PIAGGIO

WORKSHOP MANUAL

633265

NRG Power Purejet

WORKSHOP MANUAL

NRG Power Purejet

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

WORKSHOP MANUAL
NRG Power Purejet

This workshop manual has been drawn up by Piaggio & C. Spa to be used by the workshops of Piaggio-Gilera dealers. This manual is addressed to Piaggio service mechanics who are supposed to have a basic knowledge of mechanics principles and of vehicle fixing techniques and procedures. Any important changes made to the vehicles or to specific fixing operations will be promptly reported by updates to this manual. Nevertheless, no fixing work can be satisfactory if the necessary equipment and tools are unavailable. It is therefore advisable to read the sections of this manual relating to specific tools, along with the specific tool catalogue.

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

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

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

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

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

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

INDEX OF TOPICS

CHARACTERISTICS	CHAR
TOOLING	TOOL
MAINTENANCE	MAIN
TROUBLESHOOTING	TROUBL
ELECTRICAL SYSTEM	ELE SYS
ENGINE FROM VEHICLE	ENG VE
ENGINE	ENG
SUSPENSIONS	SUSP
PURE JET INJECTION	INJ PJ
BRAKING SYSTEM	BRAK SYS
COOLING SYSTEM	COOL SYS
CHASSIS	CHAS
PRE-DELIVERY	PRE DE
TIME	TIME

INDEX OF TOPICS

CHARACTERISTICS	CHAR

Rules

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

Safety rules

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

Maintenance rules

- Use original PIAGGIO spare parts and lubricants recommended by the Manufacturer. Non-original or non-conforming spares may damage the vehicle.
- Use only the appropriate tools designed for this vehicle.
- Always use new gaskets, sealing rings and split pins upon refitting.
- After removal, clean the components using non-flammable or low flash-point solvent. Lubricate all the work surfaces except the tapered couplings before refitting.
- After refitting, make sure that all the components have been installed correctly and work properly.
- For removal, overhaul and refit operations use only tools with metric measures. Metric bolts, nuts and screws are not interchangeable with coupling members with English measurement. Using unsuitable coupling members and tools may damage the scooter.
- When carrying out maintenance operations on the vehicle that involve the electrical system, make sure the electric connections have been made properly, particularly the ground and battery connections.

Vehicle identification

Frame prefix: ZAPC45200 ÷ 1001

Engine prefix: C452M

Dimensions and mass

DIMENSIONS AND MASS

Specification	Desc./Quantity
Max length	1790 mm.
Max width	850 mm.
Seat height	795 mm.
Wheelbase	1280 mm
Dry weight	99 kg.

Engine

ENGINE

Specification	Desc./Quantity
Engine type	2 stroke single cylinder Piaggio HI-PER2 PRO PUREJET
Bore x stroke	40 X 39.3 mm
Cubic capacity	49.40 cc
Compression ratio	9.4 to 10.4 :1
Throttle body	BING Ø18mm
Engine idle speed	1800 to 2000 r.p.m.
Air filter	Sponge impregnated with fuel mixture (50% SELENIA air filter oil and 50% unleaded petrol).
Starting system	electric starter/kickstarter
Cooling system	forced coolant circulation system
Lubrication	Engine lubrication (piston, cylinder, crankshaft, main bearings) with mixer oil.
Fuel supply	With electric fuel pump, controlled by the ECU and unleaded petrol (with 95 octane minimum) via throttle body
Cooling system	Through circulation of cooling liquid

Transmission

TRANSMISSION

Specification	Desc./Quantity
Transmission	With automatic expandable pulley variator, torque server, V belt, automatic clutch, gear reduction unit.

Capacities

CAPACITIES

Specification	Desc./Quantity
Rear hub oil	Quantity: approx. 75 cm^3
Mixer oil	1.2 litres
Fuel tank capacity	6.5 litres (1.5 litres of reserve)

Electrical system

ELECTRICAL SYSTEM

Specification	Desc./Quantity
Ignition type	Electronic ignition system with integrated H.T. coil managed by ECU
Ignition advance (before TDC)	variable (integrated into the ignition system)
Recommended spark plug type	CHAMPION RG6YCA
Battery	12V-9Ah
Main fuse	20A
Generator	Three-phase alternating current

Frame and suspensions

FRAME AND SUSPENSIONS

Specification	Desc./Quantity
Chassis type	Welded tubular steel chassis with stamped sheet reinforcements
Front suspension	upside-down hydraulic telescopic fork.
Front suspension travel	75 mm
Rear suspension	With coaxial spring and hydraulic shock absorber. Chassis to engine support with swinging arm.

Brakes

BRAKES

Specification	Desc./Quantity
Front brake	Ø 220 mm disc brake with hydraulic linkage (r.h. brake lever).
Rear brake	Ø 175 mm disc (hydraulically controlled via lever on left hand-side of handlebar)

Wheels and tyres

WHEELS AND TYRES

Specification	Desc./Quantity
Front tyre	Tubeless 120/70-13"
Rear tyre	Tubeless 140/60 x 13''
Wheels	With circles of 3.50 x 13" in light alloy.

Tightening Torques

STEERING ASSEMBLY

Name	Torque in Nm
Upper steering ring nut (safety locks)	35 to 40 Nm
Lower steering ring nut (safety locks)	8 to 10 Nm
Handlebar fixing pin (safety locks)	45 to 50 Nm

FRAME ASSEMBLY

Name	Torque in Nm
Swinging arm-engine pin (safety locks)	33 to 41 Nm
Swinging arm-frame pin (safety locks)	64 to 72 Nm
Shock absorber - frame nut (safety locks)	20 to 25 Nm
Shock absorber-engine pin (safety locks)	33 to 41 Nm
Rear wheel axis (safety locks)	104 to 126 Nm
Bolt holding stand to the engine	18 to 19 Nm
Side stand fixing screw	12 ÷ 20
Side stand bracket fixing screw	15 ÷ 20
Rear rim fixing screw	20÷25

FRONT SUSPENSION

Name	Torque in Nm
Front wheel axle nut (safety locks)	45 to 50 Nm
Wheel axle clamp screw	6 ÷ 7 Nm
Lower leg screw	15 to 20 Nm
Hydraulic cartridge stem nut	15 to 18 Nm

FRONT BRAKE

Name	Torque in Nm
Viti fissaggio coperchio pompa freno	1,5 ÷ 2 Nm
Brake pump support fixing screw	7 to 10 Nm
Brake fluid pump - hose fitting	13 to 18 Nm
Brake fluid tube - calliper fitting	20 to 25 Nm
Calliper tightening screw	20 to 25 Nm
Disc tightening screw (safety locks - lock with LOCTITE THREADLOCK MEDIUM TYPE 243)	6 ÷ 7 Nm
Oil bleed screw	7 to 10 Nm
Calliper coupling screw	20 to 25 Nm

REAR BRAKE

Name	Torque in Nm
Fastening screws calliper to the crankcase	20 - 25

Name	Torque in Nm
Brake reservoir cover fixing screw	2÷4 N·m (Grimeca) - 0,8÷1,5 N·m (Brembo) - 1,5÷2 N·m (Hengtong)
Brake pump support fixing screw	7 to 10 Nm
Brake fluid pump - hose fitting	13 to 18 Nm
Brake fluid tube - calliper fitting	20 to 25 Nm
Oil bleed screw	7 to 10 Nm

ENGINE UNIT

Name	Torque in Nm
Clutch bell nut	40 to 44 Nm
Clutch lock ring nut	55 ÷ 60
nut locking driving pulley on the crankshaft	40 to 44 Nm
Start-up lever screw	12 ÷ 13
Flywheel nut	40 to 44 Nm
Flywheel fan screws	3 ÷ 4
Half-crank case joint bolts	12 ÷ 13
Bolts holding exhaust pipe to the crankcase	22 ÷ 24
Screws holding the filter box to the crank case	4 ÷ 5
Head nuts	10 ÷ 11
Temperature ECU sensor	18÷22 N·m
Termistore	6÷8 N·m
Starter screws	12 ÷ 13
Ignition spark plug	25 ÷ 30
Hub oil drainage cap	3 ÷ 5
Oil hub level dipstick	Manual
Rear hub cap screws	12 ÷ 13
Transmission cover screws	12 ÷ 13
Inlet manifold screws	8 ÷ 9
Flywheel hood fixing screws	1 ÷ 2
Cylinder hood fixing screws	3.5 ÷ 5
Stator clamping screws	3 ÷ 4
Pick-Up clamping screw	4 ÷ 5
Mixer clamping screws	3 ÷ 4
Screw fixing brake lever to the journal on the engine	12 ÷ 13

Overhaul data

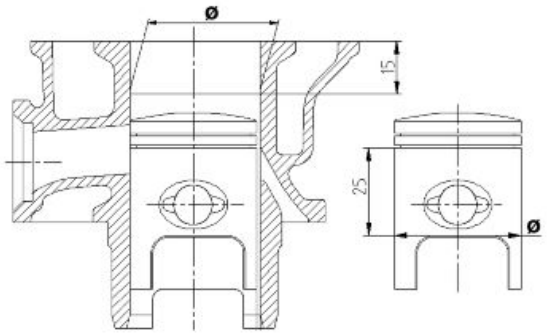
Assembly clearances

Cylinder - piston assy.

CYLINDER-PISTON FITTING

Name	Initials	Cylinder	Piston	Play on fitting
Standard fitting	M	39.997-40.004	39.943-39.95	0.047-0.061
Standard fitting	N	40.004-40.011	39.95-39.957	0.047-0.061
Standard fitting	O	40.011-40.018	39.957-39.964	0.047-0.061
Standard fitting	P	40.018-40.025	39.964-39.971	0.047-0.061
1st oversize fitting	M1	40.197-40.204	40.143-40.15	0.047-0.061
1st oversize fitting	N1	40.204-40.211	40.15-40.157	0.047-0.061

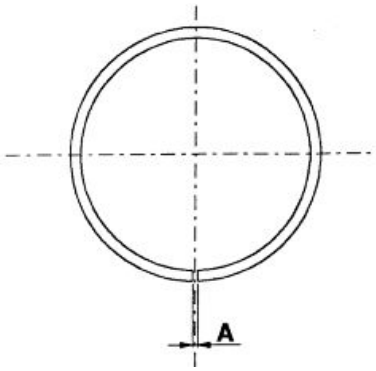
Name	Initials	Cylinder	Piston	Play on fitting
1st oversize fitting	O1	40.211-40.218	40.157-40.164	0.047-0.061
1st oversize fitting	P1	40.218-40.225	40.164-40.171	0.047-0.061
2nd oversize fitting	M2	40.397-40.404	40.343-40.35	0.047-0.061
2nd oversize fitting	N2	40.404-40.411	40.35-40.357	0.047-0.061
2nd oversize fitting	O2	40.411-40.418	40.357-40.364	0.047-0.061
2nd oversize fitting	P2	40.418-40.425	40.364-40.371	0.047-0.061



Piston rings

SEALING RINGS

Name	Description	Dimensions	Initials	Quantity
Compression ring		40	A	0.10 to 0.25
Compression ring 1st oversize		40.2	A	0.10 to 0.25
Compression ring 2nd Oversize		40.4	A	0.10 to 0.25

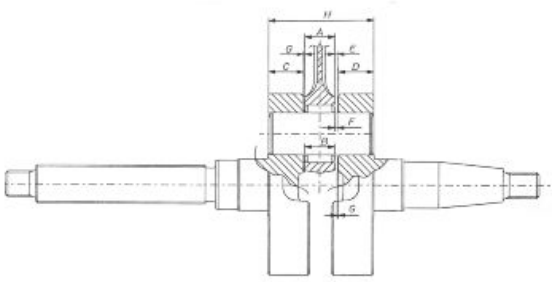


Crankcase - crankshaft - connecting rod

AXIAL CLEARANCE BETWEEN CRANKCASE, CRANKSHAFT AND CONNECTING ROD

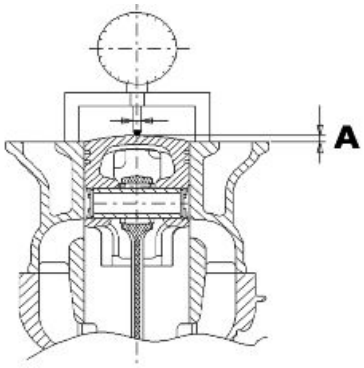
Name	Description	Dimensions	Initials	Quantity
Connecting rod		11.750-0.05	A	clearance E = 0.25 to 0.50
shoulder washer		0.5 ± 0.03	G	clearance E = 0.25 to 0.50 - clearance F = 0.20 to 0.75

Name	Description	Dimensions	Initials	Quantity
Half-shaft, transmission side		13.75+0.040	C	clearance E = 0.25 to 0.50 - clearance F = 0.20 to 0.75
Flywheel-side half-shaft		13.75+0.040	D	clearance E = 0.25 to 0.50 - clearance F = 0.20 to 0.75
Lining between the shoulders		40.64	H	clearance E = 0.25 to 0.50 - clearance F = 0.20 to 0.75
Cage		11.800-0.35	B	clearance F = 0.20 to 0.75



Slot packing system

- Fit the cylinder without installing the basic gasket.
- Apply a centimetre dial gauge on the special tool and zero it on the ground plane
- Fit the tool to the top of the cylinder fixing it with two nuts to the studbolts and take the piston to the T.D.C.
- The thickness of the gasket to fit will change depending on the value detected. For this purpose, there are three with different thicknesses



Specific tooling

020272Y Piston position check tool

SHIMMING SYSTEM

Name	Measure A	Thickness
Shimming	2.80 ÷ 3.04	0,4
Shimming	3.04 ÷ 3.24	0,6
Shimming	3.25 ÷ 3.48	0,8

Products

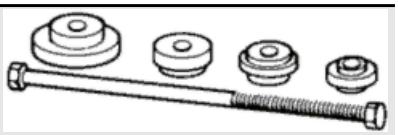
TABLE OF RECOMMENDED PRODUCTS

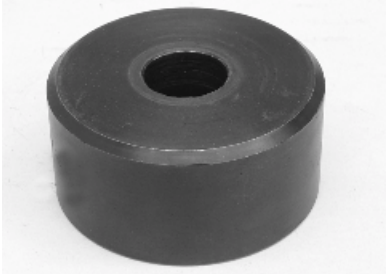
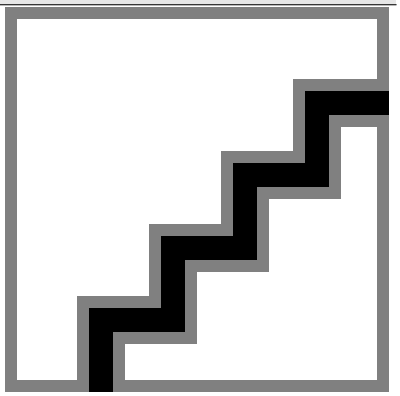
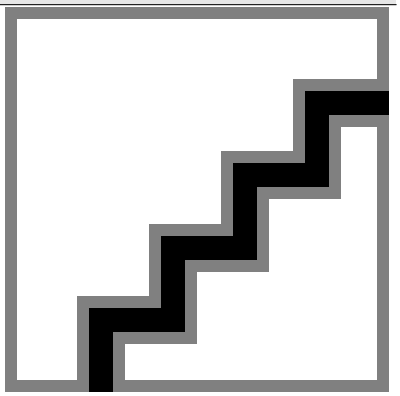
Product	Description	Specifications
AGIP ROTRA 80W-90	Rear hub oil	SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications
AGIP CITY HI TEC 4T	Oil for flexible transmission lubrication (brake, throttle control and mixer, odometer	Oil for 2-stroke engines: SAE 5W-40, API SL, ACEA A3, JASO MA
AGIP FILTER OIL	Oil for air filter sponge	Mineral oil with specific additives for increased adhesiveness
AGIP CITY TEC 2T	Mixer oil	synthetic oil for 2-stroke engines: JASO FC, ISO-L-EGD
AGIP GP 330	Grease for brake levers, throttle	White calcium complex soap-based spray grease with NLGI 2; ISO-L-XBCIB2
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
AGIP BRAKE 4	Brake fluid	FMVSS DOT4 Synthetic fluid
MONTBLANC MOLYBDENUM GREASE	Grease for driven pulley shaft adjusting ring and movable driven pulley housing	Molybdenum disulphide grease
AGIP GREASE PV2	Grease for the steering bearings, pin seats and swinging arm	White anhydrous-calcium based protective grease for roller bearings; temperature range between -20 C and +120 C; NLGI 2; ISO-L-XBCIB2.

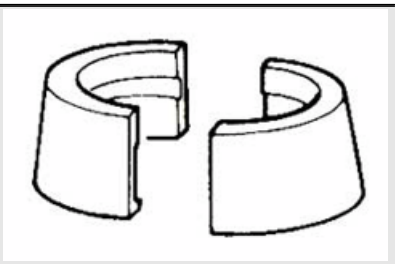
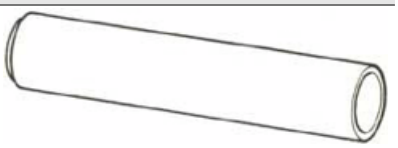
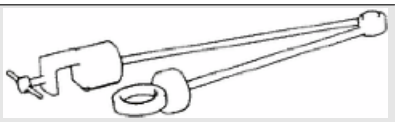
INDEX OF TOPICS

TOOLING	TOOL

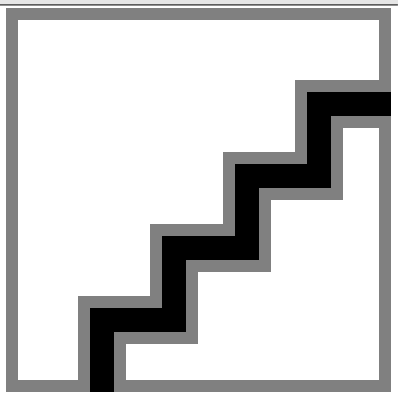
TOOLING

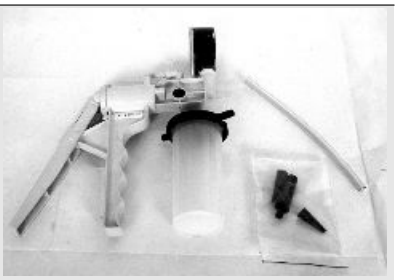
Stores code	Description	
001330Y	Tool for fitting steering seats	
001467Y006	Pliers to extract 20 mm bearings	
001467Y007	Driver for OD 54 mm bearing	
001467Y008	Pliers to extract 17 mm ø bearings	
001467Y009	Driver for OD 42 mm bearings	
001467Y013	Pliers to extract ø 15-mm bearings	
001467Y014	Pliers to extract ø 15-mm bearings	

Stores code	Description	
001467Y017	Bell for bearings, outside Ø 39 mm	
001467Y021	Extraction pliers for ø 11 mm bearings	
001467Y029	Bell for bearings, O.D. 38 mm	
002465Y	Pliers for circlips	
004499Y	Camshaft bearing extractor	

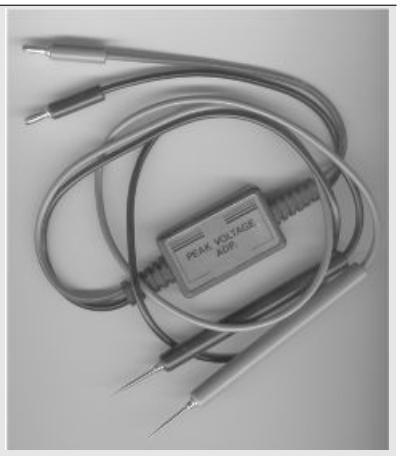
Stores code	Description	
004499Y007	Half rings	
006029Y	Punch for fitting fifth wheel seat on steering tube	
020004Y	Punch for removing fifth wheels from headstock	
020055Y	Wrench for steering tube ring nut	
020074Y	Support base for checking crank-shaft alignment	
020080Y	Punch for removing 12-mm bear-ings	
020150Y	Air heater support	

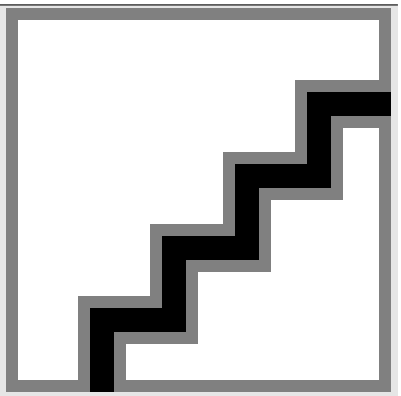
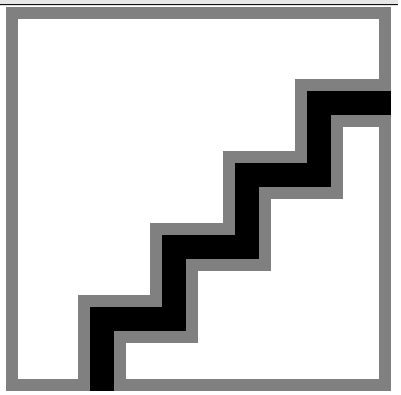
Stores code	Description	
020151Y	Air heater	
020162Y	Flywheel extractor	
020163Y	Crankcase splitting plate	
020164Y	Driven pulley assembly sheath	
020166Y	Pin lock fitting tool	
020168Y	Water seal punch mount on half-crankcase	

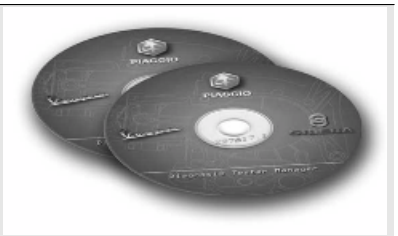
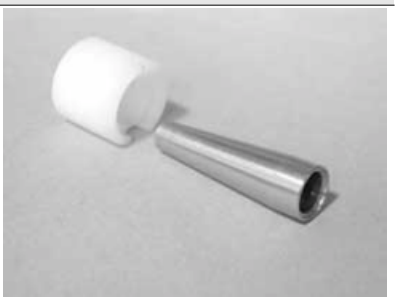
Stores code	Description	
020169Y	Water pump crankshaft fitting and removal spanner	
020170Y	Water pump/mixer command gear extractor	
020171Y	Punch for driven pulley roller bearing	
020209Y	Spring hook	
020265Y	Bearing fitting base	

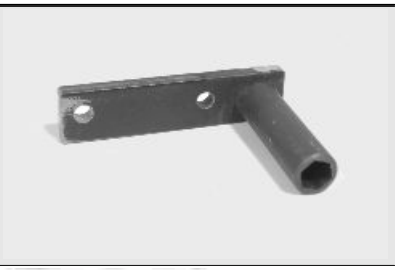
Stores code	Description	
020272Y	Piston position check tool	
020325Y	Brake-shoe spring calliper	
020329Y	MityVac vacuum-operated pump	
020330Y	Stroboscopic light for timing control	
020331Y	Digital multimeter	

Stores code	Description	
020332Y	Digital rev counter	
020334Y	Multiple battery charger	
020335Y	Magnetic support for dial gauge	
020340Y	Flywheel and transmission oil seals fitting punch	
020357Y	32 x 35 mm adaptor	
020358Y	37x40-mm adaptor	
020359Y	42x47-mm adaptor	
020362Y	12-mm guide	

Stores code	Description	
020363Y	20 mm guide	
020409Y	Multimeter adaptor - Peak voltage detection	
020376Y	Adaptor handle	
020412Y	15 mm guide	
020439Y	17 mm guide	
020444Y	Test probe removal / fitting tool	

Stores code	Description	
020456Y	Ø 24 mm adaptor	
020451Y	Start-up crown lock	
020452Y	Tube for removing and refitting the driven pulley shaft	
020460Y	Scooter diagnosis and tester	
020481Y	Control unit interface wiring	

Stores code	Description	
020565Y	Flywheel lock calliper spanner	
020469Y	Reprogramming kit for scooter diagnosis tester	
020614Y	Diagnostic tester programming software	
020615Y	Carbon dam ring fitting kit	
020616Y	Fuel pressure control kit	
020617Y	Air pressure check kit	

Stores code	Description	
020620Y	Water pump impeller stop	
020621Y	HV cable extraction adaptor	

INDEX OF TOPICS

MAINTENANCE	MAIN

Maintenance chart

EVERY 2 YEARS

Action
Brake fluid - change
Coolant - change

AFTER 1000 KM

50'

Action
Hub oil - change
Oil mixer/throttle linkage - adjustment
Odometer cable - greasing
Steering - adjustment
Brake control levers - greasing
Brake fluid level - check
Safety locks - check
Electrical system and battery - check
Tyre pressure and wear - check
Vehicle and brake test - road test

AT 5000 KM OR 12 MONTHS, 25000 KM, 35000 KM AND 55000 KM

40'

Action
Hub oil level - check
Spark plug/electrode gap - replacement
Air filter - clean
Oil mixer/throttle linkage - adjustment
Coolant level - check
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid level - check
Electrical system and battery - check
Tyre pressure and wear - check
Vehicle and brake test - road test

AT 10000 KM OR 24 MONTHS AND 50000 KM

95'

Action
Hub oil - change
Spark plug/electrode gap - replacement
Air filter - clean
Idling speed (*) - adjustment
Oil mixer/throttle linkage - adjustment
Variable speed rollers - replacement
Odometer cable - greasing
Driving belt - check
Coolant level - check
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear

Action
Brake fluid level - check
Transmission elements - lubrication
Safety locks - check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Tyre pressure and wear - check
Vehicle and brake test - road test

(*) See CO regulation in the «Adjusting the engine idle» section

AT 15000 KM AND 45000 KM

65'

Action
Hub oil level - check
Spark plug/electrode gap - replacement
Air filter - clean
Oil mixer/throttle linkage - adjustment
Driving belt - replacement
Coolant level - check
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid level - check
Electrical system and battery - check
Tyre pressure and wear - check
SAS box (sponge) (**) - cleaning
Vehicle and brake test - road test

(**) See the regulations of the "Secondary air system" section

AT 20000 KMS AND 40000 KMS

120'

Action
Hub oil - change
Spark plug/electrode gap - replacement
Air filter - clean
Idling speed (*) - adjustment
Cylinder cooling system - check/cleaning
Oil mixer/throttle linkage - adjustment
Driving belt - check
Variable speed rollers - replacement
Mixer belt - replacement
Coolant level - check
Radiator - external cleaning/ check
Odometer cable - greasing
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid level - check
Transmission elements - lubrication
Safety locks - check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Tyre pressure and wear - check

Action
Vehicle and brake test - road test

(*) See CO regulation in the «Adjusting the engine idle» section

AT 30000 KM

130'

Action
Hub oil - change
Spark plug/electrode gap - replacement
Air filter - clean
Idling speed (*) - adjustment
Oil mixer/throttle linkage - adjustment
Driving belt - replacement
Variable speed rollers - replacement
Coolant level - check
Odometer cable - greasing
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Flexible brake tubes - replacement
Brake fluid level - check
Transmission elements - lubrication
Safety locks - check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Tyre pressure and wear - check
SAS box (sponge) (**) - cleaning
Vehicle and brake test - road test

(*) See CO regulation in the «Adjusting the engine idle» section
(**)See rules in the «Secondary Air System» section

AT 60000 KM

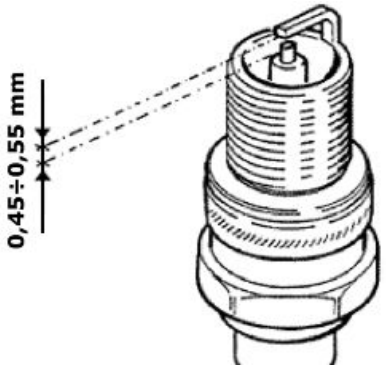
160'

Action
Hub oil - change
Spark plug/electrode gap - replacement
Air filter - clean
Idling speed (*) - adjustment
Oil mixer/throttle linkage - adjustment
Driving belt - replacement
Variable speed rollers - replacement
Mixer belt - replacement
Coolant level - check
Radiator - external cleaning/ check
Odometer cable - greasing
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Flexible brake tubes - replacement
Brake fluid level - check
Transmission elements - lubrication
Safety locks - check
Suspensions - check

Action
Electrical system and battery - check
Headlight - adjustment
Tyre pressure and wear - check
SAS box (sponge) (**) - cleaning
Vehicle and brake test - road test

(*) See CO regulation in the «Adjusting the engine idle» sectionp>
(**) Vedere norme della sezione «Sistema aria secondaria»

Spark plug



- Position the vehicle on its centre stand;
- Remove the centre cover by unscrewing the 2 set screws;
- Disconnect the cover from the plug lead;
- Unscrew the spark plug using a spark plug spanner;
- Check the conditions of the spark plug, make sure the insulation is intact and measure the gap between the electrodes with a feeler.
- Adjust the gap if necessary, carefully bending the side electrode.

In the event of defects replace the spark plug with the prescribed type;

- Position the spark plug at the correct angle and manually tighten it all the way down, then use the specific spanner to tighten it to the prescribed torque;
- Put the cover back over the spark plug;
- Reassemble the central cover.

CAUTION

THE SPARK PLUG MUST BE REMOVED WHEN THE MOTOR IS COLD. THE SPARK PLUG MUST BE REPLACED EVERY 5000 KM. USE OF STARTERS NOT CONFORMING OR SPARK PLUGS NOT THOSE DESCRIBED CAN SERIOUSLY DAMAGE THE ENGINE.

Characteristic

Recommended spark plug type

CHAMPION RG6YCA

Electric characteristic

Electrode gap

0,55÷0,65 mm

Locking torques (N*m)

Spark plug 25 - 30 Nm

Hub oil

Check

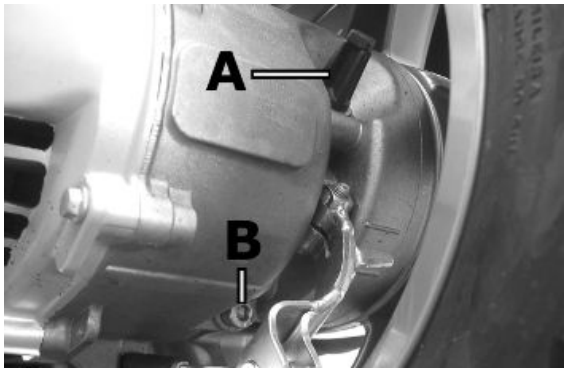
Do the following to check the correct level:

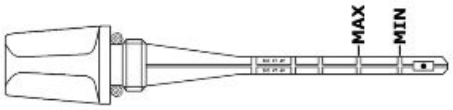
1) Stand the vehicle on the centre-stand on flat ground;

2) Remove the dipstick «**A**», and dry it with a clean cloth. Reinsert it, screwing it in all the way;

3) Remove the stick and check that the oil level is slightly over the second notch starting from the lower end;

4) Screw the dipstick back in, checking that it is locked in place.





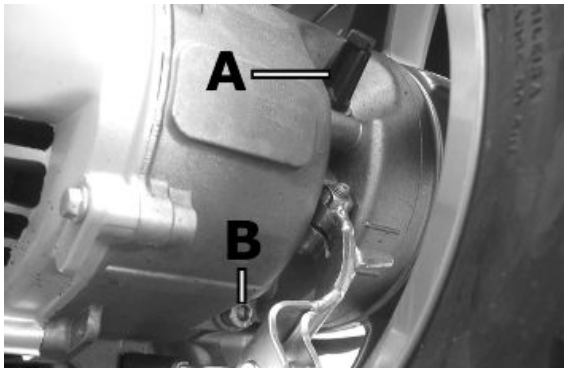
Recommended products

AGIP ROTRA 80W-90 Rear hub oil

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

Replacement

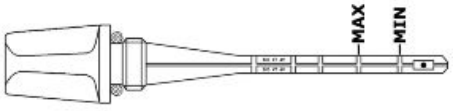
- Remove oil filler cap «**A**».
- Loosen oil draining cap «**B**» and allow for the system to drain completely.
- Refit the draining cap and refill the hub with the prescribed oil.



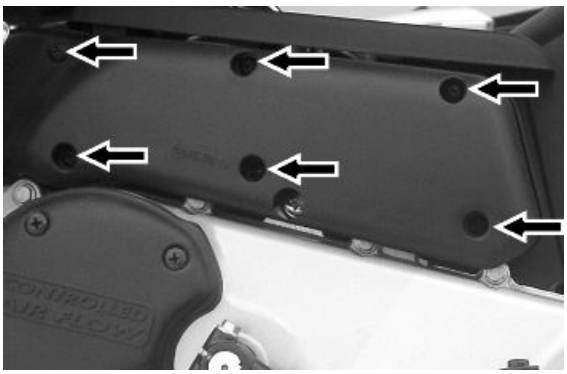
Characteristic

Rear hub oil

~ 85 cc



Air filter



-Remove the cap of the purifier, unscrewing the six clamping screws and removing the filter.

Cleaning:

-Wash with water and neutral soap.

- Dry with a clean cloth and short blasts of compressed air.

-Saturate with a 50% mixture of gasoline and oil.

-Drip dry the filter and then squeeze it between the hands without wringing.

-Let it dry and refit it again.

CAUTION

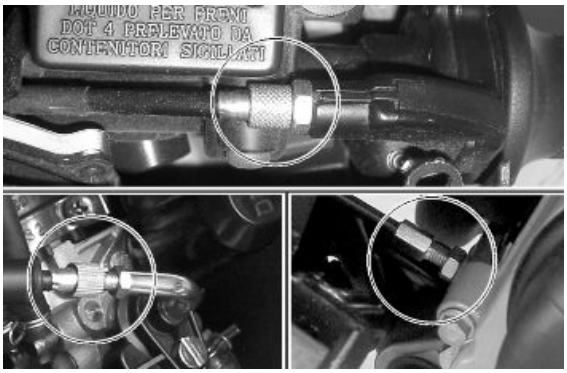
NEVER RUN THE ENGINE WITHOUT THE AIR FILTER, THIS WOULD RESULT IN AN EXCESSIVE WEAR OF THE PISTON AND CYLINDER.

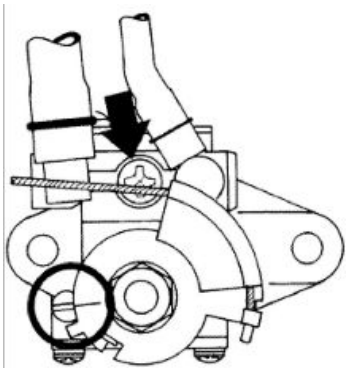
Recommended products

AGIP FILTER OIL Oil for air filter sponge

Mineral oil with specific additives for increased adhesiveness

Checking the ignition timing





- Adjust the control cables:

Mix cable: see procedure indicated in "Mixer timing".

Throttle cable: adjust the set screw on the carburettor in such a way that the sheath has no backlash.

Splitter control cable: adjust set screw on the throttle control to the handlebar in such a way that there is no backlash on the throttle control.

Adjust all transmissions in such a way that their sheathings show no sign of backlash.

Mixer Timing

- Using the transmission set screw on the crankcase, with throttle control untwisted, adjust the reference mark on the rotating plate so that it is

lined up with the reference mark on the mixer body, as shown in the figure.

While doing this, the engine must be fuelled with a 2 % oil mixture (0.5 litre minimum if the reservoir is empty).

CAUTION

IN CASE OF DISMANTLING OR RUNNING OUT OF OIL IN THE RESERVOIR BLEED THE MIXER AS FOLLOWS: REFILL THE OIL RESERVOIR WHEN THE MIXER IS FITTED TO THE VEHICLE AND THE ENGINE IS OFF, UNDO THE MIXER PIPE FROM THE CARBURETTOR AND LOOSEN THE BLEED SCREWS (SEE THE ARROW IN THE FIGURE) UNTIL THE OIL BEGINS TO FLOW OUT. TIGHTEN THE SCREWS, START UP THE ENGINE AND WAIT FOR OIL TO FLOW OUT OF THE TUBE. RECONNECT THE DELIVERY PIPE TO THE CARBURETTOR AND FIX IT IN PLACE WITH THE RELEVANT METAL CLIP.

Recommended products

AGIP CITY TEC 2T Mixer oil

synthetic oil for 2-stroke engines: JASO FC, ISO-L-EGD

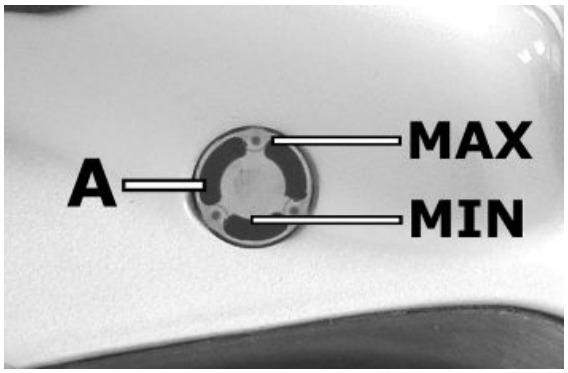
Braking system

Level check

Proceed as follows:

- Rest the vehicle on its centre stand with the handlebars perfectly horizontal;
- Check the level of liquid with the related warning light «**A**».

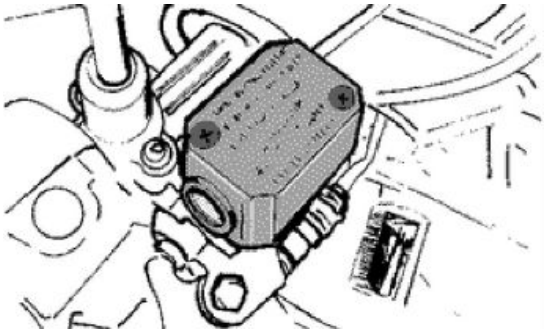
A certain lowering of the level is caused by wear on the pads.



Top-up

Proceed as follows:

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



CAUTION

ONLY USE DOT 4-CLASSIFIED BRAKE FLUID.

CAUTION

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

CAUTION

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

CAUTION

THE BRAKE FLUID IS HYGROSCOPIC, IN OTHER WORDS, IT ABSORBS MOISTURE FROM THE SURROUNDING AIR. IF THE CONTENT OF MOISTURE IN THE BRAKING FLUID EXCEEDS A CERTAIN VALUE, BRAKING WILL BE INEFFICIENT.
NEVER USE BRAKE LIQUID IN OPEN OR PARTIALLY USED CONTAINERS.
UNDER NORMAL CLIMATIC CONDITIONS, THE FLUID MUST BE CHANGED EVERY 20,000 KM OR ANYWAY EVERY TWO YEARS.

N.B.

SEE THE BRAKING SYSTEM CHAPTER WITH REGARD TO THE CHANGING OF BRAKE FLUID AND THE BLEEDING OF AIR FROM THE CIRCUITS.

Recommended products

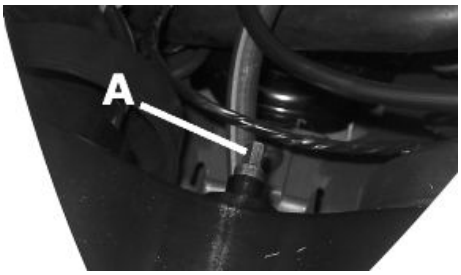
AGIP BRAKE 4 Brake fluid

FMVSS DOT4 Synthetic fluid

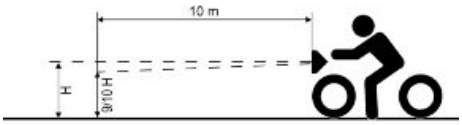
Headlight adjustment

Proceed as follows:

1. Place the vehicle in running order and with the tyres inflated to the prescribed pressure, on a flat surface 10 m away from a white screen situated in a shaded area, making sure that the longitudinal axis of the vehicle is perpendicular to the screen;



2. Turn on the headlight and check that the borderline of the projected light beam on the screen is not lower than 9/10 of the distance from the ground to the centre of vehicle headlamp and higher than 7/10;



3. Otherwise, regulate the headlight by adjusting the screw «**A**», after removing the front grille.

N.B.

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

INDEX OF TOPICS

TROUBLESHOOTING	TROUBL

This section makes it possible to find the solutions to use in troubleshooting.

For each breakdown, a list of the possible causes and respective interventions is given.

Engine

Poor performance

POOR PERFORMANCE

Possible Cause	Operation
Defective fuel pump or damaged depression line	Replace the pump or control lines
Fuel filter dirty or clogged	Clean the coupling filter
Excess of encrustations in the combustion chamber	Remove the encrustations
Lack of compression wear of the piston rings or cylinder	Check the worn parts and replace them
Exhaust pipe clogged due to excessive encrustations	Replace the exhaust pipe and check the carburation and mixer timer
Air filter blocked or dirty	Clean according to the procedure
Clutch slipping	Check the centrifugal brake shoe assembly and / or clutch bell and replace if necessary
Defective mobile pulley sliding	Check the parts, change the faulty parts and lubricate the driven pulley using only Montblanc-Molibdenum Grease (dis. 498345) grease
Transmission belt worn	Replace
Roller wear; Presence of oil; Dirt	Clean the speed variator, replace the rollers if worn out

Rear wheel spins at idle

REAR WHEEL

Possible Cause	Operation
Intake manifold cracked or incorrectly tightened	Make sure the manifold is not damaged and that it is correctly tightened on the throttle body and crankcase
Clutch fault	Check the spring/friction mass and the clutch bell

Starting difficulties

DIFFICULTY IN STARTING

Possible Cause	Operation
Defective fuel pump or damaged depression line	Replace the pump or control lines
Battery flat	Check the state of the battery. If it shows signs of sulphation replace it and bring the new battery into service charging it for eight hours at a current of 1/10 of the capacity of the battery itself
Altered fuel characteristics	Drain off the fuel no longer up to standard; then, refill
Defective spark plug or with incorrect electrode gap	Remove the encrustation, restore the plug gap or replace being sure to use the types of spark plug

Possible Cause	Operation
	recommended at all times. Bear in mind that many problems engines have, derive from the use of the wrong spark plug
Intake joint cracked or with a bad seal	Replace the intake joint and check its tightness on the crankcase and on the carburettor
Purifier-carburettor fitting damaged	Replace

Excessive oil consumption/Exhaust smoke

EXCESSIVE OIL CONSUMPTION/SMOKEY EXHAUST

Possible Cause	Operation
Excess of encrustations in the combustion chamber	Remove the encrustations

Engine tends to cut-off at idle

ENGINE IDLE

Possible Cause	Operation
Reed valve does not close	Check / replace the reed pack
Spark plug defective or faulty	Replace the spark plug with one with the specified degree and check the plug gap

Transmission and brakes

Clutch grabbing or performing inadequately

CLUTCH

Possible Cause	Operation
Tear or irregular functioning	Check that the masses open and return normally Check that there is no grease on the masses Check that the clutch masses' contact surface with the clutch bell is mainly in the middle with characteristics equivalent on the three masses Check that the clutch bell is not scored or worn abnormally Never operate the engine without the clutch bell

Insufficient braking

BRAKE SYSTEM FAULT

Possible Cause	Operation
Poor braking	The rear (drum type) brake is adjusted by regulating the special adjustment (on the wheel) bearing in mind that, with the control levers in the rest position, the wheels must turn freely. The braking action should begin when the brake levers are pressed by about a third. Check the brake pad wear.

Possible Cause	Operation
	If it is not possible to remove any problems by simply adjusting the transmissions, check the brake pads and front brake disc, the brake shoes and the rear drum. If you encounter excessive wear or scoring, make the necessary replacements.
Air bubbles inside the hydraulic braking system	Carefully bleed the hydraulic braking system, (there must be no flexible movement of the brake lever).
Fluid leakage in hydraulic braking system	Elastic fittings, piston seals or brake pump breakdown, replace
The brake fluid has lost its properties	Replace the front brake fluid and top up to the correct level in the pump
Brake noise	Check the wear of the brake pads and/or shoes

Brakes overheating

BRAKE OVERHEATING

Possible Cause	Operation
Defective piston sliding	Check calliper and replace any damaged part.
Deformed brake disc	Use a comparator to check the disc planarity with the wheel correctly mounted

Electrical system

Battery

BATTERY

Possible Cause	Operation
Battery	The battery is the electrical device in the system that requires the most frequent inspections and thorough maintenance. If the vehicle is not used for some time (1 month or more) the battery needs to be recharged periodically. The battery runs down completely in the course of 5 ÷ 6 months. If the battery is fitted on a motorcycle, be careful not to invert the connections, keeping in mind that the black ground wire is connected to the negative terminal while the red wire is connected to the terminal marked+. Follow the instructions in the ELECTRICAL SYSTEM chapter for the recharging of the batteries.

Steering and suspensions

Rear wheel

POOR ROAD HOLDING

Possible Cause	Operation
Faulty suspension	Check that the rear shock absorber and/or the front fork is/are in good working order. Replace or overhaul the front fork and/or replace the rear shock absorbers in case of malfunction
Tyres deflated or damaged	Check the correct pressure of the tyres and the condition of the tread. Inflate to the correct pressure or replace.
Loosen the anchorage points of the front and/or rear suspension unit.	Check the tightness between the frame, swinging arm and engine and the fixing of the wheels to the hub and/or the axle. Check the correct tightening of the steering ring nut.

Heavy steering

STEERING HARDENING

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

Excessive steering play

EXCESSIVE STEERING CLEARANCE

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

Noisy suspension

NOISY SUSPENSION

Possible Cause	Operation
Components of the front suspension damaged.	Check the quiet operation in the compression or release phases of the fork and if necessary overhaul it. Check that there is no noise or seizing during the wheel rotation; if there is, change the wheel bearing.
Components of the rear suspension damaged.	Check the absence of noise in the compression or release of the suspension, if necessary check the proper tightness to the swinging arm unit and the

Possible Cause	Operation
	absence of rust or replace the entire shock absorber. Check that there is no noise or seizing during the wheel rotation; if there is noise or seizing overhaul the final reduction assembly.

