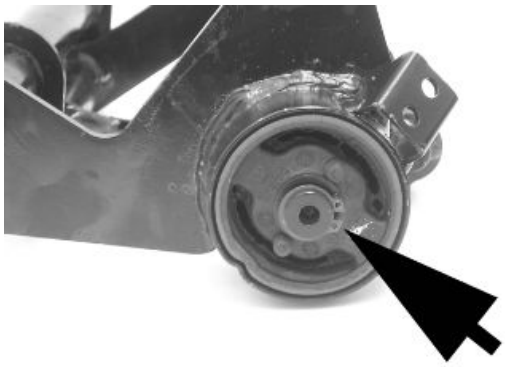
- Loosen the nut and lock nut on the left-hand side of the scooter (see figure) and unscrew the spindle from the opposite side.
- Remove the retaining screw of the rear brake pipe shown in the figure.



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

Overhaul

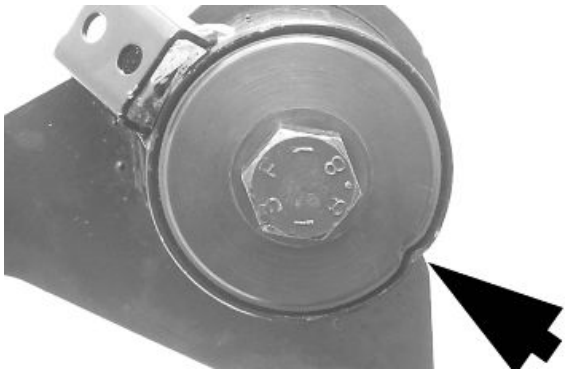
- Check that the silent bloc is not damaged. If there is, replace it.
- Remove the Seeger ring shown in the photograph



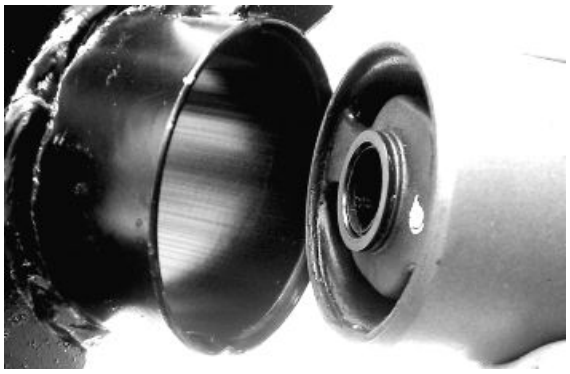
- Remove the full silent bloc bracket
- Hold the full silent bloc bracket in the clamp
- Using the appropriate tool, remove the silent bloc from the bracket from the side corresponding to the inside of the vehicle. This is to guarantee the tool is centred properly on the support

Specific tooling

020271Y Tool for removing-fitting silent bloc



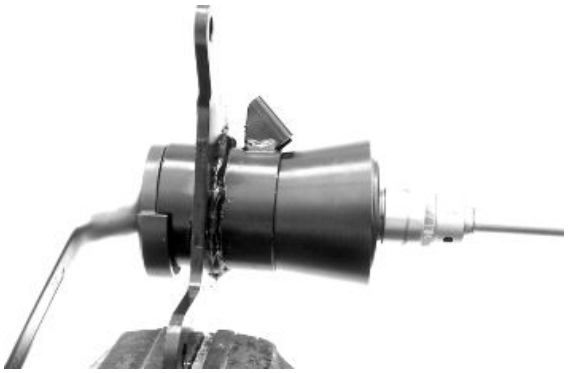
- Install a new silent bloc, making sure it aligns properly with the reference tooth.
- Fit the silent blocs, making sure the chamfered part of the silent bloc matches the chamfered part of the bracket



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

Specific tooling

020271Y Tool for removing-fitting silent bloc



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

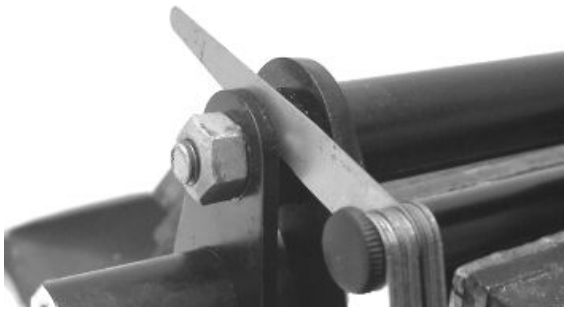
Characteristic

Allowable limit after use:

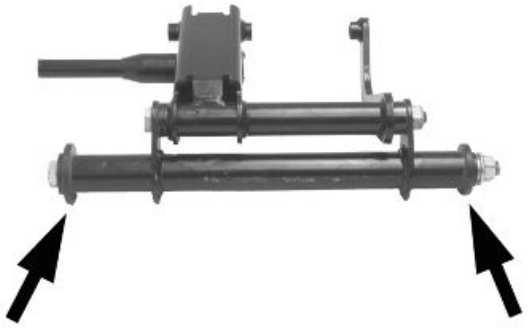
1 mm

standard clearance

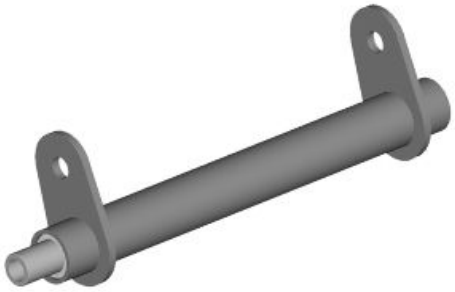
0.40 ÷ 0.70 mm



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



- Separate the swinging arm on the engine side from the vehicle side arm.
- Remove the internal spacer shown in the photograph



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

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

Specific tooling

020115Y Ø 18 punch

020244Y 15-mm diameter punch

SERVICE OF THE SWINGING ARM

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

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

Recommended products

AGIP GREASE PV2 Grease for control levers on the engine

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

Refitting

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

1. Position the silent block supporting clamp with part **3** inserted, and slightly tighten part **1**

2. Position the swinging arm, inserting part **2**

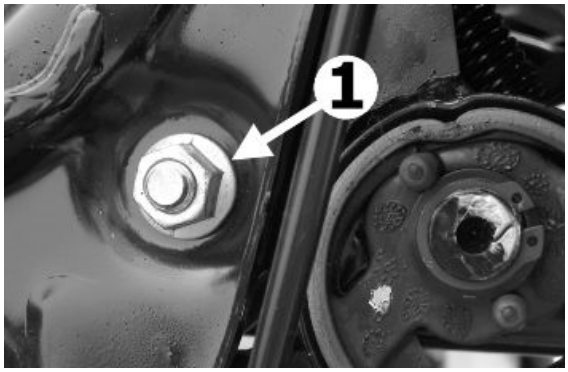
3. Tighten part **3** to the prescribed torque

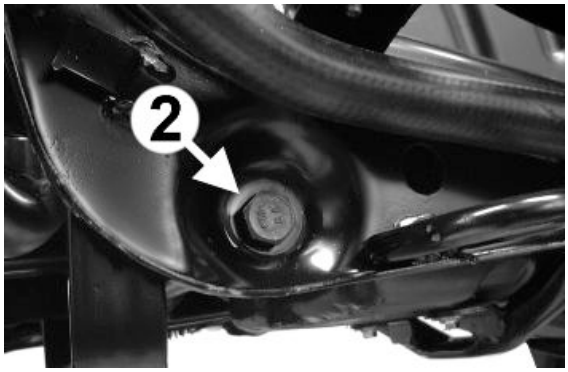
4. Screw on and tighten part **4** to the prescribed torque

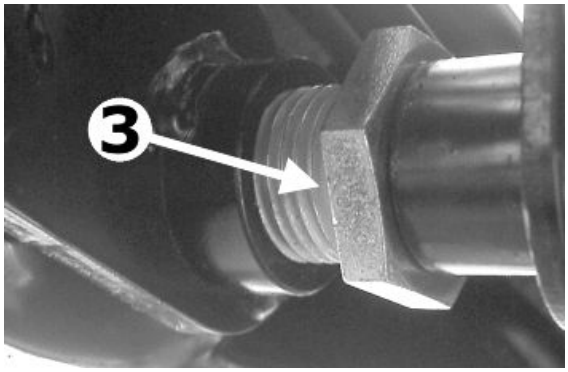
5. Screw on and tighten part **5** to the prescribed torque

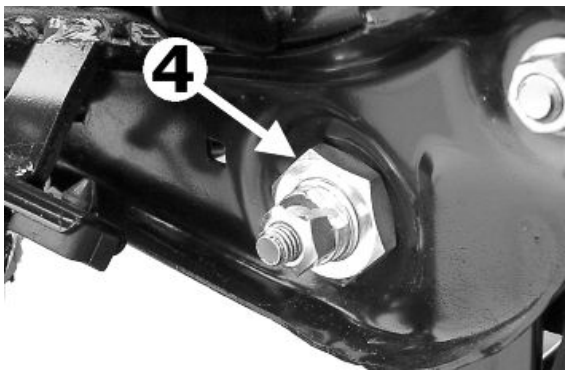
6. Tighten part **1** to the prescribed torque

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









SWINGING ARM FITTING

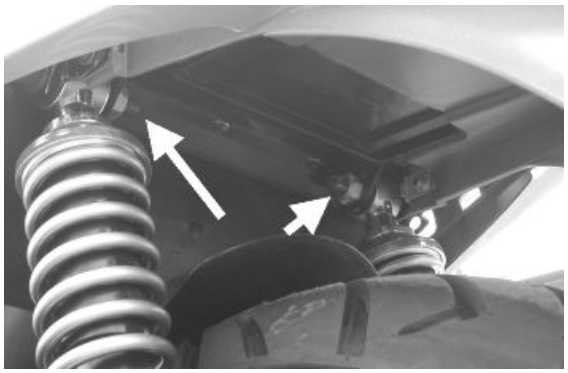
Name	Torque in Nm
Part 1	64 ÷ 72 Nm
Part 3	5 - 7 Nm
Part 4	90 ÷ 110 Nm
Part 5	64 ÷ 72 Nm
Engine-swinging arm bolt	64 - 72

Shock absorbers

Removal

Proceed as follows:

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



See also

Exhaust assy. Removal

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

Exhaust bracket

Removal

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

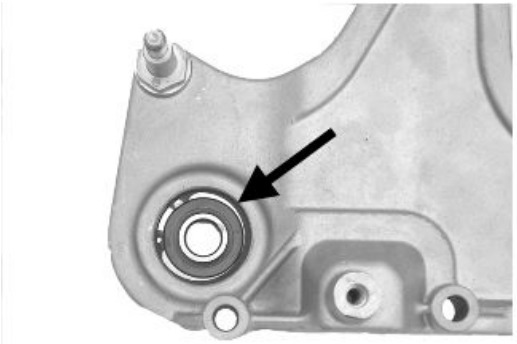
Remove the full muffler assembly.

See also

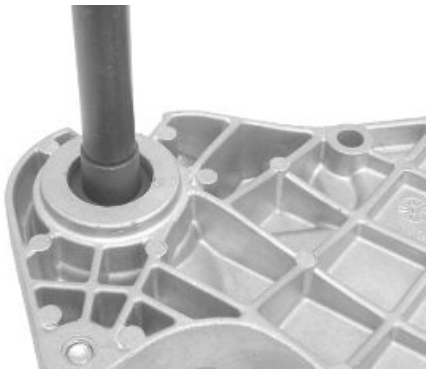
Exhaust assy. Removal

Overhaul

- Remove the circlip shown in the photograph



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

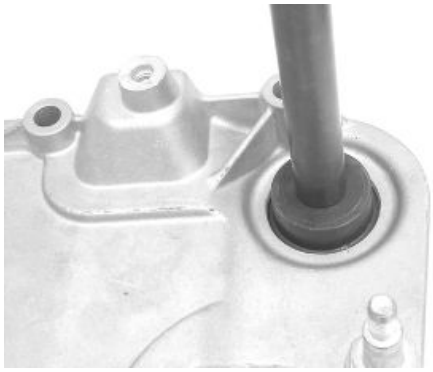


Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

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



Specific tooling

020376Y Adaptor handle

020151Y Air heater

Refitting

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

Locking torques (N*m)

Rear wheel axle nut 104 ÷ 126 Muffler support arm to engine screw (*) 20 ÷ 25 Shock absorber lower clamp 33 ÷ 41

Centre-stand

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

Locking torques (N*m)

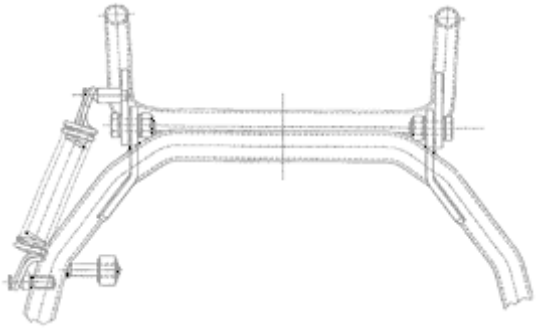
Centre stand bolt 25 ÷ 30

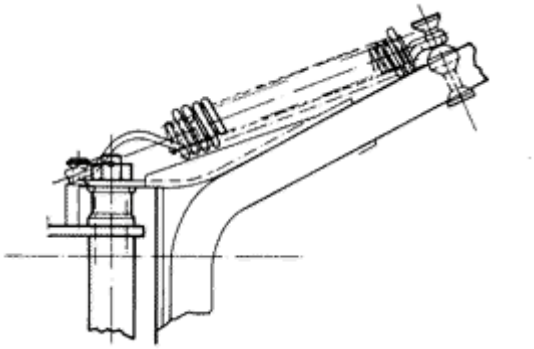
Removal

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

Reassembly

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





CAUTION

Lubricate the following parts with grease: spring coupling pins, bushings on stand fixing bracket.

Recommended products

AGIP GREASE PV2 Grease for control levers on the engine

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

Locking torques (N*m)

stand retaining bolt 20 ÷ 25

Side stand

Removal of the side stand

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

Fitting

Carry out the previous operations in reverse order.

Locking torques (N*m)

Side stand fixing bolt 35 ÷ 40

INDEX OF TOPICS

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

Interventions rules

WARNING

THE FLUID FOR THE BRAKE SYSTEM IS CORROSIVE: ALWAYS WEAR PROTECTIVE GLOVES. IN THE EVENT OF ACCIDENTAL CONTACT WITH THE EYES, RINSE THE CONTACT AREA WELL WITH COPIOUS AMOUNTS OF WATER.
THE BRAKE FLUID DRAINED FROM THE SYSTEM IS HARMFUL TO THE ENVIRONMENT. COLLECTION AND DISPOSAL MUST BE CARRIED OUT IN COMPLIANCE WITH THE REGULATIONS IN FORCE. UNDER NORMAL DRIVING AND CLIMATIC CONDITIONS YOU SHOULD CHANGE THE FLUID EVERY TWO YEARS. IF THE BRAKES ARE USED INTENSELY AND/OR IN HARSH CONDITIONS, CHANGE THE FLUID MORE FREQUENTLY.
DURING INSTALLATION, THE PARTS TO BE REUSED MUST BE ABSOLUTELY CLEAN AND FREE FROM ANY TRACES OF OIL, FUEL AND GREASE: IT IS THEREFORE NECESSARY TO CARRY OUT THOROUGH CLEANING WITH PURE ALCOHOL.

N.B.

FOR TOPPING UP AND REPLACEMENT, USE ONLY BRAKE FLUID DOT4 - NHTSA 116.
OBSERVE THE MAXIMUM DEGREE OF CLEANLINESS. THE HYDRAULIC FLUID IS EXTREMELY CORROSIVE FOR PAINTED SURFACES.
BRAKE FLUID IS HYGROSCOPIC; IT TENDS TO ABSORB MOISTURE FROM THE SURROUNDING AIR.
IF THE MOISTURE CONTENT IN THE BRAKE FLUID EXCEEDS A CERTAIN VALUE, IT WILL RESULT IN REDUCED BRAKING EFFICIENCY AND A REDUCTION IN THE BOILING POINT OF THE FLUID.

N.B.

ALWAYS STORE THE FLUID IN SEALED CONTAINERS.

N.B.

RUBBER PARTS SHOULD NEVER BE LEFT IN ALCOHOL FOR LONGER THAN 20 SECONDS. AFTER WASHING, THE PIECES MUST BE DRIED WITH A BLAST OF COMPRESSED AIR AND A CLEAN CLOTH.
THE SEAL RINGS MUST BE IMMERSED IN THE OPERATING LIQUID; THE USE OF THE PRF1 PROTECTION IS TOLERATED.

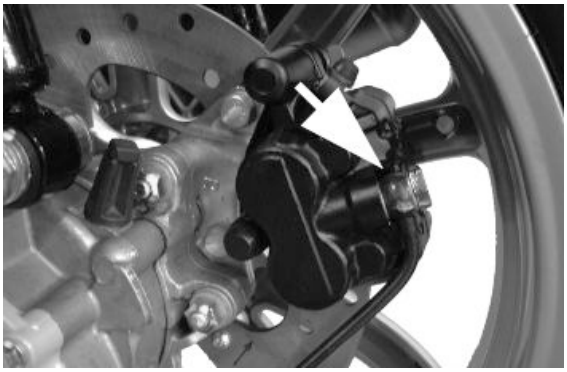
WARNING

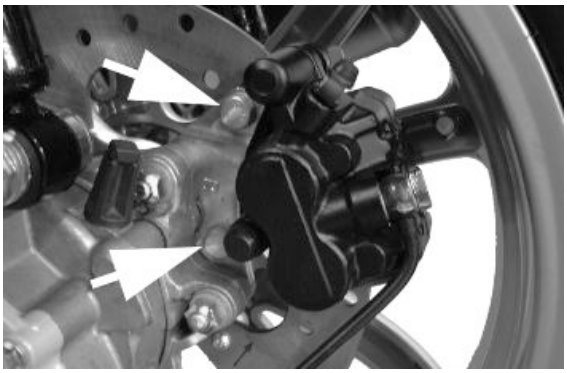
THE PRESENCE OF BRAKE FLUID ON THE DISC OR BRAKE PADS REDUCES THE BRAKING EFFICIENCY. IN THIS CASE, REPLACE THE PADS AND CLEAN THE DISC WITH A HIGH-QUALITY SOLVENT.

Rear brake calliper

Removal

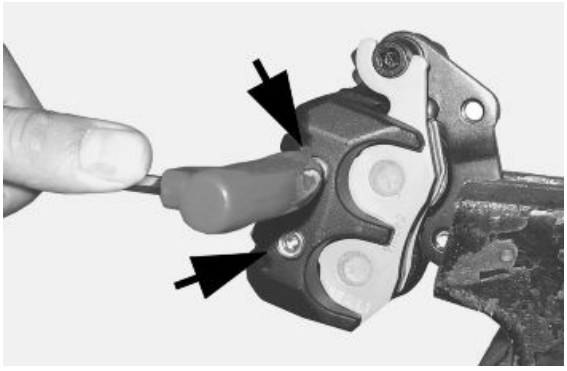
- Inspect the condition of the hoses, packing and joint. In the event of fluid leaks from the calliper, this must be replaced.
- Detach the brake fluid pipe from calliper, pouring the fluid inside a container.
- Remove the clamps shown in the figure.





Overhaul

- Remove the brake calliper.
- Suitably support the brake calliper in a vice
- Remove the two pad fixing screws.
- Remove the pads being careful with the stop spring.



- Remove the fixed plate by undoing the screw shown in the photograph.

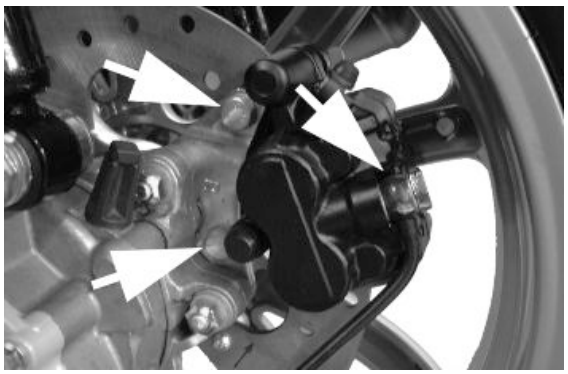
- Remove the internal parts from the floating body with short blasts of compressed air through the brake liquid pipe to facilitate expelling the plungers.
- Check:
  - that the plates and the body are whole and in good condition;
  - that the cylinders of the calliper floating body do not show signs of scratches or erosion, otherwise replace the entire calliper:
  - that the guides of the fixed plate are not scratched or eroded, otherwise replace the entire plate;
  - that the brake pad check spring works properly

CAUTION

ALL THE SEALS AND GASKETS MUST BE REPLACED EVERY TIME THE PUMP IS SERVICED.

Refitting

- Fix the brake calliper support plate to the crankcase and the brake calliper to the bracket, tightening the screws to the prescribed torque.
- Apply the recommended product to the fixing screws of the brake calliper to the bracket.
- Bleed the system.



N.B.

WHILE REFITTING, REPLACE THE COPPER GASKETS ON THEIR FITTINGS.

Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

Locking torques (N*m)

Oil bleed screw 12 - 16 Screw tightening calliper to the support 23 ÷ 25 Screw fixing rear brake calliper support to engine 20 ÷ 25 Brake fluid hose-calliper fitting 16 ÷ 20

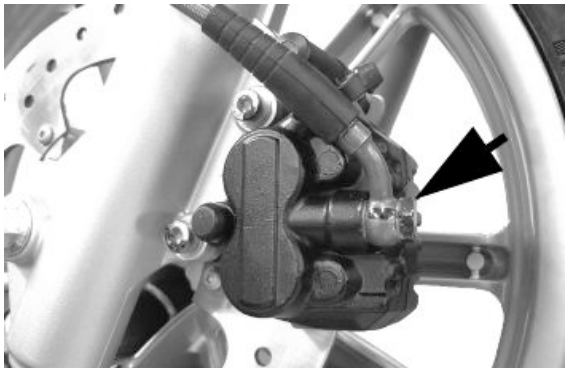
See also

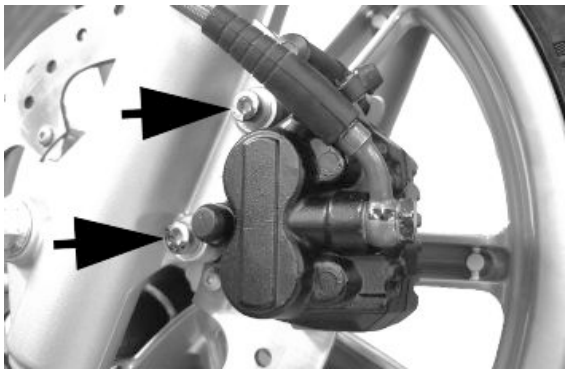
Rear - combined

Front brake calliper

Removal

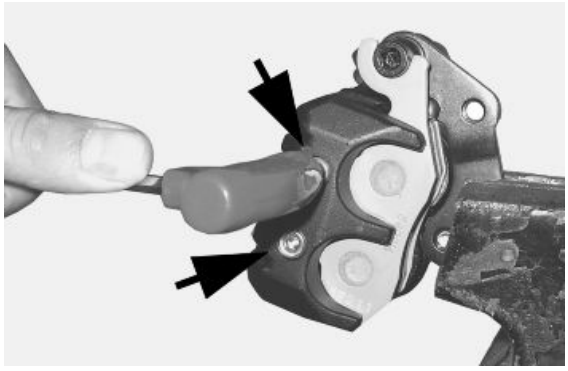
- Inspect the condition of the hoses, packing and joint. In the event of fluid leaks from the calliper, this must be replaced.
- Detach the brake fluid pipe from calliper, pouring the fluid inside a container.
- Remove the clamps shown in the figure.





