PIAGGIO

SERVICE STATION MANUAL

665026

Beverly Tourer 400 i.e.

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SERVICE STATION MANUAL
Beverly Tourer 400 i.e.

This service station manual has been drawn up by Piaggio & C. Spa to be used by the workshops of Piaggio-Gilera dealers. It is assumed that the user of this manual for maintaining and repairing Piaggio vehicles has a basic knowledge of mechanical principles and vehicle repair technique procedures. Any significant changes to vehicle characteristics or to specific repair operations will be communicated by updates to this manual. Nevertheless, completely satisfactory work cannot be carried out without the necessary equipment and tools. It is therefore advisable to read the sections of this manual relating to appropriate tools, along with the appropriate tool catalogue

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

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

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

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

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

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

INDEX OF TOPICS

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

- Should it be necessary to keep the engine running while servicing, make sure that the area or room is well ventilated, and use special exhaust fans, if required. 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 in some conditions it can be explosive. Do not smoke in the working area, and avoid open flames or sparks.
- Clean the brake pads in a well ventilated environment, directing the compressed air jet so as to not inhale the dust produced by the wear of the friction material. Even though the latter contains no asbestos, dust inhalation is harmful.

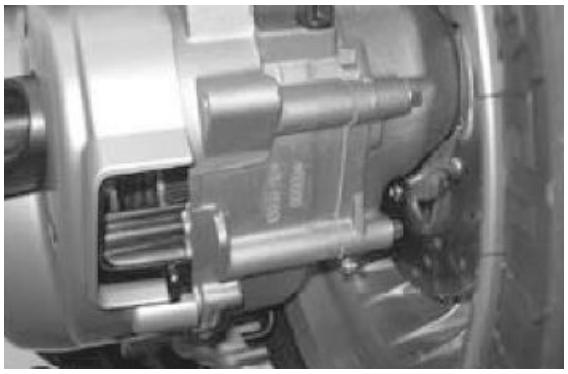
Maintenance rules

- Use original PIAGGIO spare parts and lubricants recommended by the Manufacturer. Non-original or non-conforming spares may damage the vehicle.
- Use only the special tools designed for this scooter.
- Always use new gaskets, sealing rings and split pins upon reassembly.
- After removal, clean the components using non-flammable or low fire-point solvent. Lubricate all the work surfaces except the tapered couplings before refitting.
- After reassembly, check that all components have been installed properly and that they are in good working order.
- For removal, overhaul and reassembly operations use only tools provided 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.
- Should any interventions to the scooter electrical system be required, check that the electrical connections - especially earth and battery connections - have been implemented properly.

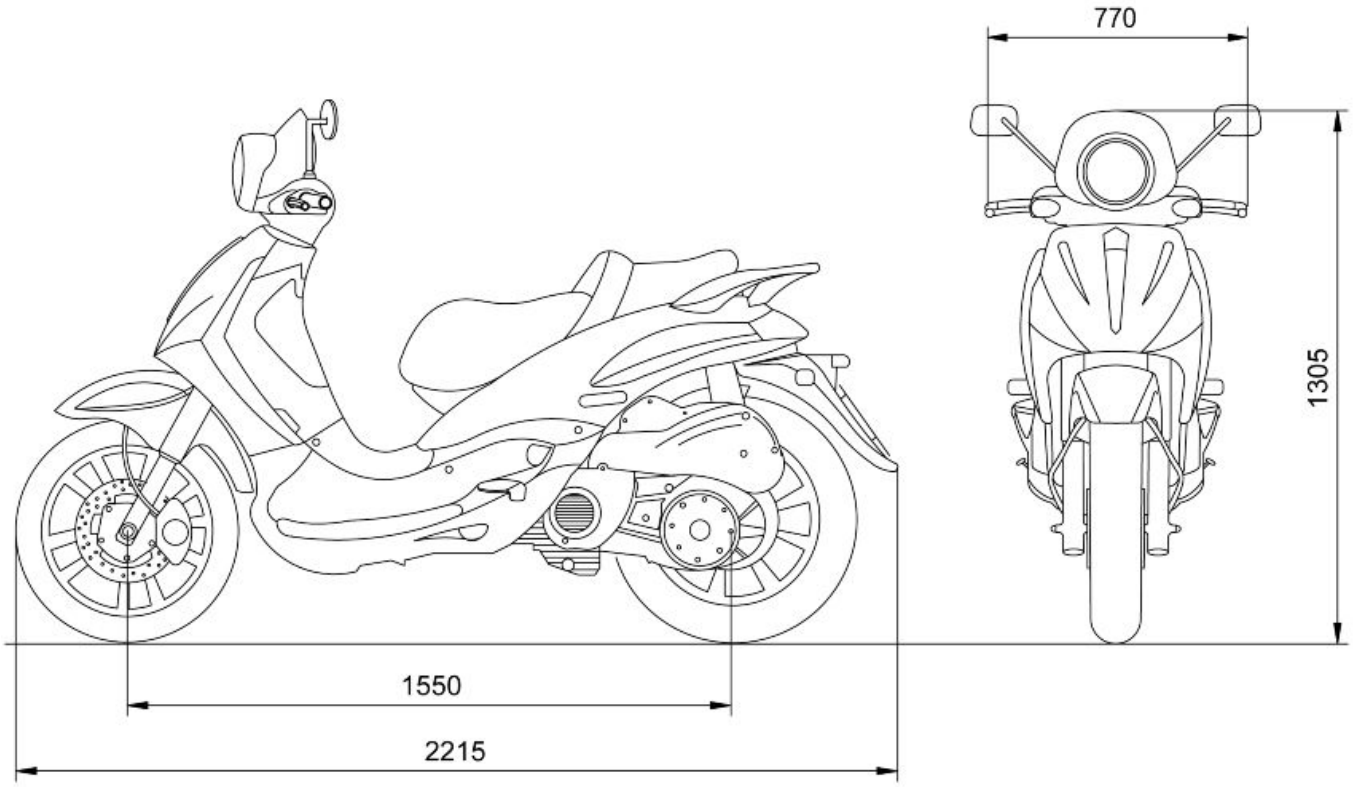
Vehicle identification

Chassis prefix: ZAPM34 400 ÷ 1001

Engine prefix: M349M ÷ 1001



Dimensions and mass



VEHICLE EARTHING

Specification	Desc./Quantity
Kerb weight	198 kg ± 5 kg
Maximum weight allowed	390 kg

Engine

ENGINE

Specification	Desc./Quantity
Engine	Single-cylinder, four-stroke
Bore x stroke	85.8 X 69 mm
Cubic capacity	399 cm^3
Compression ratio	10.6 ± 0.5 **:** 1
Timing system	Single overhead camshaft with integrated tone wheel, control from flywheel side chain, 4 valves and automatic start-up valve lifting device.
Valve clearance: intake	0.15 mm (when cold)
Valve clearance: discharge	0.15 mm (when cold)
Valve clearance adjustment	By threaded adjuster on the rockers
Idle speed	1500 ± 100 rpm
Air filter	sponge, impregnated with mixture (50% petrol and 50% oil)
CO % value (measured at the intake manifold)	1 - 1.5%
Starting system	Electric starter system with freewheel.
Lubrication	By trochoidal pump (inside the crankcase), pressure adjustment by-pass and oil filter.
Lubrication pressure	4 bar

Specification	Desc./Quantity
Minimum allowed (at 100° C)	0.8 bar
Fuel supply	38 Ø mm throttle body and single injector
Max. Power	24 KW at 7,250 rpm
MAX. torque	38 Nm at 5,250 rpm
Cooling	Forced fluid circulation, with engine driven pump; 3-way thermostat to pump intake.

Transmission

TRANSMISSION

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

Capacities

CAPACITY

Specification	Desc./Quantity
Engine oil (empty)	1.7 lt.
Engine oil (at oil and filter change)	1.5 lt.
Fuel tank (reserve)	13.5 l (~ 3 l)
Transmission oil	250 cm^3
Cooling system fluid	~ 1.8 l
Front fork	approx. 195 ± 3 cc in each fork leg

Electrical system

ELECTRICAL SYSTEM

Specification	Desc./Quantity
Ignition	Electronic, inductive, high efficiency ignition, integrated with the injection system, with variable advance and separate HV coil.
Spark plug	CHAMPION RG 6 YC
Alternative spark plug	NGK CR7EKB
Battery	SEALED 12V / 12Ah BATTERY
Generator	Three-phase alternating current

Frame and suspensions

FRAME AND SUSPENSIONS

Specification	Desc./Quantity
Chassis	Welded steel pipes with pressed sheet metal stiffening
Front suspension	Hydraulic telescopic fork with diameter 41 mm stems
Front fork max. stroke	104 mm
Rear suspension	engine in relation to the rocker forks with two double-acting hydraulic shock absorbers and setting of the preload in 4 positions.
Rear shock absorber max. travel	95.5 mm

Brakes

BRAKE SYSTEM

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

Wheels and tyres

WHEELS AND TYRES

Specification	Desc./Quantity
Wheel rim type	Light alloy rims.
Front rim	16" x 3.00
Rear rim	14" x 4.50
Front tyre	Tubeless, 110/70 - 16" 52P
Rear tyre	Tubeless 150/70 - 14" 66S
Front tyre pressure (with passenger)	2.2 bar (-)
Rear tyre pressure (with passenger)	2.3 bar (-)

N.B.

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

CAUTION

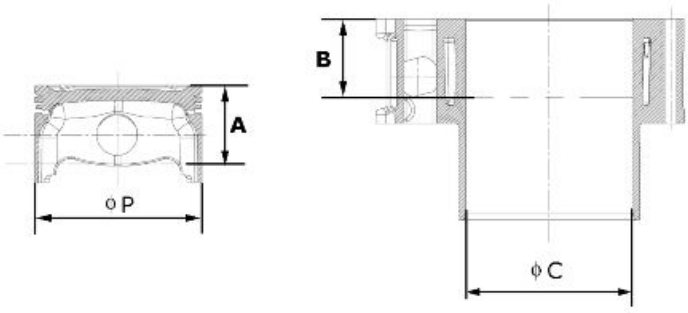
IT IS MANDATORY TO ADOPT EXCLUSIVELY "S" CLASS TYRES, WHICH GUARANTEE CORRECT VEHICLE PERFORMANCE AT THE DIFFERENT SCOOTER SPEEDS. USING ANY OTHER TYRE MAY RESULT IN VEHICLE INSTABILITY. IT IS ADVISABLE TO USE TYRE TYPES RECOMMENDED BY PIAGGIO.

Overhaul data

This section provides the main information for scooter servicing.

Assembly clearances

Cylinder - piston assy.



HEIGHT AT WHICH THE DIAMETER SHOULD BE MEASURED

Specification	Desc./Quantity
A	43.2 mm
B	43 mm

CYLINDER- PISTON

Specification	Desc./Quantity
Cylinder diameter C	85.8 - +0.018 -0.01 mm
Piston Ø P	85.768 ± 0.014 mm

CYLINDER - PISTON

COUPLING CATEGORIES

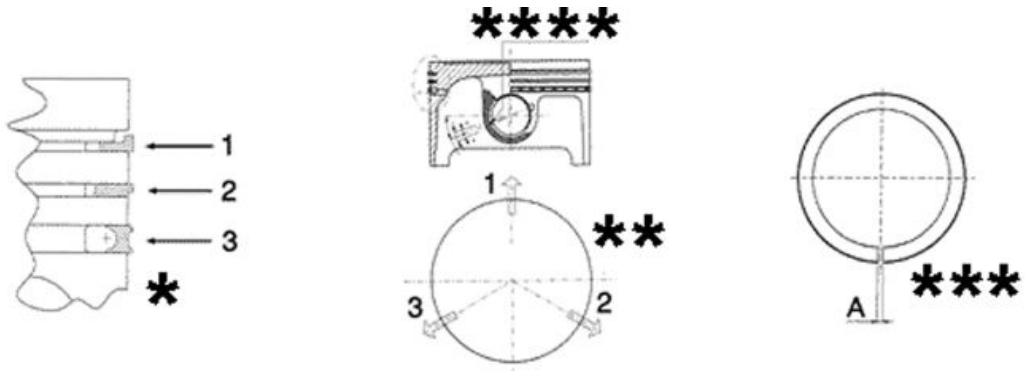
Name	Initials	Cylinder	Piston	Play on fitting
Cylinder- Piston	A	85.790÷85.797	85.754÷85.761	0.029÷0.043
Cylinder- Piston	B	85.797÷85.804	85.761 ÷ 85.768	0.029÷0.043
Cylinder- Piston	C	85.804÷85.811	85.768÷85.775	0.029÷0.043
Cylinder- Piston	D	85.811÷85.818	85.775÷85.782	0.029÷0.043

CATEGORIES OF COUPLING

N.B.

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

Piston rings



* Fit rings «2» and «3» with the word «TOP» facing upwards.

** Position the openings in the rings as shown here.

*** Value «A» of sealing ring inside the cylinder

**** Ring opening

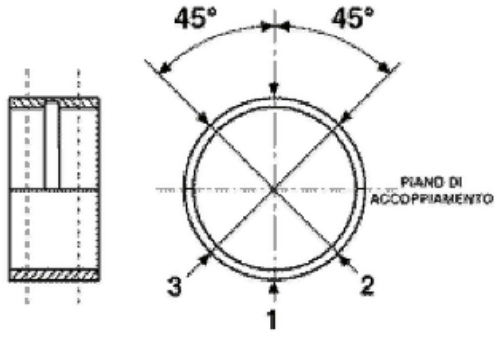
SEAL RINGS

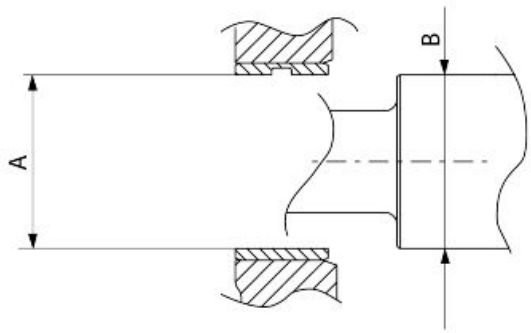
Specification	Desc./Quantity
1st compression ring	0.150 ÷0.300
2nd compression ring	0.250 ÷0.500
Oil scraper ring	0.250 ÷0.500

SEAL RINGS

Crankcase - crankshaft - connecting rod

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





Characteristic

Diameter clearance

0.025 ÷ 0.043 mm

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

CRANKSHAFT

Specification	Desc./Quantity
Category 1	40.020÷40.026
Category 2	40.026÷40.032

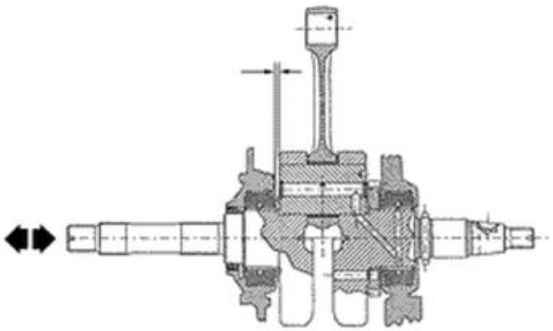
If the crankshaft is within the set limits, replace the crankshaft half-bearings mounting the crankcase so as to suit the specified couplings. The crankcase halves can be mounted with four types of crankshaft half-bearings identified by letters A (red), B (blue), C (yellow), D (green).

CRANKCASE

Specification	Desc./Quantity
Category 1	43.974 ÷ 43.980
Category 2	43.980 ÷ 43.986
Category 3	43.986 ÷ 43.992

CRANKCASE - CRANKSHAFT COUPLING / CRANKSHAFT HALF-BEARINGS

Specification	Desc./Quantity
Crankshaft category 1 - Crankcase category 1	B+B, A+C
Crankshaft category 2 - Crankcase category 1	A+A
Crankshaft category 1 - Crankcase category 2	C+C, B+D
Crankshaft category 2 - Crankcase category 2	B+B, A+C
Crankshaft category 1 - Crankcase category 3	D+D
Crankshaft category 2 - Crankcase category 3	C+C, B+D



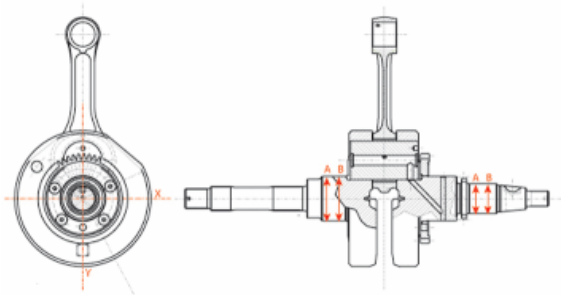
Characteristic

crankshaft / crankcase axial clearance:

0.1 ÷ 0.405 mm

Diameter of crankshaft bearings.

Measure the capacity on both axes x-y.



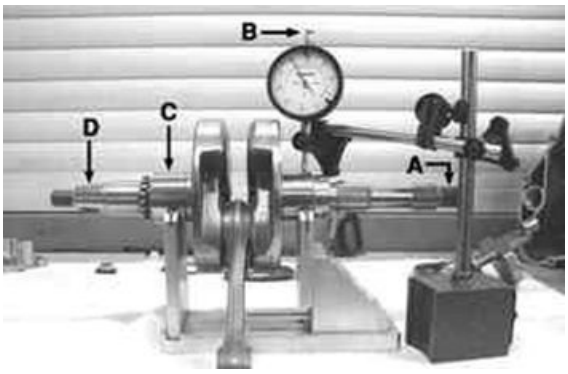
CRANKSHAFT

Specification	Desc./Quantity
Cat. 1	Standard diameter: 40.020÷40.026
Cat. 2	Standard diameter: 40.026÷40.032

Crankshaft alignment

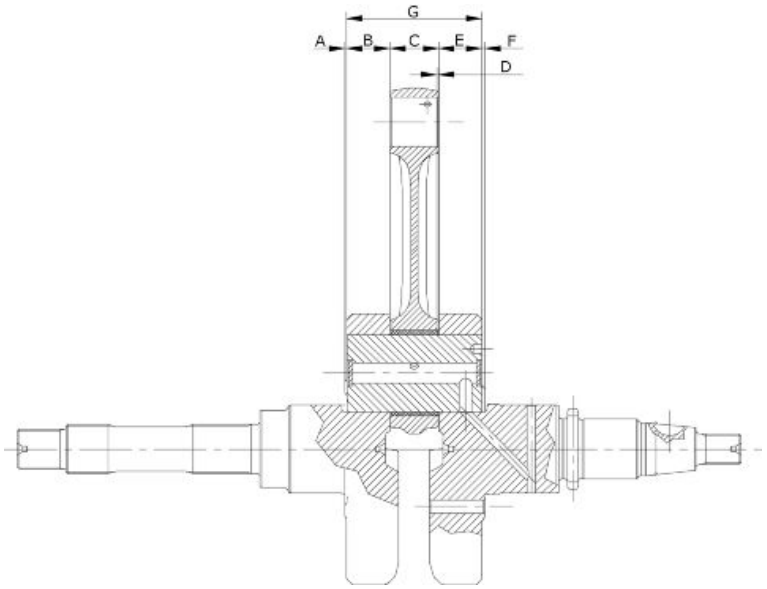
Specific tooling

020335Y Magnetic support for dial gauge



MAX. ADMISSIBLE DISPLACEMENT

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

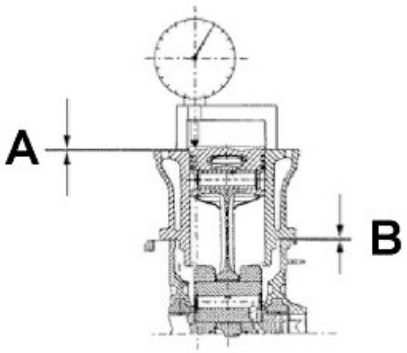


AXIAL CLEARANCE BETWEEN CRANKSHAFT AND CONNECTING ROD

Name	Description	Dimensions	Initials	Quantity
Transmission-side shoulder		1±0.025	A	D = 0.20 - 0.50
Half-shaft, transmission side		20.9 -0.05	B	D = 0.20 - 0.50
Connecting rod		22 -0.10 -0.15	C	D = 0.20 - 0.50
Flywheel-side shoulder		1.8±0.025	F	D = 0.20 - 0.50
Flywheel-side half-shaft		19.6 -0.05	E	D = 0.20 - 0.50
Complete crankshaft		65.5 +0.10 -0.05	G	D = 0.20 - 0.50

Slot packing system

Shimming system for keeping the compression ratio



DISTANCE «A» IS A PROTRUSION OR RECESS VALUE OF THE PISTON CROWN WITH RESPECT TO THE CYLINDER PLANE.
DISTANCE «A» HELPS DETERMINE THE THICKNESS OF GASKET «B» THAT HAS TO BE FITTED TO THE CYLINDER HEAD IN ORDER TO RESTORE COMPRESSION RATIO.
BASE GASKET «B» MUST BE THICKER THE MORE THE PLANE FORMED BY THE PISTON TOP PROTRUDES FROM THE PLANE FORMED BY THE CYLINDER HEAD. ON THE OTHER HAND, THE MORE THE PISTON TOP IS RECESSED INTO THE CYLINDER TOP PLANE, THE SMALLER THE GASKET THICKNESS.

Characteristic

Compression ratio

10.6 ± 0.5 : 1

BASE GASKET THICKNESS

Name	Measure A	Thickness
«A» MEASURE TAKEN	- 0.185 - - 0.10	0.4 ± 0.05
«A» MEASURE TAKEN	- 0.10 - + 0.10	0.6 ± 0.05
«A» MEASURE TAKEN	+ 0.10 ÷ + 0.185	0.8 ± 0.05

N.B.

VALUES INDICATED WITH «-» REFER TO PISTON CROWN RECESSES WITH RESPECT TO THE CYLINDER PLANE.

N.B.

DISTANCE «A» MUST BE MEASURED WITHOUT ANY GASKET FITTED AT «B»

Products

PRODUCTS

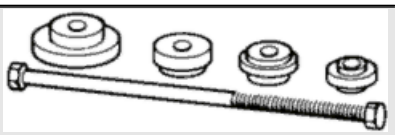
Product	Description	Specifications
AGIP ROTRA 80W-90	Rear hub oil	SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications
AGIP FILTER OIL	Oil for air filter sponge	Mineral oil with specific additives for increased adhesiveness
AGIP CITY HI TEC 4T	Engine oil	SAE 5W-40, API SL, ACEA A3, JASO MA Synthetic oil
AGIP BRAKE 4	Brake fluid	FMVSS DOT 4 Synthetic fluid
AGIP PERMANENT SPEZIAL	coolant	Monoethylene glycol-based antifreeze fluid, CUNA NC 956-16
AUTOSOL METAL POLISH	Muffler cleaning paste	special product for cleaning and polishing stainless steel muffler
AGIP GP 330	Grease for brake levers, throttle	White calcium complex soap-based spray grease with NLGI 2; ISO-L-XBCIB2
AGIP CITY TEC 2T	Mixer oil	synthetic oil for 2-stroke engines: JASO FC, ISO-L-EGD

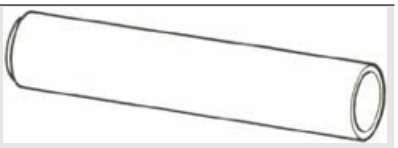
UNIT OF MEASUREMENT - CONVERSION - ENGLISH SYSTEM AND INTERNATIONAL SYSTEM (IS).

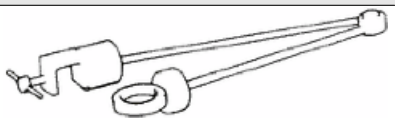
Specification	Desc./Quantity
1 Inch (in)	25.4 Millimetres (mm)
1 Foot (ft)	0.305 Meter (m)
1 Mile (mi)	1.609 Kilometre (km)
1 US Gallon (US gal)	3.785 Litre (l)
1 Pound (lb)	0.454 Kilogram (Kg)
1 Cubic inch (in^3)	16.4 Cubic centimetres (cm^3)
1 Foot pound (ft lb)	1.356 Newton meter (Nm)
1 Miles per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

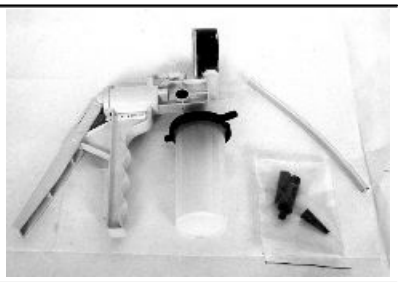
INDEX OF TOPICS

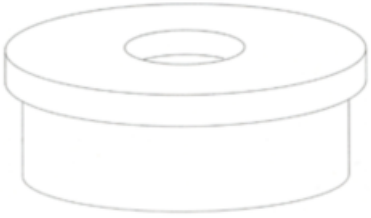
SPECIFIC TOOLS

Stores code	Description	
001330Y	Tool for fitting steering seats	
001467Y002	Driver for OD 73 mm bearing	
001467Y006	Pliers to extract 20 mm bearings	
001467Y007	Driver for OD 54-mm bearings	
001467Y008	Pliers to extract 17 mm ø bearings	
001467Y014	Pliers to extract ø 15-mm bearings	

Stores code	Description	
001467Y031	Bell	
001467Y034	Pliers to extract ø 15-mm bearings	
001467Y035	Belle for OD 47-mm bearings	
002465Y	Pliers for circlips	
006029Y	Punch for fitting fifth wheel seat on steering tube	
020004Y	Punch for removing fifth wheels from headstock	

Stores code	Description	
020055Y	Wrench for steering tube ring nut	
020150Y	Air heater support	
020151Y	Air heater	
020193Y	Oil pressure gauge	
020201Y	Spacer bushing driving tube	
020262Y	Crankcase splitting strip	
020306Y	Punch for assembling valve seal rings	

Stores code	Description	
020329Y	MityVac vacuum-operated pump	
020330Y	Stroboscopic light to check timing	
020331Y	Digital multimeter	
020648Y	Single battery charger	
020335Y	Magnetic support for dial gauge	
020357Y	32 x 35 mm adaptor	
020358Y	37x40-mm adaptor	

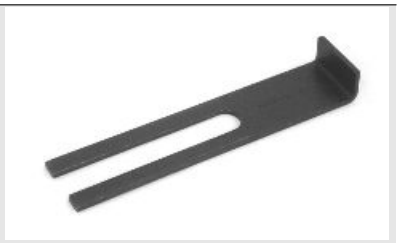
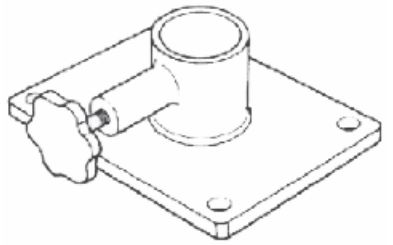
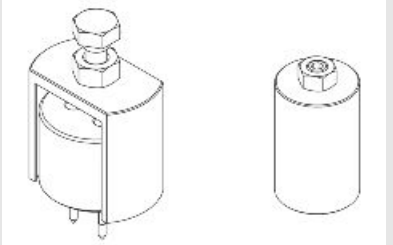
Stores code	Description	
020359Y	42x47-mm adaptor	
020360Y	Adaptor 52 x 55 mm	
020364Y	25-mm guide	
020376Y	Adaptor handle	
020382Y012	bush (valve removing tool)	
020412Y	15 mm guide	
020424Y	Driven pulley roller casing fitting punch	

Stores code	Description	
020431Y	Valve oil seal extractor	
020434Y	Oil pressure control fitting	
020439Y	17 mm guide	
020444Y	Tool for fitting/ removing the driven pulley clutch	
020456Y	Ø 24 mm adaptor	

Stores code	Description	
020458Y	Puller for lower bearing on steering tube	
020459Y	Punch for fitting bearing on steering tube	
020460Y	Scooter diagnosis and tester	
020467Y	Flywheel extractor	
020468Y	Piston fitting band	

Stores code	Description	
020469Y	Reprogramming kit for scooter diagnosis tester	
020470Y	Pin retainers installation tool	
020471Y	Pin for countershaft timing	
020472Y	Flywheel lock wrench	
020474Y	Driving pulley lock wrench	

Stores code	Description	
020475Y	Piston position checking tool	
020476Y	Stud bolt set	
020478Y	Punch for driven pulley roller casing	
020479Y	Countershaft lock wrench	
020480Y	Petrol pressure check set	
020481Y	Control unit interface wiring	

Stores code	Description	
020482Y	Engine support	
020483Y	30 mm guide	
020512Y	Piston fitting fork	
020527Y	Engine support base	
020604Y011	Fitting adapter	
020565Y	Flywheel lock calliper spanner	
020661Y	Water pump overall seal replacement kit	

Stores code	Description	
020663Y	Water pump shaft oil seal punch	

INDEX OF TOPICS

Maintenance chart

MAINTENANCE TABLE

●*Replacement*
■ *Check*
** Replace every 2 years*

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

Spark plug

Check and replacement

Characteristic

Recommended spark plugs:

CHAMPION RG6YC - NGK CR 7 EKB

- Position the scooter on centre stand.

- Open the door on the left side and remove the relevant screw lifting from the lower part in the specific groove.

- Disconnect the shielded spark plug cap
- Unscrew the spark plug.
- Check the conditions of the spark plug, make sure the insulation is intact, that the electrodes are not excessively worn or grimy, the conditions of the washer, and measure the distance between the electrodes using the appropriate feeler gauge.

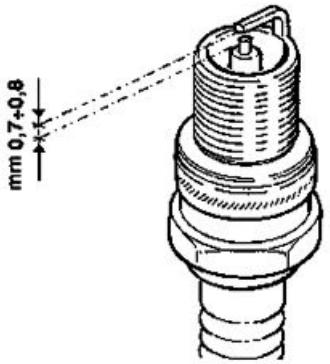
Characteristic

Electrode gap

0.7-0.8 mm

Adjust the gap if necessary, carefully bending the earth electrode. In the event of irregularity, replace the spark plug with a recommended type.

- Fit the spark plug with the correct inclination and manually screw it all the way down, then use the special spanner to tighten it.



Locking torques (N*m)

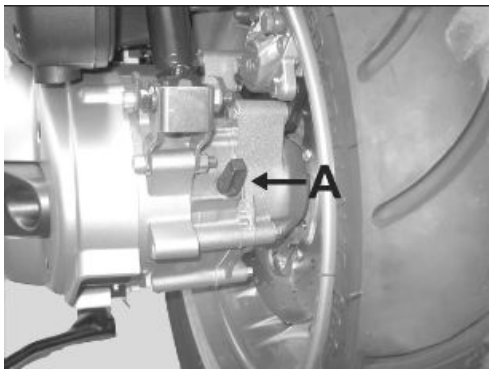
Spark plug **12 ÷ 14**

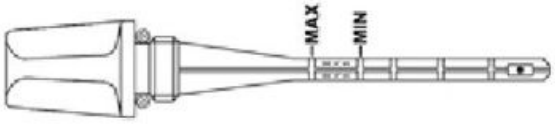
- Insert the cap onto the spark plug and proceed with the reassembly operations.

Hub oil

Check

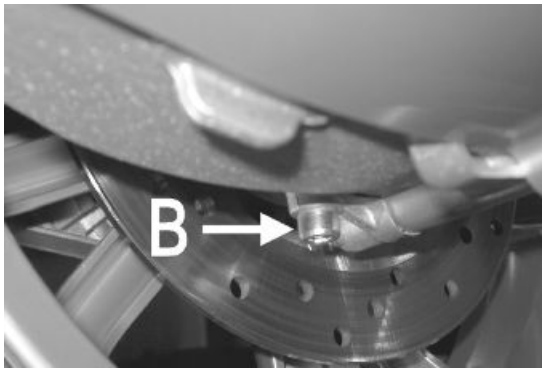
- Park the scooter on flat ground and rest it on the central stand.
- Unscrew the oil dipstick "A", dry it with a clean cloth and reinsert it, screwing it in thoroughly.
- Pull out the dipstick and check that the oil level is between the MAX. and MIN. levels indicated on the dipstick (see figure); if the level is below the MIN value, restore the proper amount of oil in the hub.
- Screw the oil bar back on, checking that it is tightly in place.





Replacement

- Remove the oil filler cap "A".
- Prepare a suitable container.
- Remove the oil drainage cap "B" and let the oil drain out completely.
- Tighten the drainage cap with its gasket and refill.
- Remove the oil loading cap



Recommended products

AGIP ROTRA 80W-90 rear oil hub

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

Characteristic

Rear hub oil

Capacity approximately 250 cc

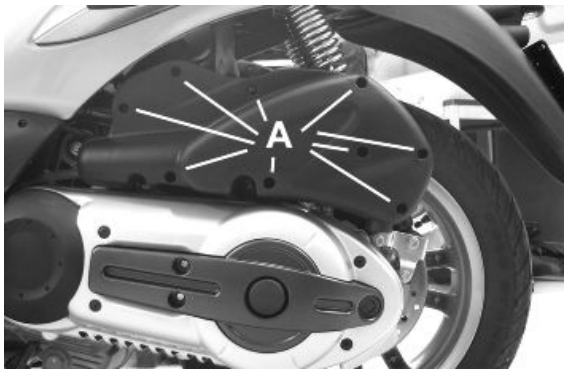
Air filter

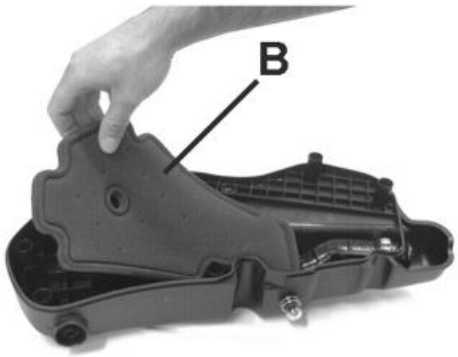
Proceed as follows:

1. Unscrew the 9 fixing screws «**A**»;
2. Remove the air filter«**B**»

CAUTION

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





1. Wash the sponge with water and neutral soap.

2. Dry it with a clean cloth and small blasts of compressed air.

3. Impregnate the sponge with a mixture of 50% petrol and 50% specified oil.

4. Gently squeeze the filter element, let it drip and then refit it.

CAUTION

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

Recommended products

AGIP FILTER OIL Oil for air filter sponge

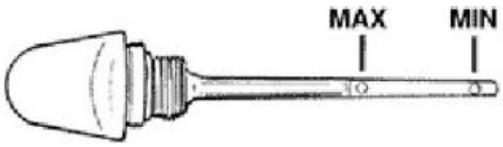
Mineral oil with specific additives for increased adhesiveness

Engine oil

In 4T engines, the engine oil is used to lubricate the 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".

Check

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



1) Rest the vehicle on the central stand and on a flat ground.
2) Unscrew the cap/dipstick "**A**", dry it with a clean cloth and reinsert it, **screwing it thoroughly**.
3) Remove the cap/dipstick again and check that the level is between the max. and min levels; top-up, if required.
Topping up from the MIN to MAX. level requires around 1700 cc.
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**.
The restoration level between the **MIN** and **MAX** levels implies a quantity of oil **of approx. 400 cc**.

Engine oil filter

CAUTION

DO NOT DISPOSE OF OIL IN THE ENVIRONMENT. OIL, GASKET AND FILTER SHOULD BE DISPOSED OF ACCORDING TO THE REGULATIONS IN FORCE.

WARNING

AVOID TOUCHING PARTS OF THE ENGINE WHEN HOT, AS THIS MAY CAUSE BURNS.

- Remove the muffler.
- Remove the filler plug.

- Remove and clean the mesh pre-filter of the drain cap with compressed air.

- Use a belt spanner for filters to remove cartridge filter "**C**".
- Make sure the pre-filter and drain cap O-rings are in good condition.
- Lubricate them and refit the mesh filter and oil drain cap by tightening to the prescribed torque.
- Refit a new cartridge filter making sure to lubricate the O-ring before fitting, then screw until it comes into contact with the seal and further tighten to the prescribed torque.

- Refit the muffler.
- Add recommended engine oil.
- Start the engine and let it run for a few minutes and then turn it off.

After 5 minutes check the level and top up, if necessary, **never exceed the MAX. level.**

N.B.

IF THE OIL IS CHANGED WITHOUT CHANGING THE CARTRIDGE FILTER (1ST COUPON) ADD AROUND 1500 CC OF OIL INSTEAD OF 1700 CC SINCE PART OF THE LUBRICATION CIRCUIT IS FILLED.

Characteristic

Engine oil:

1700 cm^3

Locking torques (N*m)

Engine oil drainage plug 24 ÷ 30 Engine oil filter 12 - 16

Oil pressure warning light

Warning light (low oil pressure)

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 comes on during braking, at idling speed or while turning, it is necessary to first switch off the engine and then to check the oil level and the lubrication system

Checking the valve clearance

- To check the clearance in the valves collimate the references between the cam shaft control pulley and head.
- Use a feeler to make sure the clearance between the valve and register screw correspond to the indicated values. If the clearance does not correspond, adjust it by loosening the lock nut using a screwdriver on the set screw as shown in the figure.

Characteristic

Valve clearance: intake

0.15 mm (when cold)

Valve clearance: discharge

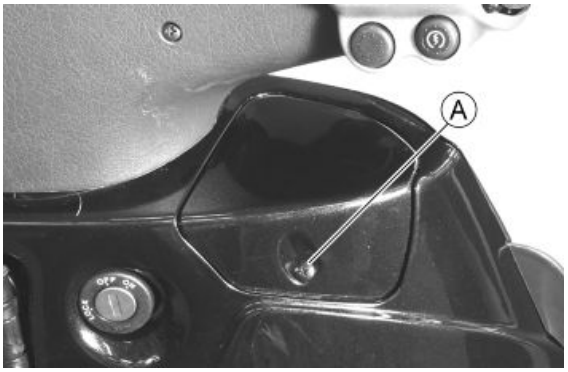
0.15 mm (when cold)

Cooling system

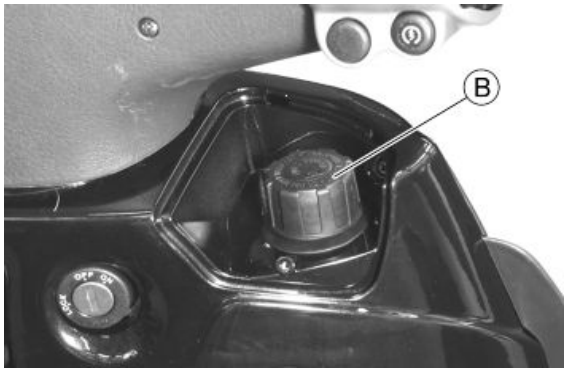
Level check

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

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

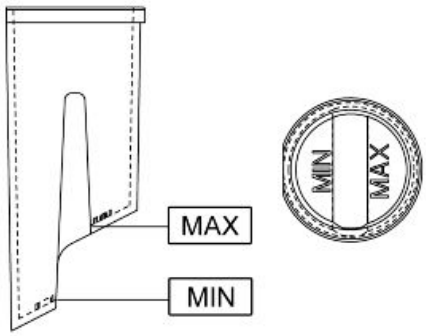


- Remove the expansion tank cover «**B**» by turning it anticlockwise.



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

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



WARNING

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

WARNING

IN ORDER TO AVOID HARMFUL FLUID LEAKS WHILE RIDING, IT IS IMPORTANT TO MAKE SURE THAT THE LEVEL DOES NOT EXCEED THE REFERENCE TONGUE TOO MUCH.
IN ORDER TO GUARANTEE THE PROPER FUNCTION OF THE ENGINE, IT IS NECESSARY TO KEEP THE RADIATOR GRILLE CLEAN.

Recommended products

AGIP PERMANENT SPEZIAL coolant

Monoethylene glycol-based antifreeze fluid, CUNA NC 956-16

Braking system

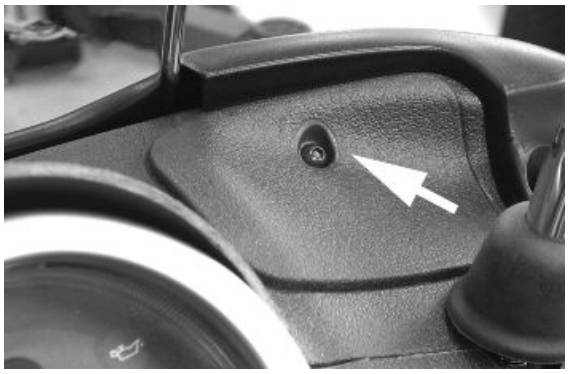
Level check

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

- Rest the vehicle on its centre stand with the handlebars perfectly horizontal
- Check the brake fluid level with the help of a lamp through the sight glass as shown in the figure

Top-up

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



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

CAUTION

ONLY USE DOT 4-CLASSIFIED BRAKE FLUID.

CAUTION

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

CAUTION

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

CAUTION

BRAKE FLUID IS HYGROSCOPIC; THAT IS, IT ABSORBS MOISTURE FROM THE SURROUNDING AIR. IF THE CONTENT OF MOISTURE IN THE BRAKE FLUID EXCEEDS A CERTAIN VALUE, BRAKING WILL BE INEFFICIENT.
NEVER USE BRAKE FLUID FROM OPEN OR PARTIALLY USED CONTAINERS.
UNDER NORMAL CLIMATIC CONDITIONS, REPLACE FLUID AS INDICATED IN THE SCHEDULED MAINTENANCE TABLE.

Recommended products

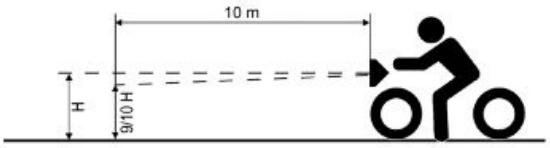
AGIP BRAKE 4 Brake fluid

FMVSS DOT 4 Synthetic fluid

Headlight adjustment

Proceed as follows:

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



- Turn on the headlight and check that the border of the projected light beam on the screen is not higher than 9/10 or lower than 7/10 f the height from the ground to the centre of vehicle headlamp;

- Otherwise, adjust the headlight.

N.B.

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

To adjust light beams:

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

Checking the end compression pressure

- Remove the spark plug cap when the engine is cold.
- Remove the ignition spark plug.
- Fit a compression test gauge into the spark plug seat using a 10 mm spark plug union at the proper tightening torque.
- Disconnect the revolution-timing sensor connector.

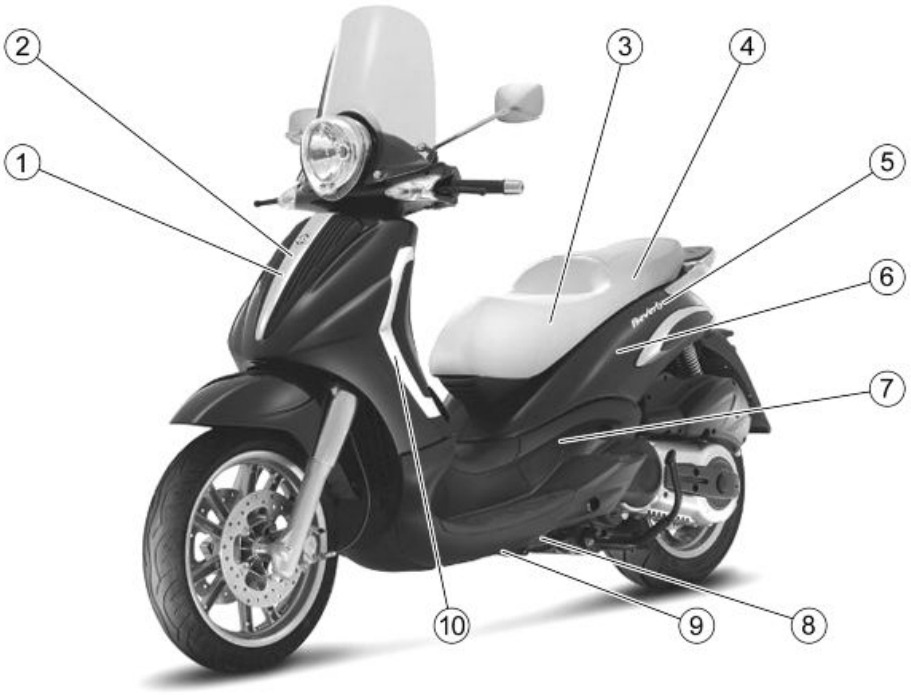
- Let the engine run using the starter and with the throttle body in fully open position as long as the gauge value is steady. If pressure is correct (> 11 bar), remove the tool and reinstall the spark plug, the cap and the rev counter connector.
- If the pressure is less than indicated, check the rpm at which the test is carried out; if it is less than 450 rpm, check the starter system; if not, check the following:
- Distribution timing
- Valve clearance
- Check valve seal
- Check lining seal
- Proper compression ratio selection

Locking torques (N*m)

Fitting for compression test 10

INDEX OF TOPICS

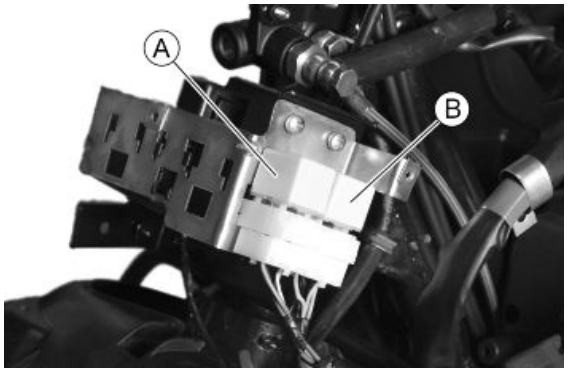
Components arrangement



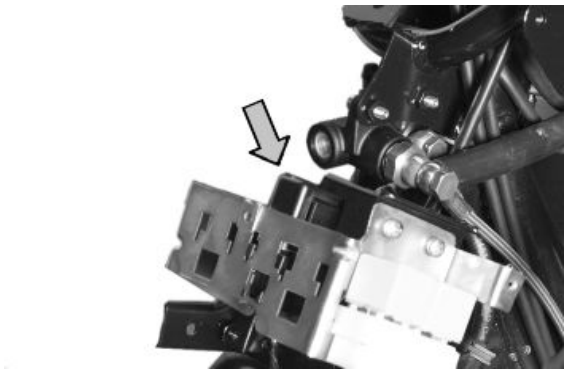
1. Front remote control switches: remove the leg-shield to reach them.

A. Electrical fan remote control switches

B. Light remote control switch



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



3. Injection ECU: remove the helmet compartment to reach it.

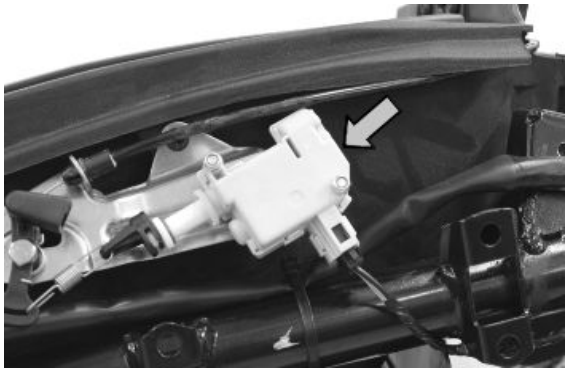
4. Battery: remove the battery cover placed in the helmet compartment to reach it.

Electric characteristic

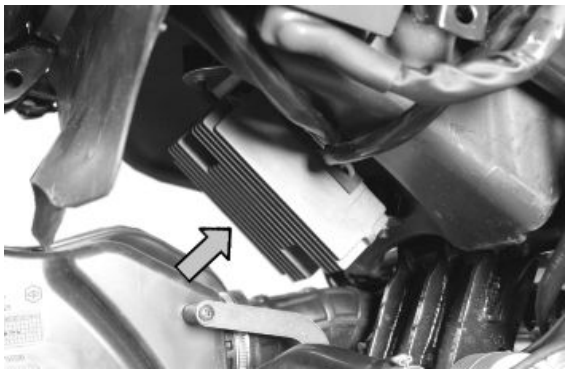
Battery

12V - 12 Ah

5. Saddle opening actuator: remove the left side panel to reach it.



6. Voltage regulator: remove the right side fairing to reach it.



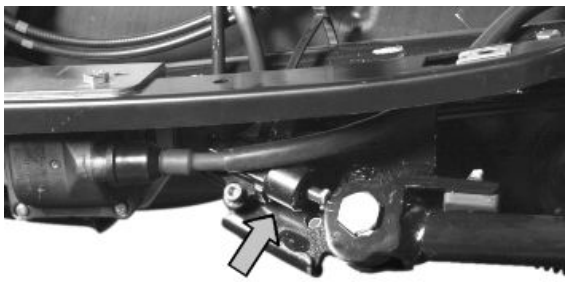
Electric characteristic

Control voltage

14÷15 V to 1500÷12000 rpm

7. Spark plug: remove the cover on the vehicle LHS to reach it.

8. Stand switch: remove the left footrest to reach it.



9. HV coil: remove the left footrest to reach it.

Electric characteristic

HV coil resistance primary value:

~ 0.9 Ω

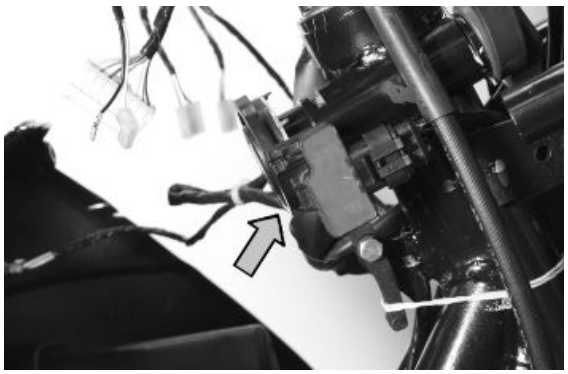
HV coil secondary resistance value:

~ 3.4 kΩ

10. Auxiliary fuses: located in the front glove-box.

11. Key switch: remove the legshield to reach it.

12. Immobilizer aerial: remove the legshield to reach it.



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

Electric characteristic

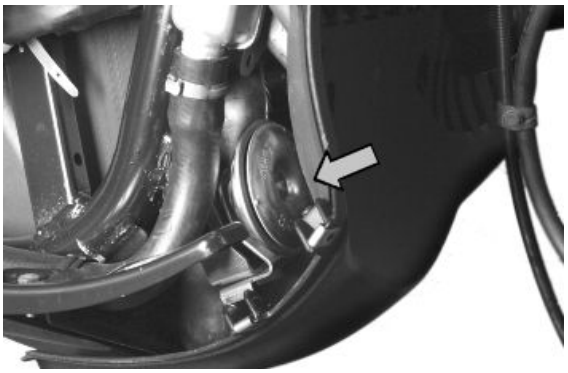
Resistance value when the tank is full

<= 7 Ω

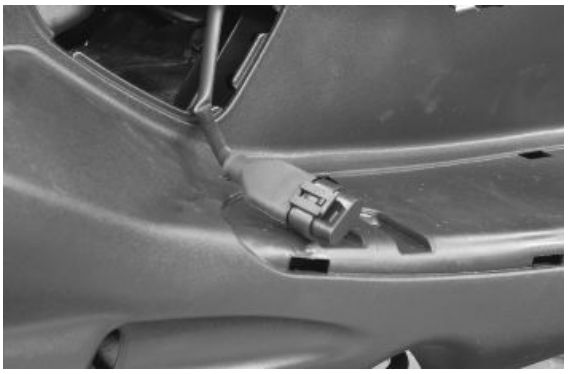
Resistance value when the tank is empty

90 +13/-3 Ω

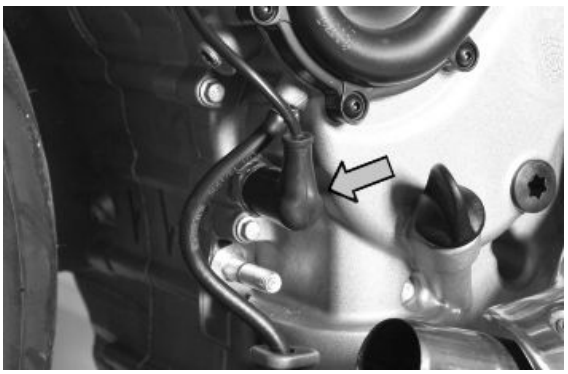
14. Horn: remove the shield back plate to reach it.



15. Diagnostics socket: remove the cover on the vehicle RHS to reach it.



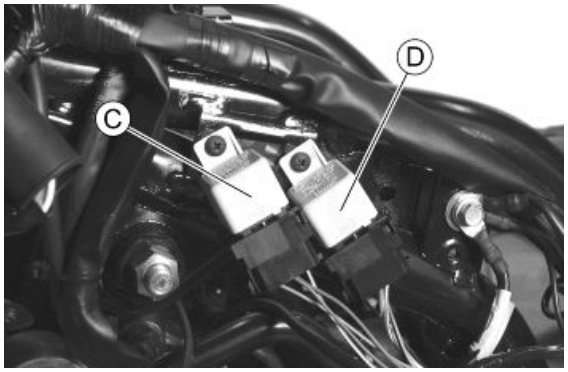
16. Oil pressure sensor: placed at the bottom at the back of the vehicle RHS.



17. Rear remote control switches: remove the right side fairing to reach them.

C. Start-up remote control switch relay

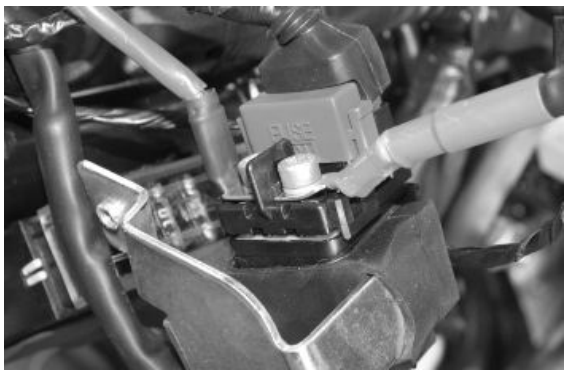
D. Injection load remote control



18. Main fuses: remove the right side cover to reach them.

19. Stator: remove the right side fairing to reach the connector.

20. Start-up remote control switch: remove the right side fairing to reach it.

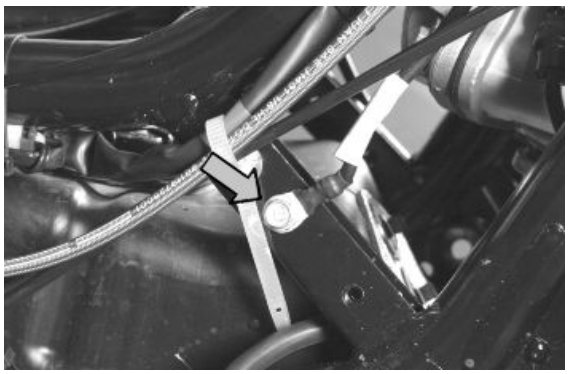


21. Plug socket: located in the helmet compartment.

Ground points

There are three ground points in the electrical system:

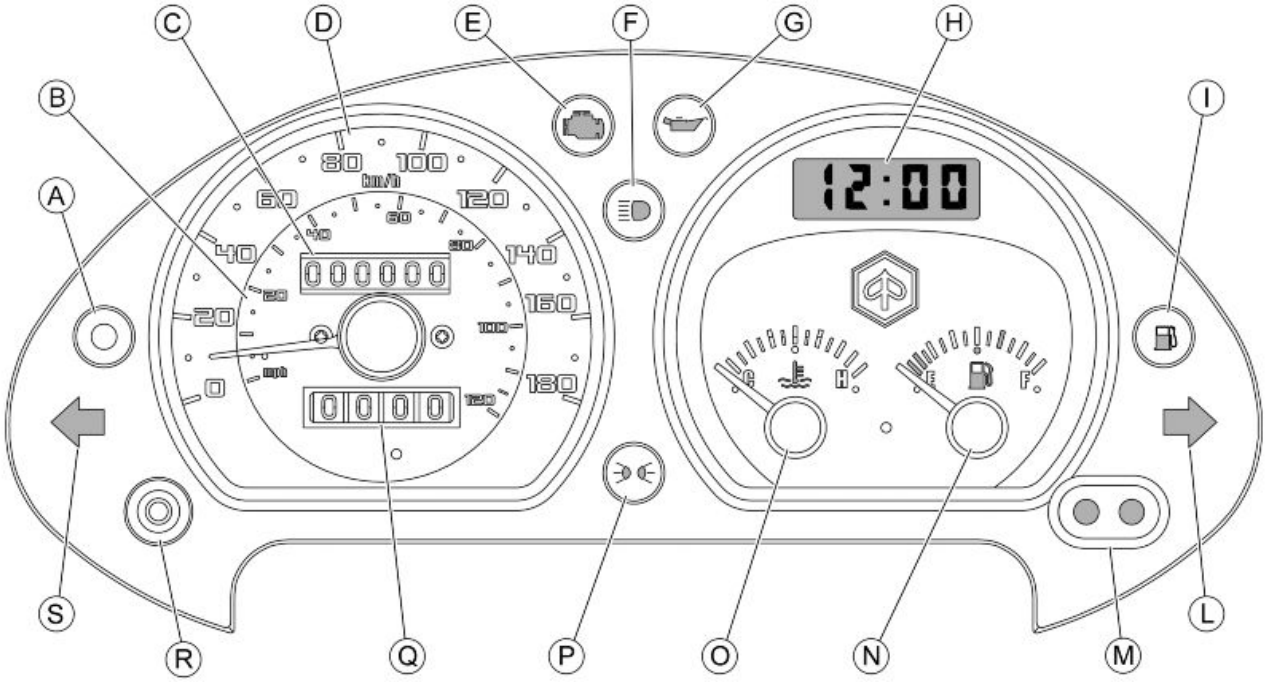
A. Ground points on the chassis: placed on the vehicle LHS. Remove the left footrest to reach them.