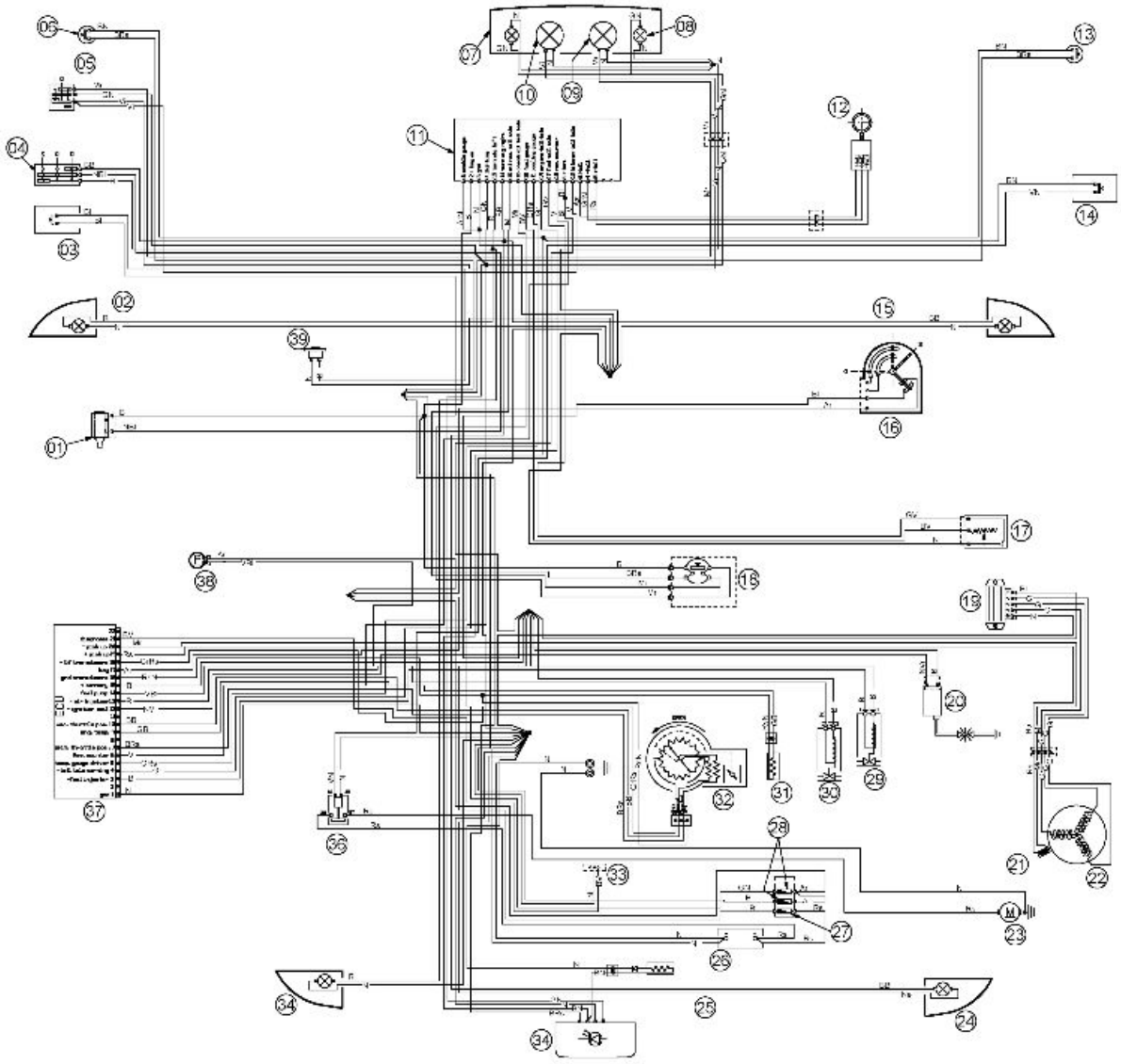
Suspension oil leakage

OIL LEAKAGE FROM SUSPENSION

Possible Cause	Operation
Shock absorbers malfunctioning	Replace the complete shock absorption unit
Hydraulic cartridge in the fork damaged.	Replace the hydraulic cartridge

INDEX OF TOPICS

ELECTRICAL SYSTEM	ELE SYS

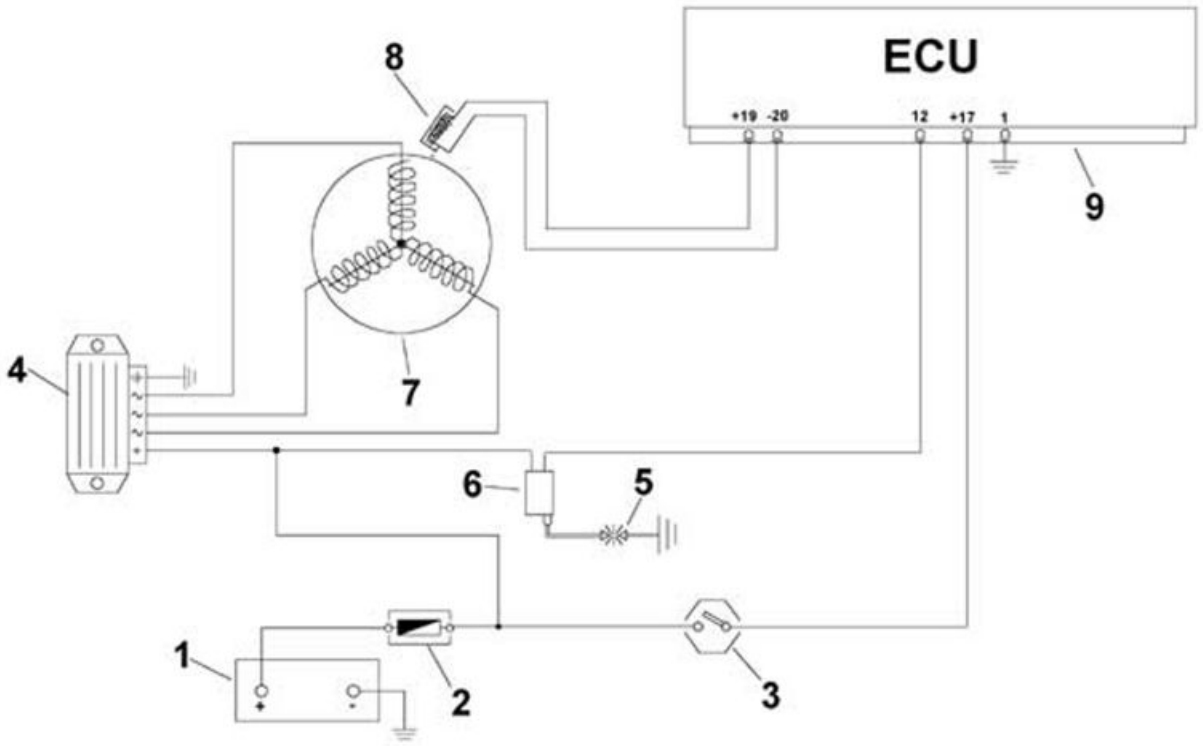


1. Blinker switch device
2. Front left indicator with lamp
3. Horn button
4. Turn indicator selector.
5. High/low beam selector.
6. Rear brake stop button
7. Complete headlight
8. 2 lamps for parking light 12V-3W
9. Lamp for dipped beam light 12V - 35W
10. Lamp for high beam light 12V - 35W
11. Instrument unit
12. Rpm-timing sensor
13. Front brake stop button

14. Start button
15. Front right indicator with lamp
16. Key switch
17. Fuel warning light transmitter
18. Oil mix lamp control
19. Voltage regulator
20. H.T. coil
21. Pick-up
22. Magneto
23. Starter motor
24. Front right indicator with lamp
25. Complete resistance
26. Battery 12V-9A
27. Fuse 20A
28. Fuse 5A
29. Petrol injector
30. Air injector
31. Water temperature sensor
32. Throttle body sensor
33. Output for diagnostics
34. Complete taillight
35. Rear left indicator with lamp
36. Starter relay
37. Electronic cpu
38. Fuel pump
39. Horn

Conceptual diagrams

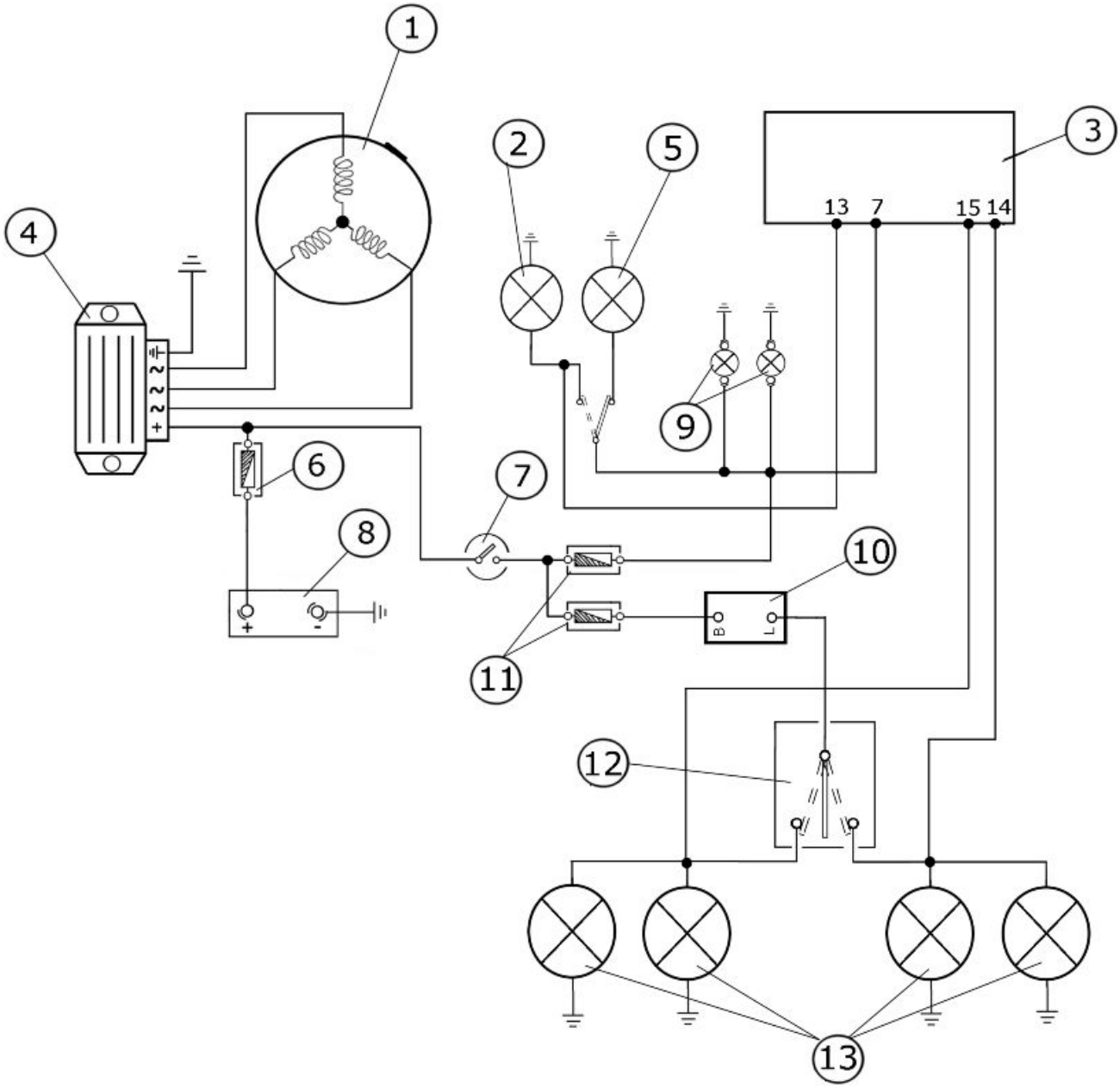
Ignition



IGNITION

	Specification	Desc./Quantity
1	Battery	12V - 9Ah
2	Fuse	20A
3	Key switch contacts	
4	Voltage regulator	
5	Ignition spark plug	
6	HV coil	
7	Flywheel magneto	
8	Pick - up	
9	CPU	

Headlights and automatic starter section

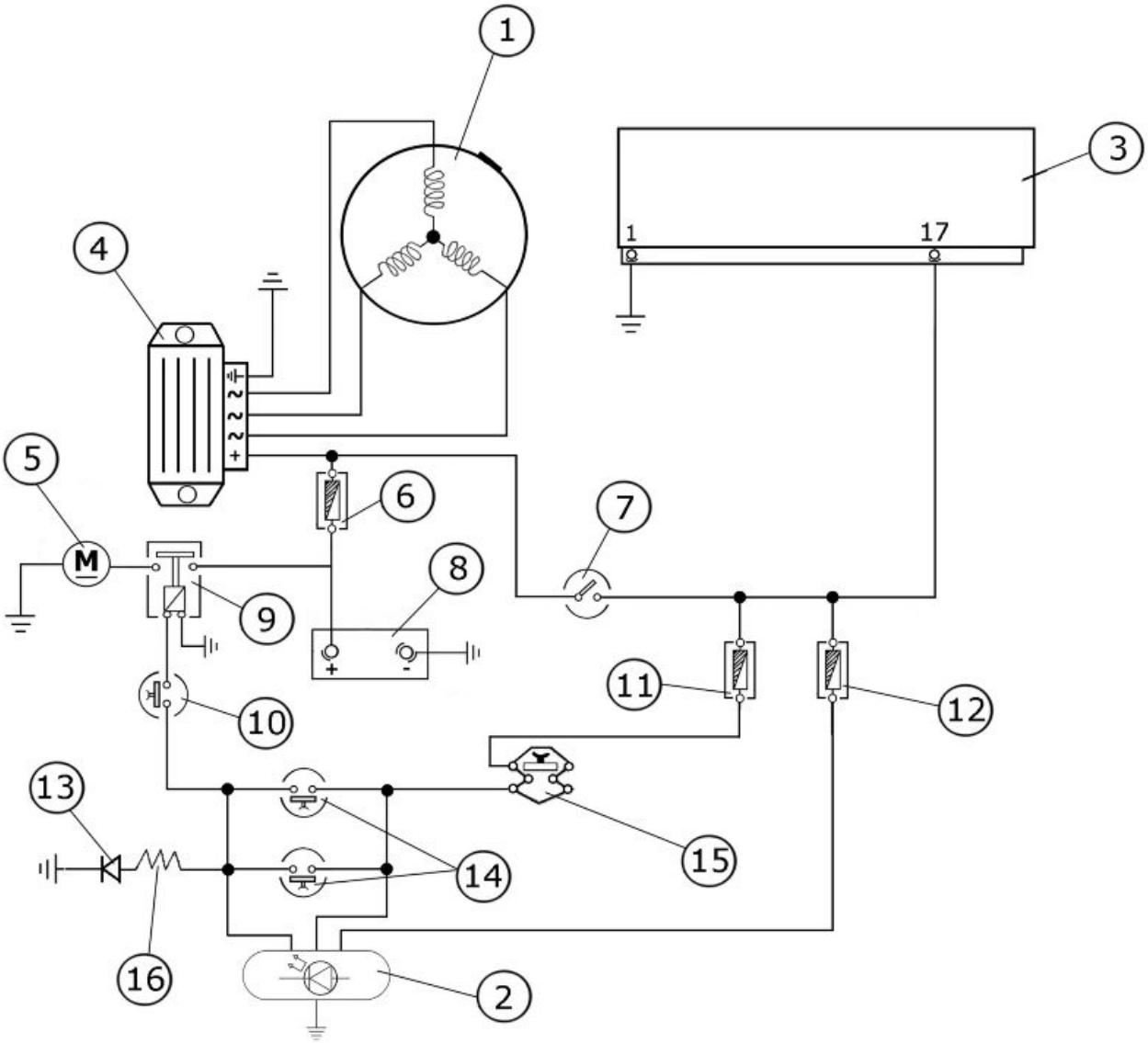


LIGHTS AND TURN INDICATORS

	Specification	Desc./Quantity
1	Flywheel magneto	
2	High beam bulb	**Type**: H8 **Power**: 12V - 35W **Quantity**: 1
3	Digital instrument unit	
4	Voltage regulator	
5	Low beam bulb	**Type**: H8 **Power**: 12V - 35W **Quantity**: 1
6	Fuse	20A

	Specification	Desc./Quantity
7	Key switch contacts	
8	Battery	12V - 9Ah
9	Front parking light	**Type:** All glass **Power:** 12V - 3W **Quantity:** 2
10	Turn indicator control device	
11	Fuse 5A	
12	Turn signal switch	
13	4 turn indicator lamps	12V-10w

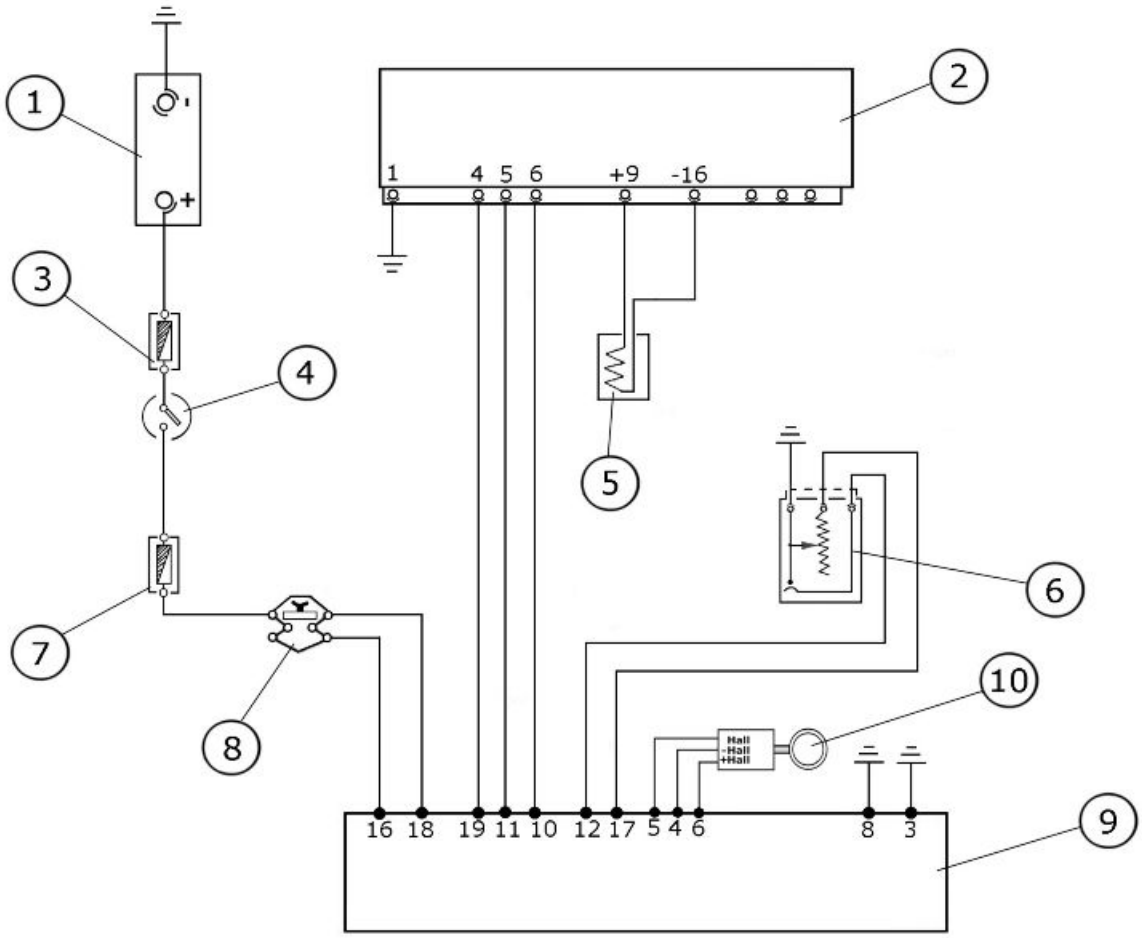
Battery recharge and starting



BATTERY CHARGER AND STARTING

	Specification	Desc./Quantity
1	Flywheel magneto	
2	Rear light with LED	
3	CPU	
4	Voltage regulator	
5	Starter motor	
6	Fuse	20A
7	Key switch contacts	
8	Battery	12V - 9Ah
9	Starter remote control	
10	Starter button	
11	Fuse 5A	
12	Fuse 5A	
13	Diode	
14	Two brake light buttons	
15	Mixture oil level sender	
16	Resistor	47 Ohm 25W

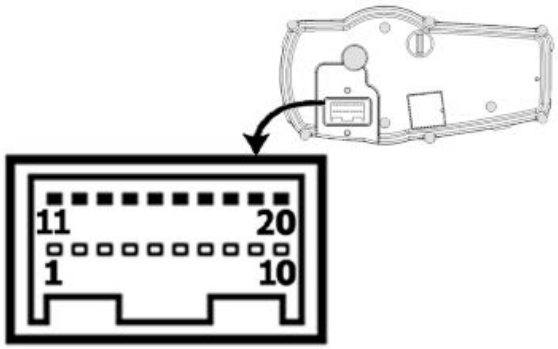
Level indicators and enable signals section



CONSENSUSES AND LEVEL INDICATORS

	Specification	Desc./Quantity
1	Battery	12V - 9Ah
2	CPU	
3	Fuse	20A
4	Key switch contacts	
5	Water temperature sensor	
6	Fuel level sending unit	
7	Fuse 5A	
8	Mixture oil level sender	
9	Digital instrument unit	
10	Wheel rpm sensor	

Digital instrument panel



INSTRUMENT UNIT CONNECTOR

	Specification	Desc./Quantity
1	+ Battery	
2	+ permanent power supply	
3	Earth	
4	Grounding for phonic wheel	
5	Power supply to phonic wheel	
6	Phonic wheel signal	
7	Instrument light and parking light indicator	
8	Instrument temperature mass	
9	Not connected	
10	Rpm indicator signal	
11	Instrument temperature signal	
12	Fuel level sensor	
13	High-beam warning light	
14	+ Right direction indicator	
15	+ Left direction indicator	
16	Low-oil warning light	
17	Low-fuel warning light	
18	Oil light check outlet	
19	Injection warning light	
20	Not connected	

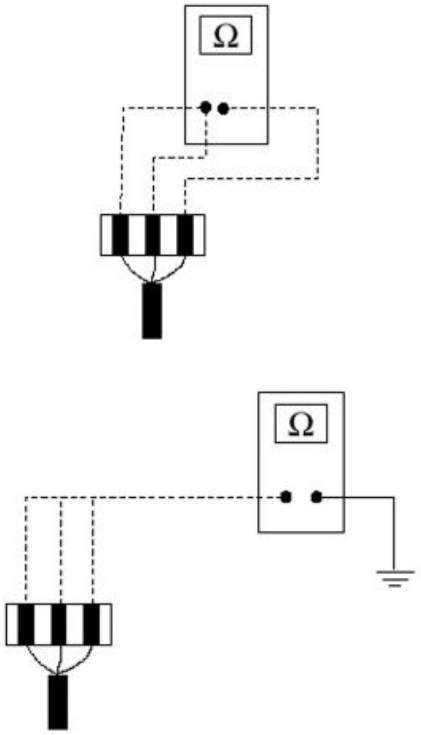
Checks and inspections

Battery recharge circuit

The recharge circuit has a three phase generator with permanent magneto.
The generator is directly connected to the voltage regulator. The voltage regulator is connected directly to the earth and battery positive passing through the 15A protection fuse. Therefore this system does not have a connection to the key switch. The three phase generator provides a significant recharge power and at low rpm, a good compromise is obtained between distributed power and idle stability.

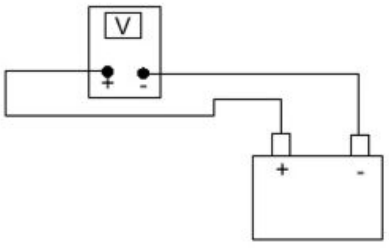
Stator check

Disconnect the connector from the voltage regulator and check for continuity between each yellow wire with the other two.
Ohm value: 0.7 - 0.9 Ohm.
Also check that each yellow wire is isolated from the ground.
If non-conforming values are found, repeat the checks on the stator; if incorrect values continue to occur, replace the stator or repair the wiring.



Voltage regulator check

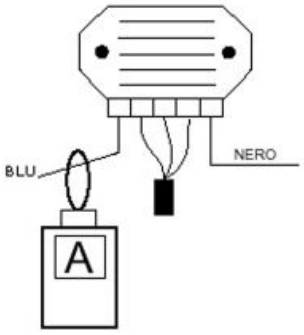
With the battery perfectly charged and the lights off, measure the voltage at the battery leads with the engine running at high rpm.
The voltage must not exceed 15.2 volts.
If higher voltages are found, replace the regulator.
If voltages under 14 volts are found, carry out the checks for the stator and related wiring.



Recharge system voltage check

Connect an ammeter induction clamp to the voltage regulator positive cable. Measure the battery voltage and turn on the lights with the engine off and wait until the voltage settles at around 12 volts. Start the engine and measure the current distributed by the circuit with the lights on and engine at high rpm.

If the current value is less than 10A, repeat the test using a new regulator and/or stator instead.



Starter motor

Specifications

- Rated voltage 12V.
- Rated power 0.25 kW.
- Left rotation viewed from pinion side.
- Connection to engine with pinion and crown wheel on transmission side crankshaft.
- Control with button

Tests to perform to check the electrical starter

Static test

Remove the left side panel.

Check the resistance of the induced brush unit.

Reference value: < or equal to 1 Ohm

- Use a lift to adequately support the vehicle.
- Remove the stand and support.
- Use a multimeter to check the continuity of the positive and negative power supply cable.
- Make sure the connections are good.

If no faults are found, replace the starter.

Specific tooling

020331Y Digital multimeter

Dynamic tests

Check the battery voltage after it has not been used for a few hours.

Voltage < or equal to 12.5 V.

Check the density of the electrolyte of each element.

Bé = 30 ÷ 32

Specific weight: 1.25 ÷ 1.26

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

- Connect the diagnostic tester.
- Connect an ammeter induction clamp to the negative power supply cable of the starter.
- Disconnect the fuel injection connector.
- Turn to «ON».
- Select the «PARAMETERS» function.
- Start the engine (making sure the vehicle cannot move) long enough to measure the rpm and starter absorption.
- Absorption at drag rpm: from 15 to 25A.
- Drag rpm: from 500 to 550 rpm

N.B.

THE VALUE OF DECLARED RPM IS THAT INDICATED BY THE DIAGNOSTIC TESTER

Specific tooling

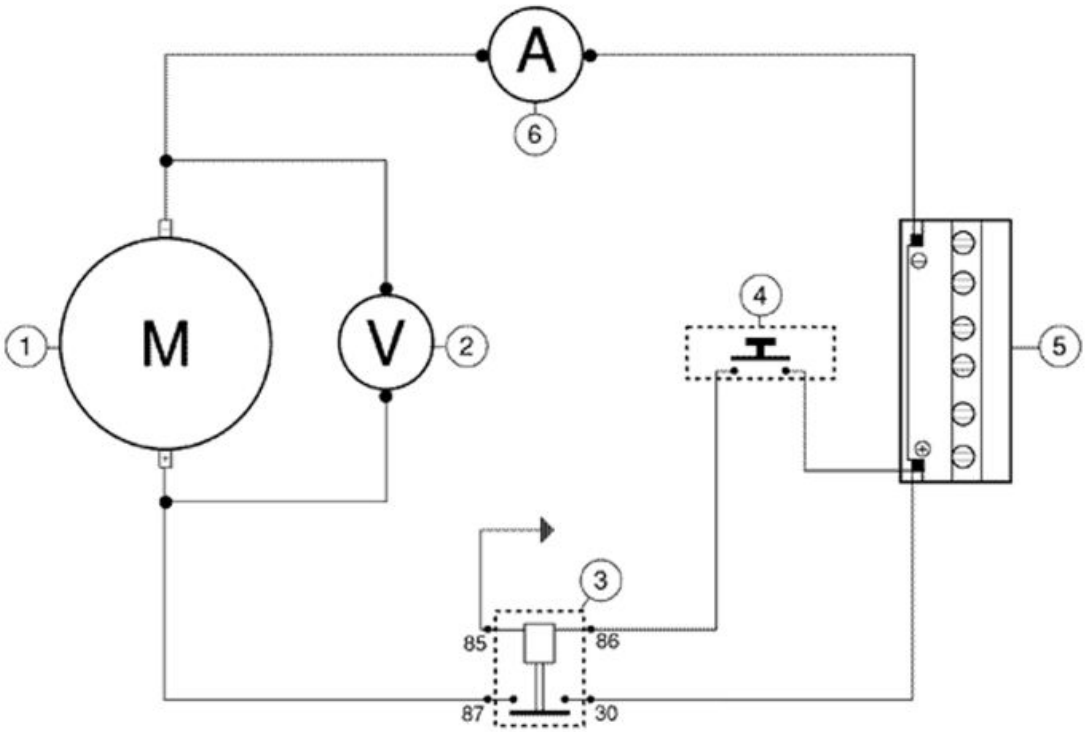
020460Y Scooter diagnosis and tester

Carry out a no-load absorption test.

Remove the transmission cover.

Remove the starter pinion.

With the starter motor in no-load, maximum absorption must be 10 A with power supply voltage ≥ 12V.



STARTER MOTOR

Specification	Desc./Quantity
Starter motor	
Voltmeter	
Starter motor contactor	
Start button	
Battery	12V-9Ah
Ammeter	

See also

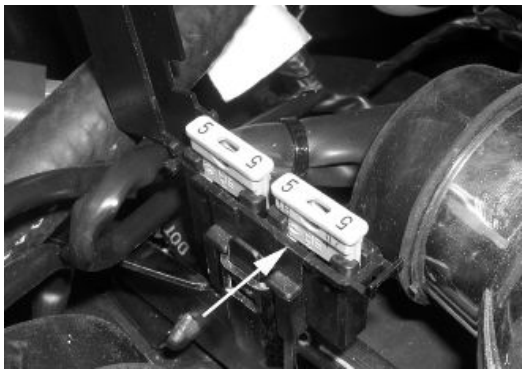
Centre-stand
Side fairings

Turn signals system check

The turn signal circuit is managed by an intermittent device.

If there is a fault in the turn signal circuit check:

- The 5A fuse indicated in the photo by removing the air duct.
- Use a multimeter to check if there is + 12V voltage on the BLUE-BLACK wire to the turn signal connector.



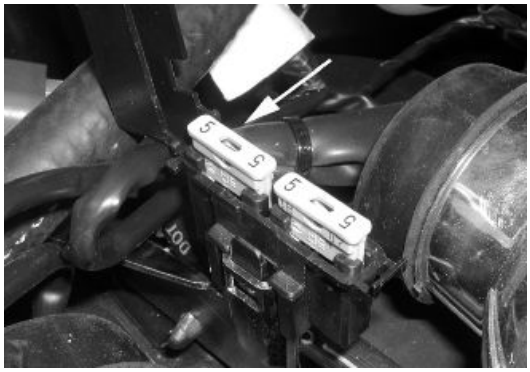
- To make sure the lamps work, apply a +12V voltage to the WHITE-BLUE wire of the turn indicator switch for the right lamps and to the PINK wire for the left lamps.

See also

Air duct

level indicators

Composed of the petrol level transmitter, analogue reading instrument and reserve warning lamp.
In the event of a fault check:
- Fuel reserve warning lamp
- The 5A fuse indicated in the photo by removing the air duct.



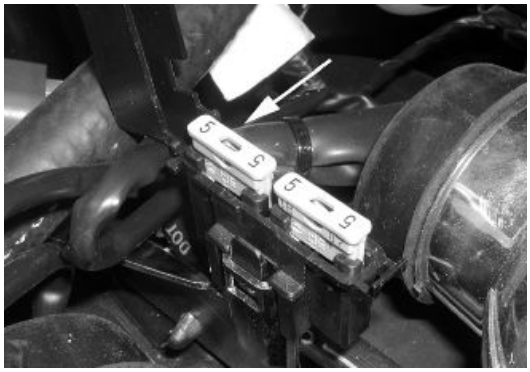
- Make sure the voltage at the WHITE wire of the instrument unit is +12V
- Using a multimeter check the ohm values of the fuel level by moving the arm with float.

Limit values:
empty tank position = 87 - 103 Ohm
½ tank position = 34 - 42 Ohm
full tank position < or equal to 7 Ohm

See also

Air duct

The oil mix lamp carries out a timed check for 3 seconds every time the key is switched to ON. The check is controlled by the turn indicator device which applies a 12V voltage to the oil warning lamp.
If the check is not carried out when the key is switched to ON, check:
- If the lamp is working
- The 5A fuse indicated in the photo by removing the air duct.



- Use a multimeter to check if there is 12V voltage at the 2 YELLOW oil mix lamp control wires when the key is turned to ON
- The oil mix lamp is working

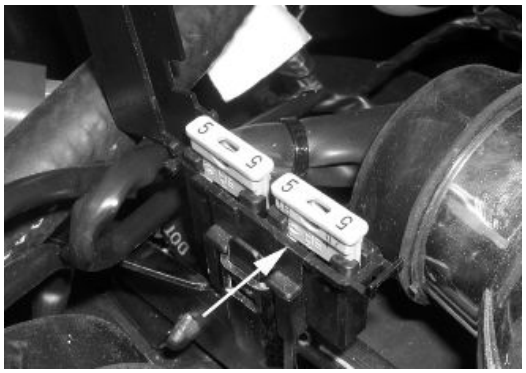
To access the oil mix lamp control remove the right panel. Remember that the +12V voltage to the 2 YELLOW oil mix lamp control lasts 3 minutes from when the key is switched to ON.

See also

Air duct
Side fairings

Lights list

The lighting system goes on when the key is switched to ON.
The high beams can be selected using the high beam/dipped beam selector.
If faults occur in the lighting system check:
- If the lamps are working
- The 5A fuse indicated in the figure by removing the air duct.



- Use a multimeter the make sure there is + 12V voltage at the GREY - RED wire of the cover with contacts
- That at the YELLOW - BLACK wires of the light there is a + 12V voltage
- Make sure the lamp holder earth is present.

See also

Air duct

Sealed battery

Airtight battery start-up operations

INSTRUCTIONS FOR REFRESHING THE STOCK CHARGE OF AN OPEN CIRCUIT

1) Voltage check

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

- If the 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 in 2).

2) Constant voltage battery charge mode

-Constant voltage equal to 14.40÷14.70V
-Initial charge voltage equal to 0.3÷0.5 for nominal capacity
-Duration of the charge: 10 to 12 h recommended
Minimum 6 h
Maximum 24 h

3) Constant current battery charge mode

-Charge current equal to 1/10 of the nominal capacity of the battery
-Duration of the charge: 5 h

WARNING

**-WHEN THE BATTERY IS REALLY FLAT (WELL BELOW 12.6V) IT MIGHT BE THAT 5 HOURS OF RECHARGING ARE NOT ENOUGH TO ACHIEVE OPTIMAL PERFORMANCE.
IN THESE CONDITIONS IT IS HOWEVER ESSENTIAL NOT TO EXCEED EIGHT HOURS OF CONTINUOUS RECHARGING SO AS NOT TO DAMAGE THE BATTERY ITSELF.**

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**

Characteristic

Battery

12V-9Ah

Commissioning dry-charge batteries:

1) Once the short closed tube and caps are removed, add sulphuric acid to the elements, of a type for batteries with a specific gravity of 1.26, corresponding to 30° Bé at a temperature of at least 15°C until reaching the upper level.

2) Let it sit for two hours.

3) Use the specific battery charger (single or multiple) to charge to an intensity equal to around 1/10 of the capacity until the voltage has reached a value of around 2.7 V per element. The density of the acid should be about 1.27, corresponding to 31° Bé, and the values have stabilised. The duration of the charging operations must be 15 - 20 hours.

4) Once the charging is complete, level out the acid (add **distilled water** or remove excess acid), put on the caps and clean carefully.

5) Once these operations have been completed, install the battery on the vehicle, correctly following the connections described in point 3) «**Battery charging**».

WARNING

- ONCE THE BATTERY HAS BEEN INSTALLED IN THE VEHICLE IT IS NECESSARY TO REPLACE THE SHORT TUBE (WITH CLOSED END) NEAR THE + POSITIVE TERMINAL WITH THE CORRESPONDING LONG TUBE (WITH OPEN END), THAT YOU FIND FITTED TO THE VEHICLE, TO ENSURE THAT THE GASES THAT FORM CAN ESCAPE PROPERLY.

Specific tooling

020333Y Single battery charger

020334Y Multiple battery charger

Battery maintenance

The battery is the electric device that requires the most careful monitoring and diligent maintenance.

The maintenance rules are:

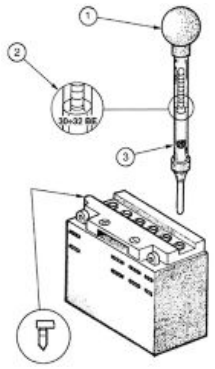
1) Check the level of the electrolyte

Check regularly that the electrolyte level is at upper level. Use only distilled water to top up the level.

If the battery needs topping up very frequently, check the vehicle electrics: the battery is probably working in overload conditions which will lead to rapid deterioration.

2) Check the charge

After topping up the electrolyte, check the density using a densimeter (see figure).



CHECKING ELECTROLYTE DENSITY

Specification	Desc./Quantity
Keep the tube vertical	
Check with bare eye	
The float must be released	

When the battery is charged, the density should be 30 ÷ 32 Bé corresponding to a specific weight of 1.26 ÷ 1.28 at a temperature not under 15° C.

If the density falls below 20° Bé, the battery is completely run down and needs to be recharged. When a battery is being charged the voltage of each element must be 2.6 ÷ 2.8V.

The discharge limit of each element is 1.8V.

When charging is completed, check the level and density of the electrolyte as well as the voltage of each element. If the vehicle is not used for long periods of time (1 month or longer) the battery must be periodically recharged.

The battery will completely discharge over three months. When the battery is refitted onto the vehicle, be careful not to invert the connections: remember that the ground wire **(black)** needs to be connected to the **negative** (-) terminal, while the **red** wire is connected to the terminal marked with the **positive (+)** sign.

3) Recharging the battery

WARNING

BEFORE RECHARGING THE BATTERY, REMOVE THE CAPS OF EACH CELL.
KEEP THE BATTERY AWAY FROM NAKED FLAMES OR SPARKS WHILE IT IS CHARGED.
FIRST DETACH THE NEGATIVE LEAD BEFORE REMOVING THE BATTERY FROM THE VEHICLE.

Normal charging on the bench is done with the specific battery charger (single or multiple), positioning the battery charger selector on the type of battery to recharge at a current of 0.9A for around 6 ÷ 8

hours. The connections with the power supply source must be made by connecting the corresponding poles (+ with + and - with -). The battery caps must be removed during charging.

Specific tooling

020333Y Single battery charger

020334Y Multiple battery charger

4) Cleaning the battery

The battery should always be kept clean, especially the upper part, and the terminals protected 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

IN EMERGENCIES, THE CHARGING TIME CAN BE DECREASED TO 5-6 HOURS.

CAUTION

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

CAUTION

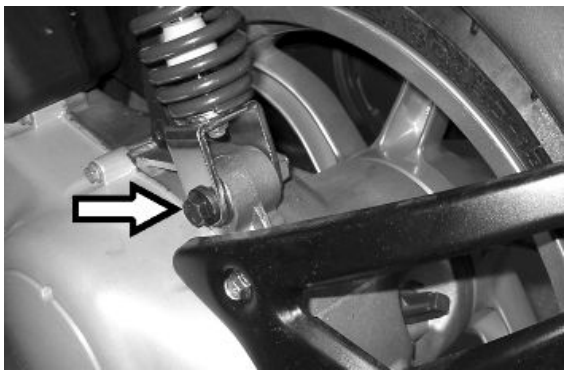
CHARGE THE BATTERY BEFORE USE TO ENSURE OPTIMUM PERFORMANCE. INADEQUATE CHARGING OF THE BATTERY WITH A LOW LEVEL OF ELECTROLYTE BEFORE IT IS FIRST USED SHORTENS THE LIFE OF THE BATTERY.

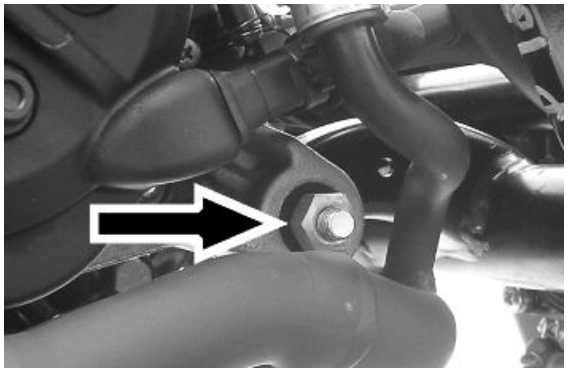
INDEX OF TOPICS

ENGINE FROM VEHICLE	ENG VE

Removal of the engine from the vehicle

1. Detach the battery.
2. Remove the exhaust assy.
3. Remove the rear wheel.
4. Remove the rear brake cable.
5. Detach the electrical connection to the fly-wheel.
6. Detach the throttle and mixer cables.
7. Detach the mixture oil, fuel, and vacuum pump outlet tubing.
8. Detach the H.T. cable from the spark plug.
9. Remove the rear shock-absorber fixing bolt from the engine.
10. Remove the nut on the l.h.s., and hence remove the engine - swing-arm fixing bolt.





Locking torques (N*m)

Engine-swinging arm bolt 33 ÷ 41 Shock absorber-engine pin 33 to 41 Nm Rear wheel axle nut 104 ÷ 126

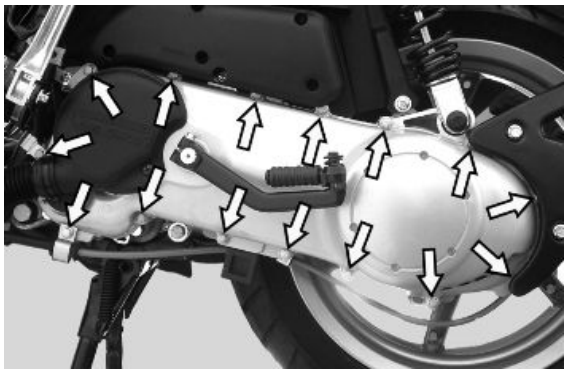
INDEX OF TOPICS

ENGINE	ENG

Automatic transmission

Transmission cover

- Loosen the 15 screws and remove the transmission cover with the aid of a mallet.

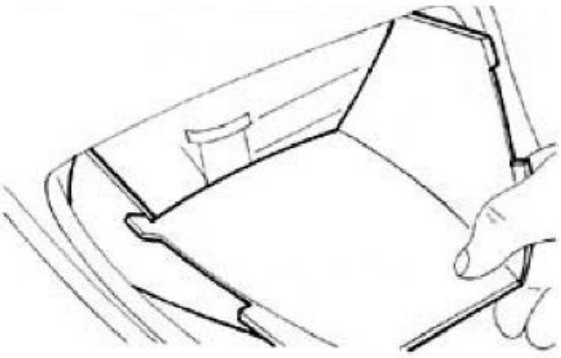


N.B.

THE CRANKCASE IS SLIGHTLY BLOCKED BY THE TIGHT FIT BETWEEN THE SHAFT OF THE DRIVEN HALF-PULLEY AND THE BEARING HOUSED ON THE CRANKCASE.

Air duct

- Remove the Radiator grill
- Remove the air conveyor by disengaging the special joints

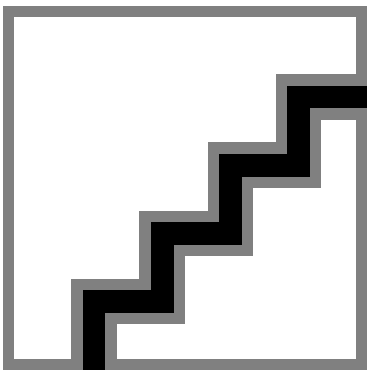


See also

Front central cover

Removing the driven pulley shaft bearing

- Slightly heat the crankshaft from the inside side to avoid damaging the coated surface and use the driven pulley shaft or a pin of the same diameter to remove the bearing.



N.B.

IN CASE OF DIFFICULTY A STANDARD 8MM-INSIDE DIAMETER EXTRACTOR CAN BE USED.

Refitting the driven pulley shaft bearing

-Refit the bearing with the aid of a bushing with the same diameter as the external plate of the bearing after slightly heating the crankcase from the inside.

N.B.

WHEN REFITTING, ALWAYS REPLACE THE BEARING WITH A NEW ONE.

CAUTION

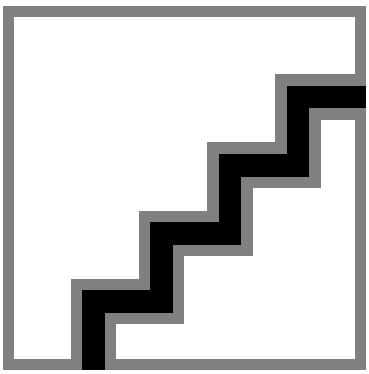
WHEN REMOVING/REFITTING THE BEARING, TAKE CARE NOT TO DAMAGE THE PAINTED SURFACE.

Removing the driven pulley

- Lock the clutch bell housing with the specific tool.
- Remove the nut, the clutch bell housing and the whole of the driven pulley assembly.

N.B.

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

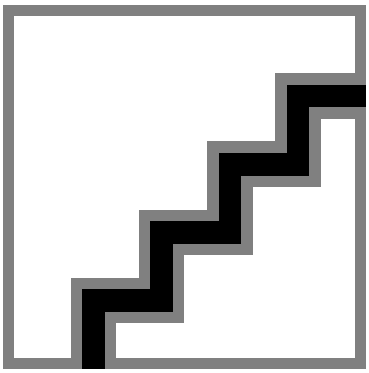


Specific tooling

020565Y Flywheel lock calliper spanner

Inspecting the clutch drum

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



Characteristic

Clutch bell diameter/standard value

Ø 107+0.2 +0 mm

Clutch bell diameter/max. value allowed after use

Ø 107.5 mm

Eccentricity measured /max.

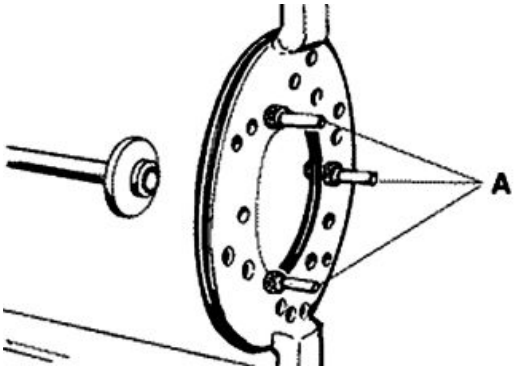
0.20 mm

Removing the clutch

- Equip the tool with long pins screwed into position «**A**» from the outside, insert the entire driven pulley in the tool and put the central screw under stress.

CAUTION

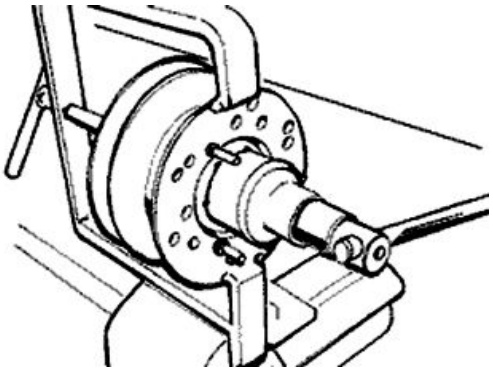
THE TOOL WILL BE DEFORMED IF THE CENTRAL SCREW IS TIGHTENED UP TOO FAR.



- Using a 34 mm socket wrench remove the clutch locking nut.
- Loosen the central screw thereby undoing the driven pulley unit
- Separate the components.

Specific tooling

020444Y Tool for fitting/ removing the driven pulley clutch



Inspecting the clutch

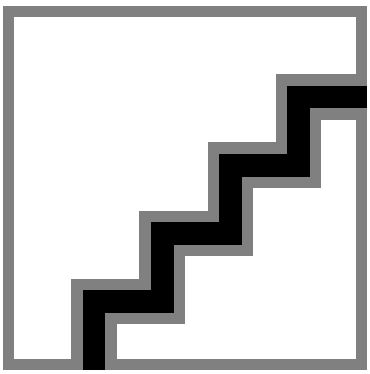
- Check the thickness of the clutch mass friction material.
- The masses must not show traces of lubricants; otherwise, check the driven pulley unit seals.

N.B.

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

CAUTION

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



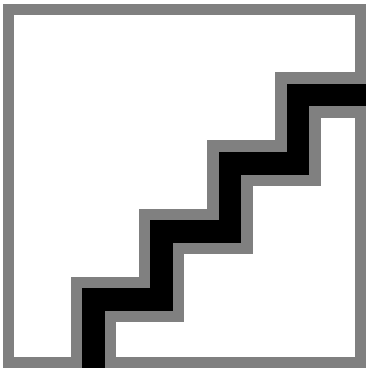
Characteristic

Check minimum thickness

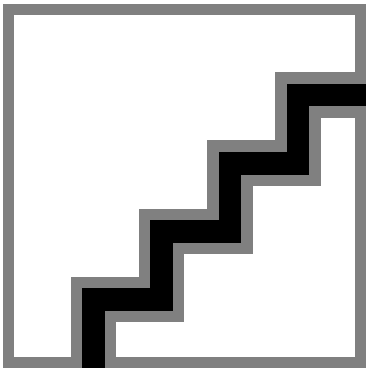
1 mm

Pin retaining collar

- Remove the collar with the aid of 2 screwdrivers.



- Remove the three guide pins and the mobile half pulley.



Removing the driven half-pulley bearing

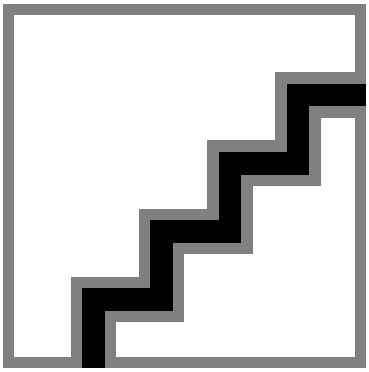
- Remove the roller bearing with the special extractor inserted from the bottom of the fixed half-pulley.

CAUTION

POSITION THE HOLDING EDGE OF THE EXTRACTION PLIERS BETWEEN THE END OF THE BEARING AND THE BUILT IN SEALING RING.

Specific tooling

001467Y029 Bell for bearings, O.D. 38 mm



- Remove the ball bearing retention snap ring.
- Expel the ball bearing from the side of the clutch housing by means of the special tool.

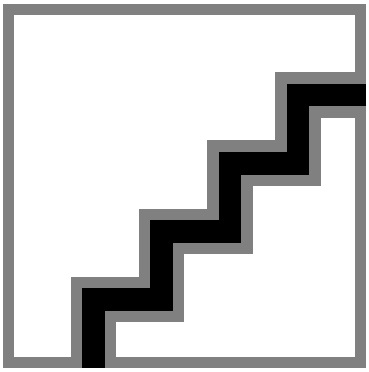
N.B.

PROPERLY SUPPORT THE HALF-PULLEY SO AS NOT TO DEFORM THE SLIDING SURFACE OF THE DRIVING BELT

Specific tooling

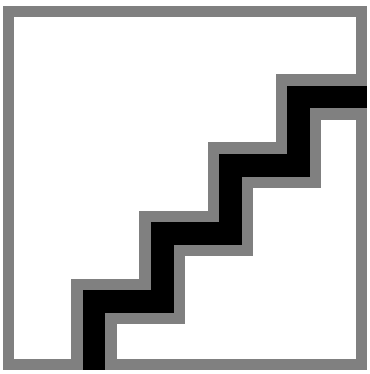
020376Y Adaptor handle

020363Y 20 mm guide



Inspecting the driven fixed half-pulley

- Check that there are no signs of wear on the work surface of the belt. If there are, replace the half-pulley..
- Make sure the bearings do not show signs of unusual wear.
- Measure the external diameter of the pulley bushing.



Characteristic

Stationary driven half-pulley/Standard diameter

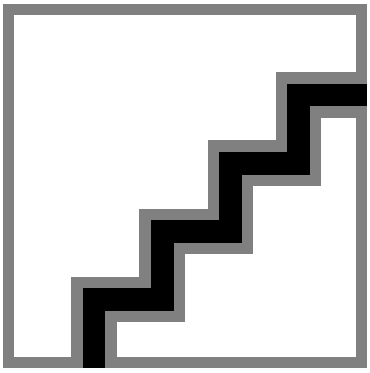
Ø 33.965 to 33.985 mm

Stationary driven half-pulley / Minimum diameter admitted after use

Ø 33.96 mm

Inspecting the driven sliding half-pulley

- Remove the 2 inner sealing rings and the two O-rings.
- Measure the inside diameter of the mobile half-pulley bushing.

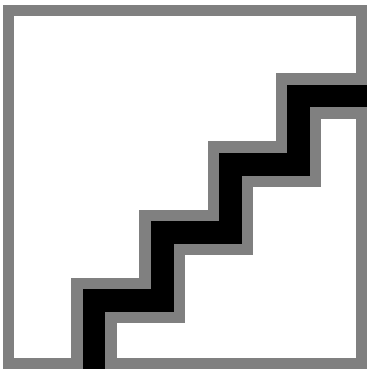


Characteristic

Mobile driven half-pulley/ Maximum diameter allowed

Ø 34.08 mm

- Check the belt contact surfaces.
- Insert the new oil seal and O-rings on the mobile half-pulley.
- Fitting the half-pulley on the bushing.



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

- Make sure the pins and collar are not worn, reassemble the pins and collar.

- Use a greaser with a curved spout to lubricate the driven pulley unit with around 6 gr. of grease. This operation must be done through one of the holes inside the bushing until grease comes out of the opposite hole. This procedure is necessary to prevent the presence of grease beyond the O-ring.

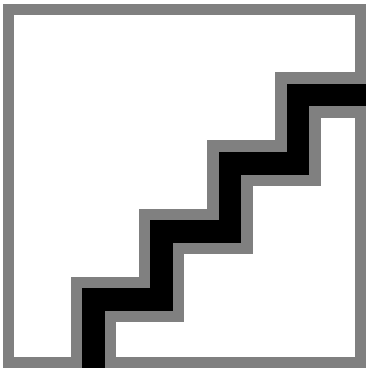
Recommended products

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

Refitting the driven half-pulley bearing

- Fit a new ball bearing with the specific tool.
- Fit the ball bearing retention snap ring.
- Fit the new roller bearing with the wording visible from the outside.



CAUTION

PROPERLY SUPPORT THE HALF-PULLEY TO PREVENT DAMAGE TO THE THREADED END WHILE THE BEARINGS ARE BEING FITTED.

Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020362Y 12 mm guide

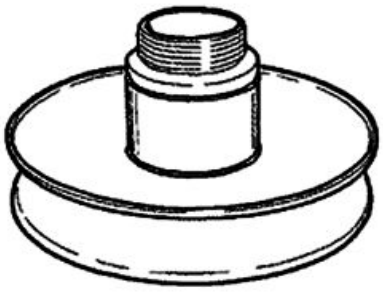
020171Y Punch for Ø 17 mm roller case

Refitting the driven pulley

• Check the surfaces contacting with the belt.

• Insert the new oil seals and the O-rings on the mobile half-pulley.

• Fit the half-pulley on the bushing.



CAUTION

WHILE FITTING THE MOBILE DRIVEN HALF-PULLEY, TAKE CARE NOT TO DAMAGE THE OIL SEALS.

• Check that pins and collar are not worn, refit pins and collar.

• Use a bent tip oiler to lubricate the pulley unit with approx. 6 gr grease. This operation must be performed through one of the holes into the bushing until the grease starts leaking from the opposite hole. This procedure is necessary to prevent the presence of grease beyond the O-ring.

Recommended products

AGIP GREASE SM 2 Grease for odometer transmission gear case

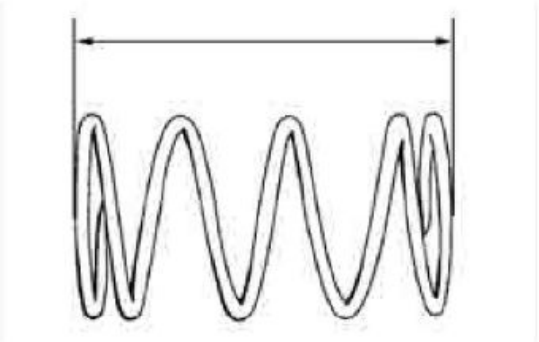
Lithium grease with NLGI 2 Molybdenum disulphide; ISO-L-XBCHB2, DIN KF2K-20

• Measure the free length of the mobile driving half-pulley.

Characteristic

Standard length:

110 mm



Inspecting the clutch spring

- Check that the contrast spring of the driven pulley does not show signs of deformation
- Measure the free length of the spring

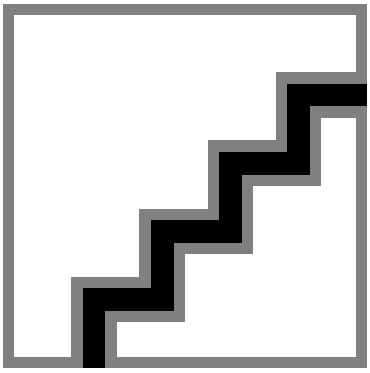
Characteristic

Standard length

118 mm

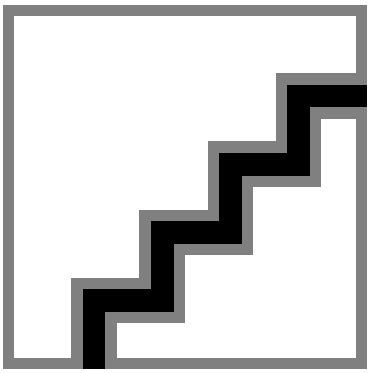
Minimum length allowed after use

XXXX



Refitting the clutch

- Preassemble the driven pulley group with spring, sheath and clutch.
- Position the spring with the sheath
- Insert the components in the tool and preload the spring being careful not to damage the plastic sheath and the end of the threaded bar.



- Reassemble the nut securing the clutch and tighten to the prescribed torque.

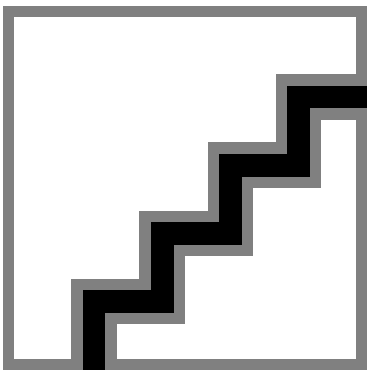
CAUTION

SO AS NOT TO DAMAGE THE CLUTCH NUT USE A SOCKET WRENCH WITH SMALL CHAMFER.

CAUTION

POSITION THE NON-CHAMFERED SURFACES OF THE NUT IN CONTACT WITH THE CLUTCH

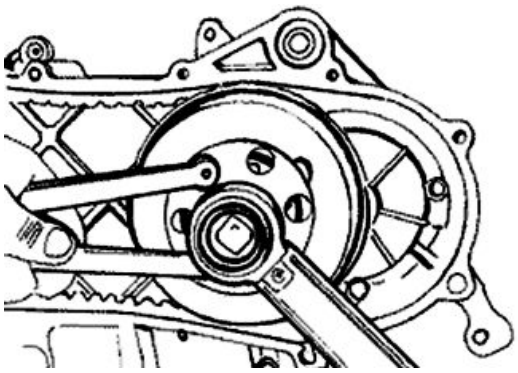
Locking torques (N*m)



Nut locking clutch unit on pulley 55 ÷ 60 Nm

Refitting the driven pulley

• Refit the driven pulley assembly, the clutch bell and the nut using the specific tool.