Overhaul

- Remove the brake calliper.
- Suitably support the brake calliper in a vice
- Remove the two pad fixing screws.
- Remove the pads being careful with the stop spring.



- Remove the fixed plate by undoing the screw shown in the photograph.

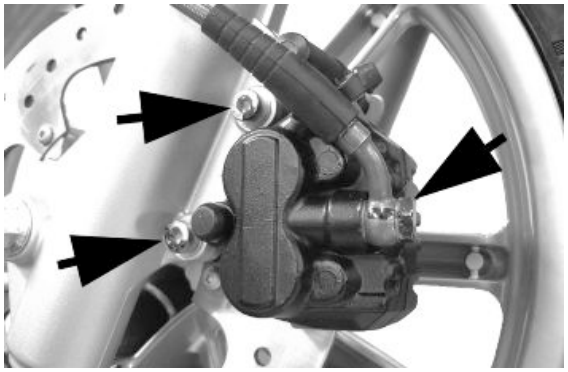
- Remove the internal parts from the floating body with short blasts of compressed air through the brake liquid pipe to facilitate expelling the plungers.
- Check:
  - that the plates and the body are whole and in good condition;
  - that the cylinders of the calliper floating body do not show signs of scratches or erosion, otherwise replace the entire calliper:
  - that the guides of the fixed plate are not scratched or eroded, otherwise replace the entire plate;
  - that the brake pad check spring works properly

CAUTION

ALL THE SEALS AND GASKETS MUST BE REPLACED EVERY TIME THE PUMP IS SERVICED.

Refitting

- When refitting, tighten the nuts to the prescribed torque.
- Bleed the system.



N.B.

WHILE REFITTING, REPLACE THE COPPER GASKETS ON THEIR FITTINGS.

Locking torques (N*m)

Oil bleed screw 12 - 16 Screw tightening calliper to the support 20 ÷ 25 Brake fluid hose-calliper fitting 16 ÷ 20

See also

Front

Rear brake disc

Refitting

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

- Tighten the screws to the prescribed torque and apply the recommended product.

N.B.

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

Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

Locking torques (N*m)

Brake disc fixing screws 11 ÷ 13

Disc Inspection

Checking the disc is important; it must be perfectly clean, with no sign of rust, oil or grease or other dirt and must not show signs of deep scoring.

Characteristic

New rear disc thickness

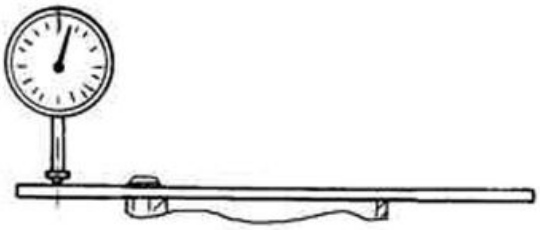
4.0 mm

Disc thickness at wear limit (rear)

3.5 mm

- Remove the wheel and check using the appropriate tools that the axial run-out of the brake surface is within the prescribed limits.

- If this is not the case, replace the disc and repeat the test.



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

Characteristic

Max. axial run-out

0.1 mm

Front brake disc

Removal

Proceed as follows:

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

See also

Removing the front wheel

Refitting

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

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

N.B.

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

Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

Locking torques (N*m)

Brake disc fixing screw 5 ÷ 6.5

Disc Inspection

Checking the disc is important; it must be perfectly clean, with no sign of rust, oil or grease or other dirt and must not show signs of deep scoring.

Characteristic

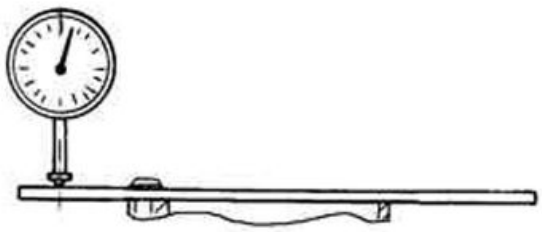
Thickness of a new front disc

4.0 mm

Disc thickness at wear limit (front)

3.5 mm

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



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

Characteristic

Max. axial run-out

0.1 mm

Front brake pads

Removal

Proceed as follows:

- Remove the front calliper.
- Loosen the two pins shown in the figure that lock the two pads.
- Remove the pads, being careful of the pads' spring clamp.
- Check the thickness of the pads.

Characteristic

Minimum value

1.5 mm

See also

Front brake calliper

Refitting

To fit, proceed as follows:

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

N.B.

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

Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

Locking torques (N*m)

Screw tightening calliper to the support 20 ÷ 25 Pad fastening pin 19.6 ÷ 24.5

Rear brake pads

Removal

Proceed as follows:

- Remove the rear brake calliper
- Remove the two pins holding the brake pads.
- Remove the pads, paying attention to the pad retaining spring.
- Check the thickness of the pads.

If the thickness is less than the minimum value, replace the pads with new pads.

Characteristic

Minimum value

1.5 mm

See also

Removal

Refitting

Carry out the installation by analogy with the procedure described for the installation of the rear brake calliper.

- Tighten the two calliper fixing screws to the prescribed tightening torque.

Locking torques (N*m)

Pad fastening pin 19.6 ÷ 24.5 Screw tightening calliper to the support 20 ÷ 25 Fixing screws for the calliper support on the engine 20 ÷ 25

Fill

Rear - combined

Proceed as follows:

- Position the vehicle on a flat surface and on the stand
- Loosen the two screws shown in the figure and open the front brake fluid reservoir.
- Through the bleed screw on the brake calliper, bleed the system using a hose of adequate diameter.
- Collect the used fluid in a container.
- Pump on the brake lever to completely drain the system of all used fluid.
- Tighten the bleed valve.
- Refill the brake system tank up to the maximum level with the prescribed fluid.
- Attach the tube of the special tool to the bleed fitting.
- Actuate the tool at the bleed fitting, at the same time constantly topping up the brake system tank to prevent air being drawn into the system, until no more air escapes at the bleed fitting. The operation is finished when only brake fluid comes out of the bleed screw.
- Close the bleed screw and tighten to the prescribed torque.
- Close the brake system tank.

N.B.

IF AIR CONTINUES TO COME OUT DURING THE BLEED OPERATION, EXAMINE ALL THE FITTINGS. IF SAID FITTINGS DO NOT SHOW SIGNS OF BEING FAULTY, LOOK FOR THE AIR INPUT AMONG THE VARIOUS SEALS ON THE PUMP AND CALLIPER PISTONS. WHEN CARRYING OUT THE OPERATION, BRAKE FLUID MAY LEAK FROM THE BLEED SCREW ON THE CALLIPER AND ON THE DISC. IN THIS CASE; CAREFULLY CLEAN THE CALLIPER AND DEGREASE THE BRAKE DISC.

Specific tooling

020329Y MityVac vacuum-operated pump

Locking torques (N*m)

Oil bleed screw 12 - 16

Front

Proceed as follows:

- Position the vehicle on a flat surface and on the stand
- Loosen the two screws shown in the figure and open the front brake fluid reservoir.
- Through the bleed screw on the brake calliper, bleed the system using a hose of adequate diameter.
- Collect the used fluid in a container.
- Pump on the brake lever to completely drain the system of all used fluid.
- Tighten the bleed valve.
- Refill the brake system tank up to the maximum level with the prescribed fluid.
- Attach the tube of the special tool to the bleed fitting.
- Actuate the tool at the bleed fitting, at the same time constantly topping up the brake system tank to prevent air being drawn into the system, until no more air escapes at the bleed fitting. The operation is finished when only brake fluid comes out of the bleed screw.
- Close the bleed screw and tighten to the prescribed torque.
- Close the brake system tank.

N.B.

IF AIR CONTINUES TO COME OUT DURING THE BLEED OPERATION, EXAMINE ALL THE FITTINGS. IF SAID FITTINGS DO NOT SHOW SIGNS OF BEING FAULTY, LOOK FOR THE AIR INPUT AMONG THE VARIOUS SEALS ON THE PUMP AND CALLIPER PISTONS. WHEN CARRYING OUT THE OPERATION, BRAKE FLUID MAY LEAK FROM THE BLEED SCREW ON THE CALLIPER AND ON THE DISC. IN THIS CASE; CAREFULLY CLEAN THE CALLIPER AND DEGREASE THE BRAKE DISC.

Specific tooling

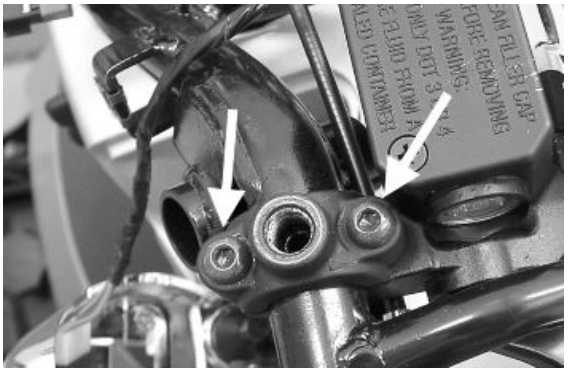
020329Y MityVac vacuum-operated pump

Locking torques (N*m)

Oil bleed screw 12 - 16

Front brake pump

Removal



- Remove the rear handlebar cover.
- Drain the brake system.
- Disconnect the brake fluid line from the pump, paying attention to a possible escape of remaining brake fluid.
- Remove the front and rear brake stop button from the lever.
- Loosen the two retaining screws of the stand and remove together with the rear view mirror.
- Remove the front brake pump together with the lever.

See also

Front
Rear handlebar cover

Overhaul

1) Remove the brake lever by loosening the fixing screw;
open the cover (2) and take out the diaphragm (3);
2) Remove the cap and unscrew the internal parts in the specified order;
3) Check that:
- The body of the pump shows no signs of internal damage or corrosion;
- The piston shows no sign of damage or abnormal wear;
- The piston return spring is in good condition.

Refitting

Reinstall the individual parts in the reverse order to the removal, paying attention to the correct positioning of the rubber parts in order to ensure leak tightness.

1. Tank cover screw
2. Tank cover
3. Diaphragm
4. Bellows
5. Seal ring
6. Piston

7. Gasket
8. Spring
9. Tank

CAUTION

ALL THE SEALS AND GASKETS MUST BE REPLACED EVERY TIME THE PUMP IS SERVICED.

Refitting

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

WARNING

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

CAUTION

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

Locking torques (N*m)

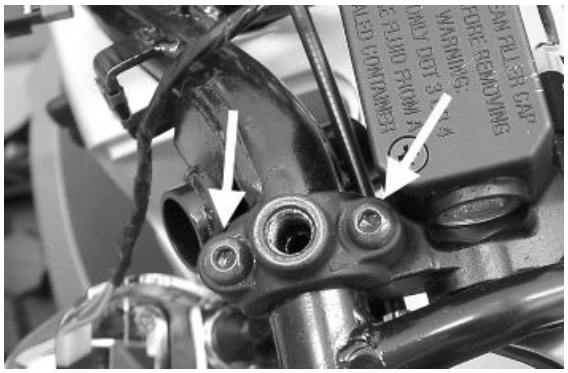
Oil bleed screw 12 - 16 Hydraulic line fixing screw: 16 ÷ 20 Fixing screws for handlebar control assembly U-bolts 7 ÷ 10

See also

Front

Rear brake pump - combined

Removal



- Remove the rear handlebar cover.
- Drain the brake system.
- Disconnect the brake fluid line from the pump, paying attention to a possible escape of remaining brake fluid.
- Remove the front and rear brake stop button from the lever.
- Loosen the two retaining screws of the stand and remove together with the rear view mirror.
- Remove the front brake pump together with the lever.

See also

Rear - combined
Rear handlebar cover

Refitting

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

WARNING

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

CAUTION

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

Locking torques (N*m)

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

See also

Front

INDEX OF TOPICS

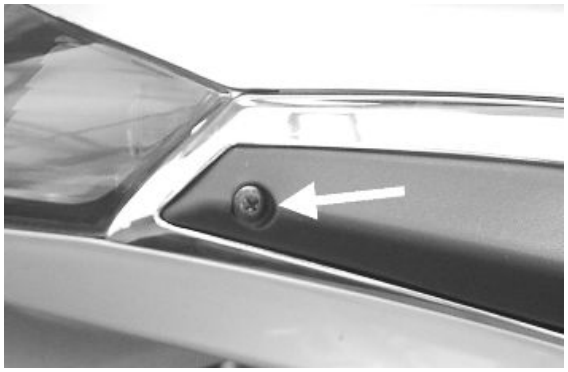
This section è is devoted to the operations that can be carried out on the vehicle's bodywork.

Seat

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

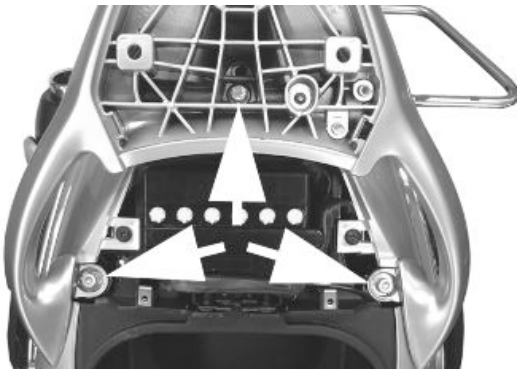
Side fairings

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



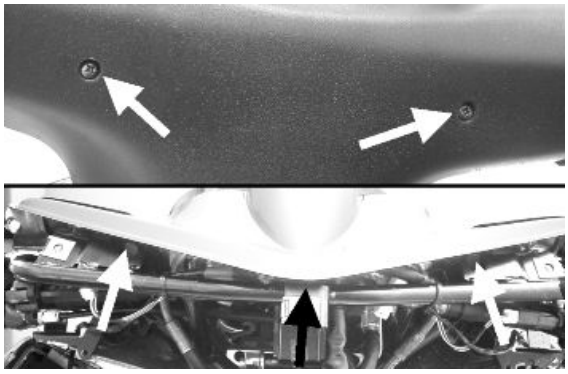
Rear rack

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



Rear handlebar cover

- Remove the front handlebar cover
- Remove the 3 screws shown in the photograph.
- Remove the 2 screws on the rear part of the handlebar cover shown in the photograph.

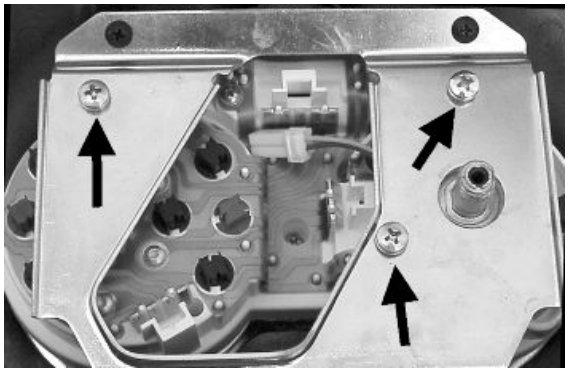


See also

Front handlebar cover
Front handlebar cover

Instrument panel

- Remove the rear handlebar cover.
- Disconnect the cable harness.
- Remove the odometer cable.
- Remove the 3 screws shown in the photograph.
- Remove the instrument panel.

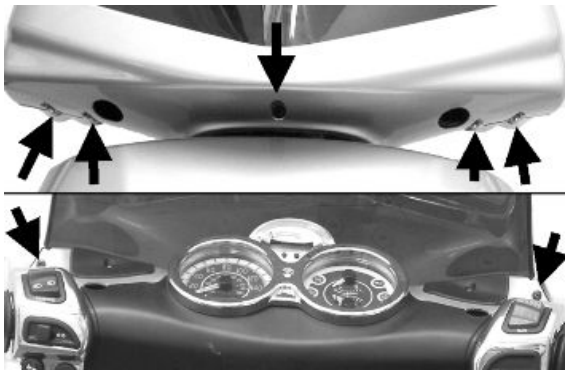


See also

Rear handlebar cover

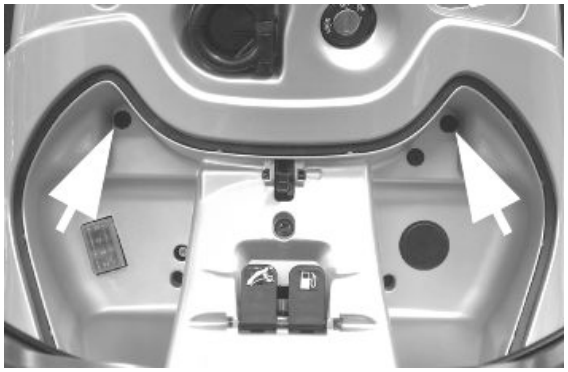
Front handlebar cover

- Remove the 5 screws on the front part of the handlebar cover shown in the figure.
- Remove the 2 screws on the rear part of the handlebar cover shown in the figure.



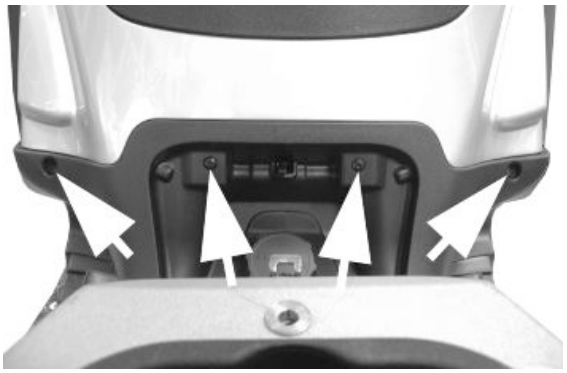
Headlight assy.

- Remove the front headlight assembly by loosening the 4 retaining screws; - Separate the electrical connectors; - Pull out the headlight assembly.



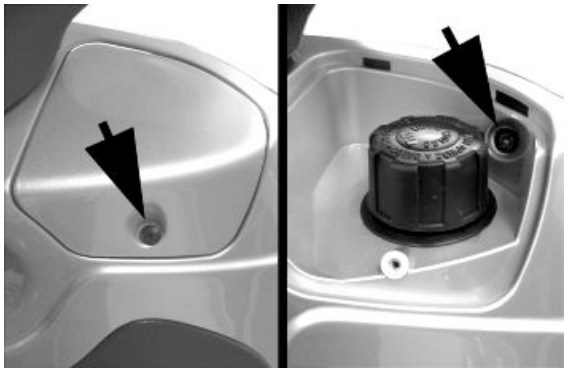
Frame central cover

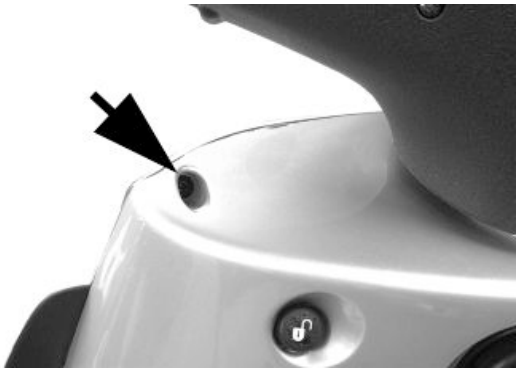
- Open the fuel tank access port.
- Loosen the 4 screws shown in the figure.
- Remove temporarily the fuel tank cap and pull out the rubber protector.
- Remove the central frame cover, separating it from the rear section of the scooter, then separating it from the transmission for the opening of the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



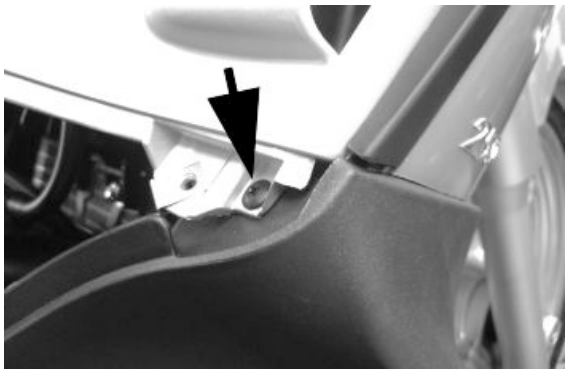
Legshield

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

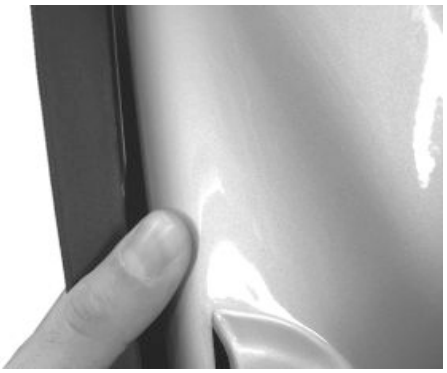




- Remove the central frame cover, then unscrew the 2 screws indicated in the figure.
- Remove the Piaggio symbol from the shield, then remove the screw.
- Remove the front shield to the front.



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

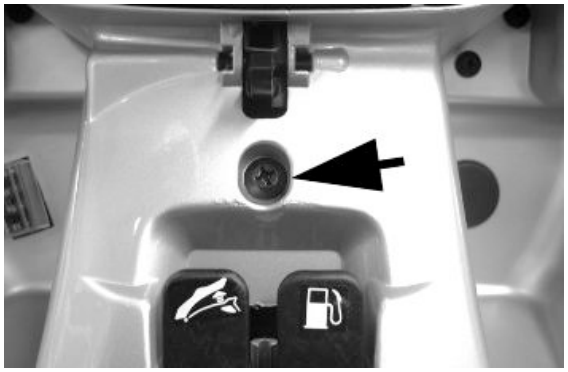


See also

Headlight assy.
Frame central cover

Knee-guard

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



See also

Legshield

Removing the ignition key-switch when on *off*

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

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

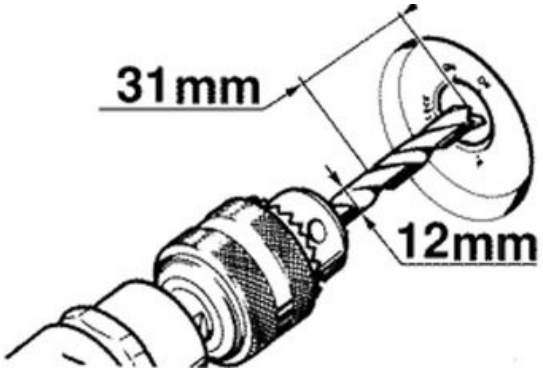
- Lightly push the master-cylinder and extract the lock from the notch shown in the figure.
- Hence extract the master-cylinder complete with the key-switch.
- For the refitting proceed in the reverse order.

See also

Knee-guard

Removing the ignition key-switch when on *lock*

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



N.B.

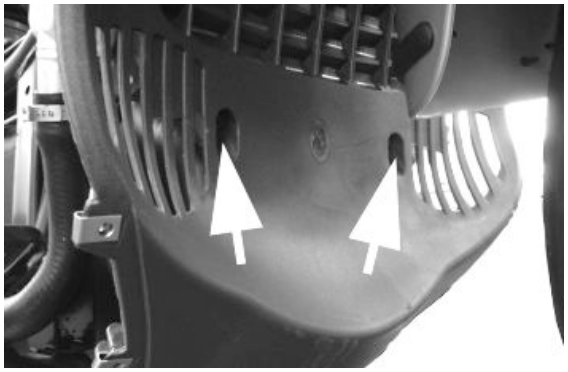
TO REFIT THIS ITEM, THE SCOOTER STEERING LOCK MUST BE RELEASED WITH THE LOCK BODY (INTERNAL AND EXTERNAL PART) IN POSITION "OFF". PROCEED AS DESCRIBED IN THE PREVIOUS PARAGRAPH.