B. Ground points on the chassis: placed on vehicle RHS. Remove the right side fairing to reach them.

C. Ground point on the engine: remove the left side panel to reach it.

Instrument panel



A = Immobilizer LED

B = Speedometer (mph)

C = Total Odometer

D = Speedometer (km/h)

E = Injection telltale light

F = High-beam warning light

G = Oil pressure warning light

H = Digital clock

I = Low fuel warning light

L = Right turn indicator warning light

M = Clock controls

N = Fuel gauge

O = Water temperature gauge

P = Headlight warning light

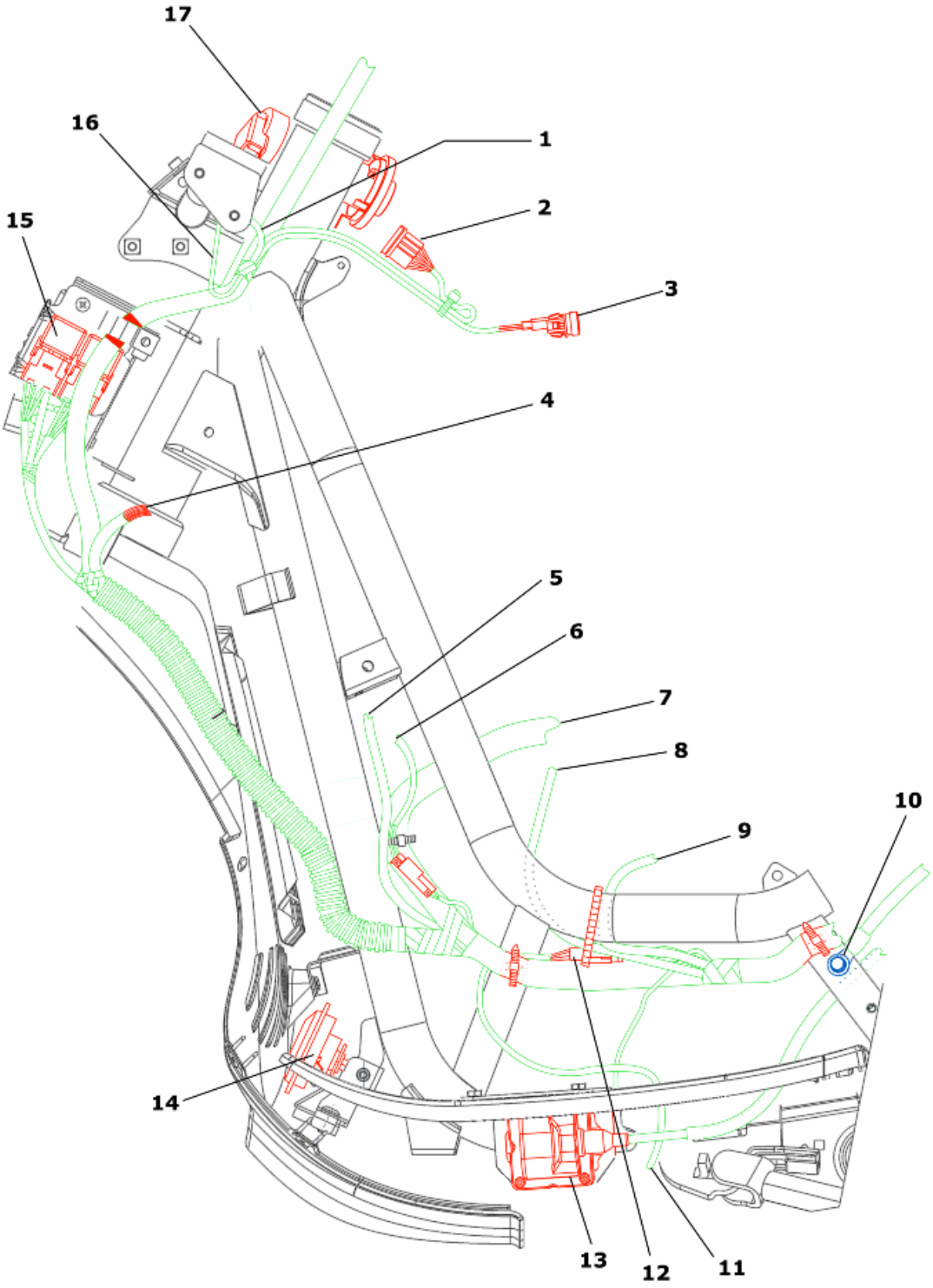
Q = Trip odometer

R = Odometer reset button

S = Left turn indicator warning light

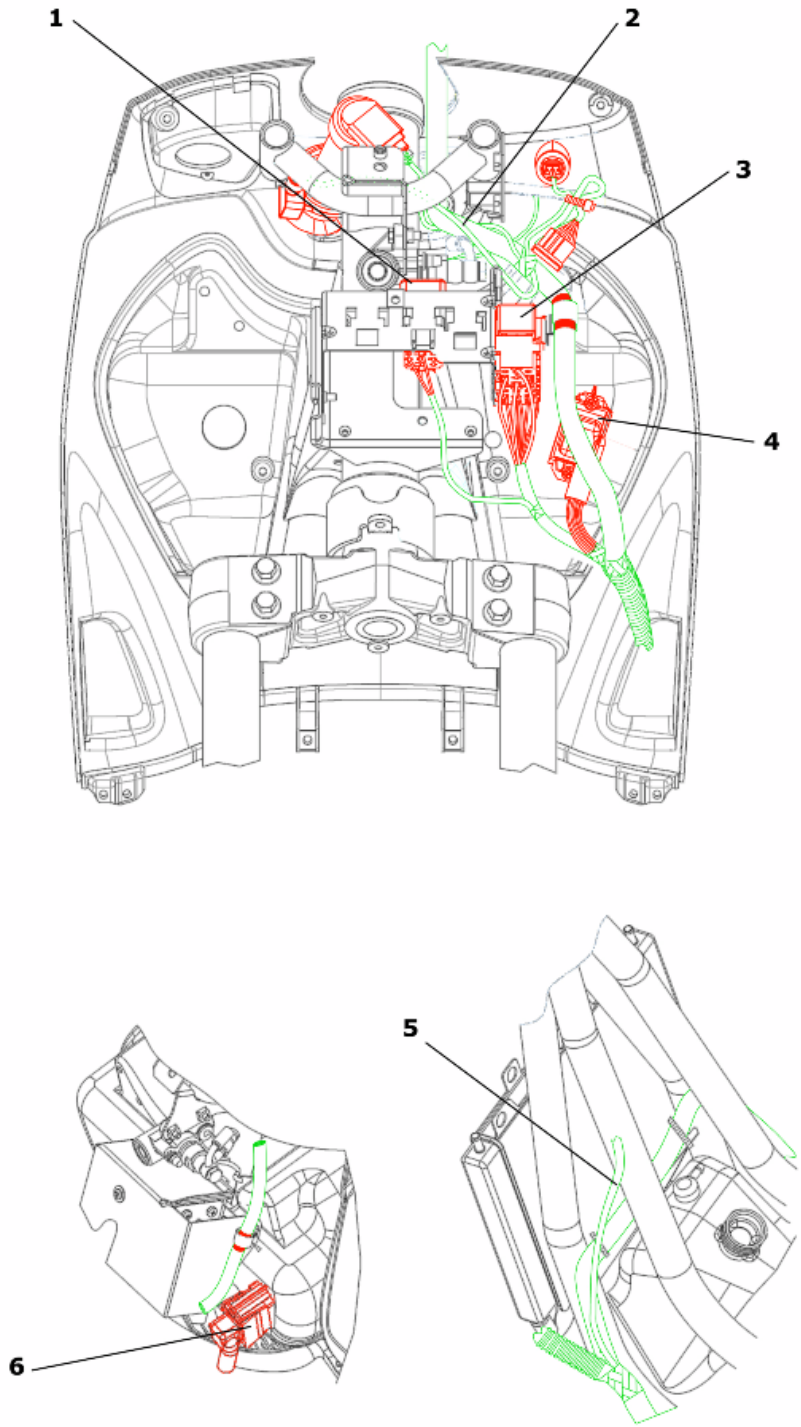
Electrical system installation

Front side



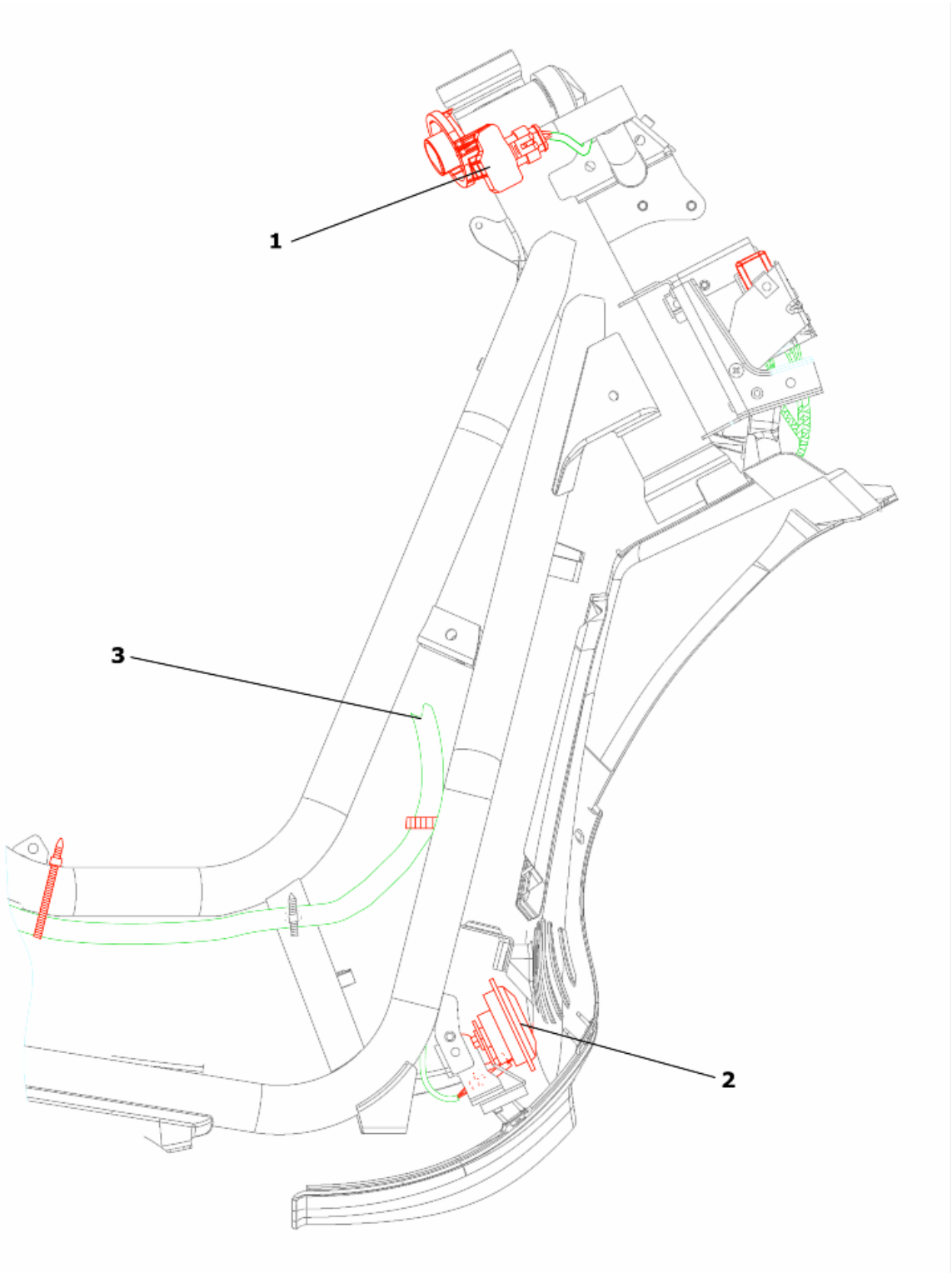
1. To key switch
2. Antitheft device pre-installation
3. Saddle opening switch
4. To the front fuse box

5. To the horn
6. To the electric fan
7. Towards the right fairing
8. To the fuel gauge
9. To the fuel pump
10. Ground point
11. Side stand switch cable
12. Side stand switch connection
13. HV coil
14. Horn
15. Remote control switches
16. To the immobilizer aerial
17. Key switch connector



1. Turn indicator control device
2. To the immobilizer aerial
3. Remote control switches

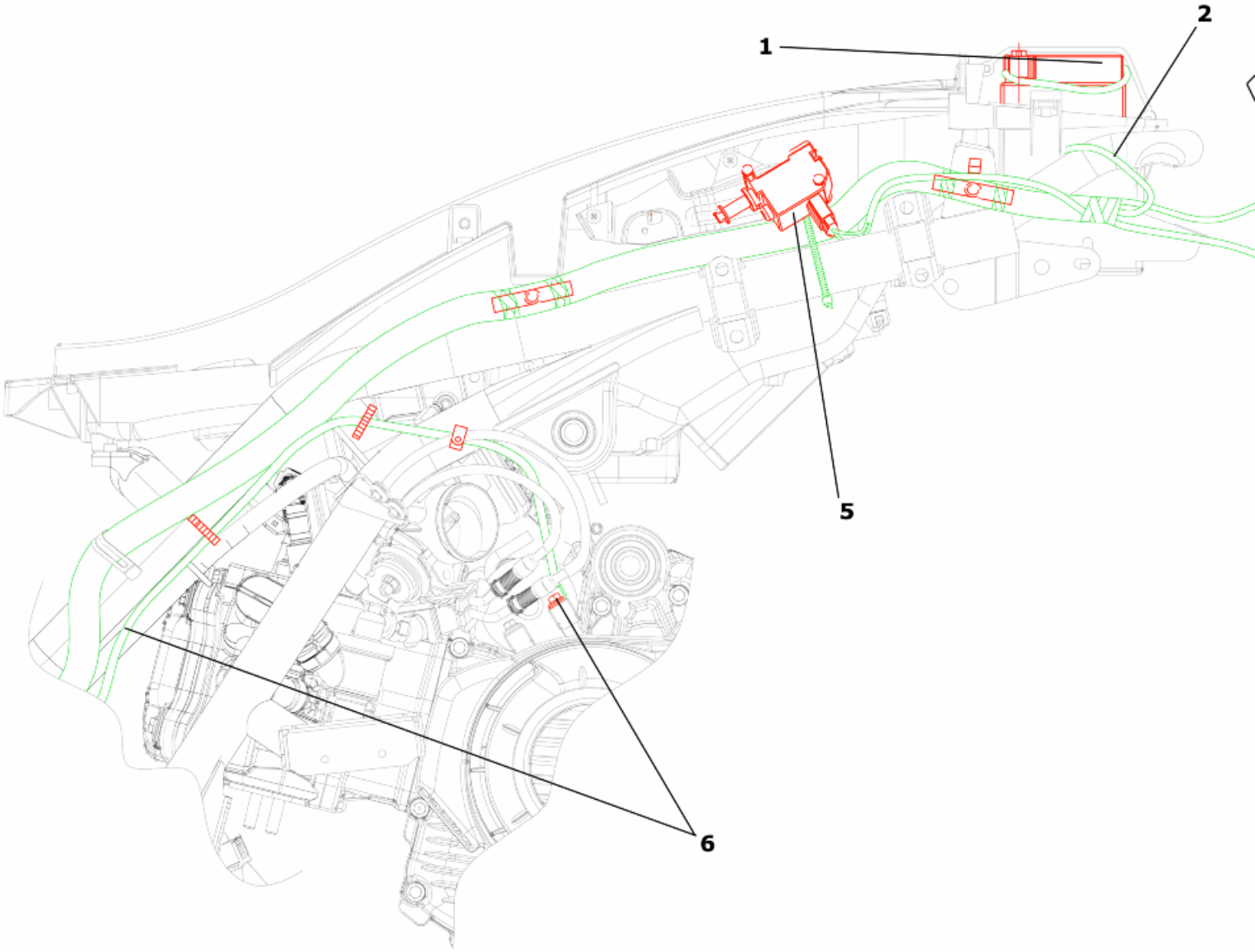
4. Front fuse box
5. To the electric fan
6. Front fuse box



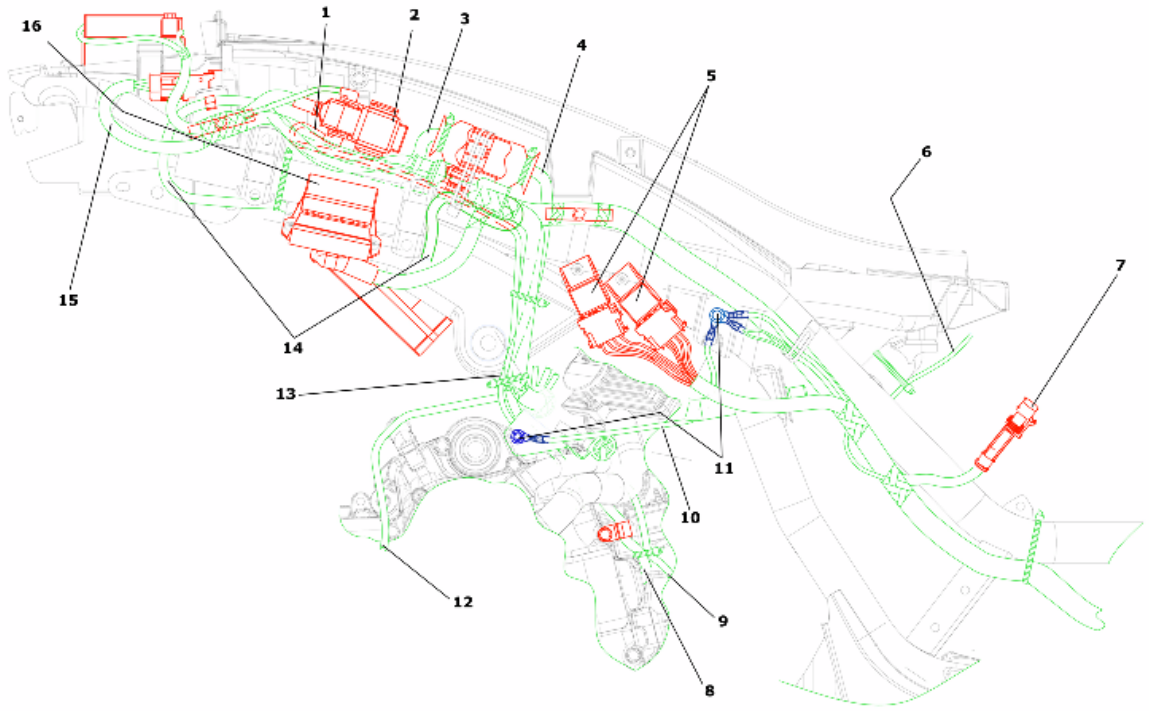
1. Immobilizer aerial

2. Horn
3. Towards the right fairing

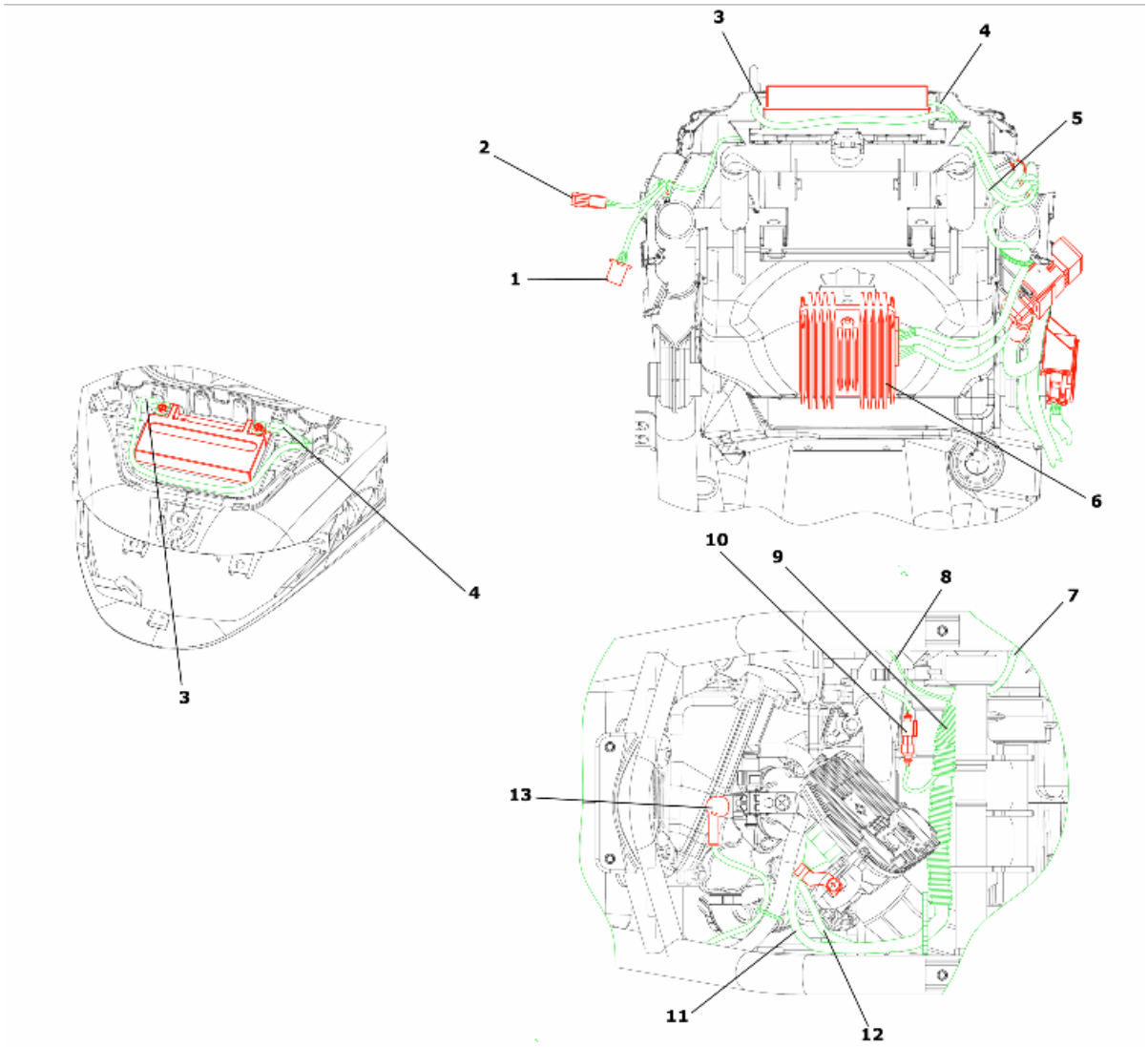
Back side



1. Battery
2. To the helmet compartment internal light
3. To the license plate light
4. To rear light
5. Saddle opening actuator
6. Starter motor ground lead



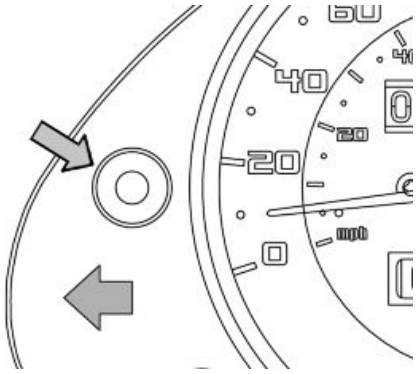
1. Starter motor positive cable
2. Start-up remote control switch
3. From regulator
4. From flywheel
5. Remote control switches
6. To the helmet compartment light switch
7. Diagnostics socket
8. Flywheel cable
9. Lambda probe cable
10. Engine ground lead
11. Ground points
12. To the oil pressure sensor
13. To the starter motor
14. From regulator
15. To the accessories plug socket (LV)
16. Rear fuse-box



1. To rear light
2. To the license plate light
3. To the battery negative
4. To the battery positive
5. To the accessories plug socket (LV)
6. Voltage regulator
7. Flywheel cable
8. To the oil pressure sensor
9. From the chassis wire unit
10. Lambda probe connection
11. To the MIU control unit
12. To the coolant temperature sensor
13. To the fuel injector

Checks and inspections

Immobiliser



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

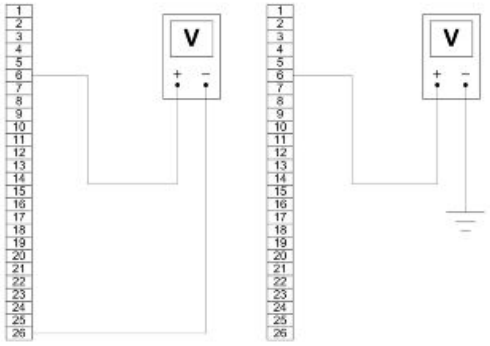
- electronic control unit
- immobilizer aerial
- master key with built-in transponder
- service key with built-in transponder
- HV coil
- Diagnosis LED

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

- there is battery voltage
- fuses No. 1; 6; 9 are in working order
- there is power to the control unit as specified below:

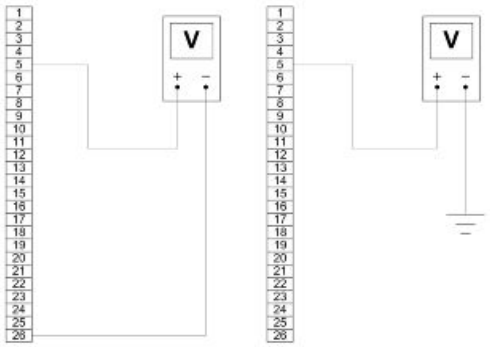
With the key switch set to OFF:

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

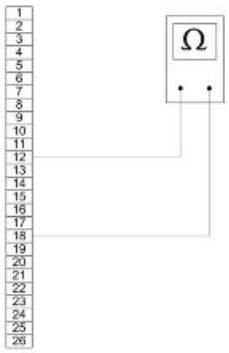


With the key switch in the OFF position:

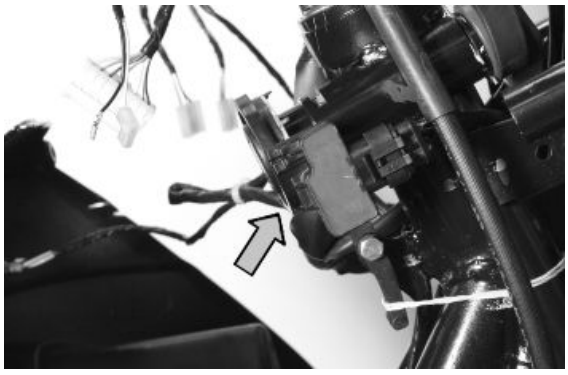
- if there is battery voltage between terminals 5-26 and terminals 5-chassis ground (fixed power supply). If there is no voltage, check the key switch contacts, and that fuses No. 1 and 9 and their cable harnesses are in working order.



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



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



Remove the protective base from the connector.

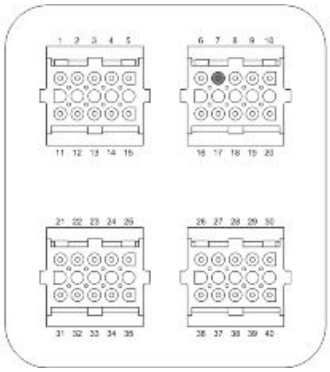
With the ignition key switch at «ON» check if there is battery voltage between the Red-White and Black cables

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

Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter



Virgin circuit

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

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

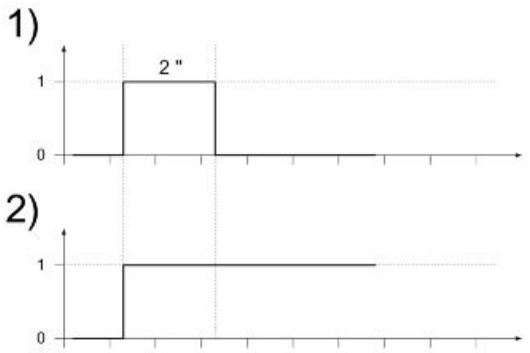
The maximum time to change keys is 10 seconds.

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

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

Diagnostic codes

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

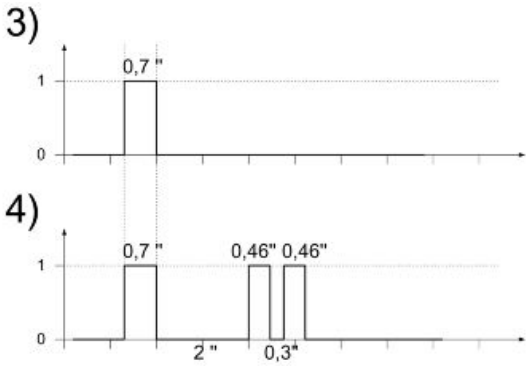


1. Previously unused control unit - key inserted: a single 2 second flash is displayed, after which the LED remains off permanently. The keys can be stored to memory, the vehicle can be started but with a limitation imposed on the number of revs.

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

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

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



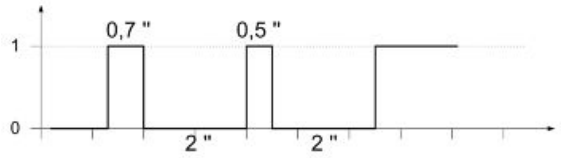
5. Programmed control unit - fault detected: a light code is displayed according to the fault detected, after which the LED remains on permanently. The engine cannot be started. The codes that can be transmitted are:

- 1-flash code
- 2-flash code

- 3-flash code

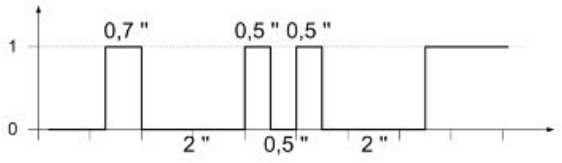
Diagnostic code - 1 flash

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



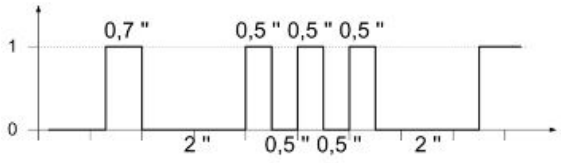
Diagnostic code - 2 flashes

A two-flash code shows a system where the control unit does not show the transponder signal. This might depend on the inefficiency of the immobiliser aerial or the transponder.
Turn the switch to «ON» using several keys: if the code is repeated even with the Master key, check the aerial wiring and change it if necessary. If this is not the case, replace the defective key and/or reprogram the control unit.



Diagnostic code - 3 flashes

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



Ignition circuit

No spark plug

WARNING

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

HV coil primary resistance value:

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

Characteristic

HV coil resistance primary value:

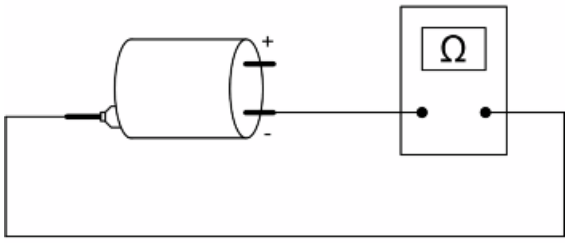
~ 0.9 Ω

HV coil secondary resistance value:

1) Disconnect the HV cable from the spark plug and measure the resistance between the spark plug cap and the HV coil negative terminal.

2)Disconnect the spark plug cap from the HV cable and measure the resistance between the HV cable end and the HV coil negative terminal (see figure).

3) Measure the resistance between the 2 ends of the spark plug cap.



Characteristic

HV coil secondary resistance value with spark plug cap

~ 8.4 kΩ

HV coil secondary resistance value:

~ 3.4 kΩ

Spark plug cap resistance value

~ 5 kΩ

Battery recharge circuit

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

The alternator is directly connected to the voltage regulator.

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

This system therefore requires no connection to the key switch.

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

Stator check

Stator winding check-up

WARNING

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

1 Remove the right side panel.

2) Disconnect the connector between stator and regulator located next to the starter remote control.

3) Measure the resistance between each of the black terminals and the other two.

Electric characteristic

Resistance:

0.2 - 1 Ω

4) Ensure that each black cable is isolated from the earth.

5) If values are incorrect, replace the stator.

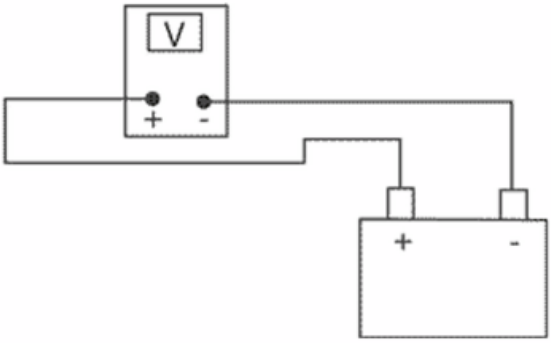
Voltage regulator check

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

Voltage should not exceed 15 Volt.

In case higher voltages are detected, replace the regulator.

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



Electric characteristic

Control voltage

14÷15 V to 1500÷12000 rpm

Recharge system voltage check

Look for any leakage

1) Access the battery by removing its cover under the saddle.

2) Check that the battery does not show signs of losing fluid before checking the output voltage.

3) Turn the ignition key to «OFF», connect the multimeter leads between the battery negative pole (-) and the Black cable. Only then disconnect the Black cable from the battery negative pole (-).

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

Check the charging current

WARNING

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

1) Place the vehicle on its centre stand

2) With the battery correctly connected to the circuit, place the tester terminals between the battery terminals..

3) Turn on the engine, increase the engine rpm and, at the same time, measure the voltage.

Electric characteristic

Voltage ranging between 14.0 and 15.0V at 5000 rpm.

Maximum current output check.

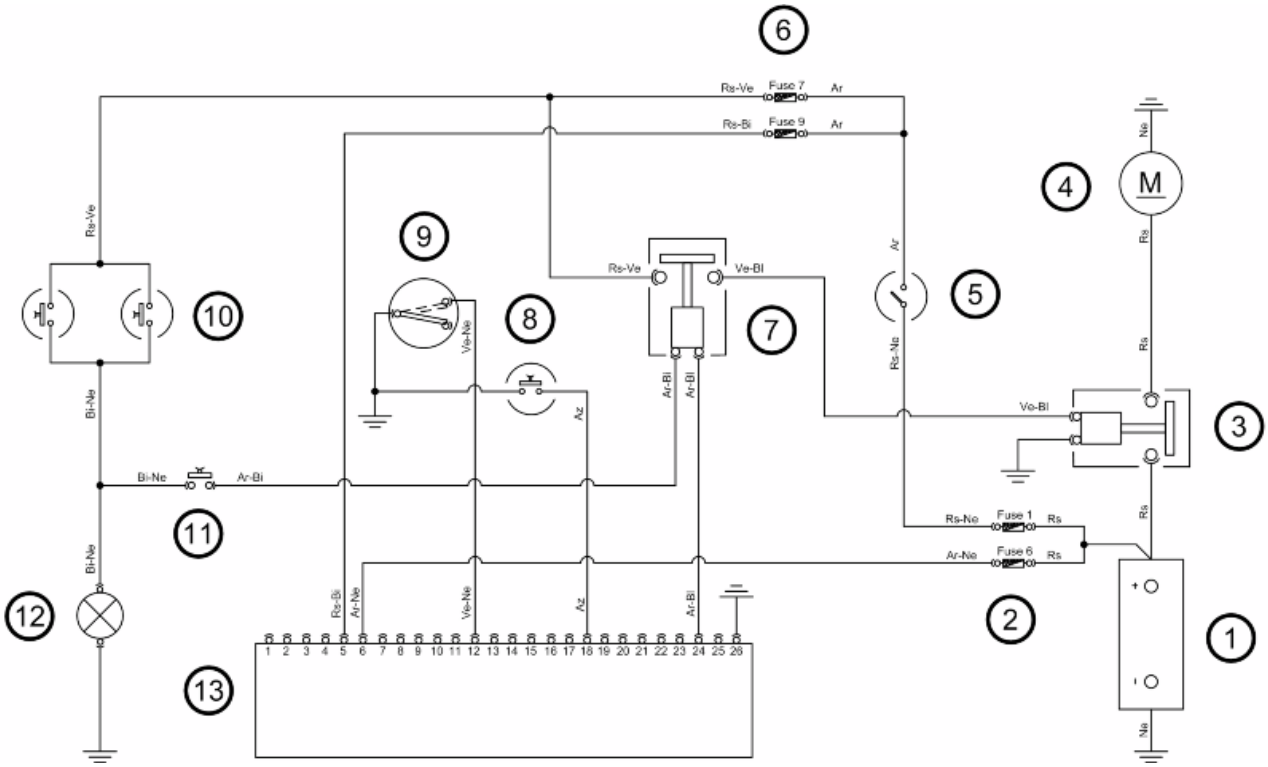
- With the engine off and the panel at «ON» with the lights on, allow the battery voltage to stop at 12V.
- Connect ammeter pliers to the 2 recharge positive poles in output from the regulator.
- Start the engine and rev it up to a high engine speed while reading the value on the pincer.

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

VOLTAGE REGULATOR/RECTIFIER

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

Starter motor



KEY

1. Battery

2. Main fuses

3. Start-up remote control

4. Starter motor

5. Key remote control contacts

6. Auxiliary fuses

7. Start-up remote control switch relay

8. Stand switch

9. Engine stop switch

10. Stop button

11. Starter button

12. Stop light bulb

13. Injection ECU

WARNING

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

1) Check fuses No. 1 and 7, the key switch contacts, the stop switches and the starter button.

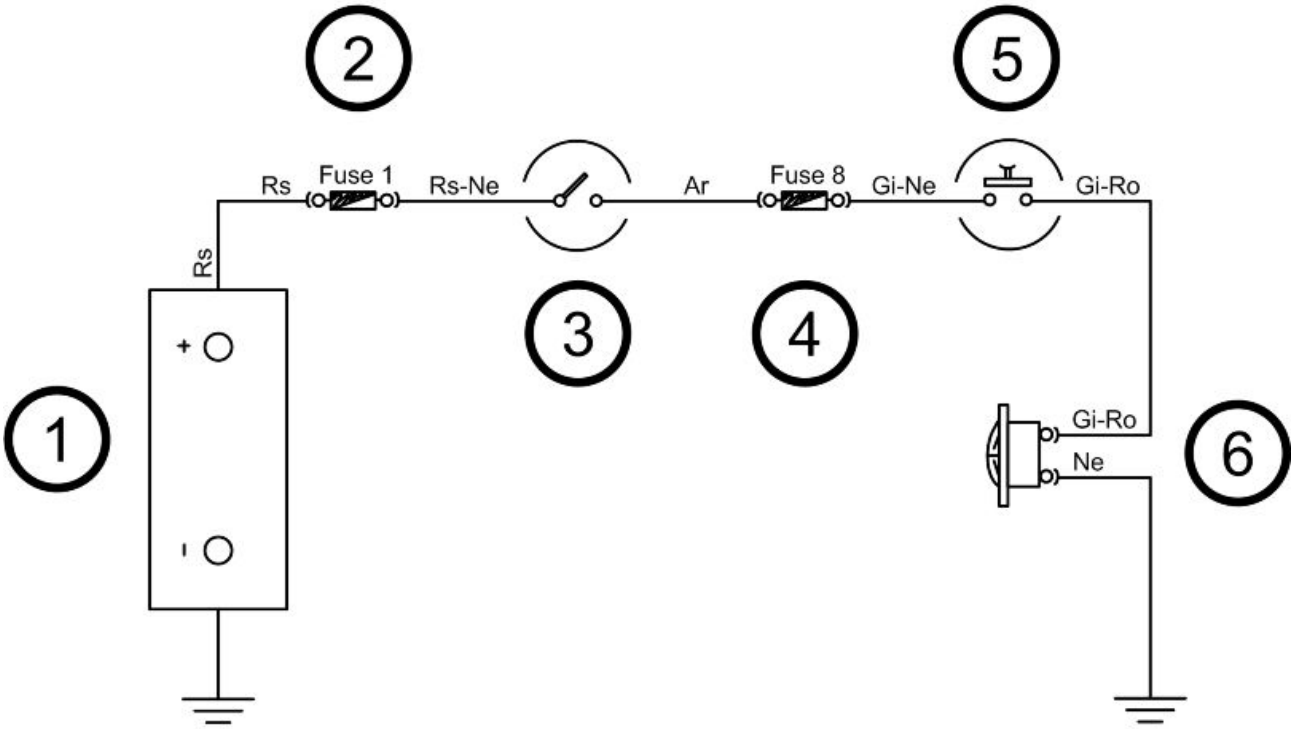
2) Check the start-up remote control switch relay and the start-up remote control switch.

3) Check the following wiring for continuity:

- Red-Black cable between fuse-box (fuse No. 1) and key switch.
- Orange cable between key switch and fuse-box (fuse No. 7).
- Red-Green cable between fuse-box (fuse No. 7), stop buttons and start-up remote control relay.
- White-Black cable between stop buttons and starter button and the Orange-White cable between the starter button and the start-up remote control relay.
- Orange-Blue cable between the start-up remote control relay and the electronic control unit.
- Green-Blue cable between the start-up remote control relay and the start-up remote control switch.
- Red cable between battery and the start-up remote control switch and between the latter and the starter motor.

4) Check the ground connections for the start-up remote control switch and the starter motor (Black cables).

Horn control



KEY

1. Battery

2. Fuse No. 1

3. Key switch contacts

4. Fuse No. 8

5. Horn button

6. Horn

WARNING

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

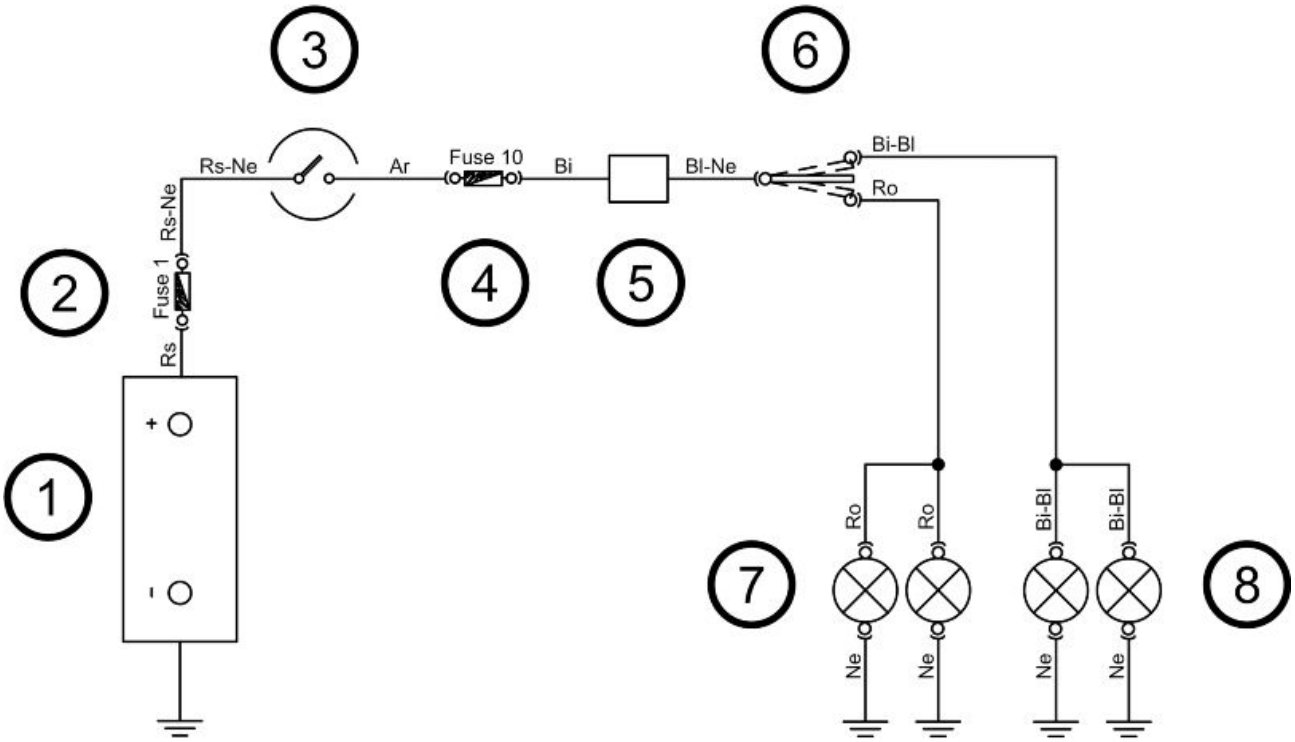
1) Check fuses No. 1 and 8, key switch contacts and the horn button.

2) If the components are not damaged, check wiring for continuity.

3) Check that the Yellow-Pink cable between the horn and horn button is not interrupted.

4) Check that the Black cable of the horn is earthed.

Turn signals system check



KEY

1. Battery

2. Fuse No. 1

3. Key switch contacts

4. Fuse No. 10

5. Turn indicator control device

6. Turn indicator switch

7. Left turn indicators

8. Right turn indicators

WARNING

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

1) Check the working order of bulbs.

2) Check fuses No. 1 and 10 and the key switch contacts.

3) Check if there is intermittent voltage between the Blue-Black cable of the turn indicator control device and the ground connection.

4) If there is no voltage, check that the cable harness is not interrupted.

5) Check the turn indicator switch.

6) Check that the Blue-Black cable between the turn indicator control device and the turn indicator switch is not interrupted.

7) Check that the Pink and White-Blue cables connecting the bulbs and the turn indicator switches are not interrupted.

8) Check the bulbs ground connection.

level indicators

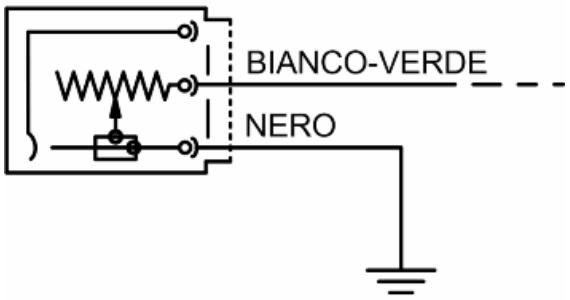
WARNING

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

If faults are detected:

1) With a multimeter, check resistance values between the White-Green cable and the Black cable of the fuel level transmitter by moving the arm with the float.

2) If the transmitter operates correctly but the indication on the instrument panel is not exact, check that the cable harnesses between them are not interrupted.



Electric characteristic

Resistance value when the tank is full

<= 7 Ω

Resistance value when the tank is empty

90 +13/-3 Ω

Lights list

LIST OF BULBS

	Specification	Desc./Quantity
1	High-/low-beam bulb	**Type**: Halogen (H4) **Quantity**: 1 **Power**: 12V - 55/60W
2	Front tail light bulb	**Type**: All glass **Quantity**: 1 **Power**: 12V - 5W
3	Turn indicator bulbs	**Type**: Spherical **Quantity**: 4 **Power**: 12V - 10W
4	Rear tail light bulb	**Type**: All glass **Quantity**: 2 **Power**: 12V - 3W
5	Stop light bulb	**Type**: Spherical **Quantity**: 1 **Power**: 12V - 10W
6	Instrument panel light bulbs	**Type:** All glass **Quantity:**5 **Power:** 12V - 1.2W
7	Helmet compartment light bulb	**Type**: Cylindrical **Quantity**: 1 **Power**: 12V - 5W

	Specification	Desc./Quantity
8	License plate light bulb	**Type**: All glass **Quantity**: 1 **Power**: 12V - 5W

Tail lights and instrument panel lighting line

In the event of a malfunction, check:

- Efficiency of the bulbs
- Fuses No. 1 and 8
- Key switch contacts
- Cable harness continuity

High-beam/low-beam light line

In the event of a malfunction, check:

- Efficiency of the bulbs
- Light switch
- Headlight remote control
- Fuses No. 1, 2 and 7
- Key switch contacts
- Cable harness continuity

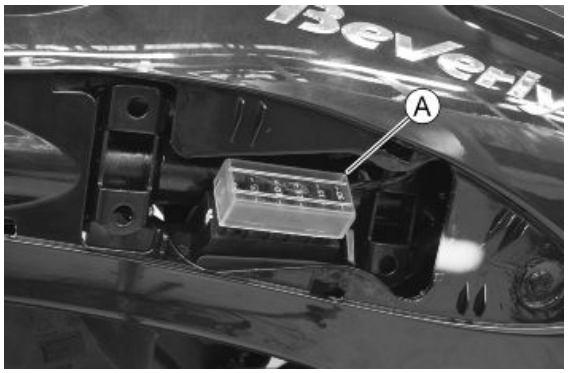
Fuses

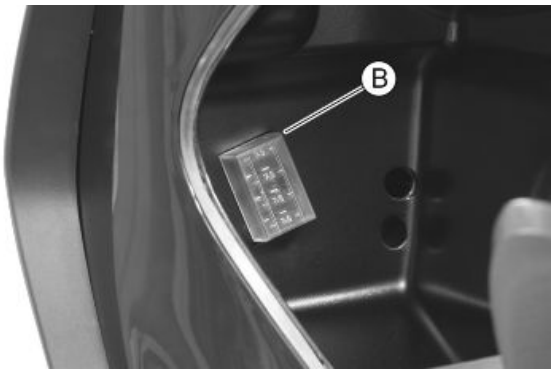
The electrical system is equipped with:

1. Six protective fuses «**A**» located inside the side panel on the right-hand side;

2. Four protective fuses «**B**» located inside the compartment on the upper left-hand side.

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





CAUTION

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

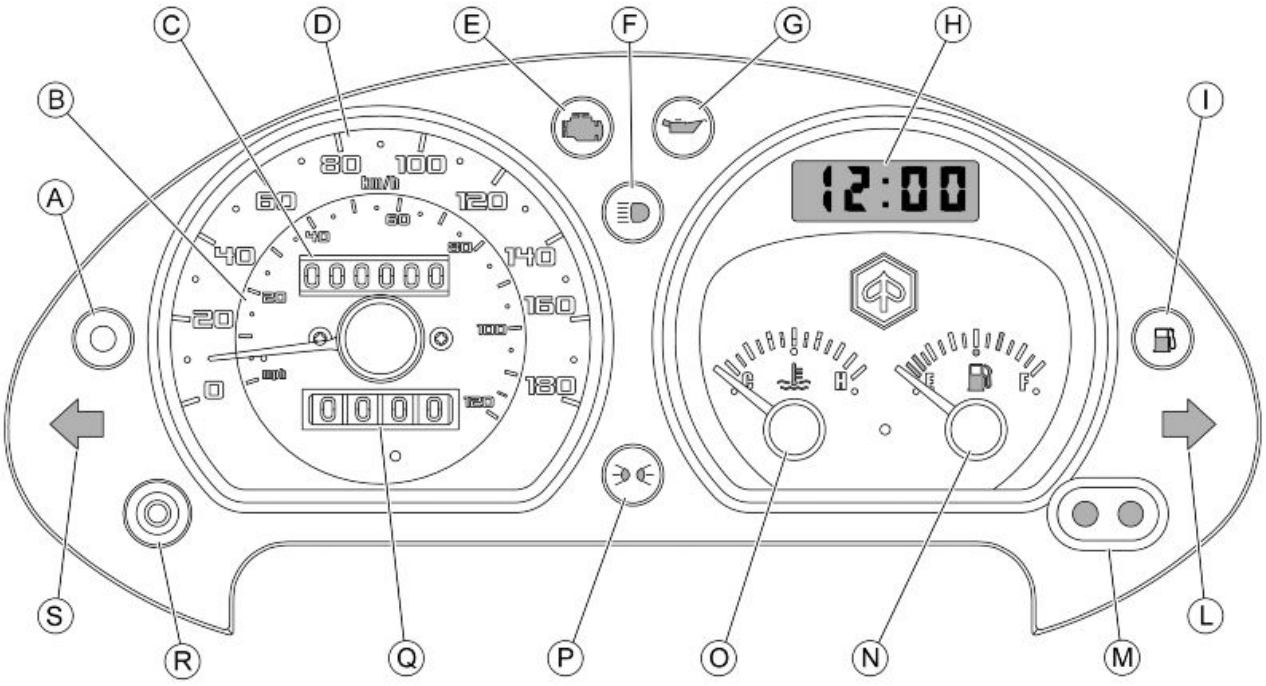
CAUTION

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

FUSES

	Specification	Desc./Quantity
1	Fuse No. 1	**Capacity**: 30 A **Protected circuits:** Battery recharge circuit. **Live**: Fuses No.7-8-9-10.
2	Fuse No. 2	**Capacity**: 15A **Protected circuits:** Light switch (via remote control)
3	Fuse No. 3	**Capacity**: 15A **Protected circuits:** Plug socket, helmet compartment light switch, electrical fan (with remote control), pre-installation for antitheft device. **Live**: Saddle opening actuator.
4	Fuse No. 4	**Capacity**: 10 A **Protected circuits:** Injection load (via remote control).
5	Fuse No. 5	**Capacity**: 7.5 A **Protected circuits:** Clock, Immobilizer LED.
6	Fuse No. 6	**Capacity**: 7.5 A **Protected circuits:** Battery-powered electronic control unit.
7	Fuse No. 7	**Capacity**: 7.5 A **Protected circuits:** Headlight remote control, start-up circuit.
8	Fuse No. 8	**Capacity**: 7.5 A **Protected circuits:** Horn, tail lights, license plate light, instrument panel lighting.
9	Fuse No. 9	**Capacity**: 7.5 A **Protected circuits:** Electrical fan remote control, injection load remote control, Immobilizer aerial, live power supply to electronic control unit.
10	Fuse No. 10	**Capacity**: 7.5 A **Protected circuits:** Pre-installation for antitheft device, turn indicators, instrument panel.

Dashboard



A = Immobilizer LED

B = Speedometer (mph)

C = Total Odometer

D = Speedometer (km/h)

E = Injection telltale light

F = High-beam warning light

G = Oil pressure warning light

H = Digital clock

I = Low fuel warning light

L = Right turn indicator warning light

M = Clock controls

N = Fuel gauge

O = Water temperature gauge

P = Headlight warning light

Q = Trip odometer

R = Odometer reset button

S = Left turn indicator warning light

Sealed battery

Commissioning sealed batteries

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 scooter and afterwards every six months.

INSTRUCTIONS FOR THE RENEWAL RECHARGE AFTER OPEN-CIRCUIT STORAGE

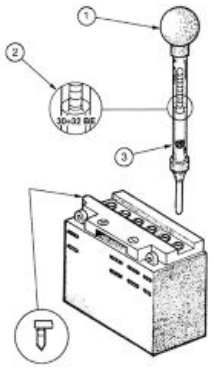
1. **Voltage check**
2.
   - Before installing the battery on the vehicle, check the open circuit voltage with a regular tester.
   - If voltage exceeds 12.60 V, the battery may be installed without any renewal recharge.
   - If voltage is below 12.60 V, a renewal recharge is required as explained at 2).
3. **Constant-voltage battery instructions**
4.
   - Constant voltage charge equal to 14.40-14.70V
   - Initial charge current equal to 0.3-0.5 x rated capacity
   - Charge time:
   - 10 to 12 h recommended Minimum 6 h Maximum 24 h
5. **Constant-current battery charger mode**
6.
   - Charge current equal to 1/10 of the battery rated capacity

Dry-charge battery

WARNING

THE BATTERY ELECTROLYTE IS POISONOUS AS IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH THE EYES, THE SKIN AND CLOTHING. IF COMING INTO CONTACT WITH EYES OR SKIN, WASH ABUNDANTLY WITH WATER FOR APPROX. 15 MIN. AND SEEK IMMEDIATE MEDICAL ATTENTION.
IN THE EVENT OF ACCIDENTAL INGESTION OF THE LIQUID, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR MILK, MAGNESIUM MILK, BATTERED EGG OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.
THE BATTERIES PRODUCE EXPLOSIVE GAS; KEEP CLEAR OF NAKED FLAMES, SPARKS OR CIGARETTES; VENTILATE THE AREA WHEN RECHARGING INDOORS.
ALWAYS WEAR EYE PROTECTION WHEN WORKING IN THE PROXIMITY OF BATTERIES.
KEEP OUT OF REACH OF CHILDREN

- Remove the short closed tube and the caps, then pour sulphuric acid into the cells using the type specified for batteries with a specific gravity of 1.26, corresponding to 30 Bé at a minimum temperature of 15°C until the upper level is reached.
- Allow to stand for at least 2 hours, then top up the level with sulphuric acid.
- Within 24 hours, recharge using the special battery charger (single) or (multiple) at an intensity of about 1/10 of the battery nominal capacity and until the acid gravity is about 1.27, corresponding to 31 Bé and such values become steady.
- After charging, top up the acid (adding **distilled water**). Close and clean carefully.
- After carrying out the operations above, install the battery on the scooter, observing the connections described in point 3) of paragraph "**Battery recharge**".



1 Keep the pipe in vertical position

2 Inspect visually

3 The float must be freed

Checking the electrolyte level

The electrolyte level must be checked frequently and must reach the upper level. Only use distilled water, to restore this level. If it is necessary to add water too frequently, check the vehicle's electrical system: the battery works overcharged and is subject to quick wear.

Charging status check

After topping-up the electrolyte level, check its density using special density gauge.

When the battery is charged, you should detect a density of 30 to 32 Bé corresponding to a specific weight of 1.26 to 1.28 at a temperature of no lower than 15° C.
A density reading of less than 20° Bé indicates that the battery is completely flat and it must therefore be recharged.
If the scooter is not used for a given time (1 month or more) it will be necessary to periodically recharge the battery.
The battery runs down completely in the course of three months. When refitting the battery onto the scooter pay attention not to invert the cables, bearing in mind that the earth (**black**) wire marked with a (-) must be connected to the **negative** terminal whilst the other two **red** wires, marked with a (+) must be attached to the **positive**, + terminal.

Battery recharge

WARNING

BEFORE RECHARGING THE BATTERY, REMOVE THE PLUGS OF EACH CELL. KEEP SPARKS AND NAKED FLAMES AWAY FROM THE BATTERY WHILE RECHARGING.

Remove the battery from the vehicle removing the negative clamp first.
Normal bench charging must be performed using the special battery charger (single) or (multiple), setting the battery charge selector to the type of battery that requires recharging (i.e., at a current equal to 1/10 of the battery rated capacity). Connections to the power supply source must be implemented by connecting corresponding poles (+ to + and - to -).

The battery should always be kept clean, especially on its top side, and the terminals should be coated with Vaseline.

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.

CAUTION

ORDINARY AND DRINKING WATER CONTAINS MINERAL SALTS THAT ARE HARMFUL FOR THE BATTERY. FOR THIS REASON, YOU MUST ONLY USE DISTILLED WATER.

CAUTION

CHARGE THE BATTERY BEFORE USE TO ENSURE OPTIMUM PERFORMANCE. FAILURE TO CHARGE THE BATTERY ADEQUATELY BEFORE BEING PUT INTO OPERATION WILL LEAD TO A PREMATURE FAILURE OF THE BATTERY.

Remote controls check

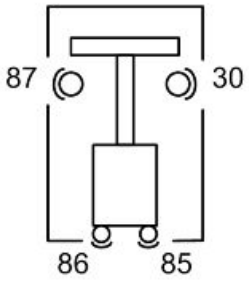
To check the operation of a remote control:

1) Check that, given regular conditions, there is no continuity between terminals 87 and 30.

2) Apply a 12V voltage to power terminals 86 and 85 of the remote control.

3) With the remote control fed, check that there is continuity between terminals 87 and 30.

4) If these conditions are not met, the remote control is surely damaged and, therefore, it should be replaced.