Specific tooling

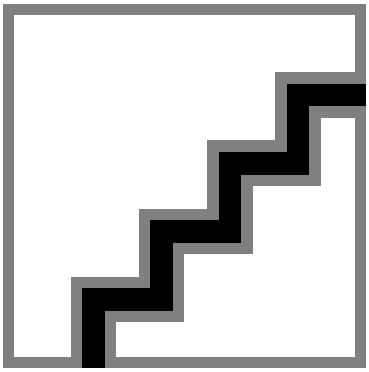
020565Y Flywheel lock calliper spanner

Locking torques (N*m)

Locking torque: 40 ÷ 44 N·m

Drive-belt

- Make sure the driving belt is not damaged and does not have cracks in the toothed grooves.
- Check the width of the belt.



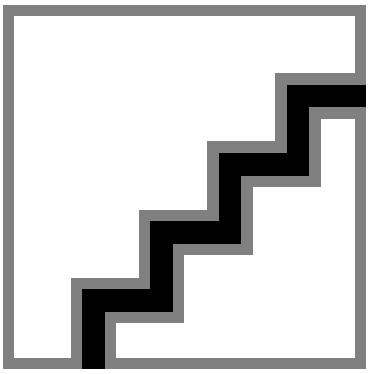
Characteristic

Transmission belt/Minimum width

17.5 mm

Removing the driving pulley

- Lock the driving pulley using the appropriate tool.
- Remove the central nut with the related washer, then remove the drive and the plastic fan.
- Remove the stationary half-pulley.



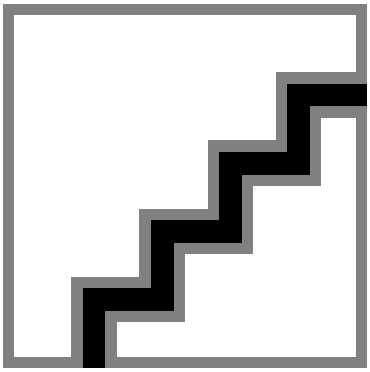
- Remove the belt, washer and remove the mobile half-pulley with its bushing, being careful that the rollers and contrast plate fitted loosely on it do not come off.

Specific tooling

020451Y Start-up crown lock

Inspecting the rollers case

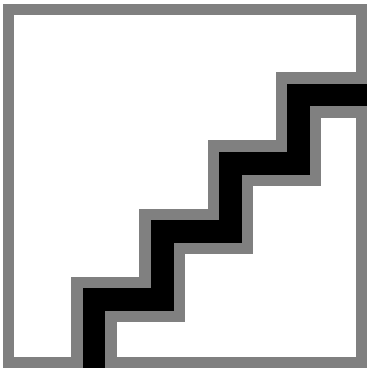
1) Check that the bushing and the sliding rings of the mobile pulley do not show signs of scoring or deformation.
2) Check the roller running tracks on the contact pulley; there must not be signs of wear and check the condition of the contact surface of the belt on the half-pulleys (mobile and stationary).
3) Check that the rollers do not show signs of marked facetting on the sliding surface and that the metallic insert does not come out of the plastic shell borders.
4) Check the integrity of the sliding blocks of the contact plate.



- Check that the internal bushing shown in the figure is not abnormally worn and measure inside diameter «**A**».
- Measure outside diameter «**B**» of the pulley sliding bushing shown in the figure.

CAUTION

DO NOT LUBRICATE OR CLEAN THE BUSHING.



Characteristic

Driving pulley / Maximum diameter:

20.12 mm

Driving pulley/ Standard diameter:

20.021 mm

Driving pulley bushing/ Diameter maximum:

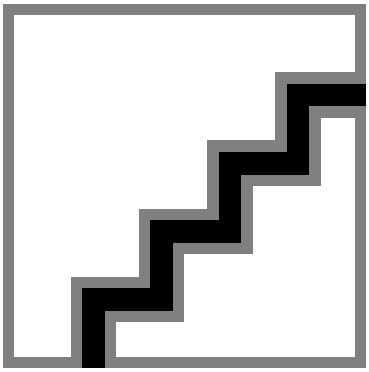
XXX mm

Driving pulley bushing/ Standard diameter:

20 -0.020/-0.041mm

Refitting the driving pulley

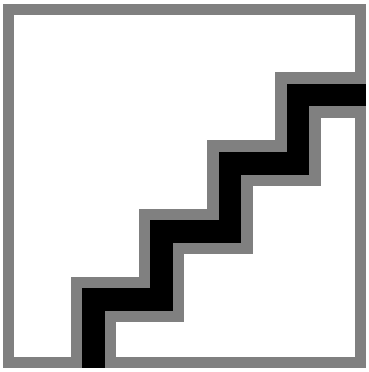
- Manually move the mobile driven half-pulley away pulling it towards the clutch unit and insert the belt repeating the direction of rotation of the first fitting.



N.B.

IT IS GOOD PRACTICE ALWAYS TO FIT THE BELT SO THE WORDING CAN BE READ, IN THE CASE THAT THIS DOES NOT SHOW A FITTING SIDE.

- Refit the particular components of the assembly (roller container assembly with bushing, limiting washer, stationery half-pulley, cooling fan belt with drive, washer and nut).
- Tighten the lock nut to torque 20 Nm and then perform a final 90° lock preventing the rotation of the drive pulley with the specific tooling.



N.B.

REPLACE THE NUT WITH A NEW ONE AT EVERY REFIT

CAUTION

IT IS MOST IMPORTANT WHEN FITTING THE DRIVING PULLEY UNIT THAT THE BELT IS FREE INSIDE IN ORDER TO AVOID MAKING A WRONG TIGHTENING WITH THE POSSIBLE LATER DAMAGE OF THE CRANKSHAFT KNURLING.

Specific tooling

020451Y Start-up crown lock

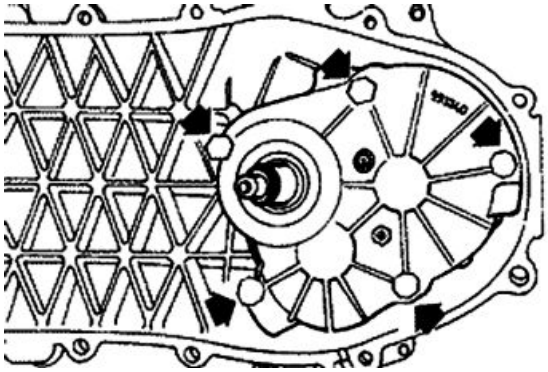
Locking torques (N*m)

Crankshaft pulley nut 18 to 20 + 90° N.m

End gear

Removing the hub cover

- Remove the transmission cover
- Remove the clutch assembly
- Discharge the rear hub oil.
- Remove the 5 screws indicated in the figure.
- Remove the hub cover with driven pulley shaft.

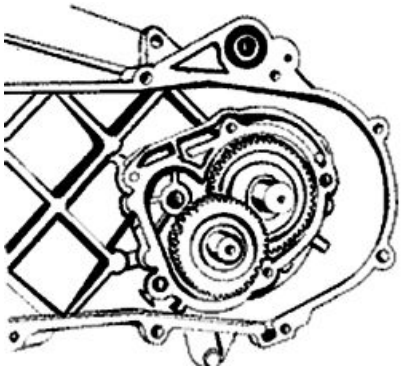


See also

Refitting the clutch

Removing the wheel axle

- Remove the intermediate gear and the complete gear wheel axle.
- When removing the intermediate gear pay attention to the various shim adjustments.



Removing the wheel axle bearings

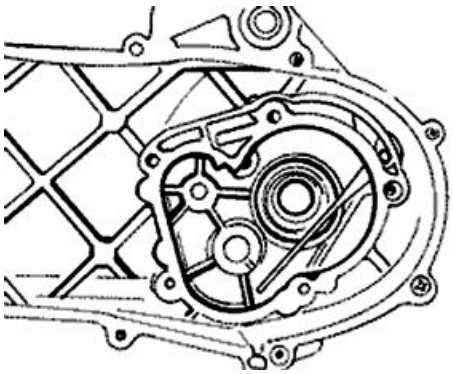
- Remove the oil seal and the seeger ring.
- Remove the bearing by pushing from the outside towards the inside of the gear compartment, using the appropriate punch.

Specific tooling

020363Y 20 mm guide

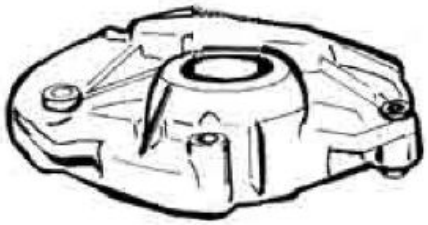
020376Y Adaptor handle

020358Y 37x40-mm adaptor



Removing the driven pulley shaft bearing

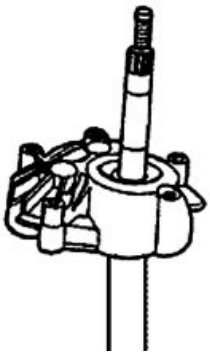
- Remove the seeger ring inside the cover.
- Remove the oil seal from the outside.
- Remove the centring dowels and position the cover on a plane.
- Position the special tool on the internal track of the bearing and remove said bearing with the aid of a press.



Specific tooling

020452Y Tube for removing and refitting the driven pulley shaft

- Position the special tube on the internal raceway of the bearing and from the shaft toothed side as indicated in the figure. Expel the driven pulley shaft with the aid of a press.



Specific tooling

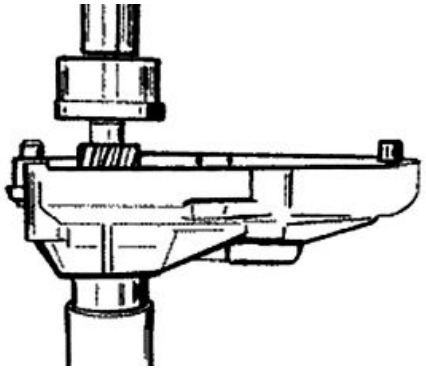
020452Y Tube for removing and refitting the driven pulley shaft

Inspecting the hub shaft

- Check that the three shafts exhibit no wear or deformation on the toothed surfaces, at the bearing housings and at the oil guards.
- In case of anomalies, replace the damaged components.
- Check that the fitting surface is not dented or distorted.
- If faults are found, replace the hub cover.

Refitting the driven pulley shaft bearing

- Support the inner track of the bearing from the outside of the hub cover with the specific tool positioned under the press and insert the driven pulley axle.
- Refit the oil seal flush with the cover.



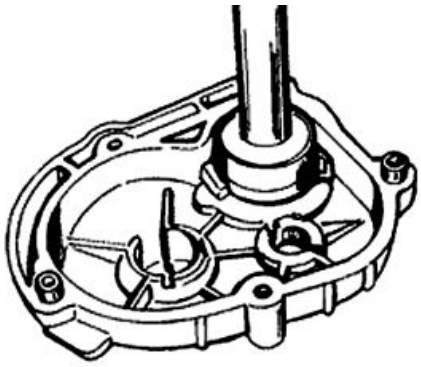
Specific tooling

020452Y Tube for removing and refitting the driven pulley shaft

• Heat the hub cover and insert the bearing with the specific punch.
• Fit the snap ring with the concave or radial part on the bearing side.

N.B.

FIT THE BALL BEARING WITH THE SHIELD FACING THE OIL SEAL.



Specific tooling

020151Y Air heater

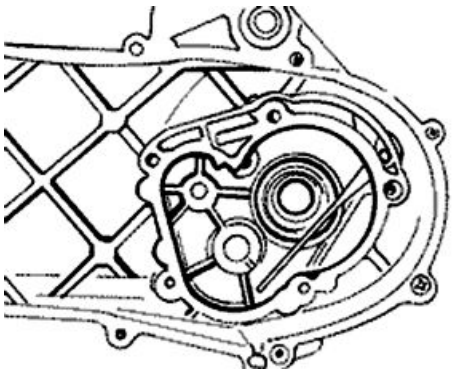
020376Y Adaptor handle

020439Y 17 mm guide

020358Y 37x40-mm adaptor

Refitting the wheel axle bearing

- Heat the half crankcase on the transmission side using a thermal gun.
- After lubricating its outer strip, insert the bearing with the special adapter with the aid of a hammer.
- Refit the seeger ring and the oil seal using the 42 x 47 mm adapter and the handle.



Specific tooling

020151Y Air heater

020376Y Adaptor handle

020363Y 20 mm guide

020359Y 42x47-mm adaptor

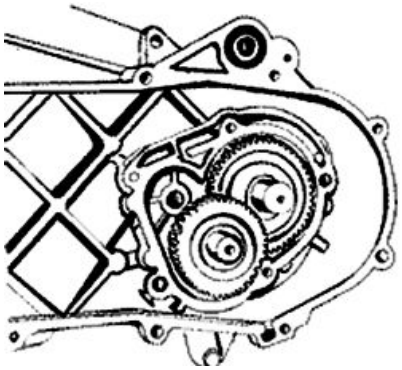
Refitting the ub cover

• Refit the complete wheel axis.

• Refit the intermediate gear being careful of the two shim adjustments.

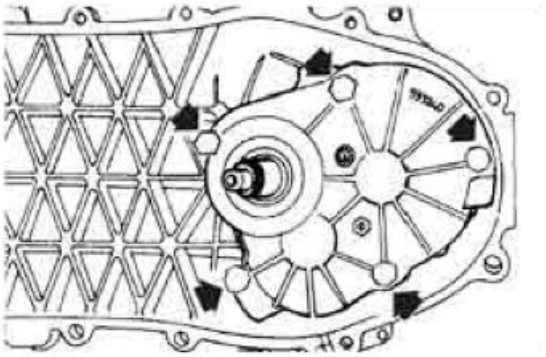
• Apply LOCTITE 510 for surfaces on the hub cover and refit it with the complete pulley shaft.

• Insert the 5 screws and tighten them to the prescribed torque.



N.B.

CLEAN THE CONTACT SURFACES OF THE HUB COVER AND THE HALF CRANKCASE OF RESIDUE FROM PREVIOUS GASKETS BEFORE APPLYING A NEW ONE.



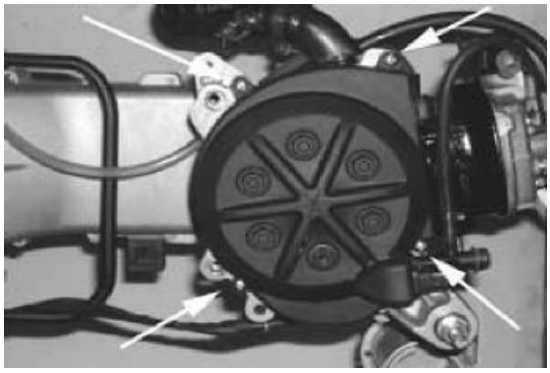
Locking torques (N*m)

Locking torque: 11 to 13 Nm

Flywheel cover

Removing the stator

- Remove the flywheel cover.



• Use a specific compass wrench and a 15 mm Allen wrench to remove the flywheel lock-nut.

Specific tooling

020565Y Flywheel lock calliper spanner

• Use a specific extractor to remove the flywheel

Specific tooling

020162Y Flywheel extractor

• Remove the two studs of the revolutions sensor to the coolant inlet pipe.

• Remove the coolant inlet duct

• Remove the two stator fixing screws

• Remove the stator with wiring and revolution sensor

Locking torques (N*m)

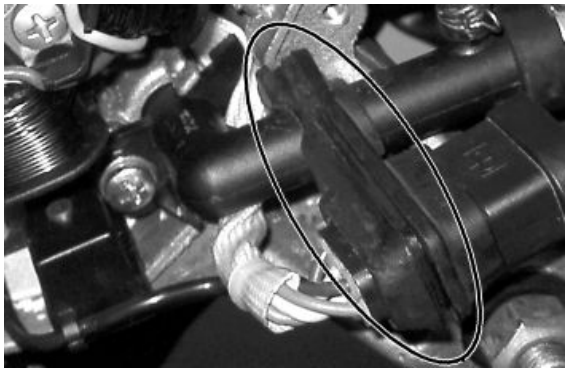
Flywheel nut 40 to 44 N.m

Refitting the stator

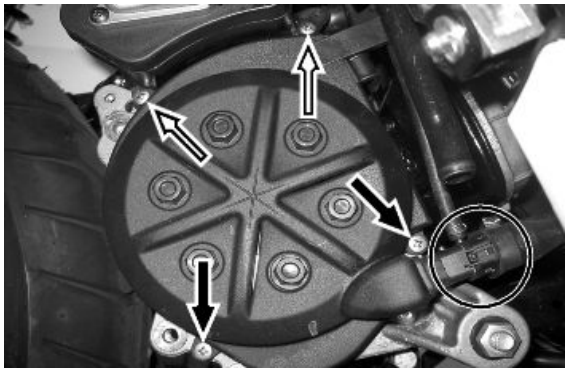
- To refit, perform the removal procedures in the reverse direction.

Refitting the flywheel cover

- Fit the rubber seal on the flywheel connector and around the inlet coolant hose.

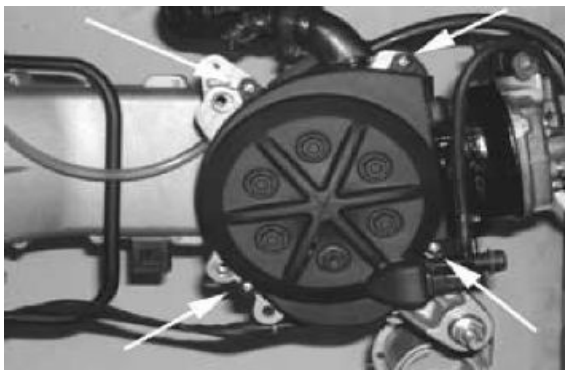


- Keeping the flywheel connector rubber clamp on the coolant inlet hose, refit the flywheel cover paying attention in inserting the strap in the groove.
- Tighten the 4 studs, noting that the two longer golden screws are inserted in the 2 top holes and are also responsible for restraining the secondary airbox.



Cylinder assy. and timing system

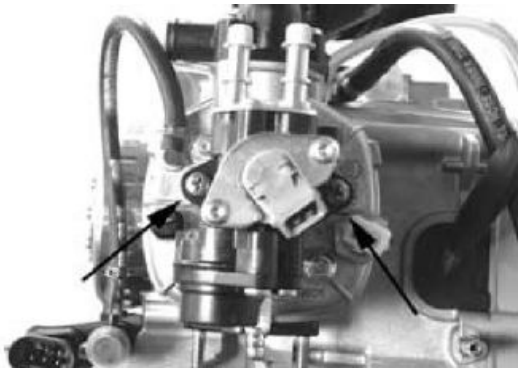
• Remove the flywheel cover using the 4 screws shown in the figure.



Removing the cylinder head

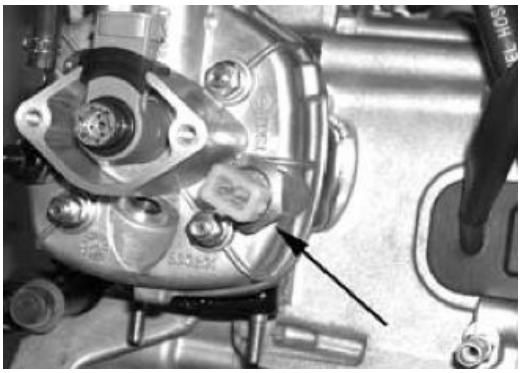
• Use a TORX 20 wrench to remove the air feeding line from the injection head as shown in the figure.

• Remove the injection head, including the fuel injector and the pressure regulator, using the 2 screws shown in the figure



• Remove the spark plug

• Remove the temperature sensor shown in the figure

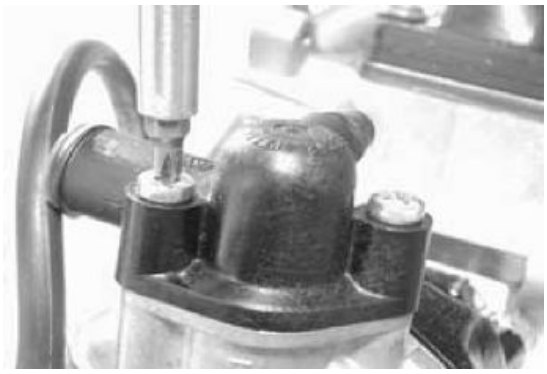


To remove the air injector, extract the dust cover and use a screwdriver to remove the injector as shown in the figure

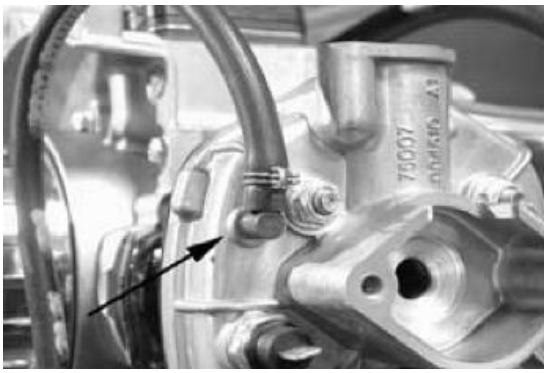
N.B.

BE CAREFUL NOT TO DAMAGE THE INJECTOR PLASTIC SUPPORT

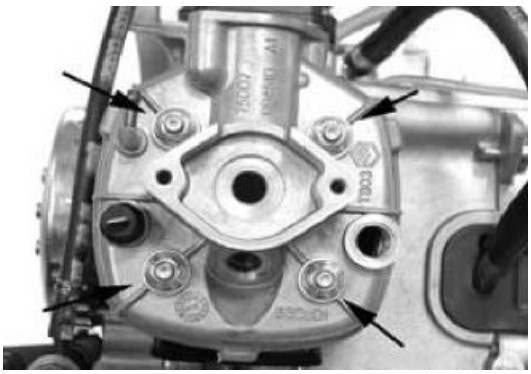
• Remove the coolant outlet union from the head with the relevant O-ring, using the two screws, as shown in the figure.



• Remove the head inside recirculation duct as shown in the figure.

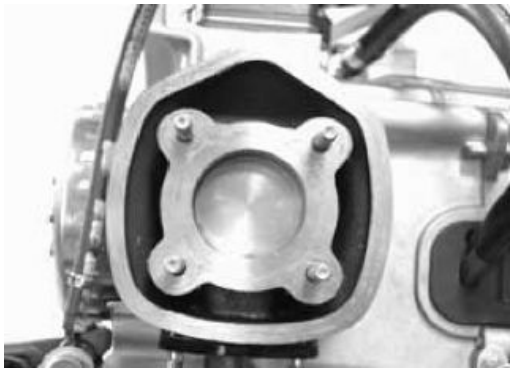


• Remove the head using the 4 screws as shown in the figure.



Removing the cylinder - piston assy.

• Remove the cylinder holding the piston in order to prevent damage



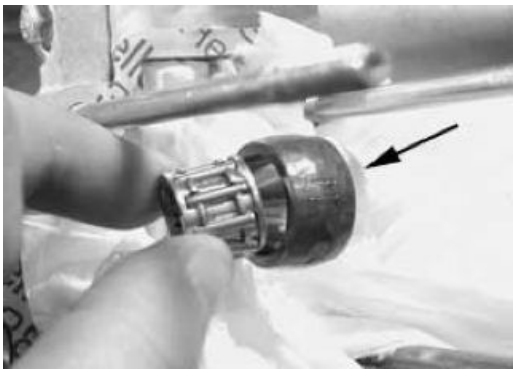
• Remove the 2 plug stops by a screwdriver inserted into the special slits on the piston

• Remove piston 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 roller from the connecting rod as shown in the figure



• Remove the piston sealing rings

CAUTION

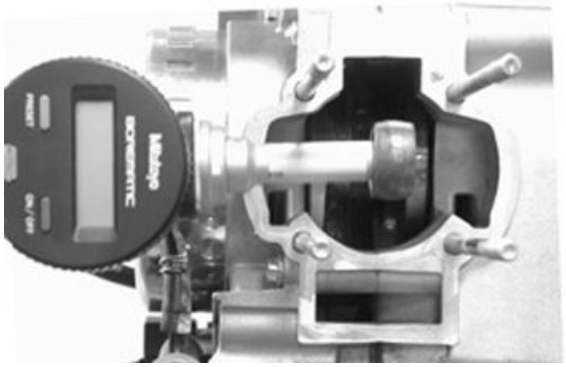
NOTE THE ASSEMBLY POSITIONS OF THE LININGS TO PREVENT INVERTING THE POSITION IN CASE OF REUSE.

N.B.

BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.

Inspecting the small end

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



N.B.

IF THE DIAMETER OF THE ROD SMALL END EXCEEDS THE MAXIMUM DIAMETER ALLOWED, SHOWS SIGNS OF WEAR OR OVERHEATING REPLACE THE CRANKSHAFT AS DESCRIBED IN THE "CRANKCASE AND CRANKSHAFT" CHAPTER".

Characteristic

Rod small end: standard diameter

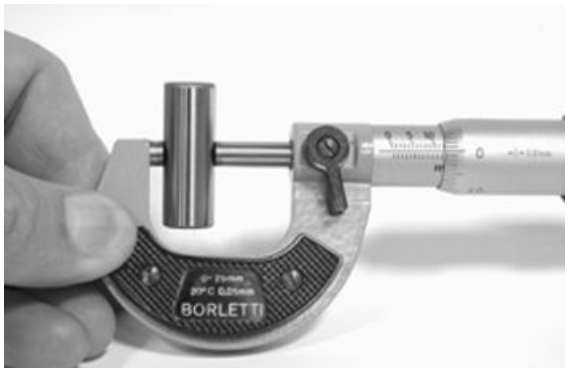
17 +0.011-0.001

Rod small end: maximum allowable diameter

17,060 mm

Inspecting the wrist pin

- Check the wrist pin external diameter using a micrometer



Characteristic

Wrist pin: standard diameter

12 +0.005 +0.001 mm

Inspecting the piston

- Measure the bearings on the piston using a bore meter

- Calculate the piston-pin coupling clearance.

Characteristic

Wrist pin housing: standard diameter

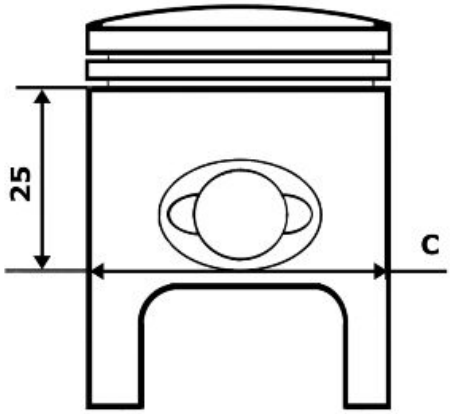
12 +0.007 +0.012

Wrist pin housing: standard clearance

0.002 ÷ 0.011 mm

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

To classify the cylinder-piston fitting, check the appropriate table

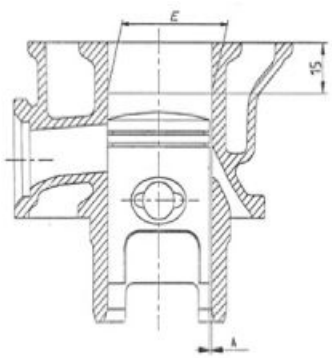


See also

Cylinder - piston assy.

Inspecting the cylinder

• Check that the cylinder exhibits no seizure. If it does, replace or adjust it, while respecting the allowable oversizes.
• Use a bore meter to measure the cylinder inside diameter according to the directions shown in the figure.



• Check that the fitting surface with the head is not worn or deformed

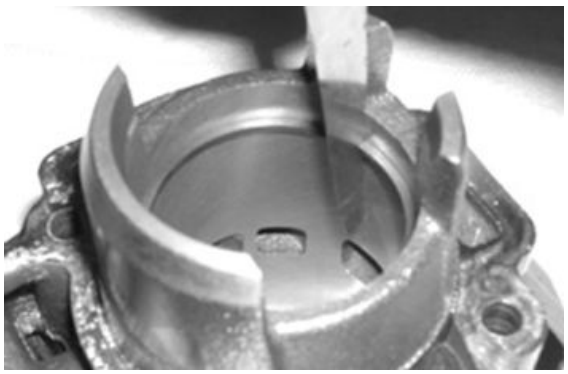
To classify the fitting, refer to the tables.

See also

Cylinder - piston assy.

Inspecting the piston rings

• Alternatively, insert the 2 sealing rings into the cylinder.
• Insert the rings in an orthogonal position relative to the cylinder axis, using the piston.
• Measure the sealing ring opening by a feeler gauge, as shown in the figure.

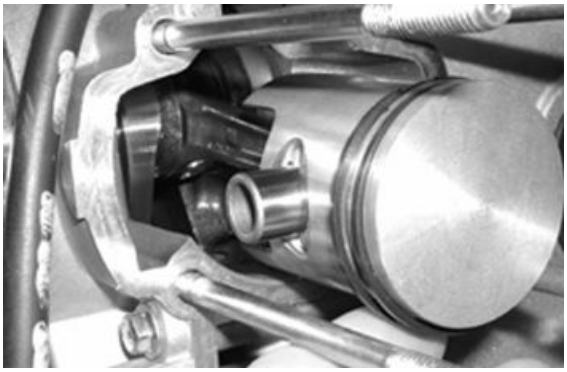


• If the values are higher than those prescribed on the chart, replace the rings

Removing the piston

• Insert the roller in the connecting rod

• Fit piston and wrist pin on the connecting rod, with piston facing the outlet



• Insert the wrist pin stop ring in the specific tool with the aperture in the position shown on the tool, as in the figure

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

Specific tooling

020166Y Pin lock fitting tool

• Fit the wrist pin stop using the plug as shown in the figure

Specific tooling

020166Y Pin lock fitting tool

Choosing the gasket

• Temporarily fit the cylinder on the piston, without the basic gasket.

• Fit a dial gauge on the specific tool, using the short union as shown in the figure.

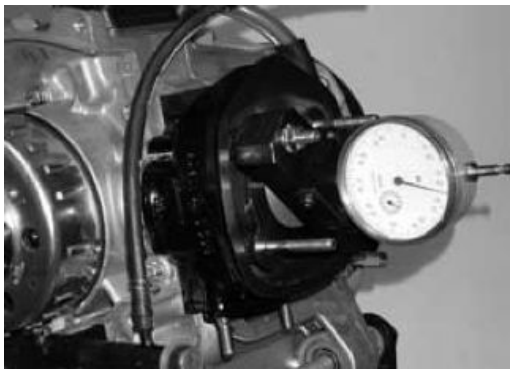
Use a reference plane to reset the dial gauge with a pre-load of a few millimetres.

Set the dial gauge.

Check that tracer slides smoothly.

Fit the tool on the cylinder without changing the dial gauge position.

Lock the tool by the nuts used to secure the head.



Turn the engine shaft to the dead centre position (dial gauge rotation inversion point).

Measure the difference with the reset value.

Refer to the table to identify the thickness of the cylinder base gasket to use for refitting. The correct identification of the thickness of the cylinder base gasket allows maintaining the correct compression ratio.

Remove the specific tool and the cylinder.

Specific tooling

020272Y Piston position check tool

See also

Cylinder - piston assy.

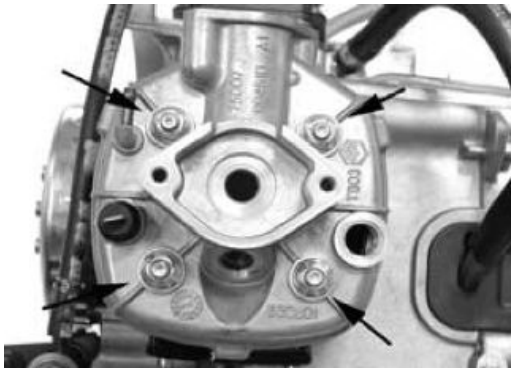
Refitting the head and timing system components

• Carefully clean the head, removing any carbon residues

• Check the perfect condition of the fitting surfaces

• Check that the O-rings are not broken, otherwise replace them

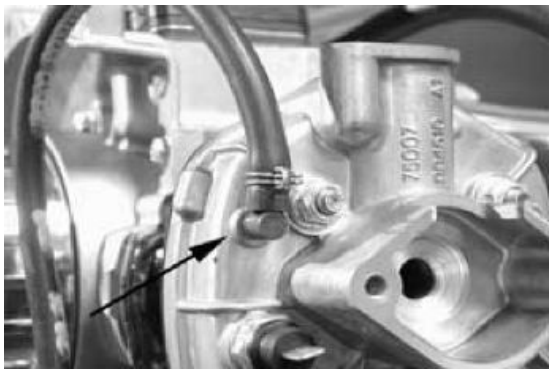
• Screw the 4 head fixing nuts and tighten them in crossed sequence to the prescribed torque



Locking torques (N*m)

Head fixing nuts: 10 ÷11 Nm

• Refit the head inside recirculation duct as shown in the figure.



• Check that the O-Ring is in good working condition.

• Fit the coolant outlet union on the head with relevant O-ring by tightening 2 screws to the prescribed torque.

Locking torques (N*m)

Coolant outlet union fixing screws: 3 ÷ 4 Nm

• Introduce the air injector into the head.

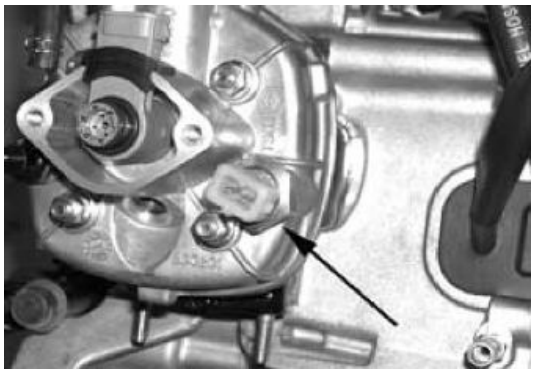
• Refit the dust cover onto the air injector.

N.B.

NOTE THAN WHEN THE AIR INJECTOR IS RE-FITTED, THE CARBON DAM O-RING MUST BE NEW. IF A NEW AIR INJECTOR IS FITTED, THE NEW CARBON DAM RING IS ALREADY PRESENT. IF THE OLD AIR INJECTOR IS FIT-TED, THE CARBON DAM REQUIRES RE-PLACEMENT.

• Fit the spark plug

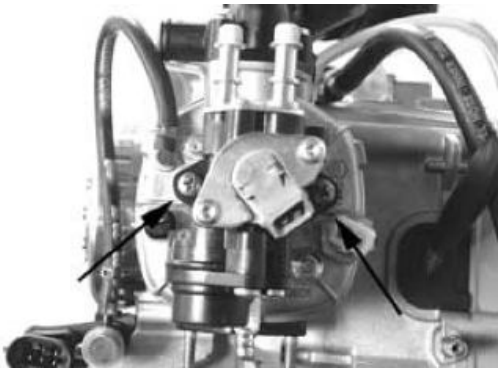
• Refit the temperature sensor shown in the figure and tighten to the prescribed torque.



Locking torques (N*m)

Temperature sensor 18 ÷22 Nm Spark plug: 11 ÷ 14 Nm

• Refit the injection head including the fuel injector and pressure regulator and tighten to the prescri-bed torque.



Locking torques (N*m)

Injection head fixing screw: 3 ÷ 4 Nm

• Use a TORX 20 wrench to refit the air feeding pipe from the injection head.

See also

air injector circuit

Air Injection

Carbon - dam replacement

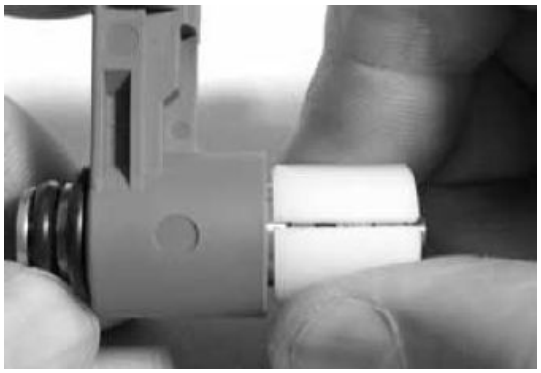
- Remove the air injector
- The carbon dam ring must be broken to be removed.
- Carefully clean the air injector and the seat removing any carbon residues.
- Check that the sealing rings exhibit no wear, or replace them.
- To refit, use a new carbon dam ring.
- Use the specific tool to fit the carbon dam ring. We recommend doing this in several steps to ensure a correct widening of the ring as shown in the photo.

Specific tooling

020615Y Carbon dam ring fitting kit

- Position the specific tool with the rung facing the injector as shown in the figure.

- Use the specific tool to tighten the carbon dam ring seat as shown in the figure.
- Take several steps to ensure a correct insertion into the seat.
- Refit the air injector in its seat on the head quickly to prevent the carbon dam ring from expanding again.



Specific tooling

020615Y Carbon dam ring fitting kit

Crankcase - crankshaft

• Remove flywheel and stator
- Remove the driving pulley
- Remove the driven pulley
- Remove the mixer

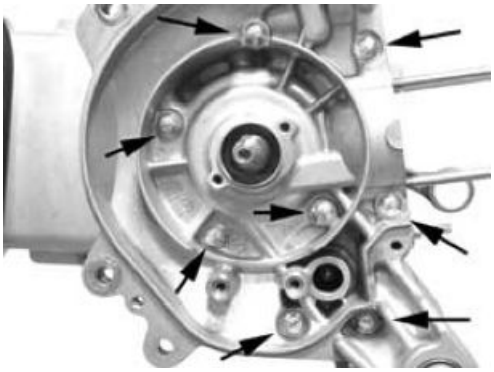
- Remove the throttle body with manifold, diaphragm, gasket and blade support
- Remove the volumetric compressor
- Remove the thermal unit
- Remove the starter

See also

Removing the driven pulley
Removing the driving pulley
Cylinder assy. and timing system
Removal

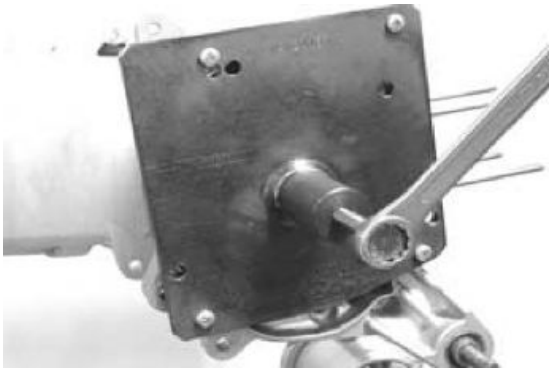
Splitting the crankcase halves

- Remove the 8 crankcase half clamping screws shown in the figure



- Insert the guard on the crankshaft as shown in the figure.

- Use the specific tool to remove the crankcase half on the flywheel side. Place the tool being careful to correctly centre it
- Use a 17 mm Allen wrench to remove the crankcase half on the flywheel side.



N.B.

IF SEPARATION REQUIRES FORCING, USE A THERMAL GUN TO HEAT THE CRANKCASE IN THE BENCH BEARING ZONE

Specific tooling

020151Y Air heater

020163Y Crankcase splitting plate

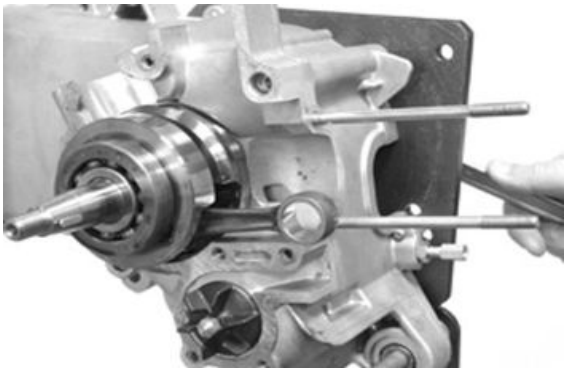
- Install the specific tool with relevant guard on the transmission side crankcase half. Use four M6 screws of a suitable length.
- Use a 17 mm Allen wrench to remove the crankshaft from the transmission side crankcase half.

Removing the crankshaft

- Install the specific tool on the half crankcase on the transmission side using four M6 screws of an adequate length.
- Remove the crankshaft from the transmission side half crankcase

Specific tooling

020163Y Crankcase splitting plate



Removing the crankshaft bearings

- Bearings may be left on the crankcase halves or on the crankshaft.
- Use the specific tool to remove any bearings left on the crankshaft.

N.B.

HALF-RINGS MUST BE INSERTED ON THE BEARINGS BY STRIKING THEM WITH A MALLET.

Specific tooling

004499Y Camshaft bearing extractor

004499Y007 Half rings

- Use the specific tool to remove any bearings left on both crankcase halves.

Specific tooling

001467Y006 Pliers to extract 20 mm bearings

001467Y007 Driver for OD 54 mm bearing

Refitting the crankshaft bearings

- This operation requires assembly by temperature
- Dip the bearings in oil bath when this is still cold. Avoid contact between bearings and container.
- Use an appropriate amount of oil (approx.1 l)

- Gradually heat the container with a thermal gun until the oil temperature reaches approx. 150°.
- Check the temperature using a multimeter provided with thermal probe

N.B.

IF THE BEARINGS WERE IMMERSED INTO HOT OIL, THEY WOULD BE IMMEDIATELY DAMAGED.

- Place the crankshaft on the special support
- Alternately introduce the 2 bearings to insert them home.
- If required, use a specific pipe to ensure their insertion.

N.B.

THIS OPERATION SHOULD BE PERFORMED QUICKLY AND WITH PRECISE MOVES. OTHERWISE, START OVER.

Specific tooling

020265Y Bearing fitting base

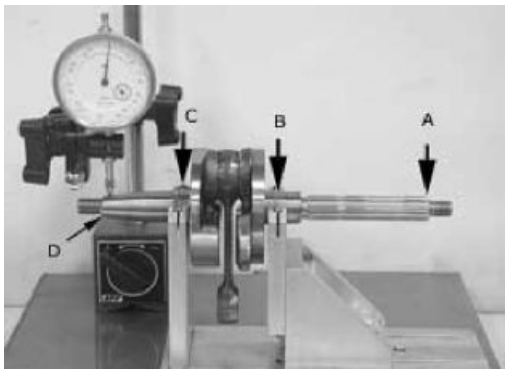
008119Y009 Tube to assemble shafts and axles

Inspecting the crankshaft components

- Check for any abnormal wear on the eccentric track.
- To check using the dial gauge, see the section «Checking crankshaft alignment»

Inspecting the crankshaft alignment

With the specific tool shown check that the eccentricity of the surfaces of diam. «**A**»-«**B**»-« **C**» are within 0.03 mm. (reading limit on the dial gauge); in addition, check the eccentricity of diam. «**D**», for which a maximum reading of 0.02 mm is permitted. In the case where eccentricity is not much above prescribed levels, **straighten** the shaft by acting on the counterweights with a shim or tighten them in a clamp (with an aluminium bushing) as required..



Specific tooling

020335Y Magnetic support for dial gauge

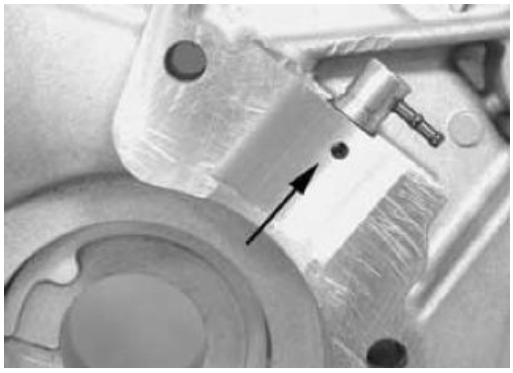
020074Y Support base for checking crankshaft alignment

Inspecting the crankcase halves

- Remove the oil seals from both crankcase halves using a screwdriver.

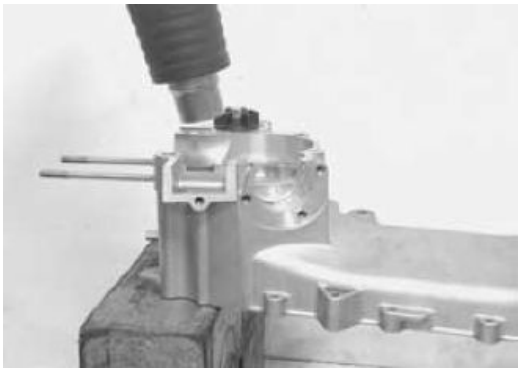
- Clean the fitting surfaces removing Loctite residues and residues of the paper seal on the cylinder.
- For this operation, use specific products available on the market. Avoid any method that may impair the crankcase fitting surfaces.
- To facilitate this operation, remove the rotor. Please note that the threading is anticlockwise.
- Check the fitting surfaces and the bearing and oil seal capacities.

- Check the cleaning and efficiency of the unidirectional valve of the oil supply to the pump case.
- Check the correct installation of the reference dowels.



Refitting the crankshaft

- Place the transmission side crankcase half on two wooden supports.
- Refit the water pump rotor (note that the threading is anticlockwise)
- Use the thermal gun to heat the bearing seat to approx. 120°.



N.B.

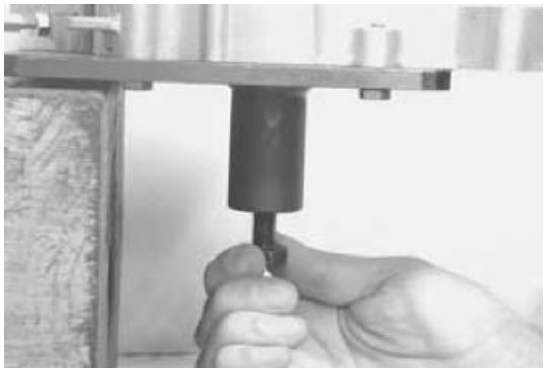
MAKE SURE THAT THERE IS THE NECESSARY SPACE IN THE LOWER SIDE TO INSERT THE CRANKSHAFT.

- Insert the crankshaft using a firm movement until the bearing reaches home.

N.B.

CHECK THAT THE CONNECTING ROD IS PLACED ACCORDING TO THE CYLINDER AXIS. IF ASSEMBLY IS UNSUCCESSFUL, START OVER FOLLOWING THE HEATING RULES AND BEING CAREFUL TO THE SHAFT INSERTION MOVEMENT. DO NOT LUBRICATE THE SHAFT SINCE THE CRANKCASE HALF FITTING SURFACES MAY BE SOILED.

- Let the crankcase half temperature settle with the crankshaft temperature.
- Install the specific crankcase separation plate again without installing the crankshaft guard.
- Keep the central thrust screw loosened during assembly.
- Move the 4 fixing screws to the end of stroke and loosen them again by the same angle (e.g. 90°)
- When temperature has settled, pre-load the thrust screw of the tool manually until the bearing ball backlash is zeroed.



N.B.

AN EXCESSIVE PRE-LOAD MAY CHANGE THE CRANKCASE BEARING POSITION.

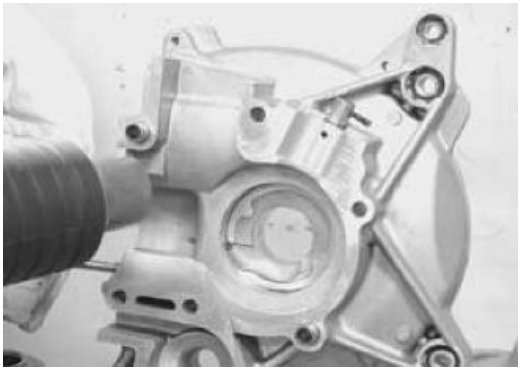
- Prepare the fitting surface using the recommended product applying a thin layer after degreasing the surface with a suitable solvent (e.g. trichloroethylene)

Recommended products

Loctite 510 Liquid sealant

Gasket

- Assemble the equipment need to close the crankcase half (screws, wrench).
- Heat the crankcase half on the flywheel side using the thermal gun, with the same procedure on the transmission side crankcase half.



- Keep the transmission side crankcase half in horizontal position to introduce the flywheel side crankcase half with a firm and precise move.

N.B.

WEAR GLOVES WHEN HANDLING THE CRANKCASE HALF. DO NOT USE RAGS FOR THIS OPERATION.

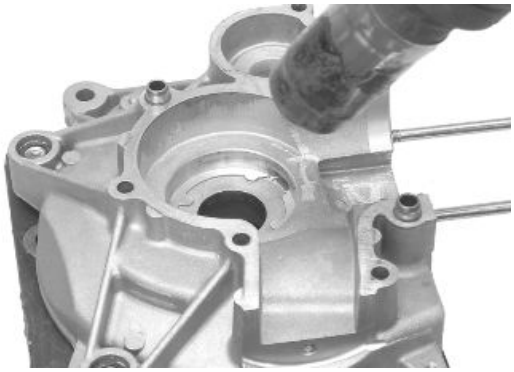
- Insert at least 3 fixing screws and tighten quickly.
- Insert 5 more screws and tighten at the prescribed torque.

Locking torques (N*m)

Crankcase closing screws: 12 -13 Nm

Refitting the crankcase halves

- Prepare the coupling surface with LOCTITE 510 applying a thin layer of it after degreasing the surface using a suitable solvent (e.g. trichloroethylene)
- Heat the flywheel-side half crankcase with a thermal gun.

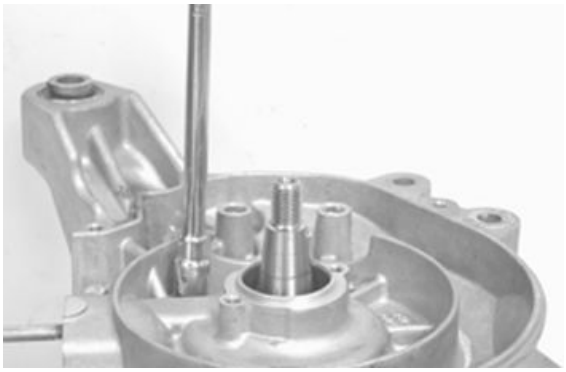


Recommended products

Loctite 510 Liquid sealant

Gasket

- Keeping the half crankcase on the transmission side, insert the flywheel side half crankcase with a clean precise movement
- Insert at least three clamping screws and tighten up rapidly
- Insert the other 5 screws and tighten them to the specified torque.

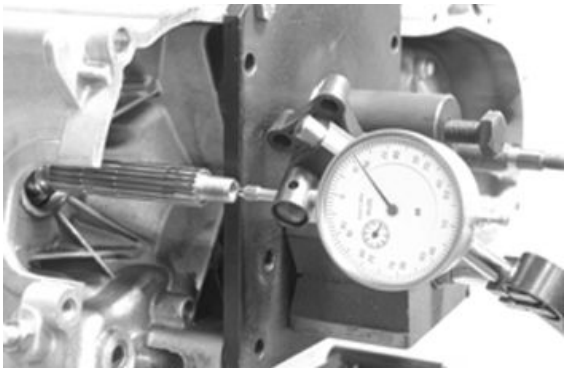


Locking torques (N*m)

crankcase coupling screws 11 - 13

- Move the crankcase separation plate in a position back from the one indicated in the figure
- Install the special magnetic support with dial gauge at the end of the crankshaft
- Check the axial clearance of the crankcase

If this is not within the maximum limit allowed, repeat the crankcase coupling procedure



Specific tooling

020335Y Magnetic support for dial gauge

Characteristic

Axial clearance with warm crankcase

0.10 ÷ 0.12 mm

Axial clearance with cold crankcase

0.06 to 0.08 mm

Limit value with cold crankcase

0.02 ÷ 0.03 mm

Air compressor

Removal

Air compressor removal

- Remove the throttle body manifold
- Remove the air piping union from the injection head using a Torx 25mm wrench

- Remove the air piping support bracket fixing screw from the transmission covers.

- Remove the 4 screws fixing the air compressor to the crankcase, as shown in the figure.
- Remove the air compressor

Overhaul

Air compressor check

- Check the presence of any unusual wear, traces of overheating on the roller contacting with the eccentric, as shown in the figure.

- Use a feeler gauge to measure the axial play of the control roller by placing the blade between roller and one of the two shim adjustments.

Characteristic

Standard axial play:

XXX

Allowable limit after use:

XXX

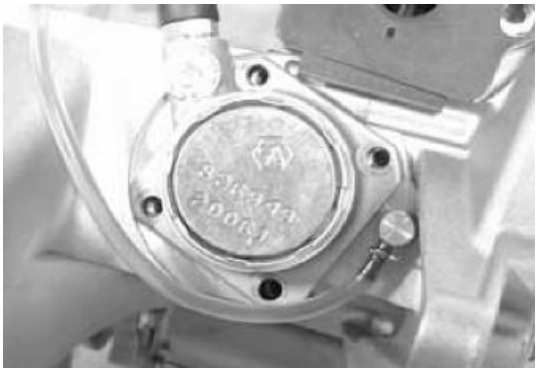
- Check that the O-ring exhibits no breakage or squashing.