See also

Removing the ignition key-switch when on *off*

Front wheel housing

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



See also

Footrest
Removing the front wheel
Knee-guard

Taillight assy.

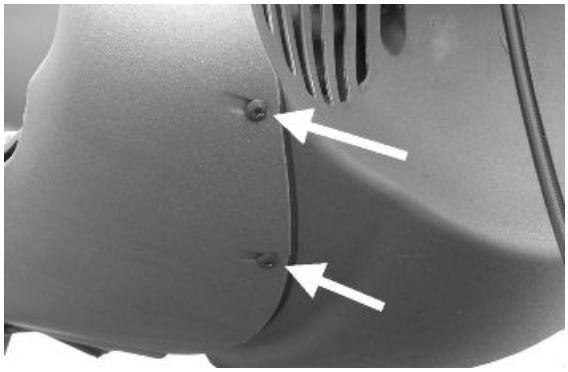
- Remove the cover of the luggage rack.
- Remove the side bumpers.
- Unscrew the 3 screws holding the rear light.
- Remove the rear light assembly after disconnecting the electrical cable harness.

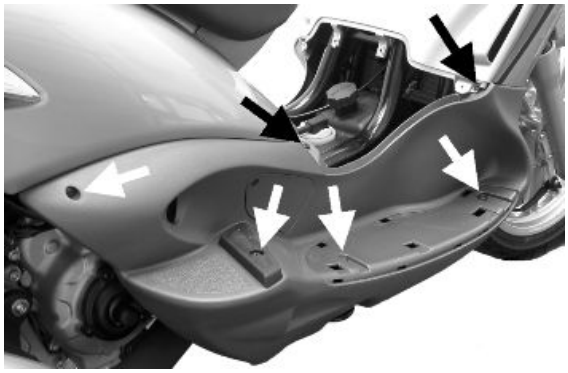
See also

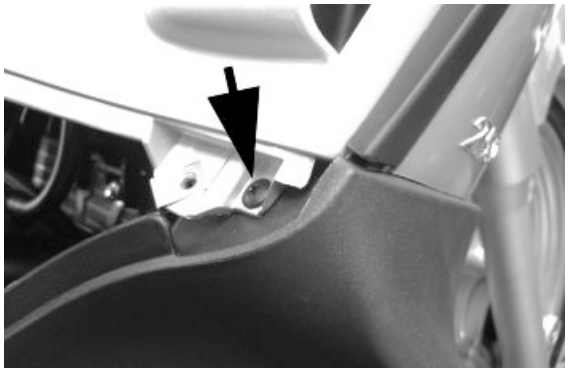
Rear rack
Side fairings

Footrest

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





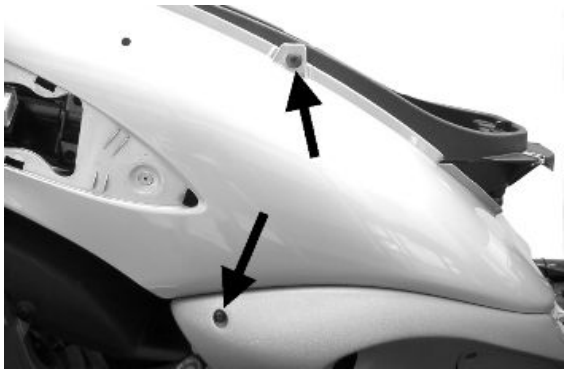


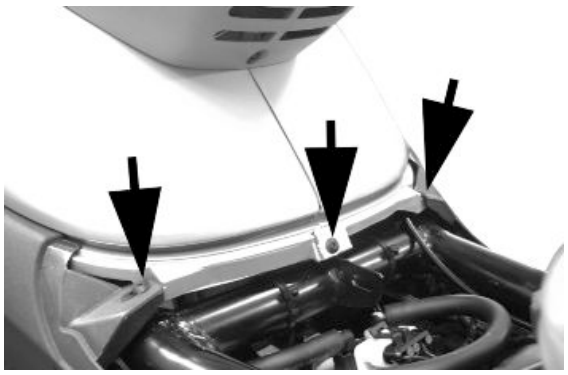
See also

Frame central cover

Side fairings

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





See also

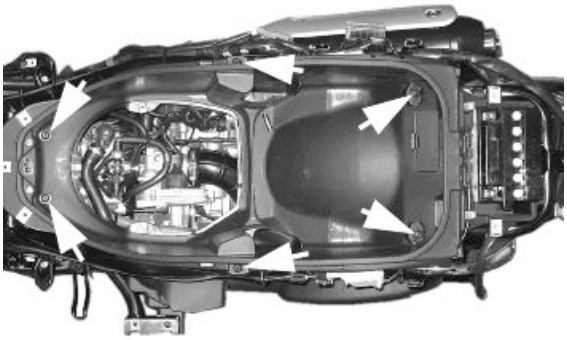
Taillight assy.
Rear rack
Frame central cover
Seat

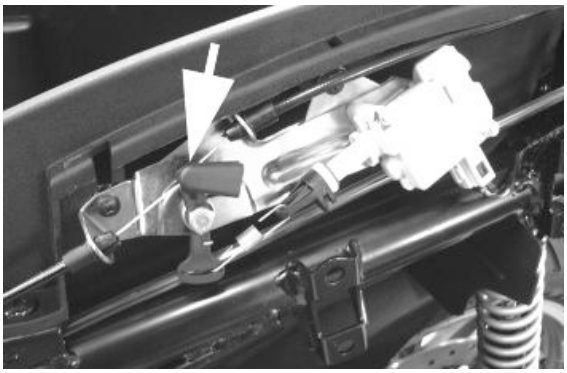
Rear mudguard

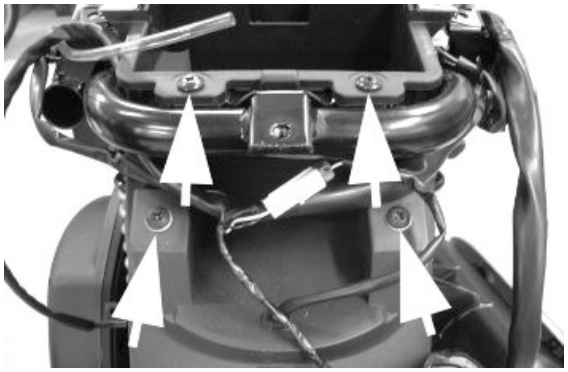
- Loosen the 4 fixing screws, 2 of which are indicated in the figure and the other 2 located on the opposite side under the air filter;
- Remove the rear mudguard.

Helmet bay

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





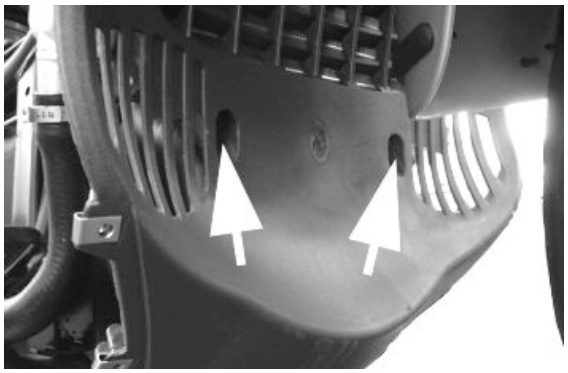


Fuel tank

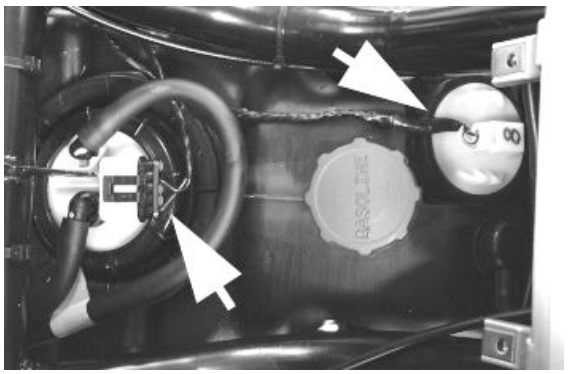
- Remove the shield back plate.
- Remove the two lower screws of the front wheel housing.
- Remove the footrest.

N.B.

THIS OPERATION SHOULD PREFERABLY BE PERFORMED WITH THE TANK EMPTY.

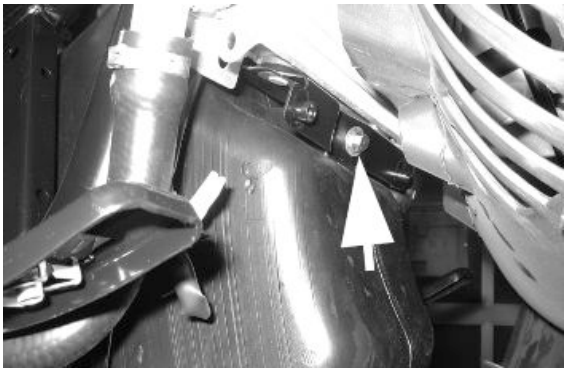


- Separate the electrical connections of the fuel gauge and disconnect the fuel supply line and tank breather;
- Remove the toggle handles by loosening the 4 retaining screws;
- Remove the support bracket by loosening the 2 retaining screws of the bracket at the frame;
- Remove the three tank retaining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



N.B.

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

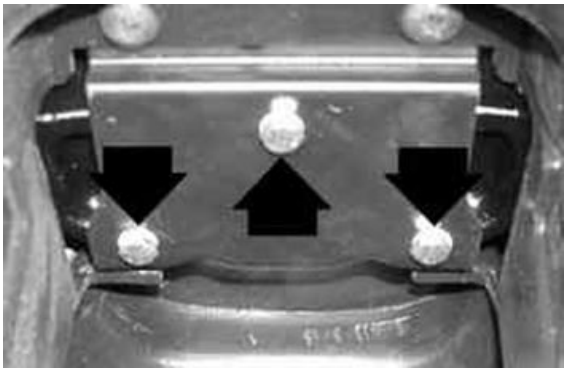


See also

Knee-guard
Front wheel housing
Footrest

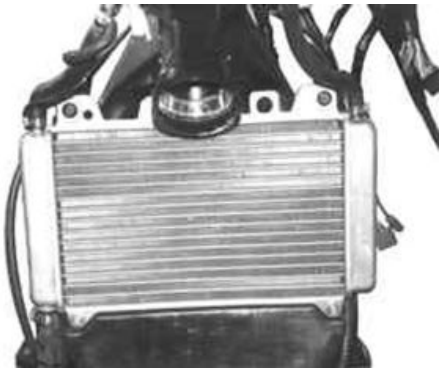
Front mudguard

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



Radiator fan

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



See also

Front wheel housing

Flyscreen

- Remove the front handlebar cover
- Remove the 3 screws shown in the photograph.

See also

Front handlebar cover

INDEX OF TOPICS

Carry out the listed tests before delivering the vehicle.

Warning- be very careful when handling fuel.

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 Lower front shock absorber fitting
Front wheel axle nut Front wheel screws Rear wheel screws
Front and rear wheel hub nut Front and rear brake calliper clamping screws
Frame - swinging arm bolt *
Swinging arm bolt - Engine
Engine arm pin - Frame arm
Handlebar lock nut
Steering lower ring nut
Upper steering ring nut

Electrical system

• Main switch

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

- Regulating the headlights according to the regulations currently in force

• Front and rear stop light buttons and relative light •Turn indicators and relative telltales

• Instrument lighting

• instruments: fuel and temperature indicator

•Instrument panel lights

• Horn

• electric start up

• Engine stopping with emergency stop switch

• electric saddle opening button

CAUTION

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

CAUTION

WHEN INSTALLING THE BATTERY, ATTACH THE POSITIVE LEAD FIRST AND THEN THE NEGATIVE 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.
- Rear hub oil level
- Engine coolant level
- Engine oil level

Road test

Test ride

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

- Abnormal noise

Static test

Static control after the test ride:

• Hot engine restart

• Minimum seal (turning the handlebar)

• Uniform steering rotation

• Possible losses

• electric radiator fan operation

CAUTION

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

CAUTION

NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES OR TYRES MAY BURST.

Functional inspection

Functional check up:

• Hydraulic braking system: lever travel

• Clutch: proper functioning check

• Engine: proper general functioning and no abnormal noise check

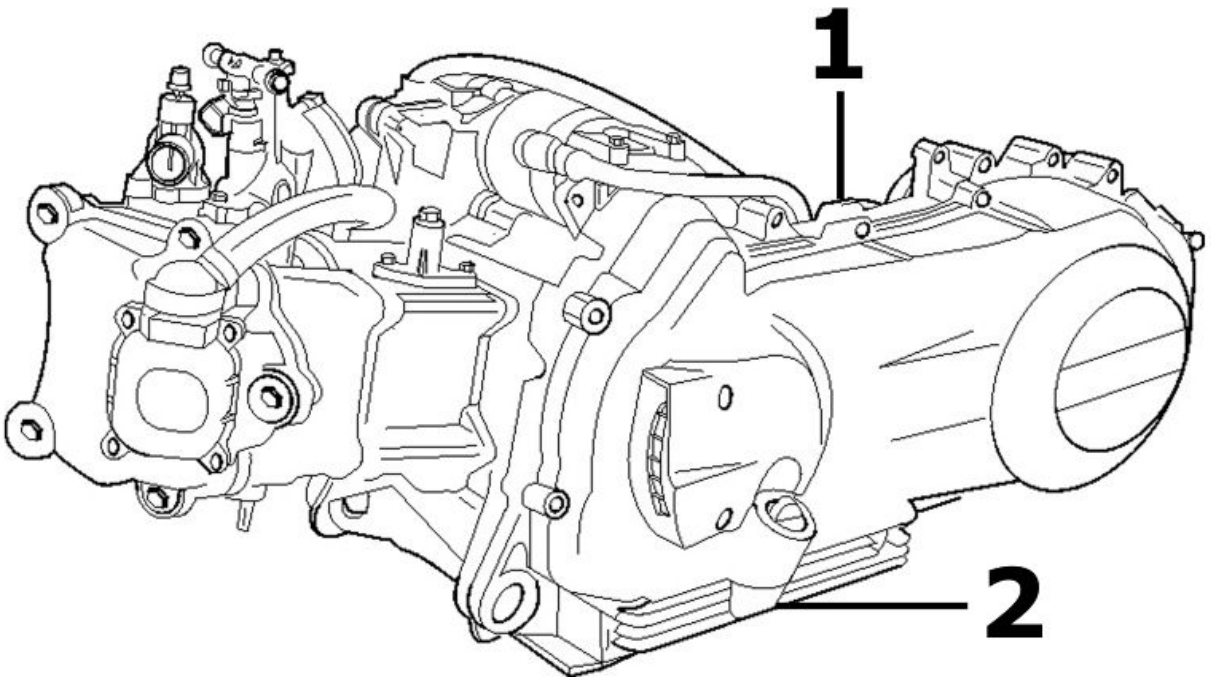
• Other: papers check, frame and engine number check, tools and equipment, licence plate fitting, lock check, tyre pressure check, rear-view mirror and any accessory fitting

INDEX OF TOPICS

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

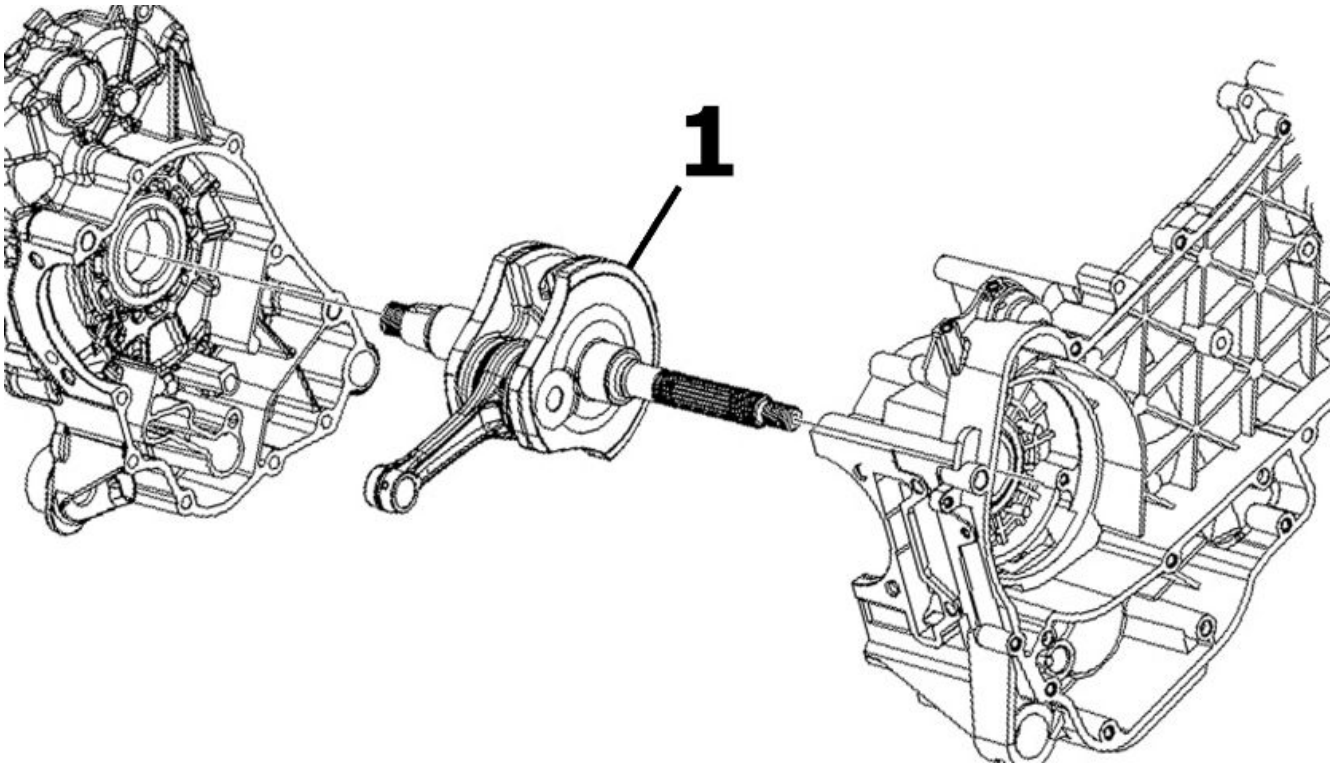
	Code	Action	Duration
1	001001	Engine from frame - Removal and refit.	
2	003064	Engine oil - change	

Crankcase

CRANKCASE

	Code	Action	Duration
1	001153	Crankcase halves gasket - Replacement	
2	001133	Engine crankcase- Replacement	

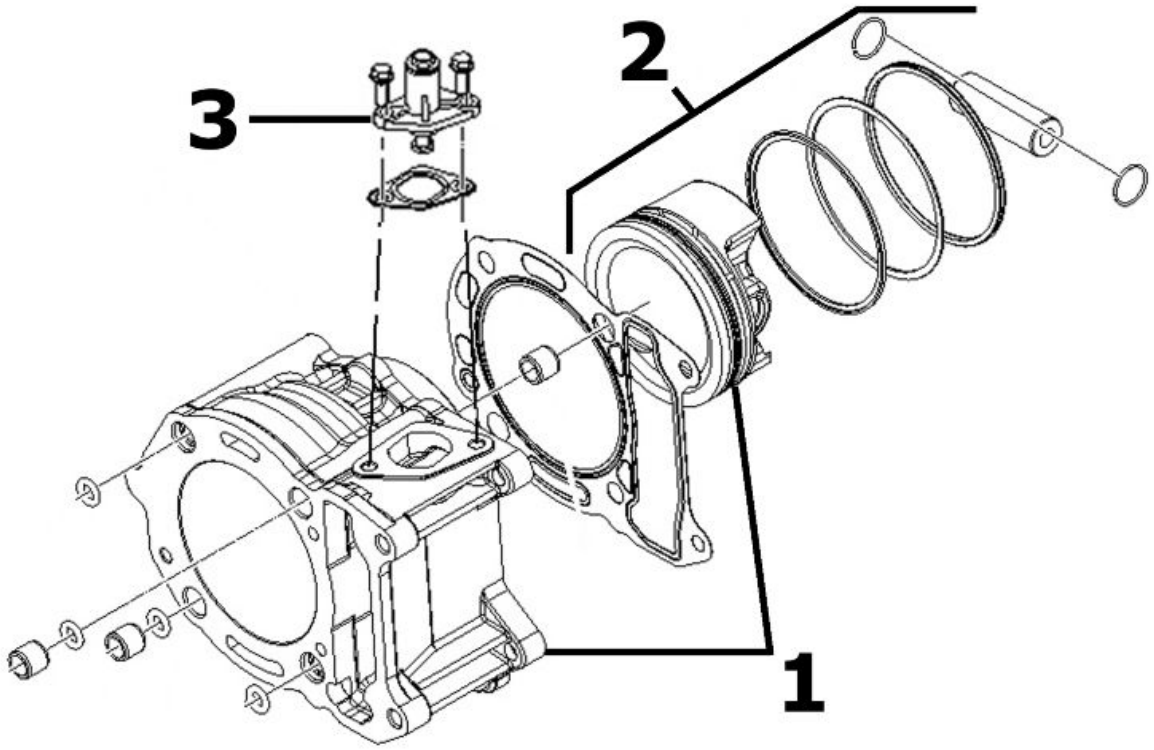
Crankshaft



CRANKSHAFT

	Code	Action	Duration
1	001117	Crankshaft - Replacement	

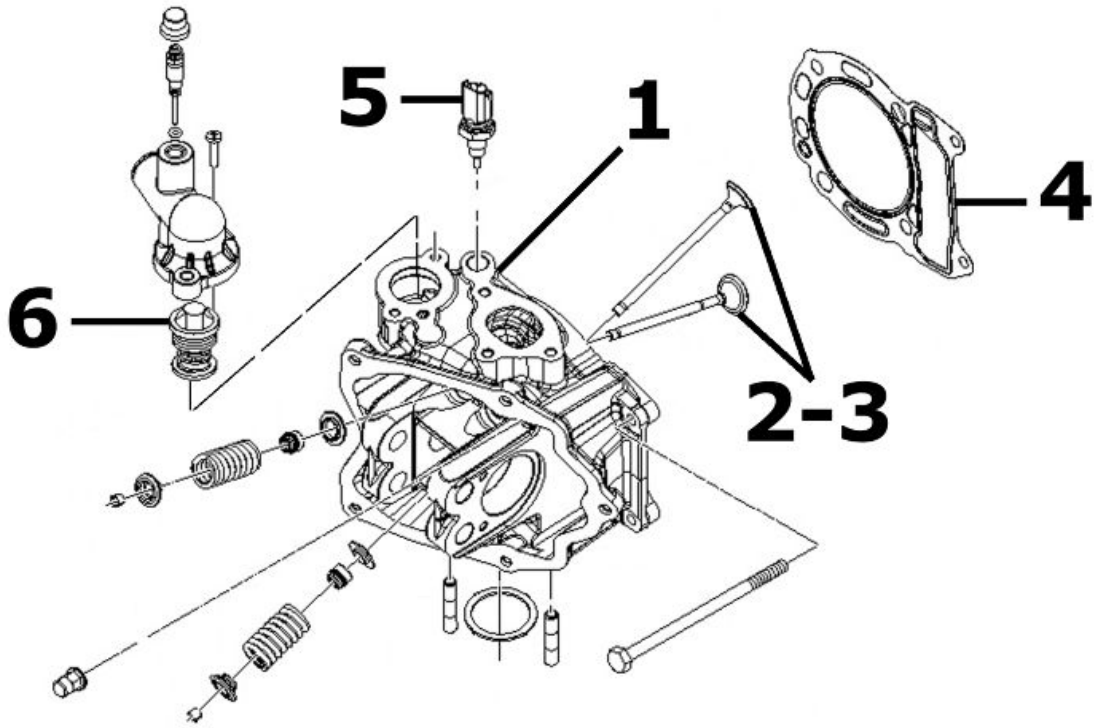
Cylinder assy.