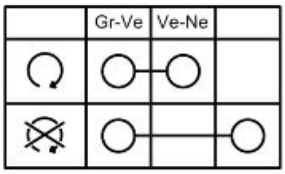
Switches check

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

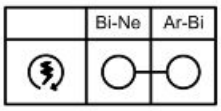
KEY

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

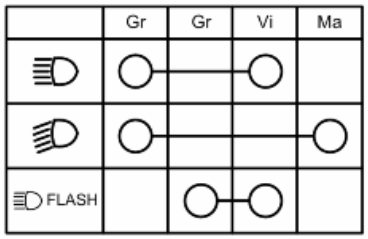
ENGINE STOP SWITCH



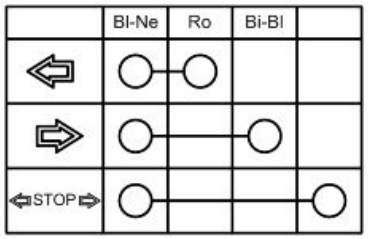
STARTER BUTTON



LIGHT SWITCH

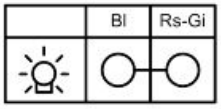


TURN INDICATOR SWITCH



HORN BUTTON

HELMET COMPARTMENT LIGHT SWITCH

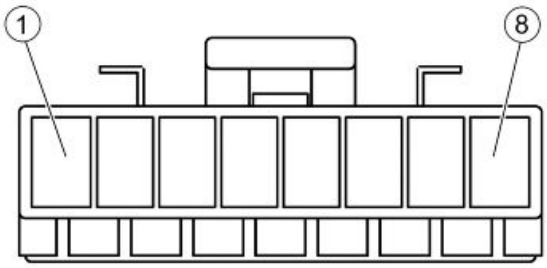


SADDLE OPENING SWITCH

Connectors

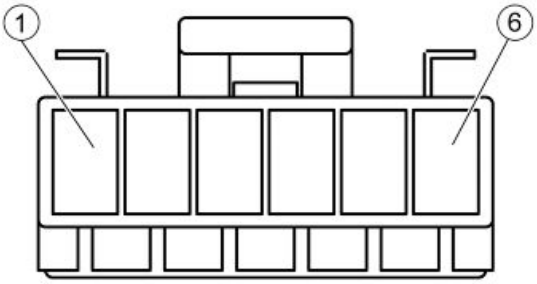
INSTRUMENT PANEL CONNECTOR «A»

1. Left turn indicator warning light (Pink)
2. Immobilizer (Red-Blue)
3. Battery powered (Red-Black)
4. Coolant temperature sensor (Orange)
5. Not connected
6. Fuel level transmitter (White-Green)
7. Right turn indicator warning light (White-Blue)
8. Low fuel warning light (Grey-Black)



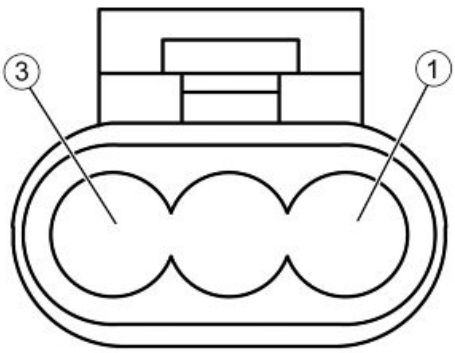
INSTRUMENT PANEL CONNECTOR «B»

1. High-beam warning light (Purple)
2. Ground (Black)
3. Injection telltale light (Brown-Black)
4. Oil pressure sensor (Pink-Black)
5. Power permanent supply (White)
6. Instrument panel lighting (Yellow-Black)



IMMOBILIZER AERIAL CONNECTOR

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



FUEL PUMP CONNECTOR

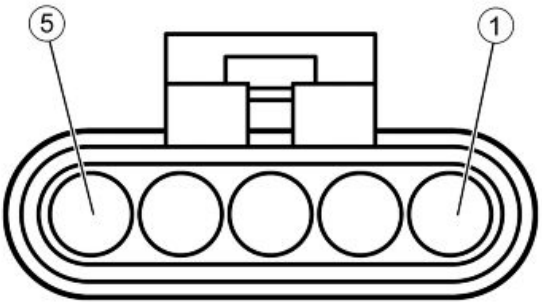
1. Not connected

2. Ground (Black)

3. Not connected

4. Not connected

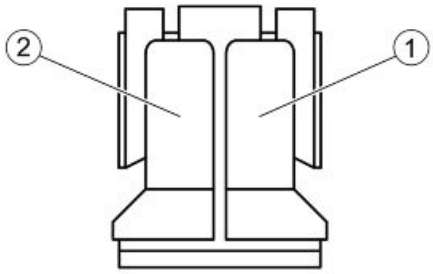
5. power via remote control (Black-Green)



ELECTRIC FAN CONNECTOR

1. Ground (Black)

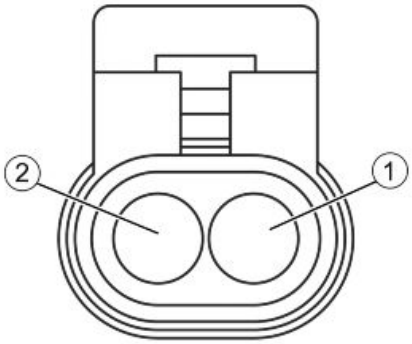
2. Power via remote control (Red)



PICK-UP CONNECTOR

1. Engine revolution sensor ECU positive (Red)

2. Engine revolution sensor ECU negative (Brown)



ANTITHEFT DEVICE PRE-INSTALLATION CONNECTOR

1. LHS Turn indicator bulbs (Pink)

2. RHS Turn indicator bulbs (White-Blue)

3. Ground (Black)

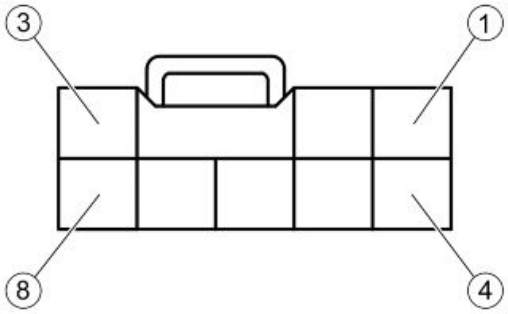
4. Battery-powered (Blue)

5. Power permanent supply (White)

6. Helmet compartment light bulb (Red-Yellow)

7. Not connected

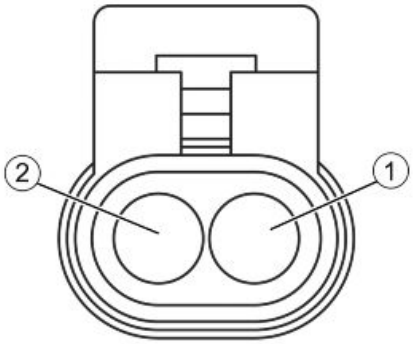
8. Not connected



LAMBDA PROBE CONNECTOR

1. Lambda probe ECU positive (Blue)

2. Lambda probe ECU negative (Green)



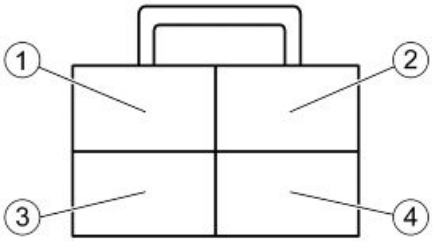
VOLTAGE REGULATOR CONNECTOR

1. Battery positive (Red-Black)

2. Ground (Black)

3. Battery positive (Red-Black)

4. Ground (Black)



INJECTION ELECTRONIC CONTROL UNIT

1. Injection telltale light (Brown-Black)

2. Not connected

3. Not connected

4. Lambda probe negative (White)

5. Live supply (Red-White)

6. Battery powered (Orange-Black)

7. Immobilizer aerial (Orange-White)

8. Electric fan remote control (Blue-Yellow)

9. Coolant temperature sensor (Sky blue-Green)

10. Not connected

11. Lambda probe positive (Blue)

12. Engine stop switch (Green-Black)

13. Engine revolution sensor positive (Red)

14. Injector negative (Yellow-Red)

15. Engine revolution sensor negative (Brown)

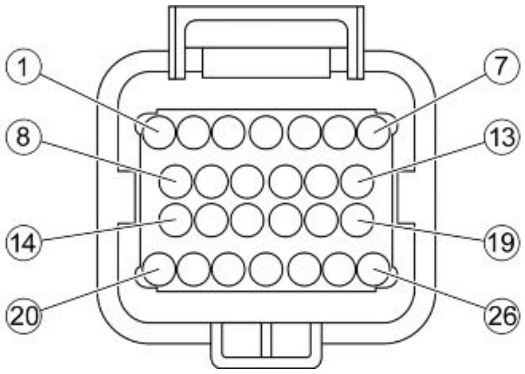
16. Diagnostics socket (Purple-White)

17. Immobilizer LED (Red-Blue)

18. Side stand (Sky blue)

19. Not connected

20. Injection load remote control (Black-Purple)



21. Not connected

22. HV coil negative (Pink-Black)

23. Not connected

24. Start-up remote control switch (Orange-Blue)

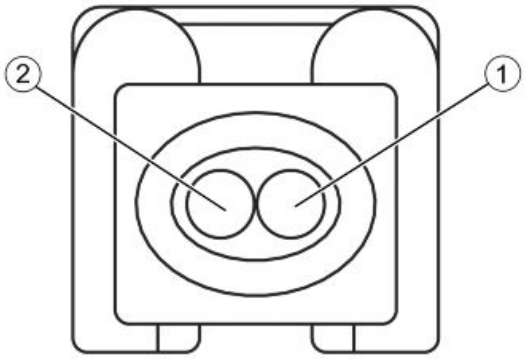
25. Not connected

26. Ground (Black)

INJECTOR CONNECTOR

1. Power via remote control (Black-Green)

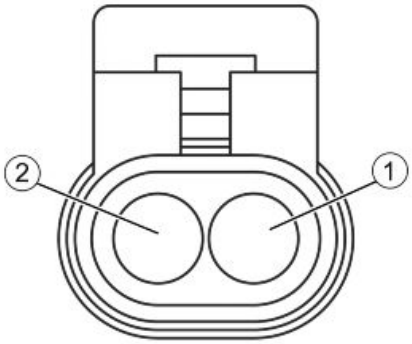
2. Control unit negative (Yellow-Red)



HV COIL CONNECTOR

1. Power via remote control (Black-Green)

2. Control unit negative (Pink-Black)

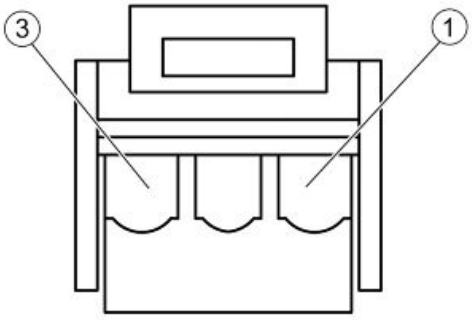


FUEL LEVEL TRANSMITTER CONNECTOR

1. Fuel level indicator (White-Green)

2. Ground (Black)

3. Low fuel warning light (Grey-Black)



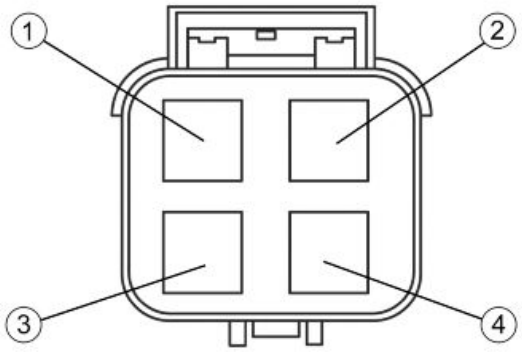
COOLANT TEMPERATURE SENSOR CONNECTOR

1. Ground (Grey-Green)

2. Instrument panel (Orange)

3. Injection ECU (Sky blue-Green)

4. Ground (Black)

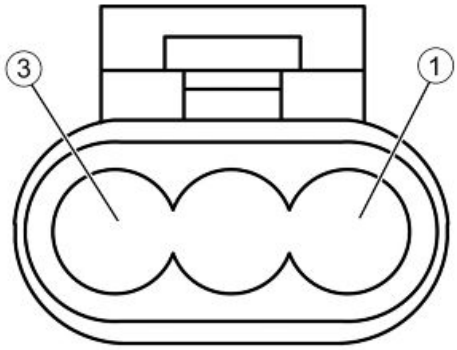


DIAGNOSIS CONNECTOR

1. Not connected

2. Ground (Black)

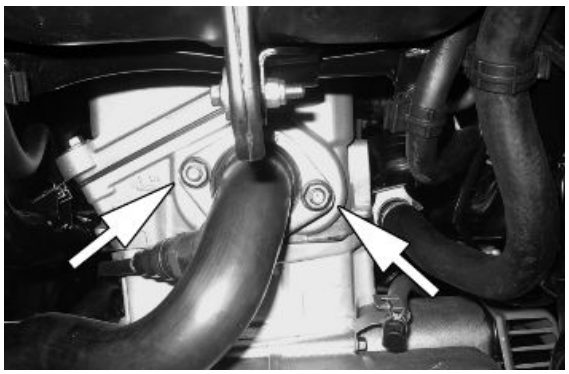
3. Injection ECU (Purple-White)



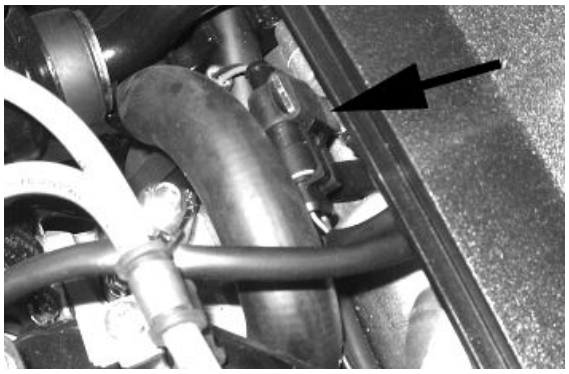
INDEX OF TOPICS

Exhaust assy. Removal

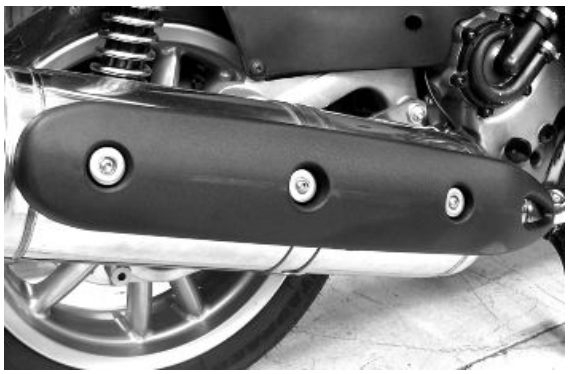
- Remove the right-hand side fairing
- Undo the two exhaust manifold fixings on the head.

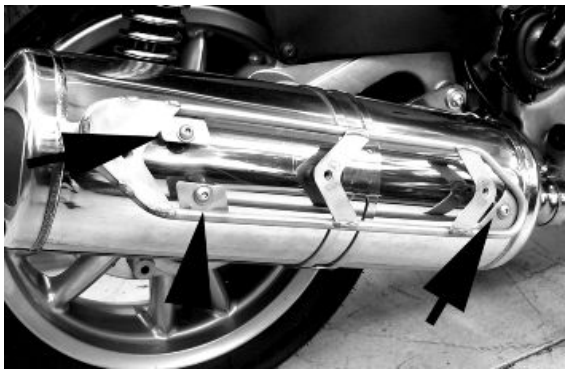


- Remove the Lambda probe from its support and disconnect it.

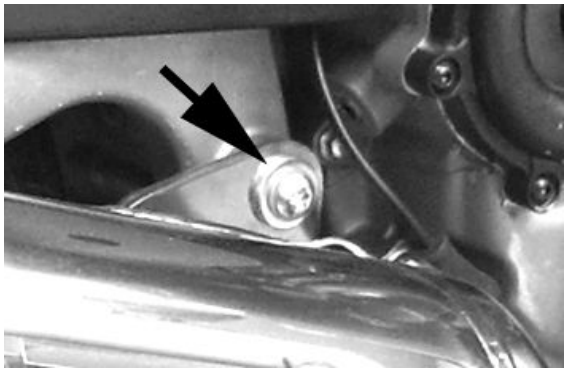


- Remove the protection on the exhaust end.

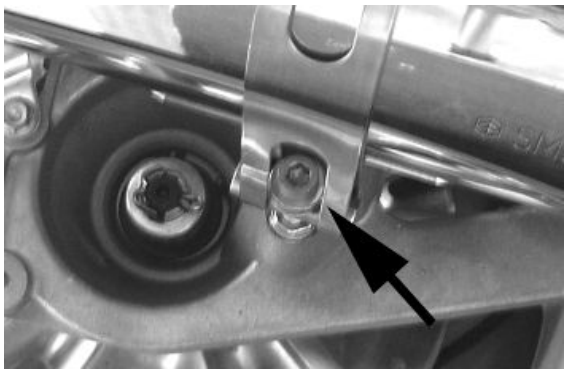




Remove the screw indicated in the photograph.

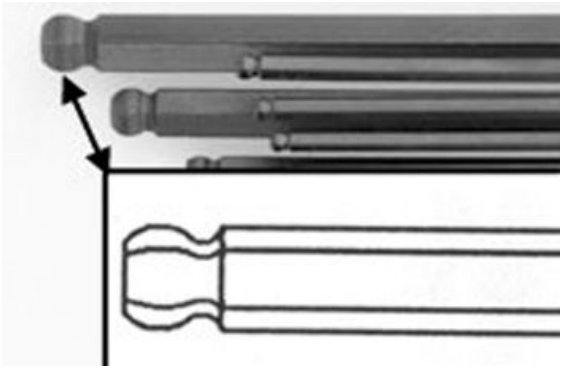


- Loosen the screw shown in the figure so as to loosen the muffler strap and remove the whole muffler.



N.B.

DUE TO MUFFLER DIMENSIONS IT IS NOT POSSIBLE TO ACTUATE ON THE SCREW PERPENDICULARLY TO REMOVE IT; USE A COMMERCIALLY AVAILABLE «BONDUS» MALE HEXAGONAL WRENCH.



Remove the lambda probe from the manifold.

Removal of the engine from the vehicle

WARNING

CARRY OUT THESE OPERATIONS WHEN THE ENGINE IS COLD.

CAUTION

SUITABLY SUPPORT THE VEHICLE AND THE ENGINE TO AVOID ACCIDENTAL FALL.

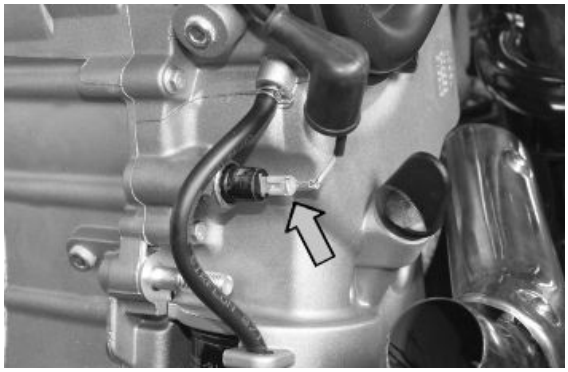
Remove:

- Side fairings.
- Helmet compartment.
- Rear wheel
- Brake calliper, and release the hoses from the engine clamps.

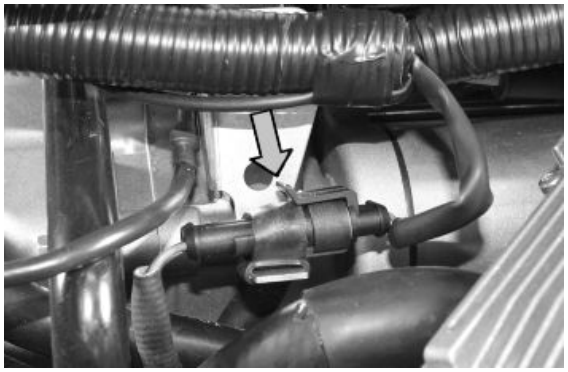
Remove the coolant delivery pipe and empty the system.

- Remove the coolant return pipes.

Remove the oil pressure sensor feeding cable.

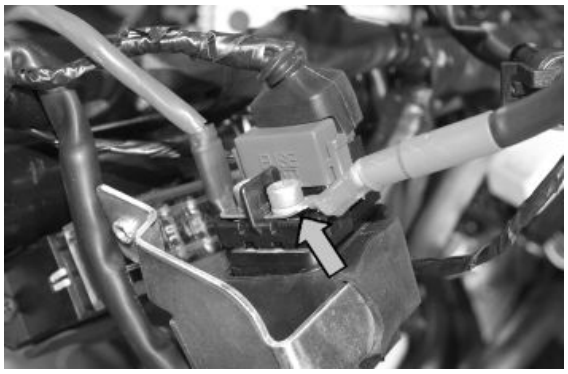


Detach the lambda probe connector.



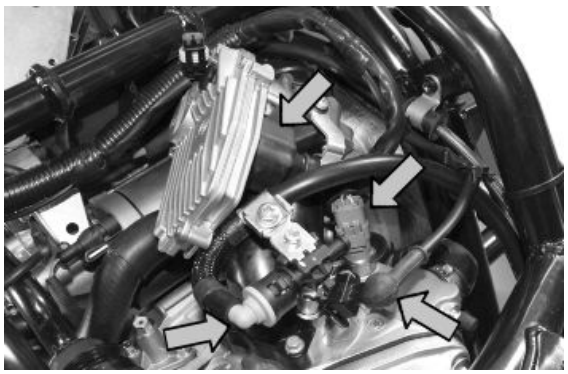
Detach the voltage regulator and the rpm timing sensor connectors.

Detach the starter motor power supply cable from the ignition remote control switch.



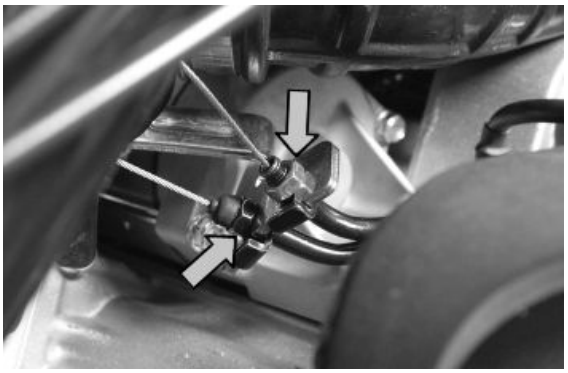
Remove:

- Fuel supply pipe.
- Injector fuel supply.
- Water temperature sensor.
- MIU connector.



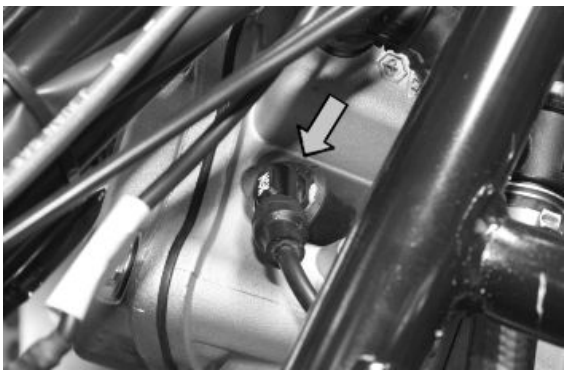
Remove the ground lead.

Disconnect the throttle grip transmissions by loosening the two nuts.

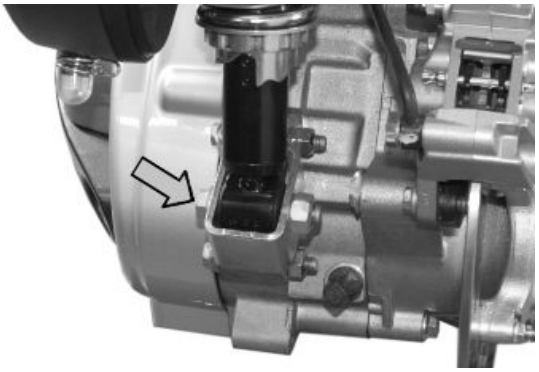


Remove the engine ground lead.

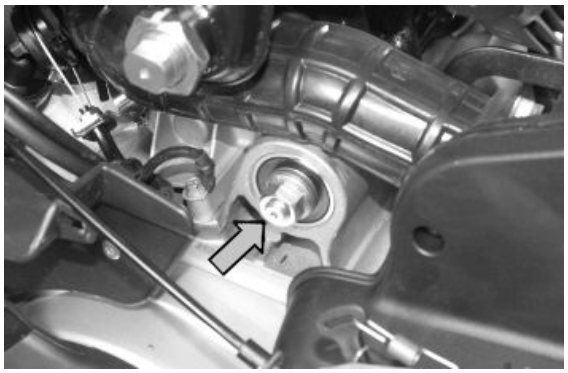
Remove the tube from the spark plug.



Remove the left shock absorber to engine retainer.



Remove the pin fixing the engine to the swinging arm.



Scooter engine assembly

- Perform the operations for removal in the reverse order according to the tightening torque indicated in Chapter "Characteristics".

Check that there is a small clearance when the valve is in abutment against the set screw.

- Check the engine oil level and top up using the recommended brand, if required.
- Top up the coolant circuit.
- Check that throttle and electric devices are in good working order.

CAUTION

PAY PARTICULAR ATTENTION TO POSITIONING THE THROTTLE CONTROL 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

- Loosen the 4 fastening screws
- Extract the outside plastic transmission cover.

- Using a screwdriver, remove the driven pulley axle cover near the bottom of the cap.

- Loosen the driven pulley shaft fastening nut using a misaligned wrench and prevent the pulley shaft rotation using a machine hexagon bush.
- Remove the nut and the two washers.

N.B.

DUE TO THE HIGH TIGHTENING TORQUE, USING DIFFERENT WRENCHES - SUCH AS A CONVENTIONAL POLYGONAL BUSH - MAY DAMAGE THE HEXAGON OBTAINED ON THE SHAFT OR BREAK THE BUSH ITSELF.

- Remove the six M6 screws.

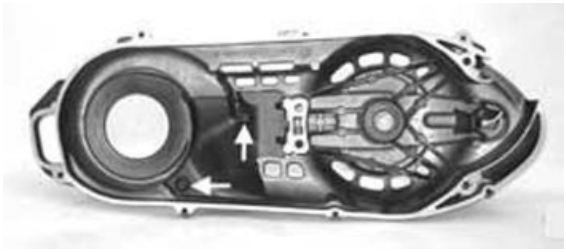
- Remove the four M8 screws.
- Remove the transmission cover.
- Check that the bearing rotates freely, otherwise replace it.

Air duct

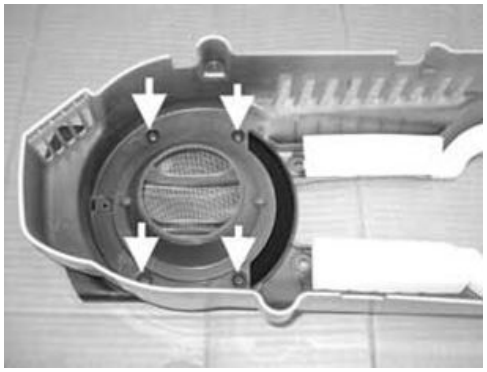
- Remove the transmission cover.
- Unscrew the two screws shown in the figure to remove the air conveyor.

Locking torques (N*m)

Air conveyor screws **11 ÷ 12**



- Remove the external transmission cover.
- Unscrew the 4 fastening screws shown in the figure to remove the external air conveyor.



Air duct filter

- Remove the external air conveyor.
- Unscrew the 2 fastening screws shown in the figure to remove the conveyor filter.

Removing the driven pulley shaft bearing

- Remove the transmission cover.
- Remove the Seeger ring.

- Place transmission cover on a wood surface and use the special tool so that it is adequately supported.
- Pull out the bearing using the special tool.

N.B.

BELL MUST BE PLACED INTO THE TRANSMISSION COVER, CLOSE TO THE BEARING SEAT AND THE WOODEN SURFACE, SINCE WITHOUT BELL THE ENTIRE COVER STRUCTURE WOULD BEND. NOT ONLY IN THE AREA OF MAXIMUM STURDINESS.

Specific tooling

001467Y002 Driver for OD 73 mm bearing

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm

020439Y 17 mm guide

Refitting the driven pulley shaft bearing

- Heat the transmission cover interior using the heat gun.

N.B.

BE CAREFUL NOT TO OVERHEAT THE COVER AS THIS WOULD DAMAGE THE OUTSIDE PAINTED SURFACE.

Specific tooling

020151Y Air heater

- Place the bearing onto the special tool with a little grease to prevent it from coming out.
- Install the new bearing using the special tool.

N.B.

PROPERLY SUPPORT THE OUTSIDE COVER TO PREVENT DAMAGING THE PAINTED SURFACE.

Specific tooling

020376Y Adaptor handle

020358Y 37x40-mm adaptor

020439Y 17 mm guide

Baffle roller

Plastic roller

- Check that the roller does not show signs of wear and that it turns freely.
- Loosen the retaining bolt using a 13 mm spanner.
- Remove the complete roller with bearing.

N.B.

IF THE ROLLER DOES NOT ROTATE FREELY, REPLACE THE COMPLETE ROLLER.

Installation of belt anti-vibration roller

- Install the anti-flapping roller with the lip facing the engine crankcase.
- Tighten the central screw to the prescribed torque.

N.B.

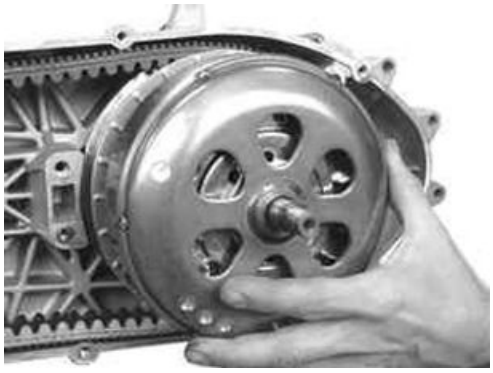
TURN THE DRIVEN AND/OR DRIVING PULLEY UNTIL A CORRECT TENSIONING OF THE BELT IS OBTAINED.

Locking torques (N*m)

Anti-vibration roller screw 16.7 ÷ 19.6

Removing the driven pulley

- Remove the clutch bell.



- Remove the fixed driving half-pulley.
- Remove the driven pulley assembly with the belt.

Inspecting the clutch drum

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

N.B.

CHECK THE ECCENTRICITY MEASURED, 0.2 MM MAX.

Characteristic

Max. value:

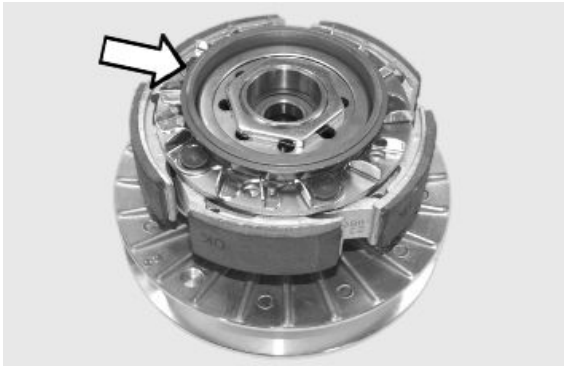
160.5 mm

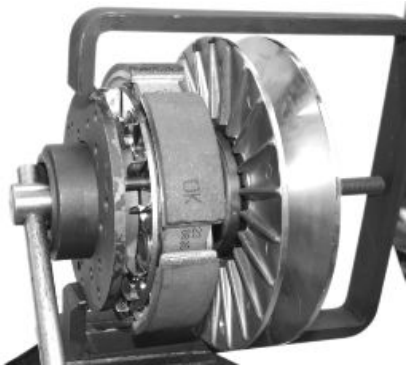
Standard value:

160.2 mm

Removing the clutch

- To remove the clutch with the driven pulley it is necessary to use the special tool;
- Arrange the tool with the mean pins screwed in position "**E**" on the inside;
- Fit the adapter ring to the clutch assembly as shown in the photograph.
- Install the driven pulley unit onto the tool inserting the pins into the ventilation holes;
- Move the rear stop screw in abutment against the fixed driven pulley as shown in the figure.





CAUTION

THE TOOL SHOULD BE FIRMLY SECURED IN A VICE USING THE SPECIAL TOOL. DO NOT TIGHTEN THE REAR SCREW TOO MUCH AS THIS COULD CAUSE AN IRREVERSIBLE TOOL DEFORMATION.
USING THE SPECIAL 55-MM WRENCH, REMOVE THE FASTENING RING NUT.
LOOSEN THE TOOL SCREW AND DISASSEMBLE THE DRIVEN PULLEY UNIT, CLUTCH, SPRING WITH SHEATH.

Specific tooling

020444Y Tool for fitting/ removing the driven pulley clutch

Inspecting the clutch

- Check the thickness of the clutch mass friction material.

Characteristic

Minimum thickness permitted:

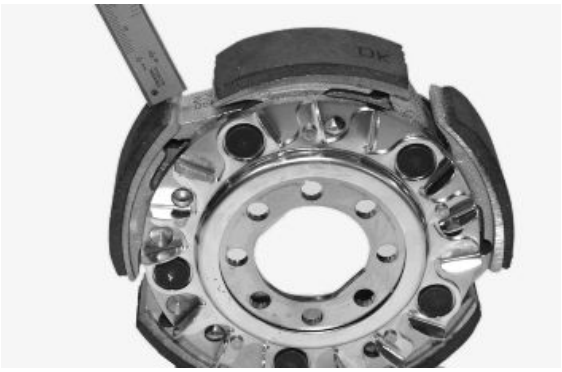
1 mm

- 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.

- Do not open the masses using tools to prevent a variation in the return spring load.



Pin retaining collar

- Extract the collar using 2 screwdrivers.

- Remove the 4 guide pins.
- Extract the moving driven half-pulley.

Removing the driven half-pulley bearing

- Check that the bushing is free from wear and damage; otherwise replace the fixed driven half-pulley.
- Remove the lock ring using pliers.

- Using the special tool inserted through the roller bearing, pull out the ball bearing.

N.B.

PROPERLY SUPPORT THE PULLEY TO PREVENT DAMAGING THE THREADING.

Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020363Y 20 mm guide

N.B.

IF YOU NEED TO OVERHAUL THE BEARINGS ON AN ASSEMBLED DRIVEN PULLEY UNIT, IT IS NECESSARY TO SUPPORT THE UNIT BY THE BELL

Specific tooling

001467Y002 Driver for OD 73 mm bearing

- Remove the roller bearing using the special tool, supporting the fixed half-pulley with the bell.

Specific tooling

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm

020364Y 25-mm guide

001467Y002 Driver for OD 73 mm bearing

Inspecting the driven fixed half-pulley

- Check that the belt contact surface is free from wear.
- Measure the outer diameter of the pulley bushing.

Characteristic

Minimum admissible diameter

49.91 mm

Standard diameter:

50.00 -0.015 -0.035 mm

Inspecting the driven sliding half-pulley

- Check that the belt contact surface is free from wear.
- Remove the 2 inside sealing rings and the 2 outside O-rings.
- Measure the movable half-pulley bushing inside diameter.

Characteristic

Maximum admissible diameter:

50.05 mm

Standard diameter:

50.00 +0.035 0.00 mm

Refitting the driven half-pulley bearing

- Install a new roller bearing using the special tool.

N.B.

PLACE THE BEARING WITH THE WRITINGS AND THE EMBEDDED OIL GUARD FACING OUTWARDS.

- Properly support the half-pulley to prevent damaging the threading.

If you are working on the driven pulley unit fully assembled, use the special tool.

Specific tooling

020478Y Punch for driven pulley roller casing

001467Y002 Driver for OD 73 mm bearing

- Install a new ball bearing using the special tool.

Specific tooling

020376Y Adaptor handle

020477Y Adaptor 37 mm

020363Y 20 mm guide

- Insert the Seeger lock ring.

Refitting the driven pulley

- Insert the new oil guards
- Insert the new O-rings

N.B.

O-RINGS ARE OF TWO SIZES. THE LARGE ONE IS INSTALLED ON THE MACHINING END RADIUS, AT THE BASE OF THE HALF-PULLEY.

- Install the half-pulley on the bushing being careful not to damage the top sealing ring during the introduction.
- Make sure the pins and collar are not worn, reassemble the pins and collar.

- Using a bent beak greaser, lubricate the driven pulley unit with about 10 gr. of grease, this operation should be carried out through one of the two holes into the bushing to obtain the exit of the grease from the opposite hole. This operation is necessary to avoid the presence of grease beyond the O-rings.

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:

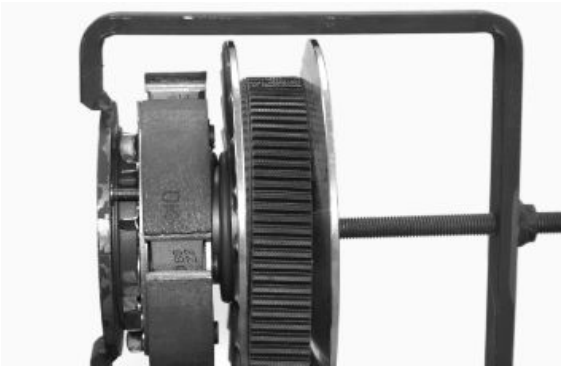
125.5 mm

Admissible limit after use:

120 mm

Refitting the clutch

- Prepare the special tool as for removal;
- Preassemble the driven pulley unit with the drive belt according to its direction of rotation;
- Insert the driven pulley unit, the spring with sheath and clutch into the tool.



Specific tooling

020444Y Tool for fitting/ removing the driven pulley clutch

- Compress the spring and insert the clutch on the driven pulley bushing.

N.B.

BE CAREFUL NOT TO DAMAGE THE SHEATH OR THE BUSHING THREADED END.

- Tighten the ring nut by hand and complete the tightening using the special wrench to the prescribed torque.

Specific tooling

020444Y Tool for fitting/ removing the driven pulley clutch

Locking torques (N*m)

Clutch ring nut **65 - 75**

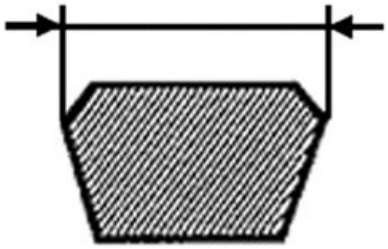
- To facilitate reassembly on the engine, turn the moving driven pulley and insert the belt onto the smaller diameter.

Refitting the driven pulley

- Install the driven pulley assembly with belt.

Drive-belt

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



Characteristic

Minimum width:

27 mm

Standard width:

28.2 mm

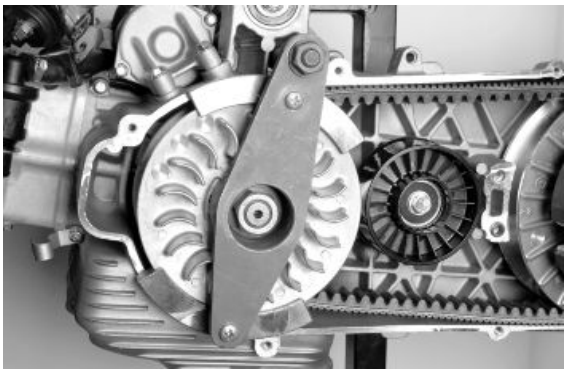
Removing the driving pulley

- Using a 27 mm wrench, turn the central pulley nut to horizontally align the central inside holes and install the special tool.

Specific tooling

020474Y Driving pulley lock wrench

- First fit the 2 retainer clamps of the special tool onto the pulley so that the splines are completely engaged.
- Then, insert the tool so as to insert the stud bolts on the ring into the holes obtained onto the tool itself.
- Tighten the two tool fixing screws, also manually.
- Loosen the central nut.
- Remove the spring washer and the flat washer.
- Remove the fixed driving half-pulley.
- Remove the bushing connection washer.



- Move the belt downwards.
- Suitable support the roller contrast and extract the mobile driving half-pulley with the relevant bushing and the rear washer, being careful not to make the rollers come out.

Inspecting the rollers case

- Check that the inside bushings shown in the figure exhibit no signs of abnormal wear and measure the inside diameter.

CAUTION

DO NOT LUBRICATE OR CLEAN THE BUSHINGS

Characteristic

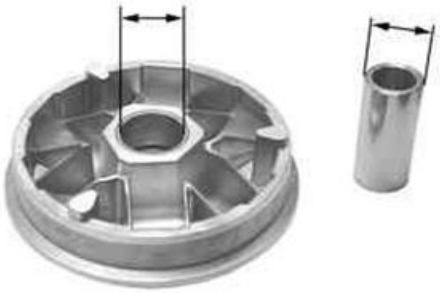
Maximum admissible diameter:

30.12 mm

Standard diameter:

30.021 mm

- Measure the pulley sliding bushing outside diameter shown in the figure.



Characteristic

Minimum admissible diameter

Ø 29.95 mm

Standard diameter:

Ø 29.959 mm

- Check that the rollers are not damaged or worn.

Characteristic

Minimum admissible diameter

Ø 24.5 mm

Standard diameter:

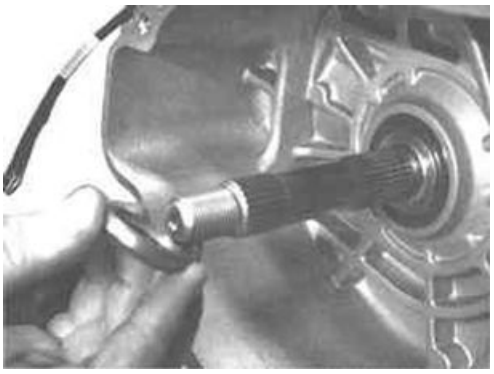
Ø 24.9 mm

- 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.

Refitting the driving pulley

Installing the roller container

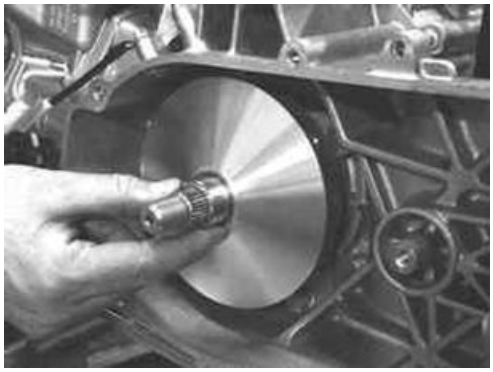
- Install the spacer with the internal chamfer facing towards the inside.



- Position the rollers on the half-pulley as shown in the figure.
- The closed side must rest on the inside thrust face of the roller container.

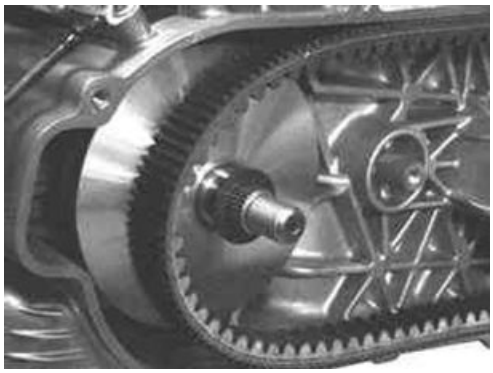
- Assembly the half-pulley with the roller contrast plate and sliding blocks.

- Insert the half-pulley on the crankshaft.
- Insert the spacer bushing.

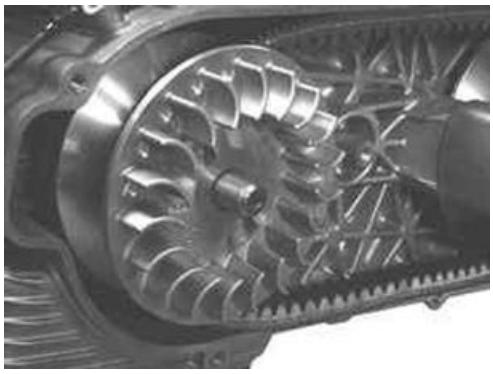


Installing the fixed driving half-pulley

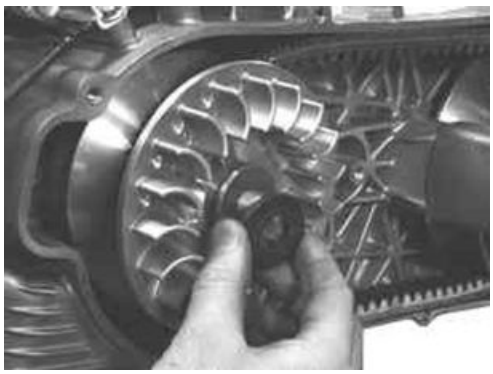
- Insert the spacer.



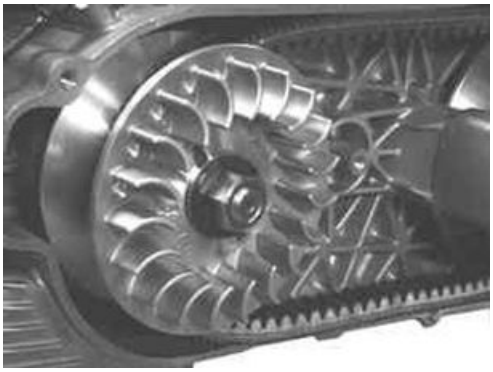
- Install the fixed driving half-pulley and check that it is in contact with the spacer and with the guide bushing of the moving driving pulley.



- Remove the flat washer and the spring washer as shown in the figure.



- Insert the nut in the original position (nut side in contact with the belleville washer).



- Turn the central pulley nut to horizontally align the holes and install the special tool.

N.B.

CHECK THAT THE STOP WRENCH TOOL IS EASILY INSERTED INTO THE PULLEY AND IN THE ENGINE CRANKCASE.

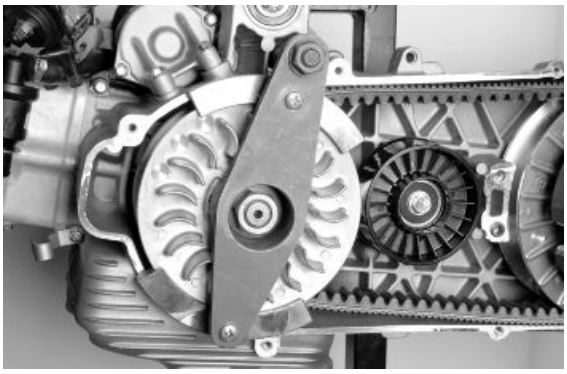
Specific tooling

020474Y Driving pulley lock wrench

- Install the lock ring from the rear so that the splines are completely engaged.
- Finally install the tool by siding the nuts by hand and ensuring the tool is resting flatly.
- Tighten the driving pulley fastening nut to the prescribed torque
- Remove the special tool.

Locking torques (N*m)

Driving pulley nut **160 - 175**



Refitting the transmission cover

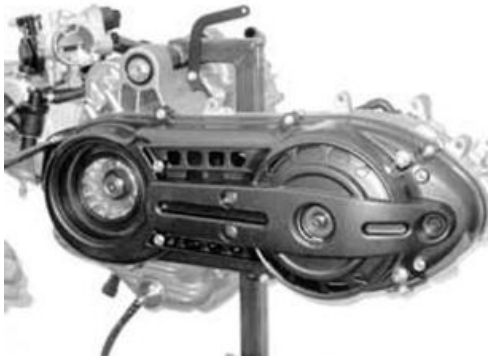
- Ensure the correct installation on the crankcase of the 2 centring dowels.

- Insert the transmission cover with the bearing and install the relevant retainers.
- Lock the four M8 retainers.

Locking torques (N*m)

M8 retainers for transmission cover 23 ÷ 26

- Lock the 7 M6 retainers.



Locking torques (N*m)

M6 retainer 11 ÷ 13

- Insert the washers on the driven pulley shaft.

N.B.

INSERT THE SMALLER WASHER FIRST, THEN THE LARGER ONE.

- Insert the flanged nut.
- Prepare the torque wrench for LHS locking using a machine hexagon wrench.
- Tighten the driven pulley shaft fastening nut using an offset wrench.

N.B.

DUE TO THE HIGH TIGHTENING TORQUE, USING DIFFERENT WRENCHES - SUCH AS A CONVENTIONAL POLYGONAL BUSH - MAY DAMAGE THE HEXAGON OBTAINED ON THE SHAFT OR BREAK THE BUSH ITSELF.

Locking torques (N*m)

Driven pulley nut 92 - 100

- Install the driving pulley shaft cover, positioning the tooth gap on the lower part with the reference mark on the transmission crankcase.

N.B.

ENSURE THAT THE AIR INTAKE AND EXHAUST OPENINGS ARE COMPLETELY FREE.

- Install the outside plastic transmission cover.
- Tighten the 4 fastening screws to the prescribed torque.

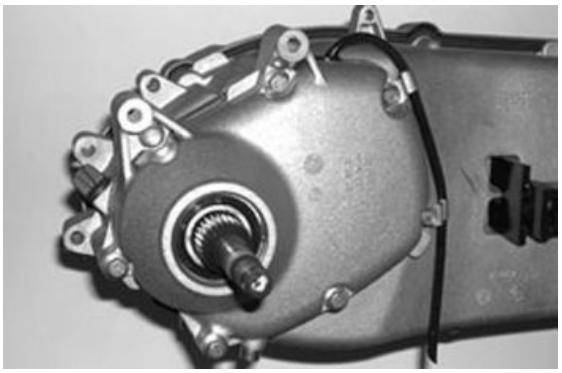
Locking torques (N*m)

External transmission cover screws **7 ÷ 9**

End gear

Removing the hub cover

- Drain the rear hub oil through the oil drainage cap located under the engine.
-Remove the 7 fastening screws. Remove the hub cover and the relevant gasket.



Removing the wheel axle

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

Removing the hub bearings

- Check all bearings (wear, clearance and noise).
In case of anomalies, proceed as follows.
To remove the gear shaft bearing on the engine crankcase, use the following parts.

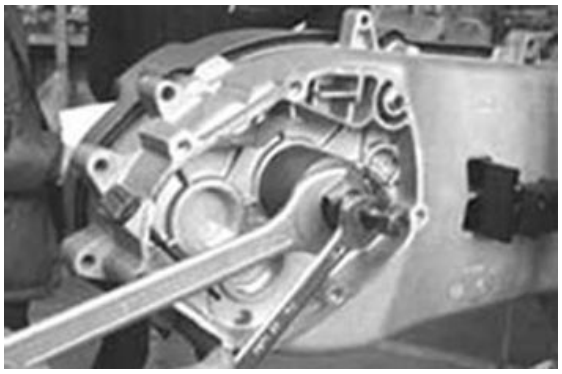
Specific tooling

001467Y014 Pliers to extract ø 15-mm bearings

001467Y034 Pliers to extract ø 15-mm bearings

001467Y031 Bell

- Use the special extractor to disassemble the bearing on the engine chassis of the countershaft.

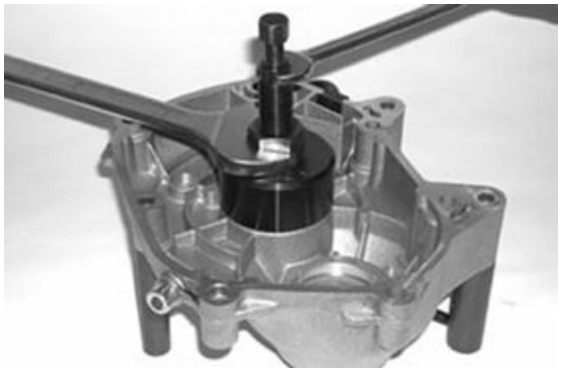


Specific tooling

001467Y006 Pliers to extract 20 mm bearings

001467Y035 Belle for OD 47-mm bearings

- Support the hub cover using the column kit.
- Pull out the bearing using the special tool.



Specific tooling

020476Y Stud bolt set

001467Y006 Pliers to extract 20 mm bearings

001467Y007 Driver for OD 54-mm bearings

Removing the wheel axle bearings

- Take out the clip on the outside of the gearbox cover.

- Support the hub cover using the column kit.
- Pull out the bearing using the special tool.

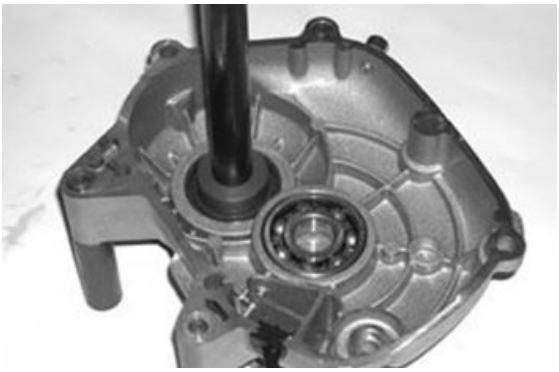
Specific tooling

020476Y Stud bolt set

020376Y Adaptor handle

020477Y Adaptor 37 mm

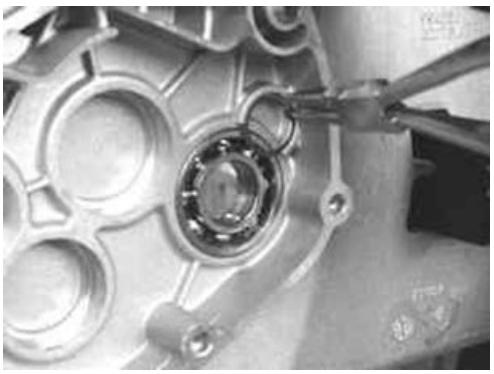
020483Y 30 mm guide



- Remove the oil guard using a screwdriver.

Removing the driven pulley shaft bearing

- If you have to remove the driven pulley shaft, the relevant bearing and the oil guard, remove the transmission cover and the clutch unit as described in the Automatic transmission chapter.
- Extract the driven pulley shaft from its bearing.
- Remove the oil guard using a screwdriver into the hub gear box.
- Remove the Seeger ring shown in the figure.



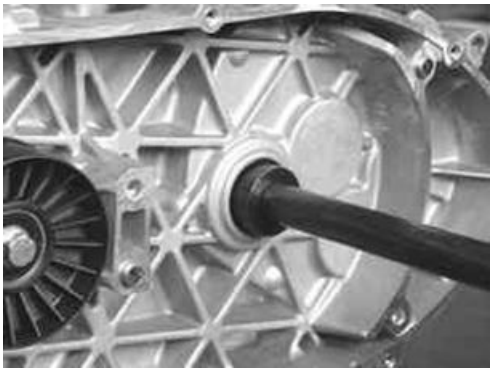
- Pull out the driven pulley shaft bearing from the engine crankcase using the special tool.

Specific tooling

020376Y Adaptor handle

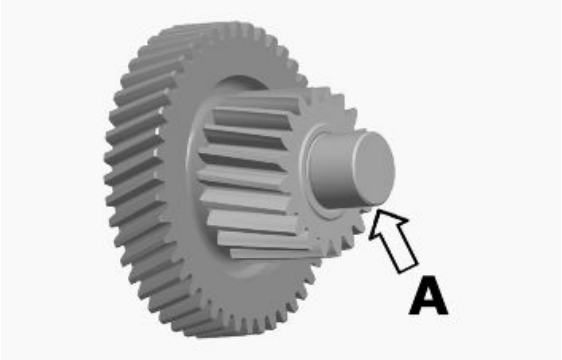
020358Y 37x40-mm adaptor

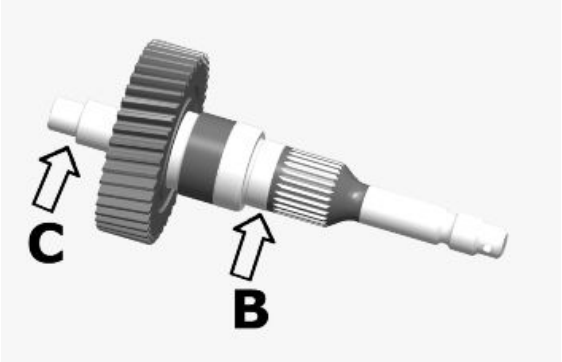
020364Y 25-mm guide

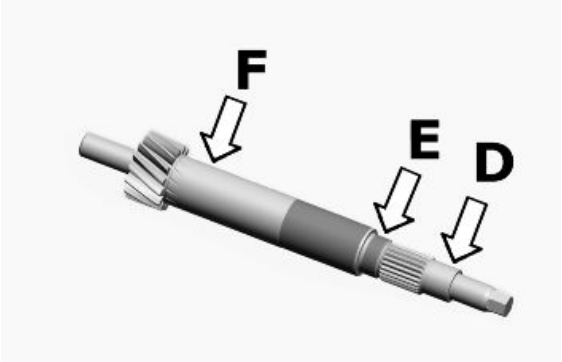


Inspecting the hub shaft

- Check that the 3 shafts exhibit no wear or deformation on the grooved surfaces, at the bearings and at the oil guards.
- In case of faults, replace the damaged parts.







Characteristic

Connection diameter for countershaft:

A = diameter 20 - 0.01 -0.02 mm

Connection diameter for wheel shaft:

B = diameter 30 - 0.010 -0.023 mm

C = diameter 15 - 0.01 -0.02 mm

Bearing diameter for driven pulley shaft:

D = diameter 17 - 0.01 -0.02 mm

E = diameter 20 - 0.01 -0.02 mm

F = diameter 25 - 0.01 -0.02 mm

Inspecting the hub cover

- Check that the mounting surface is not damaged or deformed.

- Check the bearing bearings.

In case of faults, replace the hub cover.

Refitting the driven pulley shaft bearing

- Heat the crankcase using the heat gun.

Specific tooling

020151Y Air heater

- Insert the driven pulley shaft bearing until it abuts against the bottom of the seat using the special tool.

N.B.

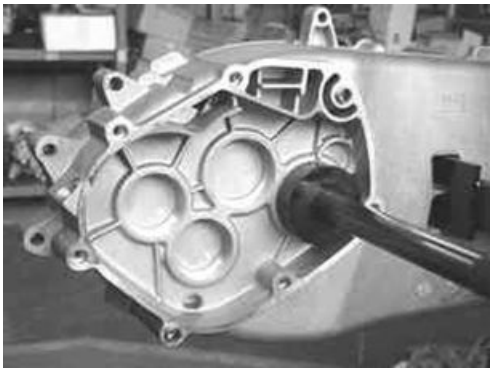
PLACE IT WITH THE BALLS FACING THE HUB (THIS APPLIES TO BEARINGS WITH PLASTIC CAGE).

Specific tooling

020376Y Adaptor handle

020360Y Adaptor 52 x 55 mm

020364Y 25-mm guide



- Heat the intermediate gear bearing seat.
- Insert the intermediate shaft bearing using the special tool.

N.B.

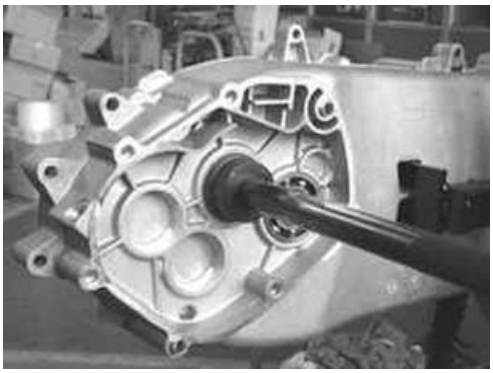
PLACE IT WITH THE BALLS FACING THE HUB (THIS APPLIES TO BEARINGS WITH PLASTIC CAGE).

Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm adaptor

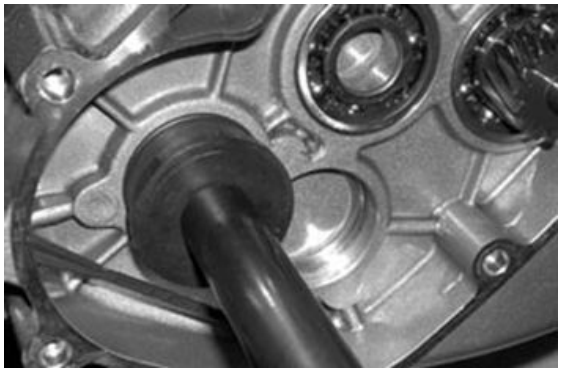
020363Y 20 mm guide



- Heat the gear shaft bearing seat on the crankcase.
- Insert the gear shaft bearing in the upper crankcase seat using the special tool.

N.B.

PLACE IT WITH THE BALLS FACING THE HUB (THIS APPLIES TO BEARINGS WITH PLASTIC CAGE).



Specific tooling

020376Y Adaptor handle

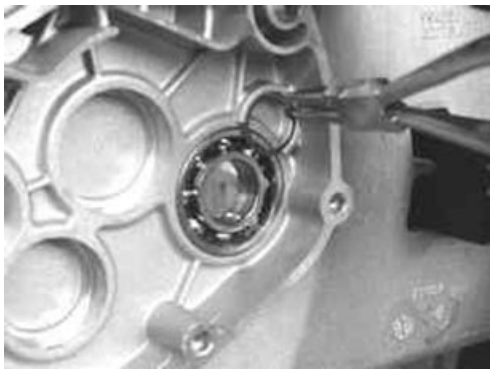
020359Y 42x47-mm adaptor

020412Y 15 mm guide

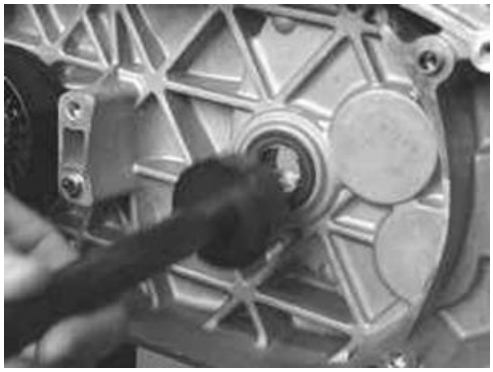
- Place the safety lock Seeger ring of the driven pulley shaft bearing.

N.B.

PLACE IT IN THE POSITION SHOWN IN THE FIGURE.



- Insert the pulley shaft oil guard on the transmission side.



Refitting the hub cover bearings

- Heat the bearing seats on the cover using the heat gun.
- Support the hub cover using the column kit.

Specific tooling

020151Y Air heater

020476Y Stud bolt set

- Insert the intermediate shaft bearing on the cover using the special tool.

N.B.

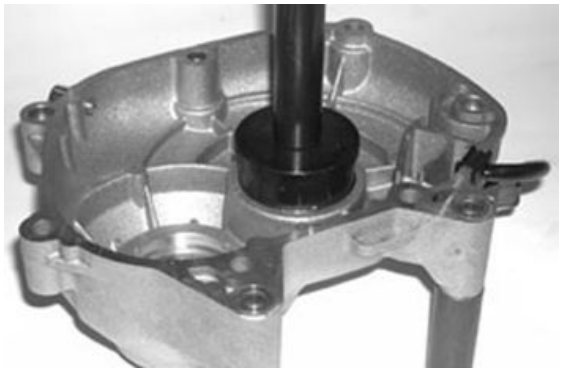
PLACE IT WITH THE BALLS FACING THE HUB (THIS APPLIES TO BEARINGS WITH PLASTIC CAGE).