- Remove the flywheel cover.
- Turn the crankshaft to check that the eccentric track exhibits no unusual wear or signs of overheating.

Refitting

Air compressor refitting

- Place the shaft with the eccentric at its lower dead point.
- Insert the compressor into the crankcase, correctly placing the reference dowels.



- Refit the sealing ring.
- Refit the 4 fixing screws tightening to the prescribed torque.

Locking torques (N*m)

Air compressor fixing screws: 3 - 4 Nm

- Refit the air pipe support bracket fixing screw on the transmission cover.
- Refit the air piping union on the injection head.

- Refit the throttle body manifold.
- Refit the flywheel cover.

Lubrication

Crankshaft oil seals

Refitting

- Install a new oil seal on the flywheel side using the specific tool punch. The flywheel side oil seal can be recognised by the smaller diameter.

N.B.

USE OF THE TOOL IS NOT COMPATIBLE WITH THE MOUNTED KEY

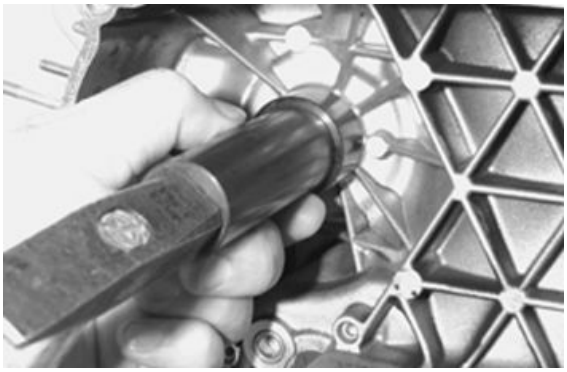
Specific tooling

020340Y Flywheel and transmission oil seals fitting punch

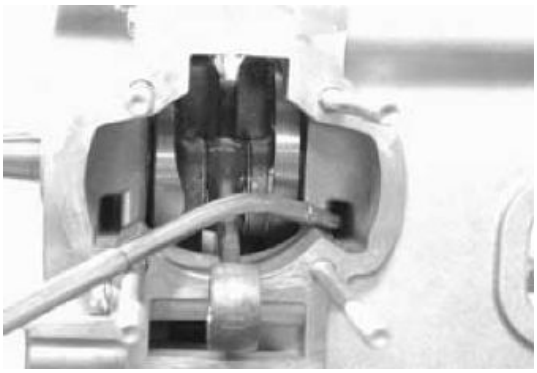
- Install a new oil seal on the transmission side using the specific tool provided with adapter ring. The transmission side oil seal can be recognised by the larger diameter.

Specific tooling

020340Y Flywheel and transmission oil seals fitting punch



- Lubricate bearings and connecting rod head using 2T oil.

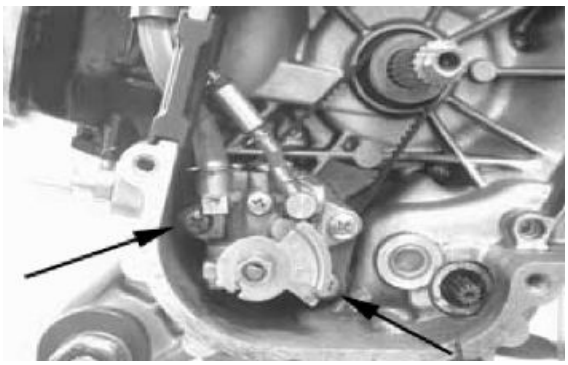


- Refit the thermal unit
- Refit the compressor
- Refit the throttle body
- Refit the flywheel - stator
- Refit the mixer
- Refit the driven pulley
- Refit the driving pulley

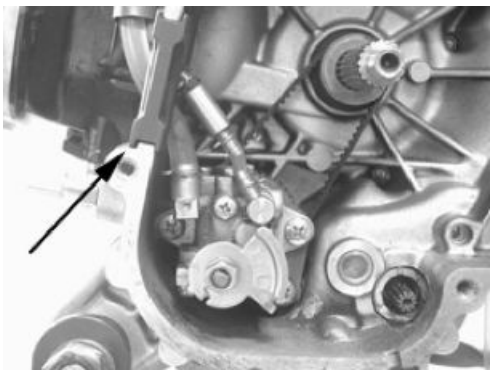
Oil pump

Removal

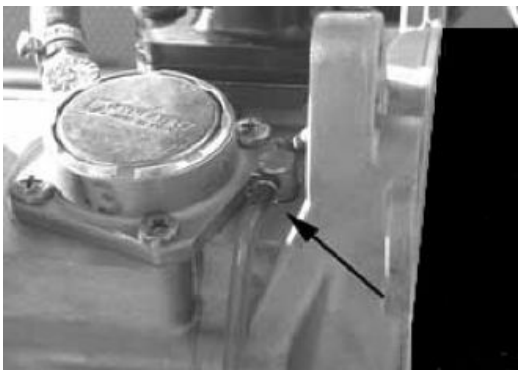
- Remove the transmission cover
- Remove driving pulley
- Remove the 2 screws shown in the figure



- Remove the pipe gasket from the case as shown in the figure



- Remove the pipe from the oil inlet union in the pump case

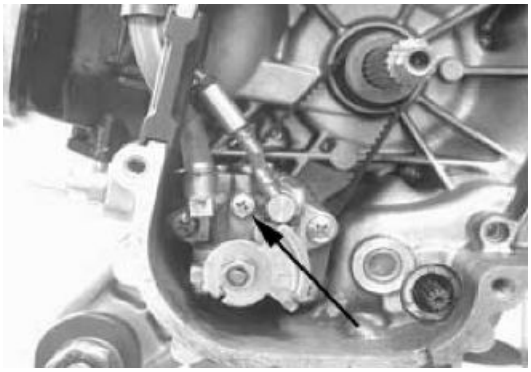


See also

Removing the driving pulley

Refitting

- To refit, perform the removal procedures in the reverse direction.
- Perform purging after refitting, using the screw shown in the figure.



INDEX OF TOPICS

SUSPENSIONS	SUSP

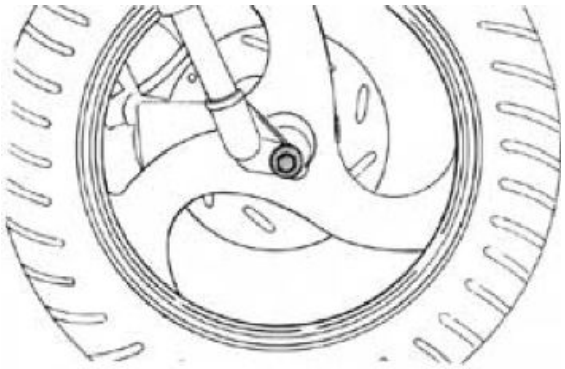
Sospensioni anteriore

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

Front

Removing the front wheel

- Support the vehicle in such a way that the front wheel is raised.
- Using two 18 mm hexagonal wrenches remove the front wheel axle.



Refitting the front wheel

- When refitting, pay attention in repositioning the odometer drive correctly.

Locking torques (N*m)

Wheel fixing nut 40 to 50 N.m

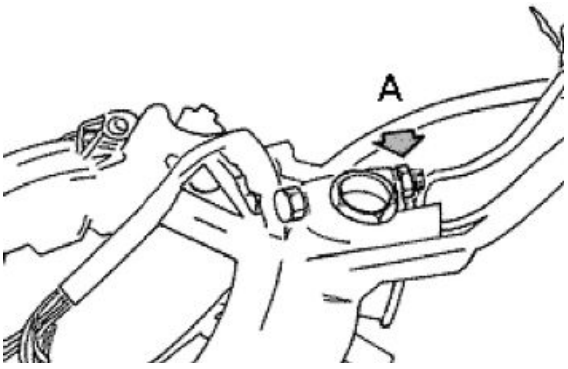
Handlebar

Removal

- Remove the front handlebar cover.
- Remove the rear handlebar cover.
- After removing the transmissions and disconnecting the electrical terminals, remove the bolt «A» and the handlebar
- Check all components and replace faulty parts.

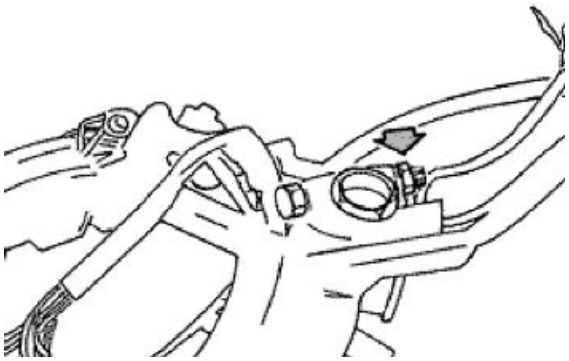
N.B.

IF THE HANDLEBAR IS BEING REMOVED TO REMOVE THE STEERING, TILT THE HANDLEBAR FORWARD TO AVOIDING DAMAGING THE TRANSMISSIONS.



Refitting

When refitting, tighten to the prescribed torque and apply the recommended grease to the threaded cone.



Recommended products

AGIP GREASE PV2 Grease for control levers on the engine

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

Locking torques (N*m)

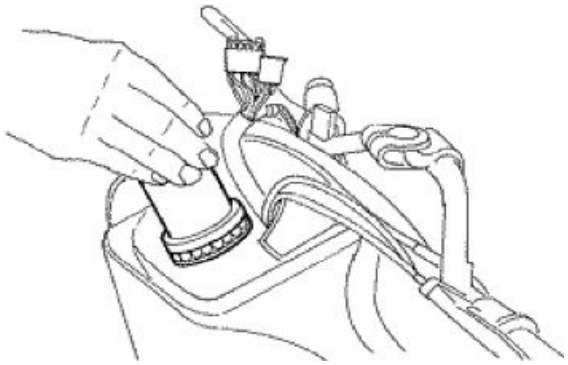
Locking torque: 65 to 70 N•m

Front fork

Removal

- Remove the front brake calliper.
- Remove the odometer cable from the reduction gear box.
- Remove the front mudguard.
- Remove the handlebar.

After removing the steering ring-nut using the special tool, lean the vehicle on one side and extract the steering tube.



Specific tooling

020055Y Wrench for steering tube ring nut

See also

Front brake calliper
Handlebar

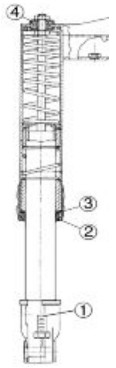
Overhaul

Disassemble damper

- Remove screw 1 fixing the screw to the stem and remove the stanchion heating it if necessary with the specified heater, then remove sealing ring 2 and seeger 3.
- Using nut 4, remove the spring stem and bushing.

The damper is an integral part of the stem and cannot therefore be overhauled, so if you need to work on the damper (loss of fork oil), carry out the operations mentioned above and replace the shock absorber-stem unit.

When refitting, tighten to the prescribed torque and apply the recommended grease to the threadlock nut.



Specific tooling

020150Y Air heater support

020151Y Air heater

Recommended products

Loctite 243 Medium strength threadlock

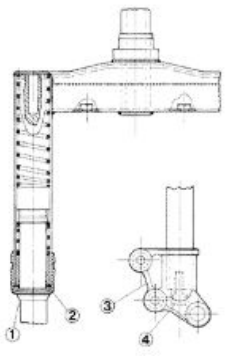
Loctite 243 medium-strength threadlock

Locking torques (N*m)

Stud-stanchion fixing screw 20 to 25 N•m Nut tightening torque 20 to 25 N•m

Replace seal ring

- Remove the wheel axle.
- Remove the screw (4).
- Remove the stanchion (3).
- Remove the dust guard (1).
- Insert the new sealing ring after lubricating the inside parts of the ring and paying attention not to damage it.
- Insert the stanchion applying the recommended product to the clean surface.
- Lock the screw (4).



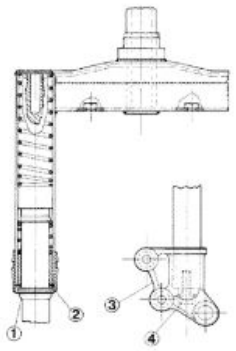
Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

Rod disassembly

- Remove the dust guard (1) using a screwdriver to prise it out.
- Remove the seeger (2) and remove the power pipe.



N.B.

GREASE THE SPRINGS AND THE BUSHINGS BEFORE REFITTING, WITH A SMALL QUANTITY OF GREASE (AROUND 3 GR.)

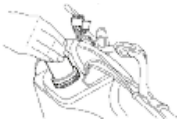
Recommended products

AGIP GREASE MU3 Grease for odometer transmission gear case

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

Refitting

Lubricate the seats and the balls with the grease recommended.



- Lock at the prescribed torque and turn the key anticlockwise by 90° to 100°.

Specific tooling

020055Y Wrench for steering tube ring nut

Recommended products

AGIP GREASE PV2 Grease for control levers on the engine

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

Locking torques (N*m)

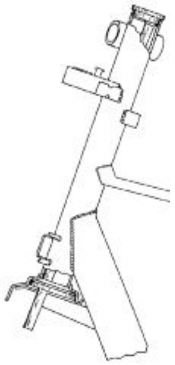
Locking torque: 50 to 60 Nm

Steering column

Removal

Lower and upper races from frame removal

- Only remove the seats if it is strictly necessary.
- Using the special tool remove the upper fifth wheel seat by putting the special tool into the lower part of the headstock as indicated in the figure.
- By inserting the punch into the top of the tube, remove the lower fifth wheel seat from the head-stock.



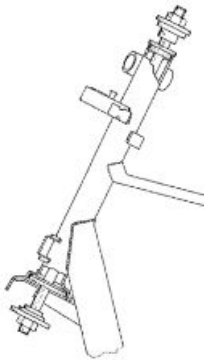
Specific tooling

020004Y Punch for removing fifth wheels from headstock

Refitting

Lower and upper races from frame refitting

- Using the special tool, refit the upper and lower bearing seats on the headstock.



Specific tooling

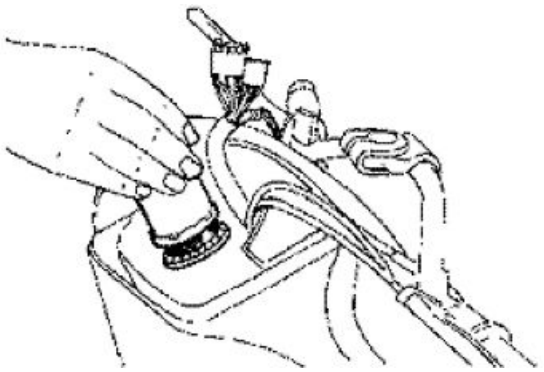
001330Y Tool for fitting steering seats

Steering bearing

Removal

Disassemble steering locking ring nut

- Remove the handlebar.
- Remove the bearing of steering ring nut using the specific tool.



Specific tooling

020055Y Wrench for steering tube ring nut

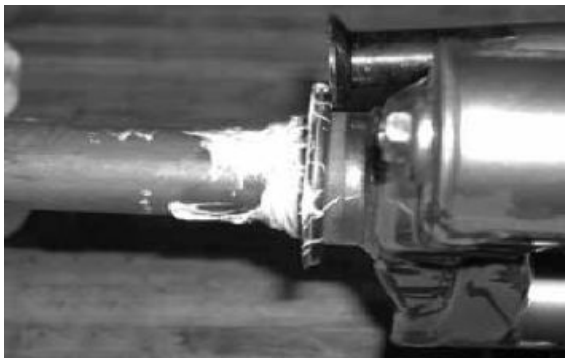
See also

Handlebar

Overhaul slew ring seat on fork

Check the condition of the fifth wheel and the fifth wheel seat on the fork (steering tube). Replace if there are faults.

- Support the fork properly.
- Using the special tool, remove the fifth wheel seat on the steering tube as shown in the photograph by applying small mallet blows.



Specific tooling

020004Y Punch for removing fifth wheels from headstock

Always use a new fifth wheel seat on refitting.

- Using the special tool, refit the fifth wheel seat with the aid of a few mallet blows and bring it as far as the stop shown in the photo.

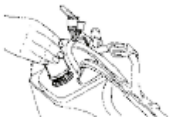
Specific tooling

006029Y Punch for fitting fifth wheel seat on steering tube

Refitting

Rimontaggio ghiera di bloccaggio sterzo

- After locking the first ring nut in place, lock the second ring nut using a specific tool.



Specific tooling

020055Y Wrench for steering tube ring nut

Locking torques (N*m)

Locking torque: 30 to 40 Nm

Rear

Removing the rear wheel

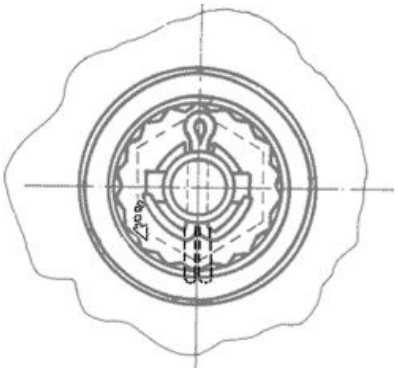
- Use a screwdriver as a lever between the drum and the cover.

-Straighten the split pin and remove the cap.

-Remove the wheel acting on the central fixing point.

WARNING

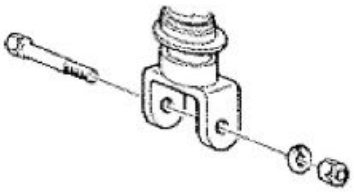
-ALWAYS USE NEW SPLIT PINS FOR REFIT-TING.

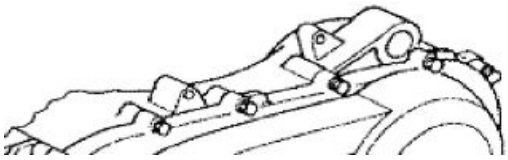


Shock absorbers

Removal

To replace the shock absorber you just need to remove the battery access flap to get and remove the shock absorber/ frame anchorage nut. Then remove the shock absorber/engine anchorage nut.





Refitting

When refitting, tighten the shock absorber/frame anchorage nut and the shock absorber/engine pin at the prescribed torque.

Locking torques (N*m)

Shock absorber/frame nut torque 20 to 25 Nm Shock absorber/engine pin torque 33 to 41 N·m

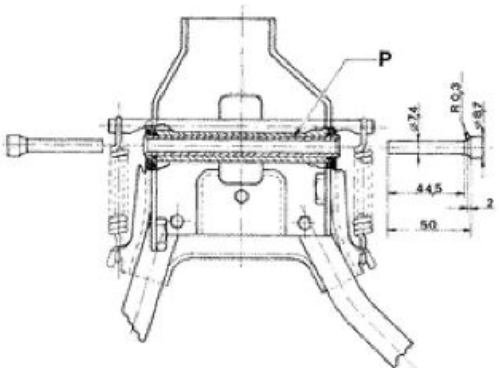
Centre-stand

Assembly and staking of stand pivot pin to bracket

- Caulk the end of the pin «P» between the two punches shown in the figure.
- After caulking it must be possible for the stand to turn freely.

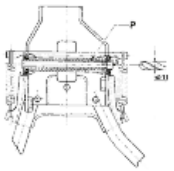
N.B.

UPON REFITTING USE NEW O-RING AND PIN, GREASE THE SPRING ATTACHMENTS AND THE PIN.



Expelling stand pivot pin from bracket

- Remove the stand support bracket from the engine.
- Drill a 5 mm hole in the bracket so that the pin «P» can come out.



Changing the complete stand

- Work on the screws shown in the figure.
- When refitting, secure to the prescribed torque.

Locking torques (N*m)

Stand screw torque 18.5 to 19 Nm

INDEX OF TOPICS

PURE JET INJECTION	INJ PJ

Introduction

EMS injection system

The injection system has an incorporated injection and ignition.

Injection is direct and pneumatic, by air electro-injector and fuel electro-injector.

Injection and ignition are phased on the 2T cycle by a phonic wheel on the flywheel and phase rpm sensor with reluctance variation.

Fuel preparation and ignition are controlled on the basis of the engine rpm and of the gas valve opening.

Further correction is made according to the following parameter:

coolant temperature.

The ECU stabilises the idle at 2000 RPM for any temperature of use, by suitably managing the air injector controls, fuel injector and HV coil. Fuel preparation therefore changes according to the use temperature.

During running, fuel preparation is controlled on the basis of the engine rpm signals, coolant temperature, and gas valve position in relation to preset mapping.

The fuel injection circuit consists of:

- Fuel filter
- Pump feeding duct with auto-bleeding
- Fuel pump
- Fuel injector
- Pressure regulator

The injector mounting is connected by two snap on pipes. The continuous circulation prevents the fuel from boiling. The pressure regulator is placed in output of the injector mounting . The fuel pump is controlled by the ECU; this ensures safety of the vehicle.

The power supply circuit consists of:

- Volumetric compressor with unidirectional valve controlled by the eccentric on the crankshaft
- Flexible lines connecting to the injector mounting
- Pressure regulator
- Air injector

The ignition circuit consists of:

- ECU
- H.V. coil
- H.V. cable
- Shielded cap
- Spark plug

The ECU manages ignition with an optimum control of the advance and of the coil magnetisation time.

The ECU injection-ignition system manages the engine functions by a default program. This injection system allows reaching great results as regards:

- Fuel consumption reduction
- Lubricant consumption reduction
- Discharge emission reduction. Emissions are further limited by the catalyser.

The injection system allows these results by:

Air washing of cycle 2T

- Stratified load
- Fine nebulisation by pneumatic injection

These results are obtaining without impairing the delivery features of torque and power Should any input signals be missing, acceptable engine performance is ensured to allow the user to reach the workshop.

Of course this cannot happen when the phase rpm signal is missing, or when the fault concerns control curcuits:

- Fuel pump
- HV coil
- Injectors
- TPS (Throttle Position Sensor)

The ECU is provided with a self-diagnosis system and informs the user by the lamp into the instrument panel. The signals are given in two ways:

- Flashing light
- Solid light

The flashing light denotes a medium fault that requires a check at the workshop. The engine may work normally or in limited conditions.

The solid light denotes serious faults that impair the engine functions.

precautionary measures

1.Before fixing any part of the injection system, check any registered faults. Never disconnect the battery before checking for faults.

2. The power supply system is pressurised at 250 ÷ 800 KPa (2.5 ÷ 8 BAR). Before disconnecting the snap on attachment of a fuel line, check that there are no free flames and do not smoke. Act with caution to prevent spraying in the eyes.

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

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

5. When washing the vehicle, be careful of the electric components and wiring.

6. When an ignition fault is detected, start the checks from the battery and the injection system connections.

7. Before disconnecting the ECU connector, perform the following steps in the order shown: Set the switch to "OFF" then disconnect the battery. Failure to comply with this rule may damage the ECU.

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

9. To prevent damage, disconnect and reconnect the ECU system connectors only if required. Before reconnecting, check that the connectors are dry.
10. During electrical checks, do not force the tester tips into the connectors. Do not perform tests not specifically required by the manual. Perform electrical checks using the interface wiring specific tool.
11. At the end of every check performed with the diagnostic tester, protect the system connector with the cap. Failure to comply with this rule may damage the ECU.
12. Before reconnecting the quick couplings of the power supply system, check that the terminals are perfectly clean.
13. During repairs, do not remove the compressed air line clamps. If required, replace the rubber hose.
14. If you have to remove the air injector, replace the carbon dam sealing ring.
15. Do not perform voltage checks on the spark plug when it is not fitted on the head. Power supply voltages are very high. Hazard of dangerous electric shock. In addition, the air - fuel mixture leaking from the spark plug may cause fire.
16. Do not switch to «ON» during repair procedures when the tank is empty. While on the road, do not use the reserve if it could deplete the fuel.
17. Do not disconnect the battery leads when the engine is running.
18. If the fuel is completely depleted, refuel with at least 4 litres. This will enable safe triggering of the fuel pump

Specific tooling

020481Y Control unit interface wiring

troubleshooting

suggestions for diagnosis

1 A failure of the injection system may most probably depend on the connections rather than the components.
Before troubleshooting the injection system, perform the following checks:
1. Power supply
Battery voltage
Burnt fuse
Connectors
2. Ground to frame
3. Air supply
Volumetric compressor
Supply line
4. Fuel supply
Faulty fuel pump
Dirty fuel filter

Fuel supply vent clogged

5. Ignition system

Faulty spark plug

Faulty coil

Faulty screened cap

6. Suction circuit

Air filter dirty

7. Others

Incorrect reset of the gas valve position sensor

2 Injection system faults may be caused by loosened connectors. Make sure that all connections are efficient.

Check the connections as follows:

1. check that the terminals are not bent.

2. check that the connectors are properly engaged.

3. check if the fault can be fixed by slightly vibrating the connector.

3 Check the entire system before replacing the ECU

If the fault is fixed by replacing the ECU, install the original ECU again and check if the fault occurs again.

4 For troubleshooting, use a multimeter with internal resistance of more than 10 Ohm / V.

Inappropriate instruments may damage the ECU.

The preferred instruments have a definition of more than 0.1V and 0.5 Ohm , precision must be more than ±2%.

menù diagnosis tester

Menu of the diagnostic tester

The specific scooter diagnostic tester is provided with a specific software for the diagnostic of the PUREJET injection system .

Specific tooling

020460Y Scooter diagnosis and tester

The diagnostic tester is provided with a base setting menu.

To select the various functions, proceed as follows:

1. Press «ESC» and «OK» and keep them pressed while enabling the battery power.

2. The display shows the following menu: ECU DIAGNOSTIC, LINK TO PC, CONTRAST SET, LANGUAGE SET, BUZZER SET, VERSION

3. Select ECU diagnostic

4. Select the software for the PUREJET system

5. Wait until the modules are loaded

6. The diagnostic tester is ready for use. The selected software will stay in memory also for the next uses

N.B.

IF THE SCOOTER DIAGNOSTIC TESTER IS NOT LOADED WITH THE SYSTEM SOFTWARE, UP-GRADE WITH A PC, THE PROGRAMMING KIT AND THE SOFTWARE TO LOAD. SET THE DIAGNOSTIC TESTER TO FUNCTION «LINK TO PC» IN THE MENU.

The main menu of the diagnostic tester has the following functions:

• PARAMETERS

• ERRORS

• PARAMETERS STORED

• ERROR CLEARING

• ACTIVE DIAGNOSTIC

• TPS RESET

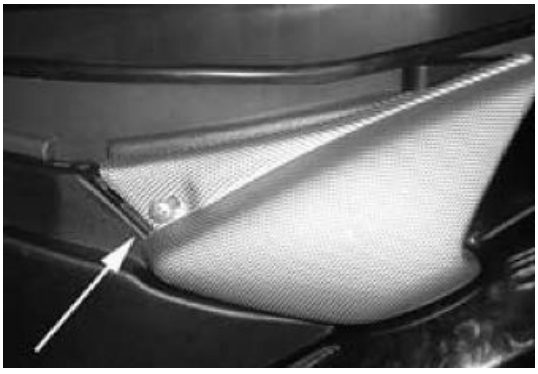
• CALIBRATION

• ECU INFORMATION

To access the individual functions, the tester must be connected to the vehicle diagnostic outlet and the ECU must be on.

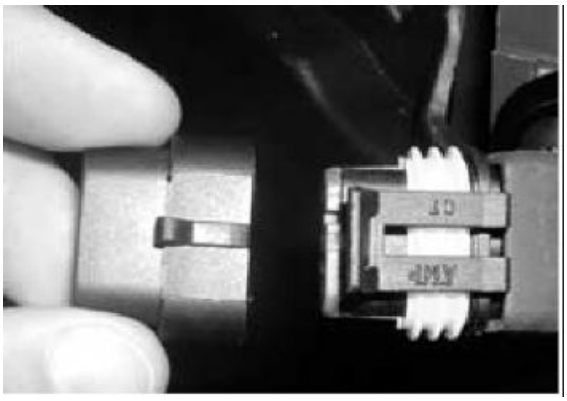
• To connect the scooter diagnostic tester, raise the seat

• Remove the left detail shown in the figure



• Extract the grip from the support clip

• Remove the cover from the diagnostic grip



• Connect the diagnostic tester wiring

• Connect the power supply cable with battery terminals to the diagnostic tester

• Connect the terminals to the battery respecting the polarity: RED (+) - BLACK (-)

N.B.

FAILURE TO DO SO MAY PERMANENTLY IMPAIR THE DIAGNOSTIC TESTER

• To disconnect the tester, remove the terminals from the battery

• Remove the connector from the outlet

• Reapply the protection cap to the outlet to prevent dirt from laying onto the contacts

• Refit the battery cover

PARAMETETERS

Specification	Desc./Quantity
ENGINE RPM	Displays the regime of the engine in all conditions, including the start-up
ENGINE TEMP. °C	Indicates the coolant temperature
THROTTLE OPEN. %	Indicates the % of opening of the throttle valve
T. FUEL INJECT. MS	Time of opening the fuel injector
AIR INJECTION T. MS	Time of opening the air injector (air- fuel spray)
ADVANCE IGN. °	Advance ignition in degrees before the TDC

Specification	Desc./Quantity
VOLTAGE SENSOR V	Denotes the voltage of the TPS sensor
TEMP. ENGINE V	Denotes the voltage of the coolant temperature indicator
TPS1 OUTPUT V	Indicates the TPS1 voltage indicator
TPS2 OUTPUT V	Indicates the TPS2 voltage indicator
TPS1 RESET V	Indicates the reset voltage of the TPS1 indicator (voltage referring to the ground)
TPS2 RESET V	Indicates the reset voltage of the TPS2 indicator (voltage referring to the positive 5V)
VOLT. BATT. V	Indicates the power supply voltage of the ECU (normally identical to the power of the vehicle battery)
T. OF DWELL MS	Indicates the core dwell time of the H.V. coil
MIN RPM	Indicates the number of engine revolutions set in the ECU for checking the minimum
INST. CONS.L/H	Indicates instantaneous fuel consumption
D. CYCLE CONS. %	Indicates the ratio in % between the time in "ON" and the time in "OFF" of the consumption meter control indicator (this vehicle is not fitted with this instrument)
ENGINE STATUS	Displays the engine status: STALL (stationary) CRANK (starting) IDLE (idle) RUN (running)
RUNNING HOURS	Displays the engine running time (in hours)
S.T. FUEL PUMP.	Denotes the status of the fuel pump (OFF - ON)
TPS TO RESET	Indicates the need to repeat the reset of the TPS indicators (YES- NO)

All the parameters can be displayed by selecting the 4 pages. In case of need, all the parameters can be stored in the tester by pressing the «TAB» key at the selected time. The parameters are stored as long as the power of the diagnostic tester is inserted.

ERRORS

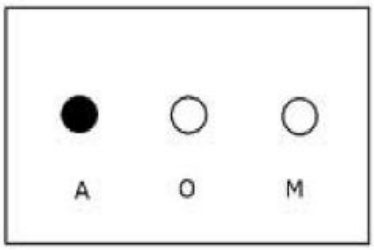
Specification	Desc./Quantity
G11 P0115	**Engine temperature indicator:** the voltage of the coolant temperature indicator is near 0V (short circuit) or 5V (open circuit). Temperature indicator off Light off
G11 P0217	**Engine temperature high:** the coolant temperature signal voltage has reached too low voltages. They denote a very high temperature, higher than what can be indicated by the instrument panel. Flashing light
G20 P1120 TPS OFFSET	The voltage of TPS signals is not as expected. Engine is in idle. Light on
G20 P1123 TPS	TPS signals missing Voltage close to 0V (short circuit) Voltage close to 5V (open circuit) Engine to forced idle

Specification	Desc./Quantity
	Flashing light
G21 P1124 TPS1 OFFSET	TPS1 signal is not as expected. Light off
G21 P1125 TPS1	TPS1 signal missing. Voltages close to 0V (short circuit) Voltages close to 5V (open circuit) Light on
G22 P1127 TPS2 OFFSET	TPS2 signal is not as expected. Light off
G22 P1128 TPS2	TPS2 signal missing Voltage close to 0V (short circuit) Voltage close to 5V (open circuit) Light on
G30 P0560 Battery voltage	ECU power supply voltage is below 8.5V or is too high Flashing light
G30 P1560 voltage sensor	The TPS sensor and coolant temperature sensor supply voltage are not as expected. Light off
G30 P1561 Sensor 2	TPS voltage sensor and coolant temperature sensor are not as expected (high temperature). Engine remains at forced idle Light on
G40 P0219 Runaway rpm	The engine has reached excessive rpm. Light on
G40 P0335 Rpm pickup	The ECU cannot properly recognise the rotation speed or the engine phase point. Engine with stall Light on
G40 P0700 Belt CVT	With engine idle or during start up, the automatic transmission or the clutch has required an excess driving force. The fault is registered when the engine management is not as expected for 3 consecutive times. Light off
G50 P0251 Fuel injector	The ECU has detected an interruption in the injector circuit. The fault can only be recognised in the presence of phase - rpm Light on
G50 P0350 H.V. coil	The ECU has detected an interruption in the HV coil primary supply circuit. The fault can only be recognised in the presence of phase - rpm. Engine without injection Light on
G60 P0230 Fuel pump	The ECU has detected an interruption or short circuit on the power supply line of the pump. Light on
G60 P0650 Check lamp.	The ECU has detected an interruption or short circuit on the injection indicator supply. Open circuit: indicator always off Circuit to ground: light always on
G60 P1561 Temp. indicator	The ECU has detected an interruption or a short circuit on the temperature indicator circuit. Light off

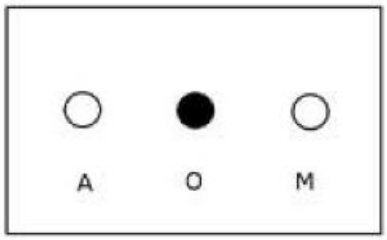
Specification	Desc./Quantity
G60 P1160 Air injector	The ECU has detected an interruption in the injector circuit. The fault can only be recognised in the presence of phase - rpm Light on

Faults are reported by a dark dot on one of the reference columns. The recognition occurs in 3 modes:

- Dot on the column marked «**A**». The fault is «CURRENT» and present during the check



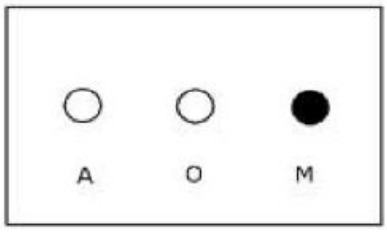
- Dot on the column marked with «**O**». The letter denotes «OCCURRED». The fault has occurred and has been fixed during the same period of use. The fault may be intermittent and not present during the check



- Dot on the column marked with «**M**». The letter denotes «STORED», the faults displayed in «CURRENT» or «OCCURRED» automatically shifts to «STORED» after switching to «OFF». The passage to «STORED» always occurs at the end of the period of use.

N.B.

THE FAULT CAN BE SIGNALLED IN A SINGLE MODE. THAT IS, THE «CURRENT» AND «STORED» CONDITIONS CANNOT COEXIST.



Parameters stored

This function displays the parameters stored previously. As already specified in the description of the parameter function, parameters are stored by pressing the «TAB» key at the selected time.

The diagnostic tester can contain a single memorisation.

It is cancelled out automatically as soon as power is disconnected from the tester.

Error clearing

This function clears any faults and settings recorded by the ECU auto-diagnostic function.

Active diagnosis

This function is very useful for making an efficiency check of the main components of the system and related circuits.

The components involved are:

ACTIVE DIAGNOSTICS

Specification	Desc./Quantity
AIR INJECTOR	Wait for the sound confirming 5 openings
FUEL INJECTOR	Wait for the sound confirming 5 openings
HV COIL	Wait for the sound confirming 5 coil magnetic activity (weak signal)
FUEL PUMP	Wait for the sound confirming the pump rotation for approx. 30 seconds.
TEMPERATURE INDICATOR	The indicator increases to display an average temperature, then returns to the rest position (to perform with cold engine)
CHECK LAMP	The light is normally on. The diagnostic is confirmed when the light turns off briefly.
ODOMETER	Instrument not present on the vehicle
CONSUMPTION GAUGE	Instrument not present on the vehicle

When the various diagnostics are enabled, the tester displays its results «ENDED SUCCESSFULLY» or «FAILED».

The tester results must always be combined with sound or visual checks.

The tester can confirm transmission of the command but cannot check the actual power supply or efficiency of the circuit under testing.

Resetting the TPS

This function allows combining the throttle body with the ECU.

Calibration

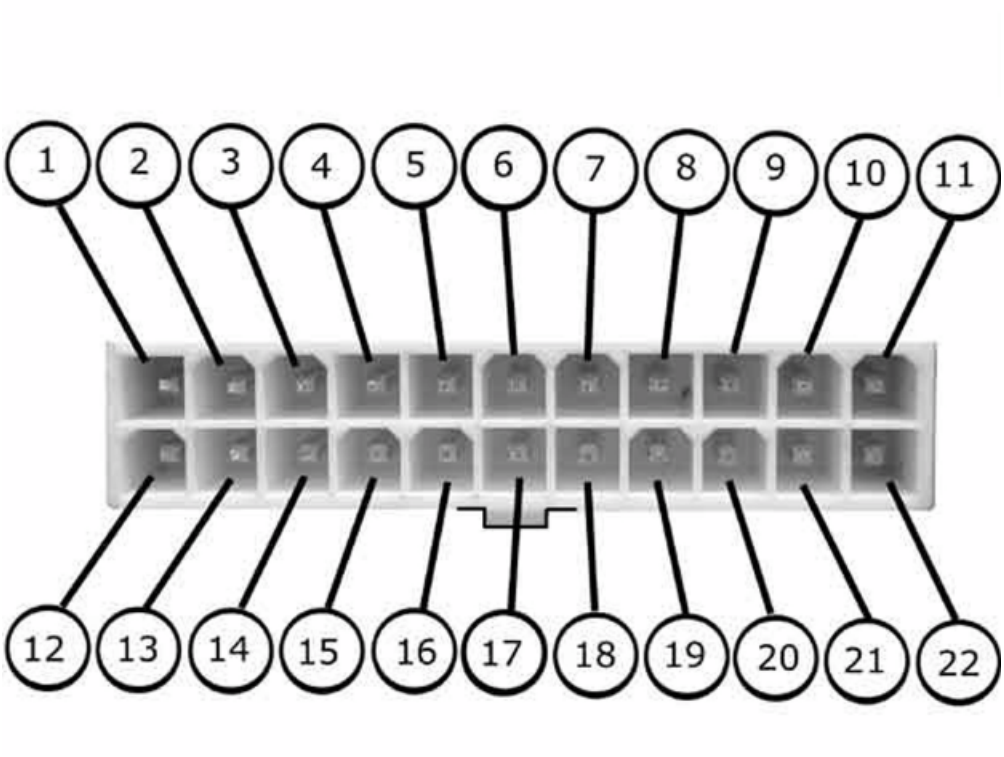
This function makes it possible to insert new calibrations to the ECU with the product developments.

ECU information

The tester displays the following information:

- N. SER. = ECU serial number
- HW REV = Hardware revision N°
- ECU SW = ECU software reference
- CALIBR = Calibration reference

terminal layout on cpu



1 - Ground

2

3 - Fuel injector (negative)

4 - To diagnosis indicator (negative)

5 - Coolant temperature indicator (button negative)

6 - Analogue rev. counter signal

7 - Signal TPS 1

8

9 - Coolant temperature sensor (positive)

10 - SignalTPS 2

11

12 - HV coil (negative)

13 - Air injector (negative)

14 - Fuel pump (negative)

15 - ECU power supply (+12V)

16 - Coolant sensor and TPS sensor ground

17 - Power supply (+12V)

18 - TPS sensor positive (+5V)

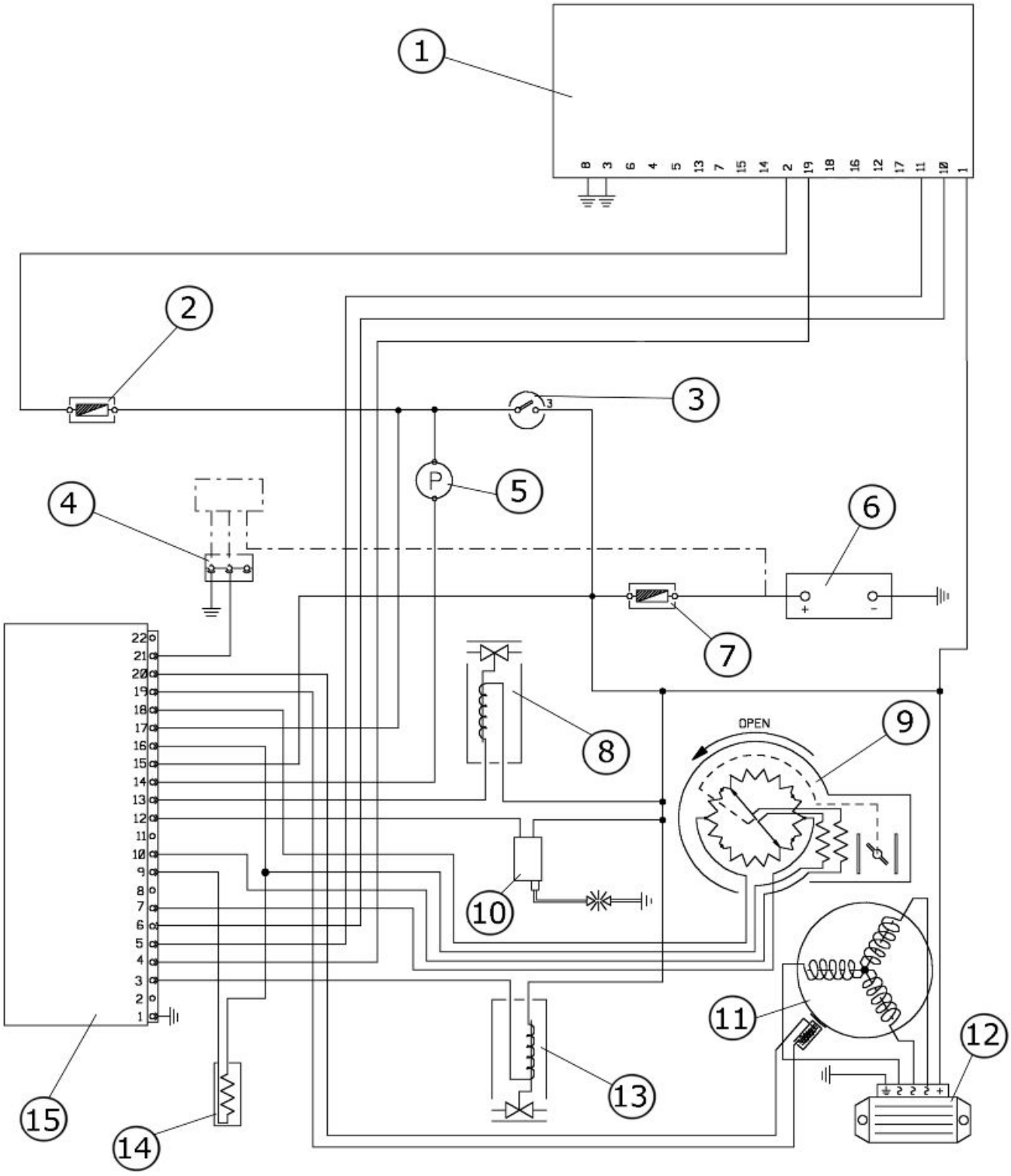
19 - Phase rpm sensor positive

20 - Phase rpm sensor negative

21 - Serial line for diagnostic tester

22

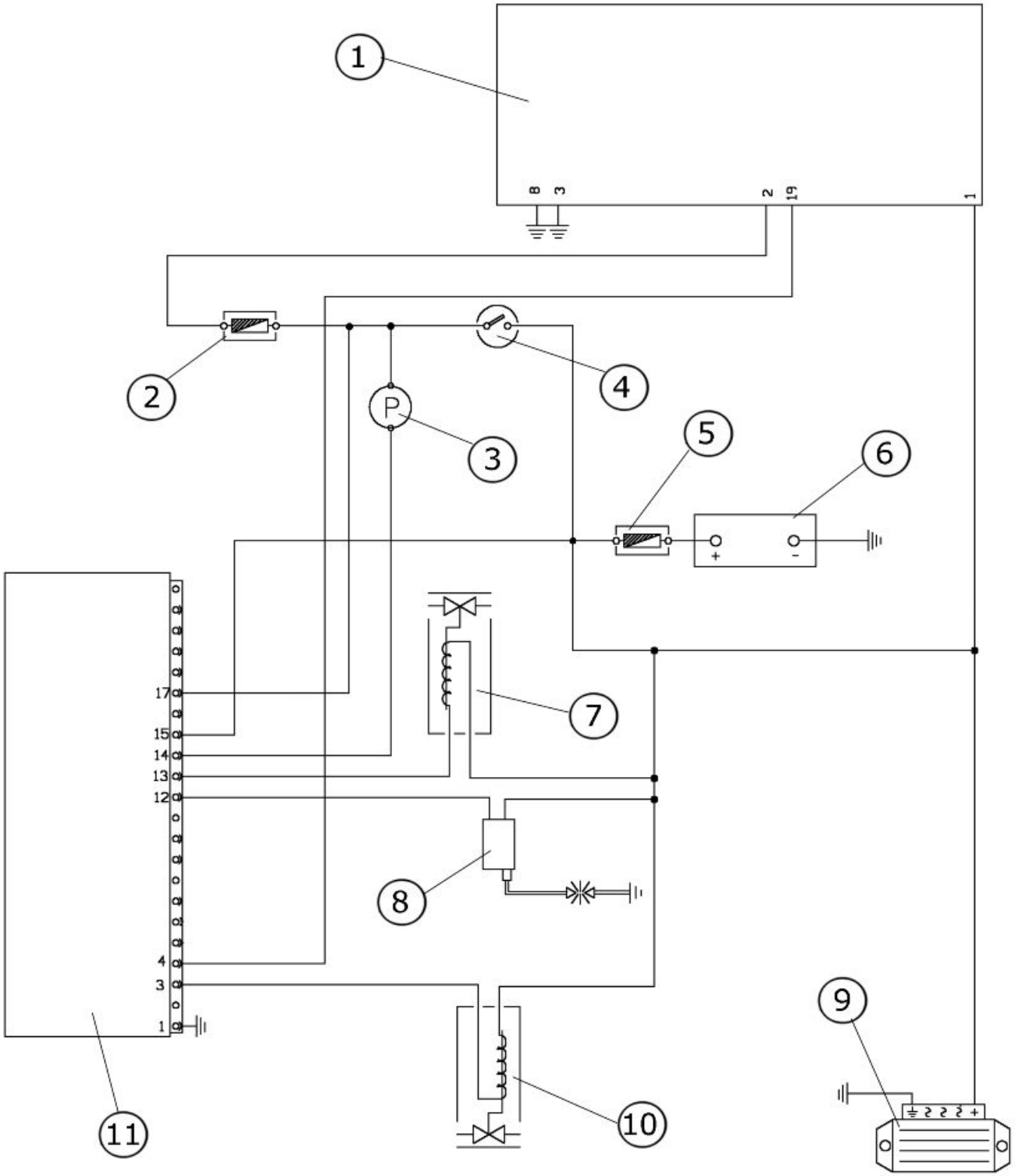
EMS system diagram



EMS SYSTEM

	Specification	Desc./Quantity
1	Digital instrument unit	
2	Fuse 5A	
3	Key switch contacts	
4	EMS diagnostic socket	
5	Fuel pump	
6	Battery	12V - 9Ah
7	Fuse	20A
8	Air injector	
9	Throttle position sensor	
10	HV coil	
11	Flywheel magneto	
12	Voltage regulator	
13	Fuel injector	
14	Water temperature sensor	
15	Injection ECU	

cpu power circuit



ECU POWER SUPPLY CIRCUIT

	Specification	Desc./Quantity
1	Digital instrument unit	

	Specification	Desc./Quantity
2	Fuse 5A	
3	Fuel pump	
4	Key switch contacts	
5	Fuse	20A
6	Battery	12V - 9Ah
7	Air injector	
8	HV coil	
9	Voltage regulator	
10	Fuel injector	
11	Injection ECU	

1-Turn the key switch to the «ON» position

Check the following conditions:

- Ignition light on steady

- Fuel pump activated for approx. 4-5 seconds

YES point 2 NO point 3 NO point 4 NO point 6 NO point 14

2- The ECU supplies are currently present.

GO TO point 9

N.B.

WHEN THE SWITCH IS ON «ON», ALL SERVICES ARE ACTIVATED. IF THERE ARE ANY FAULTS, REFER TO SECTION «VEHICLE ELECTRICS».

3- The ignition light is flashing.

GO TO point 5

4- The ignition light does not switch on and the pump is correctly activated. Perform all the checks required in the injection light section.

5- Connect the diagnostic tester of scooter. Select the «errors» function and check the faults that are signalled in current status.

GO TO point 7 GO TO point 8

Specific tooling

020460Y Scooter diagnosis and tester

6-The fuel pump did not start, but the ignition light is normally switched on. Perform all the checks required in the «pump supply» section.

GO TO point 13

7- In current mode, the tester signals faults relating to:

- engine temperature

- TPS

Make all checks reported in the relating sections The ECU supply meets specs.

8- In current mode, the tester signals faults relating to the "battery voltage"

GO TO point 10

9- Connect the diagnostic tester of the scooter. Select the errors function. Check faults relating to «battery voltage » in stored status

YES point 15 NO point 16

Specific tooling

020460Y Scooter diagnosis and tester

10- Measure the battery voltage.

GO TO point 11

GO TO point 12

11- Voltage is lower than 8.5 V. Recharge the battery.

GO TO point 15

12- The battery voltage is between 8.5 and 14.5 V

GO TO point 18

13- The ECU supplies are currently present. For a complete check, perform the check as described at point «A»

14- The ignition light did not switch on. The fuel pump is not activated. When connecting the diagnostic testers, the following message appears: «the ECU does not respond, check all connections».

GO TO point 19

Specific tooling

020460Y Scooter diagnosis and tester

15- Check the charger.

GO TO point **17**

16- The ECU supplies are conform.

17- Check all electrical installation connections for any possible problems that are related to loosening or oxidation.

GO TO point **20**

18- Check the main supply.

GO TO point **20**

19- Check the power supply to panel.

GO TO point **20**

20- Prepare the interface wiring with adapter 3. Install the specific tool as described here:

- Remove the 20A fuses
- Disconnect the connector from the ECU
- Connect the specific tool to the vehicle installation, not connecting the ECU
- Re-connect the 20A fuse

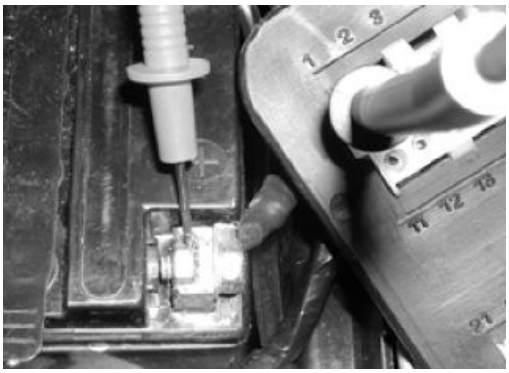
This toll, mounted this way, allows all checks on the installation sections

GO TO point **21**

Specific tooling

020481Y Control unit interface wiring

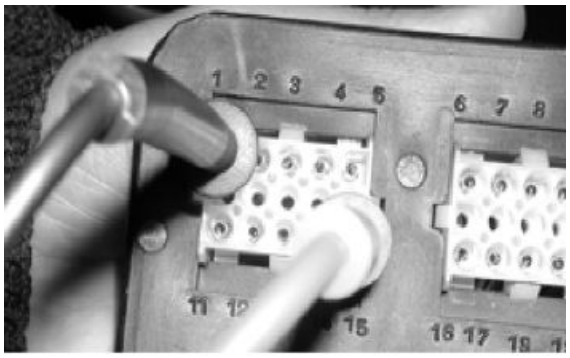
21- Check on the ground connection.
Check the ground connection on pin n°1 by using the multimeter.
1 - battery positive = battery voltage
YES point 22 NO point 23



22- The ground line is efficient.
GO TO point 24
23- Check and restore where necessary the direct ground line to the battery.
GO TO point 21
24- Check the main supply.
Check the presence of battery positive voltage on pin 15.
1 - 15 = battery voltage
YES point 25 NO point 26

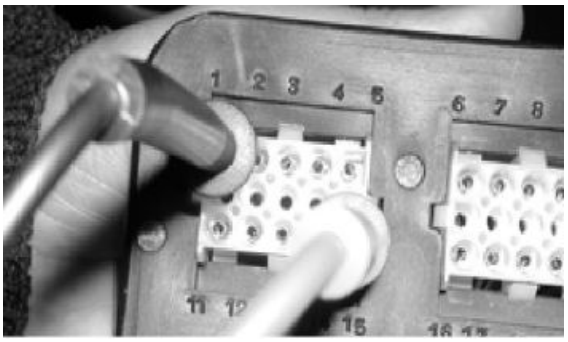
25- The supply is conform.
26- Check the efficiency of the 15A fuse and of the connections to the fuse-holder (red - blue)
YES point **27** NO point **28**
27- Restore the continuity of the line connecting fuse with pin 15 (blue cable)
GO TO point **24**
28- If connections are conform and the fuse is burnt, proceed as follows: Disconnect the following connectors:
- Air injection
- Fuel injection
- H.V. core.
- Voltage adjuster

GO TO point **29**
29- Remove the burnt fuse. Check the mass insulation of the pin 15 supply line
1 - 15 = Ohm infinite
YES point **31** NO point **30**



30- Restore the wiring insulation.