CYLINDER- PISTON

	Code	Action	Duration
1	001002	Cylinder-Piston - Replace-ment	
2	001154	Pin ring piston unit - Service	
3	001129	Chain tightener - Overhaul and replacement	

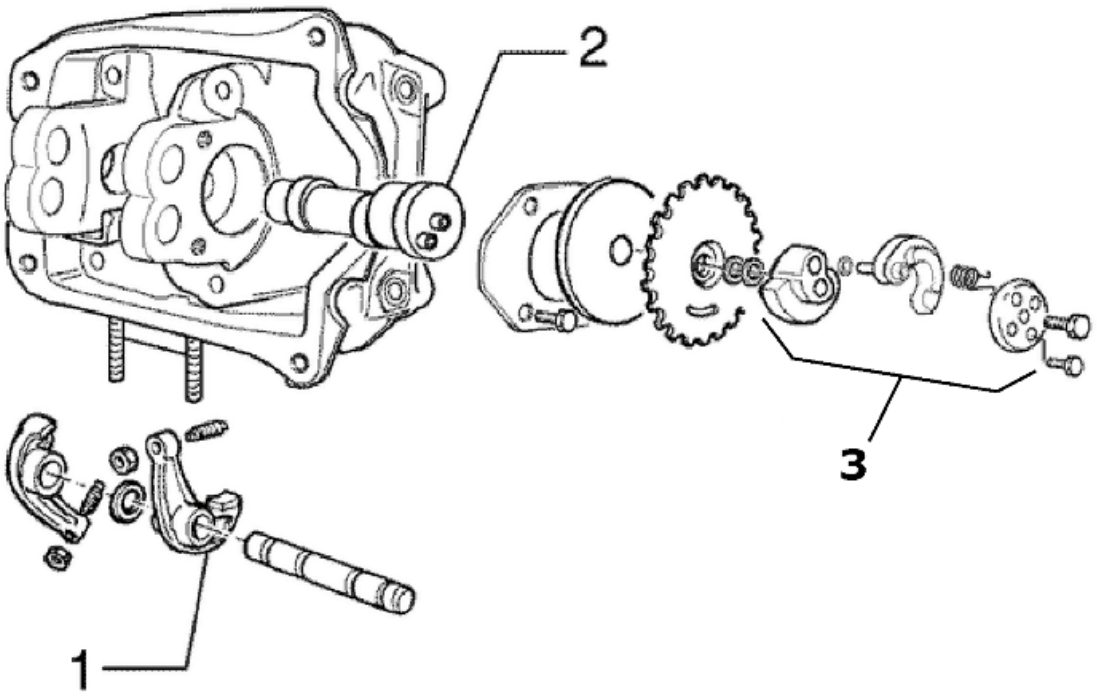
Cylinder head assy.



VALVE HEAD

	Code	Action	Duration
1	001126	Head - Replacement	
2	001045	Valves - Replacement	
3	001049	Valves - Adjustment	
4	001056	Head gasket - Replacement	
5	001083	Thermistor - Replacement	
6	001057	Thermostat - Replacement	

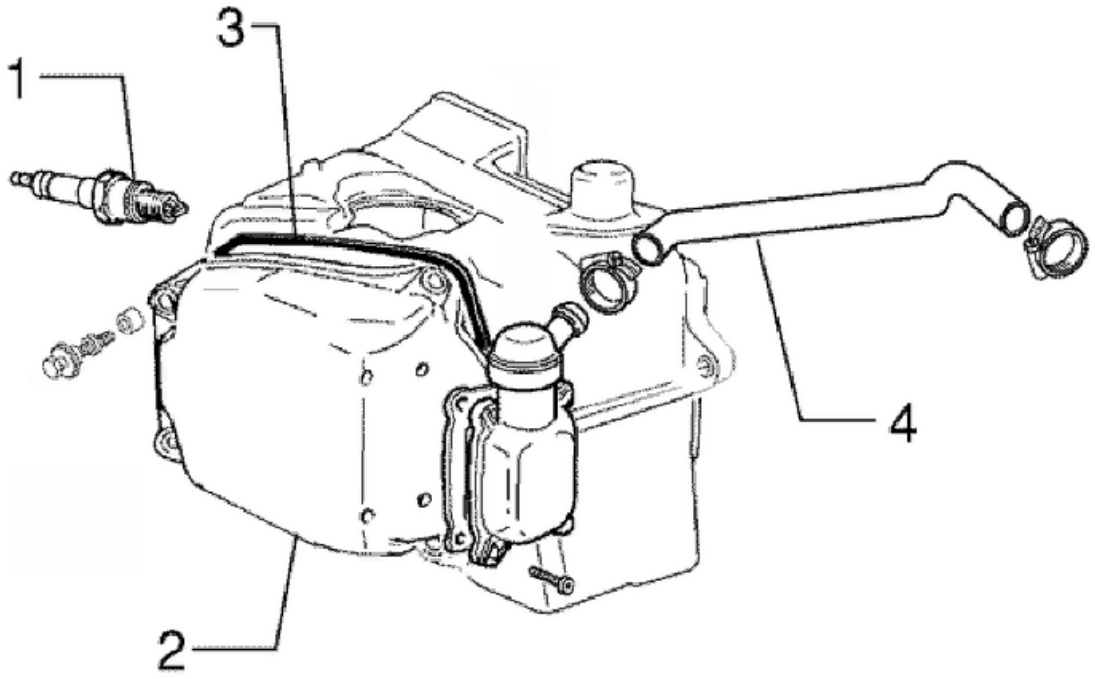
Rocker arms support assy.



CAM SHAFT

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

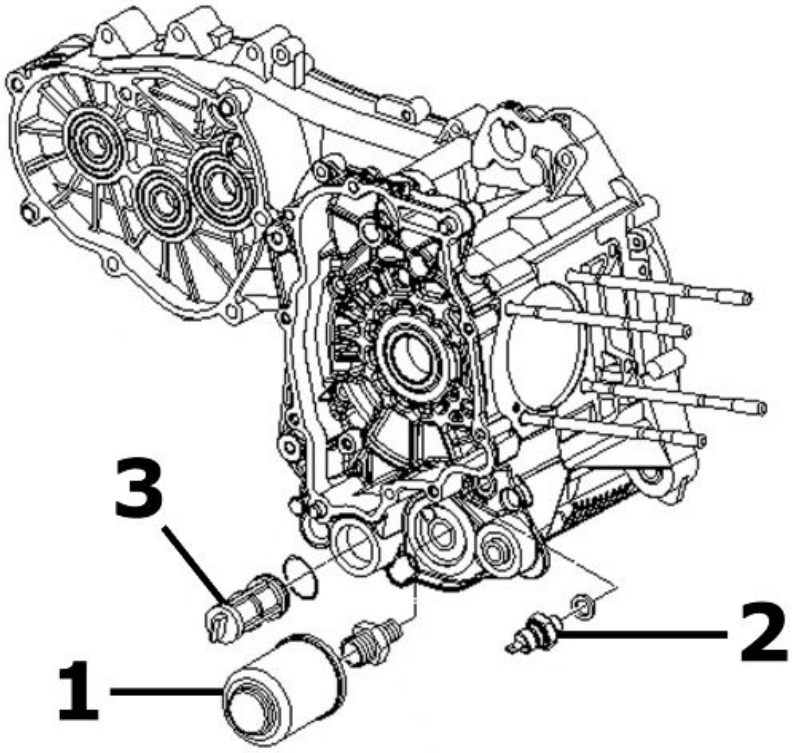
Cylinder head cover



HEAD COVER

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

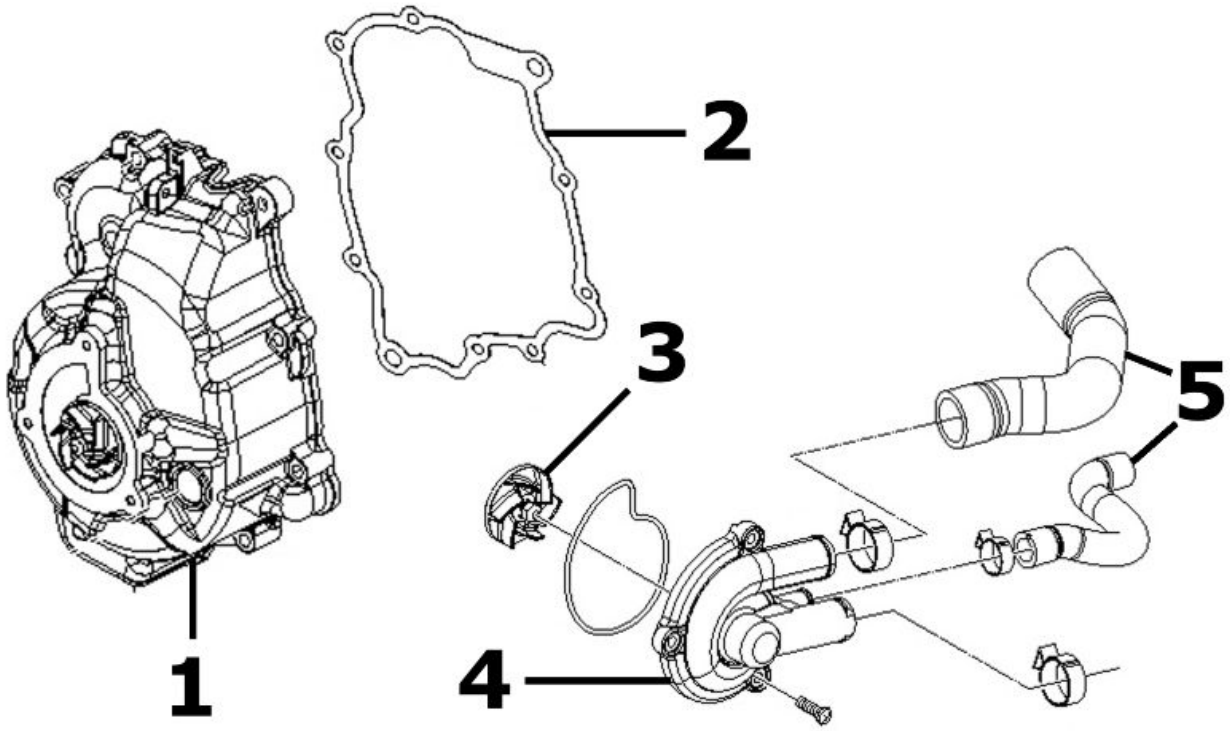
Oil filter



OIL FILTER

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

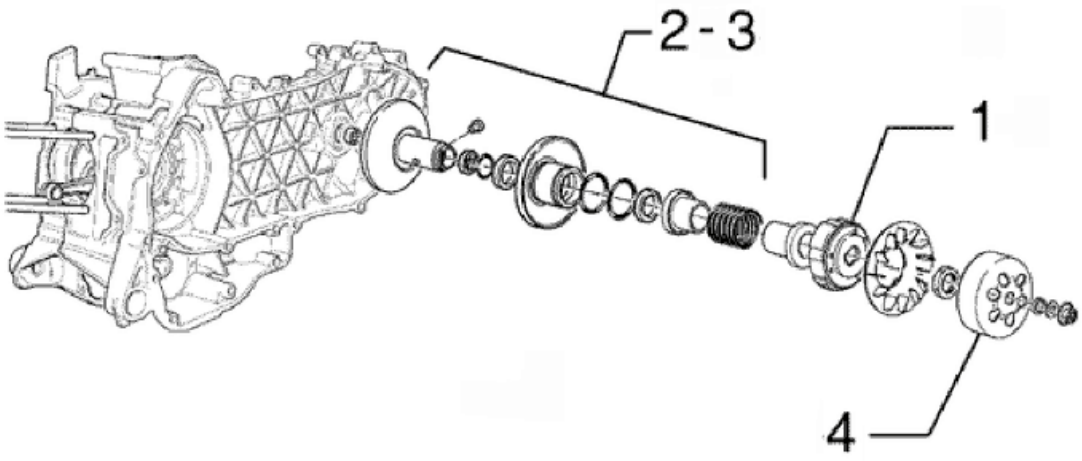
Flywheel cover



FLYWHEEL COVER

	Code	Action	Duration
1	001087	Flywheel cover - replace	
2	001150	Flywheel cover gasket - Replacement	
3	007007	Water pump rotor cover	
4	007017	Water pump cover - Replacement	
5	007003	Coolant delivery and return pipe - Replacement	

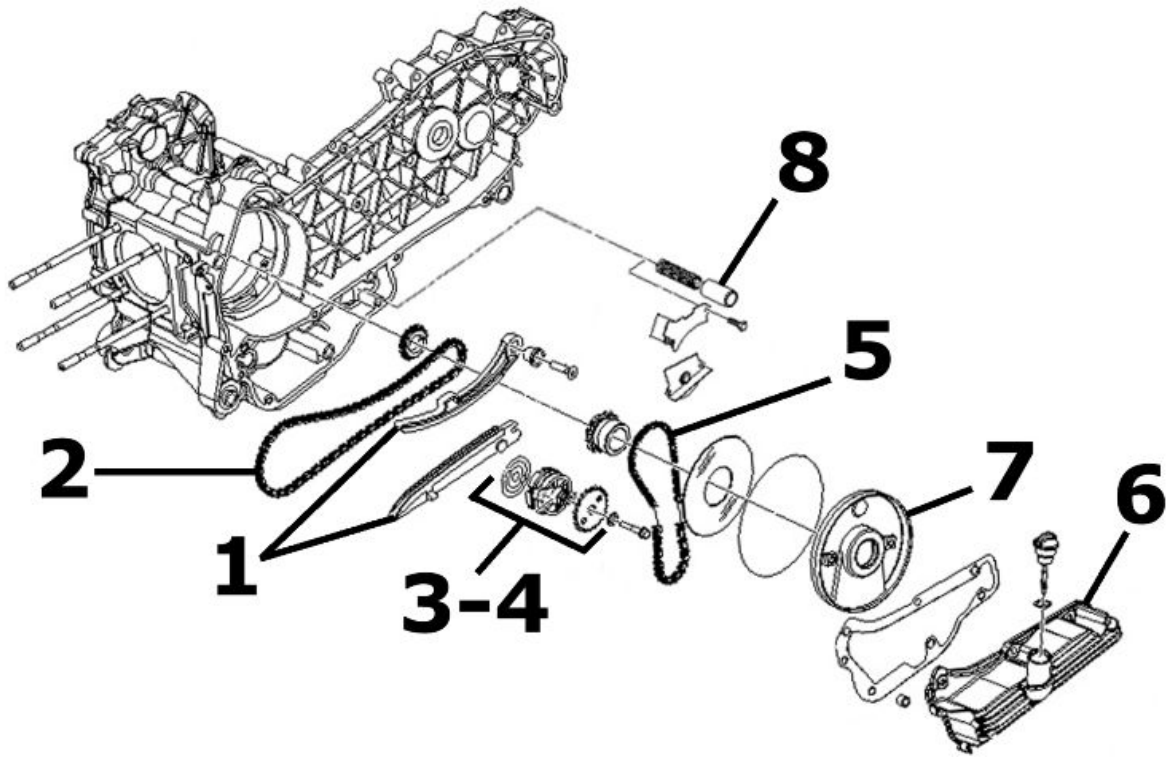
Driven pulley



DRIVEN PULLEY

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

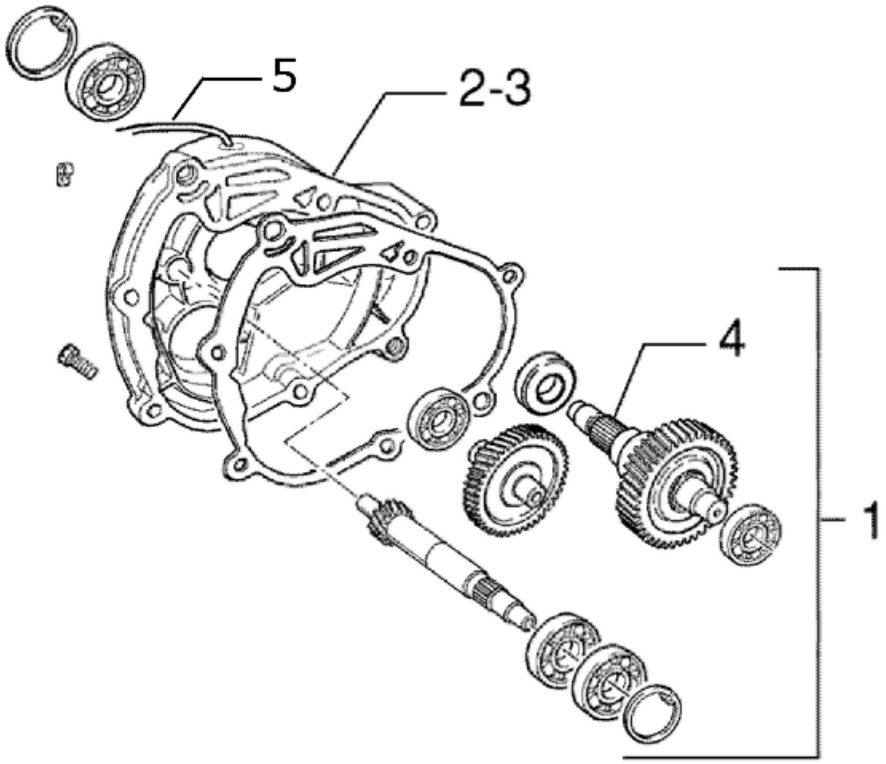
Oil pump



OIL PUMP

	Code	Action	Duration
1	001125	Chain guide pads - Replacement	
2	001051	Belt/Timing chain - Change	
3	001042	Oil pump - Service	
4	001112	Oil pump - change	
5	001122	Oil pump chain - Replacement	
6	001130	Oil sump - Replacement	
7	001172	Chain cover flap - change	
8	001124	Lubrication by-pass - Replacement	

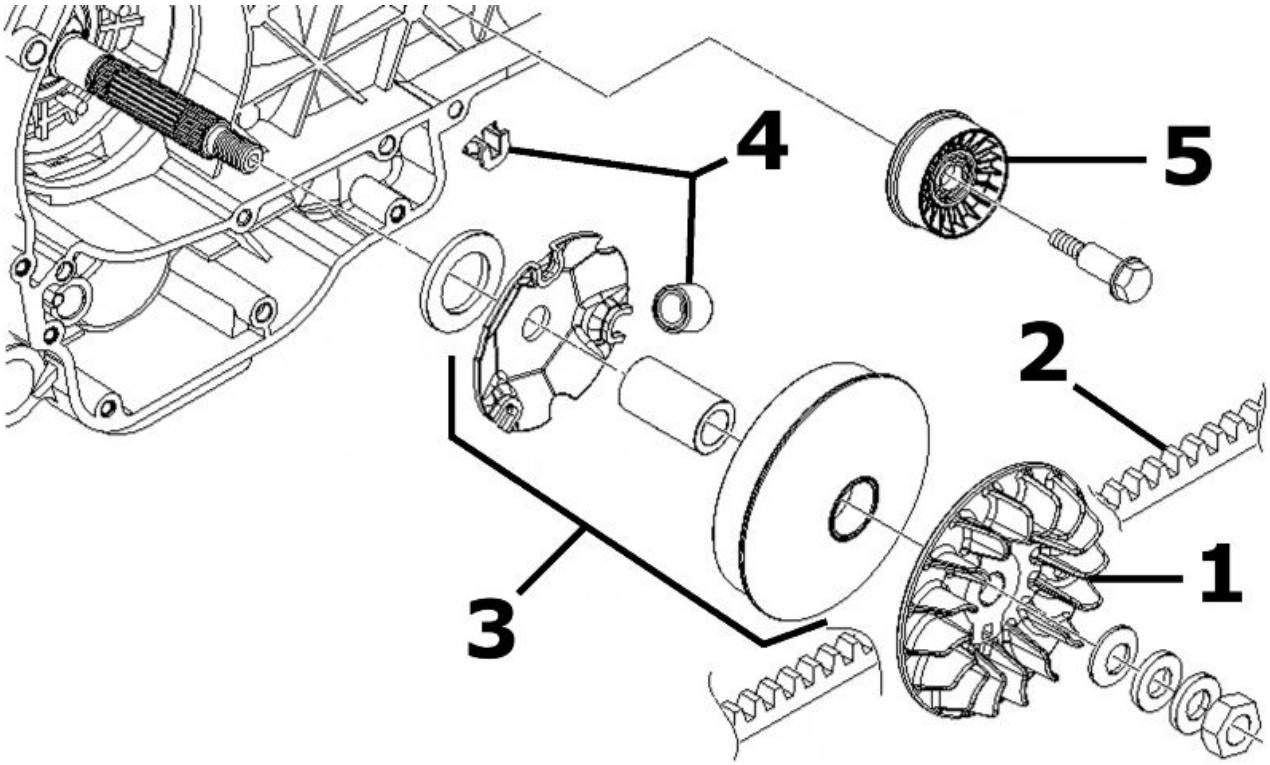
Final gear assy.