Specific tooling

020376Y Adaptor handle

020360Y Adaptor 52 x 55 mm

020363Y 20 mm guide



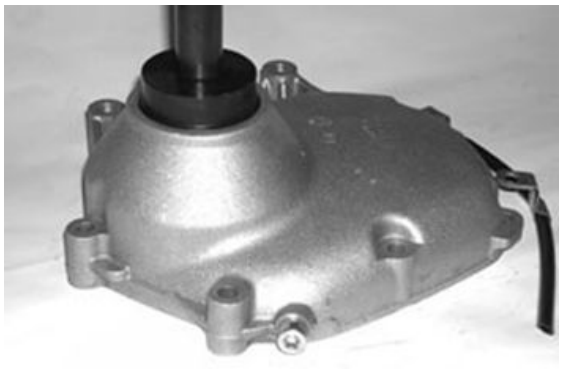
- Heat the gear shaft bearing seat from the cover outside.
- Insert the gear shaft bearing on the cover using the special punch until abutment.

Specific tooling

020376Y Adaptor handle

020360Y Adaptor 52 x 55 mm

020483Y 30 mm guide



- Replace the snap ring

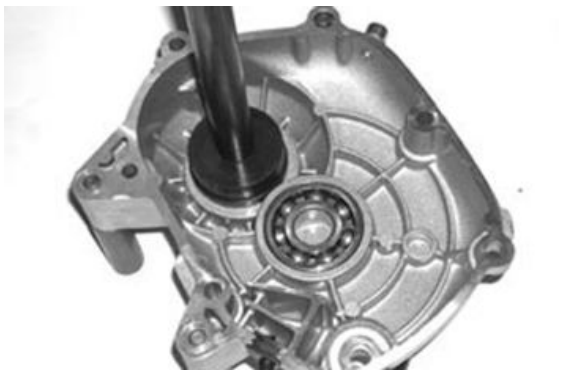
- Support the hub cover using the column kit.
- Insert the wheel shaft oil guard with the sealing lip facing the inside of the cover.
- Place the oil guard flush with the crankcase.

Specific tooling

020376Y Adaptor handle

020360Y Adaptor 52 x 55 mm

020476Y Stud bolt set

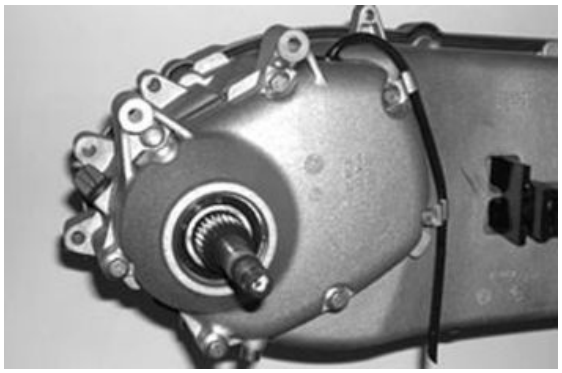


Refitting the hub bearings

- Place the 3 shafts as shown in the figure.

Refitting the ub cover

- Check the proper position of the centring dowels.
- Install a new gasket.
- Fit the gearbox cover, making sure the breather pipe is in the correct position.



- Position the 7 set screws, tighten them to the prescribed torque, being careful of the position of the bands holding the vent tube, and the position of the 3 shortest screws as indicated in the figure.
- Refill with the prescribed oil to the Max. level.

Recommended products

AGIP ROTRA 80W-90 rear oil hub

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

Characteristic

Quantity:

approx. 250 cc

Locking torques (N*m)

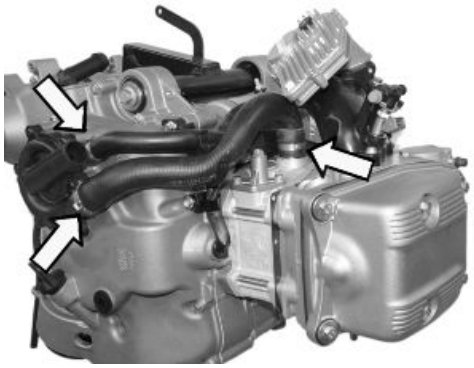
Rear hub cover screws 24 ÷ 27

Flywheel cover

- Remove the three bands shown in the figure for an easier removal of the flywheel cover, remove the feed hoses and disconnect the return hose from the pump cover.

N.B.

THE BANDS MUST BE REPLACED. TO REMOVE THEM, OPEN WITH A SCREWDRIVER OR CUT THEM.
BE CAREFUL NOT TO DAMAGE THE PLASTIC UNIONS.



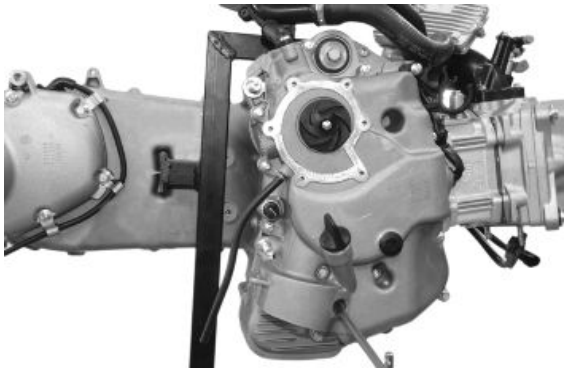
Removing the hub cover

- Drain the engine oil by removing the drainage cap.
- Prepare a suitable container to collect the oil.

- Remove the pre-filter.

- Remove the oil filter using a filter tape or shaped cup wrench.

- Loosen the 14 fastening screws.
- Remove the flywheel cover with the relevant gasket and the cooling system sleeve support.



N.B.

THE SCREWS ARE OF 4 DIFFERENT LENGTHS. NOTE THE RELEVANT POSITIONS.

CAUTION

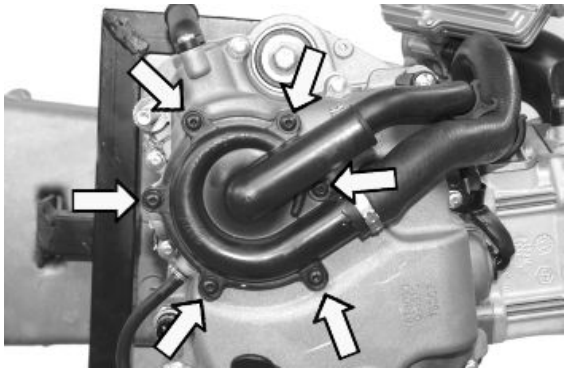
REMOVE THE COVER AVOIDING ANY POSSIBLE INTERFERENCE BETWEEN STATOR AND ROTOR.

CAUTION

BE CAREFUL TO PREVENT SLIPPAGE OF THE BY-PASS VALVE AND OF THE RELEVANT SPRING.

Removing the flywheel cover components

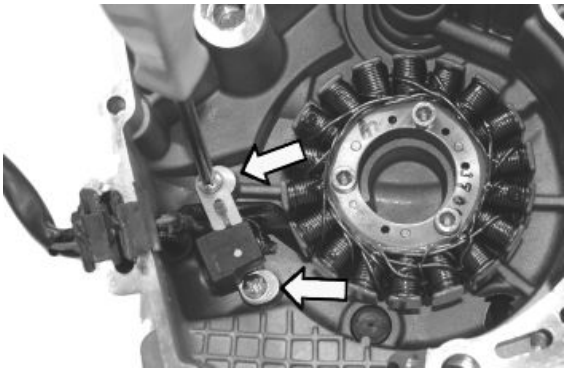
- Loosen the six mounting screws and remove the water pump cover.



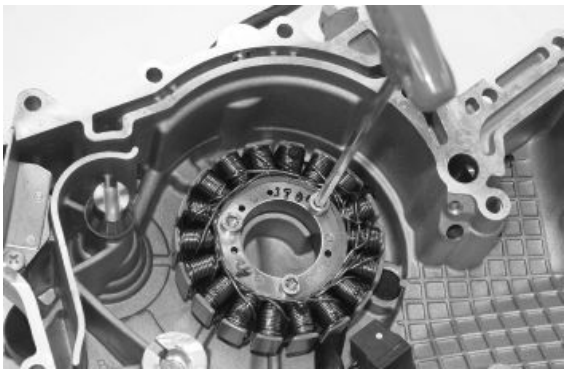
- Remove the by-pass and the relevant spring.
- Remove the oil pump seal.

Removing the stator

- Remove the two retaining screws and the cable guide bracket.

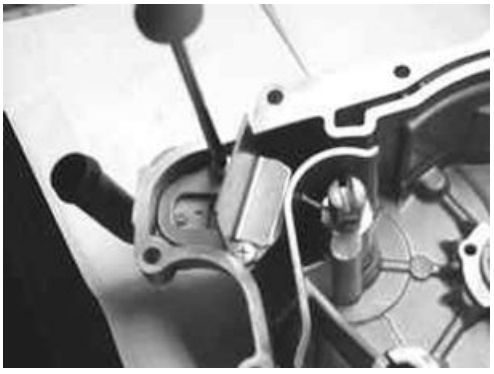


- Unscrew the 3 fastening screws and remove stator and its wiring.

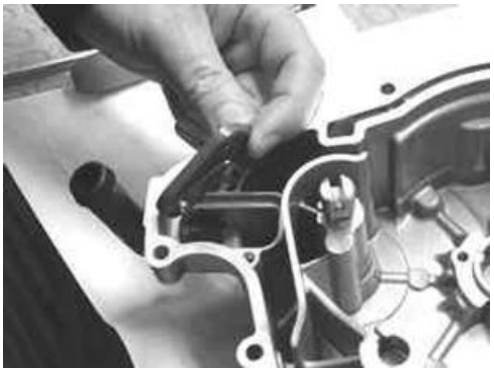


Inspecting the cover components

- Loosen the two retaining screws and remove the reed valve support with bulkhead.

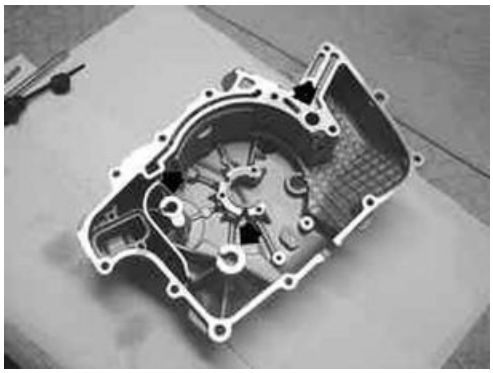


- Remove the blow-by reed valve with the relevant sealing gasket.



- Unscrew the fastening screw and remove the gas outlet union with the relevant O-ring.

- Check that the mounting surface of the crankcase is not worn or deformed.
- Check that the by-pass valve seat, the torque limiter and the water pump shaft are free from wear.



Characteristic

By-pass housing hole diameter:

13.9 mm

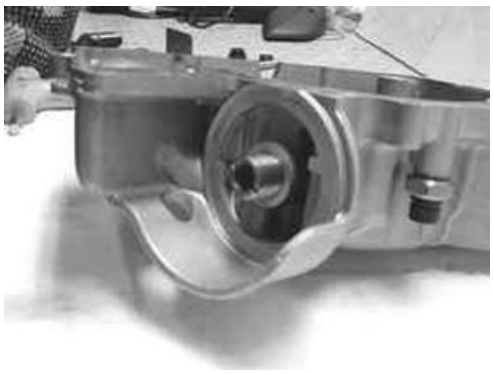
Connection diameter for start-up gear shaft:

12 mm

Connection diameter for pump shaft:

8 mm

- Check that the oil filter union and matching surface exhibit no deformations or wear.



- Check the condition of the stator and of the respective cable harness.

- Check the continuity between the 3 phases.

N.B.

VALUES ARE STATED AT AMBIENT TEMPERATURE. A CHECK WITH THE STATOR AT OPERATING TEMPERATURE MAY RESULT IN VALUES HIGHER THAN THOSE STATED.

Electric characteristic

Resistance:

0.2 - 1 Ω

- Check the ground insulation of each phase.
- If a fault is found, carry out a thorough check of the cable harness that contains two types of cable: Rigid cables close to the stator and flexible cables close to the connector.

- Check that the winding is positioned so as not to interfere with the heads of the retaining screws.

Refitting the stator

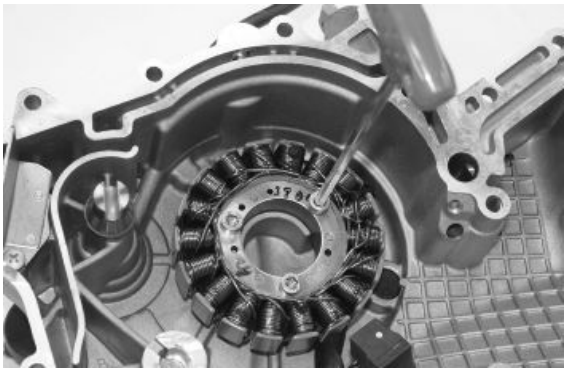
- Install the stator assembly together with the wiring harness, tightening the 3 screws to the prescribed torque.

N.B.

INSERT THE RUBBER WIRING SEALING GASKET INTO THE SPECIAL SEAT ON THE CRANKCASE.

Locking torques (N*m)

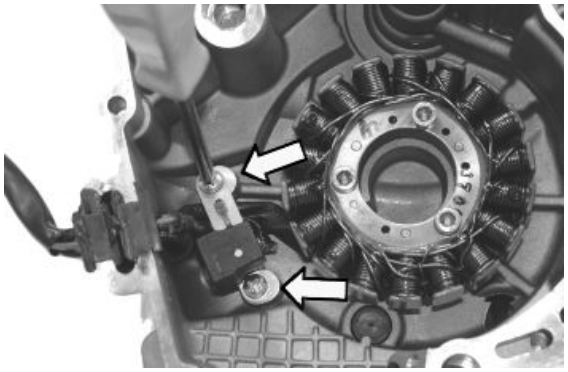
Stator retainers **8 - 10**



- Install the wiring guide bracket tightening the 2 screws to the prescribed torque.

Locking torques (N*m)

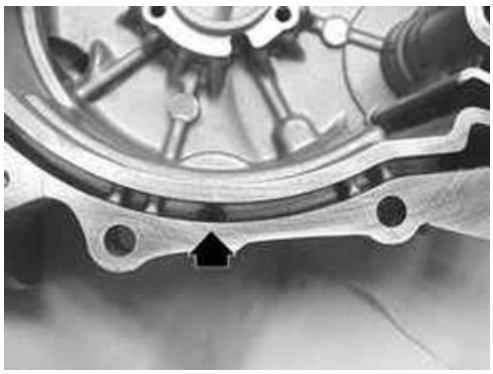
Stator cable harness guide bracket screws 3 - 4



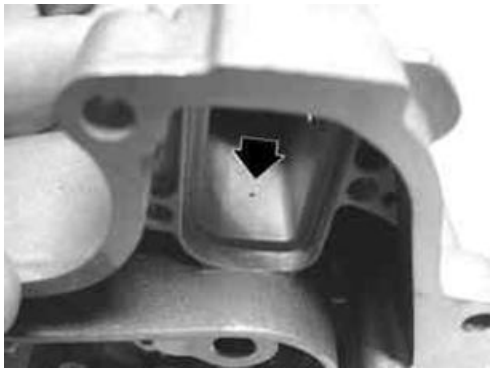
Refitting the flywheel cover components

- Before reassembling, check that all components are perfectly clean.
- For the cover, carefully check all lubrication channels, in particular:
- The 3 by-pass channels.

- Oil pressure sensor feeding duct.



- Oil vapour decantation chamber



- Temporarily install the distribution timing check hole cover and the engine oil filling cap/bar.
- Insert the blow-by recovery duct using a new O-ring.
- Tighten the screws to the prescribed torque.

Locking torques (N*m)

Blow-by recovery duct fixing screws 3 - 4

- Insert the spring and the by-pass piston on the flywheel cover.

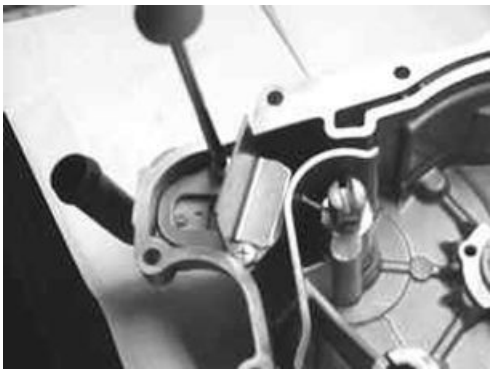
N.B.

LUBRICATE THE BY-PASS VALVE.

- Reinstall the blow-by reed valve using a new sealing gasket.
- Reinstall the support with head and tighten the screws to the prescribed torque.

Locking torques (N*m)

Supporting screws with bulkhead 0.3 - 0.4



- Correctly fit a new O-ring, do not allow it to come into contact with grease or oil.

FAILURE TO OBSERVE THIS ADVICE CAN IRRETRIEVABLY DEFORM THE O-RING.

- Refit the water pump cover and tighten the 6 fixing screws to the prescribed torque.

Locking torques (N*m)

Pump cover fixing screws: 3 ÷ 4

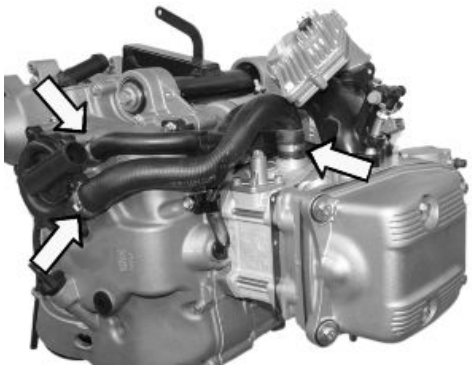
Refitting the flywheel cover

- Install a new oil filter, lubricate the gasket, screw on and finally tighten to the prescribed torque.

Locking torques (N*m)

Engine oil filter **12 - 16**

- Install the supply hose to the cylinder and connect the return hose to the pump cover using 3 new clamps.



N.B.

TIGHTEN THE CLAMPS USING APPROPRIATE PLIERS, PAYING ATTENTION NOT TO CONSTRICT THE HOSES BUT ALSO TAKING CARE TO TIGHTEN THE CLAMPS SUFFICIENTLY.

- Install the pre-filter again and insert the engine oil drain plug, tightening to the prescribed torque.
- Refill the engine with the prescribed type of oil.

Recommended products

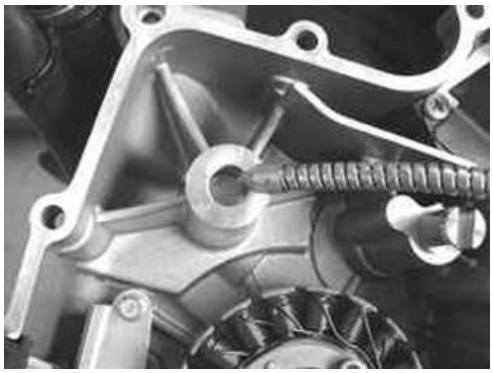
AGIP CITY HI TEC 4T Engine oil

SAE 5W-40, API SL, ACEA A3, JASO MA Synthetic oil

Locking torques (N*m)

Engine oil drainage plug **24 ÷ 30**

- Lubricate the intermediate gear seat with torque limiter on the flywheel cover.
- Align the water pump movement sensor with a reference and install the flywheel cover as described in the Flywheel cover chapter.



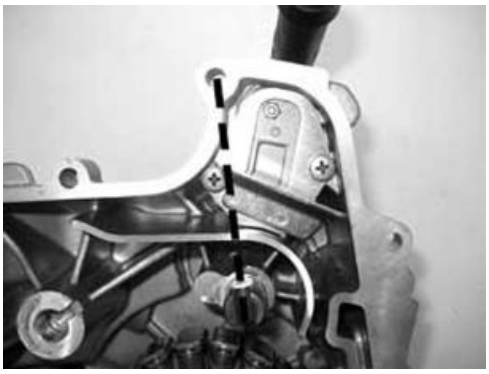
- Install a new gasket on the engine crankcase.
- Check the presence of the three centring dowels.

- Turn the crankshaft in order to align the countershaft movement sensor with a reference point on the crankcase (see figure).

- Repeat the alignment for the water pump crankshaft using the same reference point on the engine.

N.B.

THIS PREPARATION IS USEFUL PARTICULARLY IN THE EVENT OF REPAIRS WITH THE WATER PUMP COVER INSTALLED.



- Install the flywheel cover on the engine, paying attention to avoid interference between the stator and rotor.

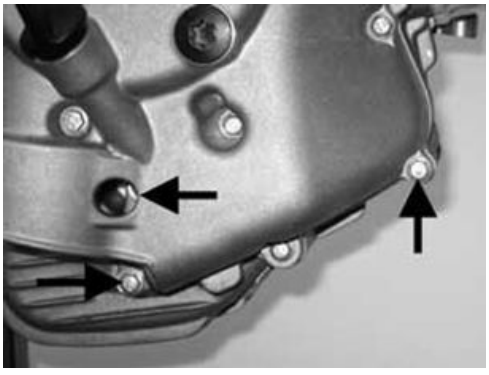
WARNING

FAILURE TO OBSERVE THIS INSTRUCTION MAY RESULT IN DESTRUCTION OF THE CERAMIC MAGNETS.

- Tighten the 14 retaining bolts of the cover to the prescribed torque.

N.B.

THE BOLTS HAVE FOUR LENGTHS:
- THE 3 SHORTEST ARE INSERTED AS SHOWN IN THE FIGURE.
- THE LONGEST IS INSERTED UNDER THE ENGINE OIL FILLER PLUG.

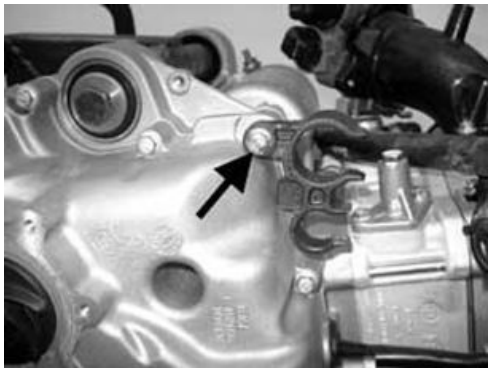


N.B.

- THE INTERMEDIATE BOLTS FOR THE REMAINING MOUNTING POINTS WITH THE EXCEPTION OF THE BOLT FOR THE MANIFOLD SUPPORT (SHOWN IN THE FIGURE) ARE SLIGHTLY LONGER.

Locking torques (N*m)

Flywheel cover screws 11 - 13

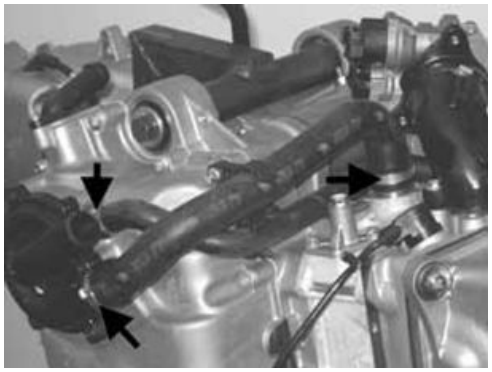


Flywheel and starting

- Remove the three bands shown in the figure for an easier removal of the flywheel cover, remove the feed hoses and disconnect the return hose from the pump cover.

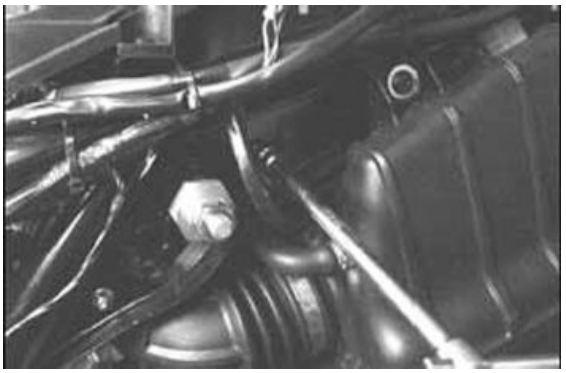
N.B.

THE BANDS MUST BE REPLACED. TO REMOVE THEM, OPEN WITH A SCREWDRIVER OR CUT THEM.
BE CAREFUL NOT TO DAMAGE THE PLASTIC UNIONS.



The starter is sold as a complete part.

Before deciding to replace it, carry out the following tests:



1 - Battery

Check the voltage after not running (a few hours):

Voltage >12.5V

Check the density of the electrolyte of each cell:

Bé = 30 ÷ 32

Specific weight: 1.25 - 1.26

YES go to 2 NO go to 3

2 - Make sure the negative terminals (battery negative and starter negative) are correctly connected to each other and to the frame.

YES go to 4 NO go to 5

3 - Recharge and if necessary replace the battery.

4 - Connect the diagnostic tester (see chapter "Injection system").

Connect the induction clamp of an ammeter to the positive power supply cable of the starter motor.

Remove the 10A fuse no. 12 (see "fuses" chapter).

Switch in position "ON" with interrupt switch in position "RUN" and side stand raised.

Select the "PARAMETERS" function.

Start the engine (so that it cannot move) long enough to measure the rpm and starter absorption.

N.B.

THE DECLARED RPM VALUE IS THAT INDICATED BY THE TESTER, THE RPM READING IS NOT THE REAL ONE, BUT IS VALID FOR DIAGNOSTIC PURPOSES.

Specific tooling

020460Y Scooter diagnosis and tester

Electric characteristic

Absorption at trailing speed:

80 - 120 A

Revolution speed =

approx. 300-400 rpm

YES go to 6 NO go to 7 NO go to 8 NO go to 9

5 - Restore the connections

6- **The values are correct.**

Finally carry out a check of the power consumption at idle speed.

Remove the starter motor (see the flywheel and starter system).

Reconnect the earth and positive and perform the test.

Electric characteristic

Current consumption at idle speed:

<40 A

YES go to 10 NO go to 11

7- **Low trailing speed**

High electrical absorption

Carry out a test of the engine rotation (example: possible melting of the bushes) and if no anomalies are found, replace the starter motor.

8- **Low trailing speed**

Low electrical absorption

Repeat the test, bridging the power terminals of the starter remote control switch or even better replacing them.

Check the new values.

YES go to 12 NO go to 13

9 - High trailing speed

Low electrical absorption

The engine turns too freely, check the compression end pressure.

If the values are not correct proceed as follows.

10 - The starter motor works properly.

11 - Check the rotation of the armature.

12 - Replace the starter remote control switch.

13 - Test the battery again and if necessary replace the starter motor.

N.B.

IF THE TRAILING SPEED OF THE CRANKSHAFT IS LOW AND COMBINED WITH STRANGE NOISE, CHECK THE FREEWHEEL OF THE TORQUE LIMITER (SEE THE "FLYWHEEL AND STARTER SYSTEM" CHAPTER).

STARTER MOTOR

Specification	Desc./Quantity
Type	Mitsuba sm13d
Power	0.9 kW

BATTERY

Specification	Desc./Quantity
Capacity	14 Ah
Starting current	125 A

START-UP REMOTE CONTROL SWITCH

Specification	Desc./Quantity
Type	SEALED
Maximum load	150 A continuous

STARTER TRANSMISSION

Specification	Desc./Quantity
Ring gear and freewheel coaxial to the flywheel.	Intermediate gear with built-in torque limiter.

The starter system has a transmission between the motor armature and engine shaft equipped with freewheel coaxial to the flywheel and torque limiter on the intermediate shaft.

The limiter is calibrated to 10 kgm (100 Nm); this component protects the structure of the engine and the starter kinematic mechanism in the event of incorrect starting with consequent inverse rotations.

The freewheel is used for a sufficiently silent starting.

The starter control (energised remote control) is slaved to enabling signals by the side stand and the emergency OFF/RUN switch, which does not allow starting given dangerous conditions.

The starter control circuit is not controlled by the immobilizer system, therefore before insisting on the starter system, check the consensus of the immobilizer.

In order to check the enabling switches circuit, see the «Electrical system» chapter, whereas to check the engine shaft control transmission, follow what is described in the «Flywheel and starter system» chapter.

Removing the starter motor

N.B.

THIS OPERATION MAY ALSO BE CARRIED OUT WITH FLYWHEEL COVER ASSEMBLED.

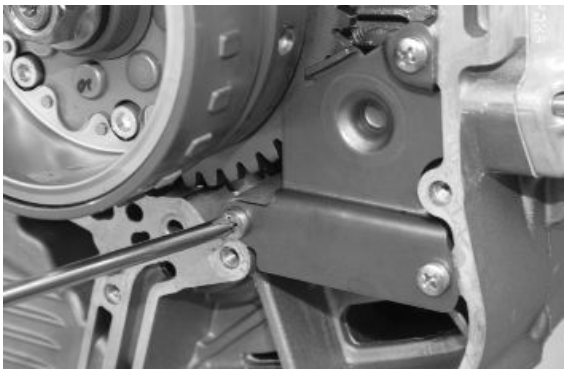
- Loosen the two fastening screws.
- Extract the complete starter motor.

Removing the flywheel magneto

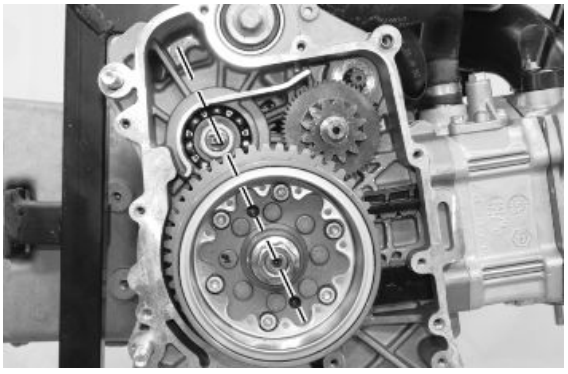
N.B.

IF YOU MUST REMOVE THE FLYWHEEL, IT IS NECESSARY TO REMOVE THE CHAIN GUIDE SLIDING BLOCK RETAIN PLATE FIRST.

- Unscrew the 3 fastening screws and remove the chain guide sliding block retain plate and the start-up rim.



- Align the holes obtained on the flywheel with the crankcase housing to allow the introduction of the special tool.

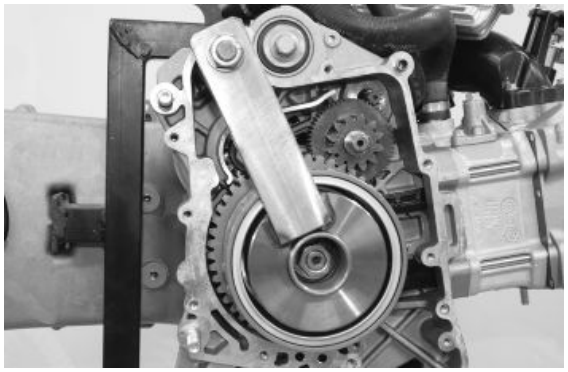


- Tighten the bushing of the flywheel lock tool on the removing tool threading.

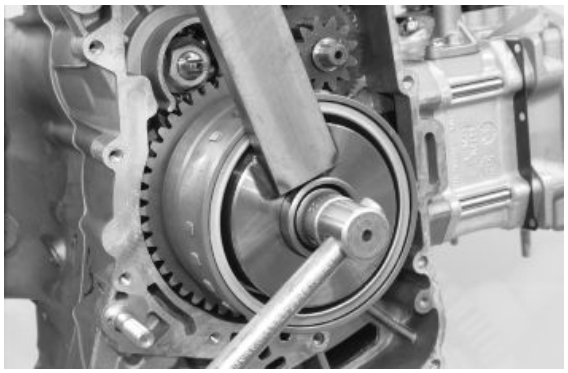
- Insert the special tool as shown in the figure, making sure that the pins are perfectly inserted into the previously aligned holes and that it is perfectly abutted and almost flush with the flywheel.

Specific tooling

020472Y Flywheel lock wrench



- Loosen the magneto flywheel fastening nut.
- Remove the special tool and the fastening nut.



- Remove the washer.

- Insert the nut again so as to slightly uncover the shaft and free the space that was occupied by the washer.

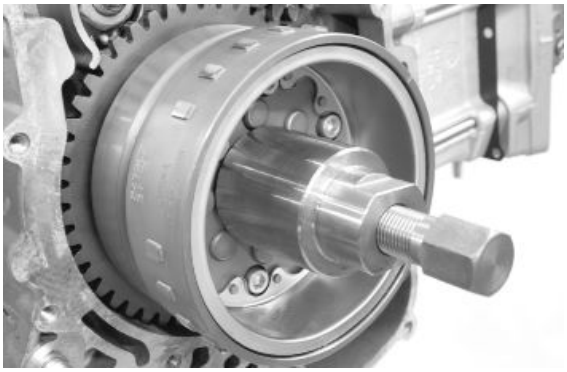
CAUTION

THIS OPERATION IS REQUIRED AS THE FLYWHEEL IS STRONGLY LOCKED; THE CONE DETACHMENT MAY THEREFORE CAUSE THE ROTOR SLIPPAGE, WITH THE CONSEQUENT BREAKAGE OF THE MAGNETS.

- Insert the special removing tool.
- Using a 27-mm wrench and a 19-mm bushing, release the flywheel.

Specific tooling

020467Y Flywheel extractor



- Remove the extractor.
- Remove the nut and extract the flywheel with the start-up rim.
- Remove the crankshaft key.

- To remove the start-up rim from the freewheel it is necessary to turn it clockwise and pull it out.

- Remove the freewheel from the flywheel by loosening the 6 fastening screws.

SINCE THE FREEWHEEL MUST BE REMOVED, IT IS ADVISABLE TO LOOSEN THE 6 FASTENING SCREWS IN ADVANCE WITH THE FLYWHEEL STILL INSTALLED ON THE CRANKSHAFT.

- The freewheel is coupled to the flywheel with high precision; if removal is difficult, use 2 screws as gripping points and as removing tools, if required.

- Extract the intermediate gear provided with torque limiter.

Inspecting the flywheel components

- Check the integrity of the magnets.
- Check that the magnet support cage is free from deformation or cracks.
- Check that the flywheel splines exhibit no loosening.

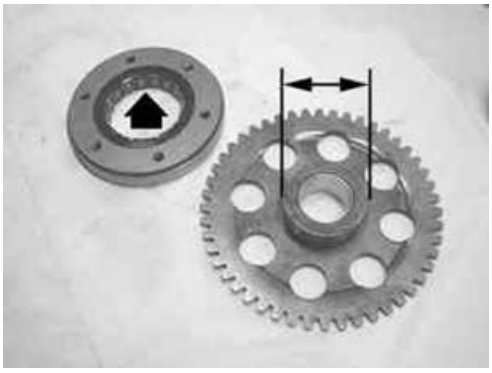
Starter gear rim

- Check that there is no wear or abnormal impressions on the "rollers" of the freewheel and on the surface of the starter ring gear hub.
- Check the hub outside diameter.

Characteristic

Hub outside diameter:

Diameter 45.665 + 0.008 +0.005 mm



- Check the inside diameter of the bushing of the starter gearing.
- Check that the toothing is not worn.

Characteristic

Inside diameter of the bushing:

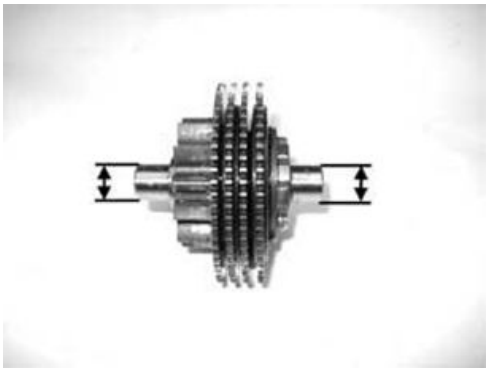
Diameter 27 + 0.020 +0.041 mm

N.B.

IF THE FAULTS DISCOVERED AFFECT THE HUB, REPLACE THE STARTER RING GEAR AND FREEWHEEL.
IF ONLY THE BUSHING IS WORN, IT IS POSSIBLE TO REPLACE ONLY THE COMPLETE START-UP RIM. IN THAT CASE, CHECK ALSO THE DIAMETER AND THE SURFACE OF THE CONNECTION ON THE CRANKSHAFT. IN CASE OR IRREGULARITIES, REPLACE THE CRANKSHAFT.

Intermediate gear

- Check that the toothing is not worn.
- Check the diameter of the two bearings.

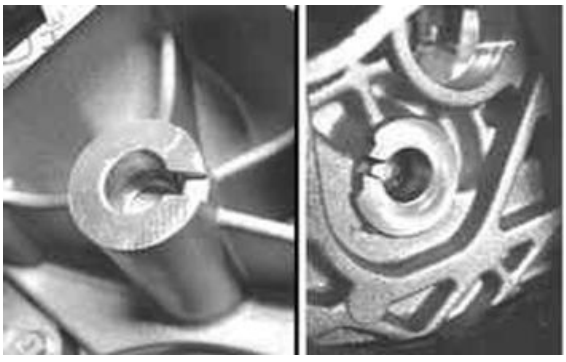


Characteristic

Gear bearing diameter:

12 - 0 0.011 mm

Also check the shaft diameter on the flywheel cover and on the engine crankcase.



Characteristic

Bearing diameter on the flywheel cover

12 + 0.034 -0.016 mm

Bearing diameter on the engine crankcase:

12 + 0.034 -0.016 mm

N.B.

THE TORQUE LIMITER IS PROVIDED WITH 4 GEARS THAT HAVE THE FUNCTION OF CLUTCH DRIVE PLATES.

Driven plates consist of 4 Belleville springs provided with grooved profiles; this assembly allows transmitting torque lower than 10 kgm.
In case of incorrect start-up manoeuvres, the limiter prevents any kicks, with consequent reversal of direction of the crankshaft which would impair the engine structure.

The limiter assembly cannot be overhauled. In case of irregularities on the toothed discs, replace the assembly.

Refitting the free wheel

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

Recommended products

Loctite 243 Medium strength threadlock

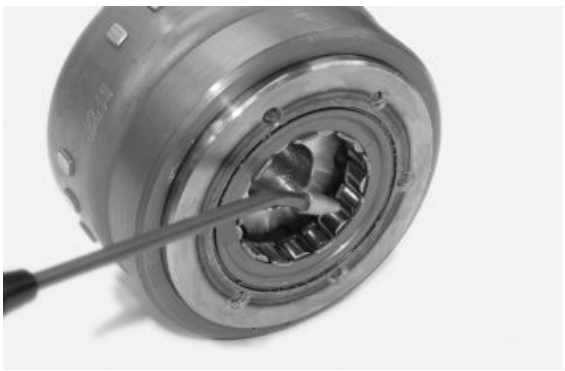
Loctite 243 medium-strength threadlock

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

Locking torques (N*m)

Screw fixing freewheel to flywheel **13 ÷ 15**

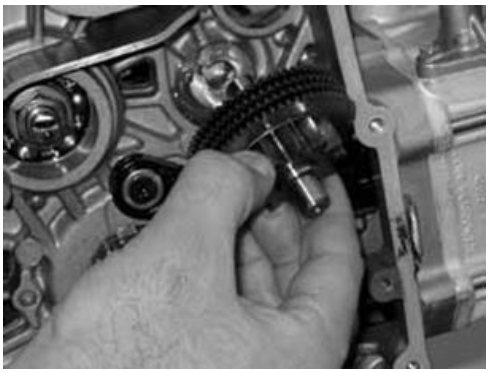
- Oil the free wheel "rollers".



Refitting the intermediate gear

- Lubricate the gear housing on the engine crank-case.

- Insert the intermediate gear with torque limiter



- Lubricate the inside bushing and the starter ring gear hub surface.

- Install the start-up rim on the flywheel turning it clockwise and inserting at the same time.

Refitting the flywheel magneto

- Insert the key on the crankshaft.
- Install the flywheel checking the proper insertion of the key and engaging the torque limiter gear with the start-up rim.

- Insert washer and nut on the crankshaft.

- Tighten thoroughly the guide bushing of the flywheel lock tool and loosen by 1/4 turn.

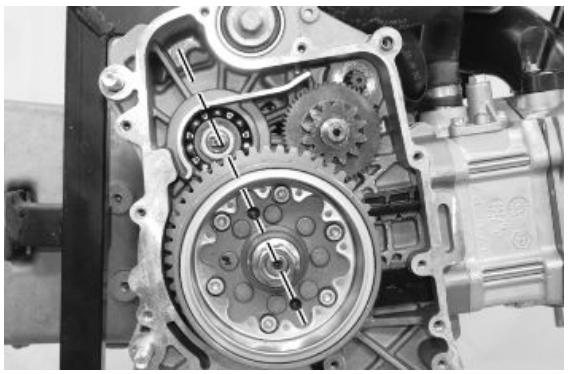
N.B.

FAILURE TO OBSERVE THIS RULE CAUSES THE LOCKING OF THE GUIDE ON THE FLYWHEEL.

Specific tooling

020472Y Flywheel lock wrench

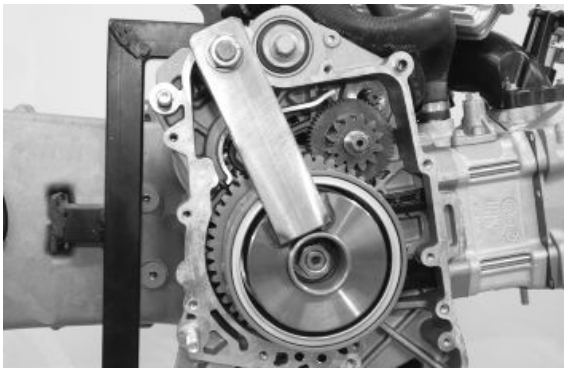
- Align the 2 holes of the flywheel with the case housing to allow the introduction of the special tool.



- Insert the special tool checking that the pins are perfectly introduced into the seat.

Specific tooling

020472Y Flywheel lock wrench



- Tighten the flywheel lock nut to the prescribed torque.

Locking torques (N*m)

Flywheel fixing nut 115 - 125

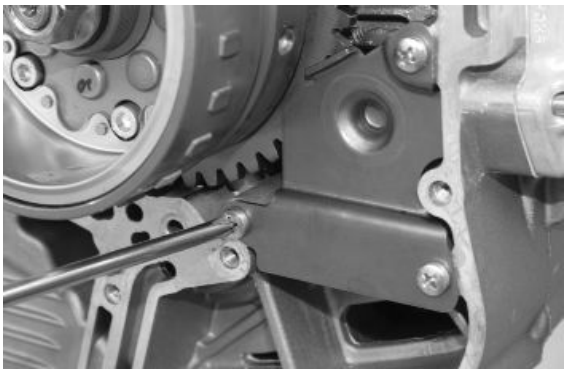
- Install the chain guide retain plate tightening the 3 screws to the prescribed torque.

N.B.

BEFORE TIGHTENING THE SCREWS, MOVE THE START-UP RIM IN CONTACT WITH THE CRANKCASE AND CHECK THAT IT IS FREE TO ROTATE IN ANTICLOCKWISE DIRECTION.

Locking torques (N*m)

Chain guide sliding block retain plate fastening screws 3 ÷ 4



Refitting the starter motor

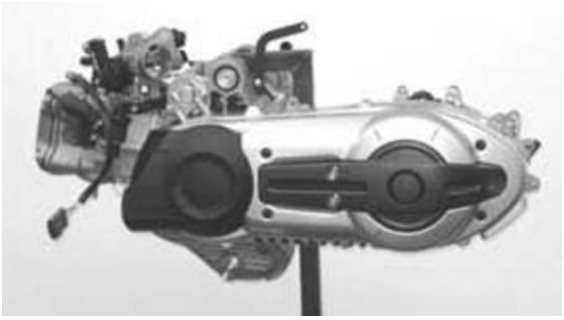
- Check that the O-ring is in good working order and lubricate it.
- Insert the starter motor.
- Tighten the 2 fastening screws to the prescribed torque.

Locking torques (N*m)

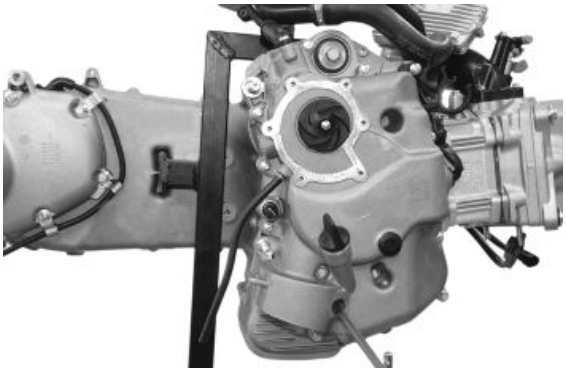
Starter motor screws 11 ÷ 13

Cylinder assy. and timing system

- Remove the external and internal transmission cover.

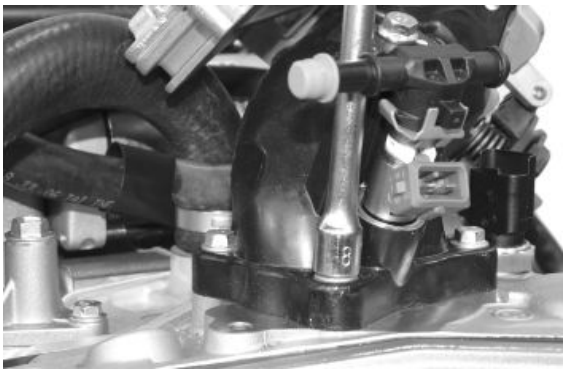


- Remove the flywheel cover, the flywheel and the torque limiter.



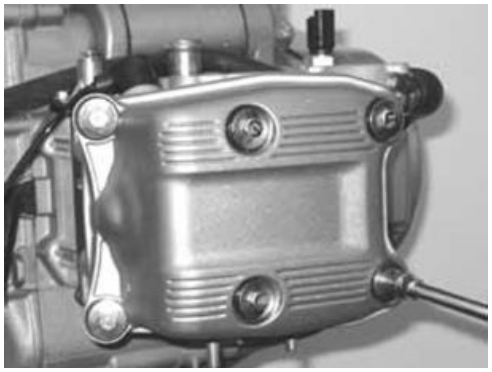
Removing the intake manifold

- Remove the 3 mounting screws.
- Remove the intake manifold unit.



Removing the rocker-arms cover

- Loosen the 6 special screws with stop and the relevant rubber gaskets.
- Remove the tappet cover with relevant gasket.



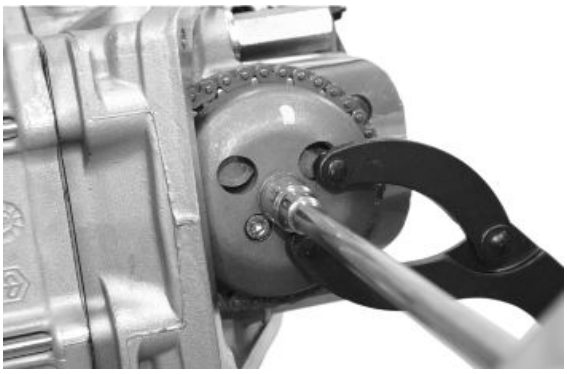
Removing the timing system drive

- Turn the engine to close the intake valves.

- Remove the central screw and the valve lifting device mass stop bell using the special tool.

Specific tooling

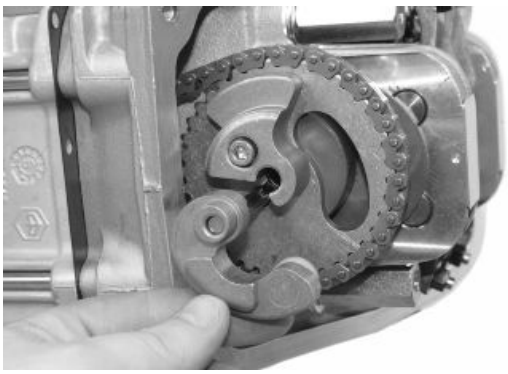
020565Y Flywheel lock calliper spanner



- Remove the return spring and the valve lifting mass with relevant travel end washer.

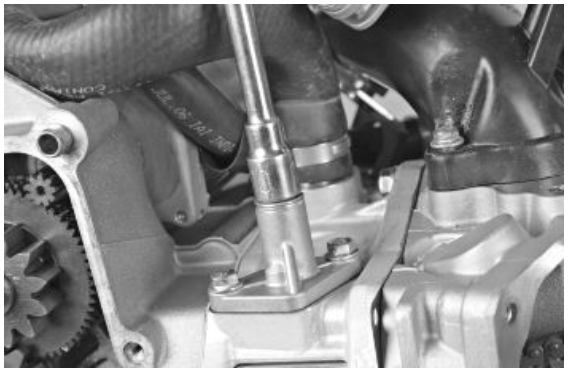
N.B.

BE CAREFUL NOT TO ALLOW THE WASHER AND SPRING TO FALL INTO THE ENGINE THROUGH THE CHAIN COMPARTMENT.

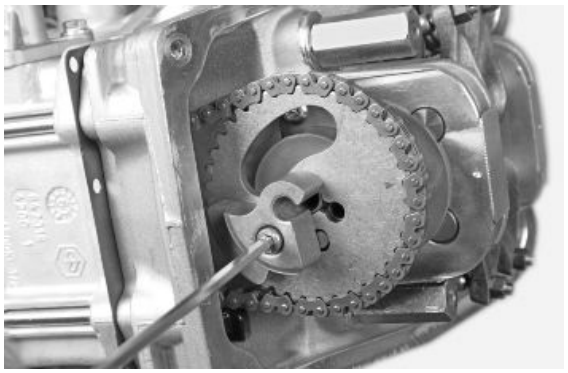


- Align the reference marks on the timing chain rim with those on the head.

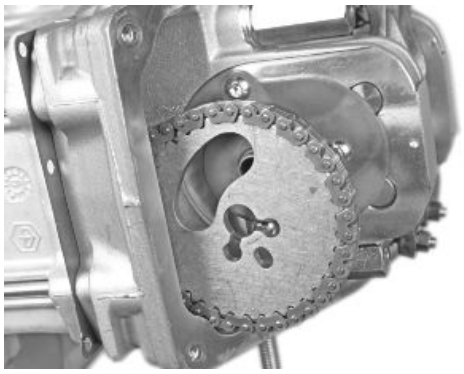
- Loosen the central screw on the tensioner first.
- Unscrew the 2 fastening screws and remove the tensioner with relevant gasket.



Remove the inside hexagon screw and the counterweight as shown in the figure.



- Remove the timing belt rim from the camshaft.
- Remove the timing belt rim.

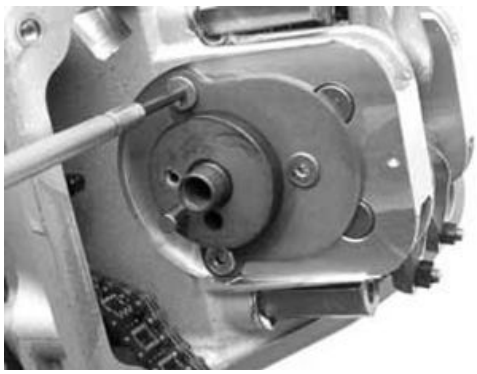


Removing the cam shaft

- Unscrew the 3 fastening screws and remove camshaft retaining bracket.

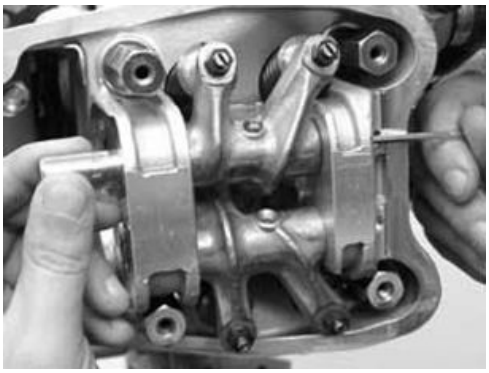
N.B.

REMOVING THE FASTENING SCREWS MAY BE DIFFICULT. BE CAREFUL NOT TO DAMAGE THE INSIDE HEXAGON. IF NECESSARY, SEPARATE THE THREADS IN ADVANCE.



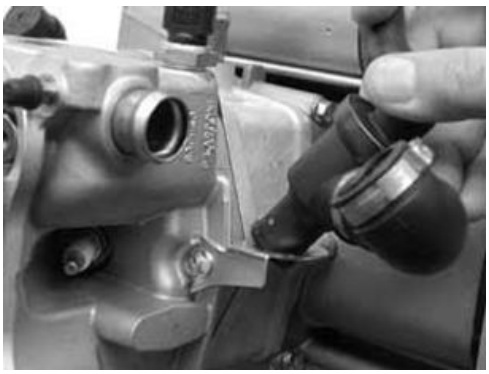
- Remove the cam shaft.

- Remove pins and rocking levers by the transmission side holes.



Removing the cylinder head

- Remove the spark plug.
- Remove the cooling system outlet sleeve with thermostat.

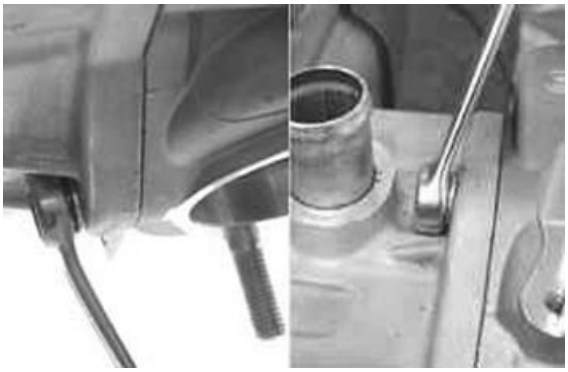


- Remove the coolant temperature sensor.

N.B.

THE SENSOR CONTROLS BOTH INJECTION AND THE ANALOGUE INSTRUMENT ON THE PANEL. TO CHECK THIS COMPONENT, SEE THE INJECTION CHAPTER.

- Remove the 2 fastening nuts on the head, on the exhaust and on the intake side.



- Remove the two M6 screws into the distribution channel and the M6 screw on the spark plug side with the thermostat support.

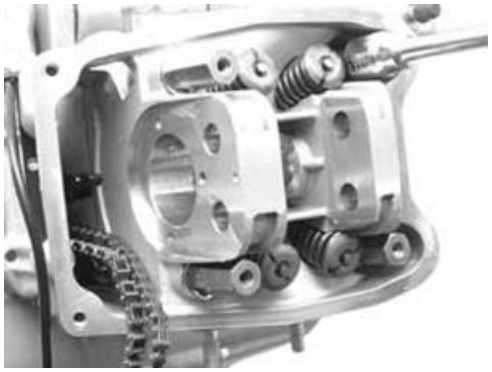
N.B.

THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, ROCKING LEVER PINS AND FITTING BRACKET IF NECESSARY.

- Loosen the 4 head-cylinder fastening nuts in 2 or 3 times and in a crossed sequence.
- Remove the head, the 2 centring dowels, the gasket and the lower chain guide sliding block.

N.B.

DO NOT REMOVE THE DOWELS IF THEY ARE FORCED INTO THEIR SEAT.

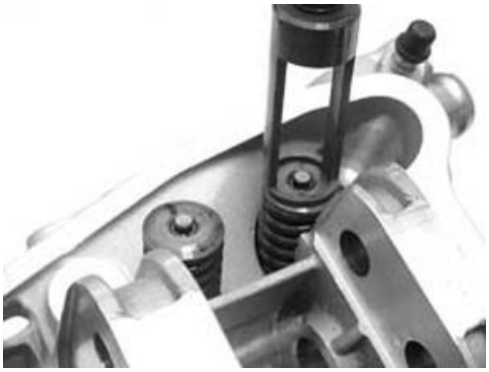


CAUTION

WHEN YOU HAVE TO REMOVE THE HEAD, PREPARE A SUITABLE CONTAINER SINCE THE THERMAL GROUP CONTAINS COOLANT.

Removing the valves

- Using the appropriate tool fitted with an adaptor, remove the cotters, caps, springs and valves.



Specific tooling

020382Y Valve cotters equipped with part 012 removal tool

020382Y012 bush (valve removing tool)

CAUTION

ARRANGE THE VALVES SO AS TO RECOGNISE THE ORIGINAL POSITION ON THE HEAD (FLYWHEEL SIDE AND TRANSMISSION SIDE).

- Remove the oil guards using the special tool.

Specific tooling

020431Y Valve oil seal extractor

- Remove the spring supports.

N.B.

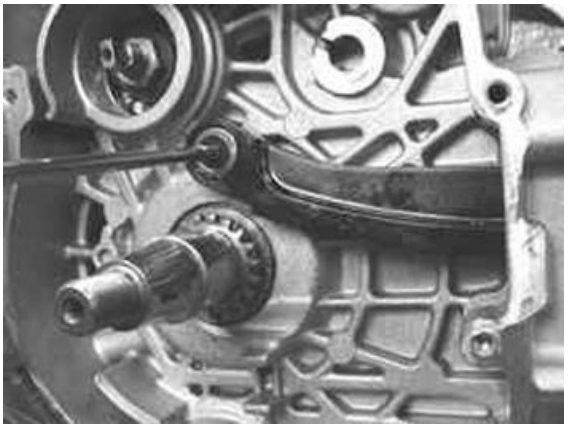
BLOW THE SEATS WITH COMPRESSED AIR TO FACILITATE THE SPRING SUPPORT REMOVAL.

Removing the cylinder - piston assy.

- Remove the timing chain.
- Loosen the fastening screw and remove the spacer and the tightening sliding block.

N.B.

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



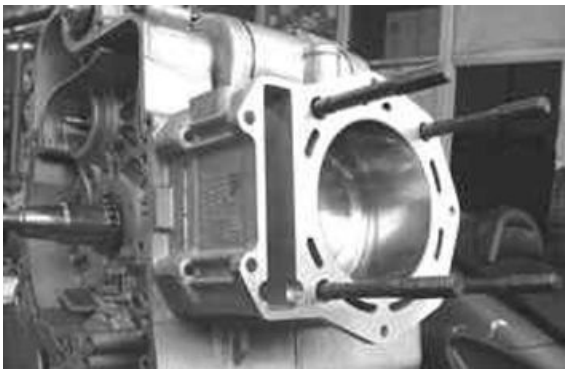
- Extract the cylinder with the relevant gasket and the centring dowel.

N.B.

THE SECOND CENTRING IS ENSURED BY A PIN SET INTO THE CYLINDER.

CAUTION

TO PREVENT DAMAGES TO THE PISTON, SUPPORT IT WHILE REMOVING THE CYLINDER.



- Remove the 2 piston pin locking rings by the specific housings.
- Extract the pin and remove the piston.

N.B.

USE PAPER OR A CLOTH TO CLOSE THE CYLINDER HOUSING MOUTH ON THE CRANKCASE TO PREVENT SLIPPAGE OF ONE OF THE PIN LOCKING RINGS INTO THE CASE.

- Remove the piston sealing rings and the oil scraper.

CAUTION

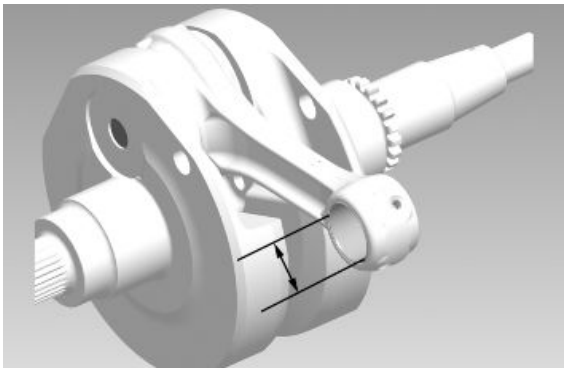
NOTE THE ASSEMBLY POSITIONS OF THE LININGS TO PREVENT INVERTING THE POSITION IN CASE OF REUSE.

N.B.

BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.

Inspecting the small end

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



N.B.

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

Characteristic

Standard diameter:

22 + 0.025 +0.015 mm

Inspecting the wrist pin

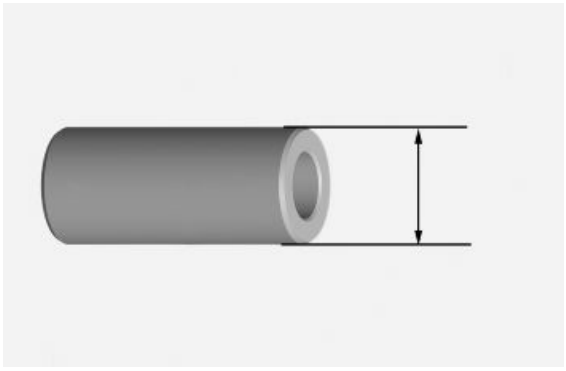
- Check the pin outside diameter using a micrometer.