GO TO point **29**



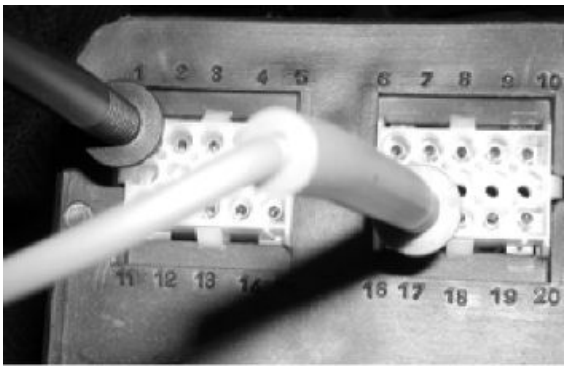
31- Connect the specific tool to the ECU. Mount a new 20A fuse. Check the presence of battery voltage between pin 15 and pin 1 (the fuse does not burn)

1 - 15 = V battery

YES point **33** NO point **32**

32- The fuse is again burnt. Check the wiring more accurately and, if necessary, replace the ECU.

GO TO point 31



33- Make a good visual check of the wiring to avoid possible causes for short circuits. If there are no faults, check any possible short circuits in the lines connecting the following components:

- air injector
- fuel injector
- H.V. coil
- Voltage adjuster

GO TO point 24

34- After confirmation of the correct main supply (point B) check the power supply to panel. Check the following conditions:

1 - 17 = battery voltage (switch on «ON»)

1 - 17 = 0V (switch on «OFF»)

YES point 35 NO point 36

35- The ECU power supply to panel is conform.

36- Check the efficiency of the 20A fuse and of the connections to the fuse-holder red - blue.

YES point **37** NO point **40**

37- Check the efficiency of the key switch.

YES point **39** NO point **38**

38- Replace the key switch.

GO TO point **34**

39- Restore the continuity of the wiring from fuse holder to pin 17

GO TO point **34**

40- If connections are conform and the fuse is burnt, proceed as follows: Disconnect the following connectors:

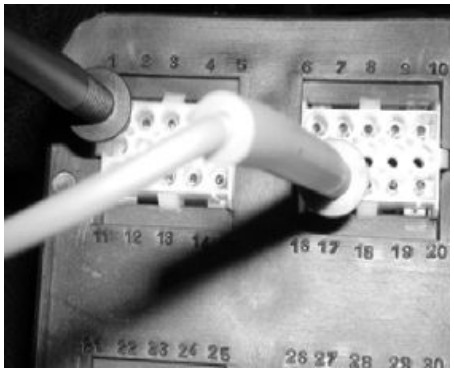
- Disconnect the specific tool 020481Y from the ECU

- Remove the 2 5 A fuses
- Remove the connector of the fuel pump

GO TO point **41**

Specific tooling

020481Y Control unit interface wiring



41- Remove the burnt 20A fuse. Check the mass insulation of the supply line of pin 17 with the switch on «ON»

1 - 17 = Ohm infinite

YES point **43** NO point **42**

42- Restore the mass insulation of the wiring or of the key switch.

GO TO point **34**

43- Re-connect the specific tool with the ECU Mount a new 20A. fuse Check the following conditions:

1 - 17 = battery voltage (switch on «ON»)

1 - 17 = 0 Volt (switch on «OFF»)

YES point **45** NO point **44**

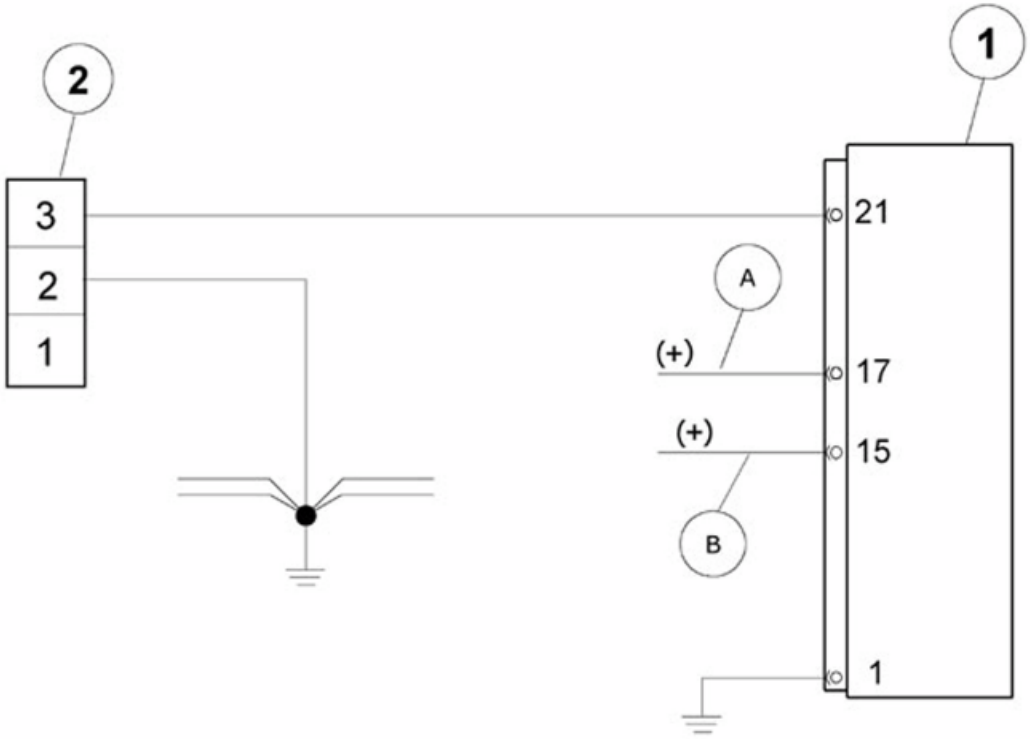
44- IlThe fuse is again burnt. Check the wiring more accurately and, if necessary, replace the ECU

GO TO point **34**

45- Make a good visual check of the wiring to avoid possible causes for short circuits. Reconnect the 5 A fuses. If there are no anomalies, check any possible short circuits or absorbance on the supply circuit of the fuel pump.

GO TO point **34**

diagnosis tester connection circuit



COMPONENTS LAYOUT:

1 ECU

2 Diagnostic outlet

A + Under-panel

B + Fixed

Connect the scooter diagnostic tester.

Enter the main menu and select a function.

If the diagnostic tester returns «ECU not responding, check connections», proceed as follows.

Specific tooling

020460Y Scooter diagnosis and tester

1. Check that the insertion of the connection to the vehicle is correct.

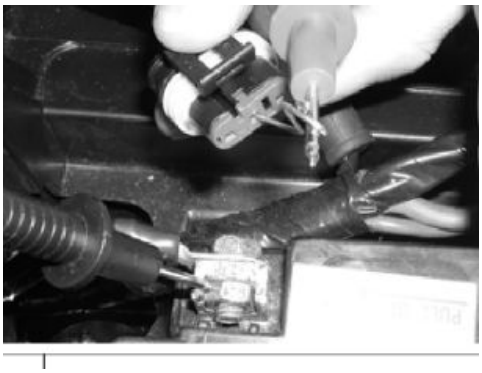
YES point 3 NO point 2

2. Restore the connection.

3. Turn to «OFF», wait a few seconds and turn again to «ON». If the fault persists, make the following checks:

GO TO point 4

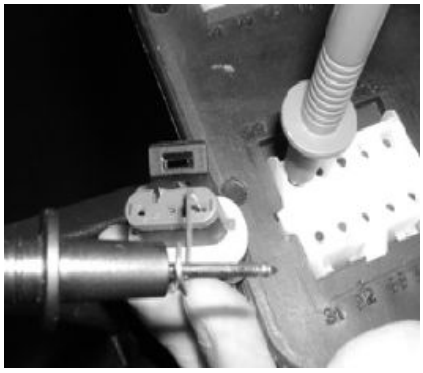
4. Check the ECU supplies.



GO TO point 5

5. Disconnect tester from diagnostic connector.
Check the continuity of the ground line between diagnostic connector and vehicle mass.
Diagnostic connector Pin «2» - Battery negative = continuity
YES point 7 NO point 6

6. Restore the continuity of the ground line.



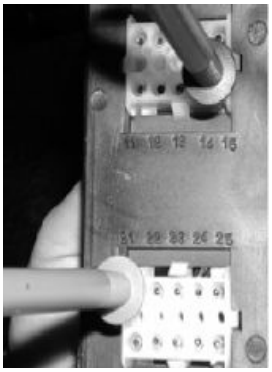
7. Connect the interface wiring.
Do not connect the wiring with the ECU. Check the continuity of the line between the diagnostic connector and ECU.
Pin 3 = diagnostic connector
Pin 21 = continuity
YES point 9 NO point 8

Specific tooling

020481Y Control unit interface wiring

8. Restore the wiring continuity.

9. Check the insulation of the line connecting the diagnostic connector with the ECU.
(Keep the ECU disconnected)
21 - 15 > 1MOhm
21 - 1 > 1MOhm
YES point 11 NO point 10



10. Restore the wiring connection.

11. The diagnostic tester connection meets specs. If the problem persists, check the diagnostic tester and the ECU, if necessary.

Injection lamp circuit

THERMIC: 1 - 4

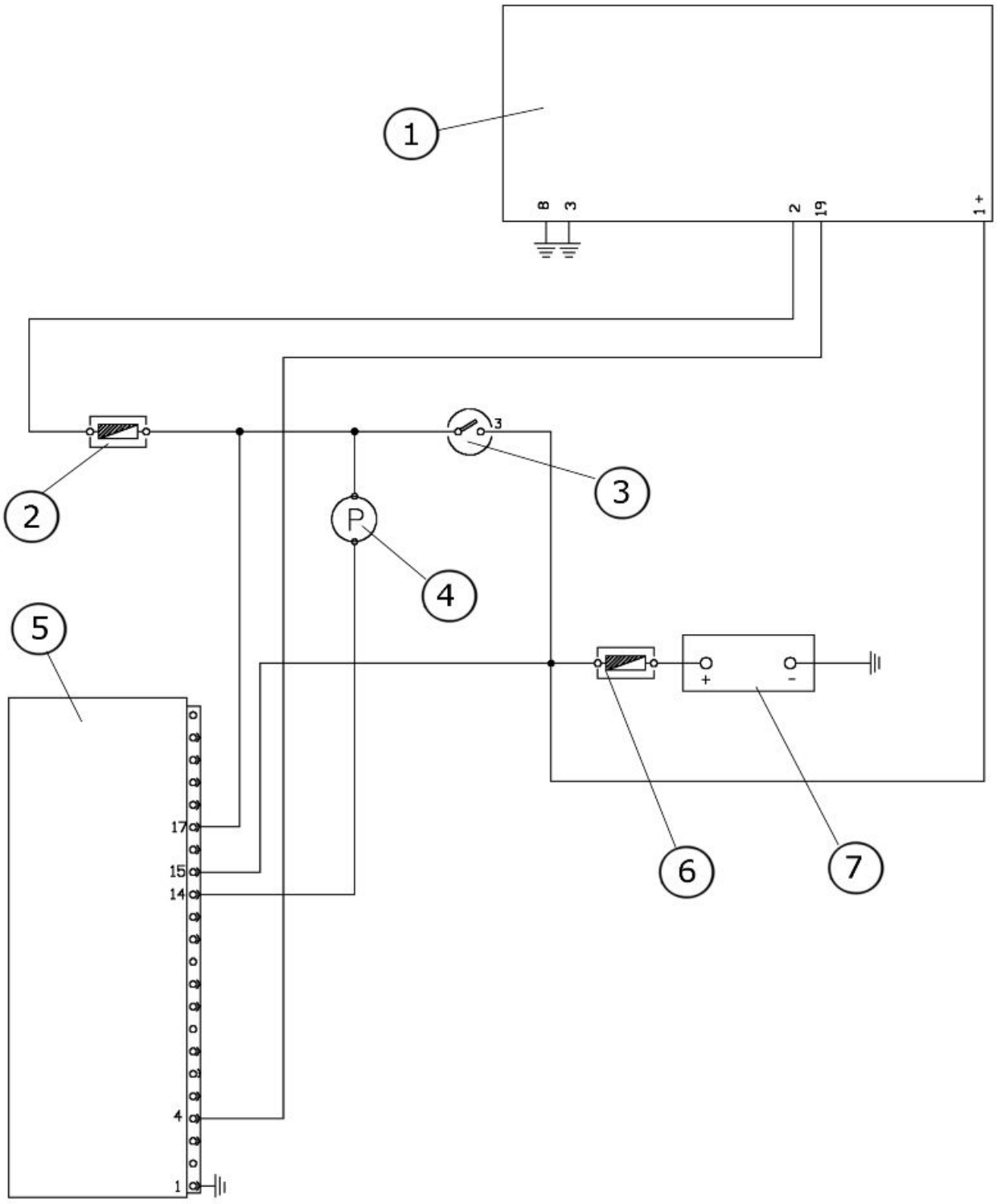
CONDITIONS: Key selector set to «ON», engine off

STANDARD:Less than 0.1 V

THERMIC: 1 - 4

CONDITIONS: Key selector set to "ON", engine on, no fault detected

STANDARD: Battery voltage



INJECTION LAMP CIRCUIT

	Specification	Desc./Quantity
1	Digital instrument unit	
2	Fuse 5A	
3	Key switch contacts	
4	Fuel pump	
5	Injection ECU	

	Specification	Desc./Quantity
6	Fuse	20A
7	Battery	12V - 9Ah

The injection lamp must go on every time «ON» is switched on and remain on until the engine is started.

When the autodiagnosis detects a fault, it turns on the lamp based on the level of priority:

• PRIORITY 1 = FLASHING

• PRIORITY' 2 = ON

See autodiagnosis

Turning on of the lamp is controlled by the ECU by managing the negative. If necessary check the operation of the ECU.

Using the scooter tester select the «enable diagnosis» function.

Activate the «check - lamp» diagnosis with the switch in the «ON» position and engine off. The light which is normally on, which go off for an instant confirming that the ECU is operational.

The operation of the autodiagnosis lamp is also enabled on the injection lamp circuit.

Specific tooling

020460Y Scooter diagnosis and tester

1. Connect the scooter diagnostic tester . Select the errors function. Check the presence of error **P0650 CHECK LAMP**

YES point **3** NO point **2**

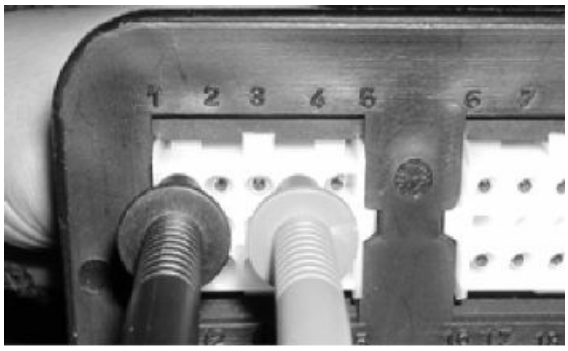
Specific tooling

020460Y Scooter diagnosis and tester

2. Control circuit and lamp are efficient

3. Any faults in current status would be perceived before connecting the diagnostic circuit. To check the circuit, proceed as follows.

GO TO point **4**



4.Connect the interface wiring to the system, omitting the connection to the ECU. Switch to «ON» and check the following condition:

1 - 4 = battery voltage

lamp off

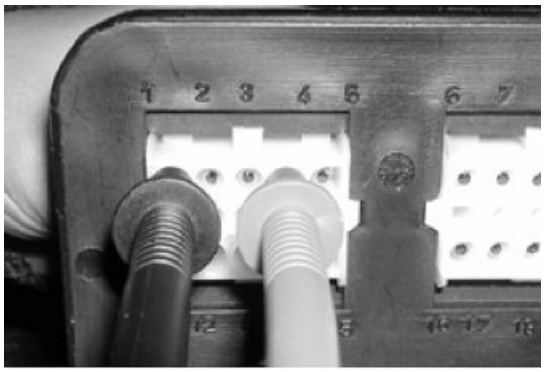
Specific tooling

020481Y Control unit interface wiring

5- Remove the 5A fuse (white lead) and check the presence of voltage.

1 - 4 = 0V

YES point **6** NO point **7**

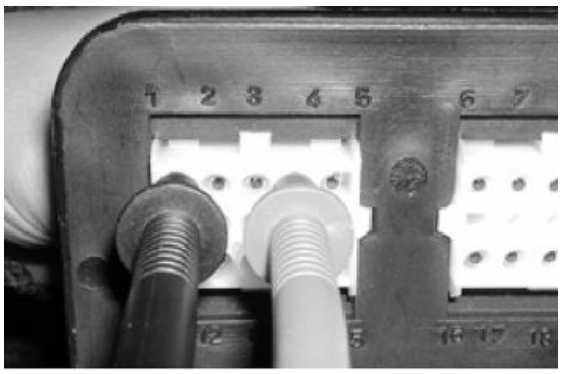


6. The lamp control circuit is efficient.

7. Access the instrument unit and disconnect the 8-pin connector. Check the positive insulation of the connection line to the ECU

1 - 4= 0V

Restore the wiring in case of faults



8.Battery voltage is lacking and the lamp is off. Access the instrument unit and disconnect the 2 electrical connectors. Check the presence of voltage between white lead (+) and black lead (-)

Black(2/4) - White(5/8) = battery voltage with switch to «ON»

YES point **10** NO point **9**

9. Positive power to panel missing. This comes from the switch and the 5A fuse. Power supply is shared by the fuel level indicator and other uses. Restore the wiring continuity.

GO TO point **8**

10. Check the instrument panel injection lamp.

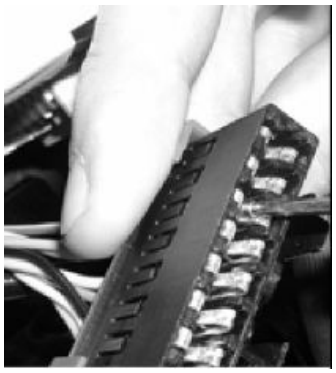
YES point **12** NO point **11**

11. Replace the lamp.

12. Check the continuity of the negative line from the instrument unit to the ECU

GREY(**1/4**) - pin **4** = 0Ohm (continuity)

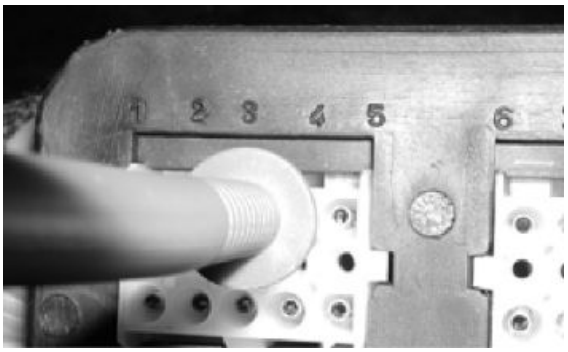
If there is no continuity, restore the wiring.



13. Battery voltage is missing and the lamp is on. Access the instrument unit and disconnect the 8-pin connector. Check the ground insulation of the connection line

1 - 4 > 1MOhm

In case of faults, restore the wiring.



throttle position sensor circuit (T.P.S.)

TERMINALS: 16 (-) - 18 (+)

CONDITIONS: Key switch set to «ON»

STANDARD VALUES: 5V

TERMINALS: 16 - 7

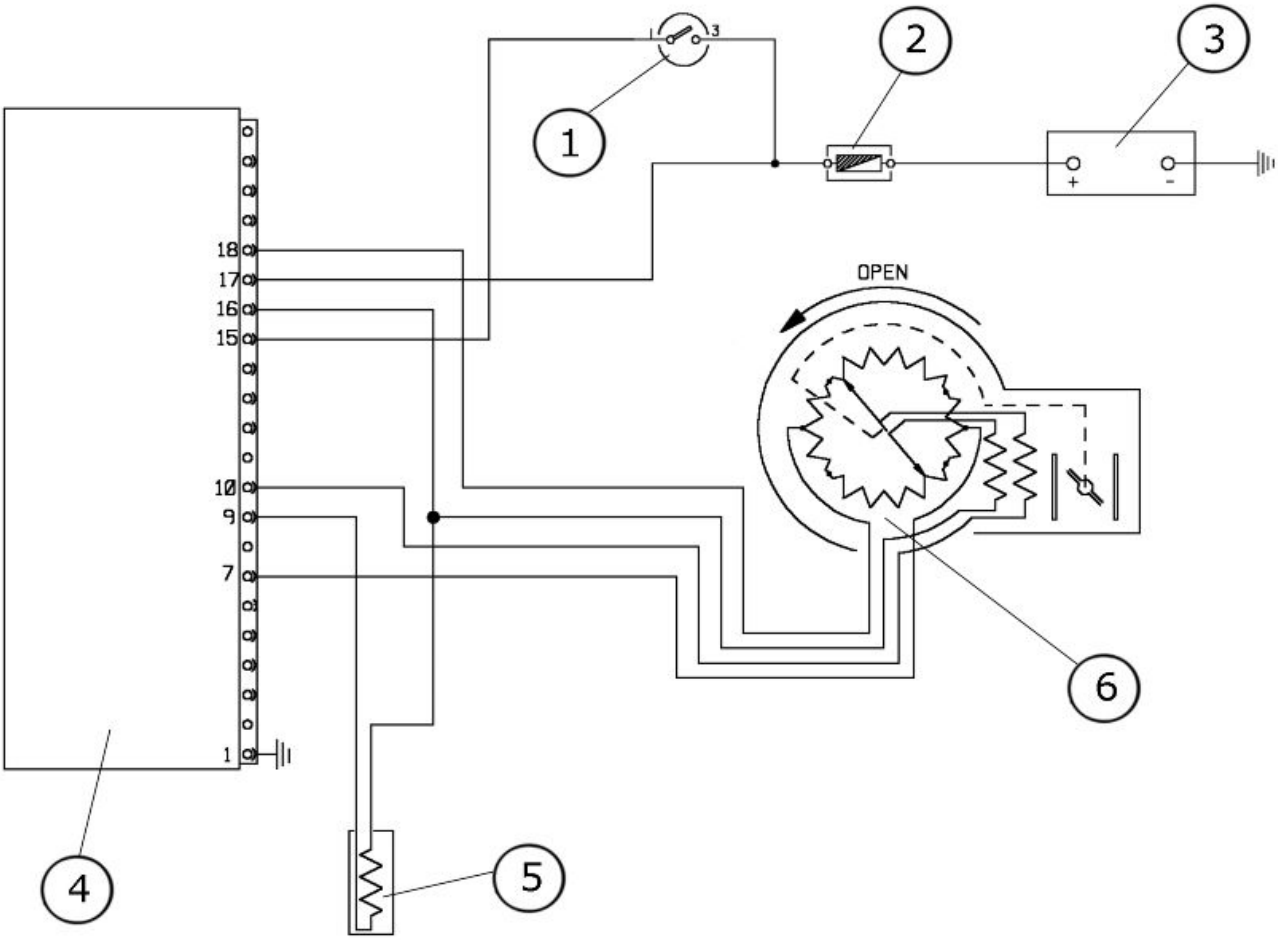
CONDITIONS: Key switch set to «ON», opening the gas gradually

STANDARD VALUES: V= progressive increase

TERMINALS: 16 - 10

CONDITIONS: Key switch set to «ON», opening the gas gradually

STANDARD VALUES: V= progressive decrease



THROTTLE POSITION SENSOR CIRCUIT (T.P.S.)

	Specification	Desc./Quantity
1	Key switch contacts	
2	Fuse	20A
3	Battery	12V - 9Ah
4	Injection ECU	
5	Coolant temperature sensor	
6	Valve position sensor	

The throttle position sensor (TPS) is a built-in part of the throttle body and cannot be removed. The sensor receives 5V power (electronically determined) from the ECU. The 5V power is used for the TPS sensor circuit and coolant temperature circuit. The TPS sensor is a double reading sensor, which means two resistive tracks which generate two opposite signals defined as TPS1 and TPS2. The TPS1 signal increases with increased throttle opening. The TPS2 signal decreases with increased throttle opening. The two signals are equivalent at a single point corresponding to average opening (50%). The two signals are converted to a percentage value of throttle opening. The dual reading system allows for greater control, since the TPS1 and TPS2 signals are compared to each other and a reference map. If missing or out of line TPS signals are detected autodiagnosis is activated and the related fault code is generated. Faults are generated according to three priority levels. The TPS signals in combination with the rpm-timing signal are the basic reference for the operation of the built-in injection - ignition system.

The throttle position sensor and related circuit can be checked by using the scooter tester.

Specific tooling

020460Y Scooter diagnosis and tester

For the check, proceed as follows.

Connect the diagnostic tester to the vehicle. Select the «parameters» function. The following values are reported:

THROTTLE OPEN. %

The displayed value refers to the valve opening percentage. Check that a progressive actuation of the valve corresponds to an equal increase of the opening percentage value. A 0% percentage denotes the minimum position (approx. 20% opening)

TPS1 OUTPUT = V

TPS2 OUTPUT = V

The displayed tensions refers to the TPS1 and TPS2 signals. Progressively open the valve and check the following conditions:

TPS1 - Increases progressively

TPS2 - Decreases progressively

Set the valve opening to 50% and check that at this value the signals TPS1 and TPS2 are equal or very close (a few hundreds volts difference).

N.B.

FOR A MORE PRECISE CHECK, PROGRESSIVELY OPEN THE VALVE DIRECTLY BY THE THROTTLE BODY. USING A FLEXIBLE TRANSMISSION CAUSES AN IRREGULAR OPENING

TPS1 ZERO = V

TPS2 ZERO = V

TPS TO REST = (NO - YES)

The TPS signal reset function is used when signals TPS are efficient.

Select the errors function.

Check the following errors and relevant ISO codes:

ERROR AND ISO CODE	WARNING ORIGIN	ENGINE BEHAVIOUR	INJECTION LIGHT
P1123 TPS	Both TPS signals missing. Acknowledgement occurs when voltages are close to: 0V = short circuit 5V = open circuit In the event of intermittent fault, the system switches to the "occurred" status. To reset the function, switch ON - OFF	Forced idle	Flashing

	- ON to allow switching to the stored status.		
P1125 TPS1	TPS1 signal missing. Acknowledgement occurs when the signal voltage is close to: 0V = short circuit 5V = open circuit	Free	On
P1128 TPS2	TPS2 signal missing. Acknowledgement occurs when the signal voltage is close to: 0V = short circuit 5V = open circuit	Free	On
P1120 TPS OFFSET	The voltage of both TPS signals in not as expected. The fault is recognised by comparing the signals with the power supply polarity	Stays idle	On
P1124 TPS1OFFSET	The voltage of TPS1 signal in not as expected. The fault is recognised by comparing the signals with the TPS1 power supply polarity	Free	Off
P1127 TPS2	The voltage of TPS2 signal in not as expected. The fault is recognised by comparing the signals with the TPS2 power supply polarity	Free	Off
P1560 SENSOR VOLTAGE	The TPS sensor and coolant temperature sensor power supply voltage do not meet specs.		Off
P1561 (*) VOLTAGES SENSOR 2	The TPS sensor and temperature sensor power supply voltage does not meet specs. Too high voltages may be recognised.	Forced idle	On

If one or more errors are detected, or differences are detected between the values shown in the parameters, check the circuit and sensor using the troubleshooting procedure.

1. Install the interface wiring ECU.

Specific tooling

020481Y Control unit interface wiring

Omit the connection to the ECU. Disconnect the connector of sensor TPS and of the coolant temperature sensor.

GO TO point 2

2. Use a multimeter to check the wiring continuity.

N° 1 (TPS) - 16 (ECU) = Ohm Continuity

N° 2 (TPS) - 7 (ECU) = Ohm Continuity

N° 3 (TPS) - 10 (ECU) = Ohm Continuity

N° 4 (TPS) - 18 (ECU) = Ohm Continuity

YES point 4 NO point 3

3. Restore or replace the wiring.

GO TO point 2

4. Check the earth insulation of the wiring with disconnected battery power supply

1 - 16 > 1 MOhm

1 - 7 > 1 MOhm

1 - 10 > 1 MOhm

1 - 18 > 1 MOhm

YES point 6 NO point 5

5. Replace or restore the wiring.

GO TO point 4

6. Check the wiring positive insulation.

N.B.

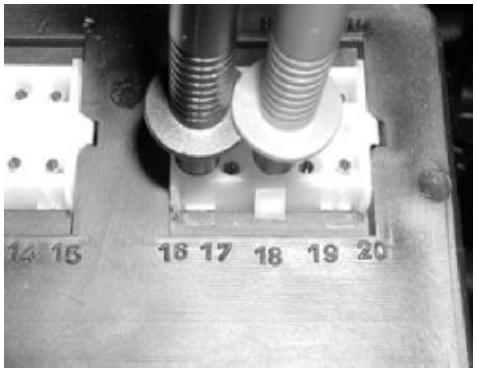
THE CHECK SHOULD BE PERFORMED WITH THE BATTERY CONNECTED, KEY SWITCH SET TO «ON» AND EFFICIENT FUSES.

1 - 16 = 0 Volt

1 - 7 = 0 Volt

1 - 10 = 0 Volt

1 - 18 = 0 Volt



YES point 8 NO point 7

7. Restore or replace the wiring.

GO TO point 6

8. Check the reciprocal insulation of the TPS sensor connection lines.

16 - 7 - 10 - 18

Reciprocal insulation > 1 MW

Check the connector efficiency.

YES point 10 NO point 9

9. Replace or restore the wiring.

GO TO point 8

10. Connect the ECU connector, switch to «ON».

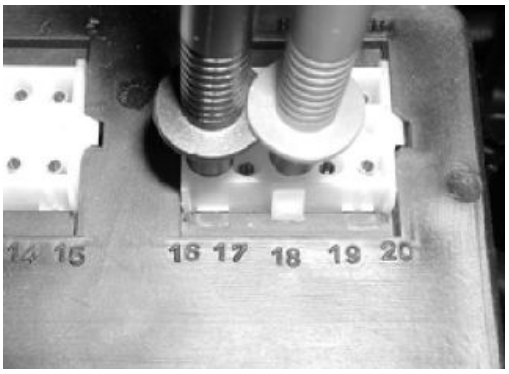
Check the TPS sensor power supply.

16(-) - 18(+) = 5 V

YES point 12 NO point 11

11. Carefully check the ECU power supply. Replace the ECU if required.

GO TO point 10



12. Connect the TPS sensor connector and measure the voltage.

16(-) - 18 (+) = 5 V

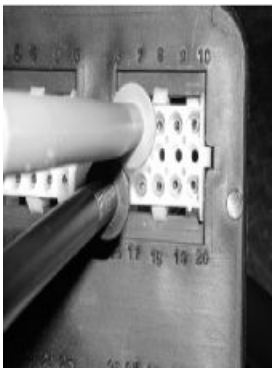
YES point 14 NO point 13

13. Voltage measured: 0 V or much lower than 5V. Check the connector and replace the throttle body, if required.

Replacement

Resetting

GO TO point 12

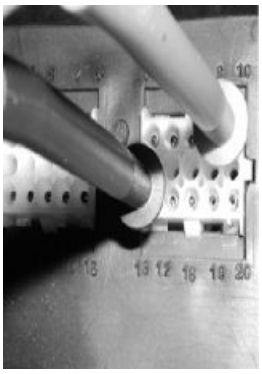


14. Measure the voltage of the TPS1 and TPS2

16 - 7 = V TPS1 (increasing with the opening from 0.5 to 4.5V)

16 - 10 = V TPS1 (decreasing with the opening from 4.5 to 0.5V)

Voltage variations must be progressive with gas opening, without stall or direction reversal. The sum of voltages TPS1 and TPS2 must be constant and with values slightly lower than the TPS sensor power supply voltage.



YES point 16 NO point 15

15. Check the TPS and ECU connectors and replace the throttle body, if required.

Replacement

Resetting

GO TO point 14

16. Check that the voltage values of signals TPS1 and TPS2 measured match those shown by the diagnostic tester in the «parameters» function.

YES point 18 NO point 17

Specific tooling

020481Y Control unit interface wiring

020460Y Scooter diagnosis and tester

17. When slightly different voltage values are found, check the ECU connector more thoroughly and replace the ECU if required.
18. TPS sensor and circuit meet specs.

See also
menù diagnosis tester

T.P.S. signal reset

The throttle body is supplied with gas valve and is precalibrated. Precalibration entails regulating the minimum opening of the gas valve to obtain a certain flow of air under preset reference conditions. Pre-calibration results in an optimum air capacity for the engine management during start up or during idle running, and at any possible temperature during the use of the vehicle. This is allowed by the electronic management of the engine and by its capacity to work with very lean air - fuel mixtures. In fact, pre-calibration results in an air capacity which, with idle and hot engine, is much higher than the actual requirements.
To achieve higher engine performance, increased rpm are not due to the gas valve opening increase, but are enabled by the ECU.
When the ECU perceives a slight increase in the gas valve opening, it enables the engine to fast rotation and excludes the idle and the CUT OFF management.
This result can be obtained by recovering the pre-calibration and keying tolerances of the TPS sensor on the throttle body.
This occurs by resetting the signals TPS1 and TPS2, i.e., by reporting the voltage values TPS1 and TPS2 corresponding to the pre-calibration position to the ECU.
These voltage values will be recognised as suitable by the ECU only if falling within the design default ranges.
The throttle body pre-calibration register is sealed with paint and must not be tampered with.
The signals TPS1 and TPS2 may be reset as follows:
- Automatic reset
- Manual reset

Specific tooling

020460Y Scooter diagnosis and tester

automatic T.P.S. reset

AUTOMATIC RESET

Automatic reset already occurs at the end of the assembly line when the battery power is connected and switched to «ON». In order to prevent resetting the signals TPS1 and TPS2 not corresponding to the actual pre-calibration position of the throttle body, the ECU should only be powered after checking that the valve command sector is correctly abutted against the register. A slight tensioning of the flexible transmission commanding the throttle body may impair the reset precision and the injection control.

A greater tensioning causes signals TPS1 and TPS2 whose voltage is not as expected by the ECU, which cancels the reset procedure.

To check that TPS signals are properly reset, use the following procedure:

1- Connect the scooter diagnostic tester

Select the «parameters» function and visualise the indicator showing the «TPS to reset»

GO TO point 2

GO TO point 4

2. The diagnostic tester responds YES. Continue to make the following checks:

- The throttle body is not tampered with
- The control transmission is correctly registered
- The connector of the throttle body is correctly connected
- The electric circuit control meets specs.

GO TO point 3

3. Carry out the manual reset procedure.

4. The diagnostic tester responds NO. The reset procedure was successful.

GO TO point 5

5. For a further confirmation, check the following indications of the "parameters" function.

TPS1 OUTPUT V 0.64

TPS2 OUTPUT V 4.27

TPS1 ZERO V 0.64

TPS2 ZERO V 0.72

The voltage reported here corresponds to a possible condition.

GO TO point 6

6. Check the following conditions:

TPS1 OUTPUT = TPS1 ZERO

TPS2 OUTPUT + TPS2 ZERO = 5V

YES point 7 NO point 8

7. The TPS reset meets specs.

8. Repeat the reset procedure using the manual mode.

Specific tooling

020460Y Scooter diagnosis and tester

Manual T.P.S. reset

MANUAL RESET

This procedure is required when the ECU or the throttle body is replaced. Before resetting, check the following conditions:

- The throttle body has not been tampered in pre-calibration
- The throttle body connector is properly inserted

- The control transmission is properly installed and adjusted

Proceed to manually reset the signals TPS1 and TPS2 as follows:

1- Connect the scooter diagnostic tester

Select «**RESET TPS**» from the menu. By using this procedure, the following indications are visualised.

GO TO point 2

2. Check for possible errors

Wait

GO TO point 3

GO TO point 4

3. Errors present

Cancel all errors

Press a key

GO TO point 5

4. No errors

Press a key

GO TO point 6

5. Check the auto-diagnostic content and make the necessary repairs

GO TO point 1

6. TPS reset in process

Wait

GO TO point 7

7. Key «OFF»

Press a key

GO TO point 8

8. Check the abut of the throttle body

Push OK to proceed

GO TO point 9

9. Wait

GO TO point 10

10. Key on «ON»

Press a key

GO TO point 11

11. Wait

GO TO point 12

12. Check for possible errors

Wait

GO TO point 13

13. No errors

Press a key

GO TO point 14

14. Wait

GO TO point 15

15. TPS resetting successful

Press a key

GO TO point 16

16. The manual procedure is completed. For a further confirmation, check that the indications reported in the parameters function comply with the instructions given for automatic reset.

rpm-timing sensor circuit

TERMINALS: 19 - 20

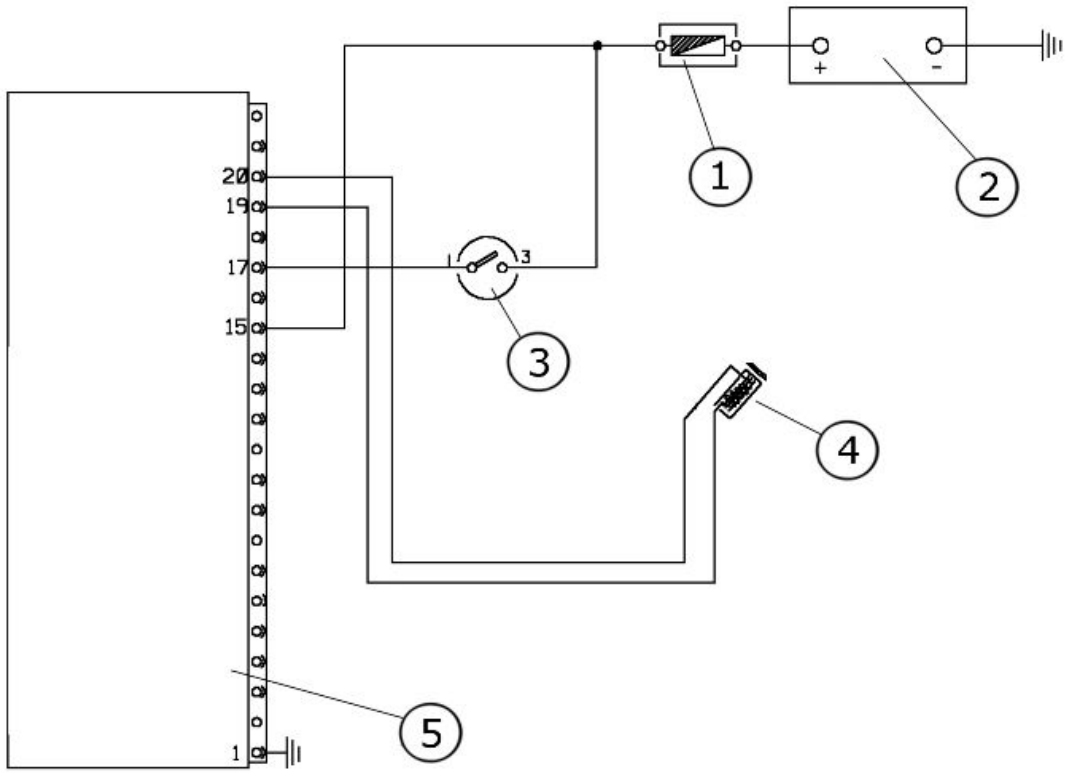
CONDITIONS: Engine driven by the starter (500-600 RPM)

STANDARD VALUES: V = 3.5 - 4

TERMINALS: 19 - 20

CONDITIONS: Idle engine

STANDARD VALUES: V = 11 - 12



RPM-TIMING SENSOR

	Specification	Desc./Quantity
1	Fuse	20A
2	Battery	12V - 9Ah
3	Key switch contacts	
4	Pick - up	
5	Injection ECU	

This built-in injection and ignition system, requires a prompt perception of the rotation speed and angular position of the crankshaft. With each engine cycle the ECU, must manage the following, in order:

• Petrol injector

• Air injector

• H.T. coil

Each actuator is managed with a specific timing. This is made possible by the rpm timing sensor from a phonic wheel on the external diameter of the magneto rotor. The magneto is subdivided into 24 sectors and has 23 control teeth of the air gap variations at the nucleus of the pick-up. This is a reluctance variation type, it has its own magnetism and produces alternating voltage. When the magneto rotates, each of the teeth changes the magnetic activity of the nucleus, generating a complete alternation. These continue every 15° making a precise measurement of the rotation speed possible, even at a periodic level. The perception of the angular position occurs via alternations separated by 30° of rotation due to the missing teeth. The electrical lines connected with the ECU are polarised to guarantee correct timing. The positive peak of the alternated signal is separated from the negative by around 2° of rotation.

The ECU autodiagnosis checks the rpm - timing signal, even if this activity is limited to recognition of signal irregularities within an engine cycle. These cases occur with missing combined with a signal to the driver via the injection lamp going on. This is different than a clean interruption of the signal, which leads to the engine going off without any recognition of the fault by the autodiagnosis. When the rpm - timing signal is missing, management of the following actuators also fails:

• Petrol injector

• Air injector

• H.T. coil

• Petrol pump

1- Connect the scooter diagnostic tester. Select the «errors» function on the menu. Check the presence of the error:

P0335 PICK UP RPM

YES point 2

GO TO point 3

Specific tooling

020460Y Scooter diagnosis and tester

2. The ECU has detected instability of the phase rpm signal. Proceed as follows, regardless of the storage status (current - occurred - stored).

GO TO point 4

3. The ECU has detected no fault relating to the phase - rpm signal. The signal may be totally missing. To check, proceed as follows.

GO TO point 4

4. Connect the interface wiring. Omit the connection to the ECU. Disconnect the connector from the flywheel magneto.

GO TO point 5

Specific tooling

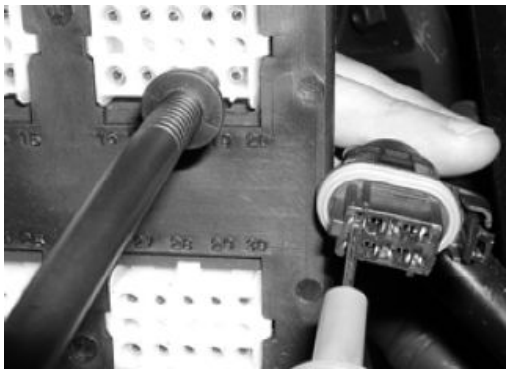
020481Y Control unit interface wiring

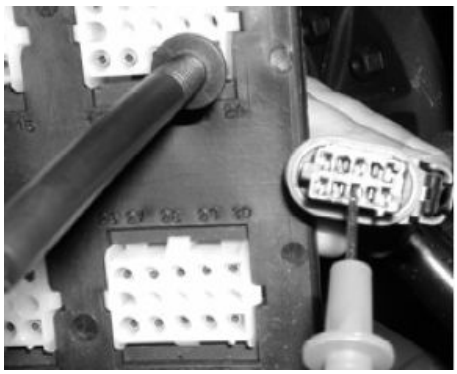
5. Check the continuity of the connection lines of the sensor from the ECU to the flywheel connector

19 - red lead= Ohm continuity

20 - brown lead= Ohm continuity

YES point 7 NO point 6





6. If continuity is not detected, restore or replace the wiring.

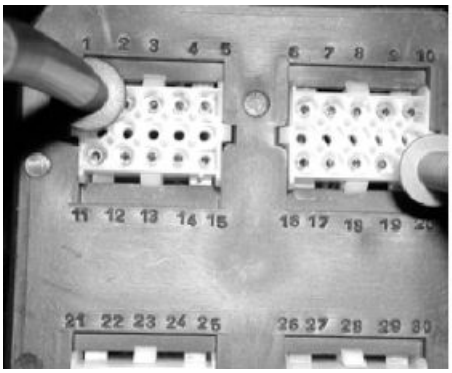
GO TO point 5

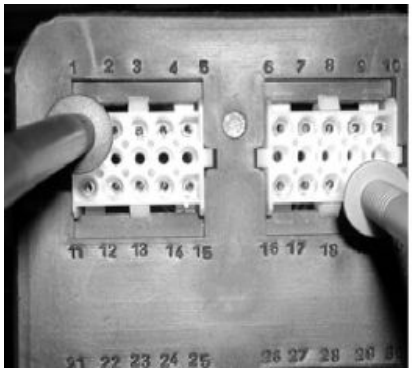
7. Check the ground insulation of the lines

1 - 19 > 1MOhm

1 -20 > 1MOhm

YES point 9 NO point 8





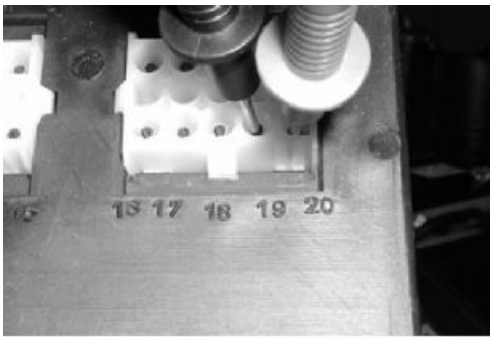
8. Restore the insulation or replace the wiring.

GO TO point 7

9. Check the reciprocal insulation of the lines

19 - 20 > 1MOhm

YES point 11 NO point 10



10. Restore the insulation or replace the wiring.

GO TO point 9

11. Check the line positive insulation.

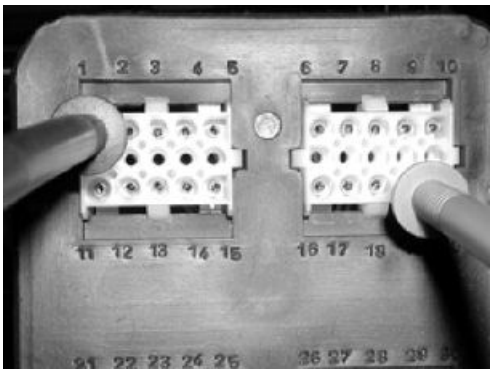
1 - 19 = 0V

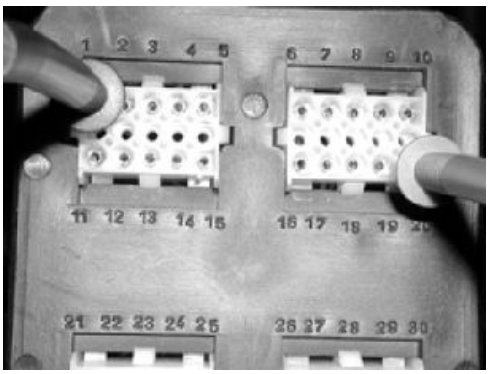
1 - 20 = 0V

YES point 13 NO point 12

N.B.

THE CHECK SHOULD BE PERFORMED WITH THE BATTERY CONNECTED, KEY SWITCH SET TO «ON» AND EFFICIENT FUSES.





12. Restore the insulation or replace the wiring.

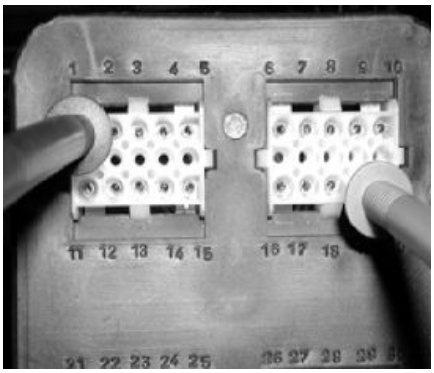
GO TO point 11

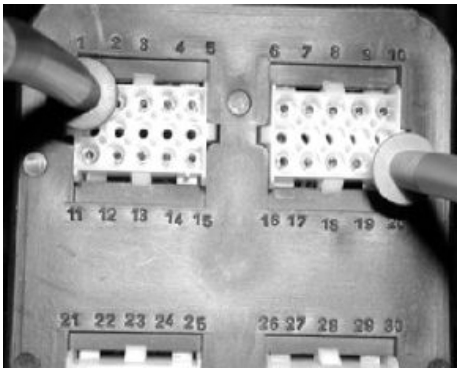
13. Connect the flywheel connector and repeat the insulation checks from earth and from positive.

1 - 19 > 1MOhm

1 - 20 > 1 MOhm

YES point 15 NO point 14





14. Restore or replace the stator with phase - rpm sensor.

GO TO point 17

15. Check the phase - rpm sensor resistance

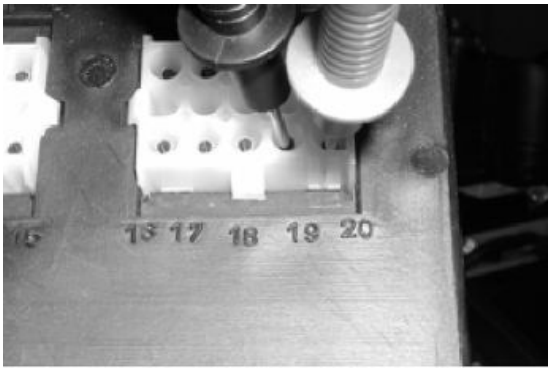
19 - 20 = Ohm…… at 20°

(detected 106.7W)

YES point 17 NO point 16

N.B.

IF THE CHECK IS DONE WHEN THE ENGINE IS HOT, RESISTIVE VALUES WILL BE HIGHER



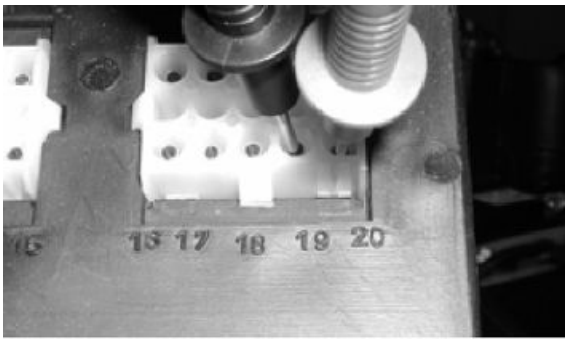
16. When out of tolerance resistive values are detected, replace the stator with phase - rpm sensor.