FINAL REDUCTION

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

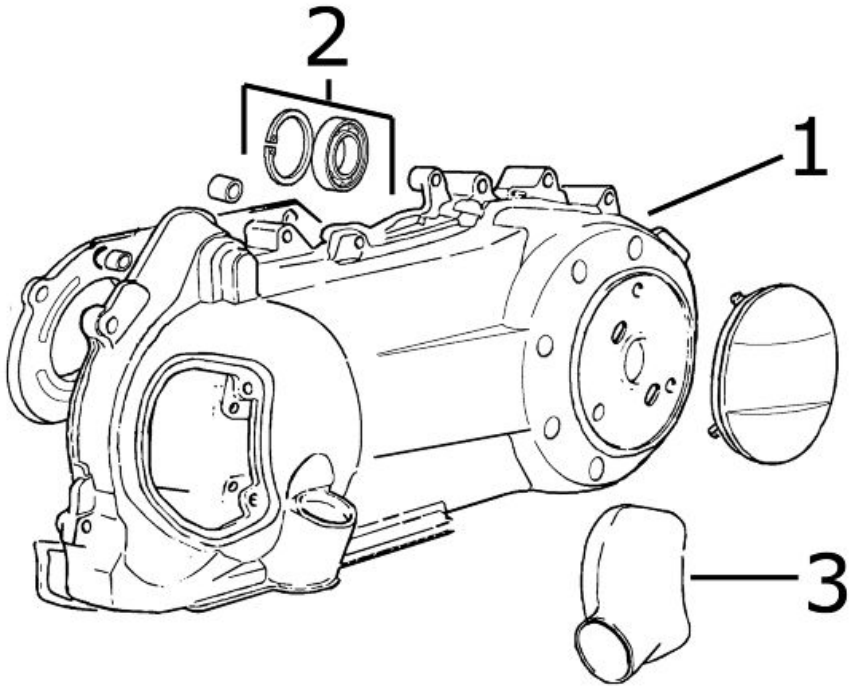
Driving pulley



DRIVING PULLEY

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

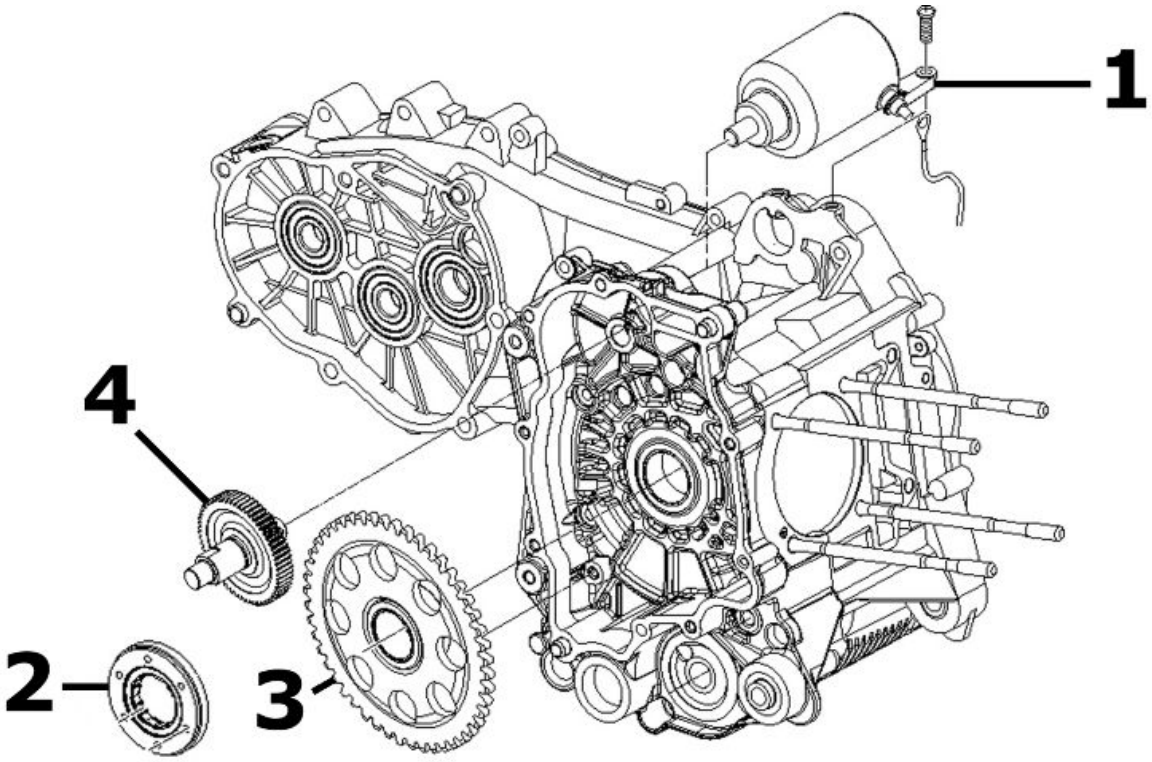
Transmission cover



TRANSMISSION COVER

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

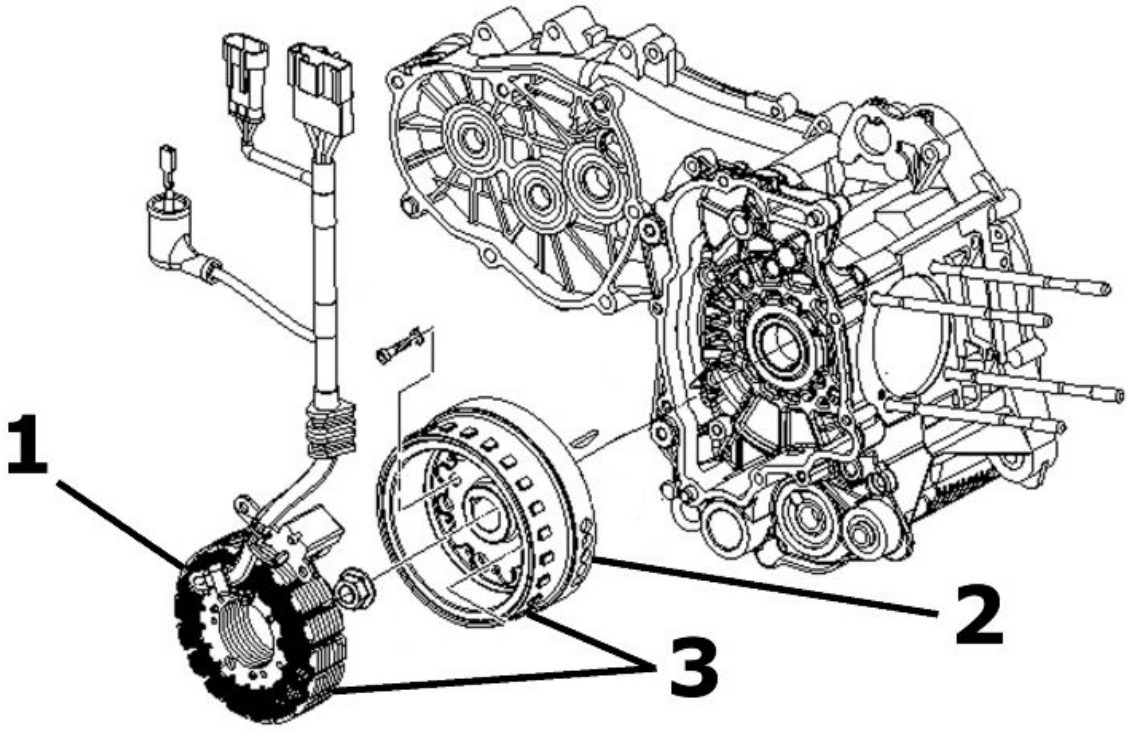
Starter motor



ELECTRICAL START-UP

	Code	Action	Duration
1	001020	Starter motor - Replacement	
2	001104	Start-up freewheel - Replacement	
3	001151	Start-up driven gearing - Replacement	
4	001017	Start-up pinion - Replacement	

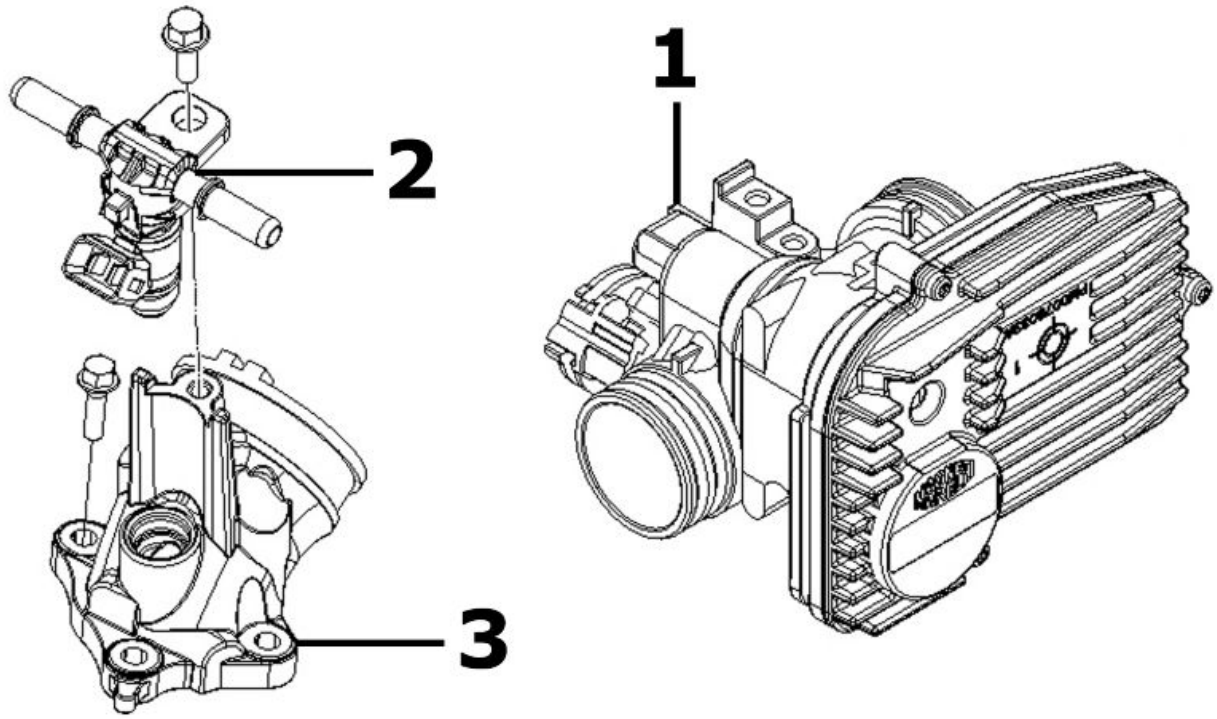
Flywheel magneto



MAGNETO FLYWHEEL

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

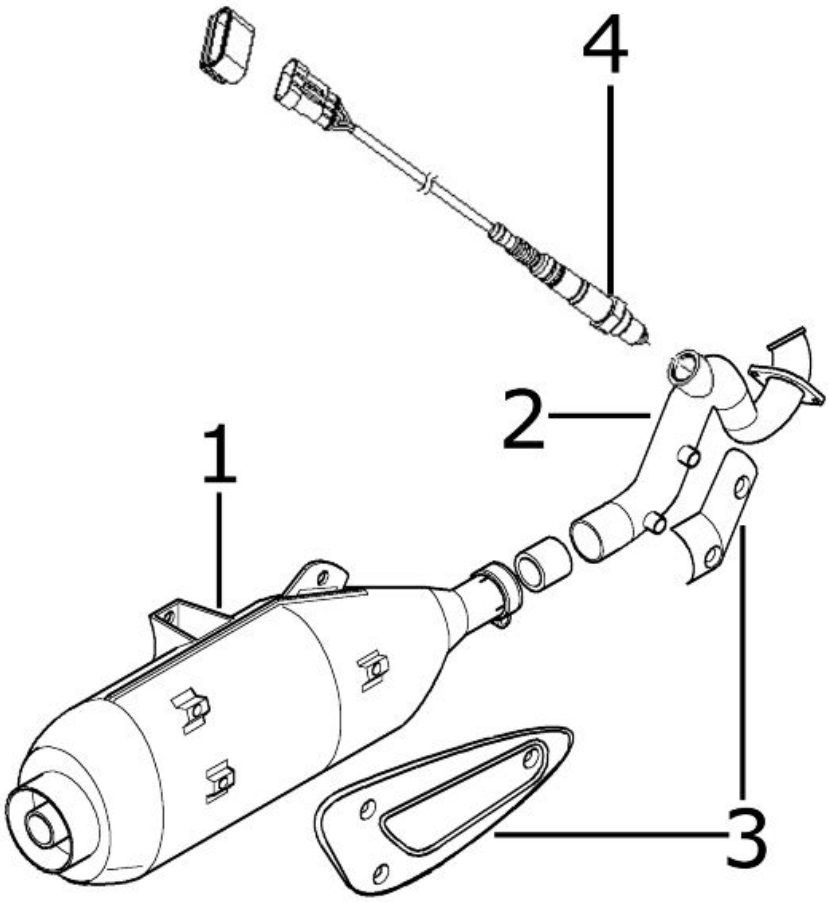
Butterfly valve



THROTTLE BODY

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

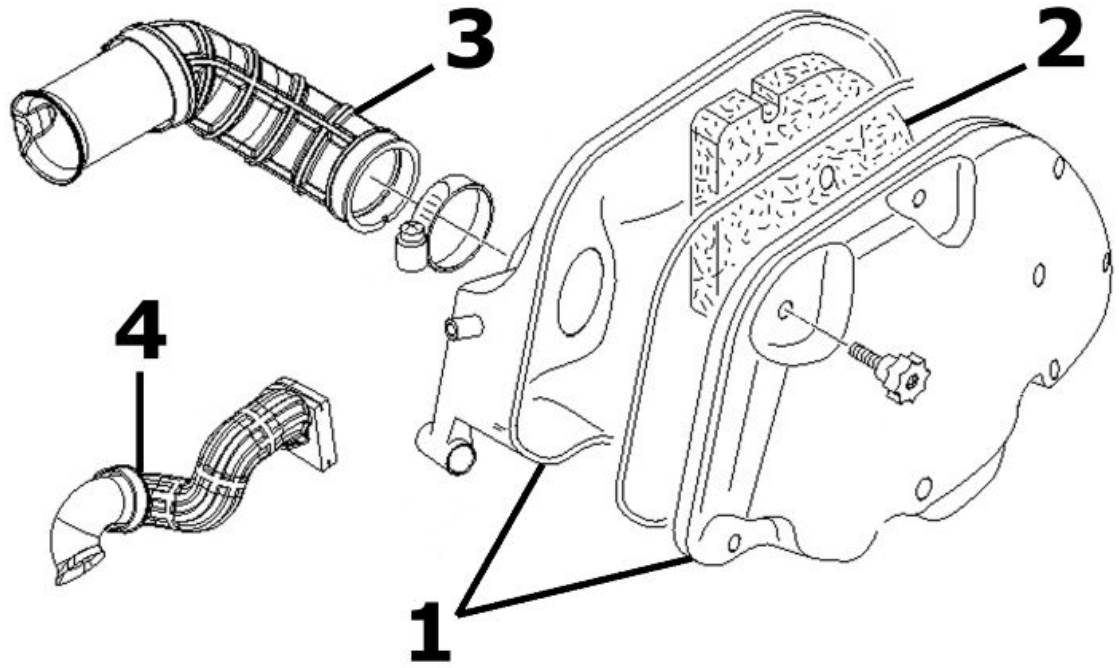
Exhaust pipe



MUFFLER

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

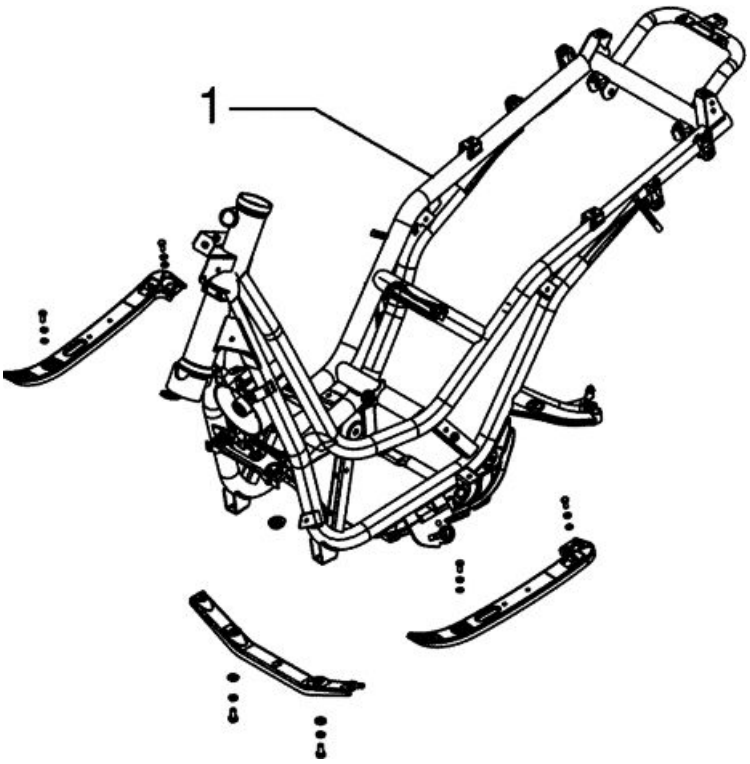
Air cleaner



AIR CLEANER

	Code	Action	Duration
1	001015	Air filter box - Replacement	
2	001014	Air filter - Replacement / cleaning	
3	004122	Air cleaner/ carburettor fitting - Replacement	
4	001027	Body / air cleaner union - Replacement	

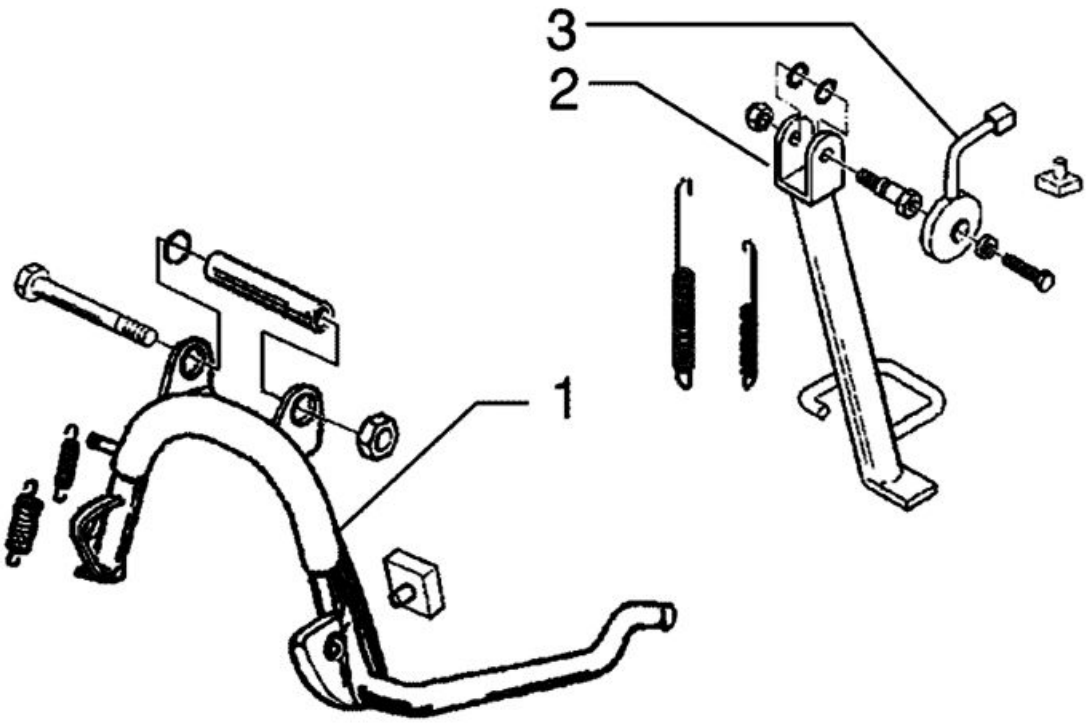
Frame



FRAME

	Code	Action	Duration
1	004001	Frame - Replacement	

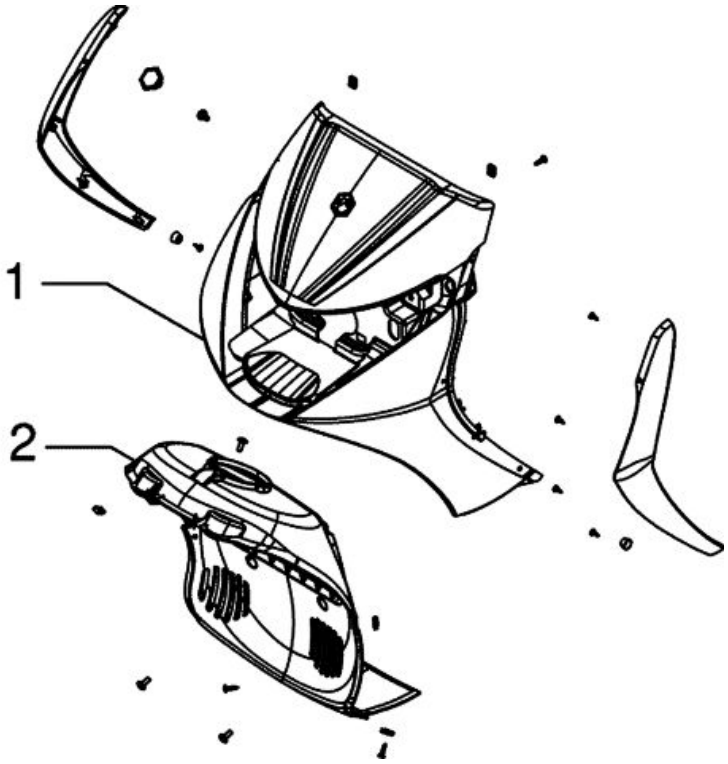
Centre-stand



CENTRE AND SIDE STANDS

	Code	Action	Duration
1	004004	Stand - Replacement	
2	004102	Side stand - Replacement	
3	005079	Stand switch - Replacement	

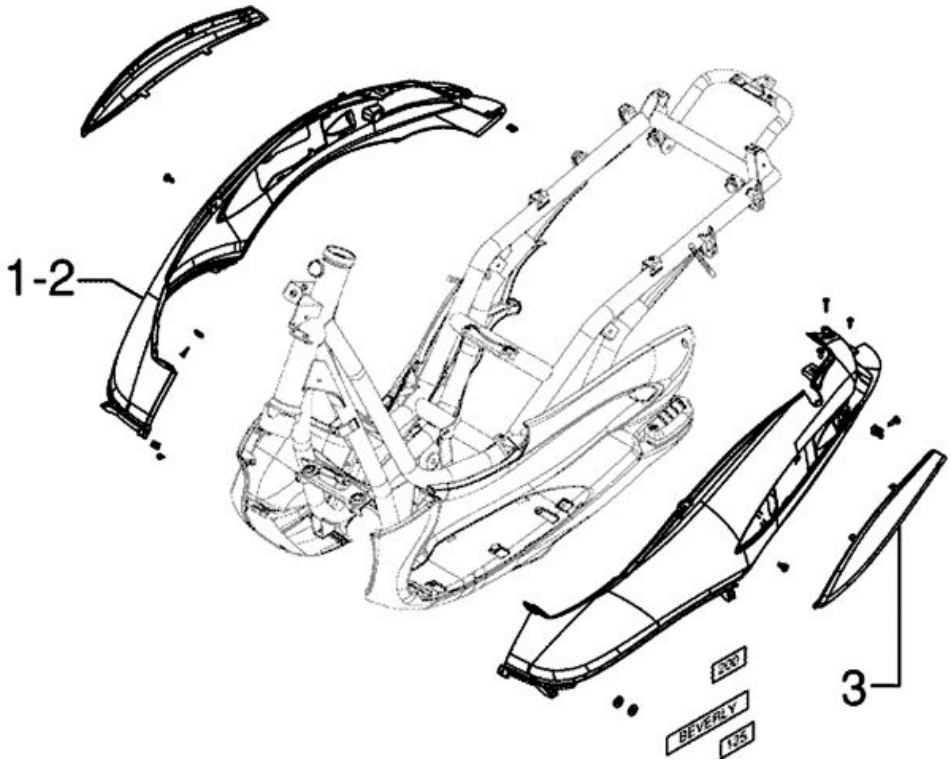
Legshield spoiler



FRONT SHIELD - SPOILER

	Code	Action	Duration
1	004064	Front shield - Replacement	
2	004053	Spoiler - Replacement	