Characteristic

Standard diameter:

22 0 -0.004 mm

- Calculate the coupling clearance between pin and connecting rod end.



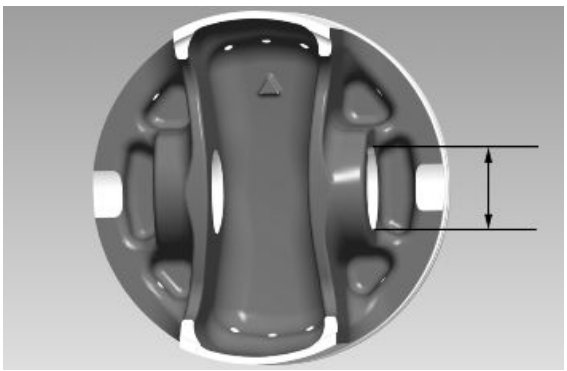
Characteristic

Standard clearance:

0.015 ÷ 0.029 mm

Inspecting the piston

- Measure the diameter of the bearings on the piston.



Characteristic

Standard diameter:

22 + 0.006 + 0.001 mm

- Calculate the piston pin coupling clearance.

N.B.

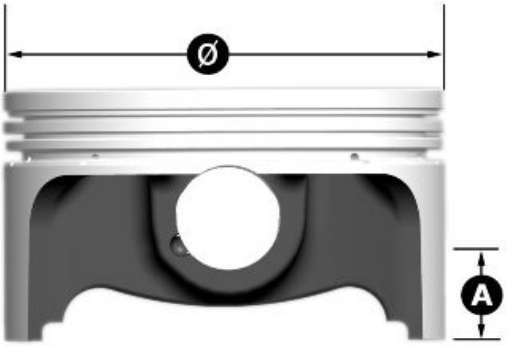
THE PIN HOUSINGS HAVE 2 LUBRICATION CHANNELS. FOR THIS REASON, MEASUREMENT MUST BE MADE ACCORDING TO THE PISTON AXIS.

Characteristic

Standard clearance:

0.001 ÷ 0.010 mm

- Measure the outside diameter of the piston, perpendicular to the gudgeon pin axis.
- Take the measurement in the position shown in the figure.



N.B.

REFER TO THE «SPECIFICATIONS» SECTION FOR THE SIZES OF THE PISTON AND THE CYLINDER-PISTON COUPLING CLEARANCES.

Characteristic

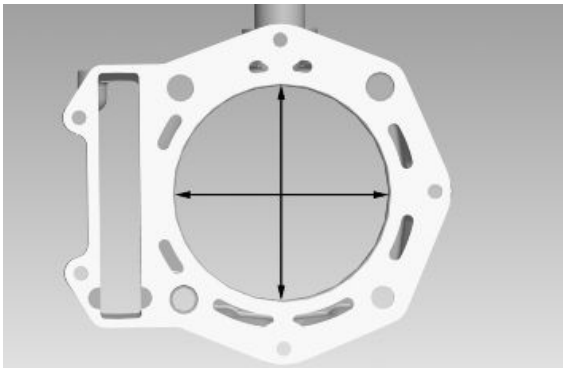
A:

10 mm

Piston diameter:

85.8 mm nominal value

- Using a bore meter, measure the cylinder inner diameter at a given height according to the directions shown in the figure.



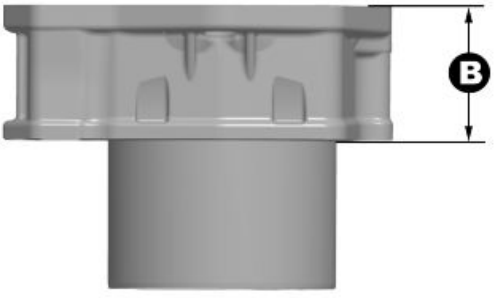
Characteristic

B:

43 mm

Standard diameter:

85.8 mm nominal value



- Check that coating is free from flakes.
- Check that the head matching surface exhibits no deformations or wear.

Characteristic

Maximum allowable run-out:

0.05 mm

- Pistons and cylinders are classified into categories based on their diameter. The coupling is carried out in pairs (A-A, B-B, C-C, D-D).

N.B.

REFER TO THE «SPECIFICATIONS» SECTION FOR THE SIZES OF THE CYLINDER AND THE CYLINDER-PISTON COUPLING CLEARANCES.

Inspecting the piston rings

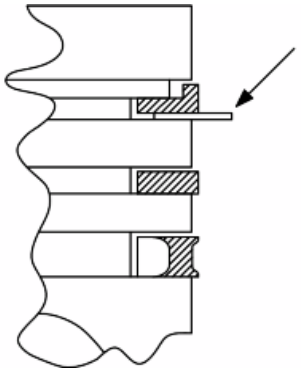
- Alternately insert the three sealing rings into the cylinder, in the area where it retains its original diameter. Using the piston, insert the rings perpendicularly to the cylinder axis.
- Make sure that each single sealing ring evenly adheres to the cylinder liner. If it does not, this means the ring is worn. Replace it.
- Measure the opening (see figure) of the sealing rings using a feeler gauge.
- If higher values than those prescribed are measured, replace the linings.

Check the size of the sealing ring opening:

Compression ring: 0.15 ÷ 0.35 mm. Max. value 0.5 mm

Oil scraper ring: 0.25 ÷ 0.50 mm. Max. value 0.65 mm

Oil scraper ring: 0.25 ÷ 0.50 mm. Max. value 0.65 mm



Rings/housing coupling clearances:

Carefully clean the sealing ring housings.

Place a thickness gauge between the ring and the housing as shown in the drawing and check the coupling clearances.

Top ring Standard coupling clearance:

0.01÷0.06 mm

Maximum clearances allowed after use: 0.10 mm

Intermediate ring Standard coupling clearance:0.02÷0.07 mm

Maximum clearances allowed after use: 0.10 mm

Oil scraper ring Standard coupling clearance:

0.01÷0.06 mm

Maximum clearances allowed after use: 0.10 mm

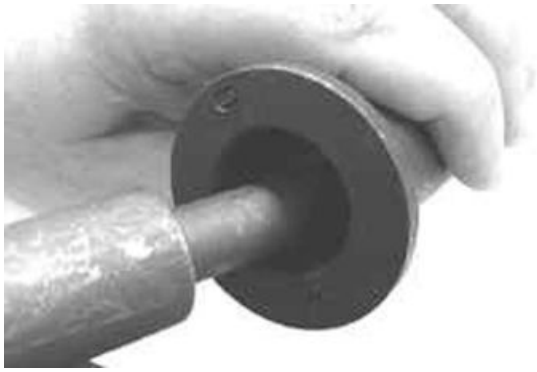
Replace the piston if clearances exceed the maximum limits specified in the table.

Removing the piston

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

- Insert the locking ring into the special tool, with the opening in the position indicated on the tool.
S = left
D= right

- Place the wrist pin stop ring into position using a punch



- Install the pin lock using the key shown in the figure.

Specific tooling

020470Y Pin retainers installation tool

N.B.

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

CAUTION

USING A HAMMER MIGHT DAMAGE THE STOPS' HOUSING.

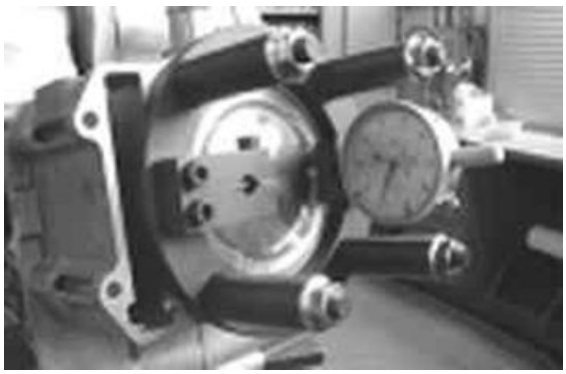
Choosing the gasket

- Provisionally fit the piston into the cylinder, without any base gasket.
- Install a comparator on the special tool using the short union, as shown in the figure.

Specific tooling

020475Y Piston position checking tool

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



- Identify the thickness of the cylinder base gasket to be used for reassembly by the table below. Correctly identify the cylinder base gasket thickness to keep the correct compression ratio.
- Remove the special tool and the cylinder.

N.B.

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

Characteristic

Recess / Projection measured 1

- 0.185 - - 0.10

Gasket thickness 1

0.4 ± 0.05

Recess / Projection measured 2

- 0.10 - + 0.10

Gasket thickness 2

0.6 ± 0.05

Recess / Projection measured 3

+ 0.10 ÷ + 0.185

Gasket thickness 3

0.8 ± 0.05

Refitting the piston rings

- Place the scraper ring spring on the piston.
- Install the scraper ring keeping the opening opposed to the spring junction and with the writing "top" facing the piston top. The chamfered side of the oil scraper ring should always be facing the piston crown.
- Fit the second lining with the identification letter or the writing "top" facing the piston crown. In any case, the step must be facing opposite the piston top.
- Install the first compression lining in the direction imposed by the housing.
- It is advisable to use a fitter to facilitate the installation of the linings.

N.B.

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

- Misalign the lining openings at 120° as shown in the figure.
- Lubricate the components with engine oil.
- The engine uses the first compression lining with an L section.

Refitting the cylinder

- Insert the cylinder base gasket with the thickness determined above.
- Using the fork and the ring clamp, fit the cylinder as shown in the figure.

N.B.

BEFORE FITTING THE CYLINDER, CAREFULLY BLOW THE LUBRICATION DUCT AND LUBRICATE THE CYLINDER LINER. CHECK THE PRESENCE OF THE TWO REFERENCE DOWELS.

Specific tooling

020468Y Piston fitting band

020512Y Piston fitting fork

Inspecting the cylinder head

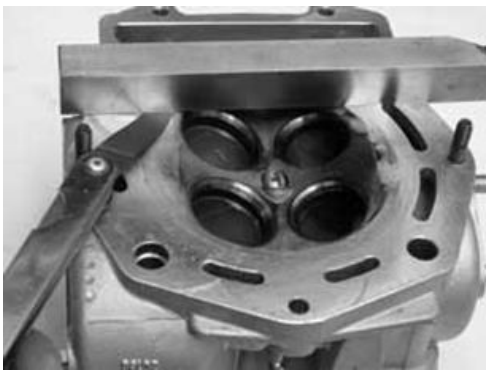
- Using a trued bar and a feeler thickness gauge check that the cylinder head surface is not worn or distorted.

Characteristic

Maximum allowable run-out:

0.1 mm

- In case of irregularities, replace the head.
- Check the sealing surfaces for the intake and exhaust manifold.
- Check that the bearings of the camshaft and the rocker pins exhibit no wear.
- Check that the head cover surface is not worn.
- Check that the coolant sealing pad exhibits no oxidation.



Inspecting the timing system components

- Check that the guide shoe and the tensioner shoe are not worn out.
- Check that the crankshaft pinion and the camshaft timing gear and crankshaft pinion exhibit no wear.

In case of wear of the sliding blocks, replace them.

In case of wear of the chain or rim, replace the entire unit.

N.B.

IF THE CHAIN HAS DAMAGED THE PINION, REPLACE THE CRANKSHAFT AS DESCRIBED IN CHAPTER CRANKCASE AND CRANKSHAFT.

Chain tensioner:

- 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.

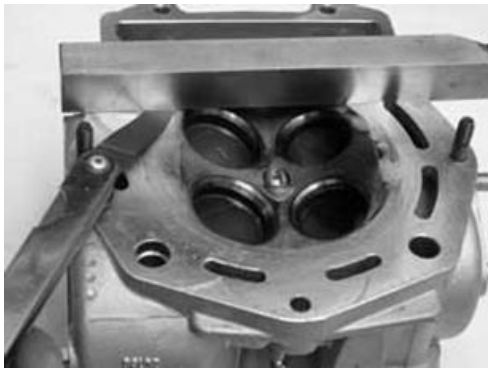
Inspecting the valve sealings

- Visually inspect the valve sealing surface.

CAUTION

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

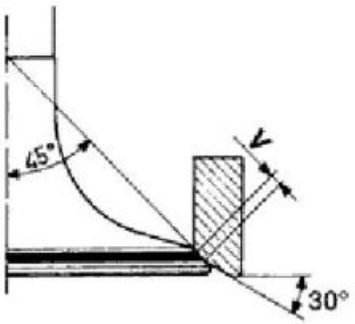
- If the sealing surface of the valve is found to be interrupted at one or more points or is not flat, replace the valve.



- 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

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



Characteristic

Standard value:

1 - 1.3 mm

Admissible limit:

1.6 mm

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

Inspecting the valves

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

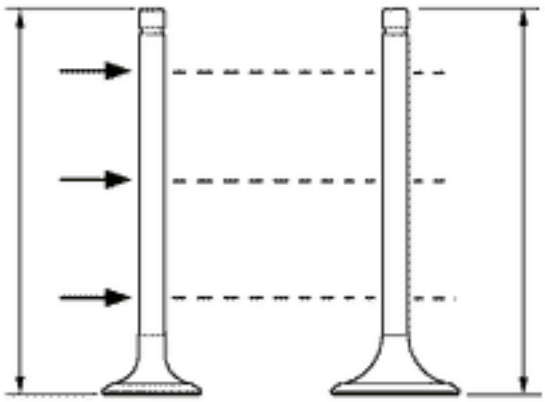
STANDARD DIAMETER

Specification	Desc./Quantity
Inlet:	4.987 - 4.972 mm
Outlet:	4.975 - 4.960 mm

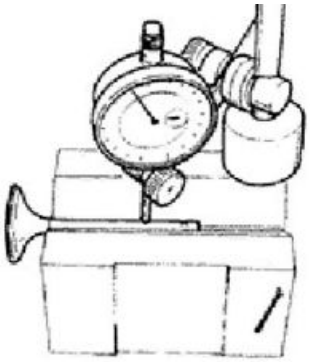
MINIMUM ADMISSIBLE DIAMETER

Specification	Desc./Quantity
Inlet:	4.96 mm
Outlet:	4.945 mm

- Calculate the clearance between valve and valve guide.



- Check the deviation of the valve stem by resting it on a "**V**" shaped abutment and measuring the extent of the deformation with a comparator.

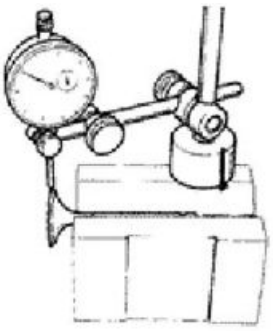


Characteristic

Limit values admitted:

0.1 mm

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



Characteristic

Admissible limit:

0.03 mm

Inspecting the valve stem guide clearance

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

INLET

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

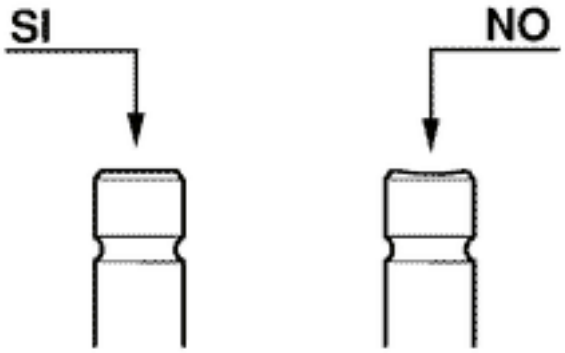
OUTLET

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

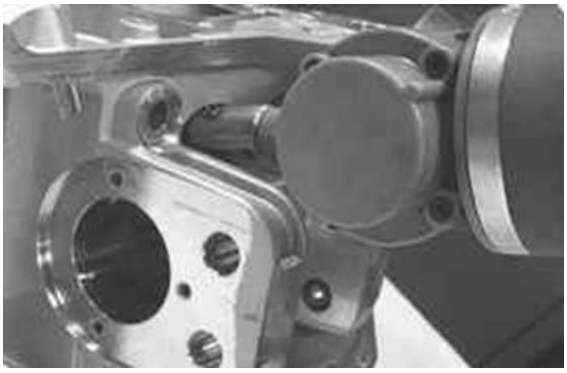
STANDARD VALVE LENGTH

Specification	Desc./Quantity
Inlet:	95.0 ± 0.3 mm
Outlet:	94.2 ± 0.3 mm

- 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. To obtain better sealing performance, grind the valve seats. Grind the valves gently with a fine-grained lapping compound. During the grinding, keep the cylinder head with the valve axes in a horizontal position. This will prevent the lapping compound residues from penetrating between the valve stem and the guide (see figure).



CAUTION

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

CAUTION

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

Inspecting the springs and half-cones

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

- Measure the unloaded spring length.

Characteristic

Standard length:

44.4 mm

Admissible limit after use:

42.4 mm

Refitting the valves

- Place the valve spring support washers on the head.
- Alternately insert the 4 oil guards using the special tool.
- Lubricate the oil guards and the valve guides.

Specific tooling

020306Y Punch for assembling valve seal rings

- Fit the valves, the springs and the caps. Using the appropriate tool with adapter, compress the springs and insert the cotters in their seats.

Specific tooling

020382Y Valve cotters equipped with part 012 removal tool

020382Y012 bush (valve removing tool)

N.B.

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

Inspecting the cam shaft

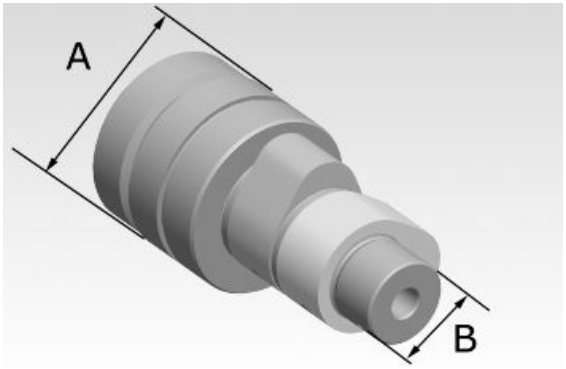
- Check that the camshaft bearings exhibit no scores or abnormal wear.
- Using a micrometer, measure the camshaft bearings.

STANDARD DIAMETER

Specification	Desc./Quantity
Bearing A Ø:	42 - 0.060 -0.085 mm
Bearing B diameter:	20 - 0.020 -0.041 mm

MINIMUM ADMISSIBLE DIAMETER

Specification	Desc./Quantity
Bearing A Ø:	41.910 mm
Bearing B diameter:	19.940 mm



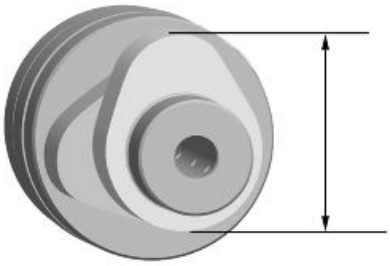
-Using a gauge, measure the cam height.

STANDARD HEIGHT

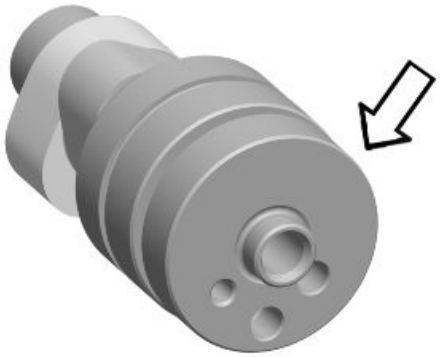
Specification	Desc./Quantity
intake	33.774 mm
discharge	33.273

ADMISSIBLE LIMITS

Specification	Desc./Quantity
intake	33.526 mm
discharge	33.026 mm
Standard axial clearance:	0 - 0.22 mm
Maximum admissible axial clearance:	0.3 mm



- 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 that the retaining plate seat shown in the figure exhibits no wear.



- Check that the automatic valve lifting device cam, the travel end roller and the rubber abutment on the containment bell are free from wear.
- Check that the valve lifting spring has not yielded.
- Replace any defective or worn components.

- Check that the rocking lever pins exhibit no scores or wear.

Characteristic

Standard diameter:

13 - 0.010 -0.018 mm

- Measure the inside diameter of each rocking lever.

Characteristic

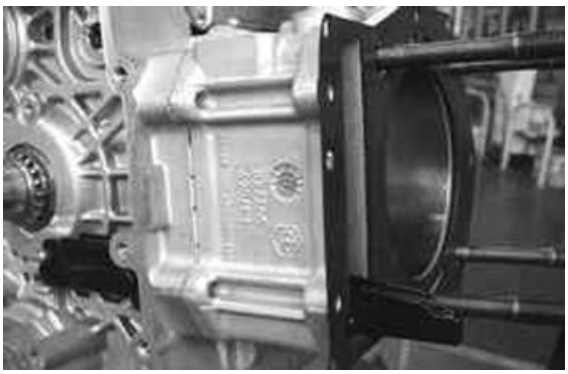
Standard diameter:

13 + 0.026 +0.015 mm

- Check that the cam contact sliding block and the articulated register plate is free from wear.
- In case of wear, replace the component.

Refitting the head and timing system components

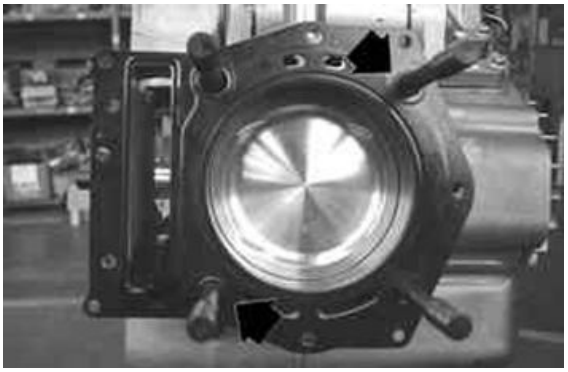
- Insert the chain guide sliding block.
- Insert the two centring dowels between head and cylinder.
- Install the head gasket.



N.B.

THE FIGURE SHOWS THE INSERTION POSITION OF THE TWO CENTRING DOWELS BETWEEN HEAD AND CYLINDER. THE DIRECTION OF INSTALLATION FOR THE GASKET IS FORCED BY THE DOWELS.

- The head gasket is made of steel and has a standard thickness.



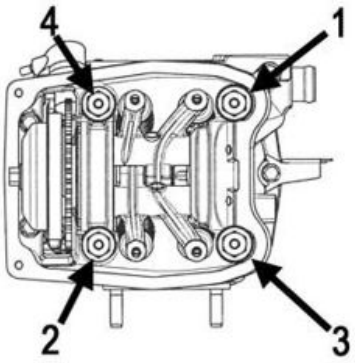
- Check that the head lubrication channel is perfectly clean. Clean with compressed air jets, if required.
- Insert the head.
- Lubricate the stud bolts and the 4 fixing stud bolts.

- Tighten the 4 fixing stud bolts crosswise to the prescribed torque as shown in the figure.

Locking torques (N*m)

Head fixing stud bolts ***

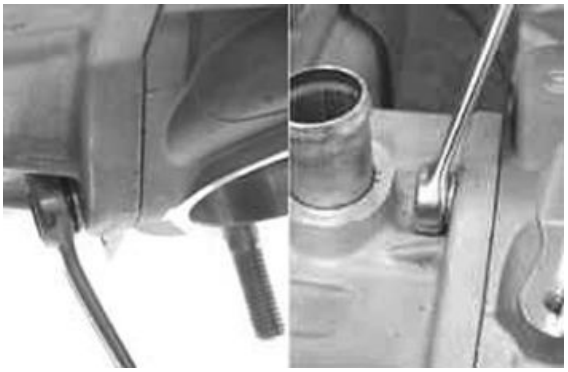
******* Apply a preliminary torque of 7 Nm in a crossed sequence.
- Tighten by 90° in a crossed sequence.
- tighten again by 90° in a crossed sequence.



- Tighten the fastening nuts on the exhaust and on the intake side to the prescribed torque.

Locking torques (N*m)

Exhaust / intake head fixing nuts **10 - 12**



- Tighten the 3 side screws to the prescribed torque.

Locking torques (N*m)

Head fixing screws 10 - 12

- Install the coolant temperature sensor with the washer and tighten to the prescribed torque.

CAUTION

FAILURE TO OBSERVE THE TIGHTENING TORQUE CAN DAMAGE THE SENSOR.

Locking torques (N*m)

coolant temperature sensor: 10 - 12

- Install the spark plug and tighten to the prescribed torque.

Locking torques (N*m)

Spark plug 12 ÷ 14

- Insert the timing control belt on the crankshaft according to the initial direction of rotation.
- Install the tensioner shoe with its spacer, tightening the bolt to the prescribed torque, using the recommended product.

Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

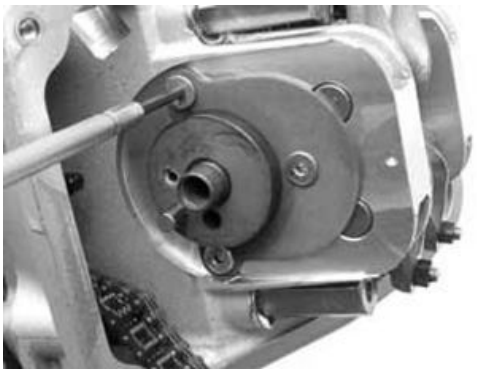
Locking torques (N*m)

Tensioner sliding block fixing screw 10 - 14

- Insert pins and rocking levers on the flywheel side.
- Lubricate the two rocking levers through the holes at the top.

- Clean the camshaft by blowing with little compressed air jets, especially the retaining plate housing.
- Lubricate the 2 shafts.
- Insert the camshaft into the head with the cams opposite the rocking levers.

- Remove any LOCTITE residues from the screws fixing the camshaft retaining bracket using a brush.
- Apply the recommended product to the fixing screws and tighten to the prescribed torque.



Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

- Insert the camshaft retain bracket with visible countersinks and tighten the 3 fastening screws to the prescribed torque, being careful not to damage the inside hexagon.

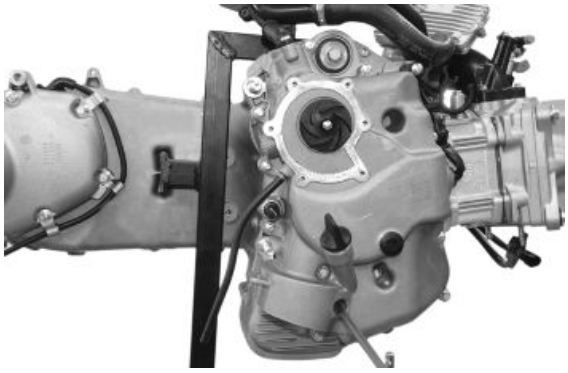
Locking torques (N*m)

Camshaft retaining bracket screws: 4 ÷ 6

- Install the intermediate gear with torque limiter, the flywheel and its cover, as described in Chapter "Flywheel and start-up system", and in Chapter "Flywheel cover".

N.B.

FOR MORE CONVENIENCE, INSTALL THE FLYWHEEL COVER WITHOUT THE COOLING SYSTEM SLEEVES.



- Using the TORX wrench, remove the timing check cap.

- Insert the belt on the camshaft control timing rim.
- Insert the timing rim on the camshaft checking that the references are aligned.

N.B.

DURING THE STROKE CHECK, KEEP THE BELT TENSIONED BY PRESSING ON THE TIGHTENER COMPARTMENT SIDE.

- Keeping the belt slightly pulled, turn the crankshaft using the driving pulley to make the reference on the magnet support collimate with that on the flywheel cover.

- Install the counterweight mass.
- Centre using the bell fastening screw.
- Lock the mass fixing screws to the prescribed torque, using the recommended product.

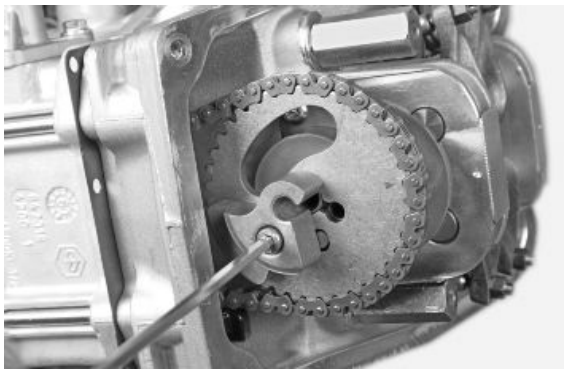
Recommended products

Loctite 243 Medium strength threadlock

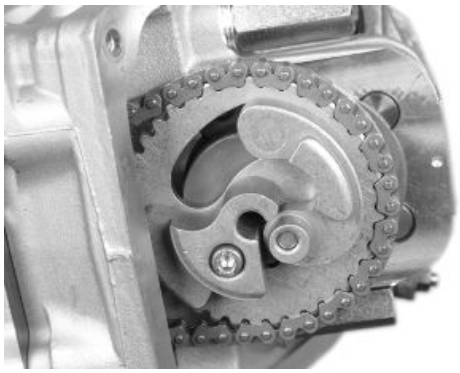
Loctite 243 medium-strength threadlock

Locking torques (N*m)

Counterweight screw 7 ÷ 8.5

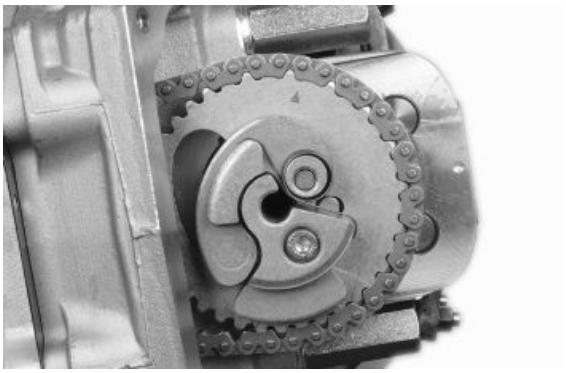


- Remove the central screw.
- Install the valve lifting mass being careful to the proper positioning of the travel end ring.
- Lubricate the mass and de-compressor control pin.



- Install the return spring and load it by about 3/4 turn.

- Turn the engine to move the references to the top as shown in the figure (intake end).



- Insert the valve lifting device mass stop bell.
- Tighten the retaining screw to the prescribed torque, using the recommended product.

N.B.

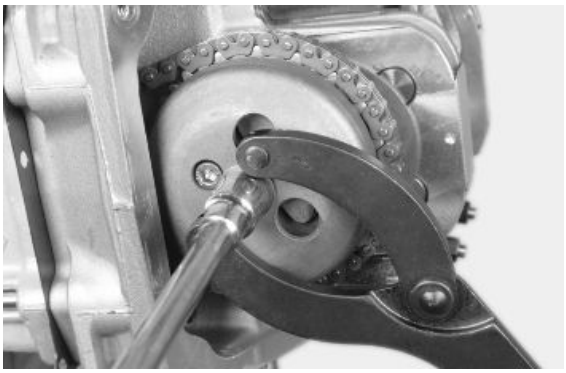
THE BELL TIMING IS ENSURED BY THE COUNTERWEIGHT MASS FASTENING SCREW HEAD.

Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

- Check that the decompression mass is free and that it is pulled by the spring.



Locking torques (N*m)

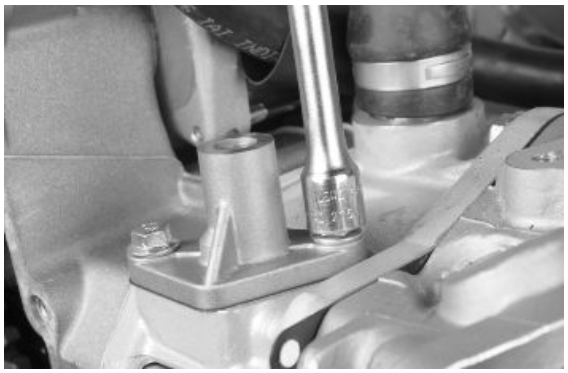
Valve lifter mass stop bell fixing screws **30 - 35**

- Place the tightener cursor in the rest position, keeping the retain tab pressed.

- Install a new tightener on the cylinder using a new gasket.
- Tighten the two fastening screws to the prescribed torque.

Locking torques (N*m)

Tightener fastening screws: 11 ÷ 13



- Insert the spring with the central screw and the washer.
- Tighten the central screw to the prescribed torque.

Locking torques (N*m)

Tightener screw: 5 - 6

- Place the engine with the valve clearance adjustment timing references aligned with the head.
- Check the clearance between valve and rocking lever using a thickness gauge.

PRESCRIBED CLEARANCE

Specification	Desc./Quantity
Inlet	0.15 mm (engine cold)
drainage	0.15 mm (engine cold)

- In case different values are found, adjust by loosening the lock nut and use a screwdriver for the set screw as shown in the figure.

Refitting the timing chain

Ignition advance is determined electronically on the basis of parameters known by the control unit. For this reason it is not possible to interpret the reference values based on the engine rpm.
The ignition advance value is detectable at any time using the diagnostic tester.
It is possible to check whether the ignition advance determined by the injection system matches the value actually activated on the engine, by means of the stroboscopic light.

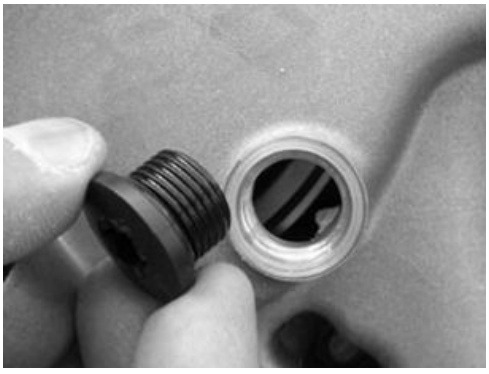
Specific tooling

020460Y Scooter diagnosis and tester

020330Y Stroboscopic light to check timing

Proceed as follows:
- Remove the outside transmission cover as described in the automatic transmission chapter.

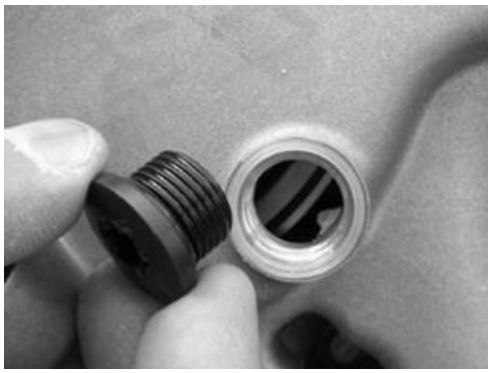
- Remove the TDC reference inspection cap between flywheel and crankcase cover. See the flywheel cover chapter.



- By the driving pulley, turn the engine to find the alignment of the references to identify the TDC.

- Repeat for the reference between driving pulley and transmission housing.

- Replace the inspection cap on the flywheel side.
- Connect the diagnostic tester.
- Start the engine.
- Select the «parameter» function in this menu.
- Select the stroboscopic light command in the traditional four-stroke engine position (1 spark 2 revs).
- Check that the real values of rpm and ignition advance match those measured using the diagnostic tester.



Specific tooling

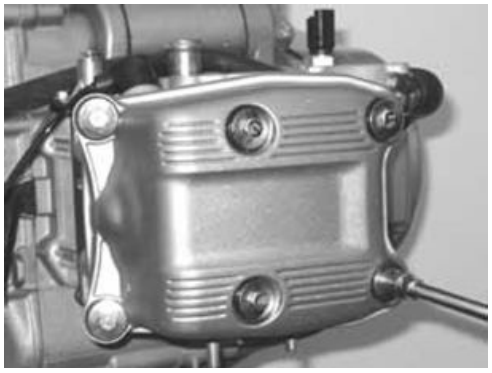
020460Y Scooter diagnosis and tester

If the values do not match, check:

- distribution timing
- rpm-timing sensor
- injection control unit

Refitting the rocker-arms cover

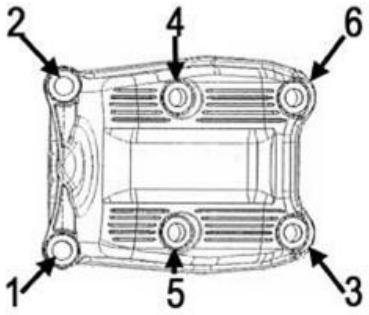
- Check that the gasket is in good working order.



- Tighten the two screws indicated in the figure with «**1**» and «**2**» to limit the reciprocal sliding of the cover surface with the head surface.
- Tighten the remaining 4 screws in a crossed sequence (**3**, **4**, **5**, **6**).

N.B.

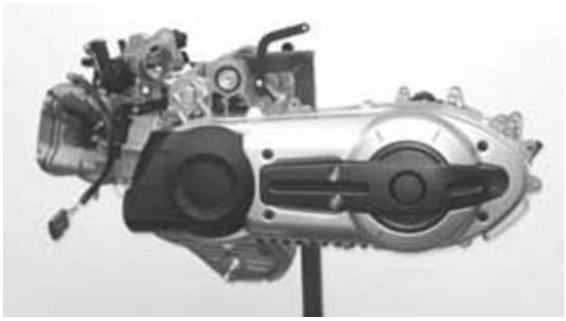
CHECK THE PROPER POSITION OF THE GASKET.



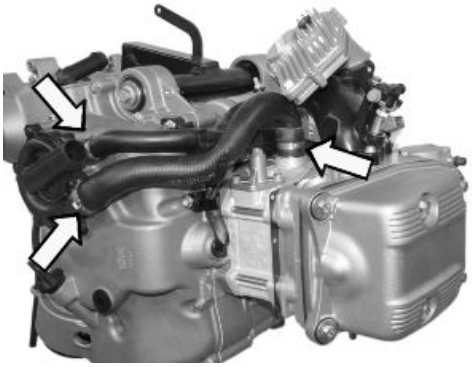
Locking torques (N*m)

Tappet cover fixing screws **7 - 9**

- Install the transmission cover and the relevant net filter and the outside transmission cover as described in the "Automatic transmission" chapter.

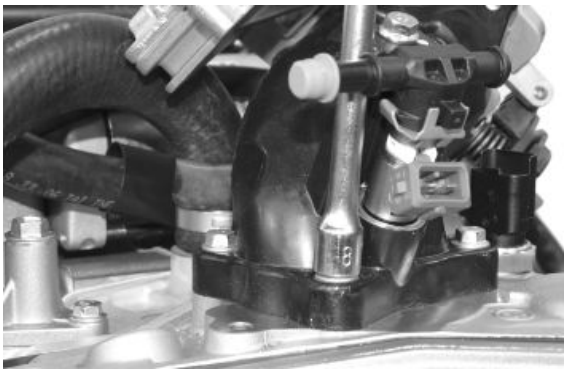


- Install the cooling system sleeves using new bands, as described in the "Flywheel cover" chapter.



Refitting the intake manifold

- Install the intake manifold on the engine.
- Insert the 3 fastening screws, one of which with a support band for the cooling system sleeve, and tighten to the prescribed torque.



Locking torques (N*m)

Inlet manifold screws **11 ÷ 13**

Crankcase - crankshaft

- Remove the outside and inside transmission cover and the complete driving pulley as described in "Automatic transmission".

- Remove the flywheel cover with the cooling system sleeves, as described in the "Flywheel cover" chapter.

- Remove the flywheel with the starting system following the instruction given in "Flywheel and Starting system".

- Remove the thermal group (cylinder, head, piston) as described in the «Thermal group and timing system chapter».

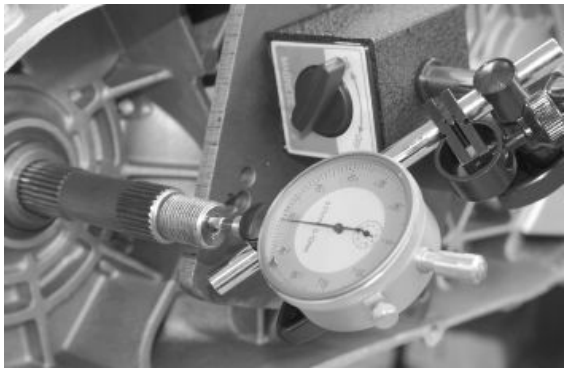
- Before opening the crankcase, check the crankshaft axial clearance.

For this purpose, use a plate (e.g. the special tool) and a support with special tool comparator.

Specific tooling

020262Y Crankcase splitting strip

020335Y Magnetic support for dial gauge



Characteristic

Standard clearance:

0.10 - 0.50 mm

Admissible increase limit after use:

0.60 mm

- Upper clearances are an indication of wear on the surfaces of the crankshaft casing support.

- To carry out an accurate measurement, measure the clearance in both directions between crankcase and crankshaft.

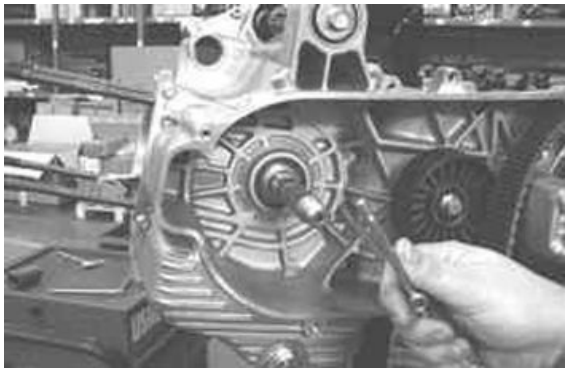
Splitting the crankcase halves

- Remove the engine support retain screw on the flywheel side half-crankcase.

- Remove the 14 crankcase coupling screws.

N.B.

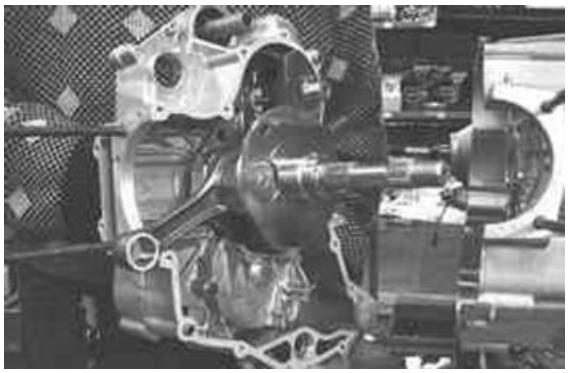
THE FASTENING SCREWS ARE OF 3 DIFFERENT LENGTHS. NOTE THEIR CORRECT POSITION.



- Split the crankcases while keeping the crankshaft inserted on the flywheel side half-crankcase.
- Remove the coupling gasket.

N.B.

THE BUSHING SUPPORT CAN BE LEFT IN THE FLY-WHEEL SIDE HALF-CRANKCASE.



Removing the crankshaft

- Before removing the crankshaft, check the timing with the countershaft. To carry out this check, turn the crankshaft to align the two holes obtained on the crankshaft with the hole on the countershaft control gear.
This is an optimal position also to remove the crankshaft.

- Remove the crankshaft with the shim adjustment washer on the flywheel side.

CAUTION

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

Removing the oil pump and countershaft control gear.

- To remove the control gear, loosen the 4 fastening screws.

Remove the gear only if actually required.

CAUTION

THE SCREWS HAVE A COUNTERSUNK HEAD AND THEIR THREADING IS LOCKED BY LOCTITE. BE CAREFUL NOT TO DAMAGE THE CONTROL HEXAGON. TO OBTAIN BETTER RESULTS IT IS PREFERABLE TO USE AN INSIDE HEXAGON SOCKET WRENCH.

Removing the countershaft

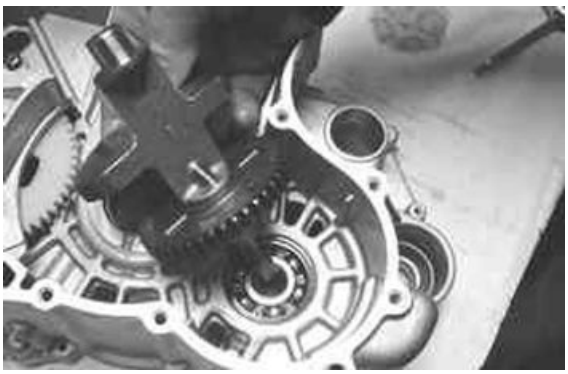
- Place the special tool as shown in the figure.

Specific tooling

020479Y Countershaft lock wrench

- Remove the fastening nut with relevant washer.

- Remove the special tool and extract the countershaft with the control gear.



Replacing the countershaft bearings

- Check that the bearings are free from irregular noise or clearance. If it does, replace it.

Flywheel-side half-crankcase

- Remove the inside Seeger ring.

- Upturn the half-crankcase.
- Remove the bearing from the flywheel side half-crankcase using the special tool and a mallet.

Specific tooling

020376Y Adaptor handle

020358Y 37x40-mm adaptor

020439Y 17 mm guide

- Remove the bearing from the transmission side half-crankcase using the special tool.

Specific tooling

001467Y008 Pliers to extract 17 mm ø bearings

001467Y007 Driver for OD 54-mm bearings

- Before installing a new bearing, heat the flywheel side half-crankcase using the special tool.
- Place the half-crankcase on a wooden base.

Specific tooling

020151Y Air heater

- Insert a new bearing on the special tool after greasing the guide seat.
- Install the new bearing on the half-crankcase using the special tool.

N.B.

IF A BEARING WITH PLASTIC CAGE IS USED, KEEP THE BALLS VISIBLE FROM THE CRANKCASE INTERNAL SIDE.

Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm adaptor

020439Y 17 mm guide

- Fit the Seeger ring.

- Before installing the new bearing on the transmission side crankcase, heat the seat using the special tool.

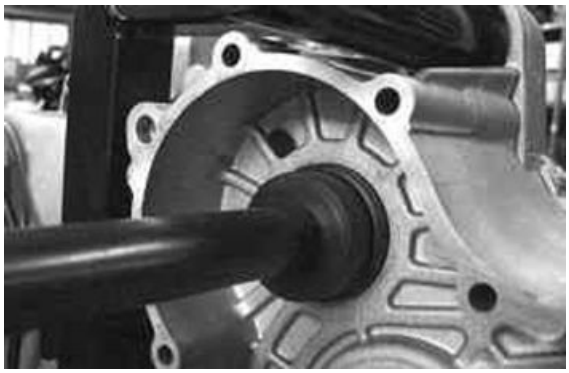
Specific tooling

020151Y Air heater

- Insert a new bearing on the special tool after greasing the guide seat.
- Install the new bearing on the engine crankcase using the special tool.

N.B.

IF A BEARING WITH PLASTIC CAGE IS USED, KEEP THE BALLS VISIBLE FROM THE CRANKCASE INTERNAL SIDE.



Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm adaptor

020439Y 17 mm guide

Inspecting the crankshaft components

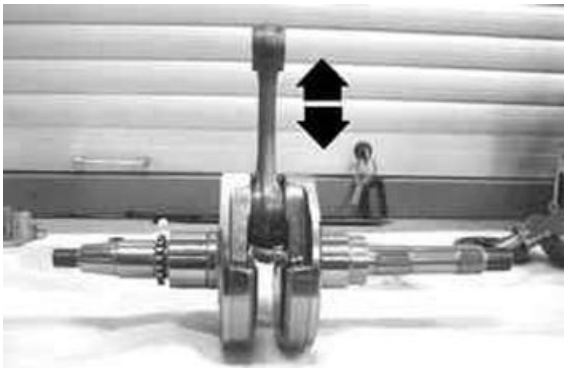
- Check the axial clearance on the connecting rod.

Characteristic

Standard clearance:

0.20 ÷ 0.40 mm

- Check the connecting rod diametrical clearance.

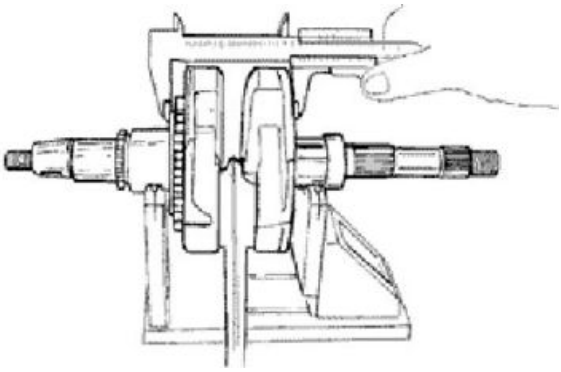


Characteristic

Standard clearance:

0.046 ÷ 0.076 mm

-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.



N.B.

BE CAREFUL NOT TO LET THE MEASUREMENT BE AFFECTED BY THE UNIONS WITH THE CRANKSHAFT ENDS.

Characteristic

Standard dimensions:

63.6 - 63.45 mm

CAUTION

THE CRANKSHAFT CAN BE REUSED WHEN THE WIDTH FALLS WITHIN THE STANDARD VALUES AND THE SURFACES ARE FREE FROM SCRATCHES.

Shimming

- Check the overall height of the crankshaft - shoulders - gear assembly.

Characteristic

Standard thickness:

71.804 - 72.000 mm

- Check that shim adjustment is free from scratches.

N.B.

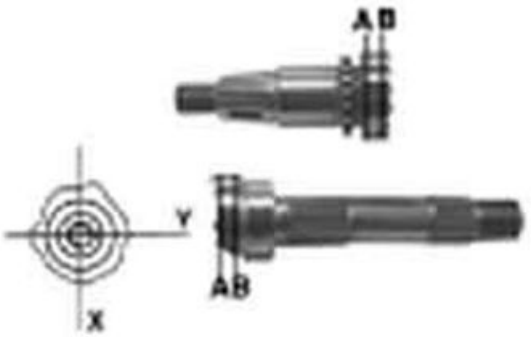
IN CASE OF NEW UTILISATION, MAINTAIN THE FIRST FITTING POSITION.

Specific tooling

020074Y Support base for checking crankshaft alignment

- If the crankshaft - crankcase axial clearance is higher than the standard value and the crankshaft exhibits no irregularity, the problem is caused by wear or by a wrong machining on the engine crankcase.

- Check the diameters of both the bearings of the crankshaft in accordance with the axes and surfaces shown in the figure. Half-shafts are classified into two categories, Cat. 1 and Cat. 2.



STANDARD DIAMETER

Specification	Desc./Quantity
Cat. 1	40.010 ÷ 40.016
Cat. 2	40.016 ÷ 40.022

Inspecting the crankshaft alignment

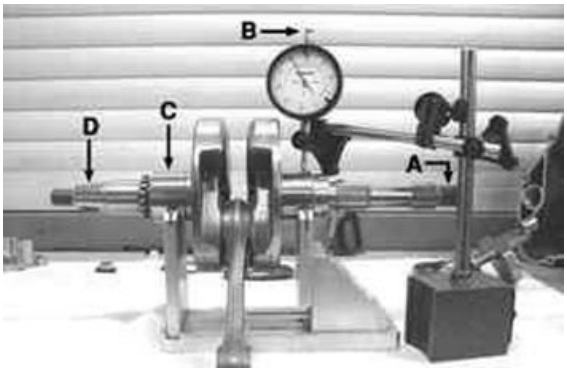
- Install the crankshaft on the support and measure the displacement at the 4 points shown in the figure.

Specific tooling

020074Y Support base for checking crankshaft alignment

MAX ADMISSIBLE DISPLACEMENT:

Specification	Desc./Quantity
A	= 0.15 mm
B	= 0.01 mm
C	= 0.01 mm
D	= 0.10 mm



- 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.

N.B.

MAIN BEARINGS CANNOT BE MODIFIED.

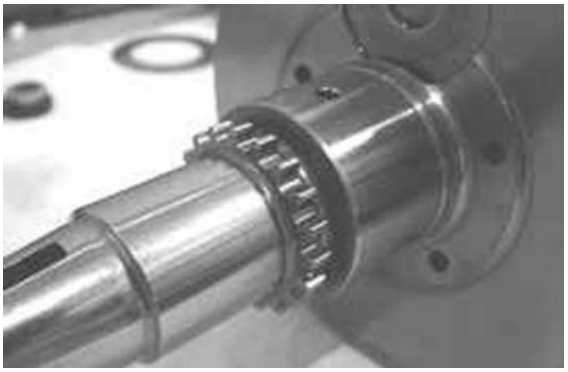
The connecting rod cannot be replaced. To check the connecting rod small end diameter, see chapter "Thermal group and timing system".

- When cleaning the crankshaft, be careful to prevent any impurity from entering into the shaft lubrication hole.

N.B.

IN CASE OF REPLACEMENT OF A CRANKSHAFT CONSISTING OF TWO HALF-SHAFTS OF DIFFERENT CATEGORY, REPLACE THE TWO HALF-CRANKCASES AS WELL, COUPLING THE TWO COMPONENTS (SHAFT AND CRANKCASE) WITH THE SAME CATEGORY.

- To check the gearing of the crankshaft, see section "Thermal group and timing system".



See also

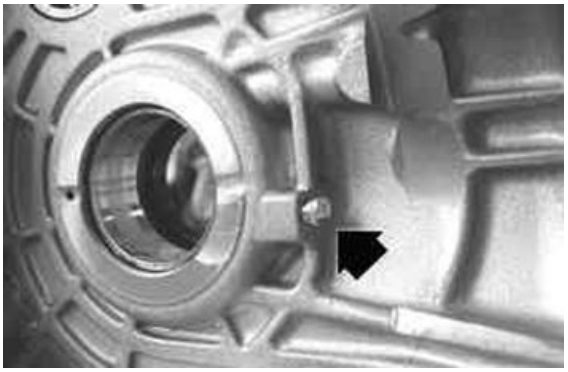
Cylinder assy. and timing system

Inspecting the crankcase halves

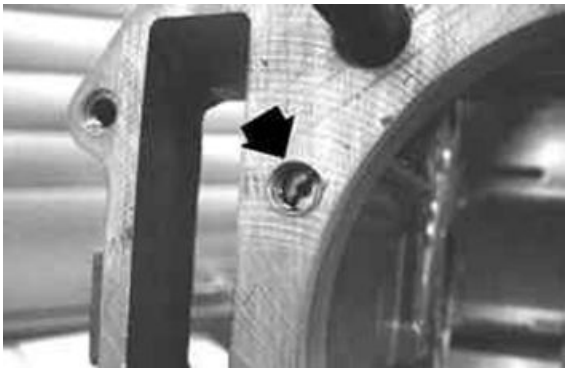
- Before proceeding to check the crankcase halves, thoroughly clean all surfaces and oil ducts.
- For the transmission-side half-crankcase, special attention should be given to the bushings, to the cooling jet on the transmission side (see figure) and to the lubrication duct.

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.



- For the flywheel side half-crankcase, special attention should be given to the lubrication channels for the main bearings and to the compartment and the channels for the oil pump, as well as to the duct for the by-pass located on the flywheel cover.



N.B.

AS ALREADY DESCRIBED IN THE "LUBRICATION" CHAPTER, IT IS ESPECIALLY IMPORTANT THAT THE BY-PASS HOUSING ON THE FLYWHEEL COVER IS FREE FROM WEAR THAT MAY IMPAIR THE PROPER SEALING OF THE LUBRICATION PRESSURE ADJUSTMENT PISTON. THE HEAD LUBRICATION CHANNEL IS EQUIPPED 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 in the main bearing and connecting rod lubrication pressure.

- Check that the surfaces exhibit no dents or deformations, with special attention to the crankcase coupling and the crankcase-cylinder surfaces.

- Any defects in the crankcase gasket or matching surfaces (see Flywheel cover coupling) can cause pressurised oil leaks, thereby affecting the connecting rod and main bearing lubrication pressure.

- Check the main bearing seats that limit axial clearance in the crankshaft show no signs of wear. For the dimensional check, refer to the instructions about checking the axial clearance and the dimensions on the crankshaft

Inspecting the crankshaft plain bearings

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

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

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

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

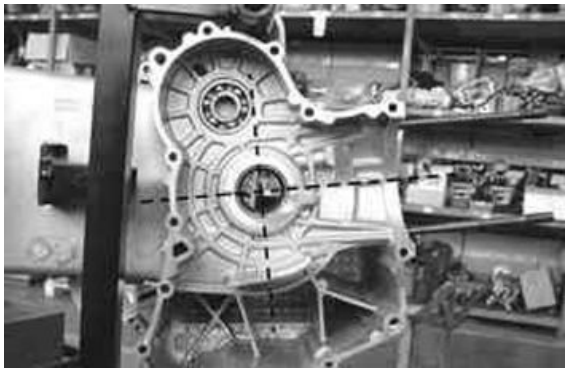
- The oil feeding channel section is also affected by the bushings driving depth compared with the crankshaft axial clearance of the limiting surface.

N.B.

TO KEEP THE BUSHINGS ON THE CRANKCASE IN SUCH POSITION, DRIVING IS FORCED ON CAST-IRON RINGS INSERTED IN THE CASTING OF BOTH CRANKCASE HALVES.

N.B.

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



See also

Crankcase - crankshaft - connecting rod

Coupling chart

The crankcase halves can be mounted with four types of crankshaft half-bearings identified by letters A (red), B (blue), C (yellow), D (green).

CRANKSHAFT

Specification	Desc./Quantity
Category 1	40.020÷40.026
Category 2	40.026÷40.032

CRANKCASE

Specification	Desc./Quantity
Category 1	43.974 ÷ 43.980
Category 2	43.980 ÷ 43.986
Category 3	43.986 ÷ 43.992

CRANKCASE - CRANKSHAFT COUPLING / CRANKSHAFT HALF-BEARINGS

Specification	Desc./Quantity
Crankshaft category 1 - Crankcase category 1	B+B, A+C
Crankshaft category 2 - Crankcase category 1	A+A
Crankshaft category 1 - Crankcase category 2	C+C, B+D
Crankshaft category 2 - Crankcase category 2	B+B, A+C
Crankshaft category 1 - Crankcase category 3	D+D
Crankshaft category 2 - Crankcase category 3	C+C, B+D

In case of breakdown, crankcases are together with bushings and are classified according to the centre to centre distance of the countershaft. Find below the possible couplings.

- Complete FC1 type crankcase equipped with bushings for housing a category 1 crankshaft and a countershaft with centre to centre distance A.
- Complete FC2 type crankcase equipped with bushings for housing a category 2 crankshaft and a countershaft with centre to centre distance A.
- Complete FC3 type crankcase equipped with bushings for housing a category 1 crankshaft and a countershaft with centre to centre distance B.
- Complete FC4 type crankcase equipped with bushings for housing a category 2 crankshaft and a countershaft with centre to centre distance B.

N.B.

THE CRANKSHAFT CATEGORY IS STAMPED ON THE COUNTERWEIGHT SHOULDER.

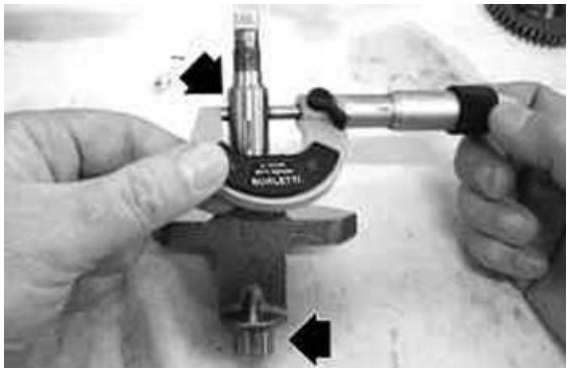
A spare crankcase cannot be combined with a driving shaft with mixed categories. Spare shafts have half-shafts of the same category.

N.B.

TO REPLACE THE HALF-SHAFTS, REMOVE THE COUNTERSHAFT BEARINGS AS DESCRIBED ABOVE. REMOVE THE COMPLETE DRIVEN PULLEY AND THE ANTI-FLAPPING ROLLER FROM THE TRANSMISSION SIDE HALF-CRANKCASE, AS DESCRIBED IN CHAPTER "AUTOMATIC TRANSMISSION", AND THE HUB COVER WITH THE RELEVANT GEARS AND BEARINGS AS DESCRIBED IN CHAPTER "FINAL REDUCTION".

Countershaft

- Using a micrometer, measure the 2 bearings of the countershaft as shown in the figure.



Characteristic

Standard diameter:

17 - 0.01 - 0.02 mm

- Check that the water pump drive is not worn.