17. Measure the alternated voltage produced by the phase - rpm sensor with engine driven by the starter.

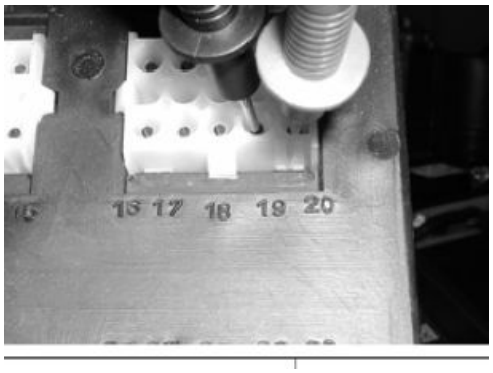
19 - 20 = 3.5 ¸ 4 V ~

(at 500 - 600 RPM)

YES point 19 NO point 18



18. Check the magnetic activity and gap of the phase - rpm sensor. Replace the stator if required.
GO TO point 17



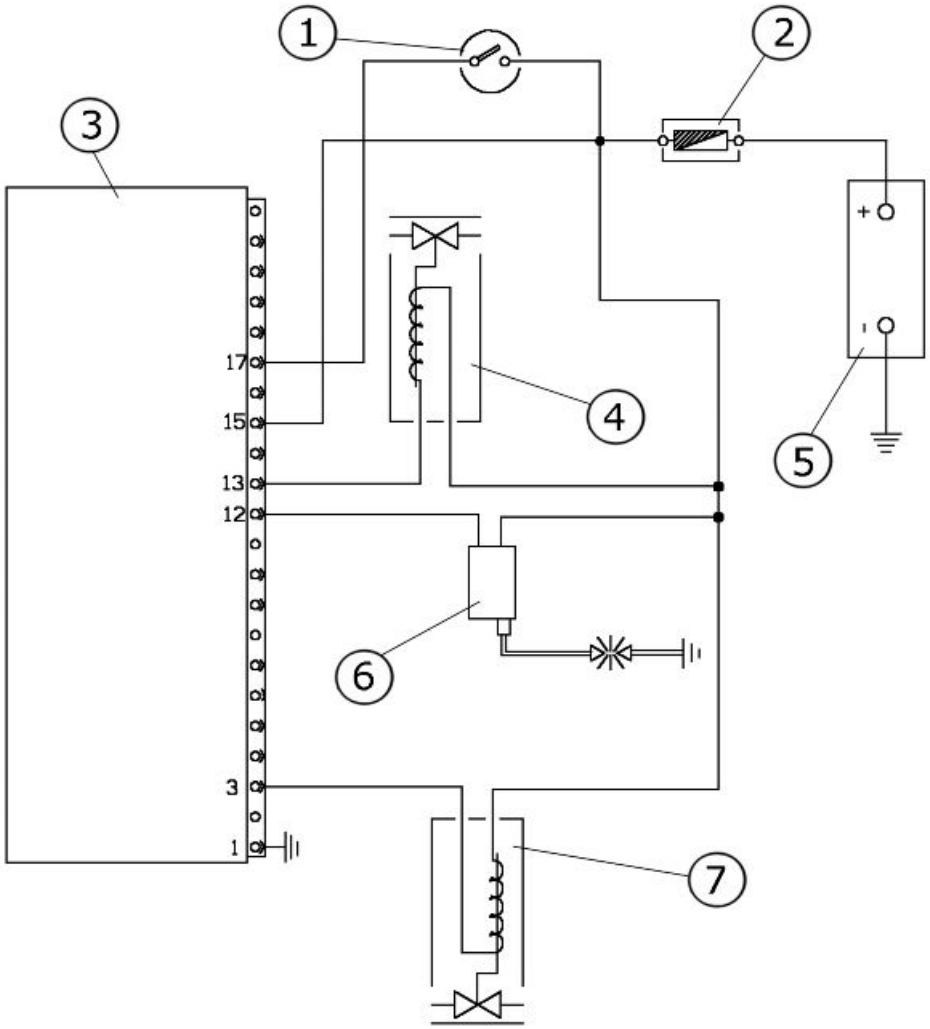
19. Connect the interface wiring to the ECU. Check the alternated voltage upon start up and at idle.
19 - 20 = 3.5 - 4 V~
(start up)
19 - 20 = 11 - 12 V~ (idle)
YES point 21 NO point 20

20. If voltages are very different, replace the ECU
GO TO point 19

21. The phase - rpm sensor and relevant circuit are efficient.

H.T. coil circuit

TERMINALS: 1 - 12
CONDITIONS: Engine stopped, switch in any position
STANDARD VALUES: Battery voltage



PETROL INJECTION CIRCUIT

	Specification	Desc./Quantity
1	Key switch contacts	
2	Fuse	20A
3	Injection ECU	
4	Air injector	
5	Battery	12V - 9Ah
6	HV coil	
7	Fuel injector	

The ignition system with built-in injection is an induction type. Ignition is managed based on two parameters:

• Ignition lead

• Dwell time

The ignition lead curve is optimised based on the rpm and engine load perceived by the TPS1 and TPS2 sensors. The dwell time is optimised based on the power required by the H.T. coil. The dwell time is optimised based on the power required by the H.T. coil.

Naturally longer dwell times are used during starting phases.

The ECU autodiagnosis also checks the coil power circuit and detects interruptions and shorts. Checking is normally only done in the presence of the rpm - timing signal (engine running). Any faults are signalled to the driver via the injection lamp. In addition to protect the vehicle, the injector power is interrupted, its operation is not automatically reset, thus preventing use with backfiring. To reset operation, it is necessary to switch «ON» to «OFF» and then «ON». The fault is recorded without the possibility of moving to «PAST EVENTS».

CIRCUIT DIAGNOSIS

1- Connect the scooter diagnostic tester. Select the active diagnostic function.

GO TO point 2

Specific tooling

020460Y Scooter diagnosis and tester

2. Start the diagnostic of H.V. coil. Check if 5 ignitions are controlled. These can be detected by the noise produced by the magnetic activity and from the spark on the plug. If this check is not possible, use an external spark plug and check the 5 sparks directly.

YES point 3 NO point 4 NO point 5

3. There are 5 sparks. The ignition system is working. For greater certainty, continue with the auto-diagnostic check in order to highlight stored errors.

4. No sparks present, even if the result is: "test successful". Continue with circuit checks. If there are no faults, replace the ECU

GO TO point 2

5. No sparks present. The result is: «test failed» Repeat the diagnostic and, if necessary, replace the ECU.

GO TO point 2

CHECKING THE auto-diagnostic MESSAGE

1- Connect the scooter diagnostic tester. Select the «errors» function on the menu. Check if there are any errors on the H.V. coil.

P0350 H.V. COIL

YES point 3 YES point 4 NO point 2

Specific tooling

020460Y Scooter diagnosis and tester

2. No errors. To be more sure, check:

- Spark plug
· H.V. coil secondary
- Shielded cap
- Ignition timing

3. Error on the H.V. coil in current status. Continue with circuit checks.

4. Error on the H. V. coil in «occurred» or stored status. Continue with circuit checks. Possible problems:

- Uncertain contacts
- Lacking insulation

CHECKING THE ELECTRIC CIRCUIT

1. Connect the interface wiring. Do not connect the ECU. Disconnect the connector of the H.V. coil primary.

GO TO point 2

Specific tooling

020481Y Control unit interface wiring

2. Check that there is a positive battery voltage to the connector supplying the primary with the switch in any position.

1 - blue cable (positive) = battery voltage

YES point 4 NO point 3

N.B.

TO MAKE THIS CHECK, USE A SMALL SOCKET. PAY ATTENTION NOT TO DAMAGE THE CONNECTOR

3. Check the efficiency of the 20A fuse. If necessary, restore the wiring. See ECU supply.

GO TO point **2**

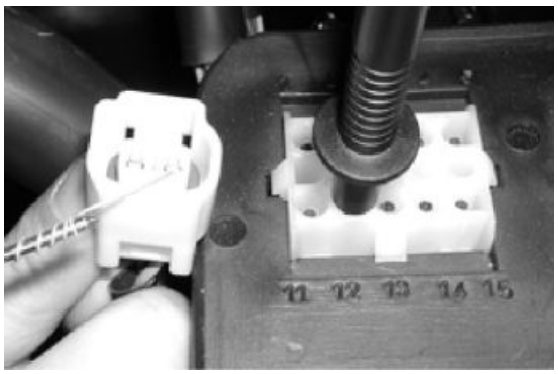
4. Check the continuity of the control line of the coil.

12 - violet - black= continuity

YES point **6** NO point **5**

N.B.

TO MAKE THIS CHECK, USE A SMALL SOCKET. PAY ATTENTION NOT TO DAMAGE THE CONNECTOR



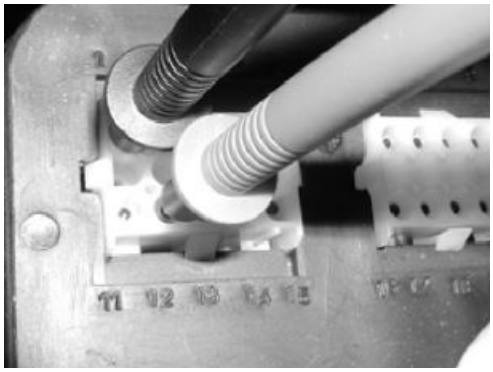
5. Restore the wiring.

GO TO point 4

6. Check the insulation - from positive - of the control line of the coil.

1 - 12 = 0V

YES point 8 NO point 7



7. Restore the wiring

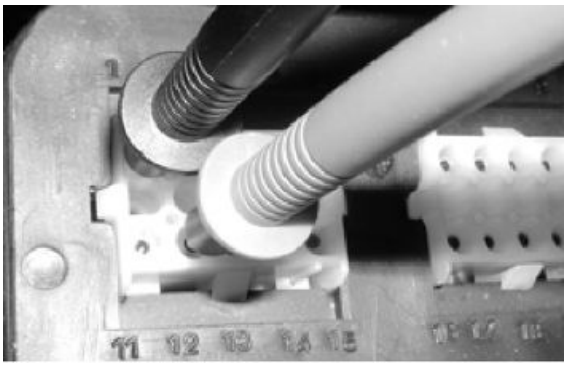
GO TO point 6

8. Check the insulation - from negative - of the control line of the coil.

1 - 12 > 1MOhm

NO point 9

GO TO point 10



9. Restore the wiring.

GO TO point 8

10. Check the resistance of the primary wiring of the H.V. coil.

Standard value: 0.63 ± 0.03 Ohm at 23°C

YES point 12 NO point 11

11. If notably different resistances are detected, replace the H.V. coil.

GO TO point 10

12. Check the ground insulation of the primary wiring. To make this check, measure the resistance between one of the primary poles and the bar supporting the coil to the frame.

Standard value> 1MOhm

YES point 14 NO point 13

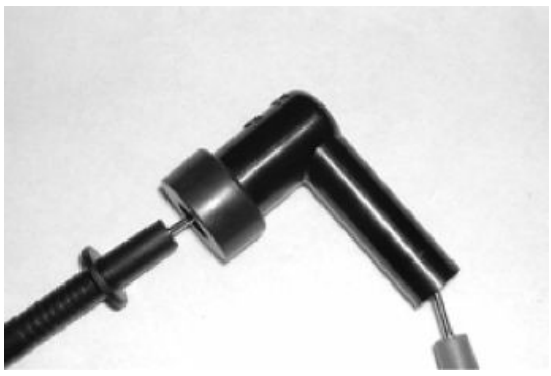
13. If lower values are detected, replace the H.V. coil.

GO TO point 12

14. Check the resistance of the screened cap as shown in the figure

Standard value= 5 KOhm ±

YES point 16 NO point 15



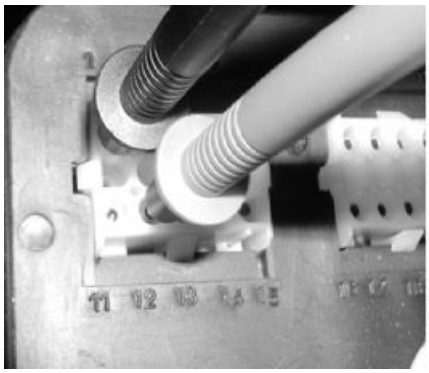
15. Replace the screened cap.

GO TO point 14

16. Reconnect the following components:

- Shielded cap
- H.V. coil supply connector
- ECU interface wiring:

GO TO point 17



17. With the engine idle, measure the induced voltage produced by the H.V. coil primary. In this case, use the digital multimeter and the peak voltages adaptor.

1 - 12 = 300V (peak)

Minimum allowable voltage ³ 200V (peak)

Standard voltage at start-up= about 350V (peak)

YES point 18 NO point 19

N.B.

USE THE ADAPTER WITH THE POSITIVE PROD ON PIN 12. IF THE ENGINE DOES NOT START, CHECK THE INDUCED VOLTAGE AT THE START-UP

Specific tooling

020331Y Digital multimeter

020409Y Multimeter adaptor - Peak voltage detection

18. The system is efficient, check timing.

19. If the detected voltage is much lower than the minimum allowable, check the core dwelling time reported in the «parameters» function of the diagnostic tester

T. OF DWELL =

6 ms (start-up)

2 ÷ 3 ms (idle)

YES point 20 NO point 21

20. Replace the H.V. coil

21. Replace the ECU

ignition timing check

The ignition advance is electronically determined on the basis of the ECU parameters. For this reason, it is not possible to state reference values based on the engine rpm.
The ignition advance value can be detected by the parameters function of the diagnostic tester. The degrees displayed in the parameters function may be checked for matching with the actual ignition command degrees.

The following is required for this check:
• Diagnostic tester
• Stroboscopic lamp
• Adapter for the H.V. cable signal
Remove the flywheel cover. Adjust the adapter for detecting the H.V. cable signal to a position between the 4th and the 5th reference and install it between the spark plug and the original cap. Connect the induction clips of the stroboscopic lamp to the screened cable of the adapter according to their polarity. Select the lamp control to the conventional engine 2T position (1 spark = 1 rev). With engine idle, set a degree phasing on the lamp equal to the indication of the advance shown in the tester parameters.

Check that the fifth to last tooth in the direction of rotation is aligned with the rpm - phase sensor core, as shown in the figure. The position denotes the top dead centre.

Checking a clear lack of correspondence of the advance values, continue with checks on the phase - rpm sensor and the ECU.

N.B.

THE STROBOSCOPIC LAMP CANNOT DISPLAY A FLYWHEEL KEYING ERROR. TO THIS PURPOSE, IF YOU HAVE ANY DOUBTS, CHECK THAT THE FLYWHEEL POSITION INDICATED IN THE FIGURE ACTUALLY MATCHES THE TOP DEAD CENTRE.

Specific tooling

020460Y Scooter diagnosis and tester

020330Y Stroboscopic light for timing control

020621Y HV cable extraction adaptor

compressed air system

Direct injection in the cylinder takes place by pressure of the compressed air. The injection pressure is vital to ensuring the correct fuel preparation and pulverisation of the mix.

The system consists of the following components:

- Volumetric compressor
- Injectors support
- Connecting union
- Fuel pressure regulator control chamber
- Air injector

The mechanical installation of these components is described in the chapter relating to engine. This section of the manual deals with the pneumatic inspections on the system.

To perform pneumatic inspections on the compressed air system, proceed as follows.

1- Remove the air supply duct of the injectors and install the air pressure control kit

GO TO point 2

N.B.

BE VERY CAREFUL WHEN CLEANING THE PARTS AND MAKING THE PROPER CONNECTION OF UNIONS. ANY IMPURITY MAY DAMAGE THE AIR INJECTOR. AVOID REMOVING THE RUBBER HOSE FROM THE BRASS HOSE HOLDERS. IF REQUIRED, REPLACE THE HOSE.

Specific tooling

020617Y Air pressure check kit

2- Remove the following electrical connectors:

- Air injector
- Fuel injector
- H.V. coil

Remove the ignition spark plug.

GO TO point 3

3- Connect the scooter diagnostic tester. Select the parameters function. Start the starter for 15 seconds and check the following:

Engine rpm > or = 500 RPM

Air pressure at the end of test > or = 4 BAR

YES point 5 NO point 4 NO point 6

4- The engine rpm and pressures are lower than specifications. Check the battery and starter system.

GO TO point 3

5- Engine rpm and pressure are as expected. Check that the pressure remains stable over time.

YES point 16 NO point 8

6- Engine rpm are as expected and pressure is lower than specifications. Check that the pressure remains stable over time.

YES point 7 NO point 8

7- Replace the volumetric compressor.

GO TO point 3

8- Pressure decreases very quickly. Check if there are any fuel leaks from the injector mounting .

YES point 9 YES point 10 NO point 11

9- There are leaks at the coupling to the head. Replace the O-Ring between air injector and support.

GO TO point 3

10-There are leaks at the pressure regulator cover. Replace the full injector mounting .

GO TO point 3

11- Use water with soap or foam to check the seal of the volumetric compressor connection hose to the injector mounting

YES point 13 NO point 12

12- Restore the seals or replace the hose.

GO TO point 3

13- Bring the system to pressure again and as soon as the starter stops rotating, close the compressor connection pipe at the shunting with the manometer by a flat and long pincer. Check the pressure progress.

GO TO point 14

GO TO point 15

14- Pressure decreases with the same trend. Check the seals on the injector mounting , replace the air injector if required.

GO TO point 3

15- Pressure remains unchanged. The compressor unidirectional valve is not efficient. Replace the volumetric compressor

GO TO point 3

16- Refit the ignition spark plug and connect the cap. Connect the following connectors:

- H.V. coil
- Fuel injector
- Air injector

Use the diagnostic tester to remove the faults registered during pressure check.

GO TO point 17

Specific tooling

020460Y Scooter diagnosis and tester

17- Start the engine and check the air pressure with engine idle and free from loads at medium rpm.

Standard air pressure = 5 ÷ 5.5 bar (500 ÷ 550 Kpa)

N.B.

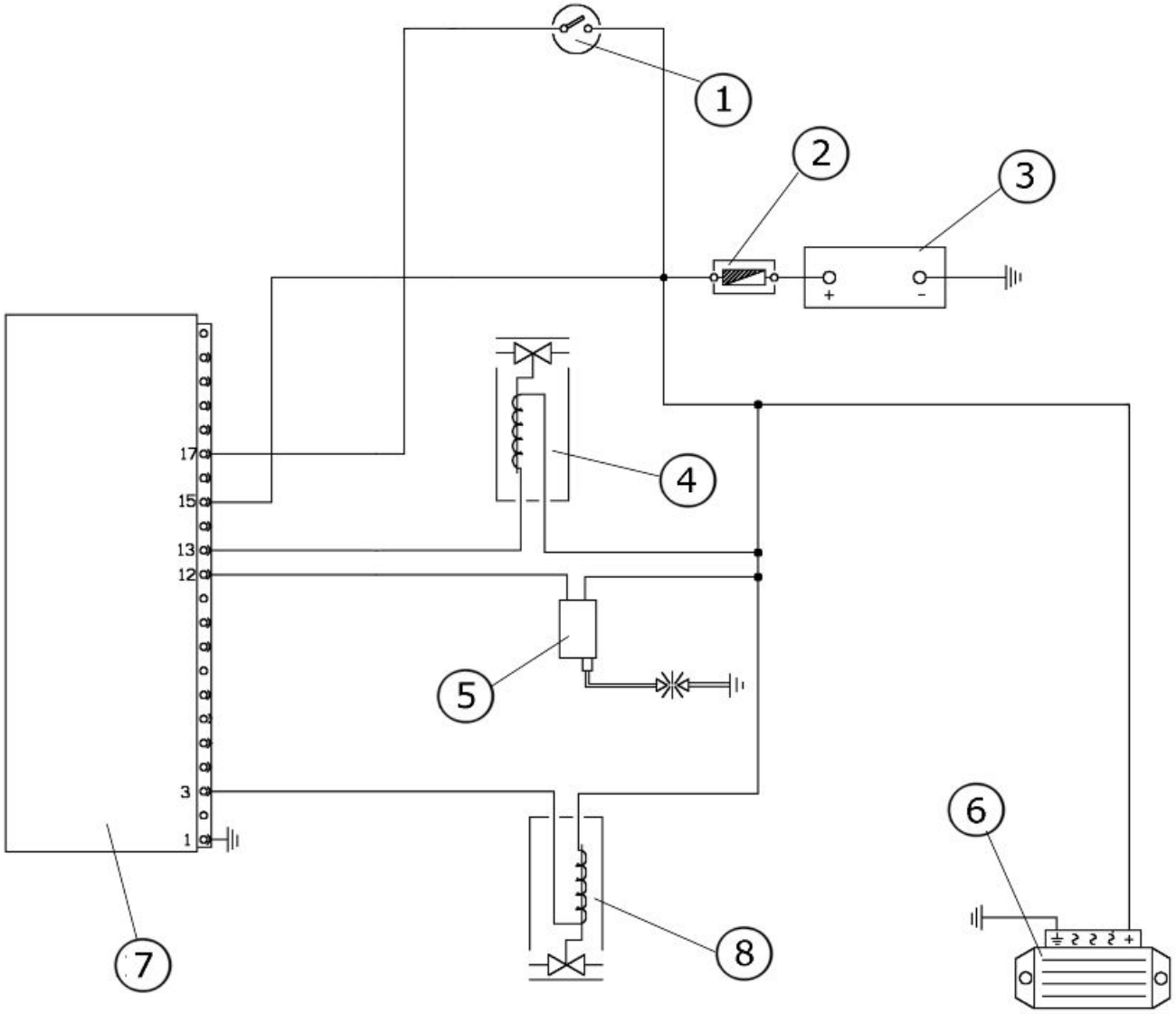
AIR PRESSURE DURING THE ENGINE OPERATION IS FAIRLY CONSTANT SINCE THE INCREASE OF CAPACITY OF THE PUMP IN RELATION TO THE INCREASE OF RPM IS PARTLY COMPENSATED BY THE LONGER OPENING TIME OF THE AIR INJECTOR. TO CONFIRM THIS, CHECK THAT THE PRESSURE INCREASES UP TO ABOUT 8 BAR (800 KPA) AFTER SWITCHING TO THE "OFF" POSITION WHEN THE ENGINE RUNS AT HIGH RPMS.

air injector circuit

TERMINALS: 1 - 13

CONDITIONS: Engine stopped, switch in any position

STANDARD VALUES: Battery voltage



AIR INJECTOR

	Specification	Desc./Quantity
1	Key switch contacts	
2	Fuse	20A
3	Battery	12V - 9Ah
4	Air injector	
5	HV coil	
6	Voltage regulator	
7	Injection ECU	
8	Fuel injector	

The air injector is the main component of the electrical-pneumatic injection. To make things easier, the injector is called an air injector, even if a mixture of air and petrol is actually injected. Direct injection of petrol transported by the compressed air makes it possible to obtain a fine mist of the mixture within the cylinder. The ECU runs the air injector by checking the time and opening time. This makes it possible to achieve better results in terms of pollution and consumption. The ECU autodiagnosis also checks

the air injector circuit. A fault is detected if the circuit is interrupted or if there is a short towards the earth or positive. Any faults are signalled to the driver via the injection lamp. If a fault is present the engine will not run. The fault is only recognised when the rpm - timing sensor is present. For this reason when there is a fault memorisation changes from the "current event" state to "past event" state when the engine stops. To check the air injector electrical circuit, proceed as follows.

1 - Connect the scooter tester. Select the "enable diagnosis" function.

GO TO point 2

Specific tooling

020460Y Scooter diagnosis and tester

2- Enable the air injector diagnostic. Check the 5 sounds that denote the air injector activation. Check the tester response.

YES point 3 NO point 4 NO point 5

3- The air injector has enabled 5 times and the tester has returned "test finished successfully". The air injector and relevant circuit are currently efficient. For greater certainty, continue with the auto-diagnostic check in order to highlight stored errors.

4- The injector has not been enabled and the tester has returned "test failed". Repeat the diagnostic and, if necessary, replace the ECU.

GO TO point 2

5- The air injector has not been enabled and the tester has returned «test finished successfully». Check the air injector circuit.

6- Connect the scooter diagnostic tester Select the «errors» function. Check the presence of error **P1160 AIR INJECTOR**.

GO TO point 7

YES point 8 YES point 9

Specific tooling

020460Y Scooter diagnosis and tester

7- No error present. The injector electrics are efficient. Check the compressed air circuit to inspect the injector seal.

8- Air injector error in current status. Check the air injector circuit.

9- Air injector error in stored status. Check the circuit for false contacts or uncertain insulation.

10- Connect the interface wiring. Omit the connection to the ECU. Disconnect the air injector connector.

GO TO point 11

Specific tooling

020481Y Control unit interface wiring

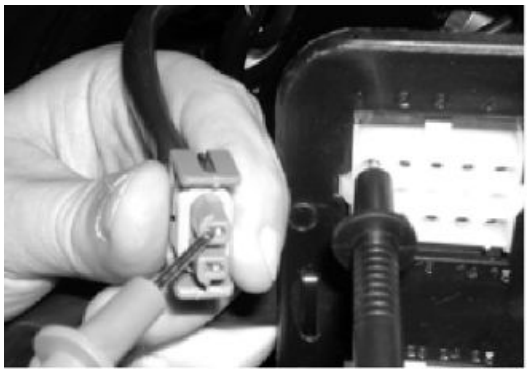
11 - Check the battery positive voltage to the blue lead of the power supply connector of the air injector.

1 - blue lead (positive) = V battery

YES point 13 NO point 12

N.B.

THIS CONNECTOR ALLOWS AN EASY CHECK USING THE MULTIMETER PRODS. DO NOT INSERT THE PRODS INTO THE PINS.



12- Check the efficiency of fuse 20A and restore the wiring if required.

GO TO point 11

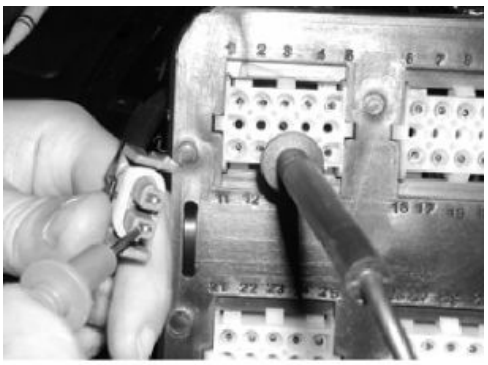
13- Check the continuity of the air injector control line.

13 - pink (injector connector) = continuity

YES point 15 NO point 14

N.B.

THIS CONNECTOR ALLOWS AN EASY CHECK USING THE MULTIMETER PRODS. DO NOT INSERT THE PRODS INTO THE PINS.



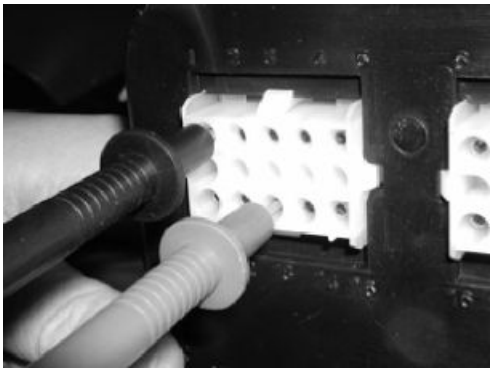
14- Restore the wiring.

GO TO point 13

15- Check the air injector control line positive insulation.

1 - 13 = 0V

YES point 17 NO point 16



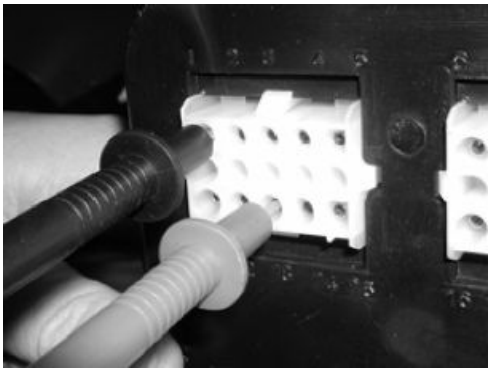
16- Restore the wiring.

GO TO point 15

17- Check the air injector control line negative insulation.

1 - 13 > or = 1MOhm

YES point 19 NO point 18



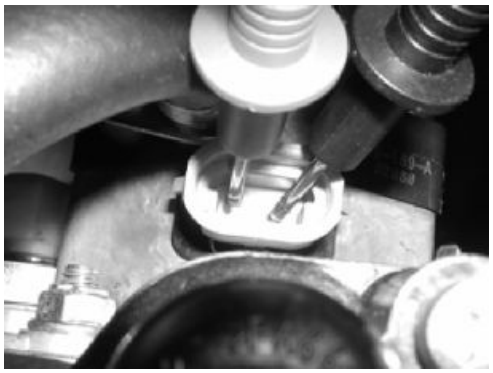
18- Restore the wiring.

TO GO point **17**

19- Check the air injector winding resistance

standard value= ... Ohm

YES point **21** NO point **20**



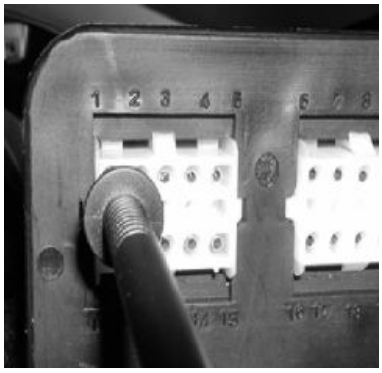
20- If very different resistive values are detected, replace the air injector.

GO TO point 19

21- Check the air injector winding negative insulation.

1 - any pin of the injector> or = 1MOhm

YES point 23 NO point 22



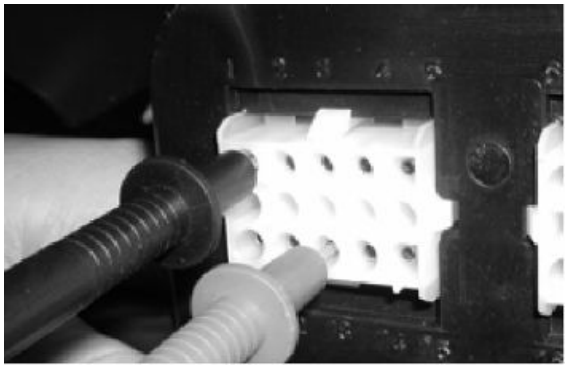
22- Replace the air injector.

GO TO point 21

23- Connect the specific tool to the ECU. Connect the air injector connector. Check the presence of voltage to the ECU.

1 - 13 = V battery (engine off and any position of the switch)

YES point 25 NO point 24



Specific tooling

020481Y Control unit interface wiring

24 - Voltage is close to 0V and the injector is open. Carefully check the control line insulation. Replace the ECU if required.

25 - The air injector control circuit is efficient. The air injector opening time can be checked when the engine is running by the «parameters» menu

AIR INJECTION T. mS =

6 ÷ 7 mS (start up at 20° C)

~ 1.6 mS (idle at 20° C)

~ 1.4 mS (idle at 60° C)

The values are indicative but useful for diagnostics. Command failures or unusual opening times are always caused by the ECU.

fuel pump circuit

TERMINALS: 1 - 14

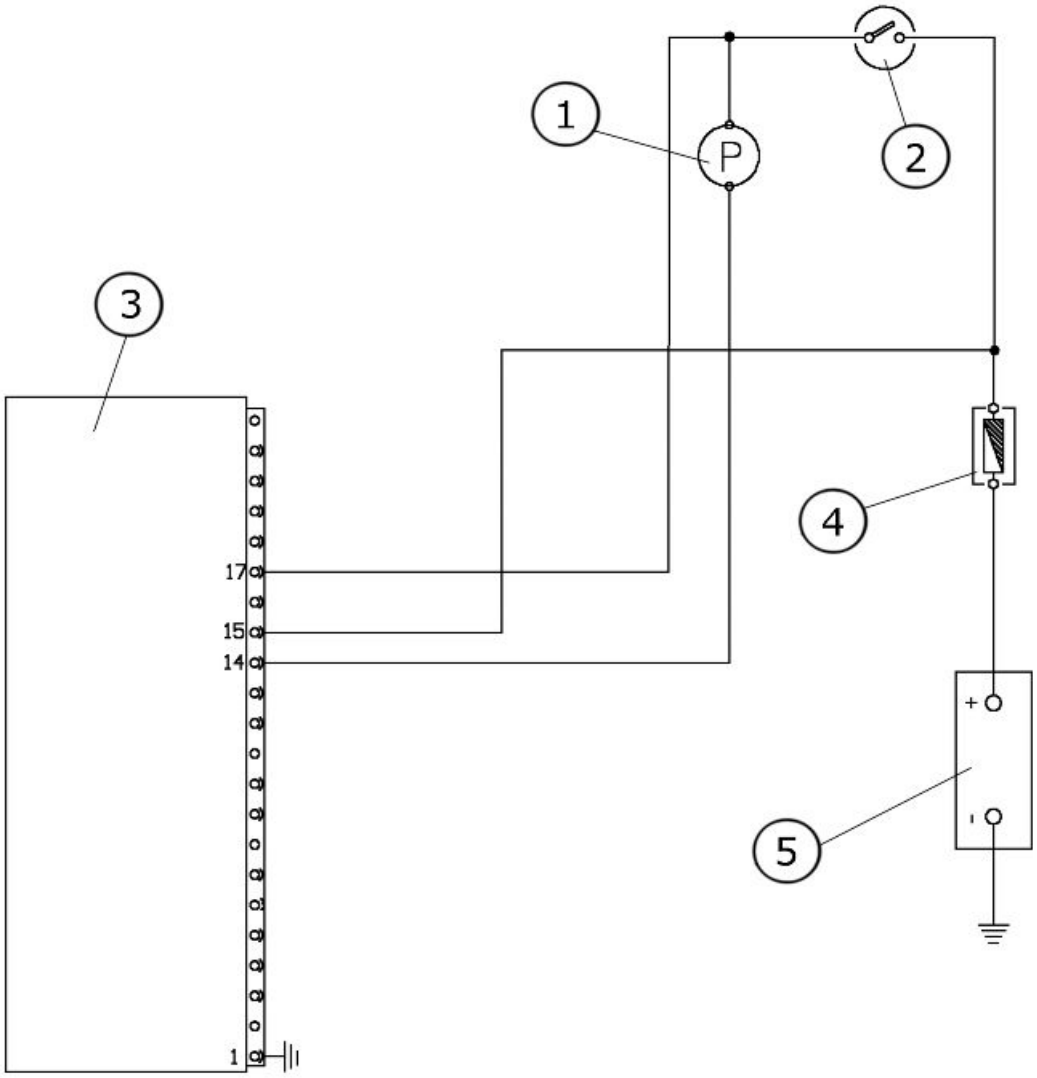
CONDITIONS: Switch in «ON» position after the engine timing

STANDARD VALUES: less than 0.1 V

TERMINALS: 1 - 14

CONDITIONS: Switch in «ON» position after timing with engine still

STANDARD VALUES: Battery voltage



FUEL PUMP CIRCUIT

	Specification	Desc./Quantity
1	Fuel pump	
2	Key switch contacts	
3	Injection ECU	
4	Fuse	20A
5	Battery	12V - 9Ah

The fuel pump is a piston type supplied with a direct current motor. It is designed to distribute high pressure with small deliveries and little absorption, thus suited for use on reduced horse power engines. Given the reduced absorption, the pumped is powered directly by the ECU without using relay switches. The pump is powered for 4 - 5 seconds after switching to «ON» this lets the system bleed

and get rid of the fuel aged by boiling within the injector support. Subsequent management of the pump is combined with the presence of the rpm timing signal. This guarantees the safety of the vehicle in the event of an accident. The ECU auto-diagnosis also checks the pump electrical circuit. A fault is recognised in the event of an interrupted circuit or short. The fault is recognised with a priority level of 3, this means registered by the auto-diagnosis but not signalled by turning on the injection lamp. Naturally, this fault causes the engine to fail and is easily recognisable on an acoustic level due to the failure of the pump to rotate.

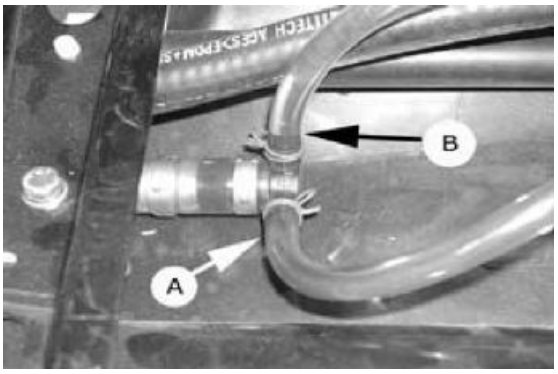
- The footrest needs to be removed to access the fuel pump.

- In order to gain access to the fuel pump it is necessary to remove the foot rest board
- A connection is present at the pump entrance with with the derivation of two tubes, respectively:

A: fuel arrival tube

B: fuel drainage tube

In the case of replacement, do not invert the order of the two tubes during reassembly.



1- Switch to the «ON» position. Listen for activation of the pump for 4-5 seconds

YES point 3 NO point 2

2 - Proceed with the auto-diagnostic and control circuit checks.

3 - Check whether the pump activation starts up again when trying to start the engine.

YES point 4 NO point 5

4- The pump control circuit is efficient.

5- Check the auto-diagnostic and the phase - rpm signal.

6- Connect the scooter diagnostic tester Select the «active diagnostic» function

GO TO point 7

Specific tooling

020460Y Scooter diagnosis and tester

7- Check that the tank is adequately topped up and proceed with the activation of the «fuel pump» diagnostic. Listen for 10 consecutive activations of around 4 seconds of the fuel pump. Check the outcome on the diagnostic tester.

YES point 8 NO point 9 NO point 10

8- The fuel pump was activated 10 times and the tester returned the «test successfully completed» outcome. The pump and the relative circuit are currently efficient. For greater certainty, proceed with the auto-diagnostic check in order to highlight any errors in stored status.

9- The pump remained inactive and the tester returned the «test failed» outcome. Repeat the diagnostic and, if necessary, replace the ECU.

GO TO point 7

10- The fuel pump was not activated and the tester returned the «test successfully completed» outcome. Proceed with checking the pump and the relative electric circuit

11- Connect the scooter diagnostic tester, select the «errors» function. Check for the presence of error **PO230 FUEL PUMP**.

YES point 13 YES point 14 NO point 12

Specific tooling

020460Y Scooter diagnosis and tester

12- No error present. The pump's electric command circuit is efficient. For a more complete check, proceed with the check on the fuel supply circuit.

13- Fuel pump error in occurred or stored status. Proceed with the check on the pump and the control circuit, paying particular attention to false contacts or uncertain insulation.

14- Fuel pump error in actual state. Proceed with the check on the fuel pump supply circuit.

15- Connect the interface wiring. Omit the connection with the ECU. Disconnect the fuel pump supply connector.

GO TO point 16

Specific tooling

020481Y Control unit interface wiring

16- Turn the switch to the «ON» position. Check for the presence of positive battery voltage at the orange pump supply connector wire.

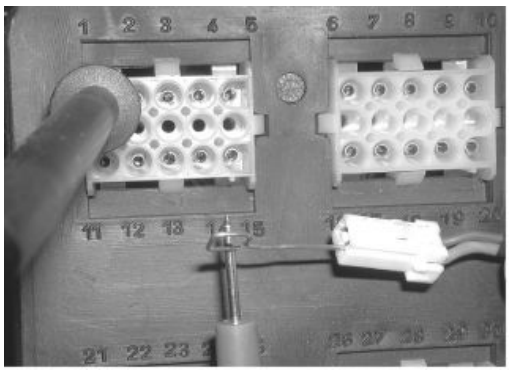
1 - ORANGE = battery voltage

NO point 17

GO TO point 18

N.B.

AVOID DAMAGING THE CONNECTOR PIN. USE A PIN ADAPTOR IF NECESSARY.



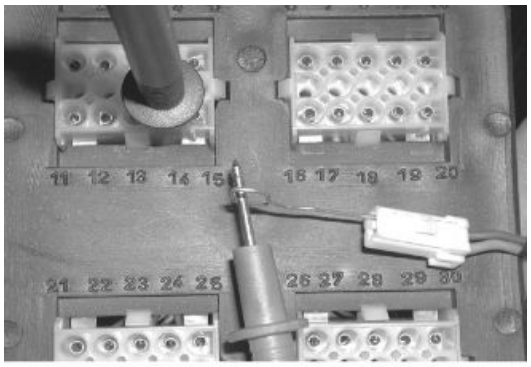
17- Check the efficiency of the 20 A fuse, the key switch and restore the wiring if necessary.

18- Check the continuity of the petrol pump control line.

14 - green/blue (pump con.) = continuity

N.B.

AVOID DAMAGING THE CONNECTOR PIN. USE A PIN ADAPTOR IF NECESSARY.



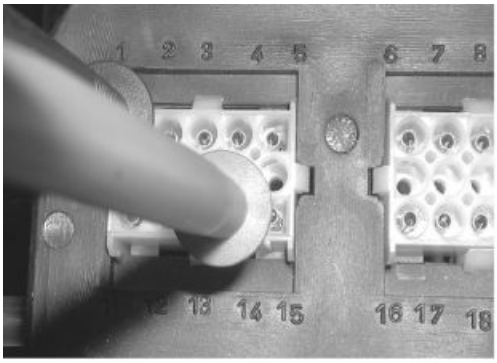
19 - Restore the wiring.

GO TO point 18

20 - Check the fuel pump control line positive insulation.

1 - 14 = 0V

YES point 22 NO point 21



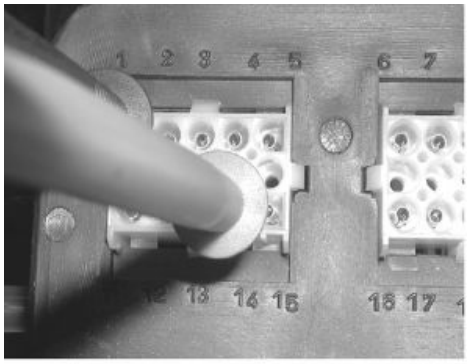
21- Restore the wiring.

GO TO point 20

22 - Check the fuel pump control line negative insulation.

1 - 14 = 1 MOhm

YES point 24 NO point 23



23- Restore the wiring.

GO TO point 22

24- Check the fuel pump winding continuity.

Standard resistance = …….Ohm (5Ohm measured)

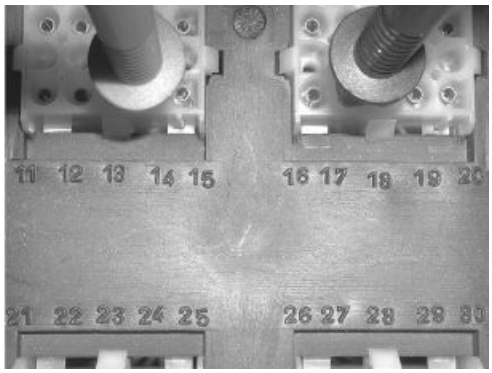
N.B.

IF THE CHECK IS DONE ON A NEW PUMP, HIGHER RESISTANCE VALUES MIGHT RESULT DUE TO THE FACT THAT THE MANIFOLD HAS NOT BEEN BROKEN IN.

If there are difficulties in doing the check directly on the pump, proceed with the check through the wiring. Reconnect the fuel pump connector and measure the resistance between the specific tool's pins, keeping the switch in the «OFF» position.

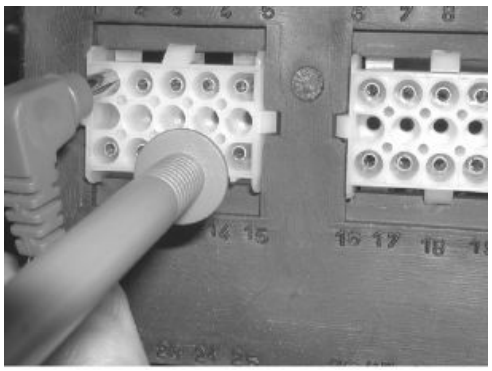
14 - 17 =…….Ohm (5Ohm measured)

YES point 26 NO point 25



25- A resistance of around 0 Ohm indicates the presence of a short circuit. A resistance significantly greater than the standard values indicates low conductivity. In these cases, replace the pump.

GO TO point 24



26- Keeping the ECU conditions disconnected and pump connector connected, check that with the key switch in the «ON» position, the pump starts to rotate each time that pin 14 is grounded.

1 - 14 (bridged) = pump activated

YES point 28 NO point 27

27- There is electric absorption but the pump does not rotate. Replace the pump due to mechanical damage.

GO TO point 24

28- Especially in case an error is verified in the «occurred» or «stored» state, repeat activation of the pump several times in order to distinguish any faults deriving from a manifold that is not perfectly efficient.

GO TO point 29

GO TO point 30

29- Some pauses are present. Check the connectors more carefully and replace the pump, if necessary.

30- The pump rotates normally. The pump connection electric system is efficient. Connect the ECU and check that the pump activates for around 4 seconds each time the switch is turned «ON» and constantly when the rpm- phase (engine in rotation) signal is present). Replace the ECU if there are any faults.

GO TO point 31

31- For a more complete fuel pump check, it is best to proceed with the checks on the current absorbed and the hydraulic characteristics of the pump.

See also

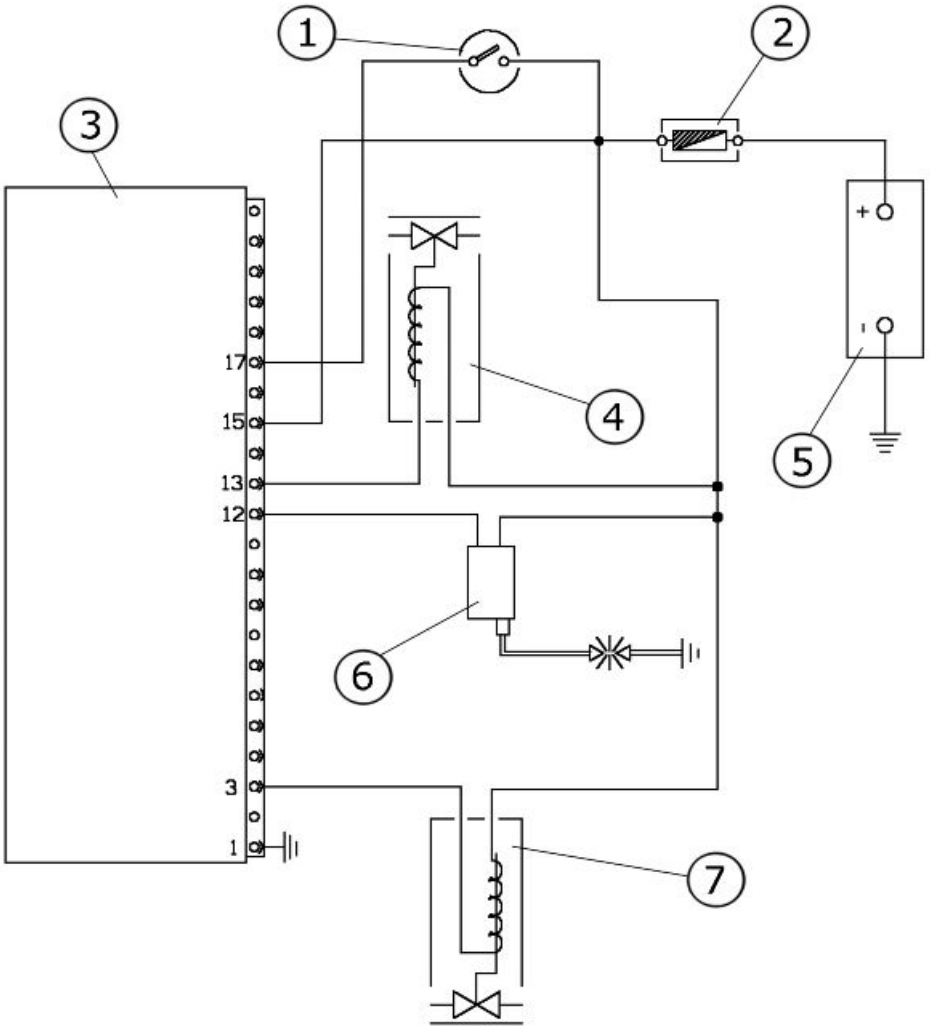
Footrest

petrol injector circuit

TERMINALS: 1 - 3

CONDITIONS: Engine stopped, switch in any position

STANDARD VALUES: Battery voltage



PETROL INJECTION CIRCUIT

	Specification	Desc./Quantity
1	Key switch contacts	
2	Fuse	20A
3	Injection ECU	
4	Air injector	
5	Battery	12V - 9Ah
6	HV coil	
7	Fuel injector	

The petrol injector receives pressurised fuel through the supply system. The ECU runs the injector by checking the time and opening time. The fuel is injected into the compressed air chamber this forming the rich titre air petrol mixture to be injected into the cylinder via the air injector. The petrol injector prepares the mixture when the air injector is still closed and the air injector injects the mixture when the

petrol injection has finished. The operation of the petrol injector is always very important in all engine operating phases, but particularly during idling and starting. The ECU autodiagnosis also checks the petrol injector control circuit. A fault is detected if the circuit is interrupted or if there is a short towards the earth or positive. Any faults are signalled to the driver via the injection lamp. If a fault is present the engine will not run. The fault is only recognised when the rpm - timing sensor is present, i.e. when the ECU controls opening of the injector. For this reason when there is a fault, recognition changes from the «current event» state to «past event» state when the engine stops.

1 - Connect the scooter tester. Select the enable diagnosis function.

GO TO point 2

Specific tooling

020460Y Scooter diagnosis and tester

2- Activate the fuel injector diagnostic. Listen for 5 fuel injector activations. Check the diagnostic tester response.

YES point 3 NO point 4 NO point 5

3- The fuel injector was activated 5 times and the tester returned the «test completed successfully» outcome. The fuel injector and the relative circuit are efficient. For further certainty, proceed with the auto-diagnostic test in order to avoid any errors in the stored status.

4- The injector remained inactive and the tester returned the outcome «test failed». Repeat the diagnostic and replace the ECU if necessary.

5- The fuel injector remained inactive and the tester returned the «test completed successfully» outcome. Check the fuel injector circuit.

6- Connect the scooter diagnostic tester. Select the «errors» function on the menu. Check the presence of any errors **PO251 FUEL INJECTOR**.

YES point 8 YES point 9 NO point 7

Specific tooling

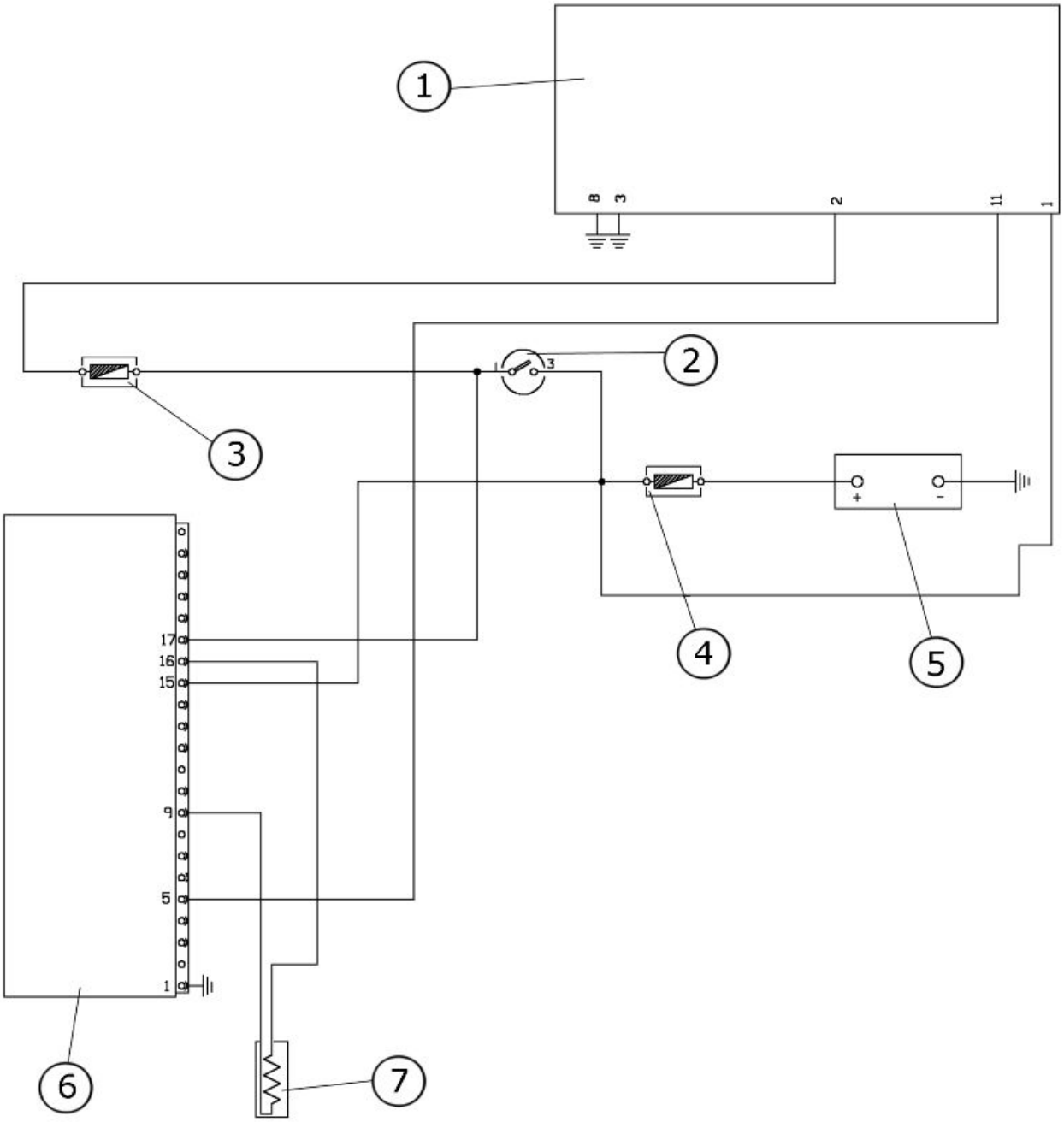
020460Y Scooter diagnosis and tester

7- No error present. The injector electric part is sufficient. Proceed with the injector hydraulic inspections.

8- Fuel injector error in current status. Check the fuel injector circuit.