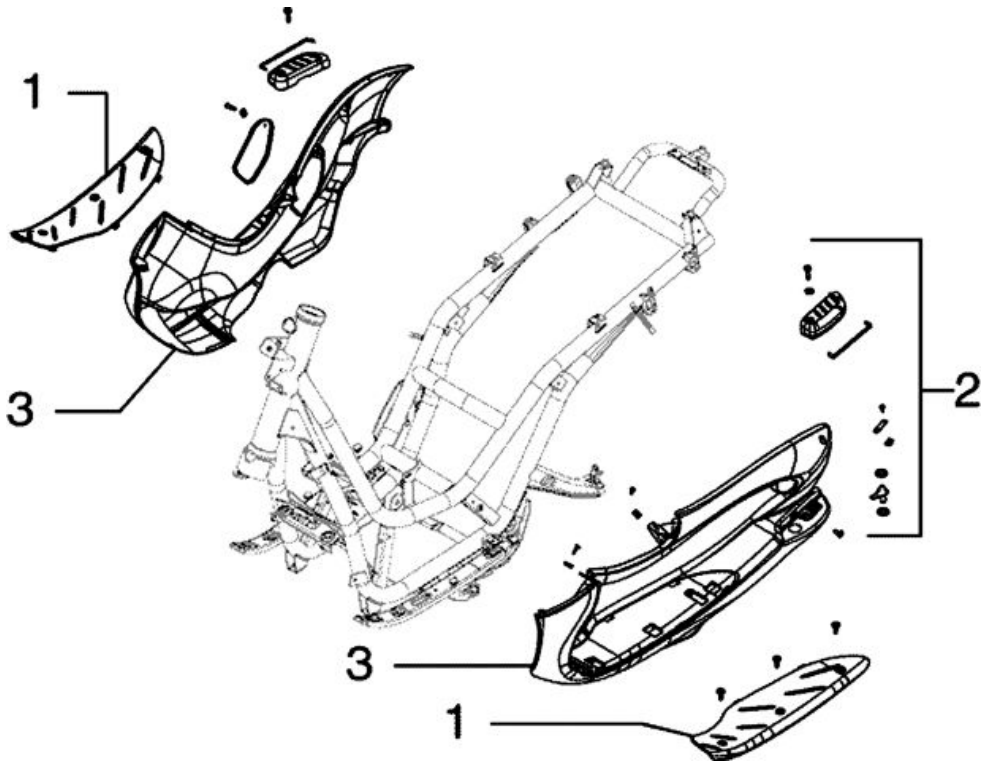
Side fairings



SIDE COVERS

	Code	Action	Duration
1	004085	Fairing (1) - Replacement	
2	004012	Rear side panels - Replacement	
3	004052	Bumper - Replacement	

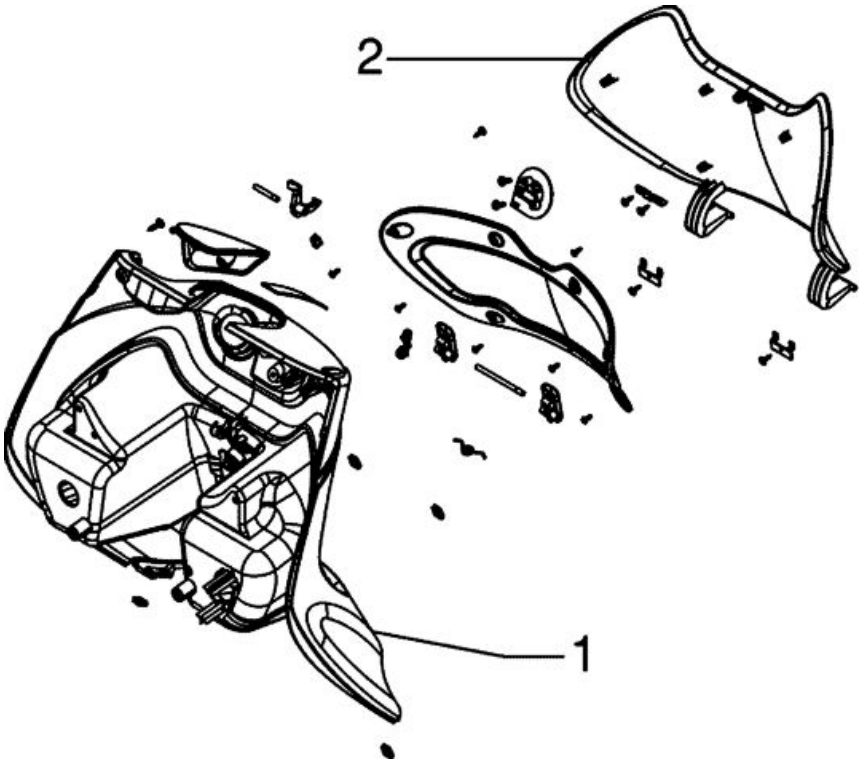
Footrests



MATS AND COVERS

	Code	Action	Duration
1	004075	Front mat - Replacement	
2	004079	Passenger footrest (1) - Replacement	
3	004015	Footrest - removal and installation	

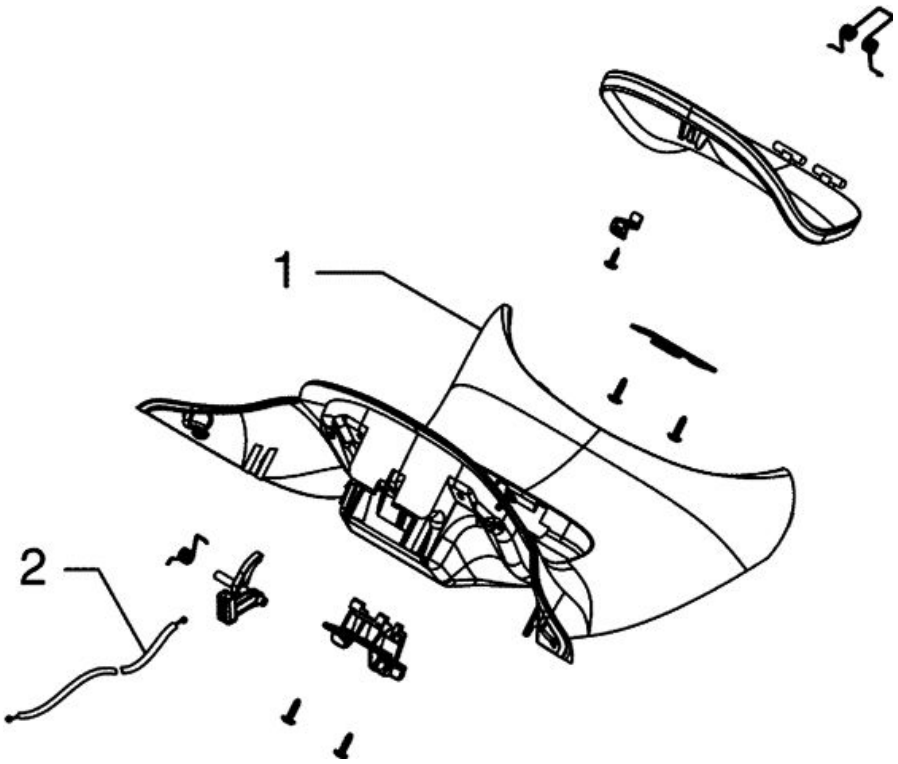
Rear cover



REAR SHIELD

	Code	Action	Duration
1	004065	Front shield rear section - removal and installation	
2	004081	Glove box door - Replacement	

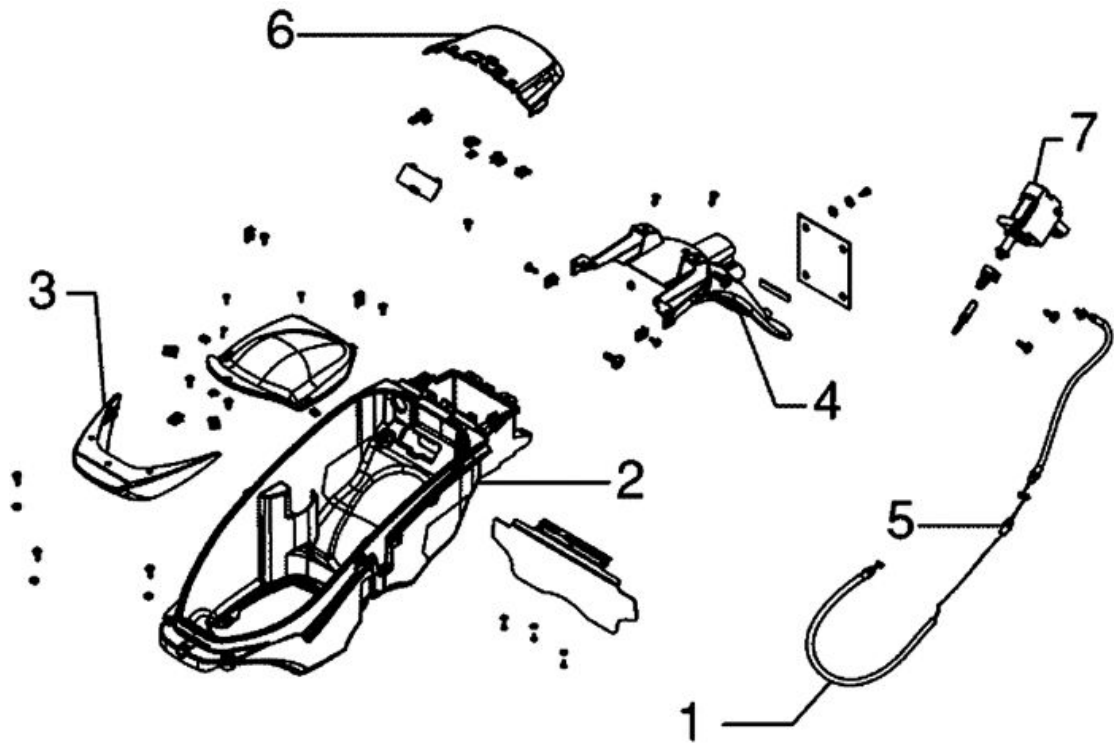
Central cover



CENTRAL COVER

	Code	Action	Duration
1	004011	Central frame cover - Replacement	
2	002082	Fuel tank cap opening drive - Replacement	

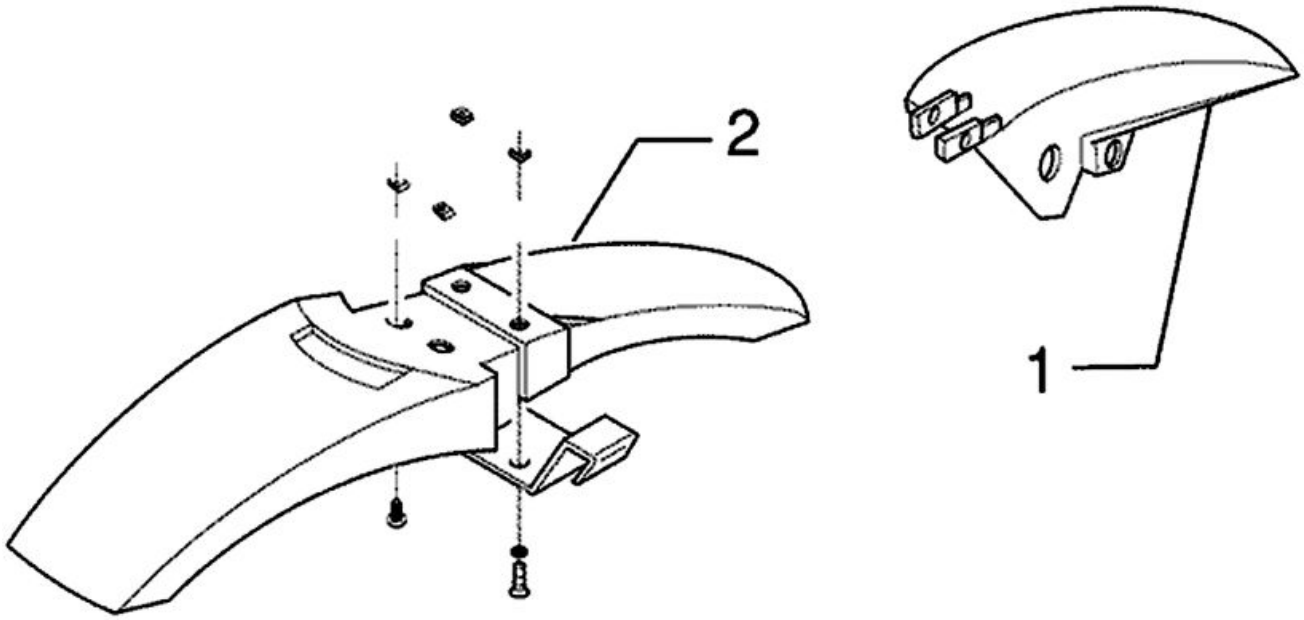
Underseat compartment



UNDER-SADDLE COMPARTMENT-ELECTRIC SEAT OPENING-LICENCE PLATE SUPPORT

	Code	Action	Duration
1	002083	Saddle opening transmission - replacement Saddle opening transmission - replacement	
2	004016	Helmet compartment - removal and installation	
3	004106	Under-saddle band - Replacement	
4	004136	License plate support - replace	
5	004158	Saddle opening splitter - Replacement	
6	005046	Battery cover - change	
7	005099	Electric saddle opening activator - Replacement	

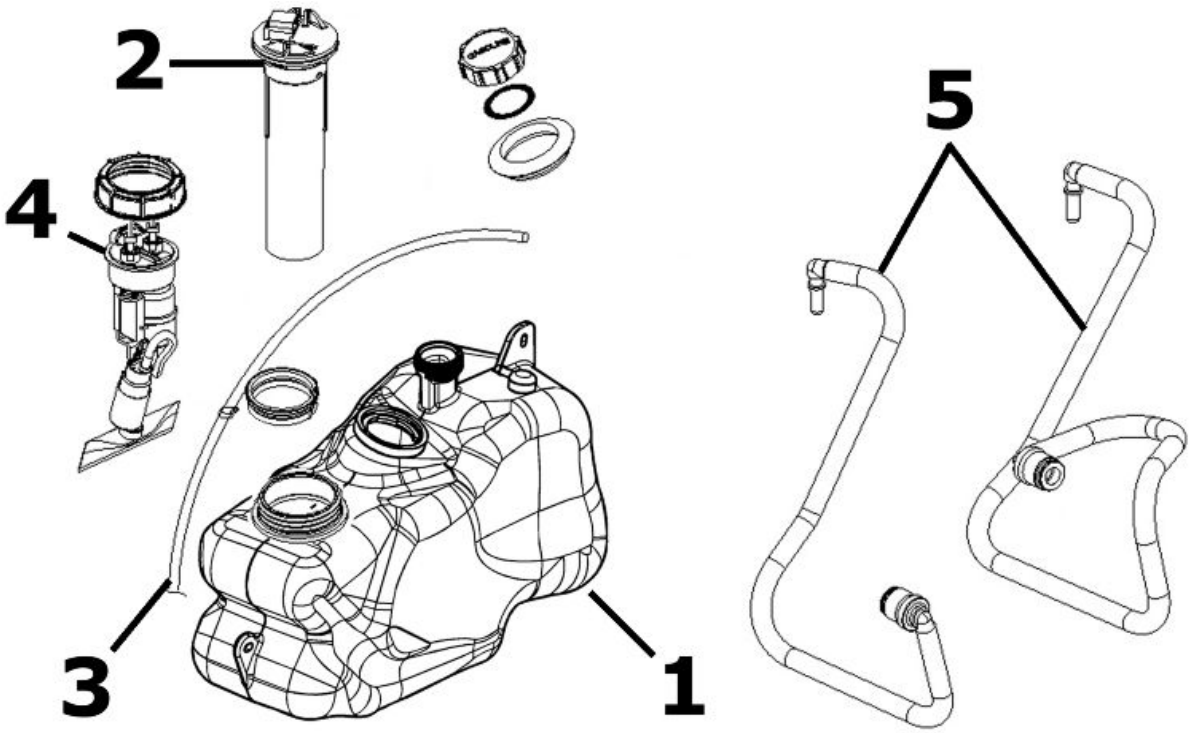
Mudguard



FRONT AND REAR MUDGUARDS

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

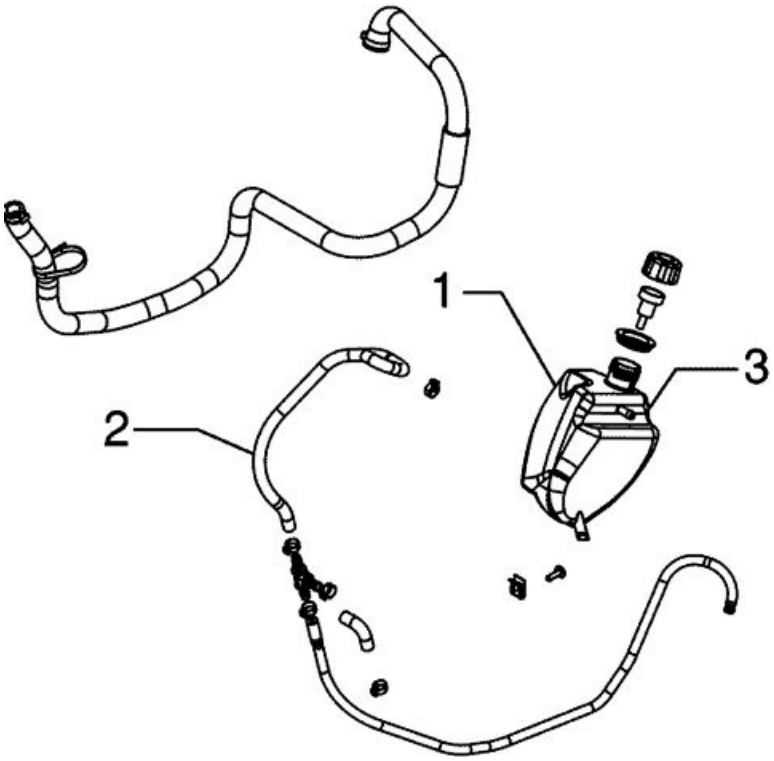
Fuel tank



FUEL TANK

	Code	Action	Duration
1	004005	Fuel tank - Replacement	
2	005010	Tank float - Replacement	
3	004109	Fuel tank breather - Replacement	
4	004073	Fuel pump - Replacement	
5	004137	Injector pump pipe - Replacement	

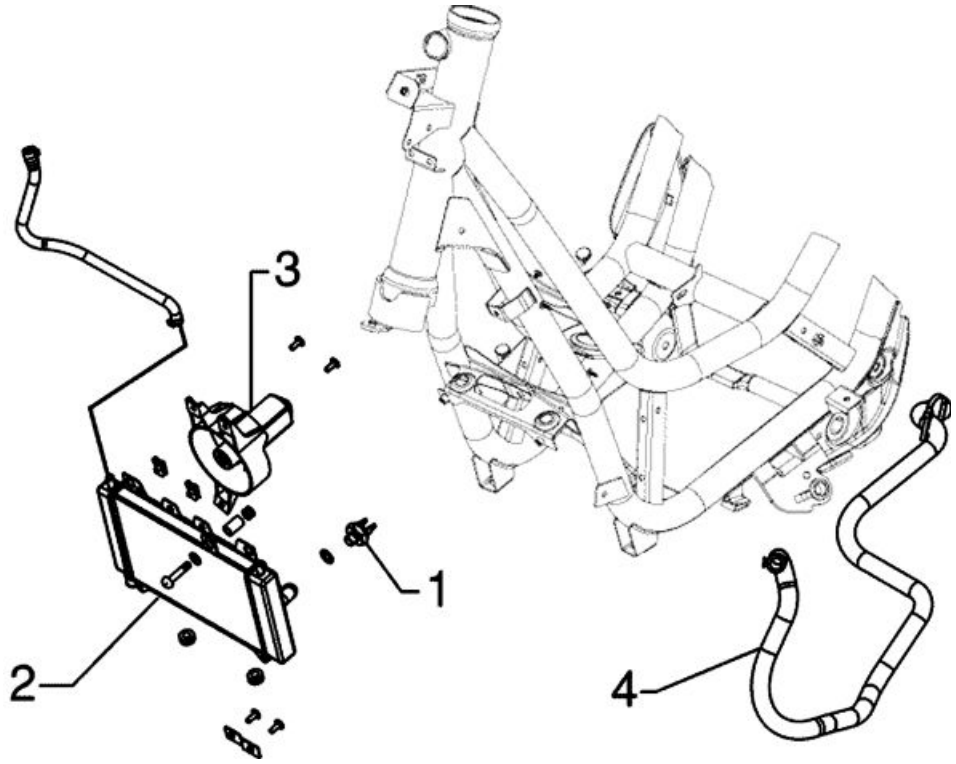
Expansion tank



EXPANSION TANK

	Code	Action	Duration
1	007001	Expansion tank - Replacement	
2	007013	Radiator expansion tank connection pipe - change	
3	001052	Coolant and air bleeding - Change	

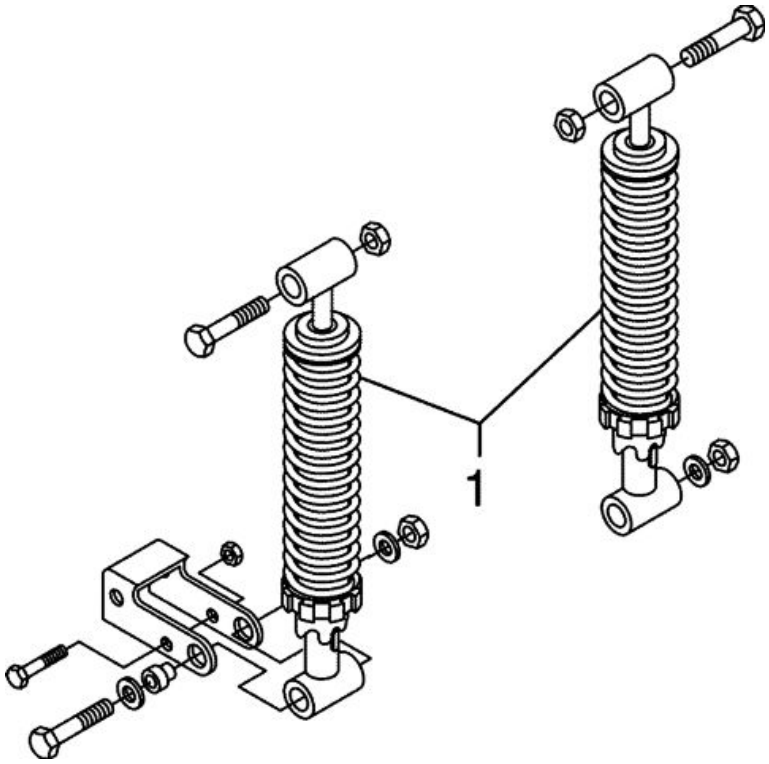
Radiator



RADIATOR

	Code	Action	Duration
1	007014	Radiator thermal switch - Replacement	
2	007002	Radiator water - Replacement	
3	007016	Complete fan with support - Replacement	
4	007003	Coolant delivery and return pipe - change	