Refitting the crankshaft

- Check that the oil pump and countershaft control gear are free from deformations or dents. Replace, if required.

N.B.

IF YOU HAVE TO REPLACE THE OIL PUMP AND COUNTERSHAFT CONTROL GEAR IT IS NECESSARY TO REPLACE THE COUNTERSHAFT GEAR AS WELL.

- Before installing the gear on the crankshaft, carefully clean the two matching surfaces removing any residues of LOCTITE from the holes using a brush.

Blow with compressed air and degrease the mounting holes on both surfaces to make the new LOCTITE grip.

Apply the recommended product to the holes again.

Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

- Repeat the same procedure for the 4 fastening screws.
- Insert the control gear on the crankshaft with the hole countersink visible.
- Tighten the 4 fastening screws to the prescribed torque.

N.B.

TO AVOID DAMAGING THE SCREW CONTROL HEXAGON, IT IS PREFERABLE TO USE AN INSIDE HEXAGON SOCKET WRENCH.

Locking torques (N*m)

Gear mounting on crankshaft screws 10 -12

- Lubricate the main bearing on the flywheel side half-crankcase.
- Lubricate the shim adjustment washer.
- Insert the shim adjustment washer on the crankshaft in its original position.
- Insert the special timing tool in the hole on the countershaft.

Specific tooling

020471Y Pin for countershaft timing

- Insert the crankshaft on the pin and into the bushing.
- Before inserting thoroughly, make the oil pump gear align with the control gear.
- Insert thoroughly and remove the special tool.

N.B.

WHEN INSERTING THE SHAFT ON THE HALF-CRANKCASE, BE CAREFUL NOT TO DAMAGE THE MAIN BEARING WITH THE THREADED TANG OF THE CRANKSHAFT AND WITH THE TIMING CONTROL TOOTHED PINION.

- Install the oil pump closing plate.
- Tighten the 2 flanged fastening screws to the prescribed torque.

Locking torques (N*m)

Bulkhead screws for oil pump housing cover 8 - 10

Refitting the crankcase halves

- Remove the oil guard from the transmission side half-crankcase using a screwdriver.

- Install a new oil guard after lubricating it, using the special tool, arranging it at a 0.5 mm recess from the crankcase plane.

CAUTION

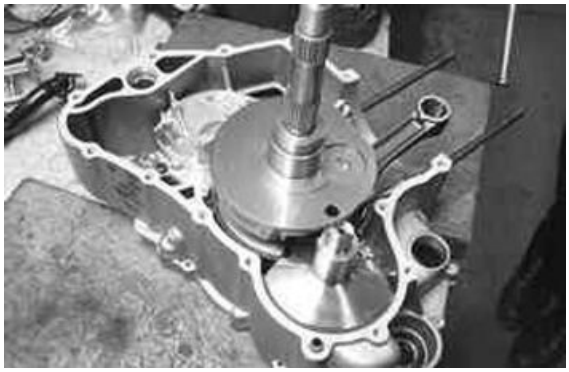
A WRONG POSITIONING OF THE OIL GUARD AFFECTS THE LUBRICATION OIL CIRCULATION.

Specific tooling

020360Y Adaptor 52 x 55 mm

020376Y Adaptor handle

- Insert the gasket on the flywheel side half-crankcase.



- Lubricate the main bearing on the transmission side half-crankcase.

- Couple the 2 half-crankcases being careful not to damage the bushing on the transmission side half-crankcase with the threaded tang of the crankshaft.

- Insert the engine support retain screw on the flywheel side half-crankcase without tightening.

- Insert the 14 fastening screws by arranging the single shorter screw «**A**» and the single longer screw «**B**» as shown in the figure.

- Tighten the screws thoroughly and tighten to the prescribed torque.

- Check that the crankshaft rotates freely.

N.B.

REMOVE ANY EXCESS FROM THE CRANKCASE COUPLING GASKET ON THE CYLINDER PLANE, TO ENSURE BETTER SEALING PERFORMANCE.

Locking torques (N*m)

Engine-crankcase coupling screws 11 ÷ 13

- Install the thermal group (cylinder, head, piston) as described in section «Thermal group and timing system».

- Install the flywheel with start-up control as described in the "Flywheel and start-up" chapter.

- Install the flywheel cover with the cooling system sleeves, as described in the "Flywheel cover chapter".

- Install the complete driving pulley, the transmission cover and the relevant mesh filter and the outside transmission cover as described in the section "Automatic transmission".

See also

Cylinder assy. and timing system
Flywheel cover

Lubrication

TECHNICAL SPECIFICATIONS

SUMP CAPACITY

Specification	Desc./Quantity
Overhaul	1.7 l
Oil and filter replacement	1.5 l

RECOMMENDED ENGINE OIL

Product	Description	Specifications
AGIP CITY HI TEC 4T	Engine oil	SAE 5W-40, API SL, ACEA A3, JASO MA Synthetic oil

OIL PUMP

Specification	Desc./Quantity
Type	Trochoidal
Rotor washers	8 mm
Assembly clearances	Lobe ends 0.05-0.008 mm
External rotor radial clearance	0.05- 0.12 mm
Rotor axial clearance	0.025 - 0.065 mm

BY-PASS

Specification	Desc./Quantity
Type	with piston
Plunger diameter	13.9 - 0.039 -0.057 mm
Spring free length	62.5 mm
Calibration pressure	4 bar

PRE-FILTER

Specification	Desc./Quantity
Type	mesh, plastic

OIL FILTER

Specification	Desc./Quantity
Type	Paper with pressure relief and anti-drain back by-pass valves

OIL MINIMUM PRESSURE INDICATOR LIGHT SWITCH

Specification	Desc./Quantity
Calibration	0.3 - 0.6 bar

HEAD LUBRICATION CONTROL JET

Specification	Desc./Quantity
Diameter	1 ± 0.05 mm *

**** Tightening torque** 5÷7 N·m*

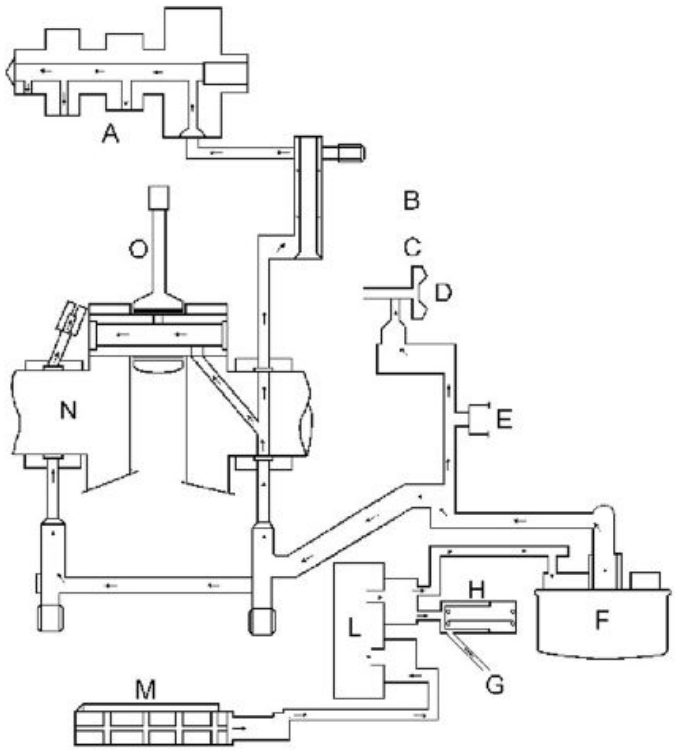
PISTON COOLING NOZZLE

Specification	Desc./Quantity
Diameter	0.8 ± 0.05 mm

CRANKCASE VENTILATION CHECK

Specification	Desc./Quantity
Device	metal reed valve and decantation chamber

Conceptual diagrams



PRINCIPLE DIAGRAM

Specification	Desc./Quantity
A	Camshaft
B	Cylinder-head plane
C	Cylinder-crankcase plane
D	Water pump impeller
E	Minimum oil pressure sensor

Specification	Desc./Quantity
F	Oil filter cartridge
G	To the oil sump
H	By-pass valve
L	Oil pump
M	Mesh pre-filter
N	Crankshaft
O	Connecting rod

General characteristics

The lubrication system is divided into two sections:

- High pressure

- Low pressure

The high pressure section includes all components located on the engine crankcase whereas the low pressure section only refers to the thermal group.

The trochoidal pump is installed in the sump and is controlled by a pair of gears.

To guarantee the integrity of the pump, a pre-filter is fitted.

This is a screw-in type pre-filter and the relevant plug serves at the same time as an engine oil drain plug.

The pump is controlled by means of a piston by-pass calibrated to 4 bar. This is located before the cartridge filter and both are installed on the flywheel cover, so that the seal of the filter is subject to the pressure of the circuit.

The by-pass located before the cartridge filter improves the operating conditions for the filter, particularly with cold oil.

The filter is equipped with an anti-drain back valve and a pressure relief valve; the latter intervenes when the filtering mass causes a pressure drop above 1 ± 0.2 bar.

These conditions naturally occur only with cold oil and at high engine revs or if the filter is clogged.

The filtered oil is used to lubricate the water pump shaft and once at the engine crankcase, to lubricate the main bearings, the connecting rod head and the piston cooling nozzle, on the transmission-side bearing.

The main bearing on the transmission side is fitted with an oil seal and the respective drain line.

The supply line for the timing system comes from the flywheel-side bearing; the supply to the head is controlled by the respective spray jets in the engine crankcase.

The components of the timing system function with low-pressure oil lubrication.

The camshaft bearings are installed directly on the aluminium of the head; the camshaft axial clearance is partially compensated by the oil supplied to the smaller diameter bearing.

The camshaft supplies the lubricant to the rocking levers via the holes provided; these are installed in a position to ensure that the lubrication is maintained even after the scooter has stopped. This is achieved when the camshaft reaches its most usual and likely position when the engine is shut off.

The oil used to lubricate the head returns to the sump via the chain casing channel and therefore it also provides lubrication for the chain.

A one-way valve and a decantation chamber are used so that gases from the crankcase do not carry any oil. The one-way valve is a metal reed valve; the decantation chamber has a drainage hole. A failure in these components implies oil getting into the line supplying air to the engine.
Excessive oil vapours may result in clogged ducts on the throttle body.
In order to signal low oil pressure in the system, a pressure switch is used, located immediately after the oil filter outlet.
The lubrication circuit does not include the countershaft. The countershaft is lubricated by the oil transported by the gears or by the centrifugal effect of the crankshaft
The same applies to the piston or the pin, but in this case the cooling nozzle is particularly important.

Diagnosis guide

1 - Minimum oil pressure warning light on with hot engine.

AHEAD - go to 2

2 - Remove the minimum pressure switch electric connector.

Check that the warning light turns off.

YES - go to 3 NO go to 11

3 Check the actual oil pressure.

AHEAD - go to 4

4 - Remove the switch and fit the special tool with the relevant gasket.

Specific tooling

020193Y Oil pressure gauge

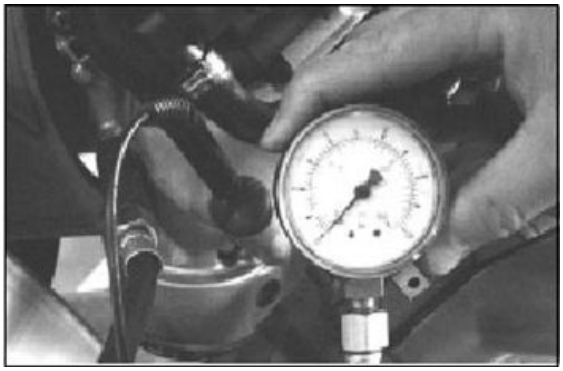
020434Y Oil pressure control fitting

- Remove the dipstick with the oil filling cap and insert a cap fitted with the temperature probe supplied with the special tool. Insert the probe to feel contact with the crankcase bottom and pull back a few millimetres.

Specific tooling

020331Y Digital multimeter

AHEAD - go to 5



5 - Measure the pressure with cold and idling engine.

STANDARD VALUES

Specification	Desc./Quantity
20°C Temperature	
1400 rpm	

approx. 4.5 bar

N.B.

RPM CAN BE MEASURED BOTH BY THE EXHAUST GAS ANALYSER AND BY THE DIAGNOSTIC TESTER

Specific tooling

020460Y Scooter diagnosis and tester

YES go to 6 NO go to 12

6 - Let the engine warm up and repeat the check with hot oil.

STANDARD VALUES

Specification	Desc./Quantity
80°C Temperature	
1400 rpm	

approx. 1.5 bar

YES go to 7 NO go to 8

7 - Replace the oil minimum pressure switch.

8 - If pressure lower than 1.3 ÷ 1.5 bar is measured.

AHEAD go to 9

9 - Replace the oil filter and repeat the pressure check with oil at 80°C.

YES go to 10 NO go to 13

10 - The failure was fixed.

It is recommended to respect the suggested number of kilometres covered.

11 - Check and restore the electrical system.

12 - If pressure lower than 4 bar is measured.

AHEAD go to 9

13 - Remove the flywheel cover and check the by-pass and the cover sealing gasket efficiency towards the case internal side, as described in the "Flywheel cover" chapter.

YES go to 14 NO go to 15

14 - Check whether there is an irregular clearance on the crankshaft:

- axial clearance (see the "Crankcase and crankshaft" chapter)
- radial clearance, especially in the direction of the cylinder axis
- clearance according to the direction of rotation with the connecting rod in quadrature

YES go to 16 NO go to 17

15 - Replace the faulty components ("Flywheel cover" chapter).

16 - Overhaul the engine ("Crankcase and crankshaft" chapter).

17 - Open the engine crankcase and remove the oil pump as described in the "Crankcase and crankshaft" chapter.

- Check the oil pump as described in the following pages.
- Check that the cooling nozzle and the timing system feeding jet are properly installed.
- Visually inspect the crankshaft couplings and their size ("Crankcase and crankshaft" chapter).

N.B.

POTENTIAL IRREGULARITIES IN COUPLINGS AND THE TIMING SYSTEM COMPONENTS CANNOT BE DETECTED WHEN INSPECTING THE LUBRICATION PRESSURE. THEY MAY BECOME EVIDENT BY AN INCREASE IN NOISE.

N.B.

IN CASE OF IRREGULAR PRESSURE ON THE CRANKCASE, CARRY OUT A VISUAL AND DIMENSIONAL INSPECTION OF THE TIMING SYSTEM COMPONENTS (SEE "THERMAL GROUP AND TIMING SYSTEM" CHAPTER).

Oil pressure check

1 - In case of oil leaks from the oil filter or from the flywheel cover coupling gasket, check the lubrication pressure.

AHEAD go to 2

2 - Install the special tool.

Specific tooling

020193Y Oil pressure gauge

020434Y Oil pressure control fitting

AHEAD go to 3

3 - Check the system pressure with cold engine and medium - high speed.

Standard pressure < 6 bar

YES go to 4 NO go to 5

4 - Replace the damaged components.

5 - Check the working order of the adjustment by-pass (see "flywheel cover" chapter) and restore proper sliding.

N.B.

STANDARD PRESSURES ARE OBTAINED USING OIL WITH THE PRESCRIBED VISCOSITY. A HIGHER VISCOSITY CAUSES AN INCREASE OF THE SYSTEM PRESSURE.

1 - If oil consumption is above 250 g/1000 km on a run-in engine, proceed as follows.

AHEAD go to 2

2 - Check the presence of oil at the scavenge duct on the filter box.

YES go to 3 NO go to 4

3 - Check the one-way reed valve and the decantation chamber drainage hole.

YES go to 5 NO go to 4

4 - Check the thermal group seals (piston rings, valve guides and oil guards), see "Thermal group and Timing system" chapter.

5 - Restore the valve or the drainage hole efficiency.

Oil pump

Removal

- Remove the closing plate of the oil pump housing by loosening the 2 retaining screws with their washers.

- Remove the oil pump complete with the gearing by loosening the 2 retaining screws through the eyes machined in the gearing proper.

- Remove the gasket.

- Remove the two screws and the oil pump cover.

- Remove the inside rotor retaining snap ring turning it to move the opening at the shaft face.

- Remove and wash the rotors thoroughly with petrol and compressed air.
- Extract the shaft with its gear and check that it is in good working order and free from wear.

- Reassemble the rotors in the pump body, keeping the two reference marks visible
- Insert the shaft with the gear and install the lock ring; then, turn it with the opening opposed to the shaft face.
- Check any irregular clearance between shaft and pump body.

- Using a thickness gauge, check the distance between the rotors in the position shown in the figure.

Characteristic

Admissible limit clearance:

0.012 mm

- Check the distance between external rotor and pump body; see figure.

Characteristic

Admissible limit clearance:

0.25 mm

- Check the rotor axial clearance using a rectified bar as reference plane, as shown in the figure.

Characteristic

Limit values admitted:

0.1 mm

Refitting

- Make sure the gasket is in the correct position.

N.B.

THE TOOTH OF THE GASKET MUST BE IN ITS SEAT.

- Lubricate the internal rotors.
- Check there are no signs of scoring or wear on the oil pump cover.
- If non-conforming values or signs of wear are found, replace the pump.
- Fit the pump cover in the position that permits the crankcase fixing screws to be aligned.
- Tighten the two fastening screws to the prescribed torque.

Locking torques (N*m)

Oil pump cover screws **0.7 ÷ 0.9**

- Insert the oil pump with gear

- Insert the 2 retaining screws through the slots on the gear and tighten to the prescribed torque.

N.B.

THE ASSEMBLY POSITION OF THE PUMP IS FIXED BY INSTALLATION OF THE SCREWS.

Failure to observe the tightening torque may alter the coupling clearance of the rotors with the pump body.

Locking torques (N*m)

Screws fixing oil pump to crankcase 5 - 6

- Insert the countershaft with gearing into the fly-wheel-side half-crankcase.
- Install the special tool in the position shown in the figure.

Specific tooling

020479Y Countershaft lock wrench

- Keep the countershaft in position and insert the washer with the nut.
- Tighten the nut to the prescribed torque, using the recommended product.
- Remove the special tool.

Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

Locking torques (N*m)

Countershaft fixing nut 25 ÷ 29

INDEX OF TOPICS

COMPONENT LAYOUT

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

MIU injection system

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

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

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

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

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

The system implements an idle feeding correction with cold engine through a Stepper motor on a by-pass circuit of the throttle valve. The control unit manages the Stepper motor and the injector opening time, thereby ensuring the idle steadiness and the proper combustion.
In all conditions of use, mixture preparation is managed by modifying the injector opening time.
The fuel supply pressure is kept constant based on the ambient pressure.

The **fuel supply circuit** consists of:

- Fuel pump
- Fuel filter
- Injector
- Pressure regulator

The pump, the filter and the regulator are placed inside the fuel tank on a single support.
The injector is connected by a pipe with fast-release fitting. The pressure regulator is located at the beginning of the circuit.
The fuel pump is controlled by the MIU control unit ; this ensures the scooter safety

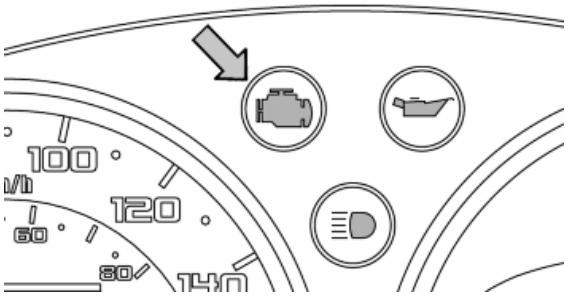
The **ignition circuit** consists of:

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

The MIU control unit manages ignition with the best advance ensuring four-stroke timing (ignition only in the compression phase) at the same time.
The MIU injection-ignition system controls engine functions by means of a pre-set program.
Should any input signals fail, an acceptable working order of the engine is ensured to allow the user to reach a service station.
Of course, this cannot happen when the rpm-timing signal is missing, or when the failure involves the control circuits:

- Fuel pump
- HV coil
- Injector

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

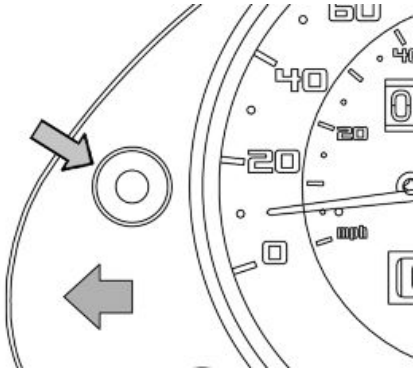


Failures are detected and restored by the diagnostic tester.
In any case, when the fault is no longer present, the data storage is automatically cleared after 16 cycles of use (cold start, running at regular engine temperature, stop).
The diagnostic tester is also required to adjust the idle mixture.

Specific tooling

020460Y Scooter diagnosis and tester

The MIU injection-ignition system carries out checks on the rpm indicator and the electric fan for radiator cooling.
The MIU control unit has a decoder for the anti-theft immobilizer system.
The MIU control unit is connected to a diagnostic LED on the instrument panel, that also carries out the deterrent flashing functions.



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

Precautions

Troubleshooting hints

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

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

A: Electrical power supply

a. Battery voltage

b. Blown fuse

c. Remote controls

d. Connectors

B: Chassis earthing

C: Fuel supply

a. Broken fuel pump

b. Dirty fuel filter

D: Ignition system

a. Faulty spark plug

b. Broken coil

c. Broken shielded cap

E: Intake circuit

a. Dirty air filter

b. Dirty by-pass circuit

c. Faulty Stepper motor

F: Other

a. Incorrect distribution timing

b. Wrong idle mixture

c.Incorrect reset of the throttle valve position sensor

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

Check the connections as follows:

A check that the terminals are not bent.

B check that the connectors have been properly connected.

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

3 Check the entire system before replacing the 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%.

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

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

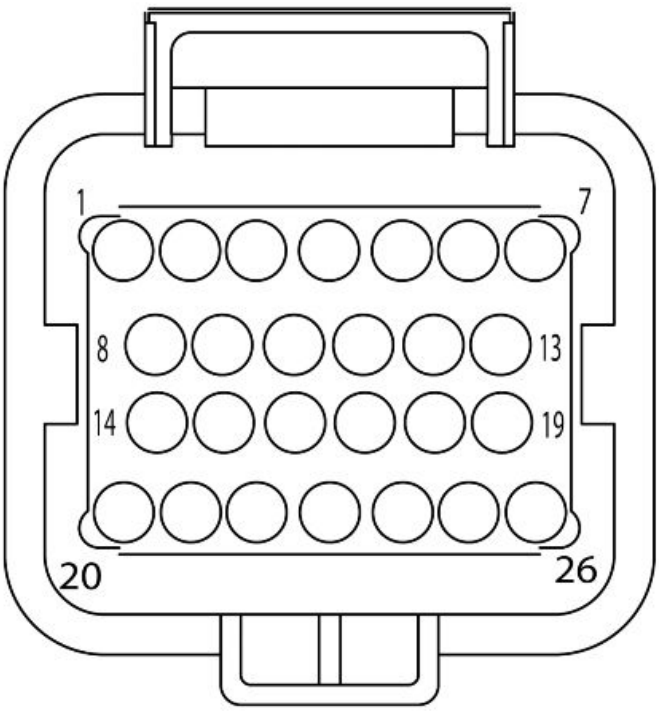
3. When fixing electric components, operate with battery connected only when actually required.

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 terminal is perfectly clean.

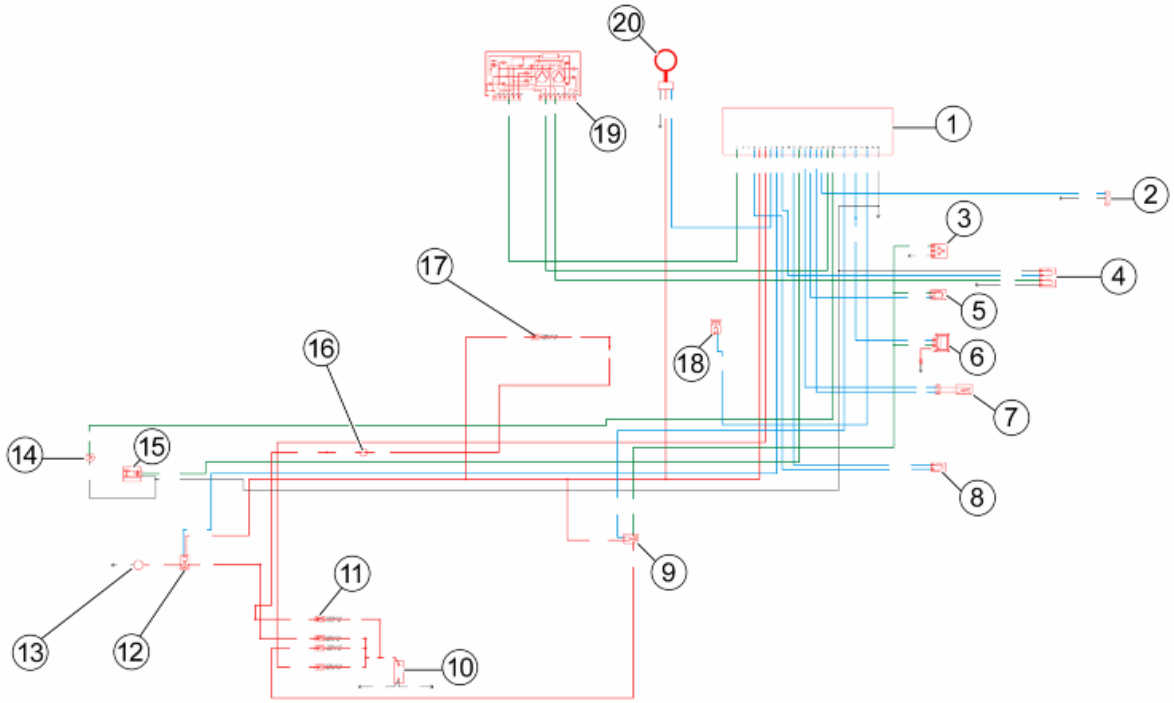
Terminals setup



TERMINAL LAYOUT

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

EMS circuit diagram



SYSTEM DIAGRAM

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

Troubleshooting procedure

Engine does not start

ENGINE DOES NOT START IF ONLY PULLED

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

Starting difficulties

ENGINE START-UP PROBLEMS

Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector revolution timing sensor Air temperature Coolant temperature
Start up engine speed	Starter motor and remote control Battery Ground connections

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

Engine stops at idle

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

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

Engine does not rev down

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

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

Possible Cause	Operation
	Pressure regulator Fuel filter Injector capacity

Exhaust backfires in deceleration

EXHAUST BACKFIRES WHEN DECELERATING

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

Engine revs irregularly

ENGINE IRREGULAR PERFORMANCE WITH VALVE SLIGHTLY OPEN

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

Poor performance at full throttle

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

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

Engine knocking

PRESENCE OF KNOCKING (COMBUSTION SHOCKS)

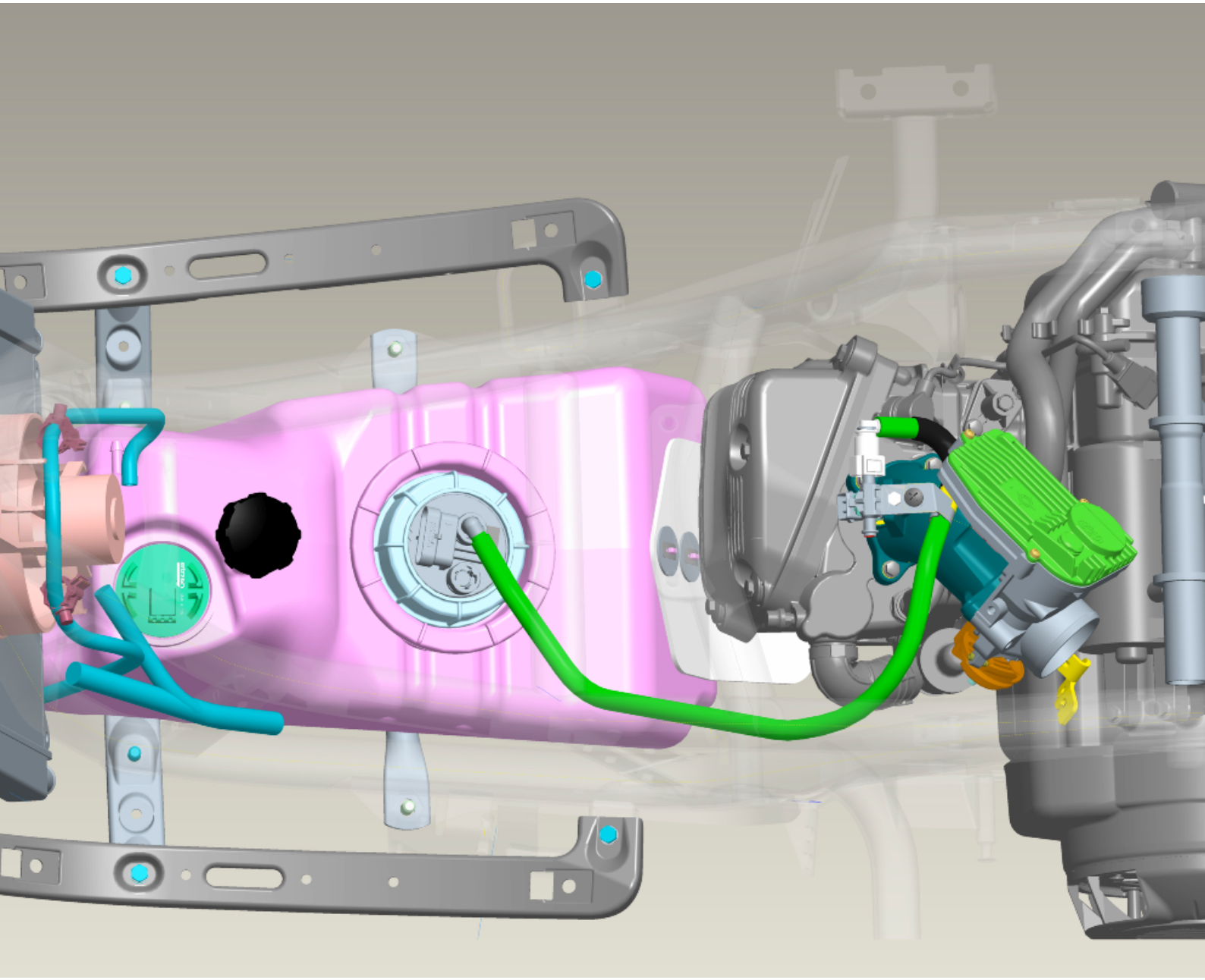
Possible Cause	Operation
Presence of faults detected by the self diagnosis	Pump relay HV coil Injector revolution timing sensor Air temperature Coolant temperature Lambda sensor
Ignition efficiency	Spark plug
Parameter reliability	Throttle valve position signal Coolant temperature indicator Intake air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

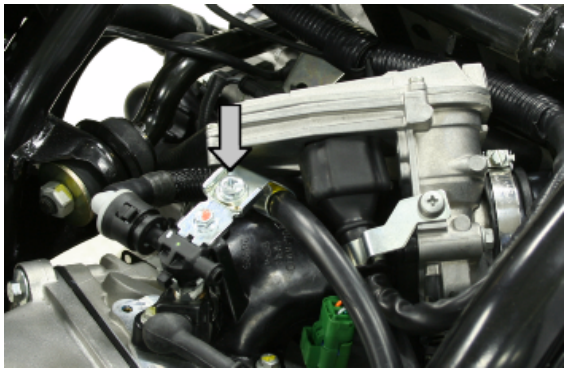
The electrical pump is located in the tank from which the fuel is pumped and sent to the injector through the filter.

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

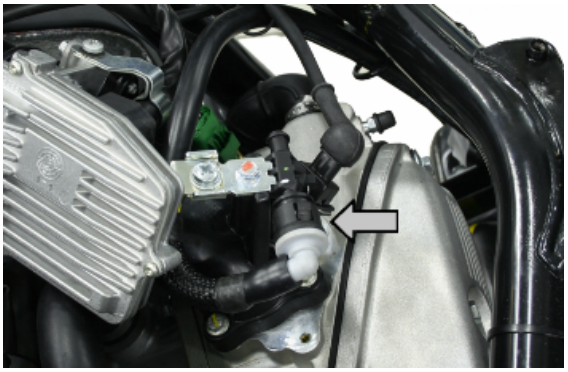


Removing the butterfly valve

Remove the fuel piping clamping screw indicated in the figure.

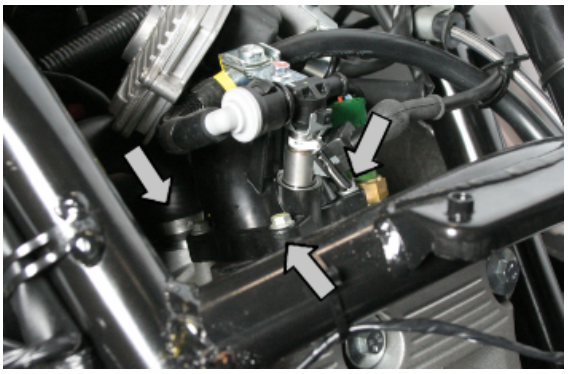


Remove the fast-release fitting from the injector support.

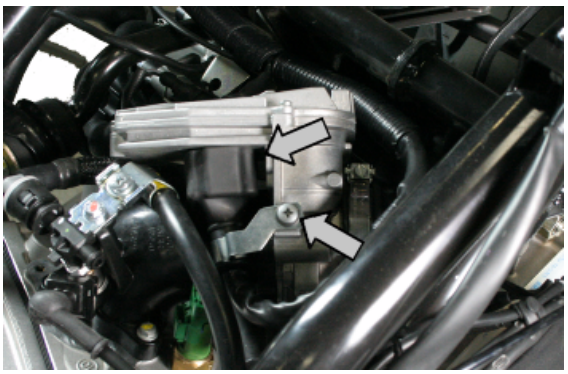


Remove the injector connector.

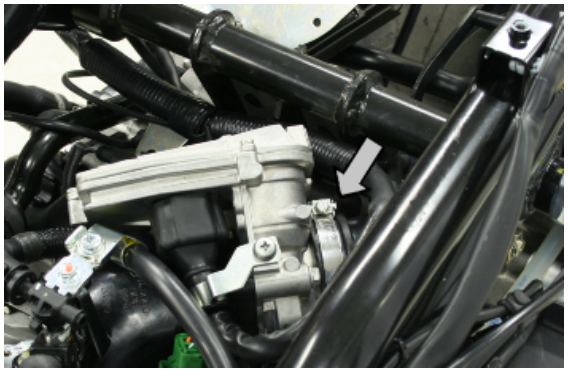
Remove the three screws fixing the manifold to the cylinder head and the clip fixing the throttle body to the manifold.



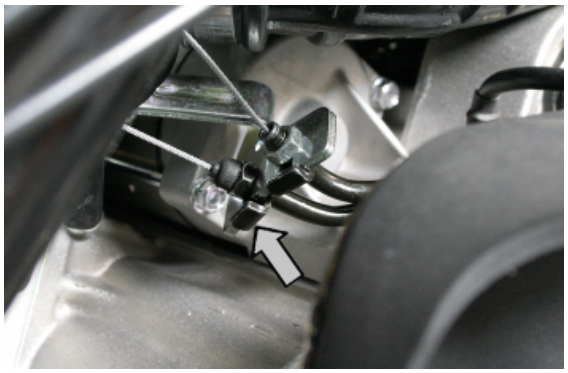
Remove the MIU ECU connector.



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

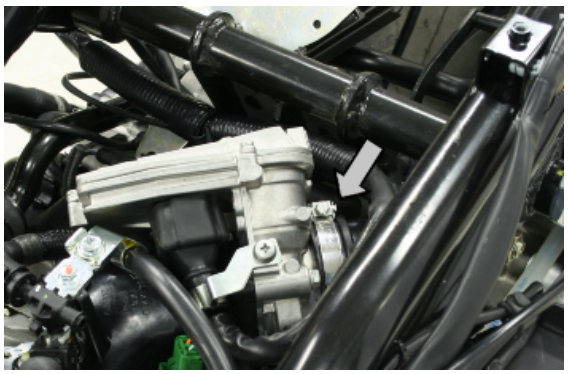


Remove the gas command fitting as indicated in the photograph

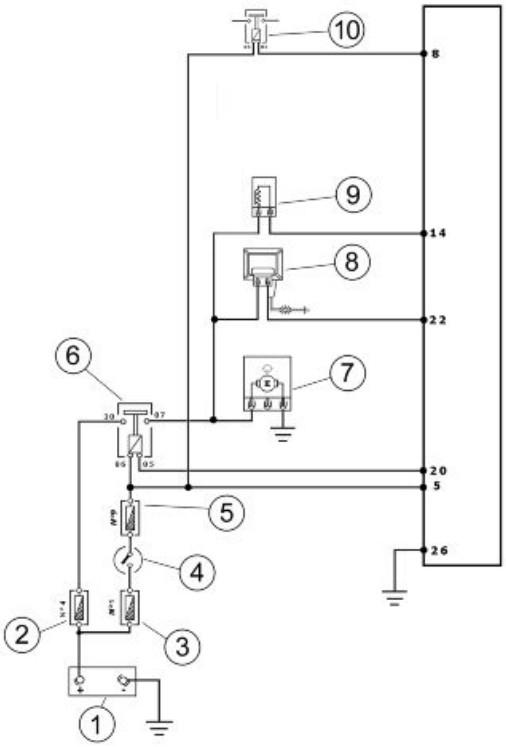


Refitting the butterfly valve

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



Pump supply circuit



INJECTION LOADS

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

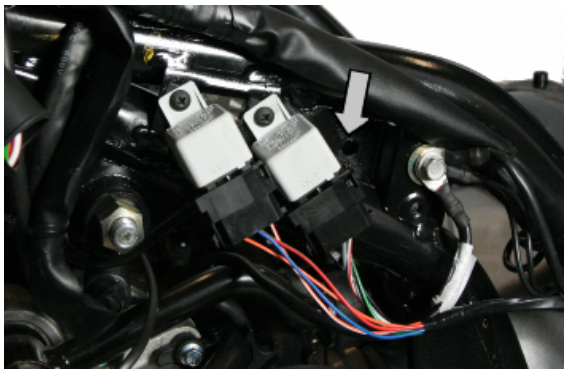
When switched to «ON», the fuel pump starts to rotate for 2 seconds and then stops. When the engine starts up, in the presence of rpm timing signal the pump is continuously supplied.

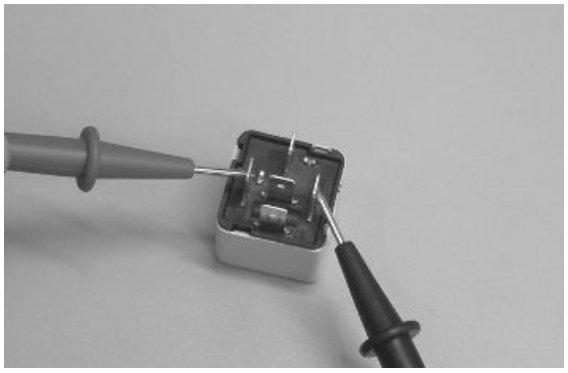
ELECTRICAL DATA

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

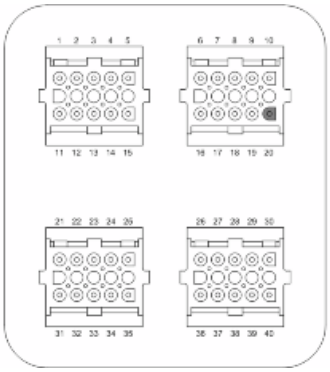
Check the efficiency of 10 A fuse N° 4 injection load .
Check the efficiency of 7.5 A fuse No. 9 key-controlled control unit power supply.

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





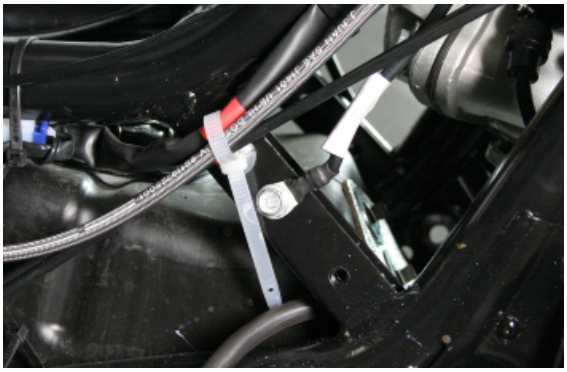
Check the power supply line of the injection load remote control energising coil: after switching to «ON», make sure there is battery voltage, for 2 seconds, between the Red-White cable and the Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-White cable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



N.B.

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

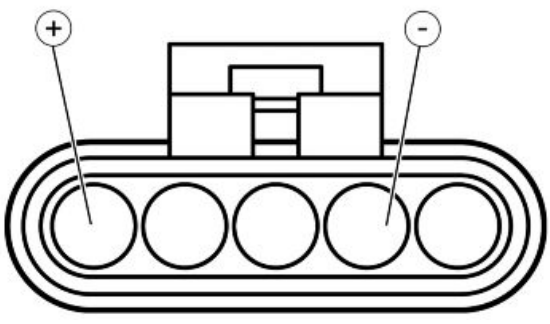
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.



N.B.

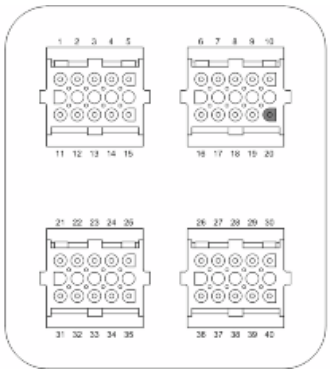
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).

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



Check the efficiency of the earth line of the fuel pump by measuring the continuity between the

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



Specific tooling

020331Y Digital multimeter

Circuit leak test

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

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

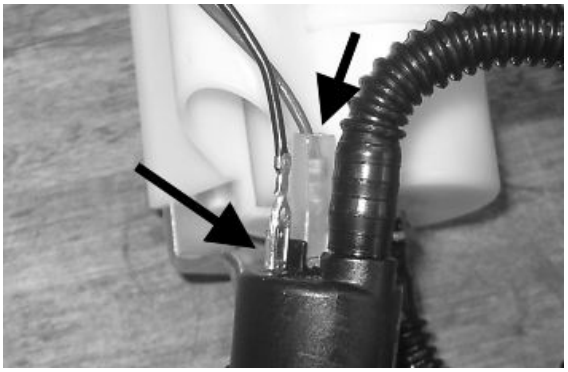
With the battery voltage > 12 V, check the pump flow rate by disconnecting from the injector the pipe equipped with the pressure gauge of the appropriate tool. Make a graded burette available with a flow rate of approximately 1 L. Rotate the pump using the active diagnosis of the palm top computer. Using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

Specific tooling

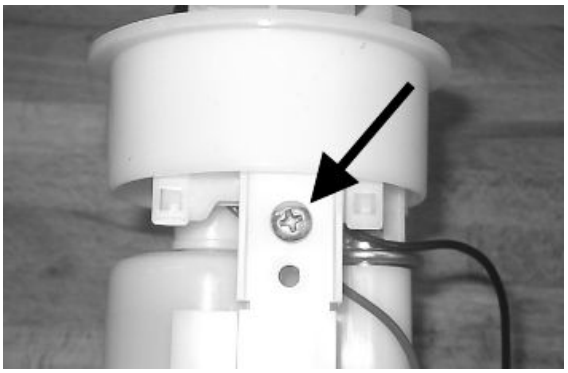
020480Y Petrol pressure check set

Fuel filter check

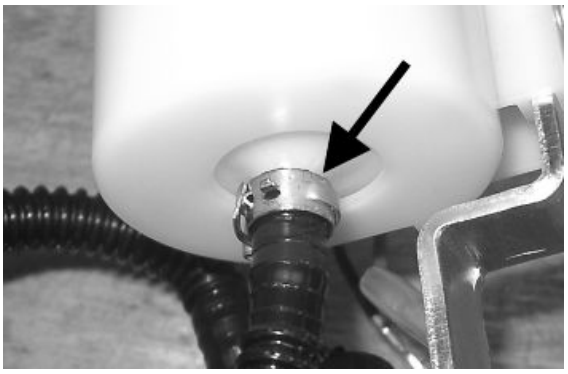
Disconnect the terminals from the electric pump



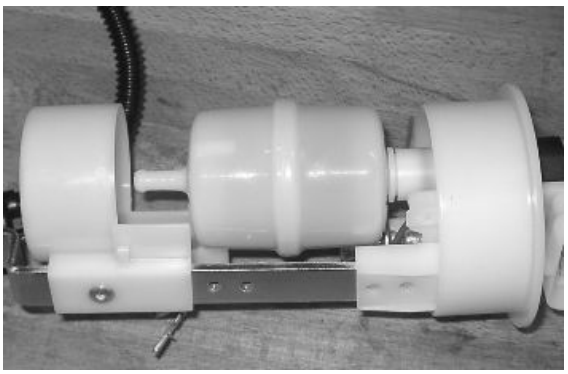
Remove the screw shown in the photograph



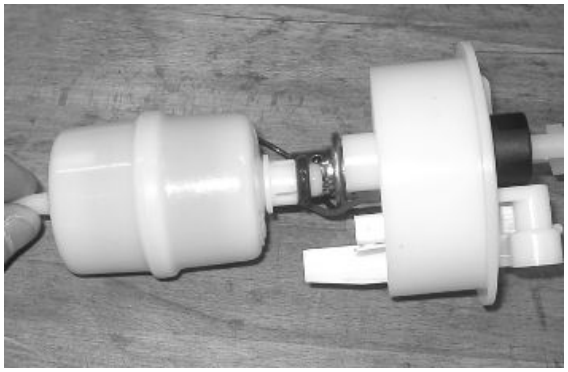
Remove the clip fixing the piping to the filter shown in the photograph



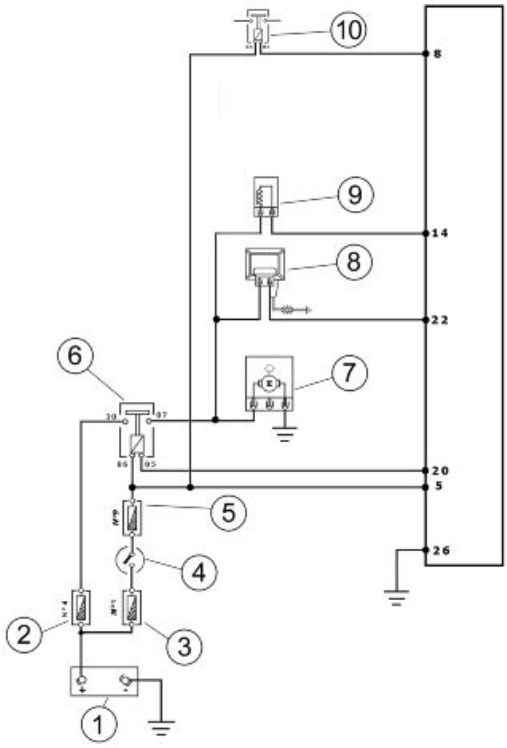
Separate the lower part of the pump support as shown in the photograph.



Remove the filter from the pump support



Inspecting the injector circuit

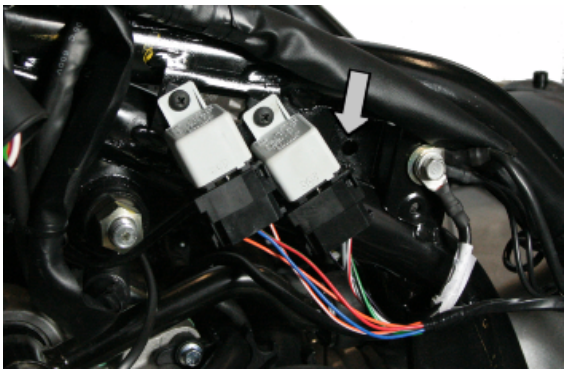


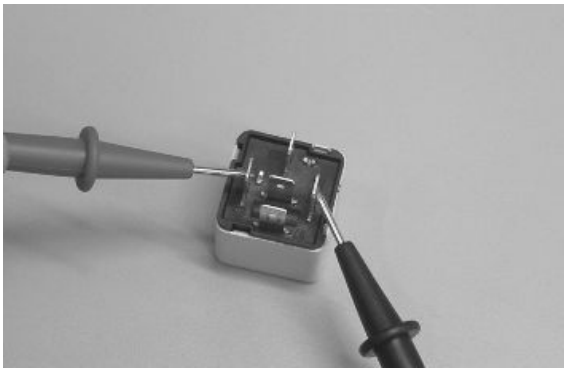
INJECTION LOADS

	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	
9	Fuel injector	
10	Electric fan remote control	

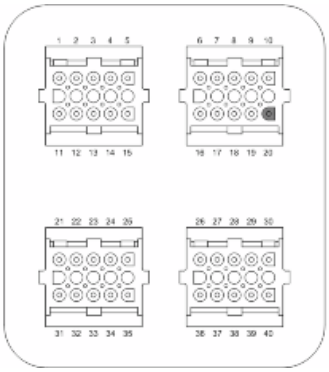
Check the efficiency of 10 A fuse N° 4 injection load .
Check the efficiency of 7.5 A fuse No. 9 key-controlled control unit power supply.

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.





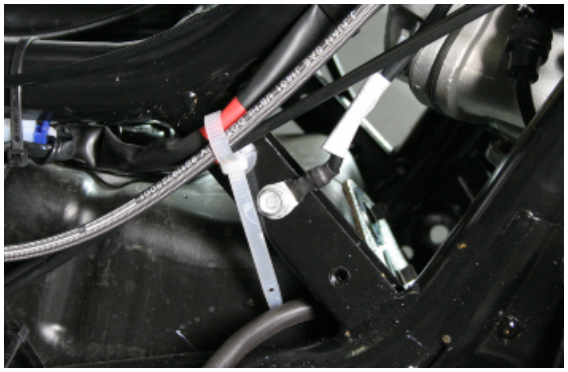
Check the power supply line of the injection load remote control energising coil: after switching to «ON», make sure there is battery voltage, for 2 seconds, between the Red-White cable and the Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-White cable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



N.B.

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

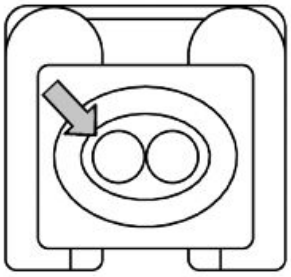
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.



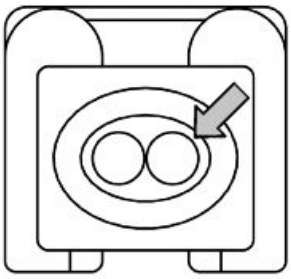
N.B.

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

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



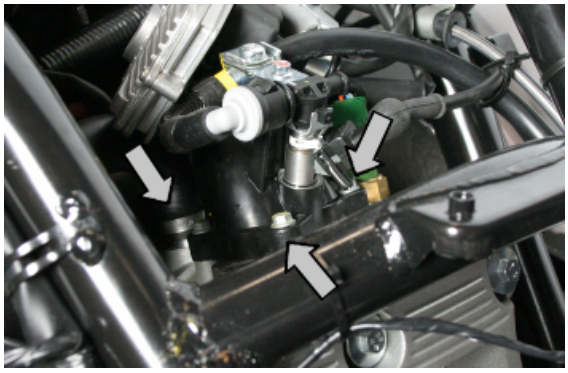
Switch to «ON» and check if there is voltage, with injector disconnected and control unit connected, between the Black-Green cable of the injector connector and the ground lead



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

Inspecting the injector hydraulics

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



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

Specific tooling

020480Y Petrol pressure check set

Proceed with the injector seal test.

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

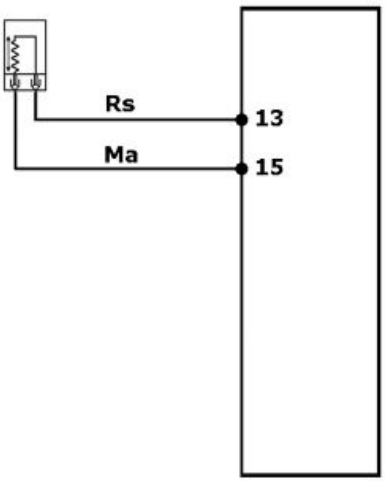
Value limit = 1 drop per minute

Components location

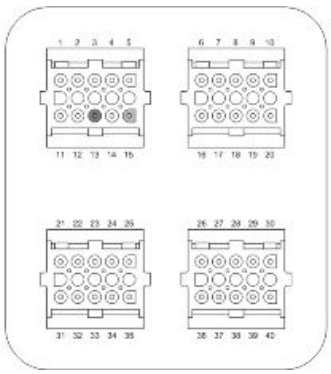
COMPONENT LAYOUT

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

Tachometer



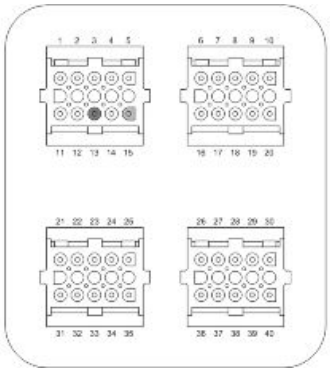
With wiring disconnected from the control unit and connected to the system, check that the sensor resistance between pins 13 - 15 is between 100 and 150 Ohm at an engine temperature of approximately 20°



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

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

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

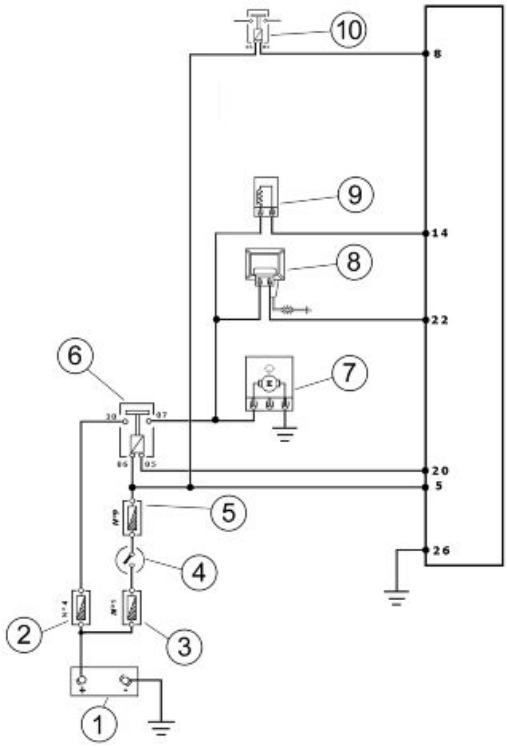


Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter

HT coil



INJECTION LOADS

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

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

The control unit manages two important parameters:

- Ignition advance

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

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

- Magnetisation time

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

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

Specific tooling

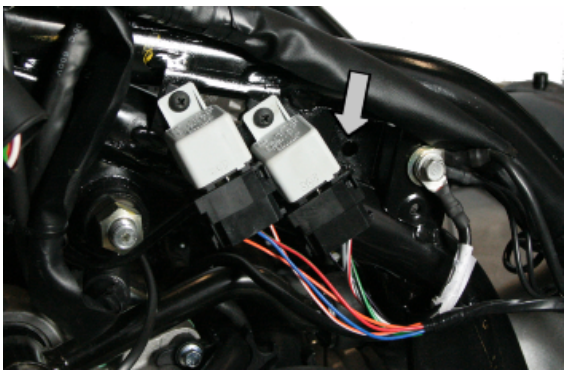
020331Y Digital multimeter

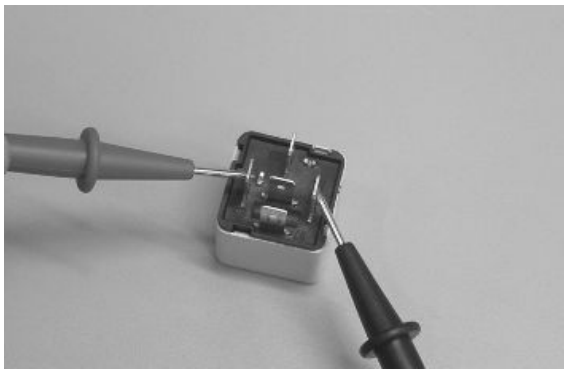
Check the efficiency of 10 A fuse N° 4 injection load .

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

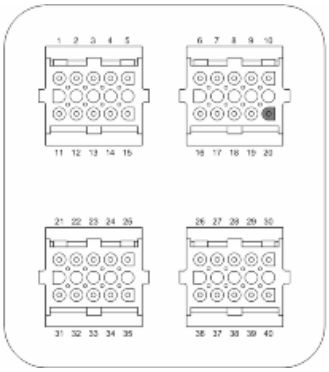
Check the efficiency of the injection load remote control: Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm

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





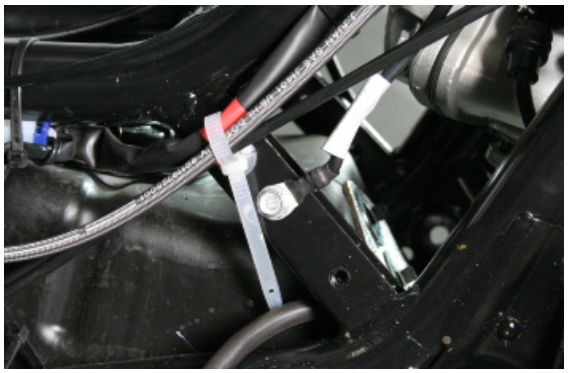
Check the power supply line of the injection load remote control energising coil: after switching to «ON», make sure there is battery voltage, for 2 seconds, between the Red-White cable and the Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-White cable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



N.B.

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

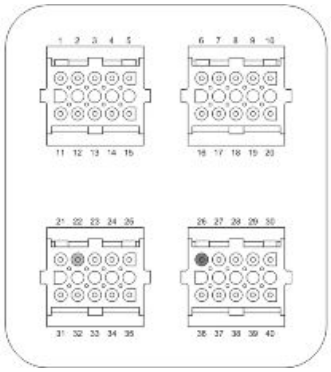
Check the presence of fixed voltage between the grey/black cable of the remote control base and earth. If there is none check the continuity of the grey/black cable between the fuse box (No. 4 10 A) and the remote control base.



N.B.

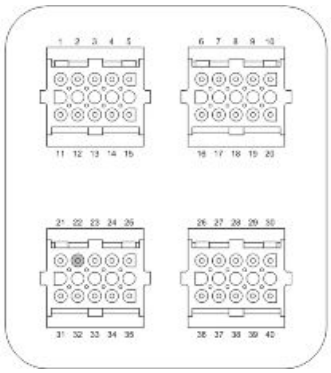
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).