9- Fuel injector error in occurred or stored status. Check the injector circuit with special attention to false contacts of uncertain insulation.

coolant temperature sensor circuit



COOLANT TEMPERATURE SENSOR

	Specification	Desc./Quantity
1	Digital instrument unit	
2	Key switch contacts	
3	Fuse 5A	
4	Fuse	20A
5	Battery	12V - 9Ah
6	Injection ECU	
7	Coolant temperature sensor	

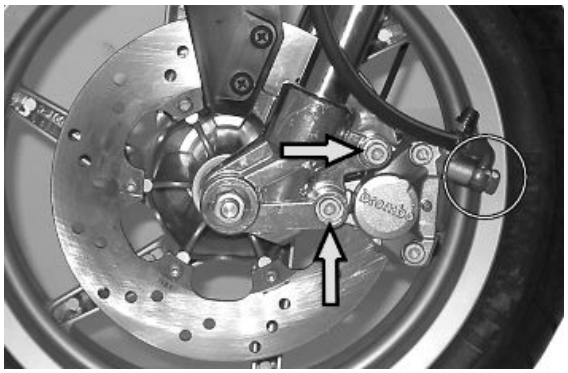
INDEX OF TOPICS

BRAKING SYSTEM	BRAK SYS

Front brake calliper

Removal

- Check that the brake piping, gasket and fitting are in good condition. If you see any oil on the brake calliper and/on the components of the system, it is necessary to replace them.
- - Disconnect the oil line from the calliper, collecting the oil in a container.
- - Remove the two clamps highlighted in the diagram.



Overhaul

- Remove the calliper assembling bolts and take out the internal bodies and components. If necessary, in order to make it easier to take out the plungers, inject (shorts blasts of) compressed air through the brake fluid pipe.

- Check that the cylinders of the internal and external body of the calliper do not show scratches or signs of erosion; otherwise, replace the entire calliper.

CAUTION

ALL THE INTERNAL COMPONENTS MUST BE REPLACED EVERY TIME THE CALLIPER IS SERVICED.

Insert the following: - sealing rings (1-2);

- pistons (3);

- locate the OR seal inside a calliper body (4).

- Join the inner and outer bodies via fixing bolts. Refit the pads and breathe any air inside the circuit (see previous paragraphs).

- Locate the calliper on the disc and secure to the supporting bracket tightening the fixing bolt.

- Tighten the tube joint on the calliper at the prescribed torque.

- When refitting the components, they must be perfectly clean and free from any trace of oil, fuel, grease, etc... It is therefore necessary to carefully clean them with denatured alcohol.

The seal rings must be immersed in the operating liquid; Protective solution **PRF1** may be used.

CAUTION

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

Locking torques (N*m)

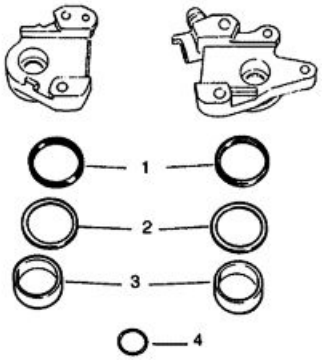
Calliper coupling screw 20 to 25 Nm Oil bleed screw 7 to 10 Nm

1 DUST GUARDS

2 SEALING RINGS

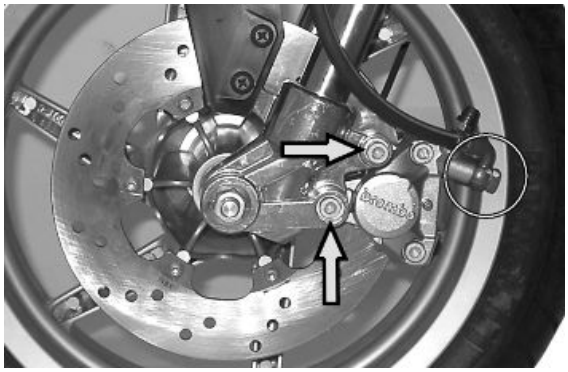
3 PLUNGERS

4 O-RING GASKET



Refitting

- Refit the pincer on the support and tighten the screws at the prescribed torque.
- Refit the tube complete with fitting with new copper gaskets.
- Bleed the air from the system.



Locking torques (N*m)

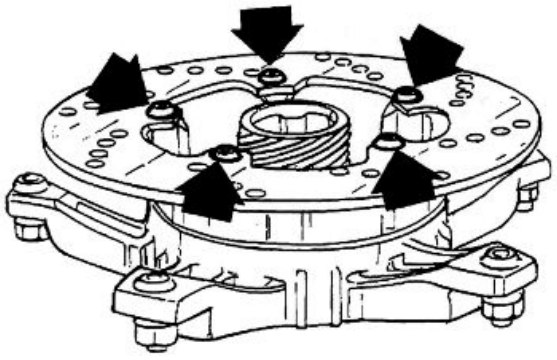
Brake fluid tube calliper 20 ÷ 25 Nm Fastening screws calliper to the crankcase 20 - 25 Oil bleed screw 7 to 10 Nm

Front brake disc

Removal

- Remove the front wheel loosening the axle clamp.

-Remove the six fastenings of the disc.



Refitting

-When refitting, position the disc correctly making sure that it rotates in the right direction.

Locking torques (N*m)

Disc tightening screw 8 - 12

Disc Inspection

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

Characteristic

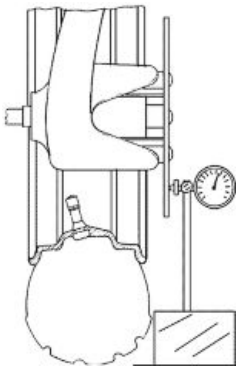
New rear disc thickness

4.0 mm

Disc thickness at wear limit (front)

3.5 mm

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



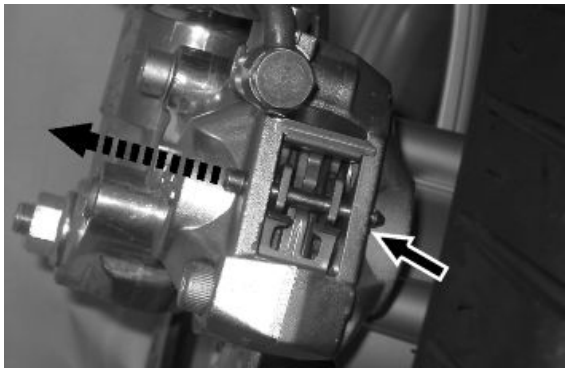
Specific tooling

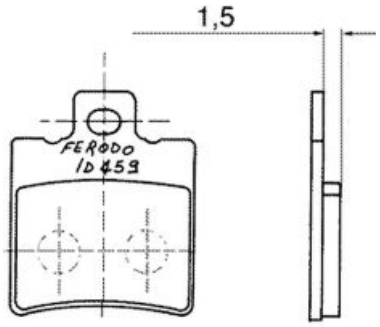
020335Y Magnetic support for dial gauge

Front brake pads

Removal

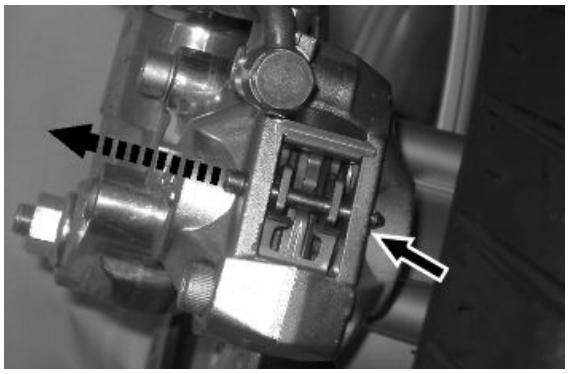
- Remove the pin split ring located at the back of the calliper body.
- Remove the pin, paying attention in recovering the spring, hence remove the pads.
- The pads must be replaced if the working thickness is less than 1.5 mm





Refitting

- To reassemble perform the above steps in reverse order. Position the leaf spring with the arrow facing up.



Fill

Front

-Once the bleed valve is closed, fill the system with brake liquid to the maximum level.

-Undo the bleed screw.

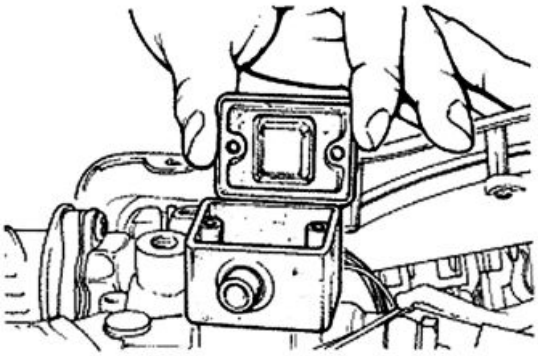
-Apply the tube of the special tool to the bleed screws.

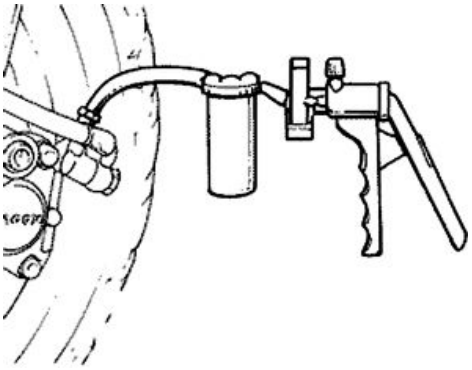
When bleeding it is necessary to fill the oil tank in continuation while working with a MITYVAC pump on the bleed screws until no more air comes out of the system.

The operation is finished when just oil comes out of the bleed screws.

-Do up the bleed screw.

-When the operation is over, tighten up the oil bleed screw to the prescribed torque.





N.B.

**IF AIR CONTINUES TO COME OUT DURING PURGING, EXAMINE ALL THE FITTINGS:
IF SAID FITTINGS DO NOT SHOW SIGNS OF BEING FAULTY, LOOK FOR THE AIR INPUT AMONG THE VARIOUS SEALS ON THE PUMP AND CALLIPER PISTONS.**

CAUTION

- DURING THE OPERATIONS, THE VEHICLE MUST BE ON THE STAND AND LEVEL.

N.B.

DURING PURGING FREQUENTLY CHECK THE LEVEL TO PREVENT AIR GETTING INTO THE SYSTEM THROUGH THE PUMP.

WARNING

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

CAUTION

WHEN CARRYING OUT THE OPERATION, BRAKE FLUID MAY LEAK FROM BETWEEN

THE BLEED SCREW AND ITS SEAT ON THE CALLIPER.
CAREFULLY DRY THE CALLIPER AND DE-GREASE THE DISC SHOULD THERE BE OIL ON IT.

Specific tooling

020329Y MityVac vacuum-operated pump

Recommended products

AGIP BRAKE 4 Brake fluid

FMVSS DOT4 Synthetic fluid

Locking torques (N*m)

Oil bleed screw 8÷12

Front brake pump

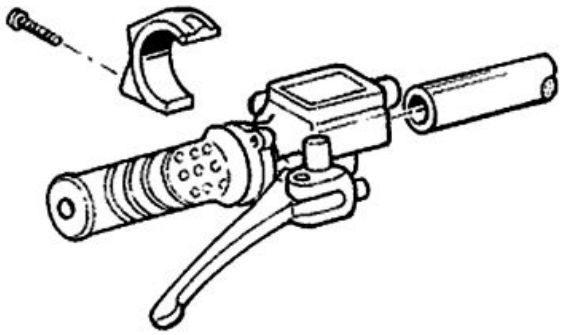
-After removing the front and rear handlebar covers, act on the two stand fixing points (see the figure).

- Disconnect the tube, collecting the brake oil in a container.

- On refitting, perform the operation in reverse.
- Tighten the hydraulic line to the prescribed torque and bleed the system.

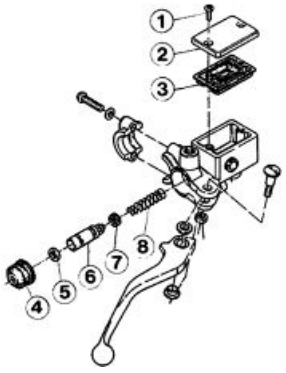
Locking torques (N*m)

Brake fluid pump - hose fitting 20 ÷ 25 Nm



Removal

- Bleed the circuit and drain the brake fluid through the bleeding screw located on the calliper and actuate the brake lever until no more fluid flows out.
-Remove the oil pump from the handlebar; remove the brake lever and then remove the wheel cylinder.



1 - Tank cap screw.
2. Tank cover.
3. Diaphragm.
4. Bellows.
5. Sealing ring.
6. Piston.
7. Gasket.

8 - Spring

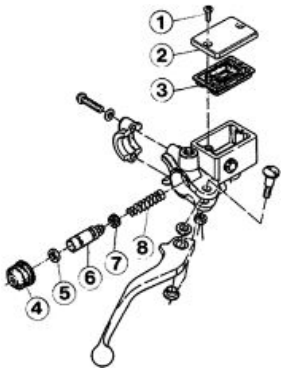
CAUTION

- THE PRESENCE OF BRAKE FLUID ON THE DISC OR BRAKE PADS REDUCES THE BRAKING EFFICIENCY.
IN THIS CASE, REPLACE THE PADS AND CLEAN THE DISC WITH A HIGH-QUALITY SOLVENT.
CONTACT WITH BRAKE FLUID WILL DAMAGE PAINTED SURFACES.
RUBBER PARTS SHOULD NEVER BE LEFT IN ALCOHOL FOR LONGER THAN 20 SECONDS.
AFTER WASHING, THE PIECES MUST BE DRIED WITH A BLAST OF COMPRESSED AIR AND A CLEAN CLOTH.
THE SEALING RINGS MUST BE IMMERSED IN THE OPERATING LIQUID.

Refitting

Before fitting, the parts must be perfectly clean and free of traces of oil, diesel fuel, grease, etc.. They should be washed thoroughly in denatured alcohol before proceeding.

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



1 - Tank cap screw.

2. Tank cover.

3. Diaphragm.

4. Bellows.

5. Sealing ring.

6. Piston.

7. Gasket.

8. Spring.

INDEX OF TOPICS

COOLING SYSTEM	COOL SYS

System bleed

1. Fill the circuit through the expansion tank to the maximum level.
2. Fasten the rubber line to the drain fitting on the head and thread it into the expansion tank mouth..
3. Loosen the fitting and restore the tank level.
4. Start up the engine and wait until only coolant exits from the line, then tighten the fitting on the head..
5. Turn off the engine, restore the level of liquid to the maximum level, then close the expansion tank..
6. Heat up the engine to normal operating temperature in order to eliminate any air formation in the main lines..
7. Stop the engine and let it cool, then check that the level of coolant in the expansion tank to the maximum;; refill it.

Water pump - overhaul

- Remove the pick-up/coolant inlet hose clamp
- Remove the transmission cover
- Remove the mixer
- Setup the special as shown in the picture

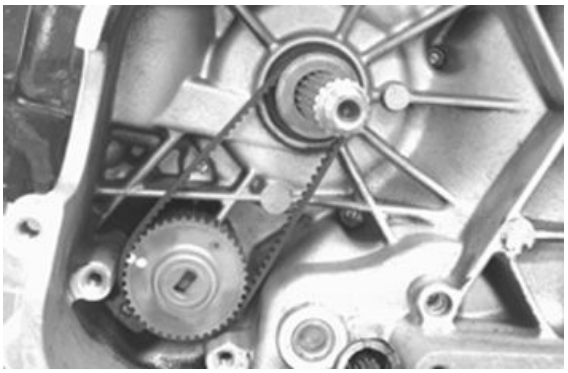
N.B.

WHEN SECURING THE TOOL, PAY ATTENTION NOT TO OVERLOAD THE PLASTIC IMPELLER.

Specific tooling

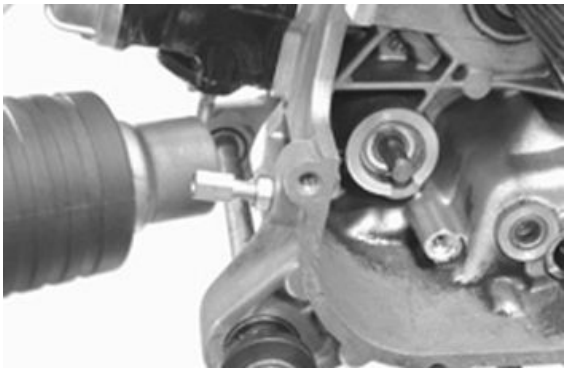
020167Y Arrest key for impeller pump

- Remove the mixer/water pump drive-belt with the two sprockets

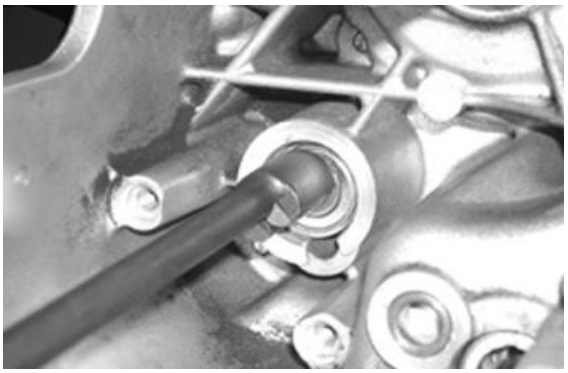


- Remove the split ring from the shaft together with the bearings
- Remove the steel washer

- Using the air heater, warm up the crankcase in the area around the water pump bearings as shown in the picture.



- With the aid of the special tool, loosen the impeller shaft turning the spanner clockwise (left-handed thread)
- As the thread is fully disengaged, extract the shaft with the aid of pliers.



Specific tooling

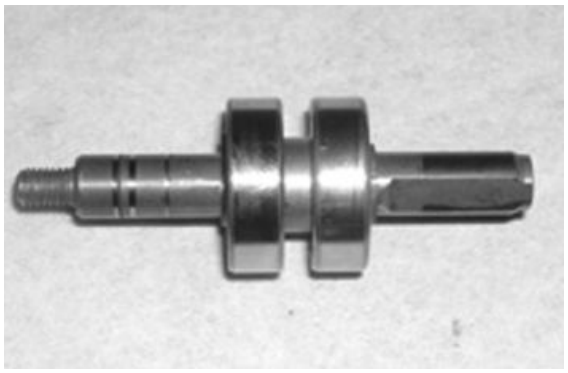
020169Y Water pump crankshaft fitting and removal spanner

- Using the special hook, remove the sealing ring from its housing as shown in the picture.

Specific tooling

020209Y Spring hook

- Ensure the shaft is not abnormally worn and the bearings not noisy. Otherwise, replace shaft and bearings
- Carefully clean oil seal and bearing housings

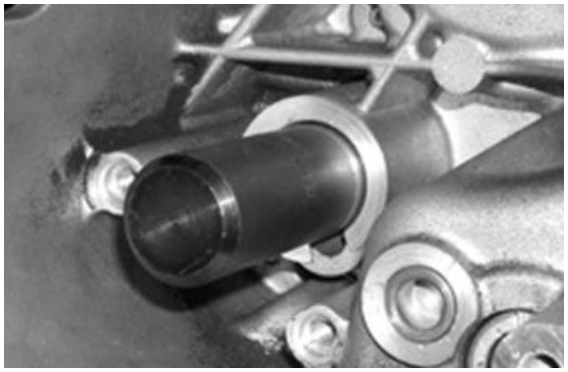


- Use a new oil seal to refit
- Position the new oil seal on the special tool with the main lip facing the bearings as shown in the picture

- Lubricate the oil seal and push it home using the special tool as shown in the picture

Specific tooling

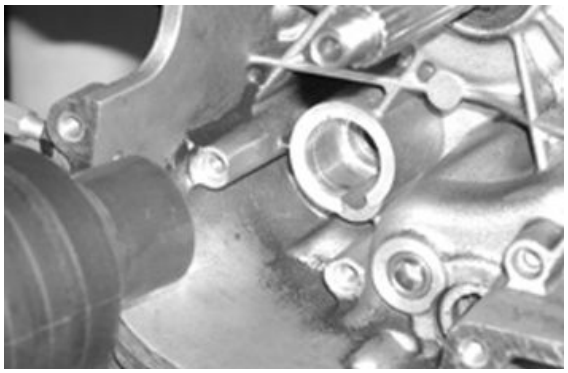
020168Y Water seal punch mount on half-crankcase



- Insert the shaft, with bearings, into its housing by pushing and turning it at the same (turn anticlock-wise for tightening)
- Turn it rapidly to the end of the threading.
- Should this operation prove difficult, do not carry on; instead, start over by reheating the crankcase

N.B.

FAILURE TO OBSERVE THIS RULE MAY RESULT IN DAMAGE TO THE THREAD OF THE COPPER INSERT ON THE IMPELLER, OR SEPARATION OF THIS FROM THE IMPELLER ITSELF.

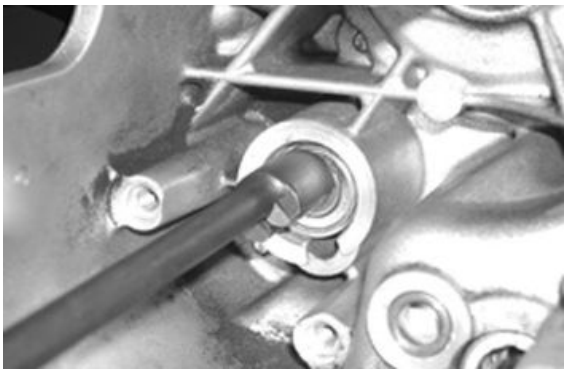


Specific tooling

020169Y Water pump crankshaft fitting and removal spanner

Using the air heater, warm up the water pump bearing housing, without directing the air flow directly against the oil seal

- Lubricate the end of the water pump shaft on the oil seal side, using the recommended product.



Recommended products

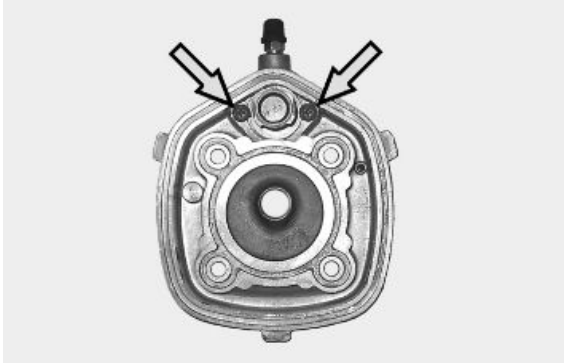
AGIP GREASE MU3 Grease for odometer transmission gear case

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

Thermostat

Removal

- Detach the coolant hose from the head, partially draining the system.
- Remove the cylinder head.
- Remove the two fixing screws and hence the thermostat.



Check

1) Visually check that the thermostat is not damaged.

2) Fill a metallic container with approx. 1 litre of water.

Immerge the thermostat, and keep it in the centre of the bowl.

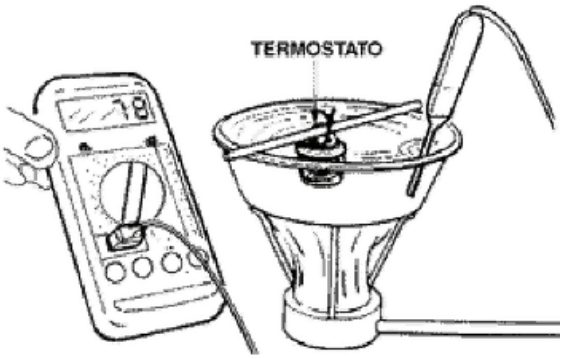
Immerge the multimeter temperature probe, and keep it close to the thermostat.

Heat up the bowl using the thermal gun.

Check the thermostat opening start temperature:

Heat up until the thermostat is completely open.

3) Replace the thermostat if not working properly.



CAUTION

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

Specific tooling

020331Y Digital multimeter

020151Y Air heater

Characteristic

Thermostat check: Opening start temperature

60±2°C

Refitting

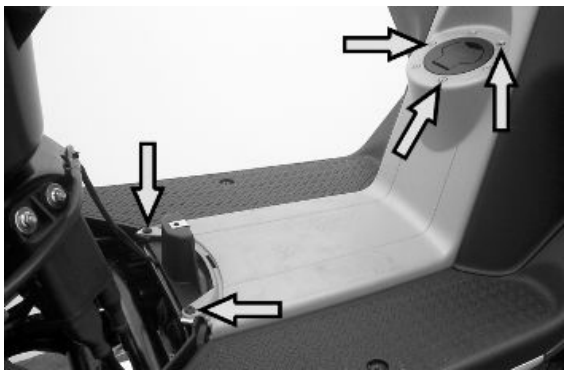
- Refit the thermostat onto the head, following the removal operations in the reverse order, and paying attention in inserting the groove on the thermostat on the reference on the head.

INDEX OF TOPICS

CHASSIS	CHAS

Frame central cover

- Remove the top and bottom fairings.
- Remove the 2 Philips screws fixing the footrest.
- Remove the 3 Allen screws located around the fuel filler cap.
- Remove the fuel filler cap.

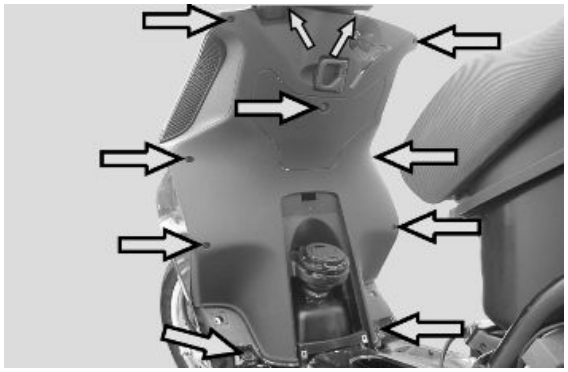


See also

Side fairings

Knee-guard

- Remove the footrest and its side fairings.
- Remove the expansion tank and the fuel filler cap.
- Remove the 11 fixing screws, and hence release the knee-guard.

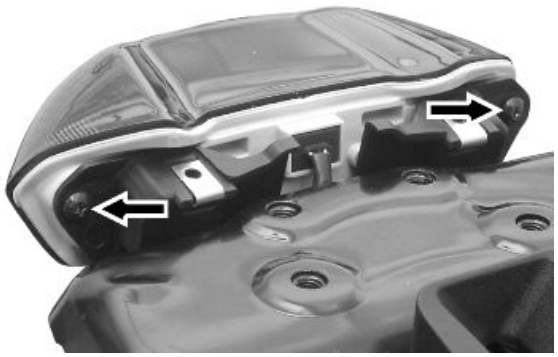


See also

Footrest

Taillight assy.

- Remove the top joining element of the fairings located behind the taillight.
- Remove the two top fairings.
- Remove the 2 fixing screws; hence remove the taillight after disconnecting the connector to the vehicle system.

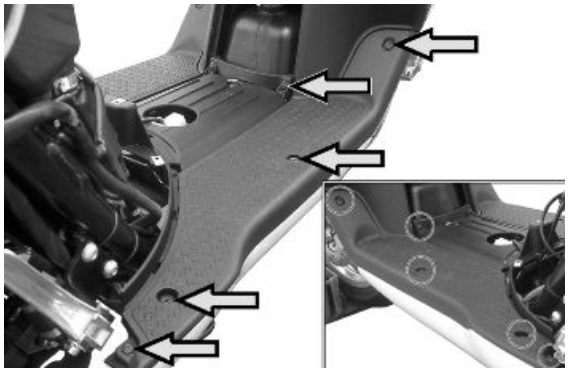


See also

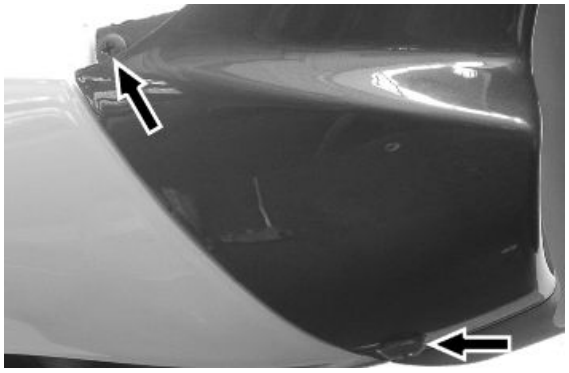
Side fairings

Footrest

- Remove the centre frame cover.
- Remove the 10 screws (5 for each side), hence remove the footrest.



- Remove the side fairing from the footrest, by removing the two screws joining this to the spoiler and the knee-guard.

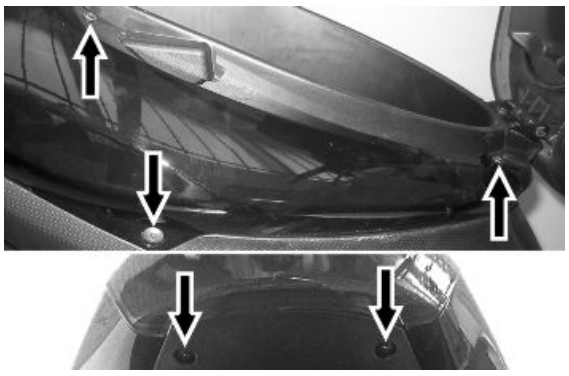


See also

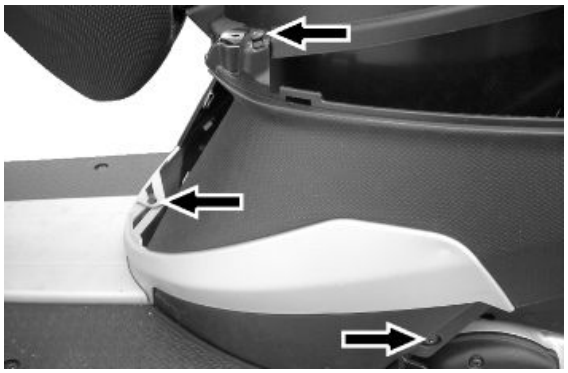
Frame central cover
Frame central cover

Side fairings

- Remove the top l.h.s. and r.h.s. fairings, by removing the 3 side screws and the screw located underneath the taillight

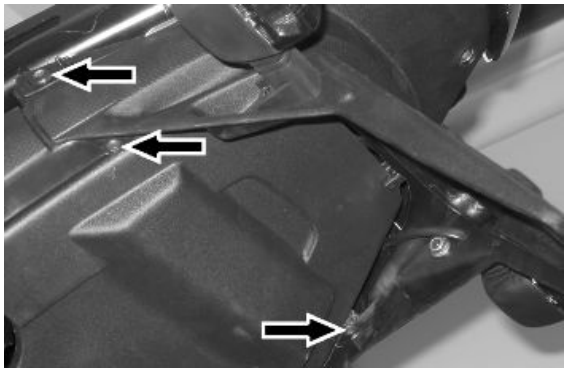


- Remove the lower fairings, removing the 2 side screws and the central joining screw located underneath the spark plug cover.



License plate holder

- Remove the top fairing joining element located behind the taillight.
- Remove the 2 screws joining the top side fairings.
- Remove the 4 lower screws joining the front wheel housing cover with the lower side fairings.

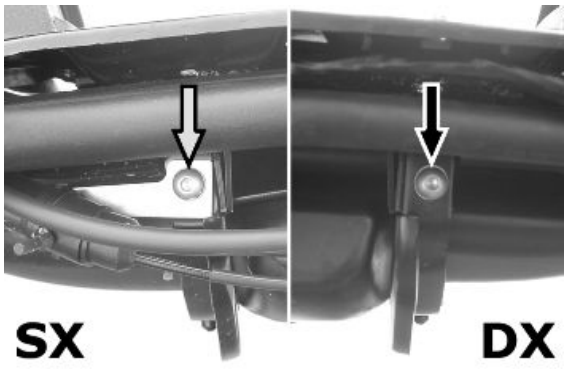


See also

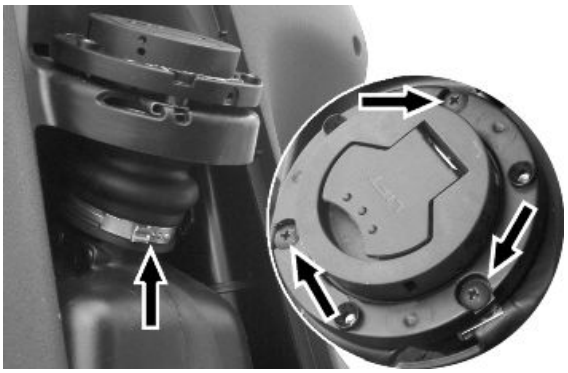
Side fairings

Fuel tank

- Remove the footrest and its side fairings.
- Remove the 2 Allen screws fixing the fuel support cross member, and remove the bracket



- Remove the metallic clip joining the rubber bellow to the tank and loosen the 3 screws fixing to the knee-guard



- Remove the 2 top screws fixing the tank to the frame and lower the tank so to disconnect the inlet and outlet fuel hoses from the pump.
- Remove the tank completely paying attention to avoid fuel spillage.

See also

Footrest

Front central cover

- Mediante cacciavite a croce rimuovere la vite come indicato in figura.
- Rimuovere la mascherina.

INDEX OF TOPICS

PRE-DELIVERY	PRE DE

Aesthetic inspection

Appearance checks:

- Paintwork
- Fitting of plastics
- Scratches
- Dirt

Tightening torques inspection

Lock check

- Safety locks
- clamping screws

Safety locks

Rear shock absorber upper fixing
Rear shock absorber lower fixing
Front wheel axle nut
Wheel hub nut
Frame - swinging arm bolt *
Swinging arm bolt - Engine
Engine arm pin - Frame arm
Handlebar lock nut
Steering lower ring nut
Upper steering ring nut

Electrical system

Electrical system

- Main switch
- Headlamps: high beam, low beam, position and parking lights and the respective warning lights
- Adjusting the headlights according to the regulations currently in force
- Tail light, parking light, stop light
- Front and rear stop light switches
- Turn indicators and their warning lights
- Instrument lighting
- Instrument panel: fuel and temperature indicator
- Instrument panel warning lights
- Horn
- Starter

CAUTION

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

WARNING

BEFORE RECHARGING THE BATTERY, REMOVE THE CAPS OF EACH CELL.
KEEP OPEN FLAMES OR SPARKS AWAY FROM THE BATTERY DURING CHARGING.
REMOVE THE BATTERY FROM THE SCOOTER, DISCONNECTING THE NEGATIVE TERMINAL FIRST.

CAUTION

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

WARNING

BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH EYES, SKIN AND CLOTHING.
IN CASE OF CONTACT WITH EYES OR SKIN, RINSE WITH ABUNDANT WATER FOR ABOUT 15 MINUTES AND SEEK MEDICAL ATTENTION AT ONCE.
IF IT IS SWALLOWED, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.
THE BATTERIES PRODUCE EXPLOSIVE GAS; KEEP THEM AWAY FROM NAKED FLAMES, SPARKS AND CIGARETTES. IF THE BATTERY IS CHARGED IN A CLOSED PLACE, TAKE CARE TO ENSURE ADEQUATE VENTILATION. ALWAYS PROTECT YOUR EYES WHEN WORKING CLOSE TO BATTERIES.
KEEP OUT OF THE REACH OF CHILDREN

CAUTION

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

Levels check

Level check:

- Hydraulic braking system fluid level.
- Rear hub oil level
- Engine coolant level.

Road test

Test ride

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

Static test

Static control after the test ride:

- Starting when warm
- Starter operation
- Minimum hold (turning the handlebar)
- Uniform turning of the steering
- Possible leaks

CAUTION

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

CAUTION

NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES OR TYRES MAY BURST.

Functional inspection

Functional check:

Braking system (hydraulic)

- Lever travel

Braking system (mechanical)

- Lever travel

Clutch

- Proper functioning check

Engine

- Throttle travel check

Others

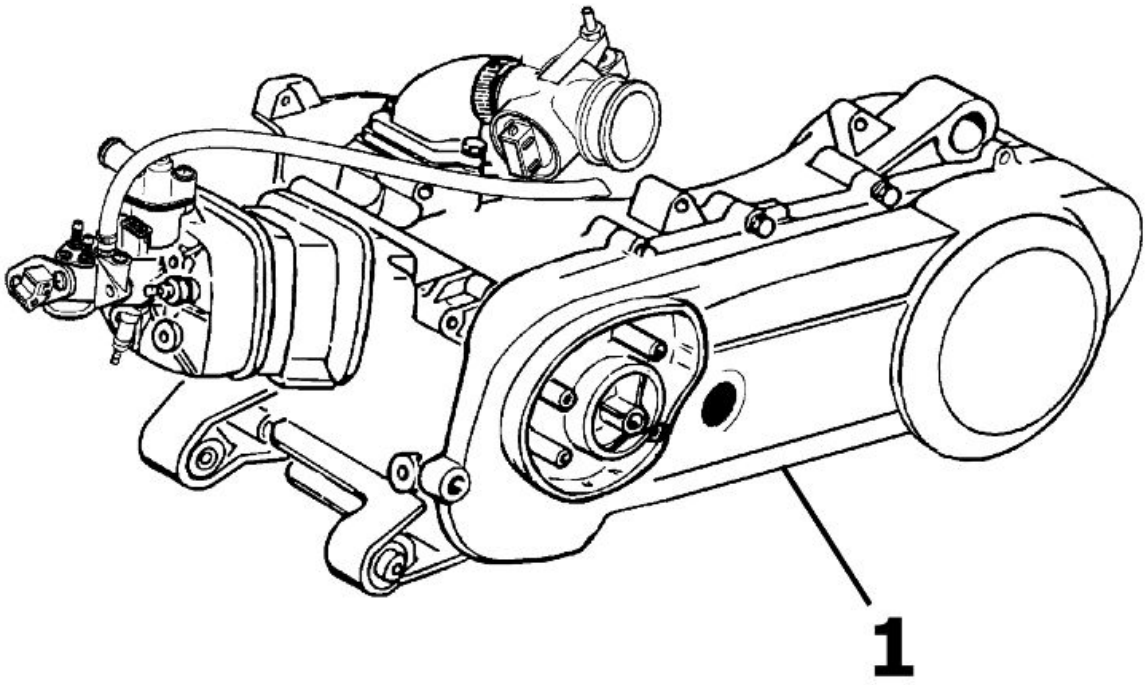
- Check documentation
- Check the frame and engine numbers
- Tool kit
- License plate fitting
- Check locks
- Check tyre pressures
- Installation of mirrors and any accessories

INDEX OF TOPICS

TIME	TIME

This section is devoted to the time necessary to carry out repairs.
The description and code for each operation is indicated.

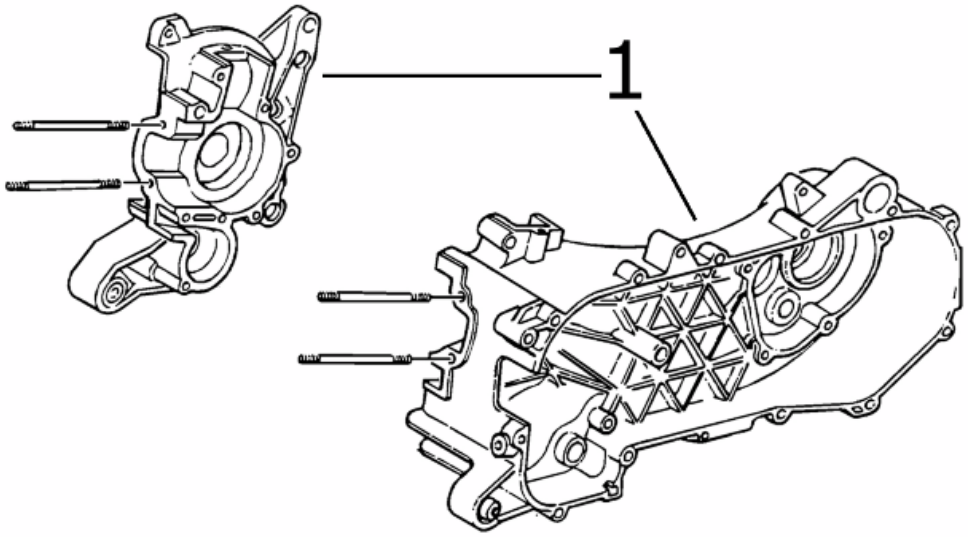
Engine



ENGINE

	Code	Action	Duration
1	001001	Engine to chassis - Replacement	

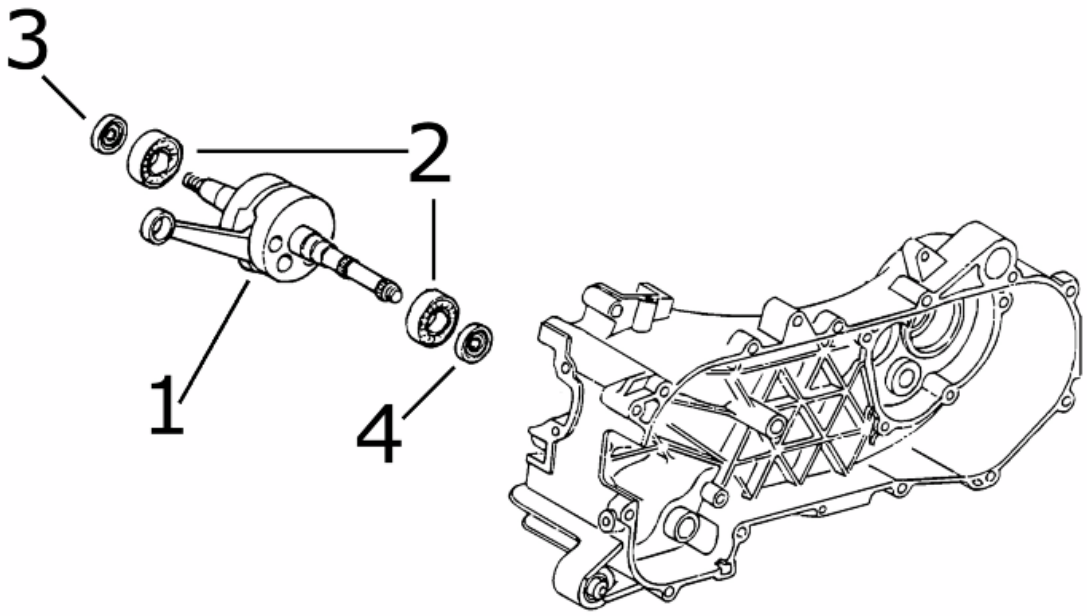
Crankcase



CRANKCASE

	Code	Action	Duration
1	001133	Engine crankcase - Replacement	

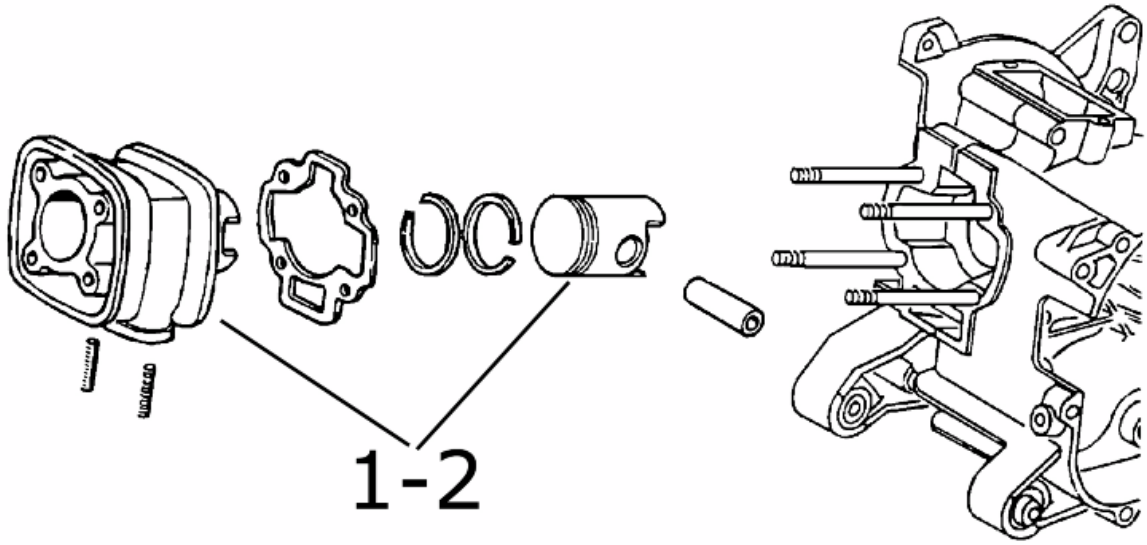
Crankshaft



CRANKSHAFT

	Code	Action	Duration
1	001117	Crankshaft - Replacement	
2	001118	Main bearings - Replacement	
3	001099	Oil seal, flywheel side - Replacement	
4	001100	Oil seal, clutch side - Replacement	

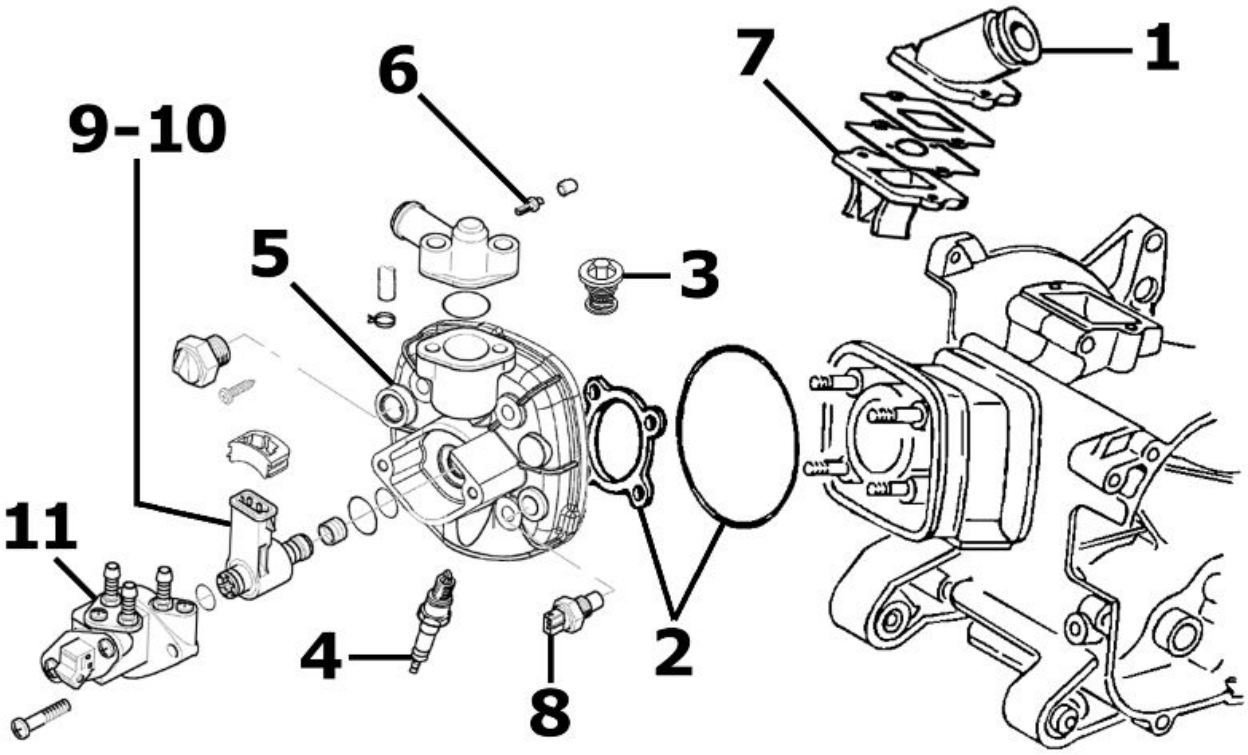
Cylinder assy.



CYLINDER / PISTON

	Code	Action	Duration
1	001002	Cylinder piston - Replace-ment	
2	001107	Cylinder / piston - Inspection / cleaning	

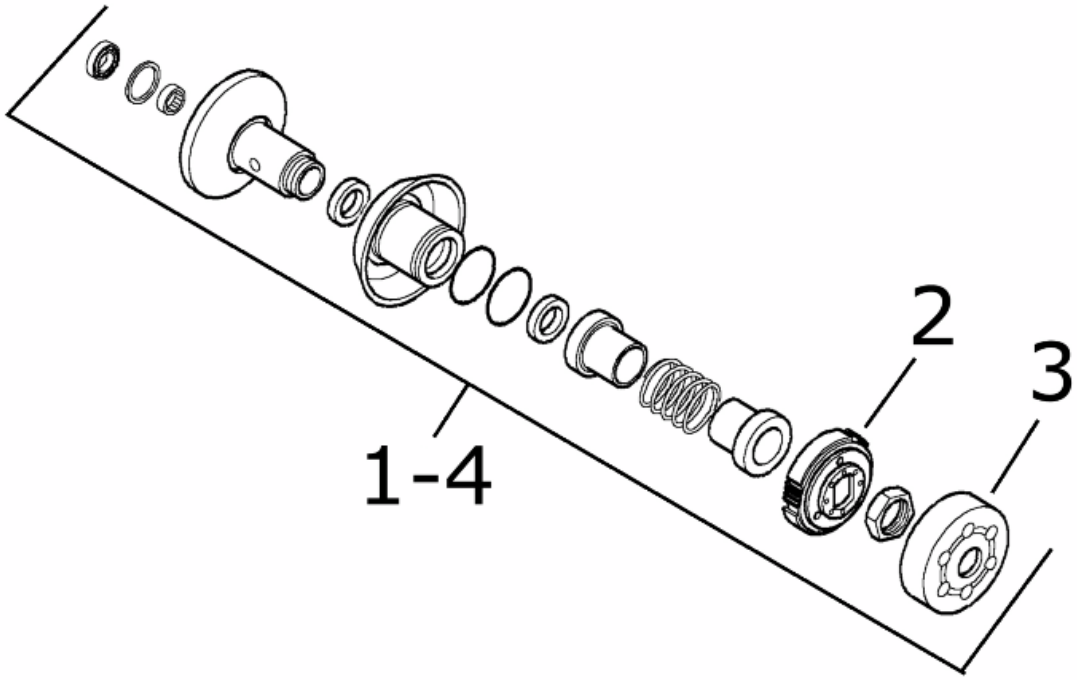
Cylinder head assy.