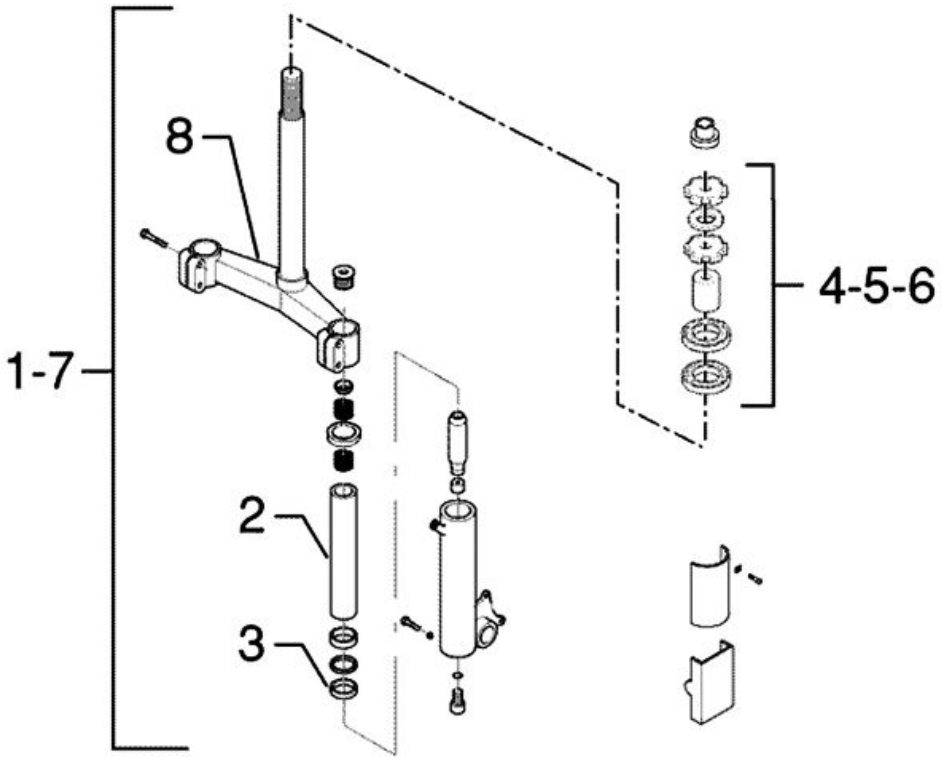
Rear shock-absorber



REAR SHOCK ABSORBER

	Code	Action	Duration
1	003007	Rear shock absorber - removal and installation	

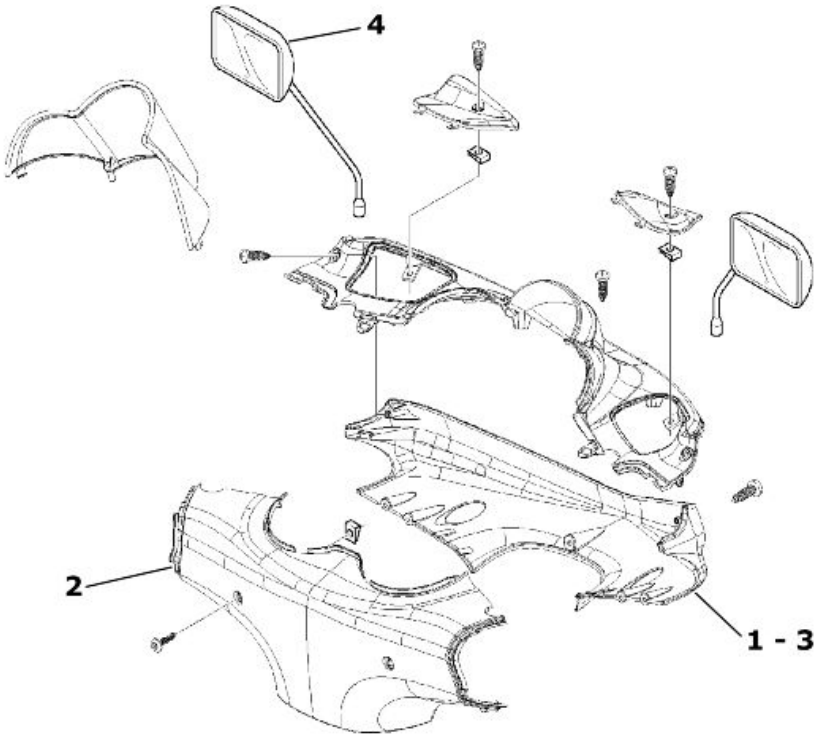
Steering column bearings



STEERING FIFTH WHEELS

	Code	Action	Duration
1	003051	Fork unit - Replacement	
2	003079	Fork stem - Replacement	
3	003048	Fork oil seal - Replacement	
4	004119	Bearing/upper steering fifth wheel - Replacement	
5	003002	Steering fifth wheel - Replacement	
6	003073	Steering clearance - Adjust	
7	003010	Front suspension - Service	
8	003050	Fork lower plate - Replacement	

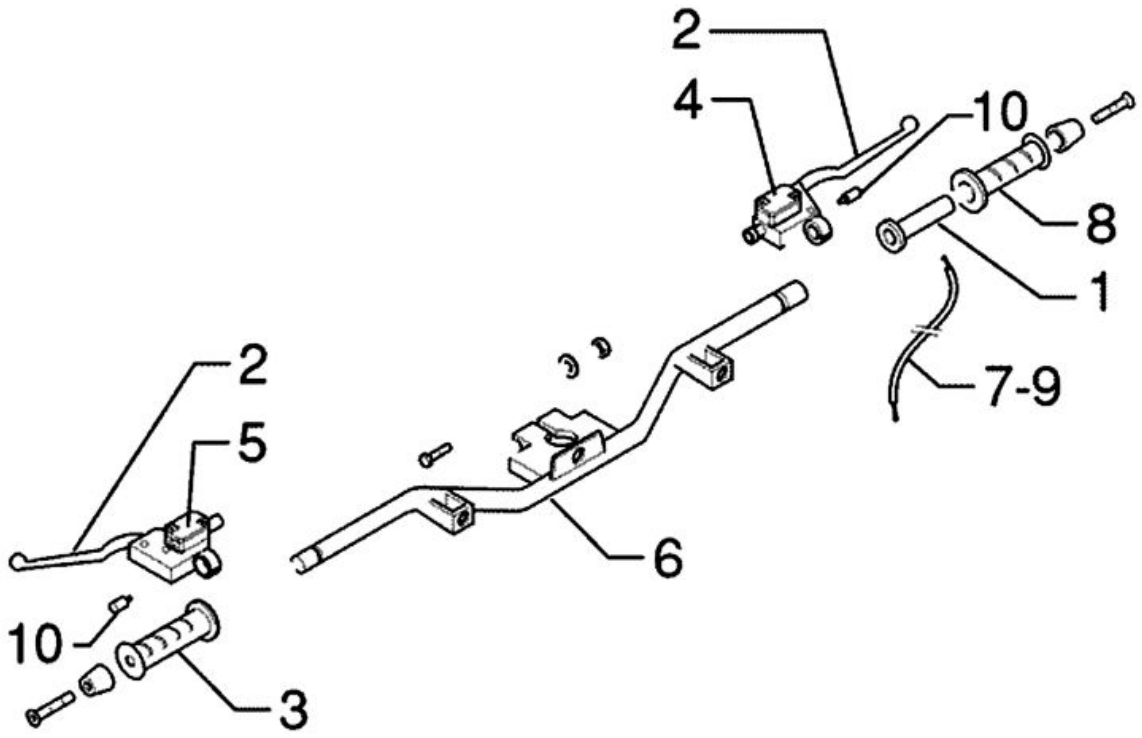
Handlebar covers



HANDLEBAR COVER

	Code	Action	Duration
1	004018	Handlebar front section - Replacement	
2	004019	Handlebar rear section - Replacement	
3	006013	Handlebar front part - Painting	
4	006014	Handlebar rear part - Painting	

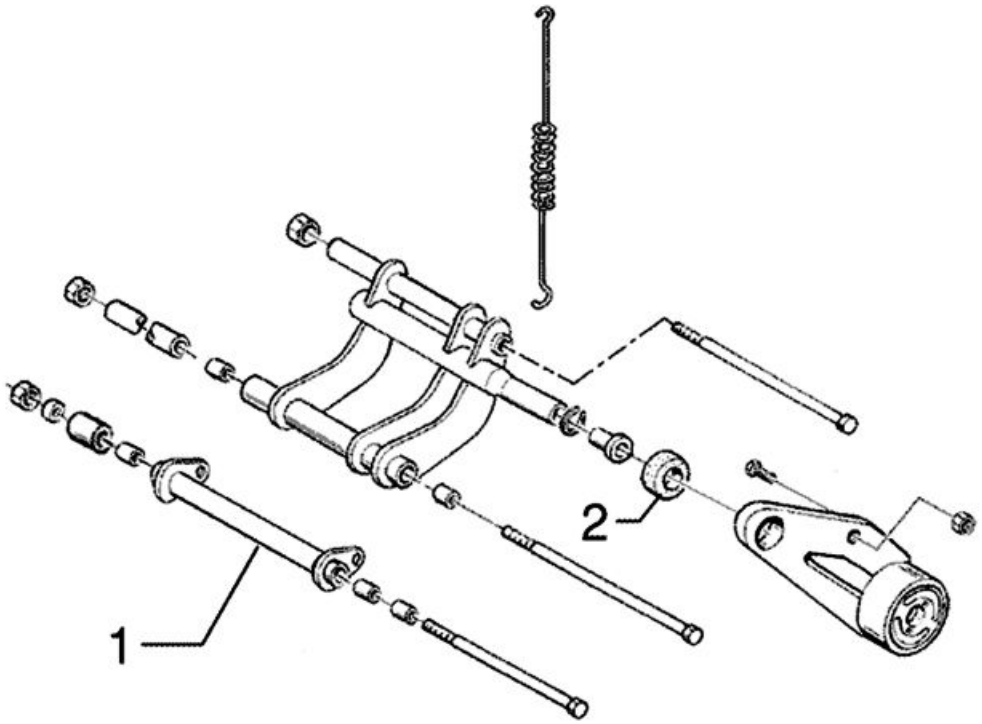
Handlebar components



HANDLEBAR COMPONENTS

	Code	Action	Duration
1	002060	Throttle grip - Replacement	
2	002037	Brake or clutch lever - Replacement	
3	002071	Left knob - Replacement	
4	002024	Front brake pump - Removal and Refitting	
5	002067	Rear brake pump - Replacement	
6	003001	Handlebar - Replacement	
7	002063	Complete throttle grip transmission - Replacement	
8	002059	Right-hand knob - change	
9	003061	Accelerator transmission - adjust	
10	005017	Stop switch - Replacement	

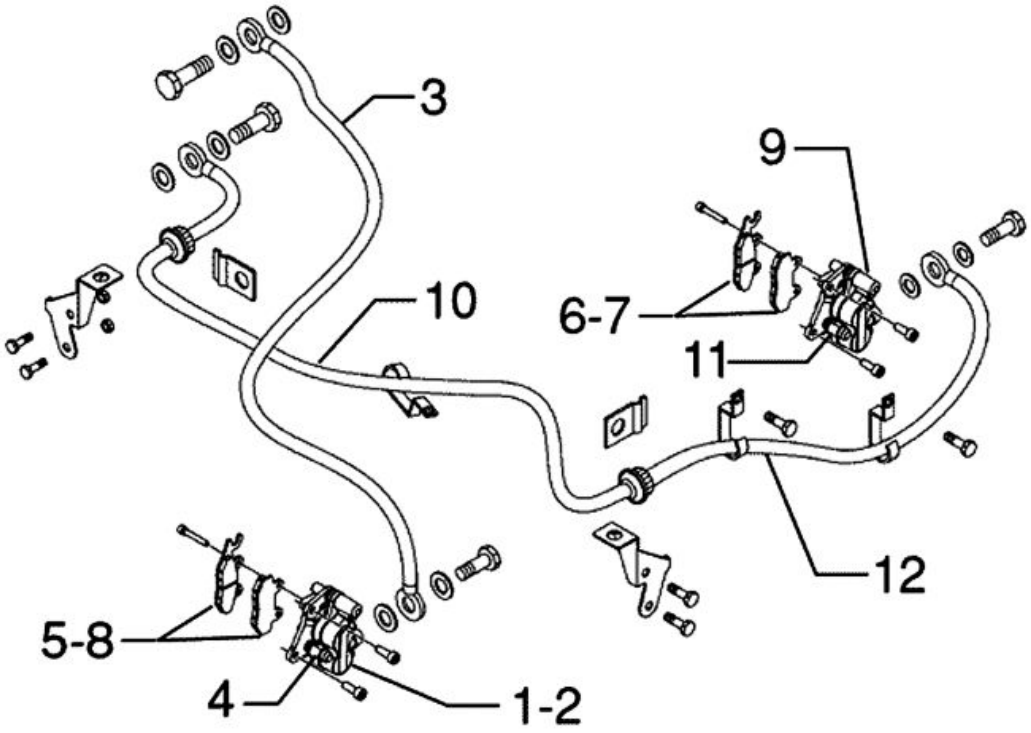
Swing-arm



SWINGING ARM

	Code	Action	Duration
1	001072	Swinging arm - Engine-chassis connection - Replacement	
2	004058	Silent block - Replacement	

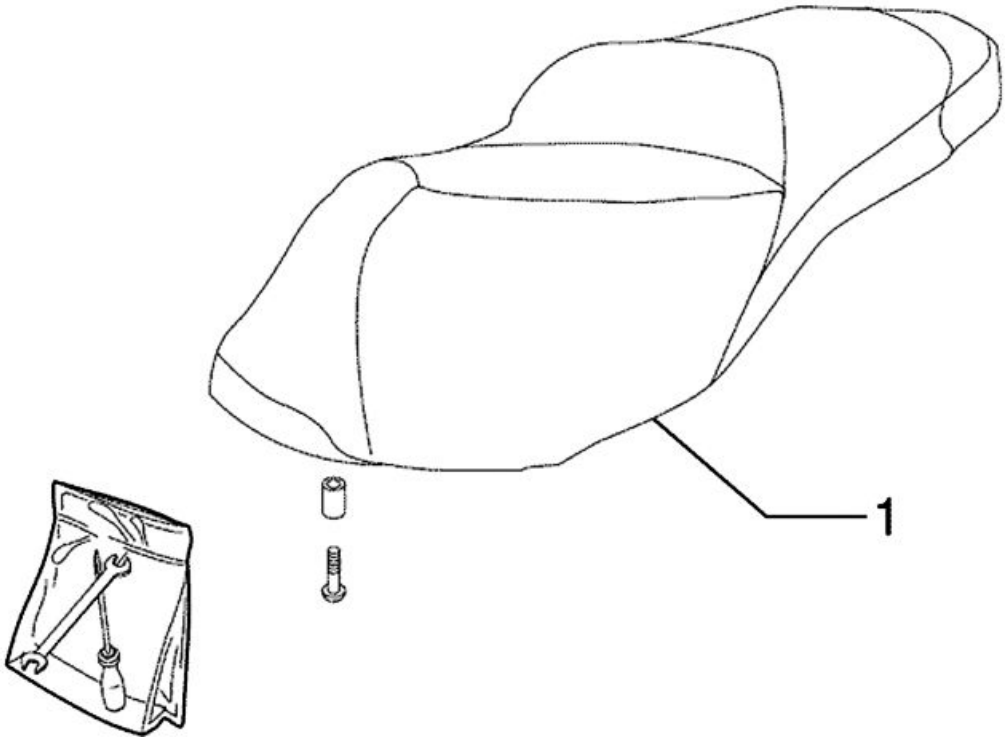
Brake hoses



BRAKE PIPING

	Code	Action	Duration
1	002039	Front brake calliper - Replacement	
2	002040	Front brake calliper - Service	
3	002021	Front brake piping - Replacement	
4	002047	Front brake fluid and system bleeding plug - Change	
5	003070	Front brake pads/shoes - check wear	
6	003071	Rear brake pads/shoes - Check wear	
7	002002	Rear brake pads/shoes - Replacement	
8	002007	Front brake pads/shoes - removal and installation	
9	002048	Rear brake calliper - Replacement	
10	002020	Rear brake hose- removal and installation	
11	002080	Rear brake oil bleeding system - Replacement	
12	002081	Rear brake piping - Replacement	

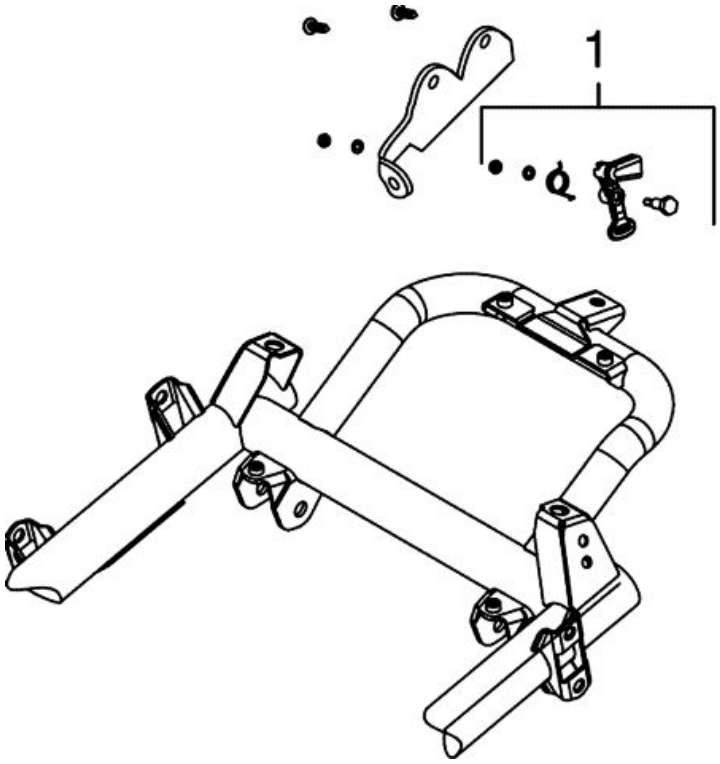
Seat



SADDLE

	Code	Action	Duration
1	004003	Saddle - Replacement	

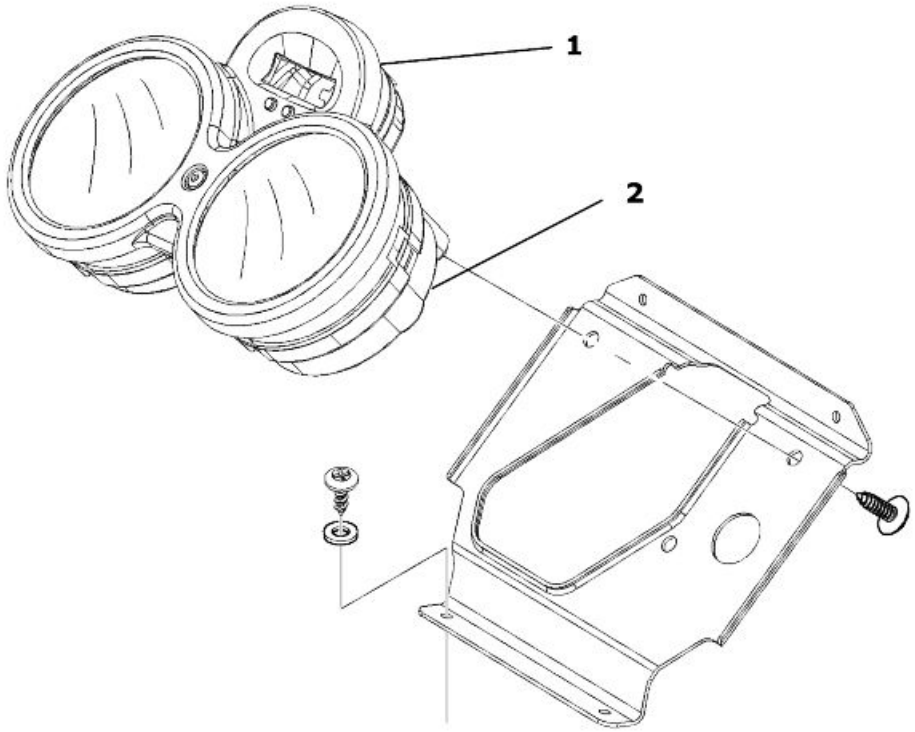
Seat lock



SADDLE CLOSING MECHANISM

	Code	Action	Duration
1	004054	Saddle lock catch - Replacement	

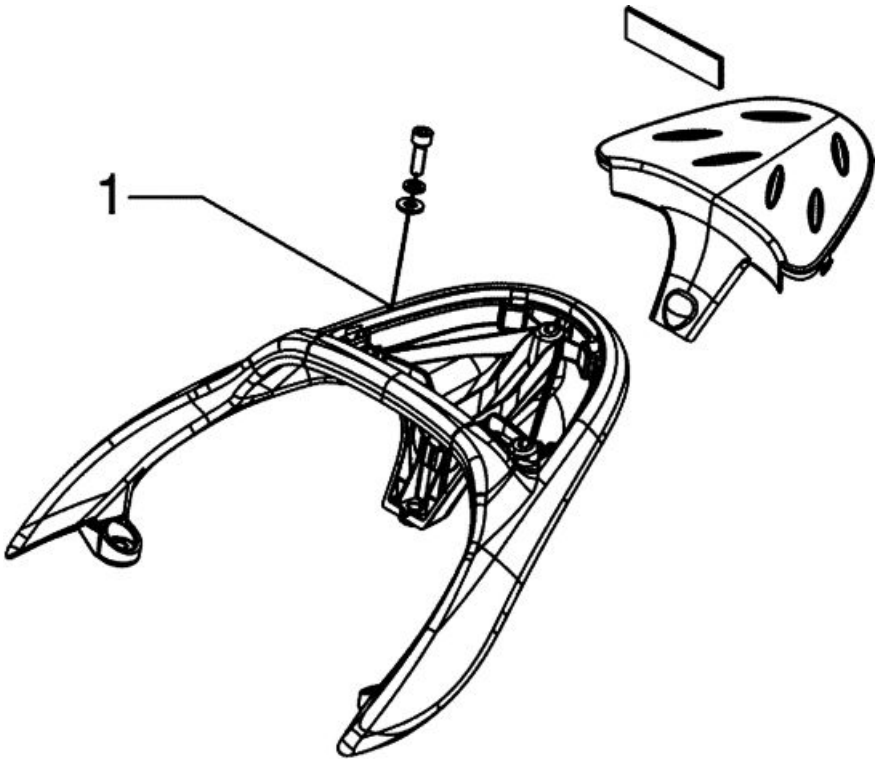
Instrument panel



INSTRUMENT PANEL

	Code	Action	Duration
1	005014	Odometer - Replacement	
2	005038	Instrument panel warning light bulbs - Replacement	