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

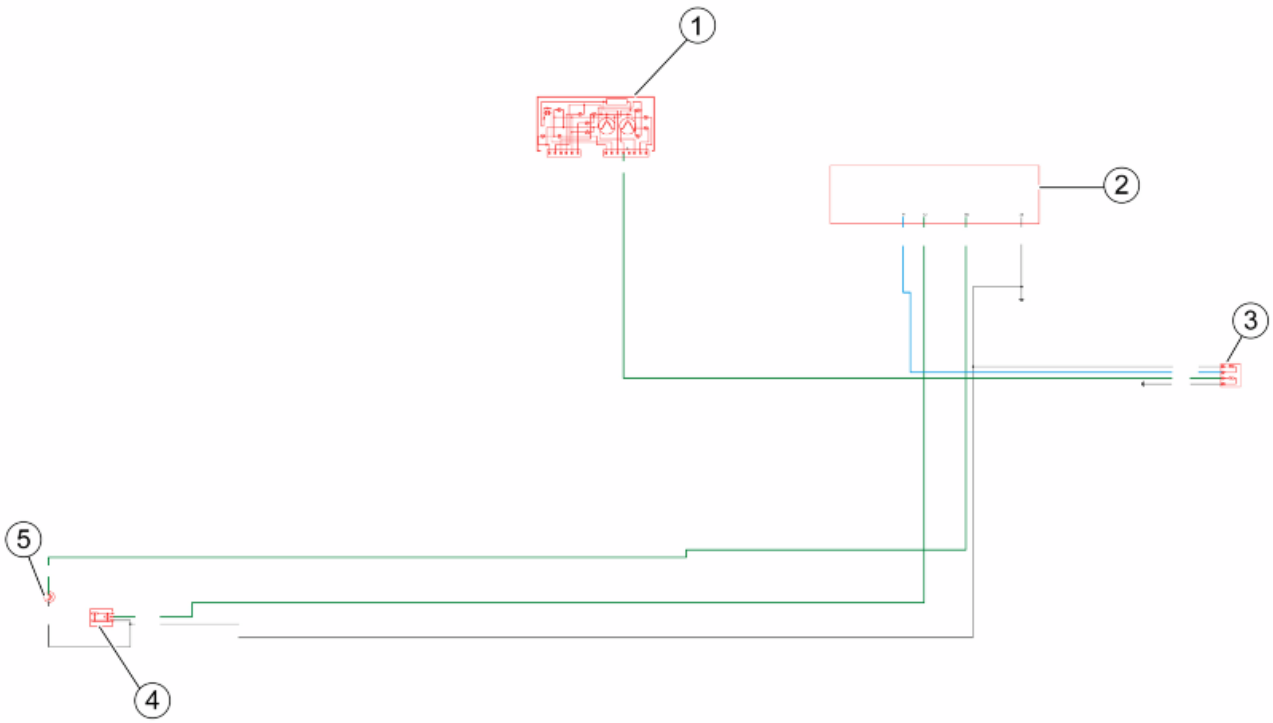


Check the resistance of the primary coil between pin 22 of the interface wiring and the green black cable of the injection load remote control base with the control unit disconnected and the remote control disconnected.

Resistance of the primary = 0.5 ± 8% Ohm



Coolant temperature sensor



TEMPERATURE SENSOR

	Specification	Desc./Quantity
1	Instrument panel	
2	Electronic control unit	

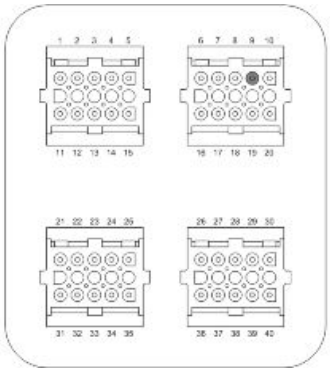
	Specification	Desc./Quantity
3	Water temperature sensor	
4	Engine stop switch	
5	Side stand switch	

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

20° = 2500 ± 100 Ω

80° = 308 ± 6 Ω

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

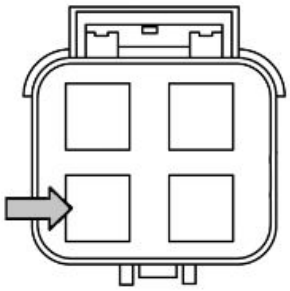


With the connector on the control unit side disconnected and the coolant temperature connector disconnected, check the continuity between pin 9 of the interface cable harness and the light-blue/green cable of the connector.

Specific tooling

020481Y Control unit interface wiring

020331Y Digital multimeter



Zeroing the throttle

Resetting the throttle valve position signal (TPS reset)

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

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

Pre-calibration ensures optimal air flow to control idling.

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

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

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

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

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

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

To reset, proceed as follows.

Connect the diagnostic tester.

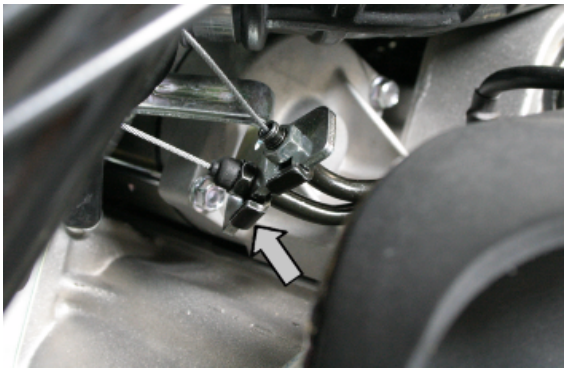
Switch to «**ON**».

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

Specific tooling

020460Y Scooter diagnosis and tester

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



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

Reset should be performed in the following cases:

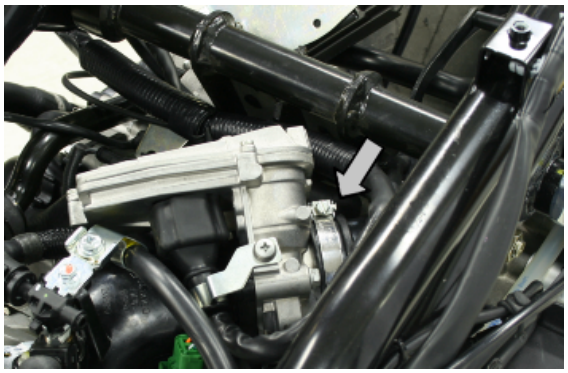
- on first fitting.

- if the injection control unit is replaced.

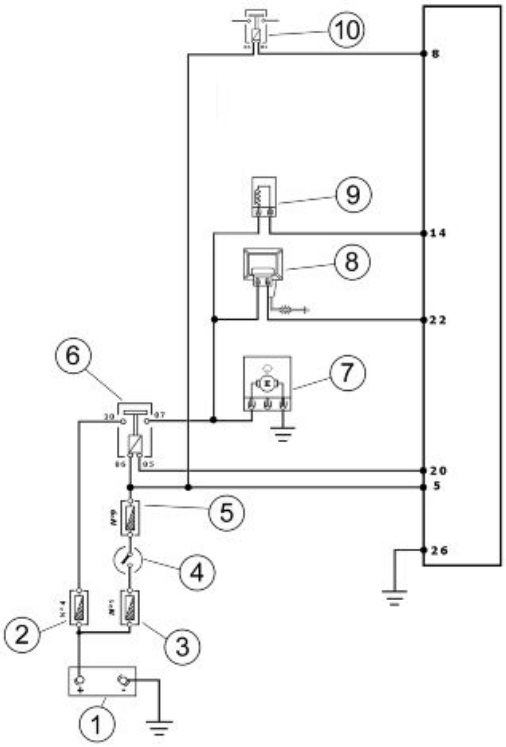
N.B.

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

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



Lambda probe



INJECTION LOADS

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

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

Specific tooling

020481Y Control unit interface wiring

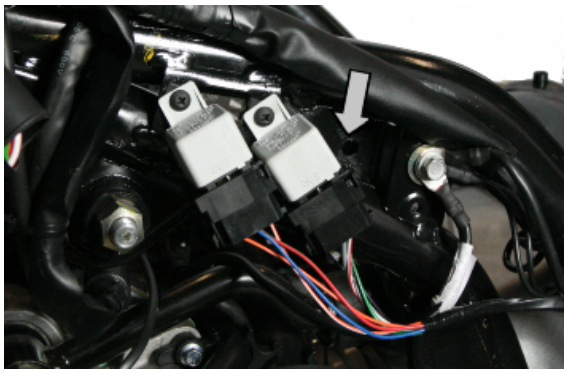
020331Y Digital multimeter

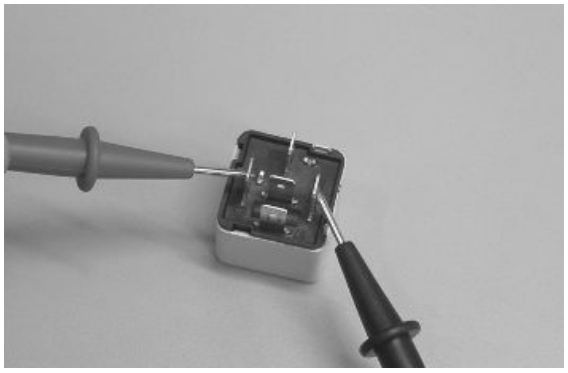
Check the efficiency of 10 A fuse N° 4 injection load .

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

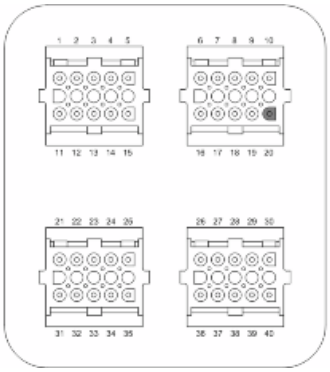
Check the efficiency of the injection load remote control: Check the resistance of the energising coil between pins 86 and 85: 40 to 80 Ohm

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





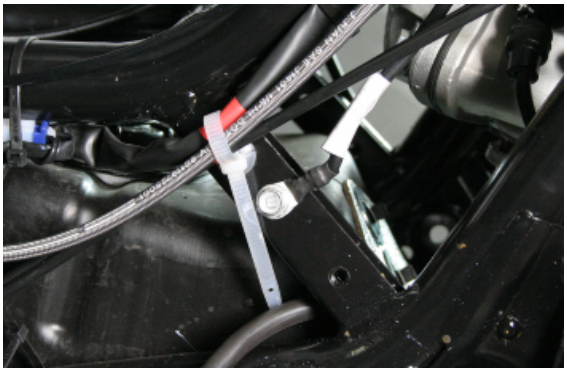
Check the power supply line of the injection load remote control energising coil: after switching to «ON», make sure there is battery voltage, for 2 seconds, between the Red-White cable and the Black-Purple cable of the remote control base. If there is not, check the continuity of the Red-White cable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



N.B.

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

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

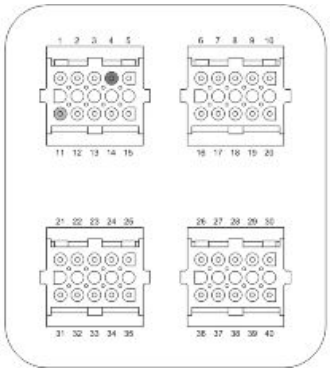


N.B.

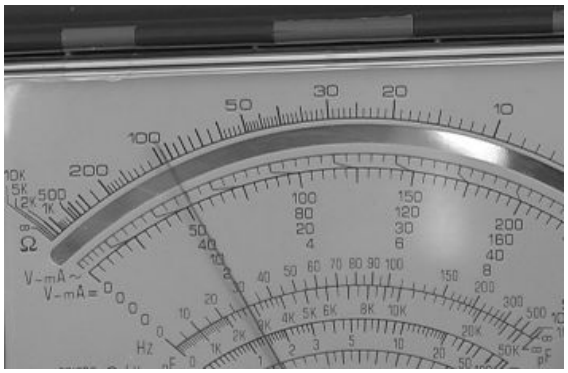
CONTINUITY TESTS MUST BE CARRIED OUT WITH THE COMPONENTS DISCONNECTED. (REMOTE CONTROLS, CONTROL UNIT, FUSES ETC.).

SIGNAL CONTROL

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



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



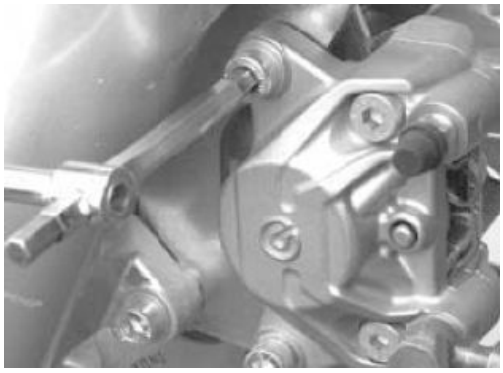
INDEX OF TOPICS

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

Front

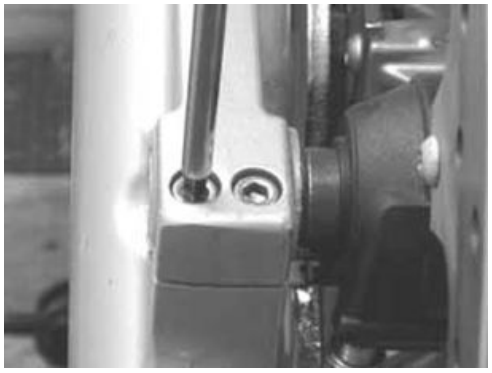
Removing the front wheel

- Support the scooter adequately.
- Undo the screws indicated from both sides and release the front brake callipers from the discs.



- Unscrew the wheel pin fixing nut.

- Loosen the two screws indicated on the right fork leg.



- Slide off the front wheel pin and remove the wheel.

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:

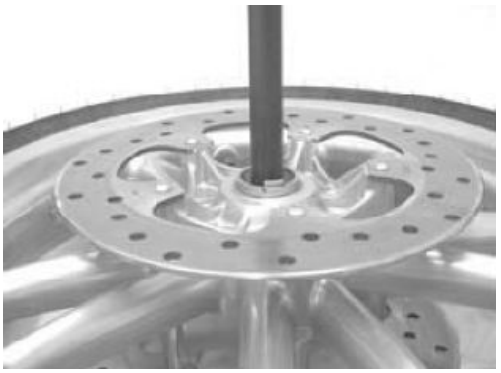
- Remove the 2 bearings on the odometer movement sensor side using the pliers 14 or 34 and the driver, part 9.
- Remove the inside spacer.

Specific tooling

001467Y034 Pliers to extract ø 15-mm bearings

001467Y014 Pliers to extract ø 15-mm bearings

001467Y009 Driver for OD 42-mm bearings



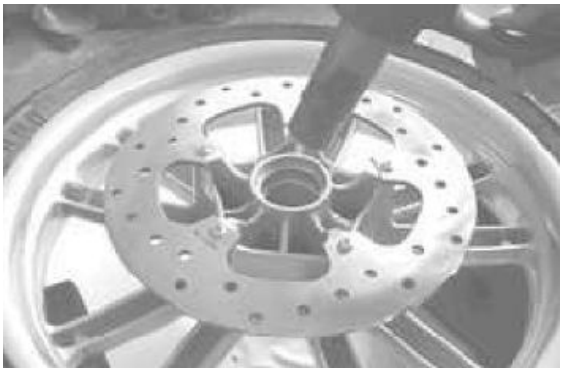
- Support the front wheel with two wooden pegs that prevents scratching in case of contact with the rim.
- Insert the punch (consisting of adaptor handle, 15 mm adaptor and guide) on the odometer movement sensor side to facilitate removing the left side bearing and the spacer bushing.

Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020412Y 15 mm guide



- Heat the seat of the bearing on the left side with the heat gun.

- Fit the bearing using the punch consisting of adaptor handle, 42x47 mm adaptor and 15 mm guide, and drive it until it stops.

- Reinsert the spacer bushing on the brake disc side using the specific tool and drive it until it stops.

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 inside spacer with the section fitted with the Seeger ring facing the left side bearing previously installed.
- Heat the seat of the bearing on the odometer movement sensor side with the heat gun.

- Fit the 2 bearings using the punch consisting of adaptor handle, 32x35 mm adaptor and 15 mm guide, and drive it until it stops.

Specific tooling

020376Y Adaptor handle

020357Y 32 x 35 mm adaptor

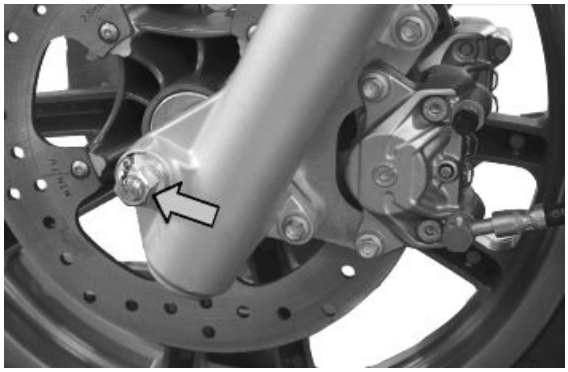
020412Y 15 mm guide

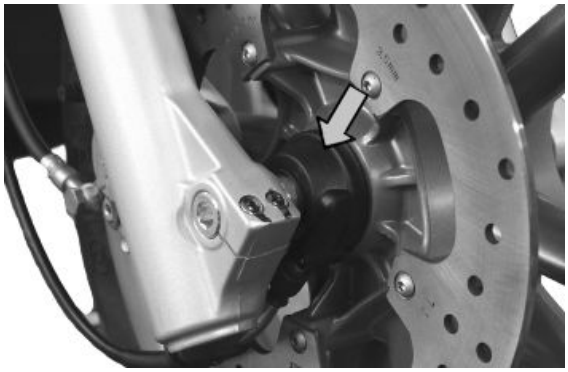
Refitting the front wheel

- 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°.

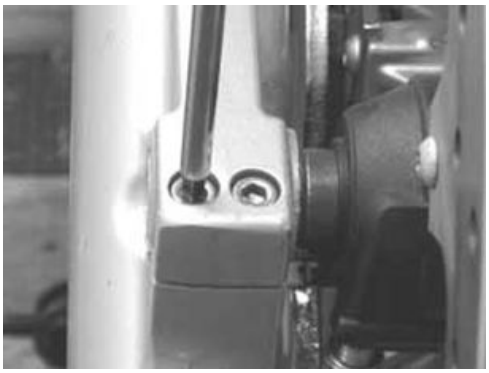




- Tighten the two safety screw on the leg to the prescribed torque.

Locking torques (N*m)

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



Front fork

See also

Removal

Overhaul

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

CAUTION

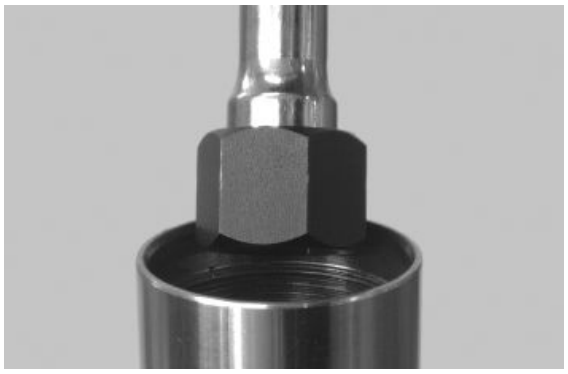
THE STEM CLOSING CAP KEEPS THE MAIN SPRING PRE-LOADED. KEEP THE CAP PROPERLY FITTED DURING THE REMOVAL FINAL STAGE TO AVOID ACCIDENTS.

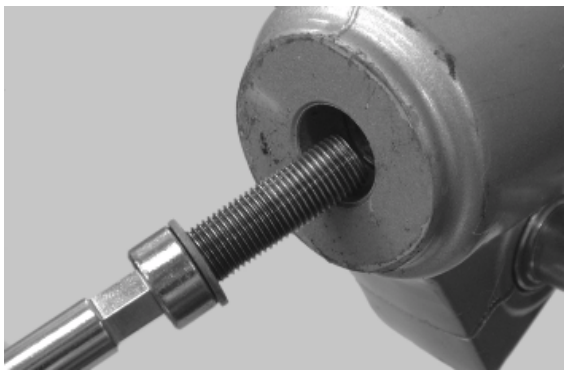
- Support the fork leg properly, remove the main spring and drain off the fork leg oil.

- Remove the hydraulic rod fixing screw with the corresponding sealing gasket:
- Lock hydraulic rod rotation using the specific tool.
- Undo the fixing screw and collect the copper washer.

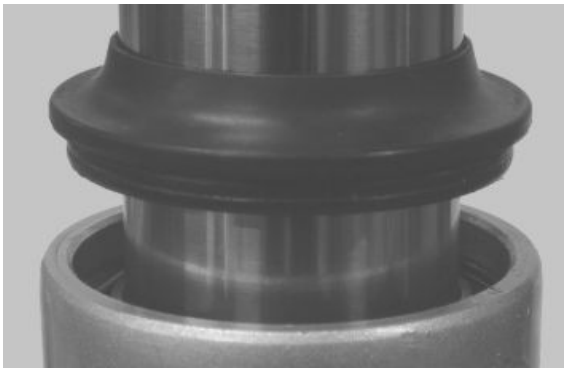
Specific tooling

020632Y 22-mm Hexagonal spanner

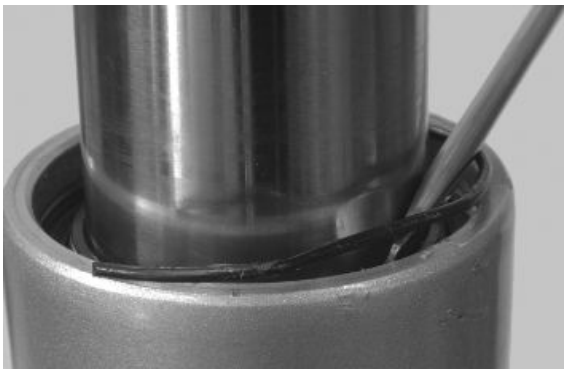




- Remove the stem dust guard with a screwdriver.



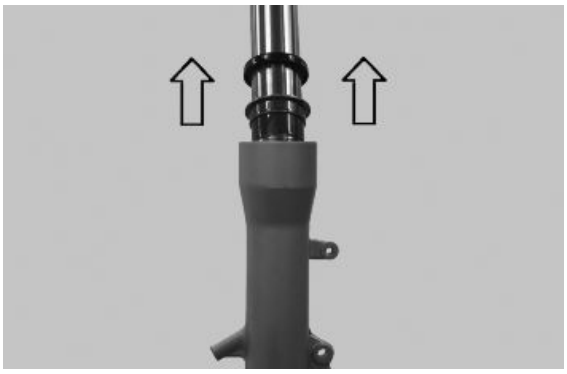
- Remove the circlip retaining the oil seal.



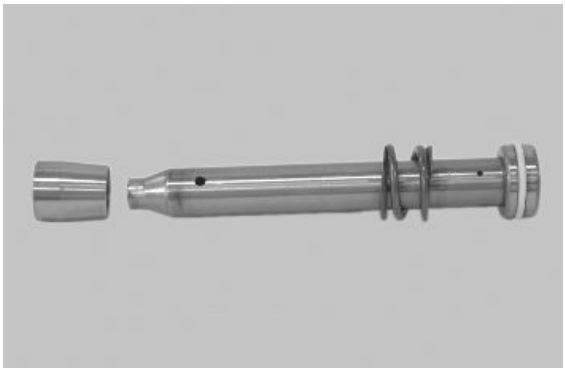
- Pull out the stem with force to the end of stroke.

N.B.

THE STEM HAS A SLIDING BUSHING LOCATED IN THE UPPER PART. WHEN THE STEM IS BEING REMOVED, THE LOWER BUSHING WORKS AS AN EXTRACTOR AGAINST THE UPPER BUSHING, THE WASHER AND THE OIL SEAL ON THE FORK LEG.



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



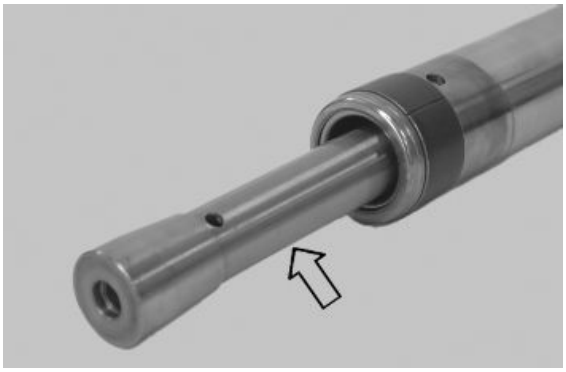
COMPONENT CHECK

CAUTION

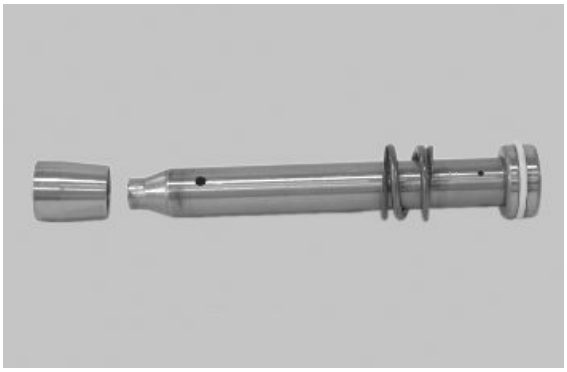
CLEAN ALL THE COMPONENTS THOROUGHLY.

- Check that the fork leg is not cracked or broken in the attachments.
- Visually inspect that the upper sliding bushing exhibits no signs of abnormal wear on the internal surface.

- Check that the stem is not scored, dented or distorted.
- Check that the stop bushing for the hydraulic rod is properly fixed through caulking.
- Visually inspect that the lower sliding bushing exhibits no signs of abnormal wear on the external surface.



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

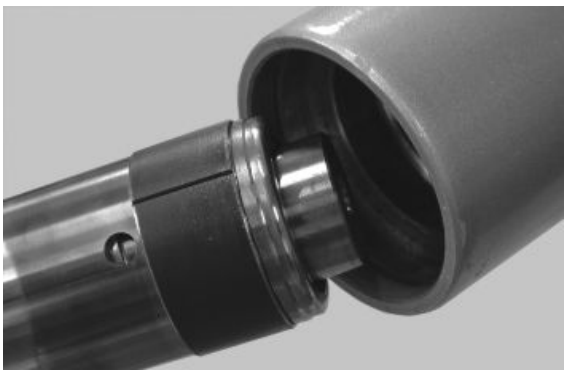


- Check that the main spring exhibits no signs of yielding or abnormal wear.

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

Refitting

- Preassemble the stem with the lower sliding bushing, the hydraulic rod with the spring and the stop bushing.
- Fit the pre-assembled components inside the fork leg.



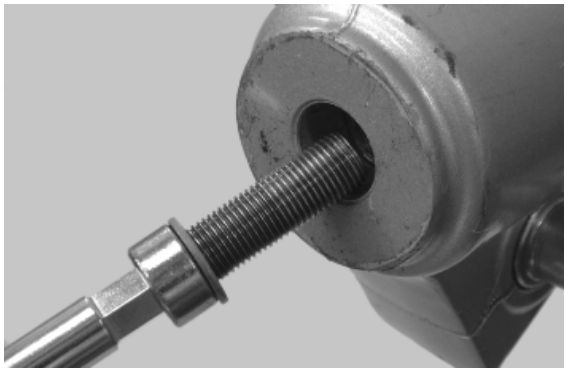
- Fit the hydraulic rod fixing screw with the copper sealing washer and tighten to the prescribed torque using the recommended product.

CAUTION

ALWAYS USE NEW COPPER WASHER.

Locking torques (N*m)

Hydraulic rod fixing screw **25 ÷ 35***

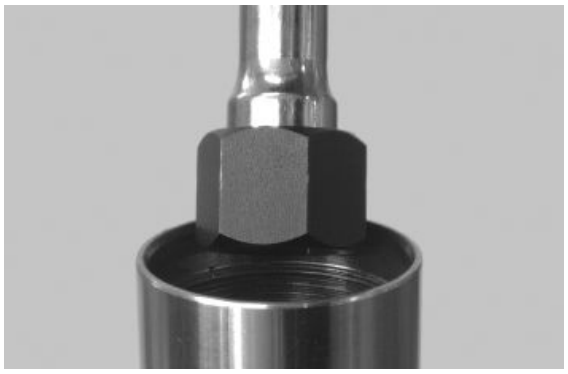


(°) Apply LOCTITE 243 threadlock

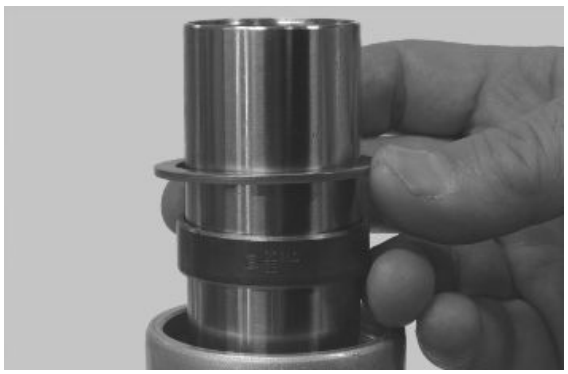
- Lock hydraulic rod rotation using the specific tool.

Specific tooling

020632Y 22-mm Hexagonal spanner



- Fit the upper sliding bushing and the bushing stop washer inside the fork leg.



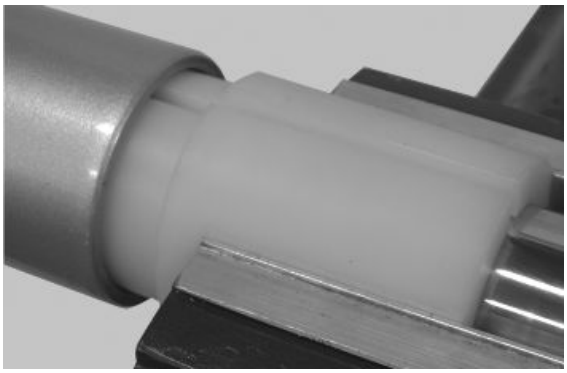
- First grease the splitting chamber of the two sealing lips of a new oil seal.
- Fit the sealing ring on the stem and keep the identification words facing upwards.

- Fit the specific tool in the sealing ring in the initial driving position.

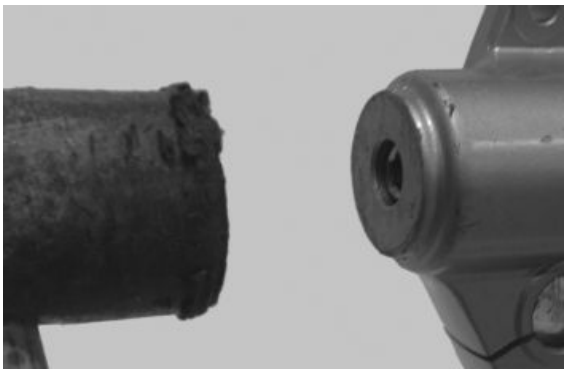
Specific tooling

020633Y Clamp for sealing ring driving of Kayaba 41-mm and Marzocchi 40-mm forks

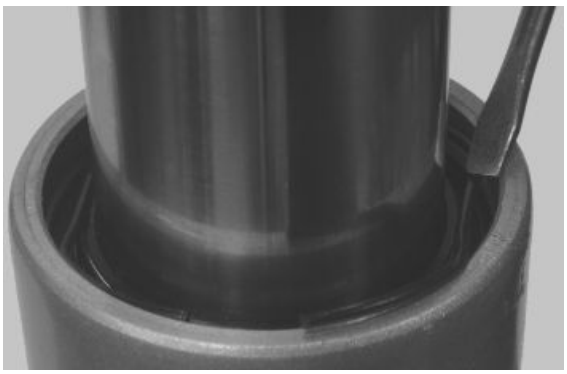
- Fix the specific tool in a vice with the stem placed at approximately halfway.



- Drive the sealing ring to the end of stroke acting on the fork leg with a mallet.



- Fit the oil seal retaining circlip.

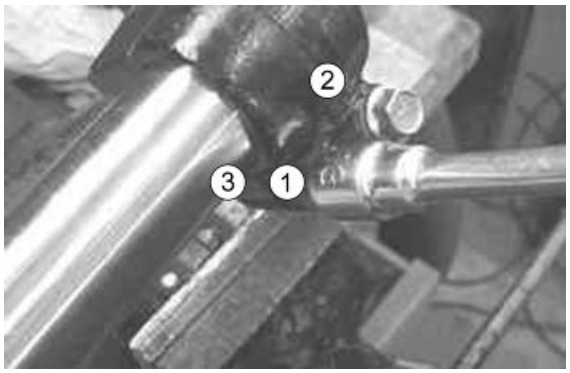


- Grease and fit a new dust guard.

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

Locking torques (N*m)

Stem support clamp tightening screws **20 ÷ 25**



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

Recommended products

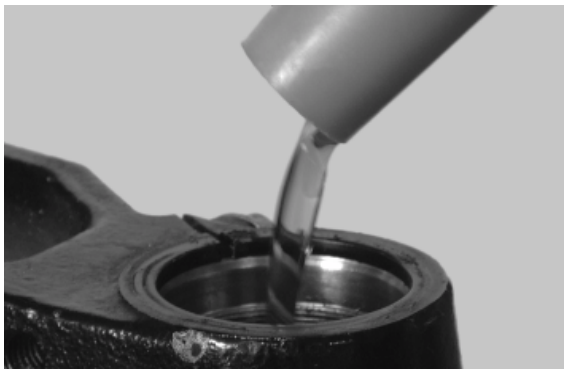
AGIP FORK 7.5 W Oil for front fork

Hydraulic fluid SAE 7.5 W

Characteristic

Oil quantity per stem

295 ± 3 cm^3



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

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

Locking torques (N*m)

Fork locking screws cap **35 - 55**

- Repeat the procedure for the other fork leg.

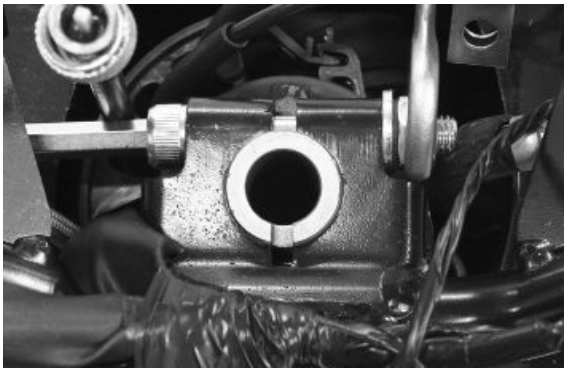
N.B.

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

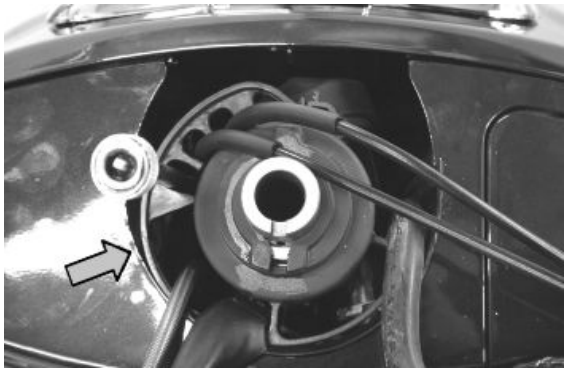
Steering column

Removal

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



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



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

- Extract the fork.

N.B.

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

Specific tooling

020055Y Wrench for steering tube ring nut

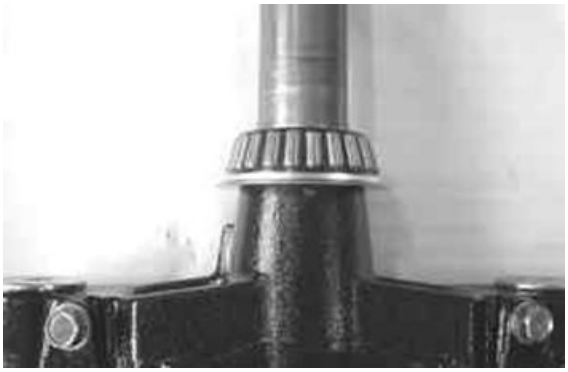
Refitting

- Grease the tapered bearing using the specified product.

Recommended products

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

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



- Insert the fork into the headstock.
- Insert the tapered bearing after applying the specified product.

Recommended products

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

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

- Using the special tool, tighten the first ring-nut on the steering tube to a holding torque, then tighten completely.

Locking torques (N*m)

Holding torque of lower ring nut 20 ÷ 25

- Tighten to the prescribed torque.

Locking torques (N*m)

Steering lower ring nut 10 ÷ 13 **

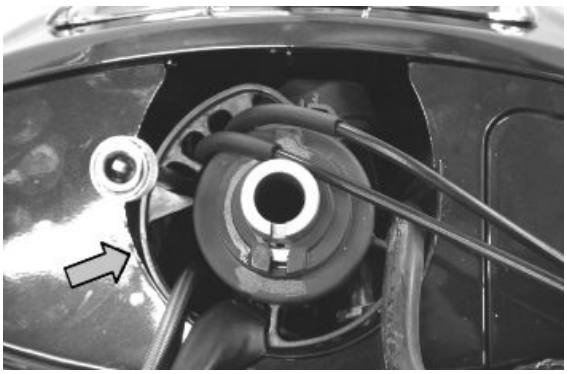
** tighten and loosen by 90°.

- Install the space washer.
- Using the special tool, tighten the second locking ring nut on the steering tube to the prescribed torque.

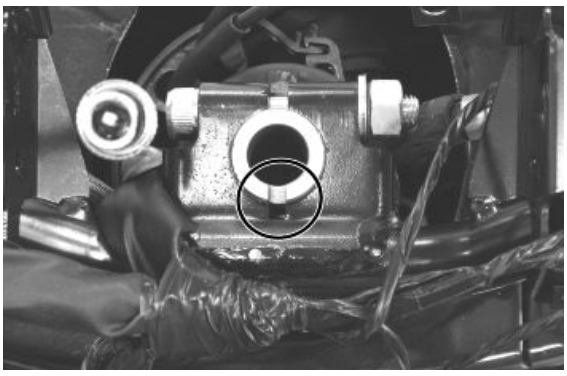
Locking torques (N*m)

Upper steering ring nut 36 - 39

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



- 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.
- Install the front and rear handlebar covers as described in the section "Scooter body".
- Install the front mudguard
- Install the front wheel.
- Install the front brake callipers.

Specific tooling

020055Y Wrench for steering tube ring nut

Locking torques (N*m)

Fixing screw handlebar to steering tube 45 ÷ 50

Steering bearing

Removal

Servicing tapered bearing seats

- Check that the seats and the tapered bearings exhibit no scratches or wear.

N.B.

THE TAPERED BEARING SEATS SHOULD BE REMOVED ONLY IF STRICTLY NECESSARY.

In case of replacement, proceed as follows:

- Using a bearing removal punch, inserted from the bottom, remove the top seat on the steering head. Then, remove the bottom seat of the tapered bearing inserting the punch from the top of the headstock.

Specific tooling

020004Y Punch for removing fifth wheels from headstock

Service of tapered bearing on fork

- Check that the tapered bearing on the fork exhibits no deformations or wear.

THE BEARING SHOULD BE REMOVED ONLY IF STRICTLY NECESSARY.

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

- Insert the special tool as shown in the figure.

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

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

Specific tooling

020458Y Puller for lower bearing on steering tube

Refitting

Reassembly of steering tapered bearing seats

Using the special tool, reassemble the tapered bearing housings on the head as described below:

- Place a new top housing on the head and a new bearing seat on the bottom side.
- Insert the screw of the special tool set-up with the adapters for inserting bearing and seat, into the steering head, as shown in the figure.
- Using two 24 mm wrenches, tighten the screw to move the two seats in abutment.

N.B.

ALWAYS USE A NEW BEARING AND A NEW SEAT.

Specific tooling

001330Y Tool for fitting steering seats

Reassembly of tapered bearing in steering tube

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

Specific tooling

006029Y Punch for fitting fifth wheel seat on steering tube

Rear

Removing the rear wheel

- Remove the muffler support arm
- Remove the spacer on the gear shaft.

- Loosen the five gear shaft fastening nuts using the rear brake.

Refitting the rear wheel

- For reassembly, perform the previous operations in the reverse order

Locking torques (N*m)

Wheel fastening screws 33 - 37

Swing-arm

Removal

- Extract the left bearing using the special tool.

Specific tooling

001467Y006 Pliers to extract 20 mm bearings

001467Y031 Bell

- Extract the right bearing using the modular punch through the left bearing seat (removed before).

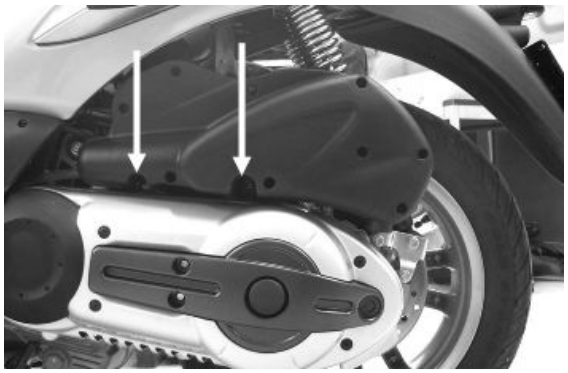
Specific tooling

020363Y 20 mm guide

020375Y Adaptor 28 x 30 mm

020376Y Adaptor handle

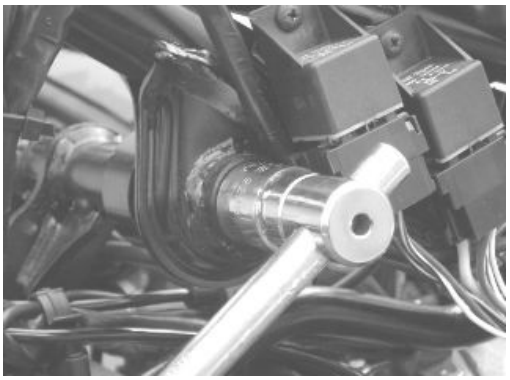
- Remove the helmet compartment.
- Remove the air filter.
- Remove the rear mudguard.



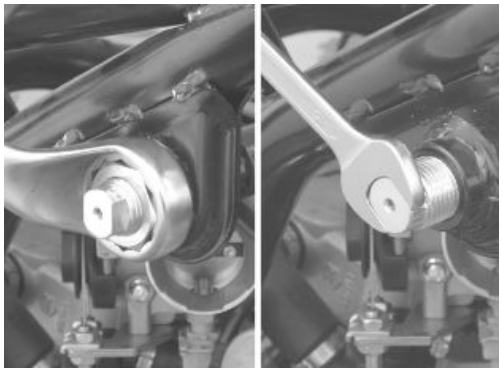
- Remove the nut and the washer mounting the swinging arm/engine pin and tie rod.

- Remove the locking nut, the washer and the tie rod buffer.

- Suitably support the engine using a jack under the oil sump.
- Remove the nut of the pin mounting the swinging arm to the chassis.

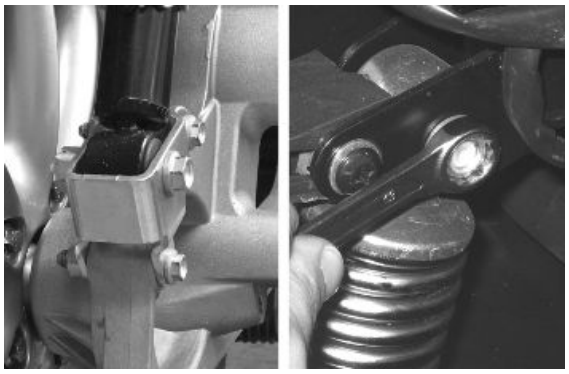


- Remove the lock nut, then using a 15-mm fork spanner, loosen the pin mounting the swinging arm to the chassis.



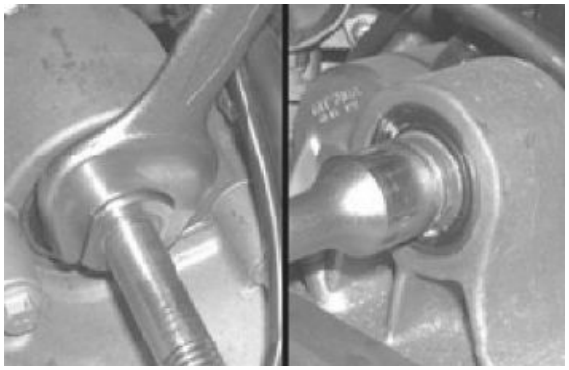
- Remove the swinging arm from the chassis and remove the shaped washer.

- Loosen the rear shock absorber mounting bolts.



- Move the engine backwards as much as piping and transmissions allow, at the same time move the front of the engine leftwards to allow removing the tie rod (with washer and pad) from the chassis and from the pin mounting the swinging arm to the engine.

- Prevent the rotation of the pin connecting the swinging arm to the engine using a 19-mm fork spanner.
- Remove the nut and the washer from the scooter left side.



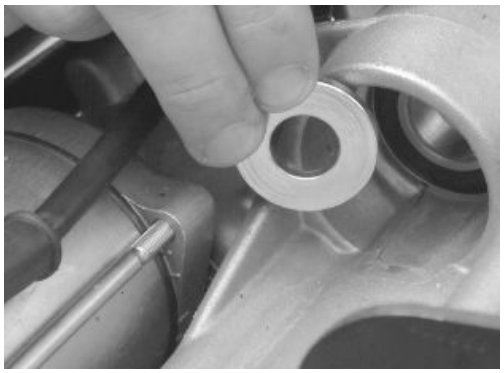
- Pull out the pin from the right side and remove the swinging arm with the washer on the right.

N.B.

CHECK THAT THE SWINGING ARM DOES NOT INTERFERE WITH THE THROTTLE BODY COMPONENTS IF PULLED USING THE SPACER BUSHING.

N.B.

IF NECESSARY, REMOVE THE CABLE HARNESS SUPPORT BRACKET MOUNTING SCREW.



- Remove the bushing from the bearing on the engine left support.

Check that the following components are not worn or dented:

- Engine crankcase supports
- Ball bearing with bushing on swinging arm
- Roller bearing on swinging arm

Check that the chassis connecting pin exhibits no wear or dents on the roller bearing connection:

In case of irregularities, replace the pin and the roller bearing.

- Check that the pin connecting the swinging arm to the engine exhibits no wear at the right bearing housing connection:

Characteristic

Diameter of shaft:

Ø 18 -0.034 mm

Diameter of pin:

Ø 20 -0.041 mm

Overhaul

- Properly support the swinging arm in the vice.
- Remove the Seeger ring.

- Remove the ball bearing bushing.

- Extract the ball bearing using the special tool.

Specific tooling

001467Y017 Driver for OD 36 mm bearings

001467Y034 Pliers to extract ø 15-mm bearings

- Extract the roller bearing using the special tool.

N.B.

POSITION THE PLIERS FOR EXTRACTING UNDER THE UPPER EDGE OF THE ROLLER BEARING.

Specific tooling

001467Y010 Driver for OD 25 mm bearings

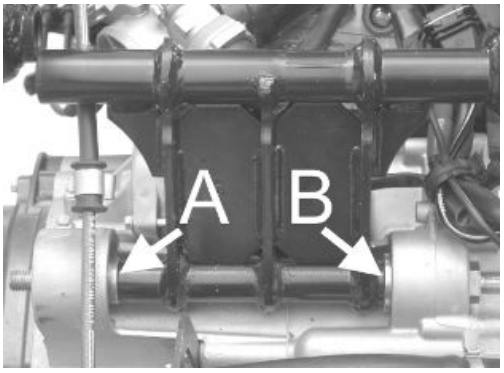
001467Y019 Extraction pliers for ø 18 mm bearings

Refitting

- Lubricate the inside tracks of the bearings on the crankcase.
- Lubricate the roller bearing into the swinging arm.
- Lubricate the bearing connection on the swinging arm/engine pin.

Lubricate the roller bearing connection on the swinging arm/chassis pin.

- Insert the spacer bushing in the left bearing "A".
- Assemble the engine connecting pin with the washer "B" and the swinging arm.
- Install the washer and the flanged nut and move them close without tightening.
- Check that the tie rod silent block is free from wear; if not, replace the complete tie rod.
- Check that the 2 tie rod spring pads are in good working order.



- Assemble the tie rod with the washer and a pad.
- Install the tie rod inserting it on the swinging arm/engine pin and into the bracket welded to the chassis.

N.B.

FOR THIS OPERATION, MOVE THE ENGINE ON THE VEHICLE LONGITUDINAL AXIS.

N.B.

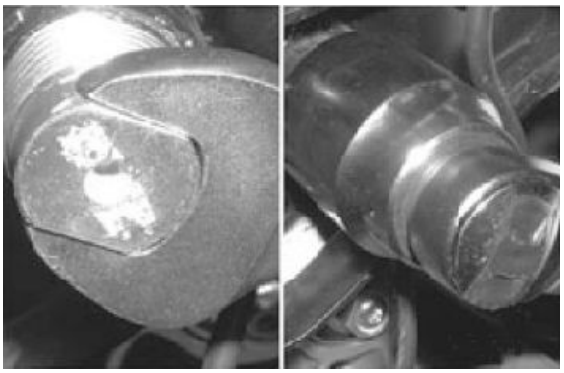
IF YOU REMOVE THE ELECTRIC SYSTEM SUPPORT BRACKET, REINSTALL IT BEFORE INSERTING THE TIE ROD.

- Apply the buffer and the washer to the tie rod and lock it.

Locking torques (N*m)

Upper tie rod mounting **40 ÷ 45**

- Lubricate the shaped washer and place it onto the bearing.
- Insert the chassis mounting pin.
- Restore the axial clearance between swinging arm and chassis tightening the pin to the prescribed torque.
- Tighten the lock nut to the prescribed torque.



Locking torques (N*m)

bolt securing swinging arm to chassis **14 ÷ 17**
Lock nut **40 ÷ 50**

- Tighten the right end of the chassis connecting pin to the prescribed torque, using a new nut.

Locking torques (N*m)

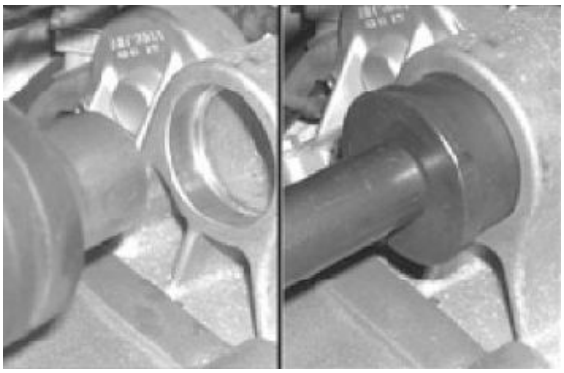
RHS chassis pin nut **66 ÷ 73**

- Use a 19-mm fork wrench to prevent the rotation of the pin connecting the swinging arm to the engine and tighten the right nut (with washer) and the left nut to the prescribed torque.

Locking torques (N*m)

Transmission-side nut **100 - 120** **Muffler-side nut** **56 ÷ 70**

- Heat the connections on the engine crankcase and insert the bearings to abutment using the modular punch.
- To install the right bearing, lower the engine.



N.B.

WHEN HEATING THE LEFT SEAT MOVE THE HOSE FOR OIL TO THE BRAKE CLAMP AWAY FROM THE ENGINE CRANKCASE. FOR THE RIGHT PART REMOVE AND MOVE AWAY THE BRACKET SUPPORTING THE WIRING.

Specific tooling

020151Y Air heater

020359Y 42x47-mm adaptor

020363Y 20 mm guide

020376Y Adaptor handle

- Insert the spacer on the ball bearing using the special tool.

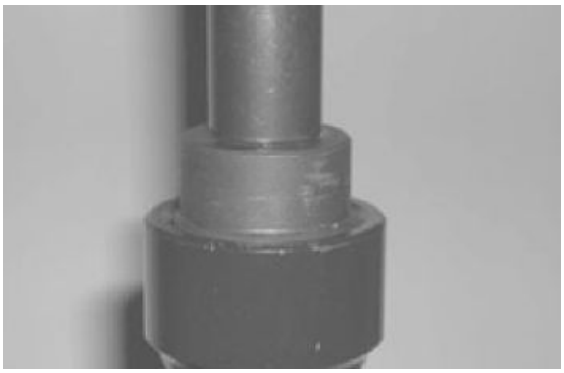
Specific tooling

020357Y 32 x 35 mm adaptor

020362Y 12 mm guide

020376Y Adaptor handle

- Heat the bearing seat on the swinging arm.
- Insert the bearing to abutment using the special tool.



N.B.

THE BEARING SPACER MUST BE INSERTED FROM THE INSIDE OF THE SWINGING ARM.

N.B.

DO NOT DETERIORATE THE PAINTED SURFACE WHILE WARMING THE SWINGING ARM.

Specific tooling

020151Y Air heater

020376Y Adaptor handle

020362Y 12 mm guide

020357Y 32 x 35 mm adaptor

- Install the Seeger ring.

- Install the roller bearing using the special tool.

Specific tooling

020083Y Punch

Shock absorbers

Removal

Proceed as follows:

- Rest the vehicle on the central stand;
- Remove the sides according to the removal sequence described in Chapter "Body".

- Slightly raise the engine using a jack to free both shock absorbers;
- Remove the muffler;

- Loosen the shock absorber spring unit fastening screw from the support fixed to the engine and from that fixed to the muffler support;

- Loosen the two top nuts (one by side) mounting the shock absorber spring unit to the chassis and remove the shock absorbers.

See also

Side fairings

Refitting

Carry out the previous operations but in reverse order.

Locking torques (N*m)

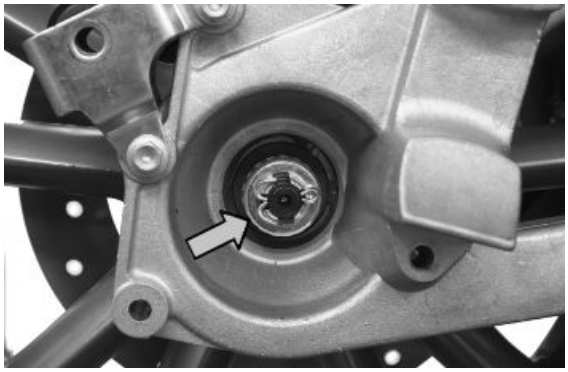
Shock absorber lower clamp 40 ÷ 45 Upper shock absorber clamp 40 ÷ 45

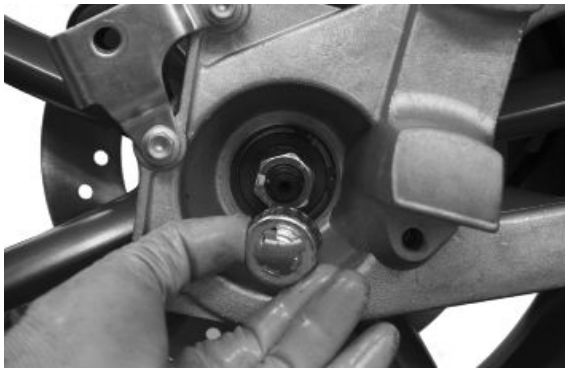
Exhaust bracket

Removal

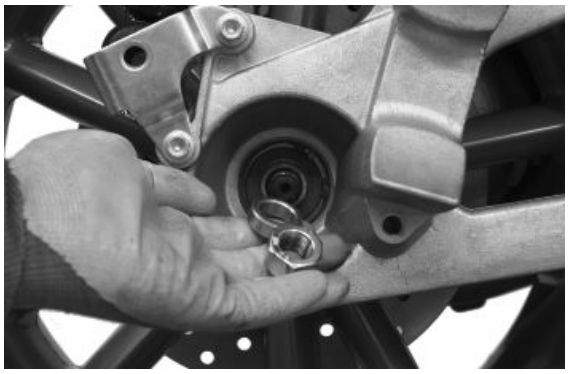
- Remove the exhaust silencer.
- Remove the rear mudguard.
- Remove the shock absorber lower clamp.

- Release the cotter pin and remove the cap.

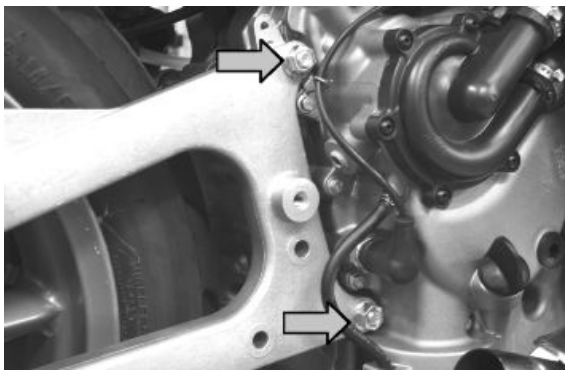




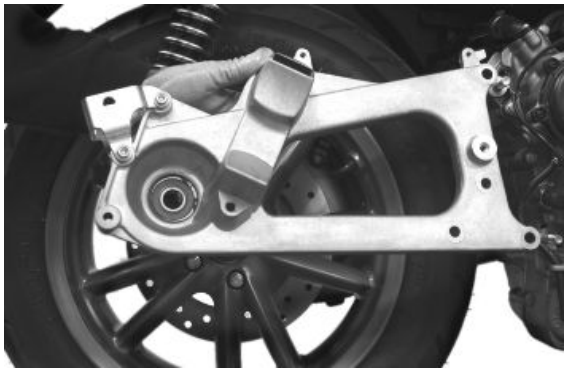
- Unscrew the rear wheel fixing nut and remove the spacer.



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



- Remove the muffler supporting bracket.



Overhaul

- Remove the Seeger ring.

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

Specific tooling

020376Y Adaptor handle

020439Y 17 mm guide

020358Y 37x40-mm adaptor

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

Specific tooling

020151Y Air heater

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

Specific tooling

020376Y Adaptor handle

020439Y 17 mm guide

020359Y 42x47-mm adaptor

- Fit the Seeger ring.

Refitting

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

Recommended products

AGIP GREASE PV2 Grease for steering bearings and spindle seats

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

Locking torques (N*m)

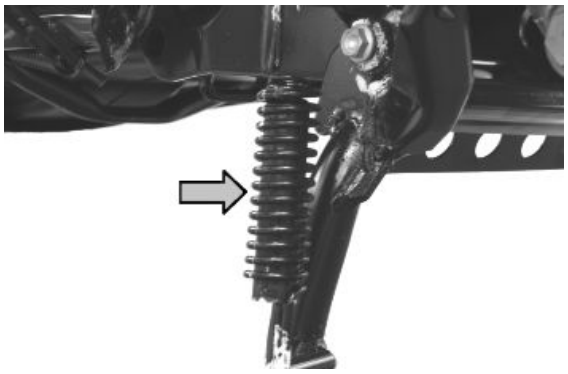
Muffler arm clamping nuts 34 ÷ 42 Rear wheel axle 104 ÷ 126

See also

Refitting
Refitting the rear wheel
Refitting

Centre-stand

- Use a jack to support the vehicle properly.
- Remove the two stand return springs.



- Working from both sides, unscrew the two bolts connecting it to the supporting plate.

- To refit, follow the removal steps but in reverse order; be careful to tighten to the prescribed torque.

CAUTION

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

Recommended products

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

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

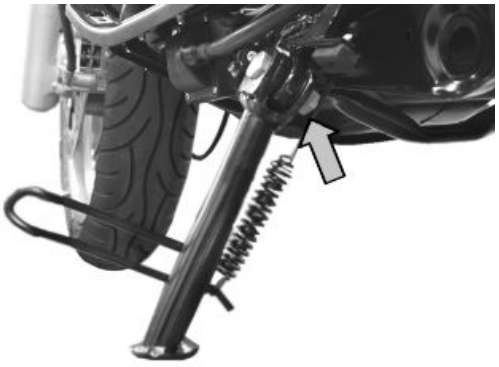
Locking torques (N*m)

Central stand retainers 25 ÷ 30

Side stand

REMOVAL

- Remove the left footrest.
- Remove the two return screws and unscrew the nut indicated.
- Slide off the pin and remove the side stand.



FITTING

- Follow the removal steps but in reverse order and tighten to the prescribed torques.

Locking torques (N*m)

Side stand bolt nut 37

- Grease with the recommended product.

Recommended products

AGIP GP 330 Grease (brake control levers, throttle grip)

Calcium complex soap-based grease with NLGI 2; ISO-L-XBCIB2

INDEX OF TOPICS

Rear brake calliper

Removal

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

N.B.

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

Refitting

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

Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

Locking torques (N*m)

Screw tightening calliper to the support 20 ÷ 25

If the calliper is replaced:

N.B.

WHILE REFITTING, REPLACE THE COPPER GASKETS ON THEIR FITTINGS.

CAUTION

ONCE REFITTING IS FINISHED, BLEED THE SYSTEM.

N.B.

IF THE REAR BREAK CALLIPER SUPPORT PLATE HAS BEEN REMOVED, UPON REFITTING IT IS NECESSARY TO FOLD THE EDGES OF THE WASHER ON THE HEAD OF THE SCREWS FIXING THE PLATE TO THE CRANKCASE.

Locking torques (N*m)

Pipe / brake calliper fitting 16 ÷ 20

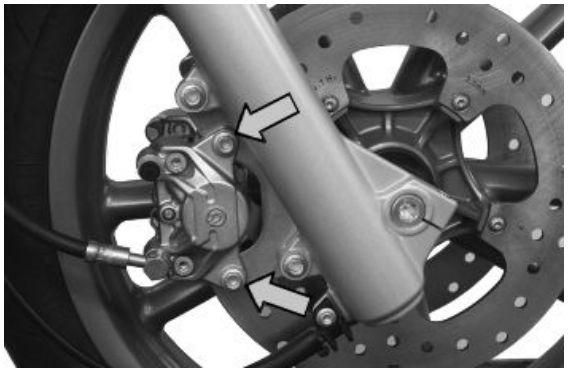
See also

Rear - combined

Front brake calliper

Removal

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



N.B.

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

Repeat the operation for the other calliper.

Refitting

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

Locking torques (N*m)

Screw tightening calliper to the support 20 ÷ 25

If the calliper is replaced:

N.B.

WHILE REFITTING, REPLACE THE COPPER GASKETS ON THEIR FITTINGS.

CAUTION

ONCE REFITTING IS FINISHED, BLEED THE SYSTEM.

Locking torques (N*m)

Pipe / brake calliper fitting 16 ÷ 20

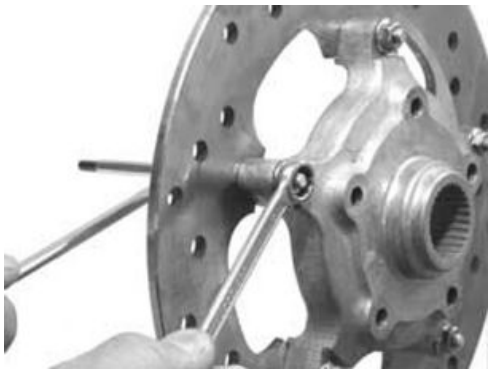
See also

Front
Front

Rear brake disc

Removal

- Remove the rear brake calliper
- Remove the brake disc with hub from the wheel axle.
- To remove the brake disc from the hub, support the unit in a vice and tighten the 5 fastening bolts with self-locking nuts.



Refitting

- To reassemble the brake disc on the hub, carry out the removal operations in the reverse order arranging the brake disc on the hub on the side opposed the wheel keying
- Follow the direction of rotation shown by the arrow and tighten to the prescribed torque.
- Lubricate the seat of the wheel bearing shaft on the manifold support with the recommended grease.

N.B.

APPLYING AN EXCESSIVE QUANTITY OF GREASE MAY IMPAIR THE BRAKE PERFORMANCE

Recommended products

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

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

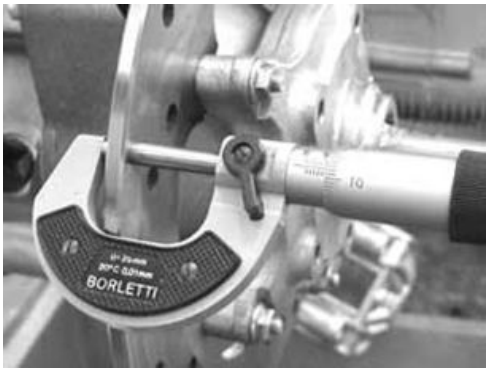
- Insert the hub - disc assembly in the wheel axle.

Locking torques (N*m)

Rear brake disc mounting 11 ÷ 13

Disc Inspection

- Use the micrometer to check the thickness of the disc as shown in the photograph



Characteristic

Standard thickness:

5 ± 0.2 mm

Disc thickness at wear limit

4.5 mm

- Repeat the measurement in at least 6 points on the disc
- Check that the measurement does not deviate over 0.1 mm
- Check that the brake disc assembly rotates smoothly using the appropriate tool fixed onto the brake calliper as shown in the photograph.
- Suitably fix the flange to the wheel axle with the original nut and spacer and a Ø 17 mm bearing

N.B.

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

Specific tooling

020335Y Magnetic support for dial gauge

Characteristic

Max. deviation allowed:

0.1 mm

- If incorrect values are detected, replace the disc. If the problem persists, replace the hub.

Front brake disc

Removal

- Remove the front wheel.

- Adequately support the front wheel and remove the break disc operating on the five screws shown in the photograph.

- Repeat the operation for the other disc.

Refitting

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

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

N.B.

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

Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

Locking torques (N*m)

Brake disc screws 8 ÷ 10

- Repeat the operation for the other disc.

Disc Inspection

- Use the micrometer to check the thickness of the disc as shown in the photograph

Characteristic

Standard thickness:

5 ± 0.2 mm

Disc thickness at wear limit

4.5 mm

- Repeat the measurement in at least 6 points on the disc
- Check that the measurement does not deviate over 0.1 mm
- Remove the front brake calliper
- Place the magnetic base with the dial gauge on the break calliper support bracket as shown in the photograph
- Place the dial gauge on the disc outer edge
- Lift the front wheel, make it turn and check the disc deviation

Specific tooling

020335Y Magnetic support for dial gauge

Characteristic

Max. deviation allowed:

0.1 mm

- Use the micrometer to check the thickness of the disc as shown in the photograph

Characteristic

Standard thickness:

5 ± 0.2 mm

Disc thickness at wear limit

4.5 mm

- Repeat the measurement in at least 6 points on the disc
- Check that the measurement does not deviate over 0.1 mm
- Remove the front brake calliper
- Place the magnetic base with the dial gauge on the break calliper support bracket as shown in the photograph
- Place the dial gauge on the disc outer edge
- Lift the front wheel, make it turn and check the disc deviation

Specific tooling

020335Y Magnetic support for dial gauge

Characteristic

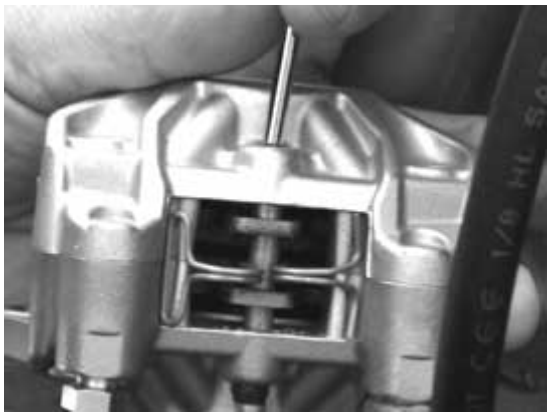
Max. deviation allowed:

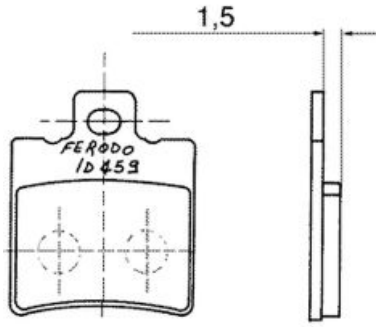
0.1 mm

Front brake pads

Removal

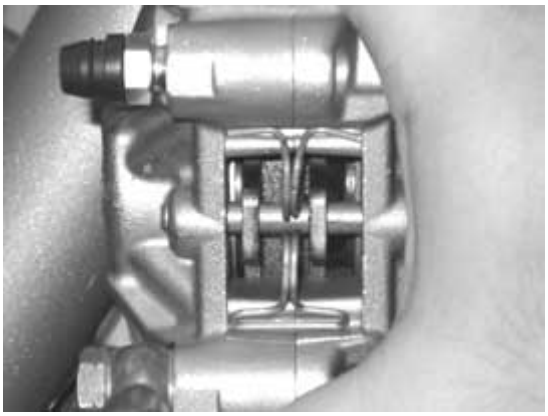
- Remove the front brake calliper
- Remove the circlip of the pad retaining pin as shown in the photograph
- Using a key remove the pad retaining pin, then remove the break pads
- Check that the pads show no flaws or warping. If there is, replace it.
- Check that the thickness of the friction material is over 1.5 mm. Otherwise, replace it





Refitting

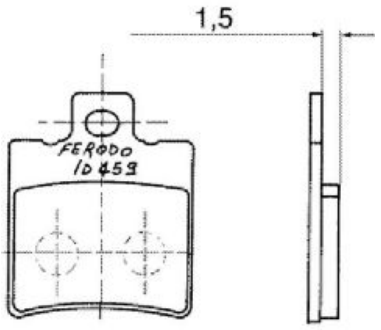
- Insert the break pad in the calliper as shown in the photograph
- Insert the pad fixing pin and the retention spring being careful to position its ends pointing towards the bleed screw as shown in the photograph
- Insert the circlips on the break pad fixing pin
- Keep the brake pad in contact with the plungers and insert the calliper in the brake disc.



Rear brake pads

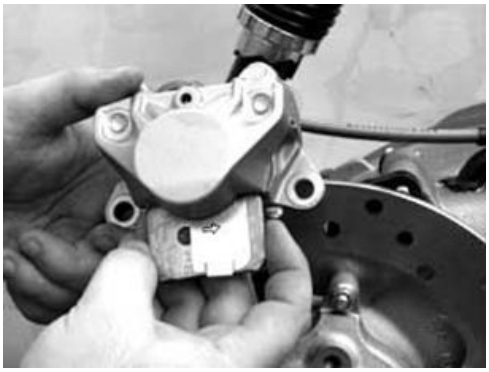
Removal

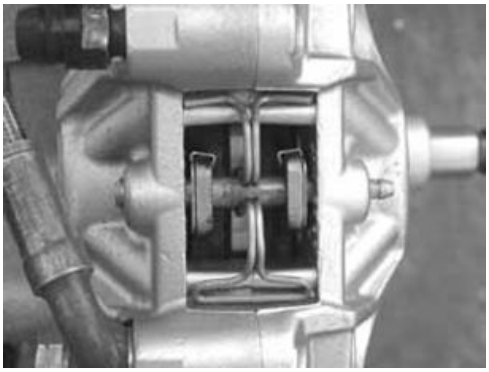
- Remove the rear brake calliper
- Remove the brake pad and check there are no faults or warping. If it does, replace it.
- Check that the thickness of the friction material is over 1.5 mm. Otherwise, replace it.



Refitting

- Insert the break pads according to the break disc direction of rotation as shown by the arrow indicated on the damping pad.
- Insert the fixing pin being careful to position the clip with its ends pointing towards the bleed screw as shown in the photograph.
- Insert the retaining circlips on pin.
- Fix the rear brake calliper to the bracket and tighten the 2 screws to the prescribed torque.





Locking torques (N*m)

Rear break calliper to chassis retainer **20 ÷ 25**

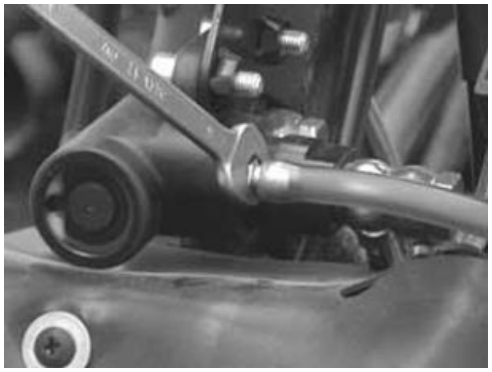
Fill

Rear - combined

To bleed the integral system, first bleed the rear break calliper.

- Remove the rubber cap from the bleed screw and insert a rubber pipe to recover the brake fluid.

- Access the regulating valve and remove the leg-shield.
- With the left-hand brake lever, load the system and bring it up to the required pressure.
- Keeping the left-hand brake lever pulled, loosen the bleed screw to purge the air. Then tighten the bleed screw.
- Repeat the operation until only brake fluid comes out of the rubber pipe.



- Afterwards repeat the bleeding operations for the front left calliper.
- Repeat the operation until only brake fluid comes out of the rubber pipe.

- Top up the brake fluid to the right level in the reservoir.

N.B.

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

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

Specific tooling

020329Y MityVac vacuum-operated pump

Locking torques (N*m)

Circuit bleed calliper fitting 12 - 16

Front

- Remove the rubber hood from the bleed screw.
- Insert a rubber pipe in the bleed screw to permit the brake fluid to be recovered.

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

N.B.

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

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

Specific tooling

020329Y MityVac vacuum-operated pump

Locking torques (N*m)

Circuit bleed calliper fitting 12 - 16

Brake fluid level check

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

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

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

Front brake pump

Removal

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

Refitting

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

N.B.

WHILE REFITTING, REPLACE THE COPPER GASKETS ON THEIR FITTINGS.

WARNING

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

CAUTION

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

Locking torques (N*m)

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

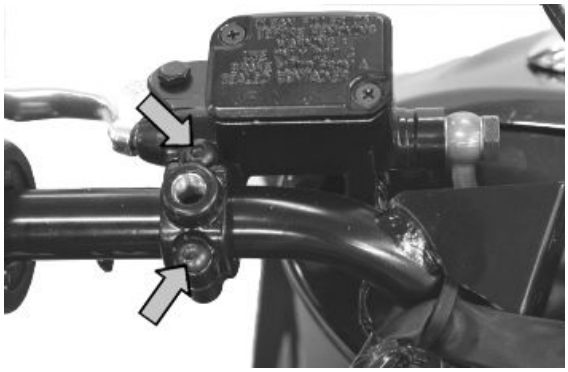
See also

Front

Rear brake pump - combined

Removal

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



Refitting

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

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Locking torques (N*m)

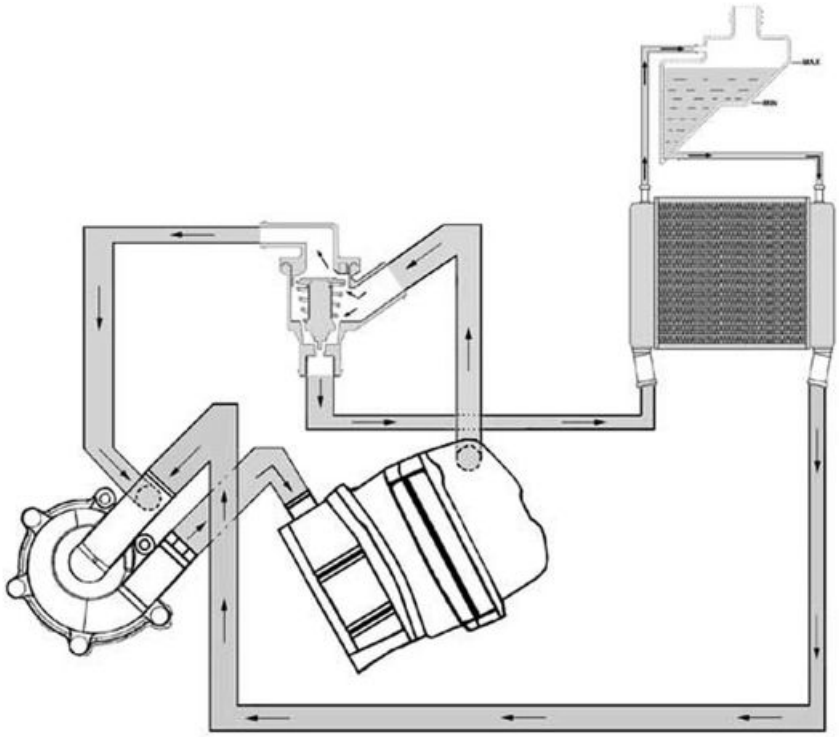
Oil bleed screw 12 - 16 Hydraulic line fixing screw: 16 ÷ 20 Fixing screws for handlebar control assembly U-bolts 7 ÷ 10

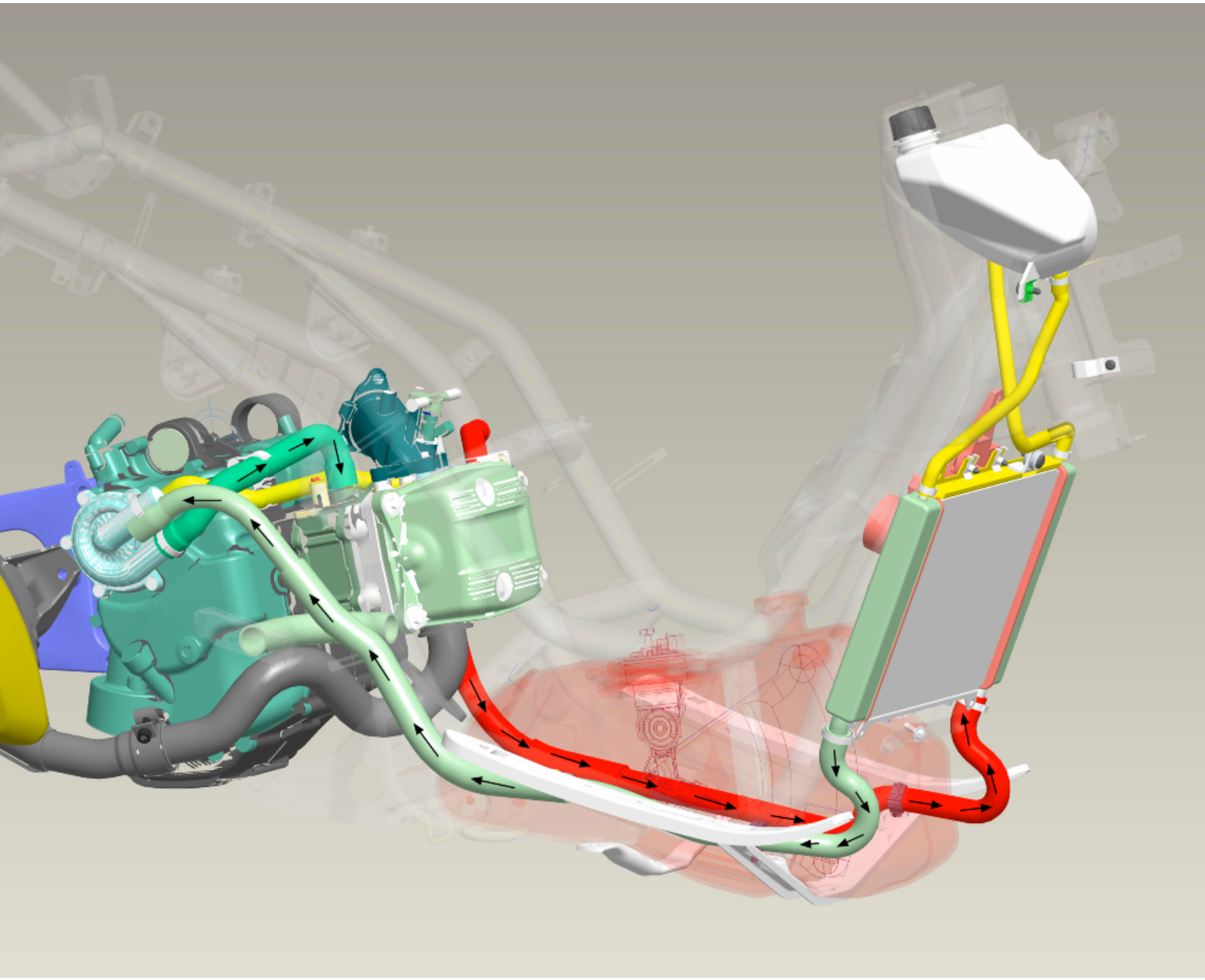
See also

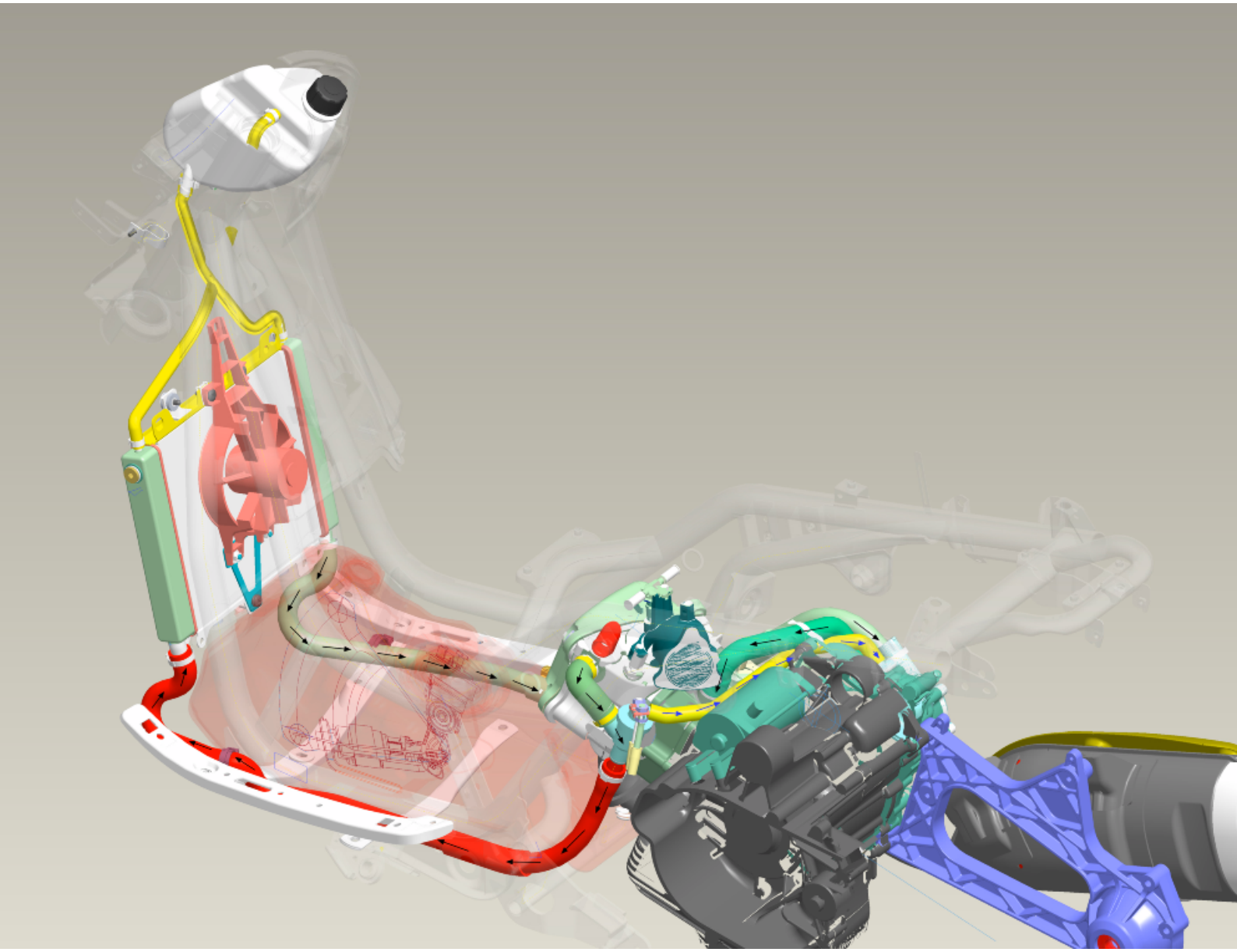
Rear - combined

INDEX OF TOPICS

Circuit diagram







The cooling system is a forced circulation type system, with continuous venting and air pressurisation.

Circulation takes places by a centrifugal pump driven by the countershaft.

The pump delivers the coolant to the thermal group.

The two-way thermostat support is connected in output to the head. One way is connected to the pump and the other to the radiator (of the horizontal circulation type).

The radiator output is directly connected to the pump.

The expansion tank is connected in parallel to the radiator.

The radiator hot box is connected to the upper side of the expansion tank (in air).

The radiator cold box is connected to the lower side of the expansion tank (in the fluid).

When the engine is cold, the thermostat output to the radiator is closed, even though there is still a little flow for de-aeration obtained by a hole into the closing plate.

In this case, the circulation into the thermal group is active to ensure an even heating.

Once the working temperature has been reached, the main circulation on radiator and expansion tank starts.

With the small openings in the thermostat there is a flow overlapping (recirculation and main one).

When the temperature is higher, the thermostat allows excluding the recirculation to favour the main circulation.

In this case, the flow is consistent in the expansion tank as well, and this ensures a continuous automatic venting.

For the system venting during the circuit filling step, there is a special union at the top of the head (see filling rules).

To ensure cooling in case of poor dynamic ventilation, there is an electric fan controlled by the injection system.

TECHNICAL SPECIFICATIONS

Specification	Desc./Quantity
Cooling system capacity	1.7 l
Prescribed fluid	Mixture of 50% water and fluid for sealed circuits (PARAFLU MOTO RIDER)
Sealing pressure	Cap calibrated at 0.9 bar

THERMOSTAT

Specification	Desc./Quantity
Type	Wax-type, with deviator
Starts opening	82 ± 2°C

ELECTRIC VENTILATION

Specification	Desc./Quantity
Type	With piston
Electric ventilation starts at	107°C
Electric ventilation stops at	103°C

WATER PUMP

Specification	Desc./Quantity
Type	Centrifugal
Control	Coaxial at the countershaft

RADIATOR

Specification	Desc./Quantity
Type	Aluminium, with horizontal circulation

EXPANSION TANK

Specification	Desc./Quantity
Calibration	Automatic bleeding, in parallel with the radiator

Electric fan check

- Connect the injection diagnostic tester and select the «ERRORS» function in this menu.
- Check any failures in the electric fan control circuit (see «Injection»chapter)

Specific tooling

020460Y Scooter diagnosis and tester

- Select the menu on the "ACTIVE DIAGNOSIS" function and start the electric fan operation simulation (see "Injection" chapter).
- If the electric fan is certainly efficient, check the ventilation start and stop temperatures.

- Select the «PARAMETERS» function in this menu to display the coolant temperature.
- If non-conforming values are detected, replace the injection control unit (see "Injection" chapter).
- If the analogue instrument temperature is close to the red zone, but the degrees indicated by the diagnostic tester is below the electric ventilation temperature, check the temperature sensor on the head and the relevant injection circuit (see Injection chapter);

N.B.

THE ELECTRIC VENTILATION TEMPERATURE AT 106° C CAN ONLY BE MANAGED WITH A SYSTEM SUPPLIED WITH A 50% MIXTURE AND PRESSURISED AT 0.9 BAR.

Characteristic

Electric fan start

106°C

Electric fan stop

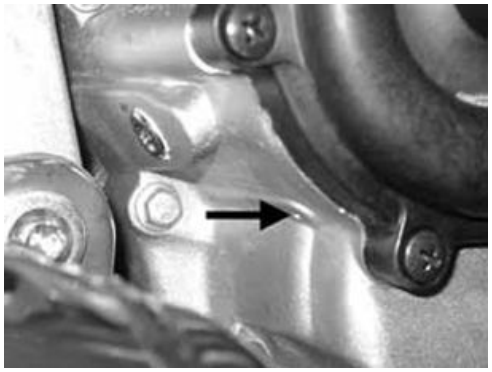
98°C

- Avoid starting the engine without pressurisation since it may reach the boiling temperature before the electric ventilation starts.

- In case of increase of the electric ventilation time, check the thermostat opening temperature and check that the coolant density is correct. The optimum density is obtained with a 50% water and cooling circuit fluid mixture.

System sealing check

- Check the proper circuit sealing when it is under pressure and at the temperature.
- For a more accurate check, wait until the system has cooled down since small leaks may not be visible due to evaporation
- The water pump is provided with a drainage hole in case of leaks from the cooling system mechanical seal, or from the shaft sealing oil guard.



- If coolant or oil leaks are detected, inspect the pump (see Flywheel cover chapter).

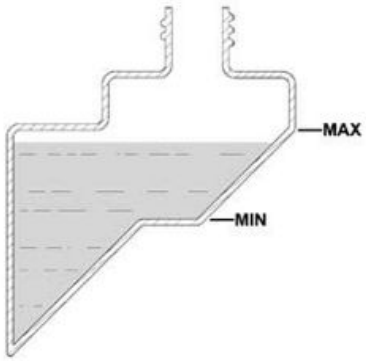
N.B.

DO NOT USE OILS OR GREASES WHILE MOUNTING THE COOLING SYSTEM. FAILURE TO OBSERVE THIS REGULATION CAN CAUSE IRREVERSIBLE DEFORMATION TO THE SEALING GASKETS.

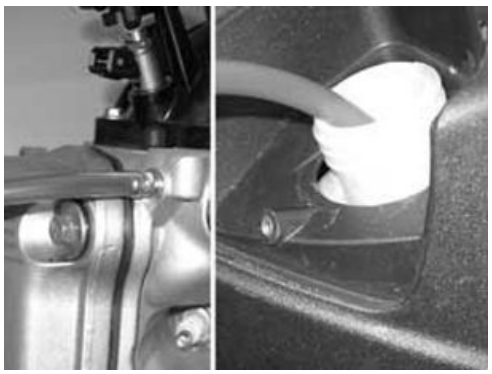
Coolant replacement

System top-up instructions

- Prepare the mixture of 50% water and 50% coolant.
- Fill the system to reach a level ranging between the MIX and MAX levels indicated in the expansion tank filler.
- Do not close the expansion tank with the cap.



- Use a transparent hose to connect the venting union with the expansion tank filler.
- Loosen the vent and start the engine.



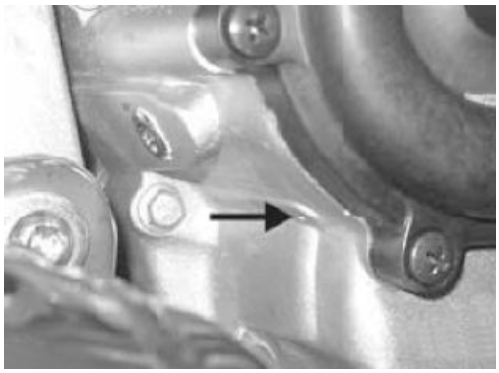
- Keep it open until the air has been fully vented.
- Close the bleed screw.

- Stop the engine.
- Restore the level into the expansion tank and tighten the cap.
- Start the engine and let it warm up to reach the electric ventilation temperature.
- Stop the engine.
- Restore the level with cold engine.

CAUTION

ELECTRIC VENTILATION IS CONTROLLED BY THE TEMPERATURE MEASURED AT THE HEAD. THE ELECTRIC VENTILATION START DOES NOT MEAN THAT THE VENTING HAS BEEN COMPLETED.
VENTING IS COMPLETE WHEN THE EXPANSION TANK TEMPERATURE RISES.

Water pump - overhaul



In case of noise or fluid leaks from the water pump drainage hole, inspect the pump as described in the "Flywheel cover" chapter.
Proceed to carry out a few preliminary operations as described below:

- Place the vehicle on its centre stand and on flat ground.
- Remove the right footrest as described in the "Body" chapter.
- Remove the muffler to access the flywheel cover, as described in the "Engine" chapter.
- Empty the cooling system, removing the hoses located on the water pump cover and the loading cap located on the expansion tank.

CAUTION

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

- Remove the water pump cover shown in the figure by loosening the 6 fastening screws.
- Follow the instructions provided in the "Engine" chapter to partly discharge the system and to inspect the pump.
- Once the fault has been fixed and all components have been replaced, fill and purge the system again.

N.B.

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

Characteristic

Cooling system

approx. 1.7 litres

See also

Flywheel cover
Engine

Thermostat

Check

Before proceeding to disassembly, carry out a few checks:

- Connect the diagnostic tester and select the "PARAMETERS" function (see "Injection" chapter);
- Start the cold engine and let it warm up.
- Make sure that there is a sudden increase of temperature.

N.B.

THERE SHOULD BE A SLIGHT AND GRADUAL HEATING CAUSED BY A SMALL PASSAGE ON THE THERMOSTAT TO THE OFF POSITION.

Specific tooling

020460Y Scooter diagnosis and tester

- Check the temperature read by the diagnostic tester.
- If opening occurs at different temperatures, check the thermostat.
- Remove the thermostat as described in the flywheel cover paragraph.

Characteristic

Thermostat opening start

approx. 82±2°C

- Visually check that the thermostat exhibits no mechanical faults.
- Prepare a metal container with approx. 1 litre of water.
- Immerse the thermostat, and keep it in the centre of the container.
- Immerse the multimeter thermometer probe close to the thermostat.
- Heat up the container using the thermal gun.
- Heat the water and periodically pull the thermostat out until its opening becomes visible.
- Insert a thin copper wire between the seat and the thermostat closing plate.
- Keep the wire into position until locking up is perceived.
- Let water and thermostat cool down.
- Progressively heat the water keeping the thermostat immersed by the wire.
- Check the opening temperature when the thermostat releases from the wire.

Specific tooling

020331Y Digital multimeter

020151Y Air heater

- Heat to obtain the thermostat full opening
- If incorrect values are detected, replace the thermostat.
- Repeat the filling and venting procedure.

N.B.

HEATING SHOULD BE GRADUAL.

N.B.

AVOID CONTACT BETWEEN THERMOSTAT AND CONTAINER FOR A CORRECT TEST PERFORMANCE.

diagnosis

Excessive system pressure

1 - Check the expansion tank cap efficiency.

N.B.

THE CAP IS EQUIPPED WITH A PRESSURE RELIEF VALVE CALIBRATED AT 0.9 BAR.

There is also a valve that must allow air inlet during the cooling step.

YES go to 2 NO go to 3

2 - Check the head gasket seal (see «Thermal group and timing system» chapter)

3 - Replace the cap.

Cooling fluid consumption

1 - Check the system outside seals as described above.

YES go to 2 NO go to 3

2 - Check the head gasket seal (see «Thermal group and timing system» chapter)

- If water leaks are detected in the engine oil, inspect the pad on the head cooling circuit.

3 - Fix any damaged seals.

Oil in the fluid

1 - Presence of oil in the coolant.

YES go to 2

2 - Check the head gasket seal (see «Thermal group and timing system» chapter)

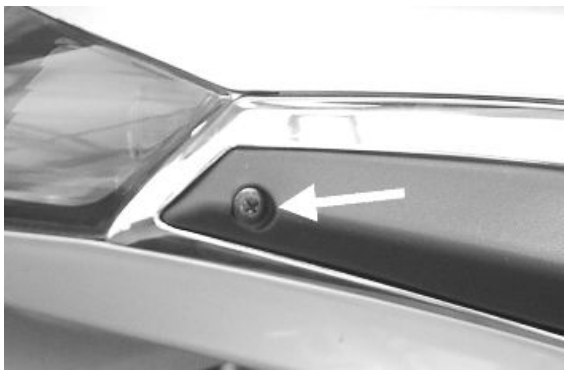
INDEX OF TOPICS

Seat

- To remove the saddle, loosen the three screws shown in the figure.

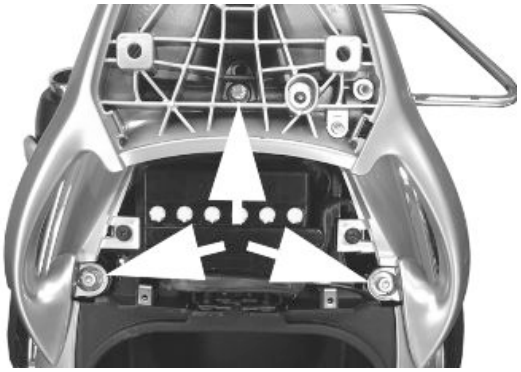
Side fairings

- Remove the side bumpers by removing the fixing screw indicated in the figure and pull towards the rear side of the vehicle.



Rear rack

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

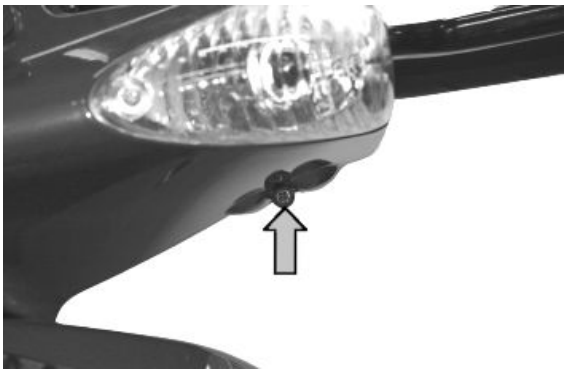


Rear handlebar cover

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

- Undo the screw indicated.

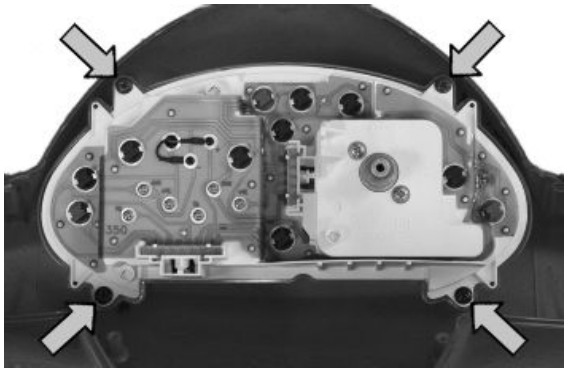
- From below undo the screw fixing it to the front handlebar cover.



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

Instrument panel

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

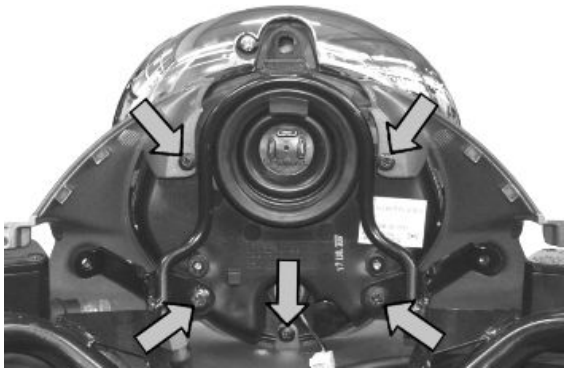


See also

Rear handlebar cover

Front handlebar cover

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

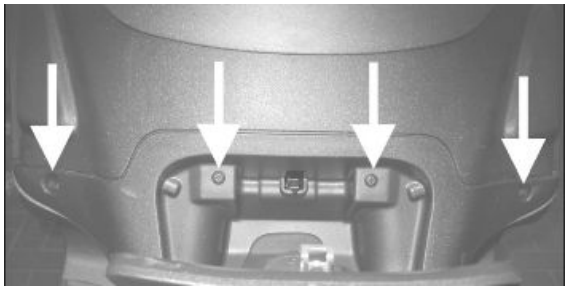


- During the fitting stage, make sure that the retainer clamp indicated is placed correctly.

Headlight assy.

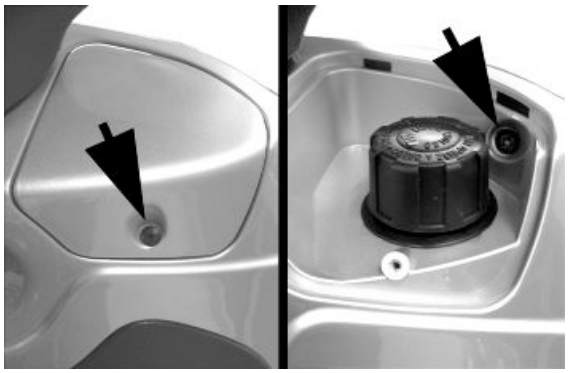
Frame central cover

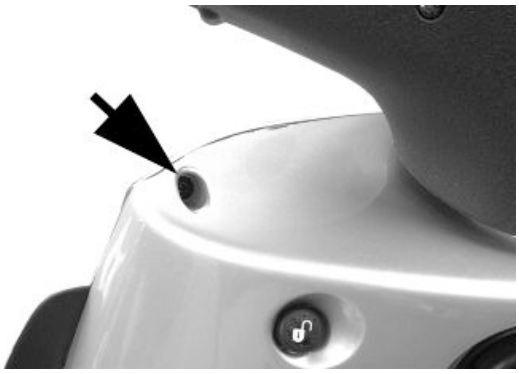
- Open the fuel tank access port.
- Loosen the 4 screws shown in the figure.
- Remove temporarily the fuel tank cap and pull out the rubber protector.
- Remove the central frame cover, separating it from the rear section of the scooter, then separating it from the transmission for the opening of the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



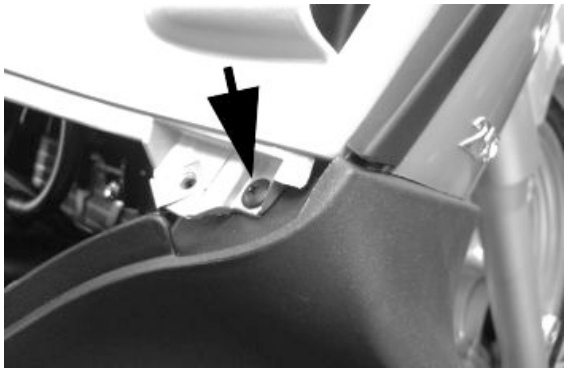
Legshield

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

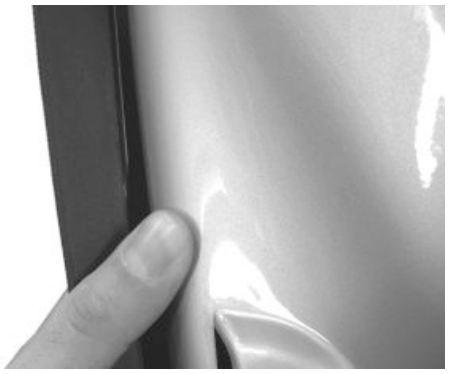




- Remove the central frame cover, then unscrew the 2 screws indicated in the figure.
- Remove the Piaggio symbol from the shield, then remove the screw.
- Remove the legshield to the front.



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

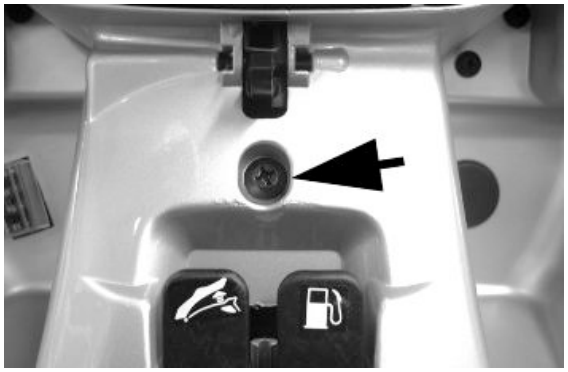


See also

Headlight assy.
Frame central cover

Knee-guard

- Remove the legshield.
- Undo the two screws fixing the fuse box to the front glove-box.
- Remove the electrical connections.
- Remove the expansion tank.
- Undo the fixing screw inside the glove-box.



- Disconnect the saddle closing mechanism.
- Remove the rear shield with the glove box.

See also

Legshield

Removing the ignition key-switch when on *off*

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

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

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

See also

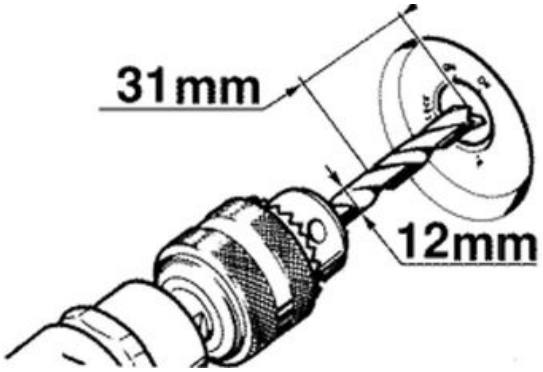
Knee-guard

Removing the ignition key-switch when on *lock*

In "Lock" and "ON" position, the cylinder locking spring cannot be accessed. Drill the clip as shown in the figure to eject the lock cylinder.

N.B.

FOR REASSEMBLY FROM THIS POSITION, RELEASE THE STEERING WHEEL AND SET THE LOCK BODY (INSIDE AND OUTSIDE PART) TO "OFF". THEN, PROCEED AS DESCRIBED IN PARAGRAPH REMOVAL, LOCK IN OFF POSITION.



See also

Removing the ignition key-switch when on *off*

Taillight assy.

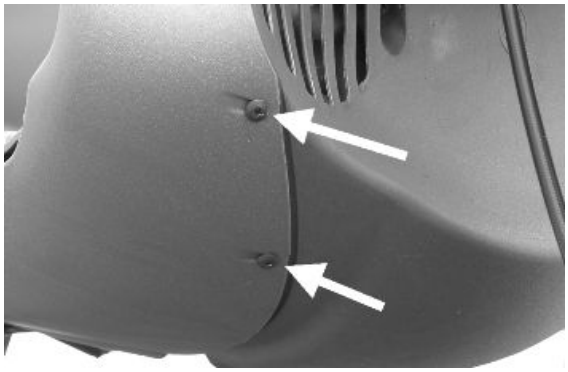
- Remove the cover of the luggage rack.
- Remove the side bumpers.
- Unscrew the 3 screws holding the rear light.
- Remove the rear light assembly after disconnecting the electrical cable harness.

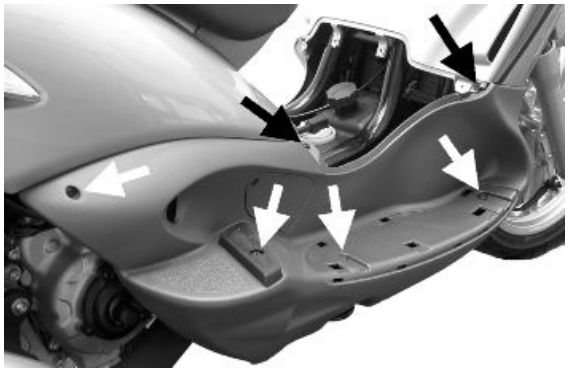
See also

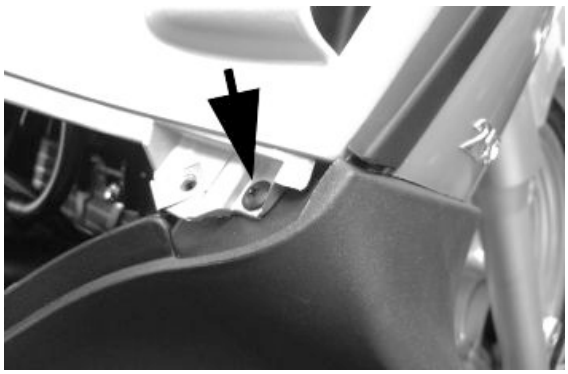
Rear rack
Side fairings

Footrest

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







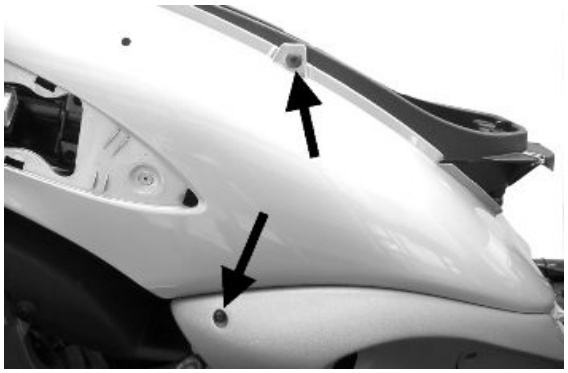
See also

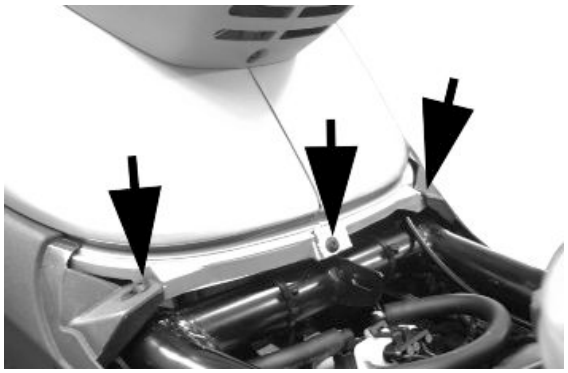
Frame central cover

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.



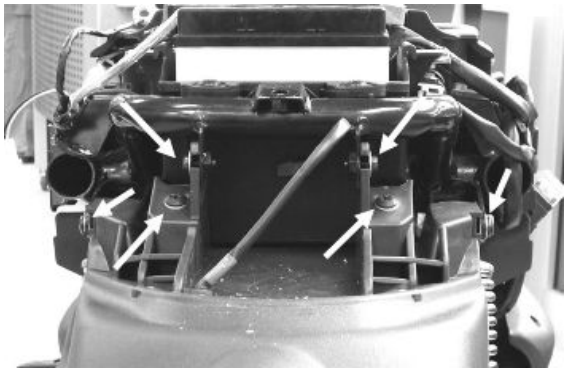


See also

Seat
Rear rack
Frame central cover
Taillight assy.
Rear rack
Seat
Taillight assy.
Frame central cover

License plate holder

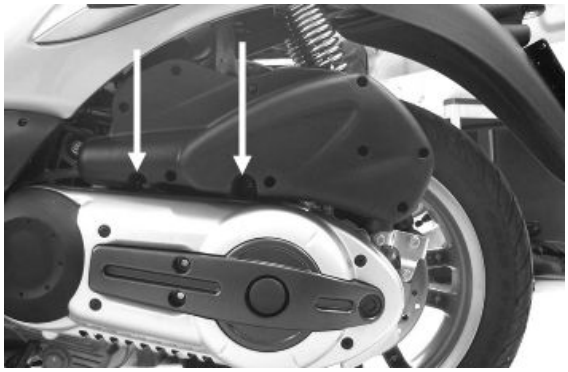
- Remove the fairings
- Disconnect the cable harnesses
- Unscrew the 6 clamps highlighted in the figure
- Remove the whole license plate support



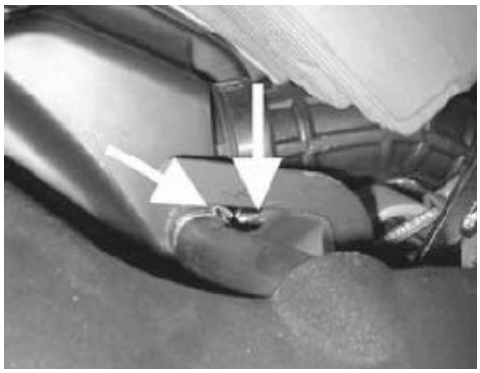
Air filter

- Remove the two mounting screws shown in the figure.

UPON REASSEMBLY, THE SHORTER SCREW MUST BE INSERTED INTO THE REAR SIDE.

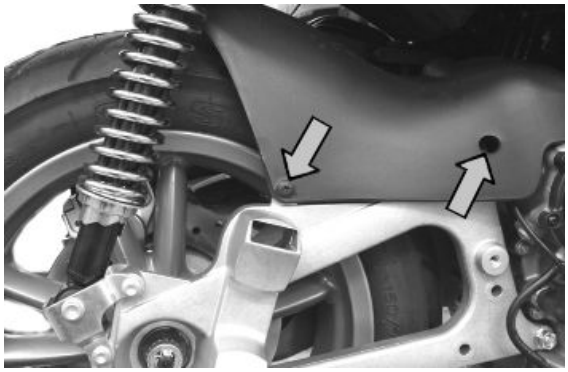


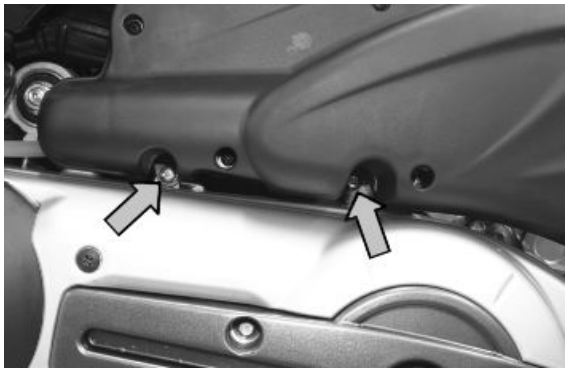
- Remove the blow-by and condensate exhaust pipe cap.
- Loosen the intake hose screw band.
- Loosen the blow-by pipe band.
- Pull out the complete air filter box.



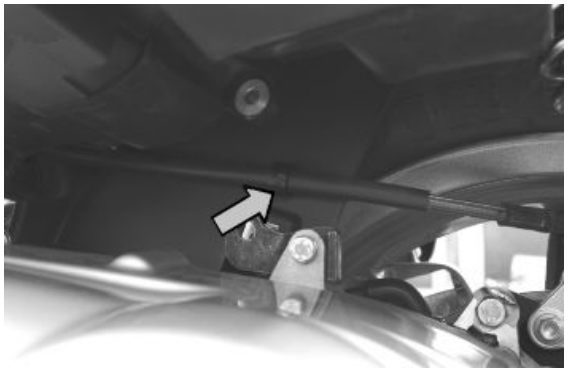
Rear mudguard

- Undo the four fixing screws, two of which are indicated in the figure and the other two located on the opposite side under the air filter.



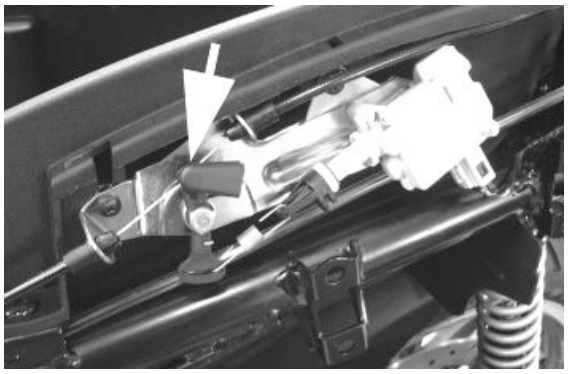


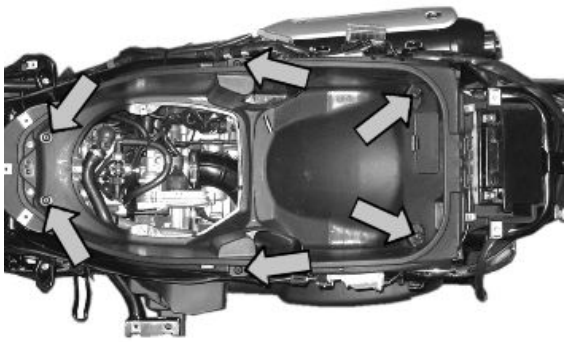
- Disconnect the rear brake pipes from the mudguard.
- Remove the mudguard.

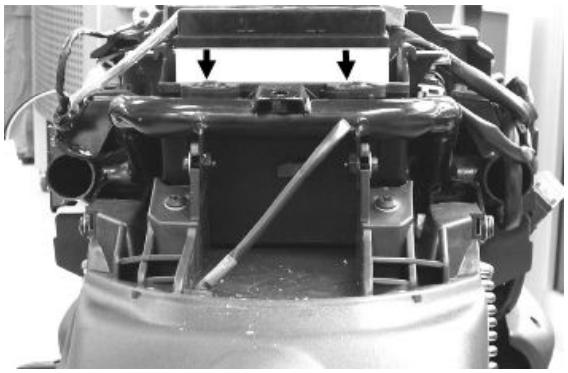


Helmet bay

- 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.





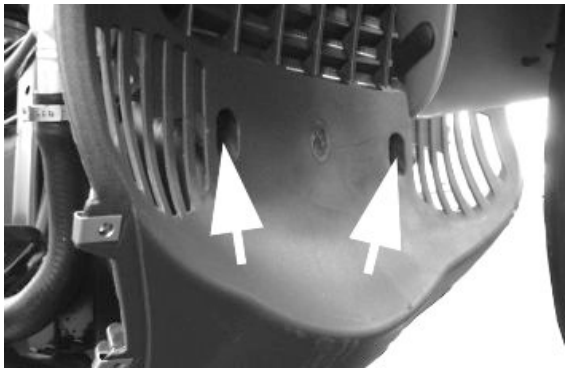


Fuel tank

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

N.B.

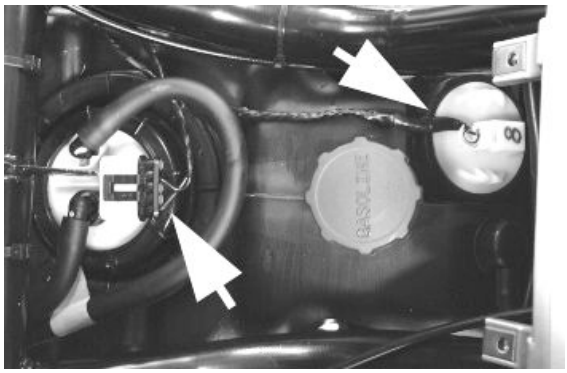
THIS OPERATION SHOULD PREFERABLY BE PERFORMED WITH THE TANK EMPTY.



- 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.

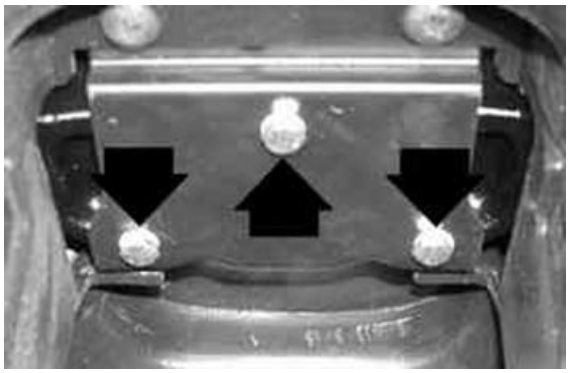


See also

Knee-guard
Front wheel housing
Footrest
Footrest
Knee-guard

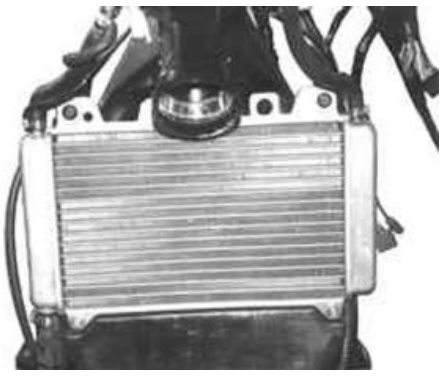
Front mudguard

- 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.



Flyscreen

- Undo the three screws indicated and remove the windshield.

INDEX OF TOPICS

Carry out the listed tests before delivering the vehicle.

WARNING

BE VERY CAREFUL WHEN HANDLING FUEL.

Aesthetic inspection

Appearance check:

- Paintwork
- Fitting of plastics
- Scratches
- Dirt

Tightening torques inspection

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

FRONT SUSPENSION

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

FRONT BRAKE

- Screws fixing the support plate to the fork
- Screws fixing the front brake callipers to the support
- Brake pipes to front brake callipers couplings

REAR SUSPENSION

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

REAR BRAKE

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

STAND

- Central stand bolt nuts

Electrical system

Electrical System:

- Main switch

- Headlamps: high beams, low beams, side/taillights (front and rear) and relevant warning lights
- Adjusting the headlights according to the regulations currently in force
- Front and rear stop light buttons and bulb
- Turn indicators and their warning lights
- Instrument lighting
- Instrument panel: fuel and temperature indicator
- Instrument panel warning lights
- Horn
- Electric start-up
- Engine stop by emergency stop switch and side stand
- Saddle electric opening button

CAUTION

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

CAUTION

WHEN INSTALLING THE BATTERY, CONNECT THE POSITIVE CABLE BEFORE CONNECTING THE NEGATIVE ONE, AND PERFORM THE REVERSE OPERATION UPON REMOVAL.

WARNING

BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH EYES, SKIN AND CLOTHING.
IN CASE OF CONTACT WITH EYES OR SKIN, RINSE WITH ABUNDANT WATER FOR ABOUT 15 MINUTES AND SEEK MEDICAL ATTENTION AT ONCE.
IF IT IS SWALLOWED, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.
BATTERIES PRODUCE EXPLOSIVE GAS; KEEP THEM AWAY FROM NAKED FLAMES, SPARKS AND CIGARETTES. IF THE BATTERY IS CHARGED IN A CLOSED PLACE, TAKE CARE TO ENSURE ADEQUATE VENTILATION. ALWAYS PROTECT YOUR EYES WHEN WORKING CLOSE TO BATTERIES.
KEEP OUT OF THE REACH OF CHILDREN

CAUTION

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

Levels check

Level check:

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

Road test

Test ride

- Cold start

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

Static test

Static test after test ride:

- Restarting when warmed up
- Starter operation
- Minimum hold (turning the handlebar)
- Uniform turning of the steering
- Possible leaks
- Operation of the radiator electric fan

Functional inspection

Operating test:

- Hydraulic brake system
- Lever travel
- Clutch - Check for correct operation
- Engine - Check for correct general operation and make sure there is no unusual noise
- Other
- Check documents:
- Check the frame and engine numbers
- Check tool kit
- License plate fitting
- Check locks
- Check tyre pressures
- Installation of mirrors and any accessories

CAUTION

NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES OR TYRES MAY BURST.

CAUTION

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

Tyres: *11*