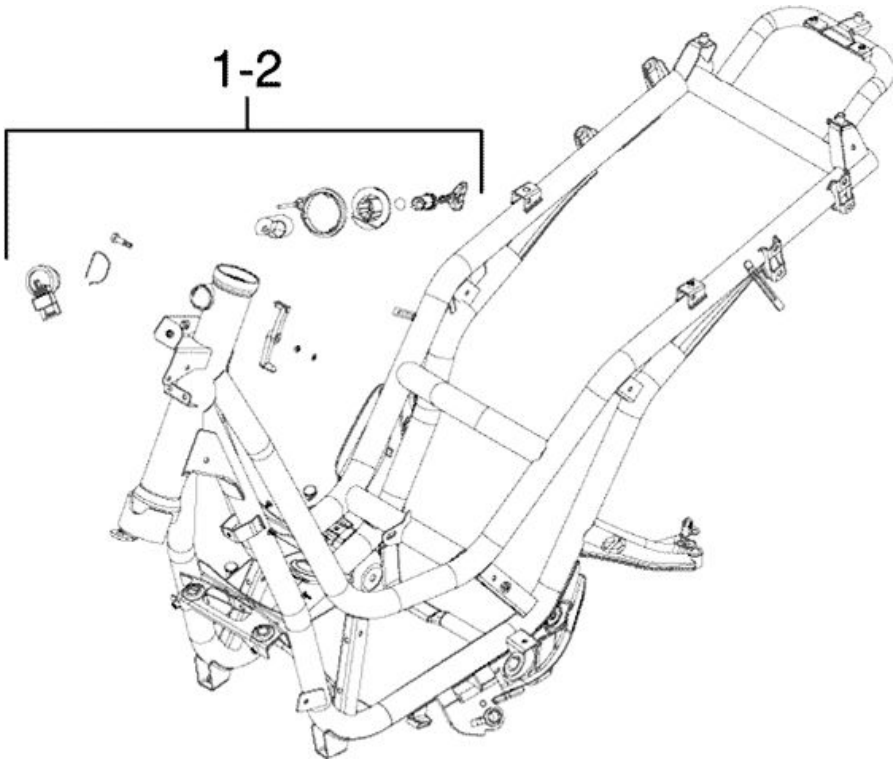
Rear rack



LUGGAGE RACK

	Code	Action	Duration
1	004008	Luggage rack - Replacement	

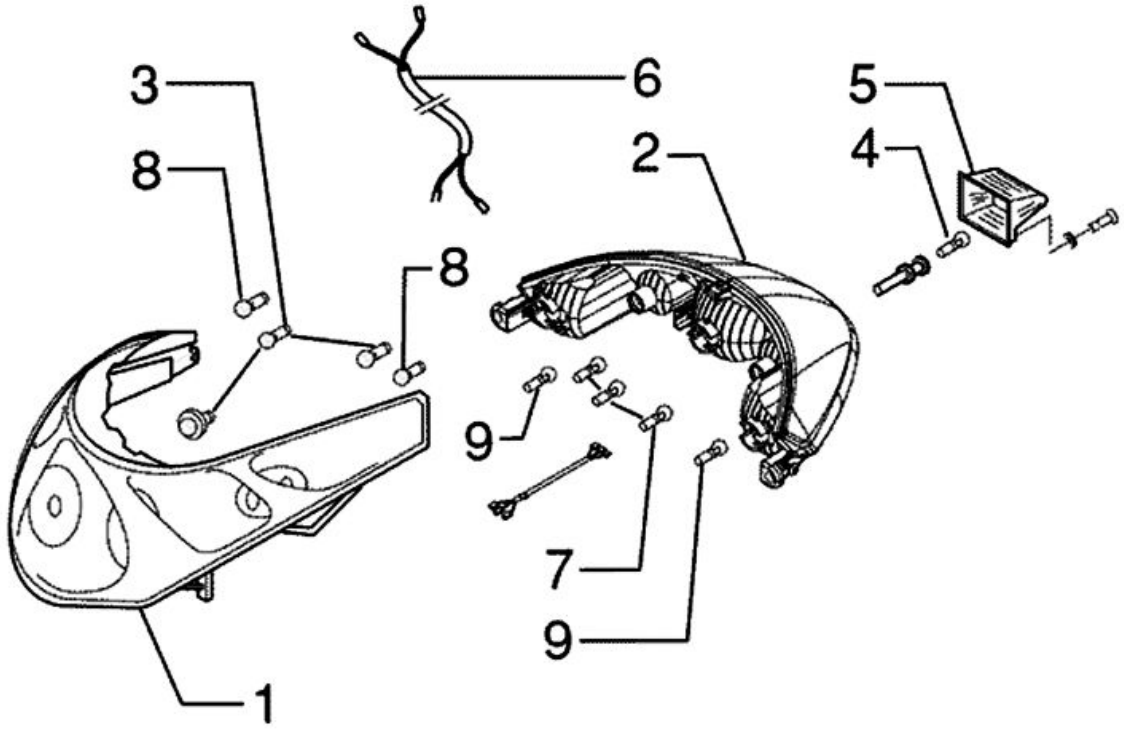
Locks



LOCKS

	Code	Action	Duration
1	005016	Key switch - Replacement	
2	004010	Antitheft lock - Replacement	

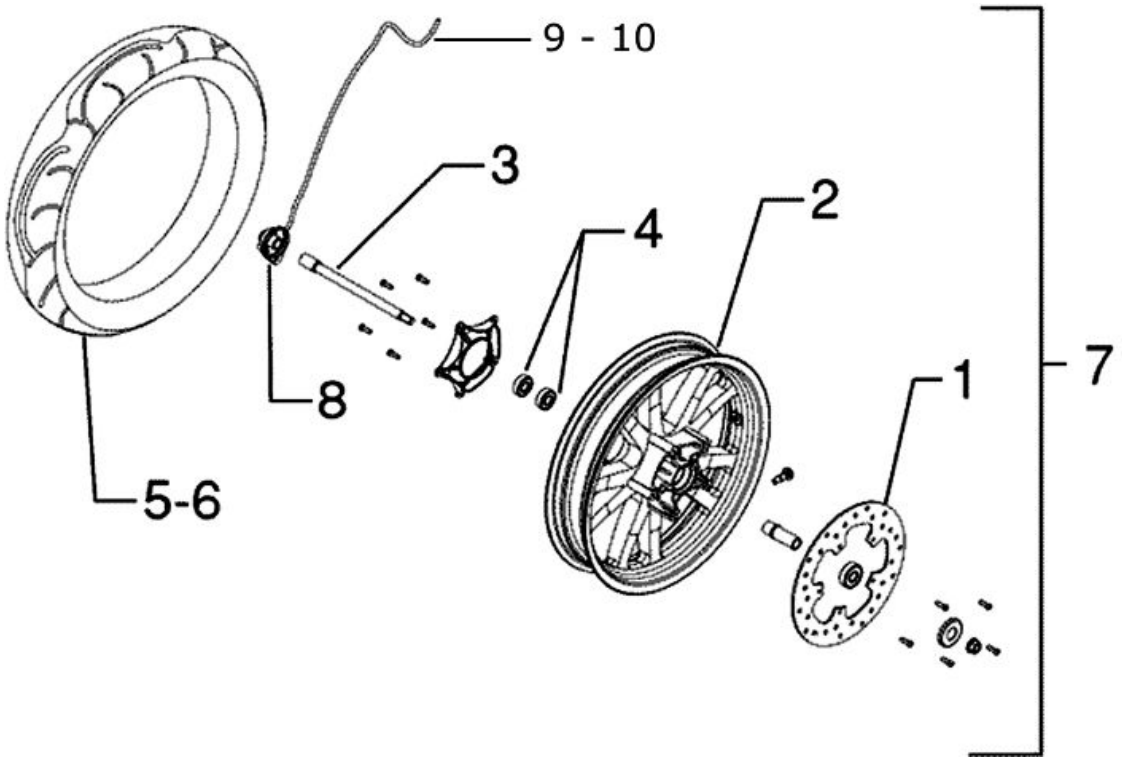
Turn signal lights



TURN INDICATOR LIGHTS

	Code	Action	Duration
1	005002	Front headlamp - change	
2	005005	Taillight - Replacement	
3	005008	Light bulbs - Replacement	
4	005031	Licence plate light bulb - Replacement	
5	005032	Transparent licence plate cover - replace	
6	005044	Front lights cable unit - replace	
7	005066	Rear light bulbs - Replacement	
8	005067	Front turn indicator light - Replacement	
9	005068	Rear turn indicator bulb - Replacement	

Front wheel



FRONT WHEEL

	Code	Action	Duration
1	002041	Brake disc - Replacement	
2	003037	Front wheel rim - removal and installation	
3	003038	Front wheel axle - removal and installation	
4	003040	Front wheel bearings - Replacement	
5	003047	Front tyre - Replacement	
6	003063	Tyre pressure - check	
7	004123	Front wheel - Replacement	
8	002011	Odometer drive- Replacement	
9	002049	Odometer cable - Replacement	
10	002051	Odometer transmission complete - change	

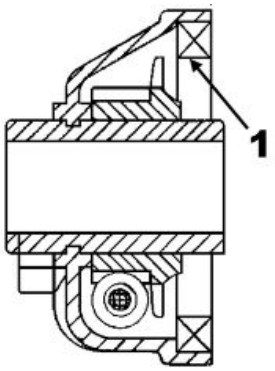
Grease tone wheel or drive

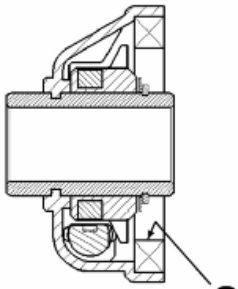
Please take note that the code has been introduced:

900001 - Tone wheel / drive greasing - 15'.

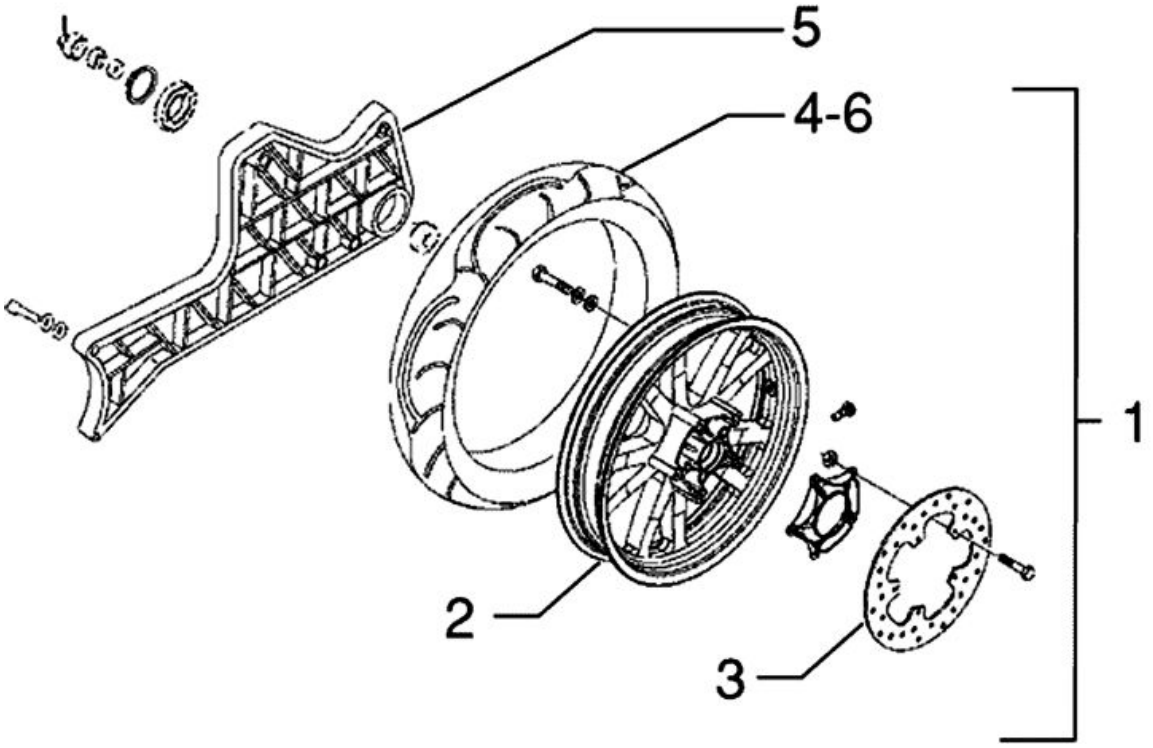
Never mistake the codes 002011 (movement sensor replacement) and 005089 (tone wheel replacement) in the event of noise of the indicated components. The grease recommended is TUTELA MRM 2 (soap-based lithium grease with Molybdenum disulphide).

In the following points we indicate with an arrow the area to be greased (1 - Drive, 2 - Tone wheel)





Rear wheel



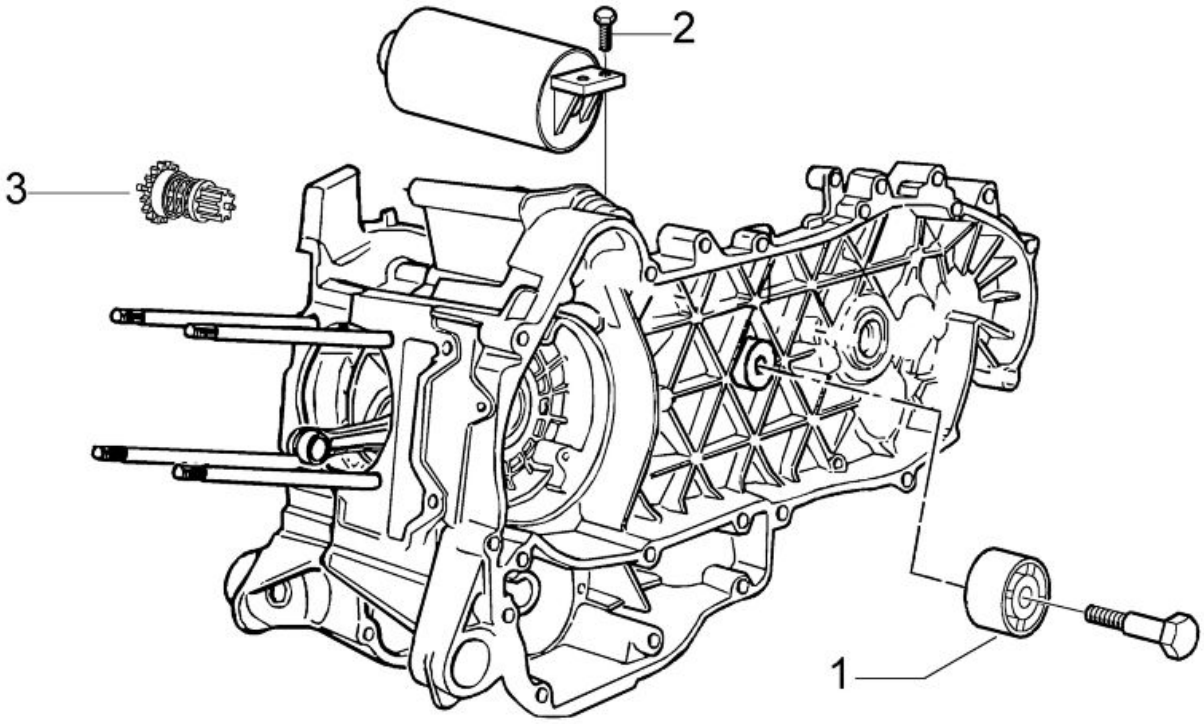
REAR WHEEL

	Code	Action	Duration
1	001016	Rear wheel - Replacement	

	Code	Action	Duration
2	001071	Rear wheel rim - Removal and Refitting	
3	002070	Rear brake disc - Replacement	
4	003063	Tyre pressure - check	
5	003077	muffler/rear shock absorber support arm - Service	
6	004126	Rear wheel tyre - Replacement	

Electric start

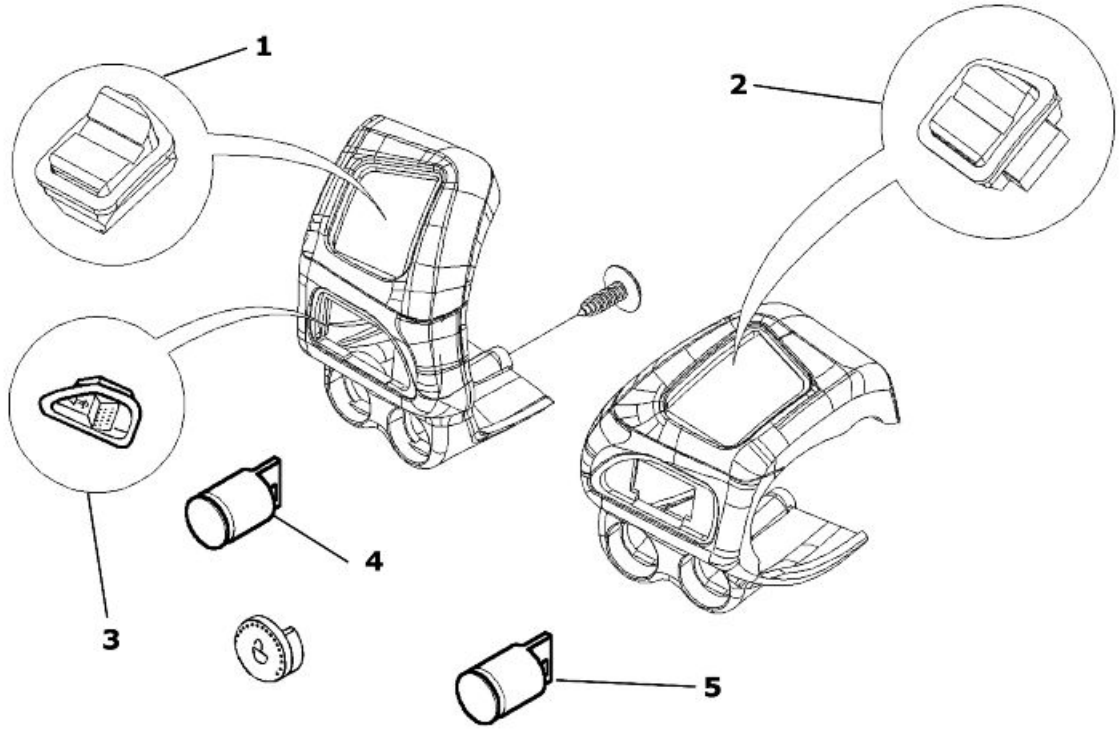
Version 250



ELECTRICAL START UP

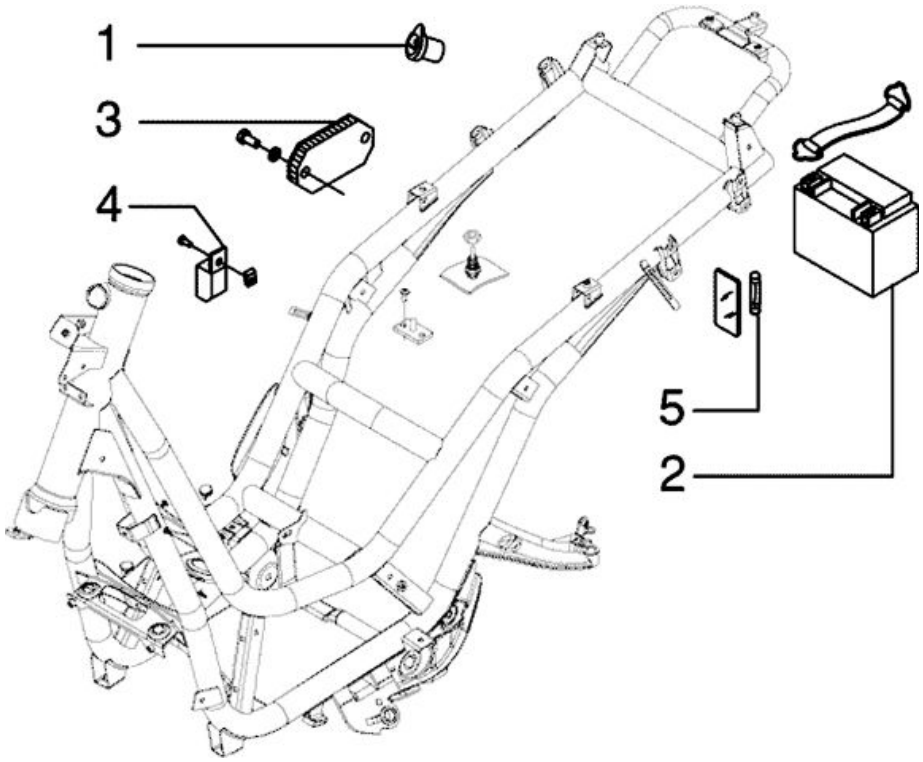
	Code	Action	Duration
1	001141	Belt anti-vibration roller - Replacement	
2	001020	Starter motor - Replacement	
3	001017	Start-up pinion - Replacement	

Electric devices



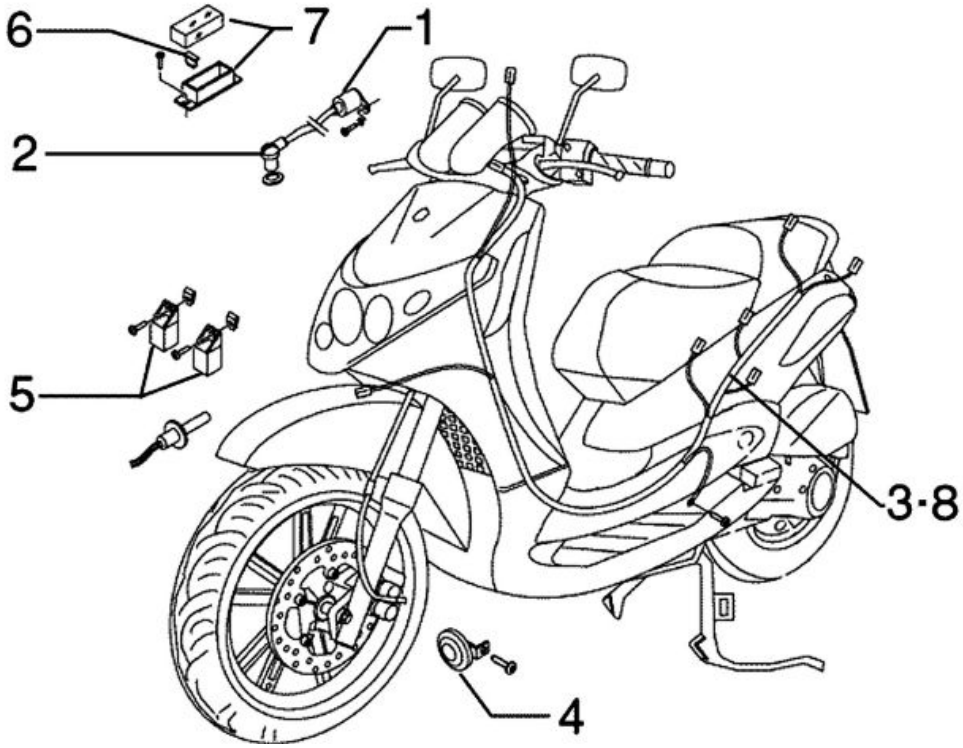
ELECTRIC DEVICES

	Code	Action	Duration
1	005039	Headlight switch - replace	
2	005077	Emergency stop switch - Replacement	
3	005006	Light switch or turn indicators - replace	
4	005040	Horn button - Replacement	
5	005041	Starter button - replace	



ELECTRIC DEVICES

	Code	Action	Duration
1	004142	Plug socket - Replacement	
2	005007	Battery - change	
3	005009	Voltage regulator - replace	
4	005011	Start-up remote control switch - Replacement	
5	005026	Helmet compartment bulb - Replacement	



ELECTRIC DEVICES

	Code	Action	Duration
1	001069	H.V. coil - Replacement	
2	001094	Spark plug hood - Replacement	
3	005001	electric system - change	
4	005003	Horn - Replacement	
5	005035	Headlight remote control - Replacement	
6	005052	Fuse (1) - Replacement	
7	005054	Fuse block (1) - Replacement	
8	005114	Electrical system - Service	