HEAD UNIT

	Code	Action	Duration
1	001013	Intake manifold - Replacement	
2	001056	Head gasket - change	
3	001057	Thermostat - Replacement	
4	001093	Spark plug - Replacement	
5	001126	Head - Replacement	
6	007010	Bleed valve - Replacement	
7	001178	Disc pack - Replacement	
8	001083	Thermistor - Replacement	
9	005111	Air injector - Replacement	
10	005112	Air injector - Service	
11	005110	Fuel injector mounting - Replacement	

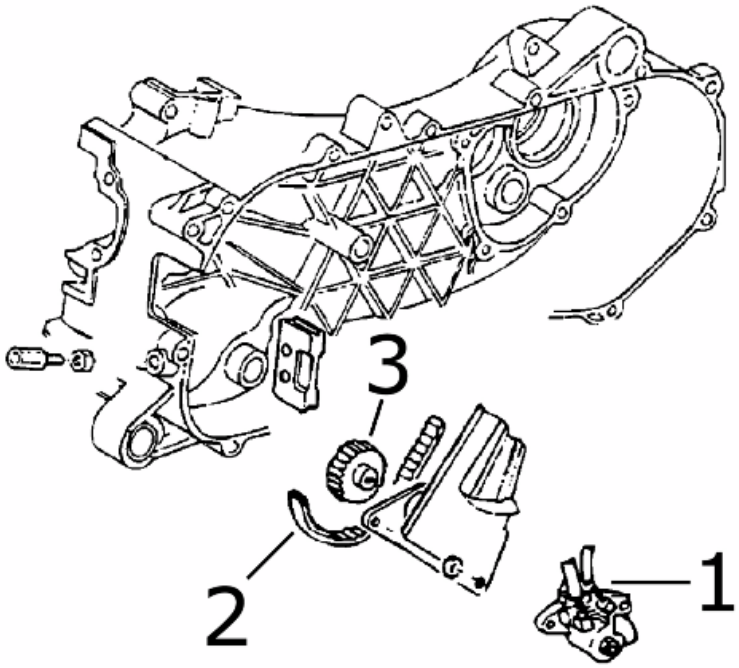
Driven pulley



DRIVEN PULLEY

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

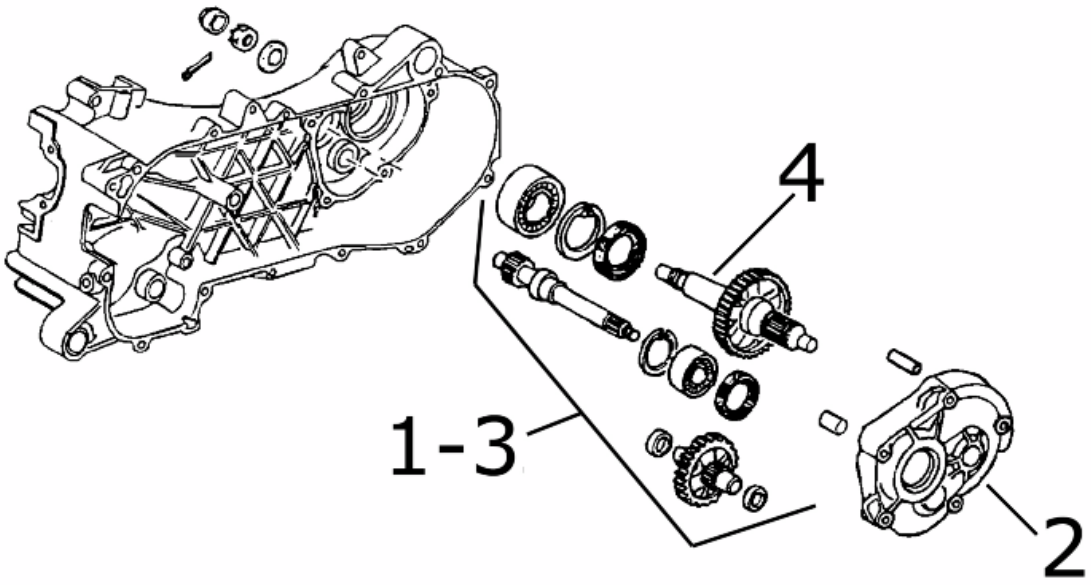
Oil pump



OIL MIX PUMP

	Code	Action	Duration
1	001018	Mixer - Replacement	
2	001019	Mixer belt - replacement	
3	001028	Mix movement gear socket - Replacement	

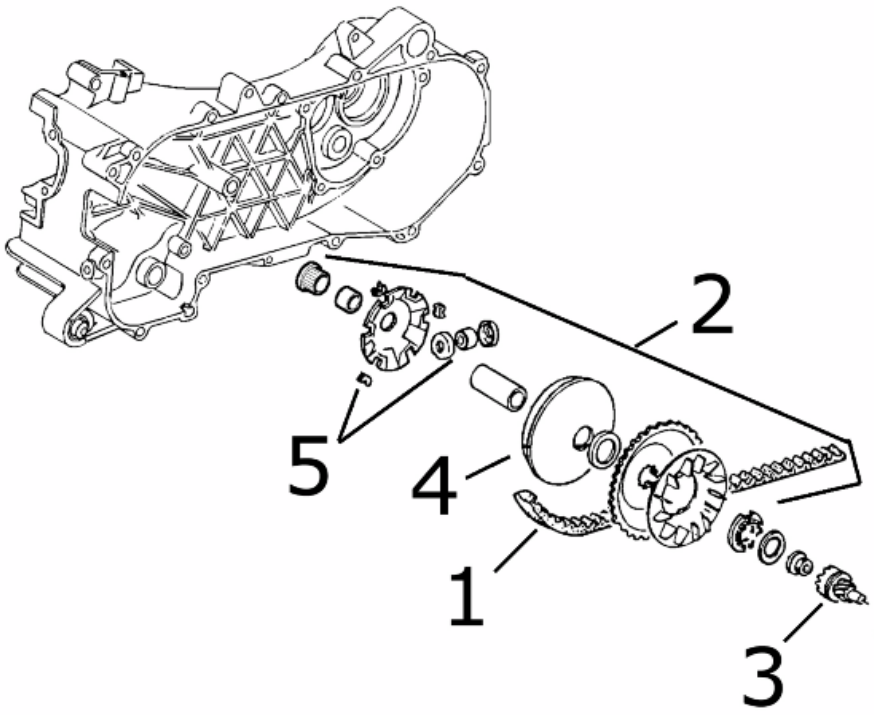
Final gear assy.



FINAL REDUCTION GEAR

	Code	Action	Duration
1	001010	Geared reduction unit - Service	
2	001156	Gear reduction unit cover - Replacement	
3	003065	Gear box oil - Replacement	
4	004125	Rear wheel axle - Replacement	

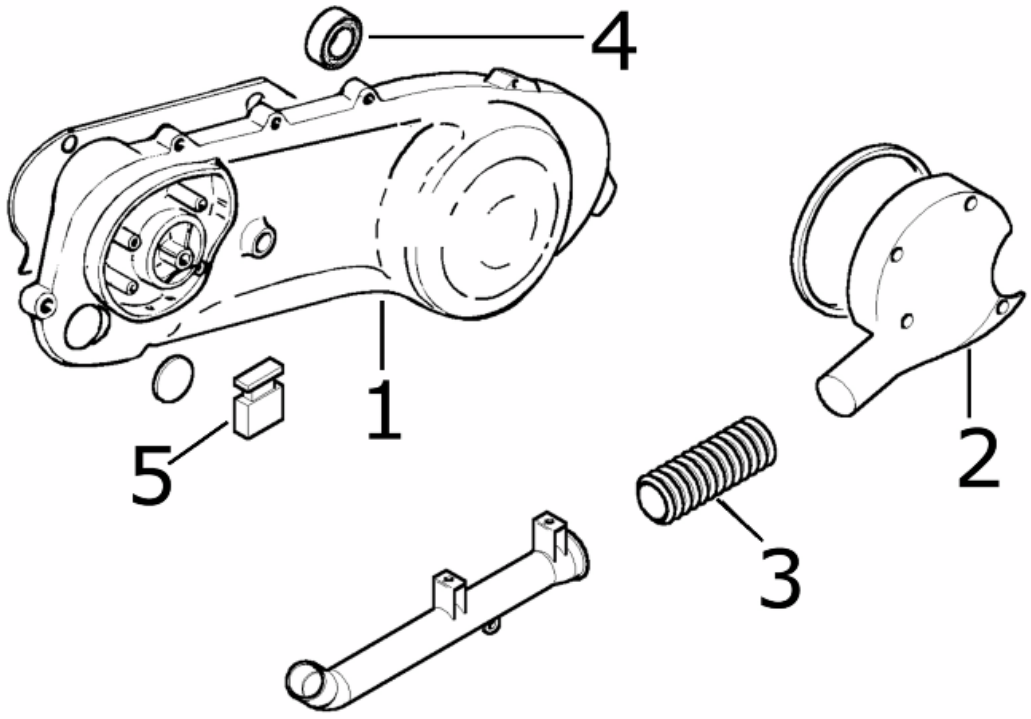
Driving pulley



DRIVING PULLEY

	Code	Action	Duration
1	001011	Driving belt - Replacement	
2	001066	driving pulley - Replacement	
3	001017	Starter sprocket wheel - Replacement	
4	001086	Driving half-pulley - replace	
5	001177	Variator rollers / shoes - Replacement	

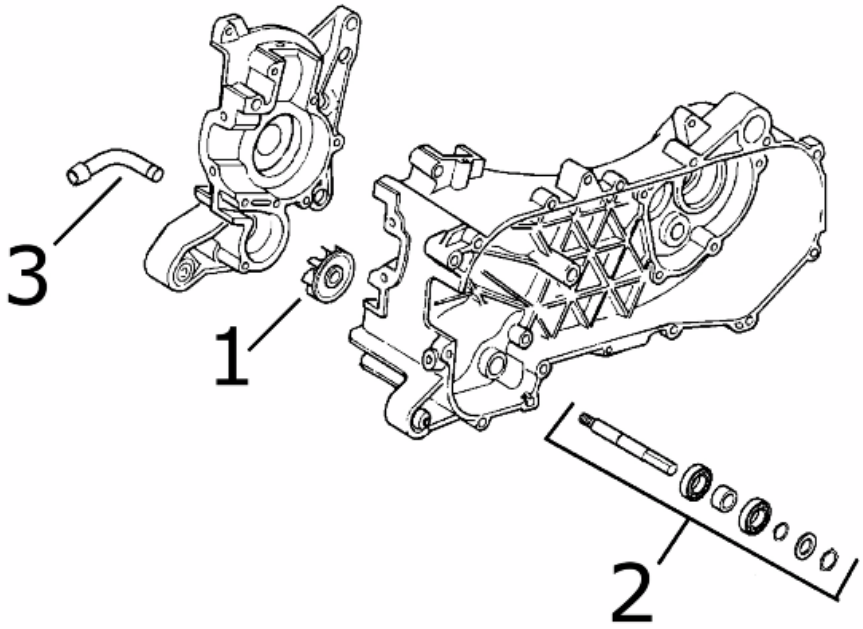
Transmission cover



TRANSMISSION COVER

	Code	Action	Duration
1	001096	Transmission crankcase cover - Replacement	
2	001131	Transmission air intake - Replacement	
3	001132	Transmission air inlet pipe - Replacement	
4	001135	Transmission cover bearing - Replacement	
5	004179	Stand buffer - Replacement	

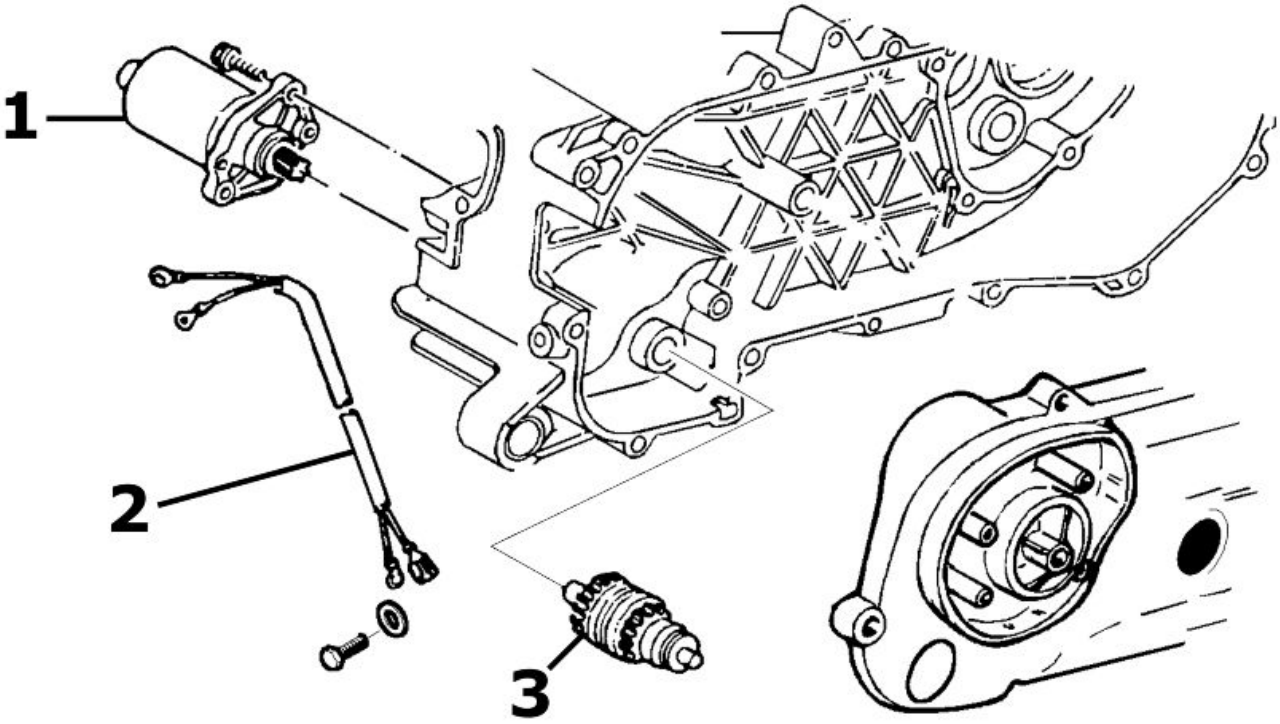
Water pump



WATER PUMP

	Code	Action	Duration
1	001113	Water pump - Replacement	
2	001062	Water pump command shaft - Replacement	
3	007019	Connection water pump pipe / return pipe - Replacement	

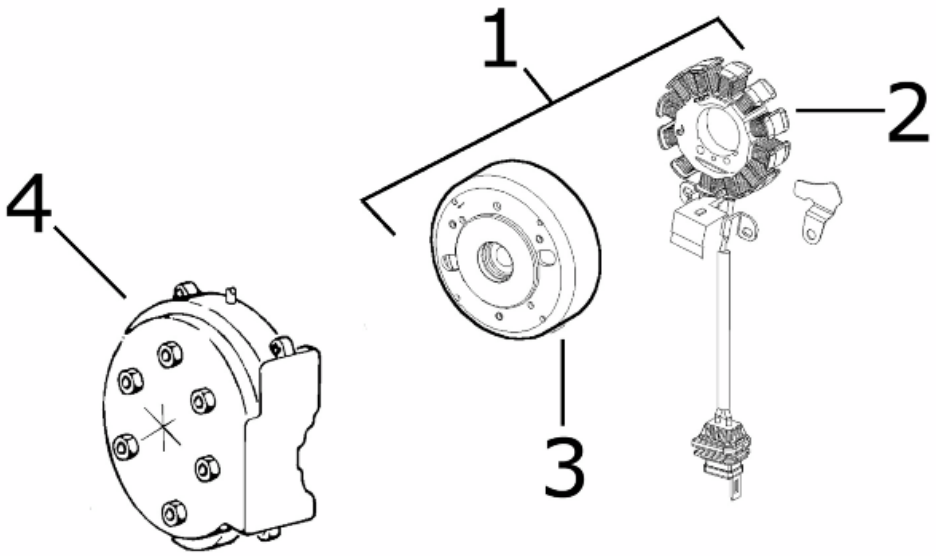
Starter motor



STARTER MOTOR

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

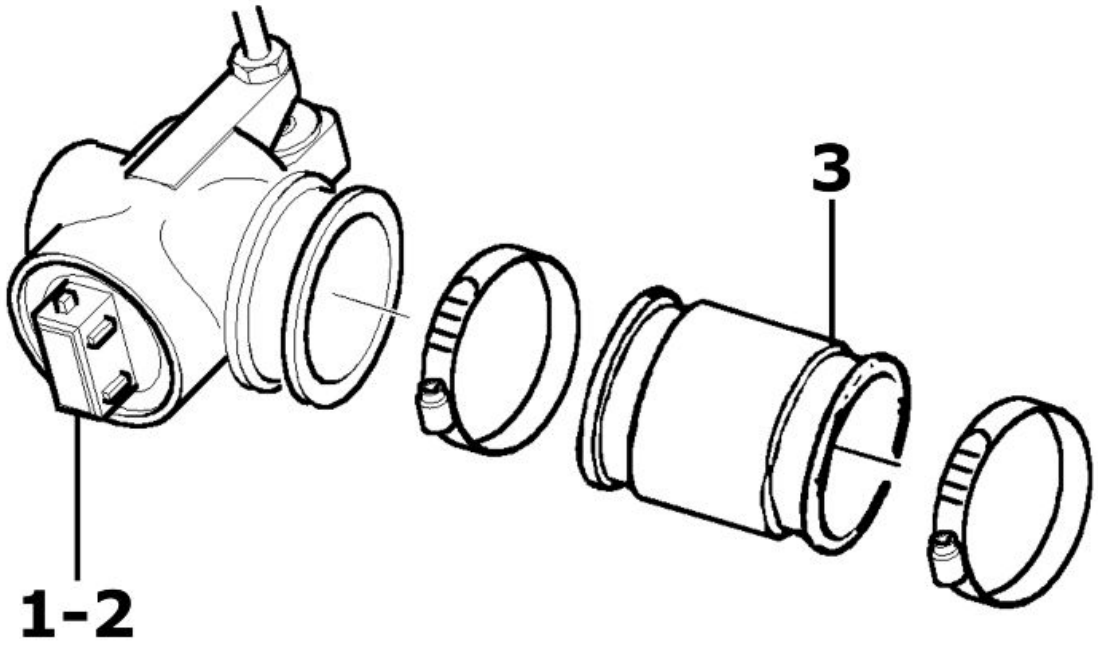
Flywheel magneto



FLYWHEEL MAGNETO

	Code	Action	Duration
1	001058	Flywheel - Replacement	
2	001067	Stator - Replacement	
3	001173	Rotor - Replacement	
4	001087	Flywheel cover - Replacement	

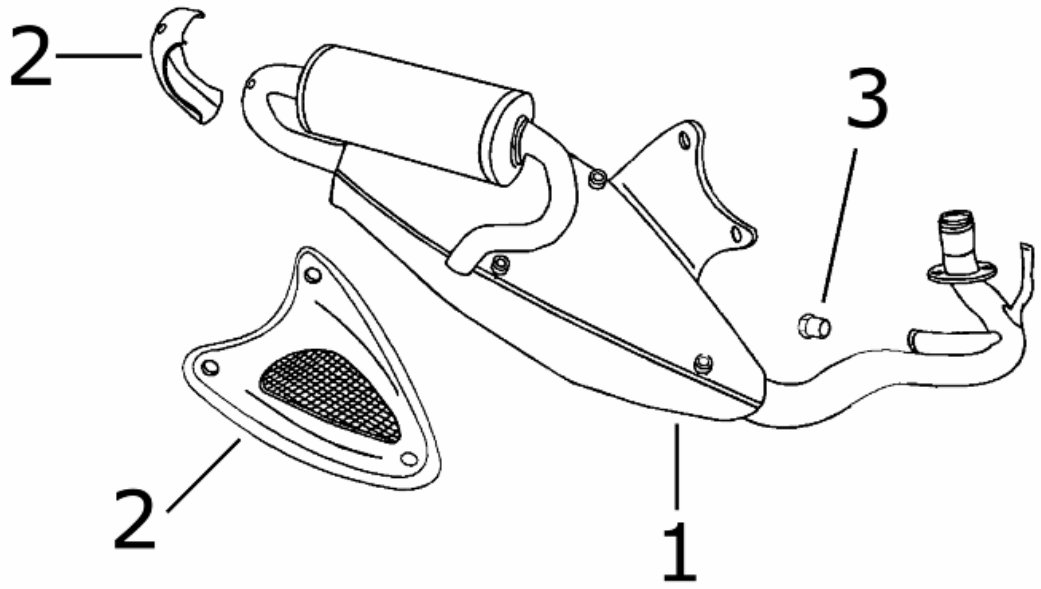
Butterfly valve



THROTTLE BODY

	Code	Action	Duration
1	001166	Throttle body	
2	001171	Throttle body - Overhaul	
3	004122	Air cleaner carburettor fitting - Replacement	

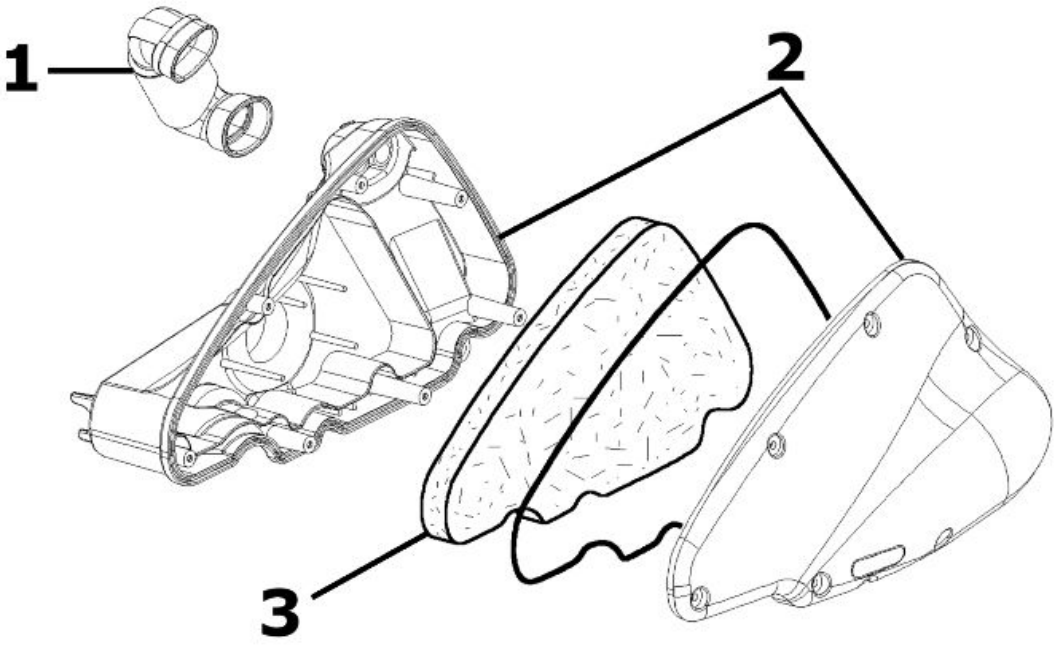
Exhaust pipe



MUFFLER

	Code	Action	Duration
1	001009	Muffler - Replacement	
2	001095	Muffler guard - Replacement	
3	001136	Exhaust emissions - Adjustment	

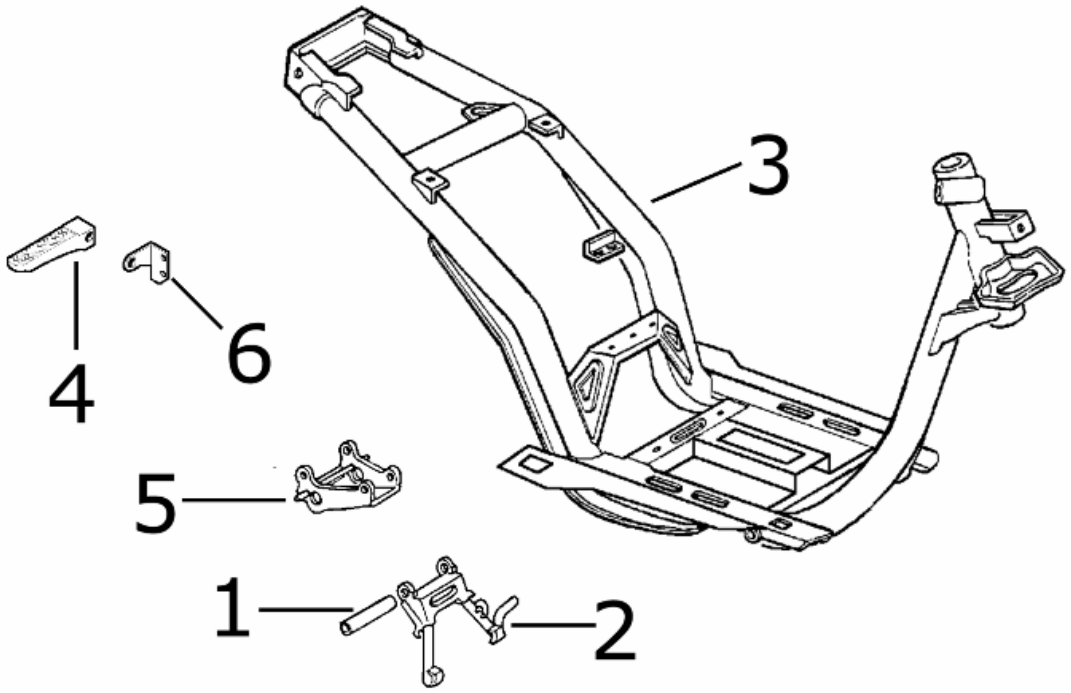
Air cleaner



AIR PURIFIER

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

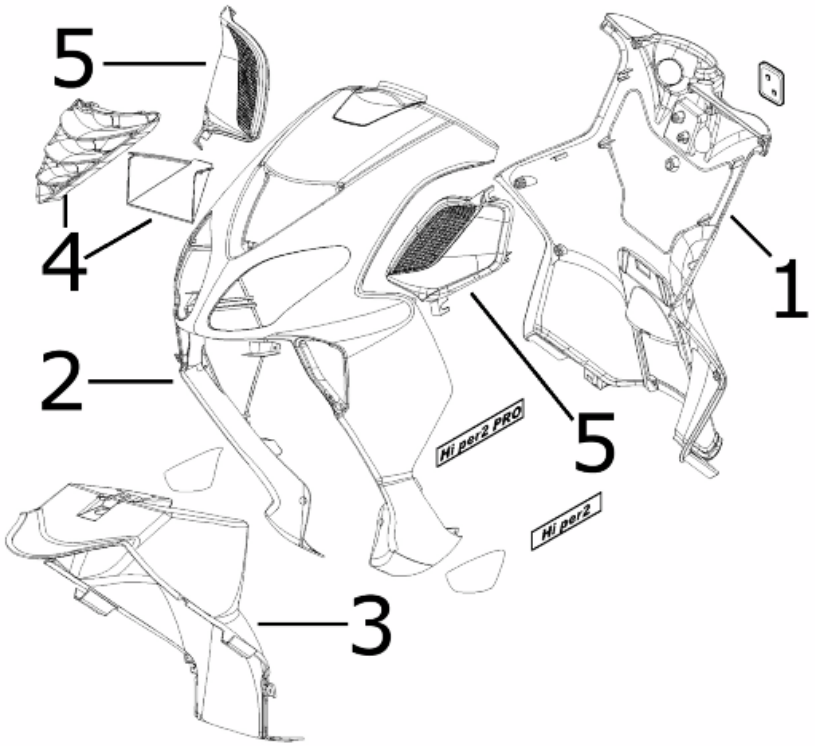
Frame



CHASSIS

	Code	Action	Duration
1	001053	Stand bolt - Replacement	
2	004004	Stand - Replacement	
3	004001	Frame - replace	
4	004015	Footrest - Replacement	
5	004171	Stand support plate - Replacement	
6	004143	Footrest support - replace	

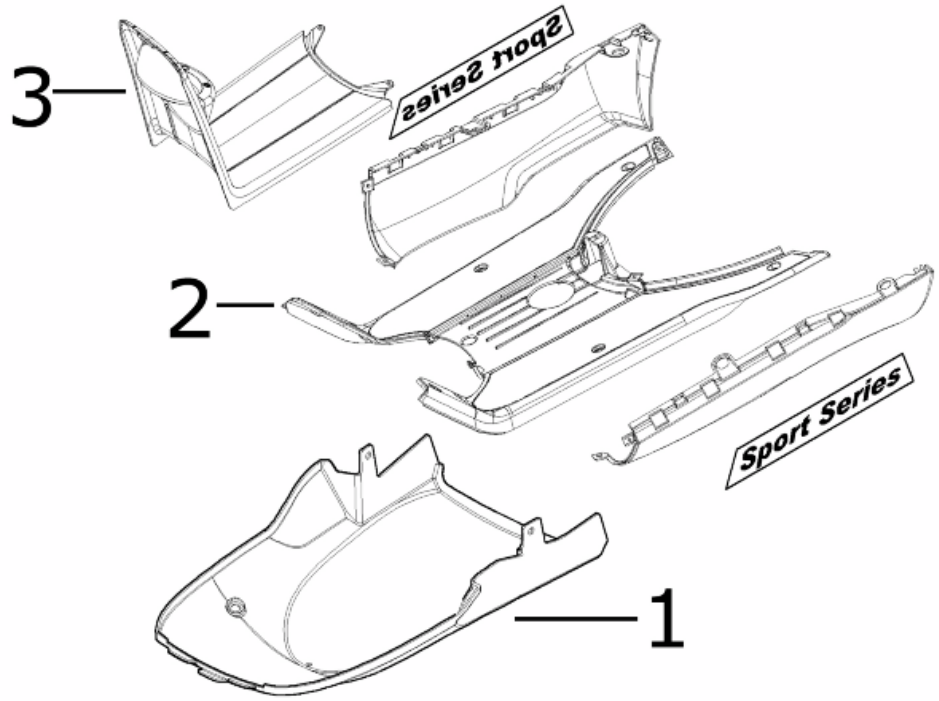
Legshield spoiler



FRONT SHIELD

	Code	Action	Duration
1	004065	Front shield rear section - Replacement	
2	004064	Front shield - Replacement	
3	003087	Wheel housing - Replacement	
4	004167	Grill / radiator cover - Replacement	
5	004176	Air vent - Replacement	

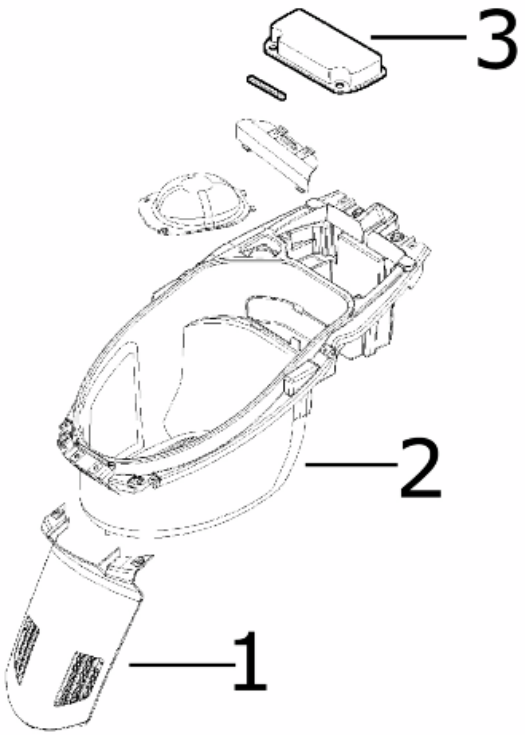
Side fairings



CENTRAL COVER

	Code	Action	Duration
1	004053	Spoiler - Replacement	
2	004178	Footrest - Replacement	
3	004011	Central chassis cover - Replacement	

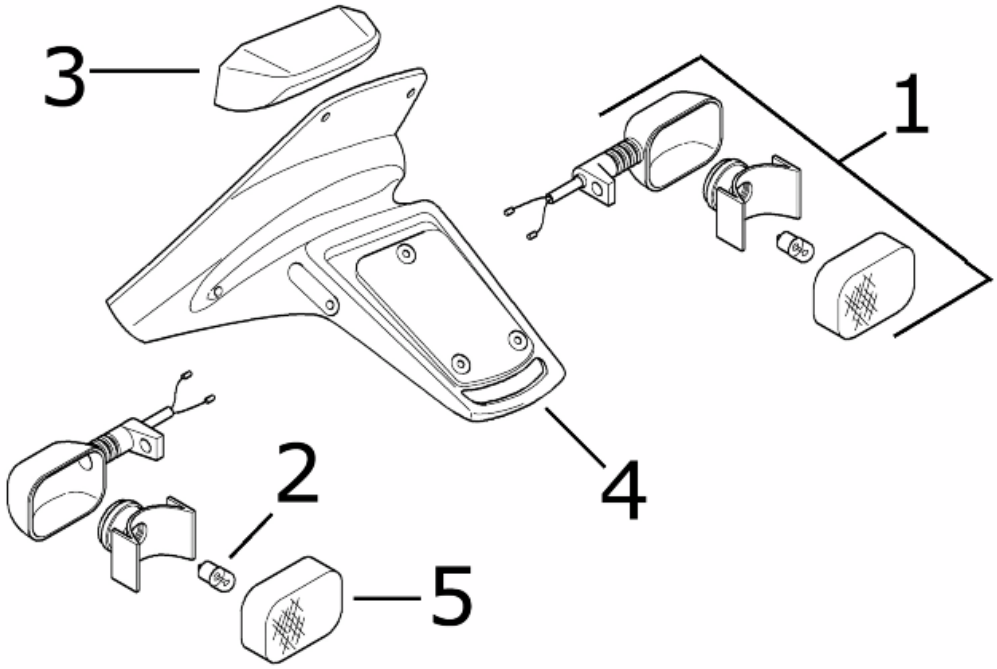
Underseat compartment



HELMET COMPARTMENT

	Code	Action	Duration
1	004059	Spark plug inspection flap - Replacement	
2	004016	Helmet compartment - Replacement	
3	005046	Battery cover - change	

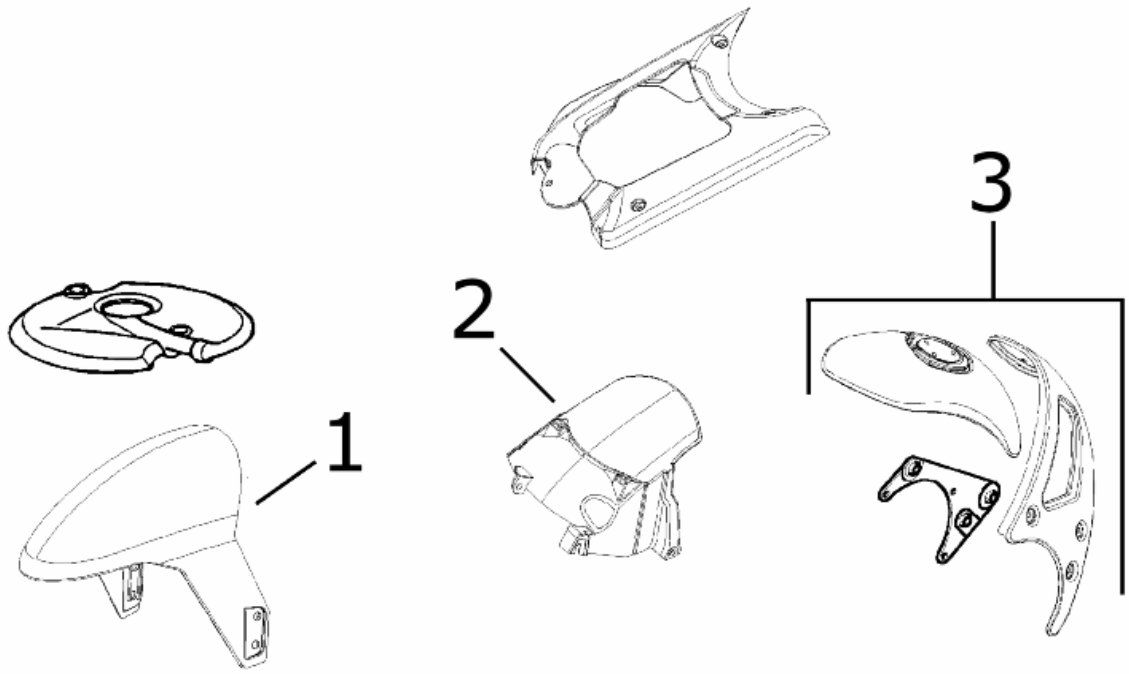
Plate holder



LICENSE PLATE HOLDER

	Code	Action	Duration
1	005022	Rear turn indicators - Replacement	
2	005068	Rear turn indicator bulb - Replacement	
3	005005	Taillight - Replacement	
4	005023	Rear tail light support - Replacement	
5	005091	Turn indicator glass - Replacement	

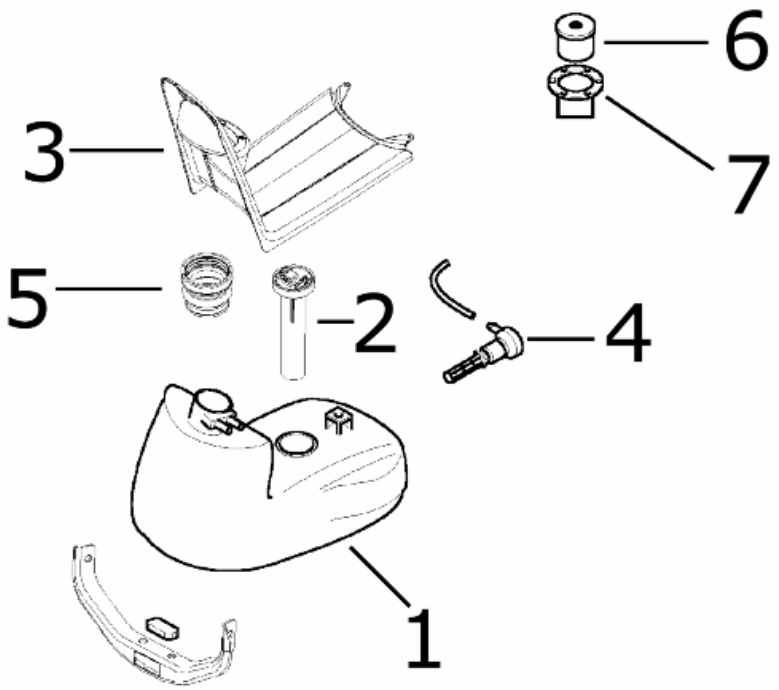
Mudguard



MUDGUARDS

	Code	Action	Duration
1	004009	Rear mudguard - Replacement	
2	004052	Bumper - Replacement	
3	004002	Front mudguard - Replacement	

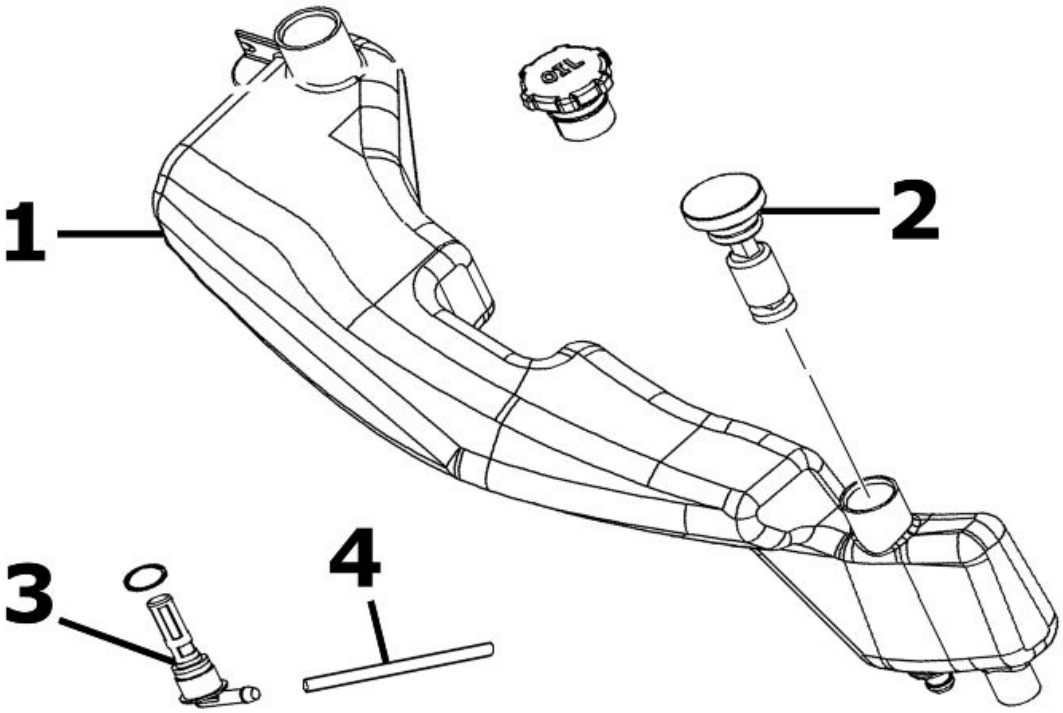
Fuel tank



FUEL TANK

	Code	Action	Duration
1	004005	Fuel tank - Replacement	
2	005010	Tank float - Replacement	
3	004011	Central chassis cover - Replacement	
4	004072	Fuel filter - Replacement	
5	004110	Fuel tank hose - Replacement	
6	004168	Fuel tank cap - Replacement	
7	004170	Tank filler neck - Replacement	

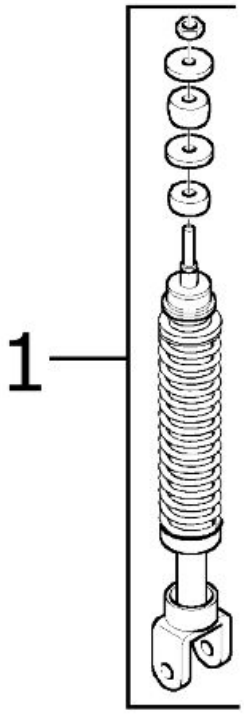
Tank oil



OIL TANK

	Code	Action	Duration
1	004017	Oil reservoir - Replacement	
2	005018	Oil reservoir float - Replacement	
3	004095	Oil reservoir cock - Replacement	
4	004091	Oil reservoir hose - Replacement	

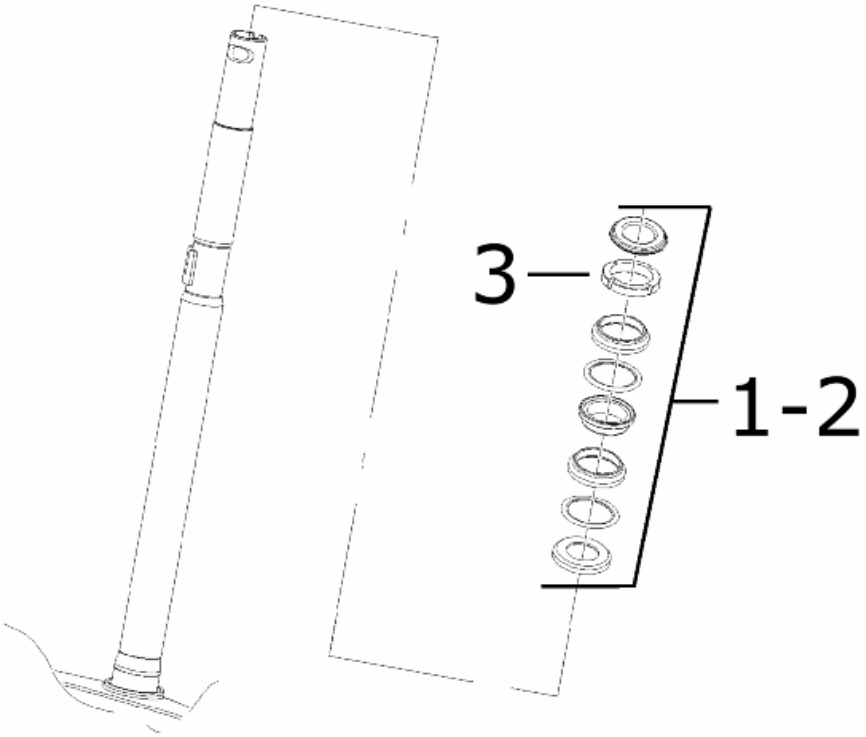
Rear shock-absorber



REAR SHOCK ABSORBER

	Code	Action	Duration
1	003007	Rear shock absorbers - Replacement	

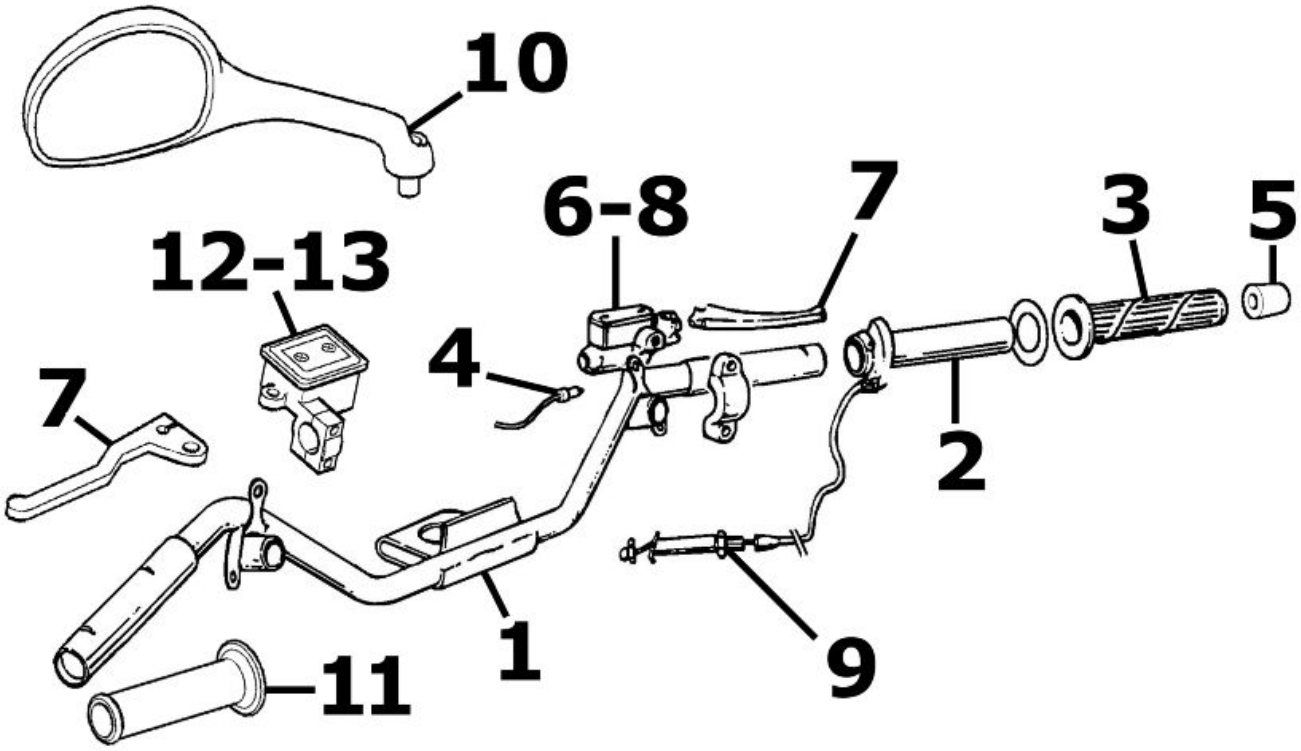
Steering column bearings



STEERING FIFTH WHEELS

	Code	Action	Duration
1	003002	Steering fifth wheel - Replacement	
2	003073	Steering clearance - Adjustment	
3	004119	Bearing / upper steering fifth wheel - Replacement	

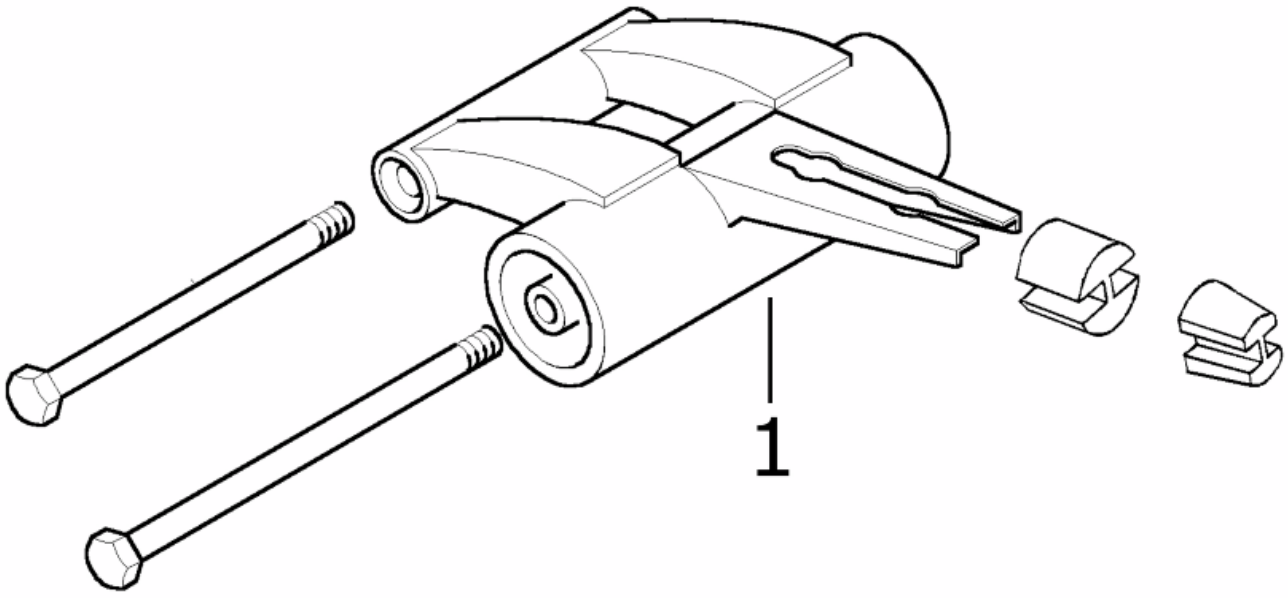
Handlebar components



HANDLEBAR COMPONENTS

	Code	Action	Duration
1	003001	Handlebar - Replacement	
2	002060	Complete throttle control - Replacement	
3	002059	Right hand grip - Replacement	
4	005017	Stop switch - Replacement	
5	003059	Counterweight - Replacement	
6	002024	Front brake pump - replace	
7	002037	Brake or clutch lever - Replacement	
8	002047	Front brake fluid and air bleeding system - Replacement	
9	003061	Accelerator transmission - Adjustment	
10	004066	Driving mirror - Replacement	
11	002071	Left hand grip - Replacement	
12	002067	Rear brake pump - Replacement	
13	002080	Rear brake oil bleeding system - Replacement	

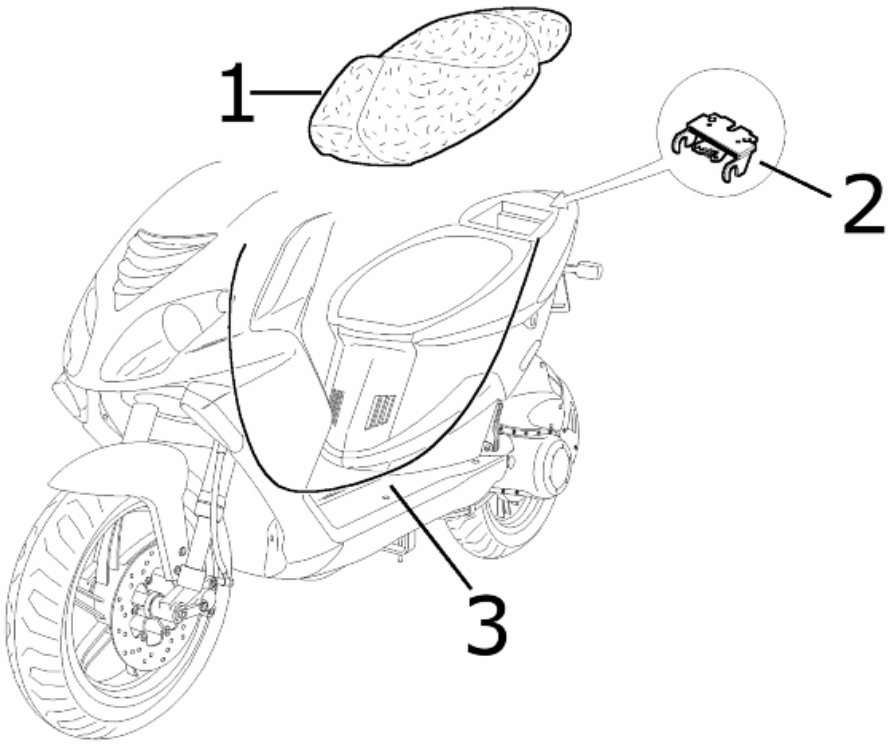
Swing-arm



SWINGING ARM

	Code	Action	Duration
1	001072	Engine / frame swinging arm fitting - Replacement	

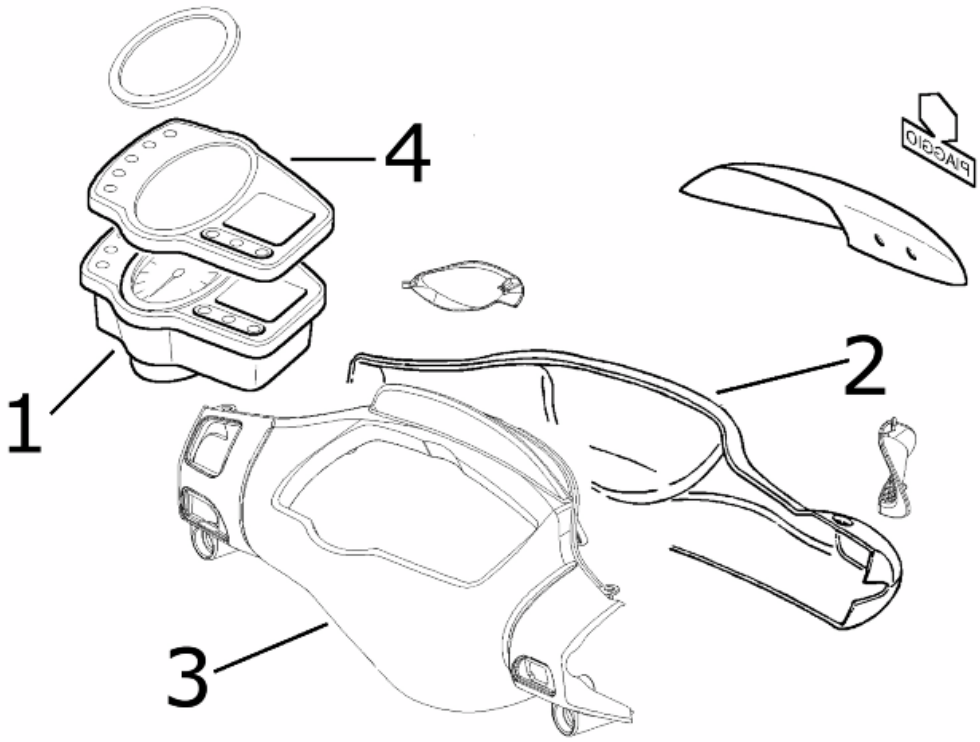
Seat



SEAT

	Code	Action	Duration
1	004003	Saddle - Replacement	
2	004054	Seat lock hook - Replacement	
3	002083	Saddle opening transmission - Replacement	

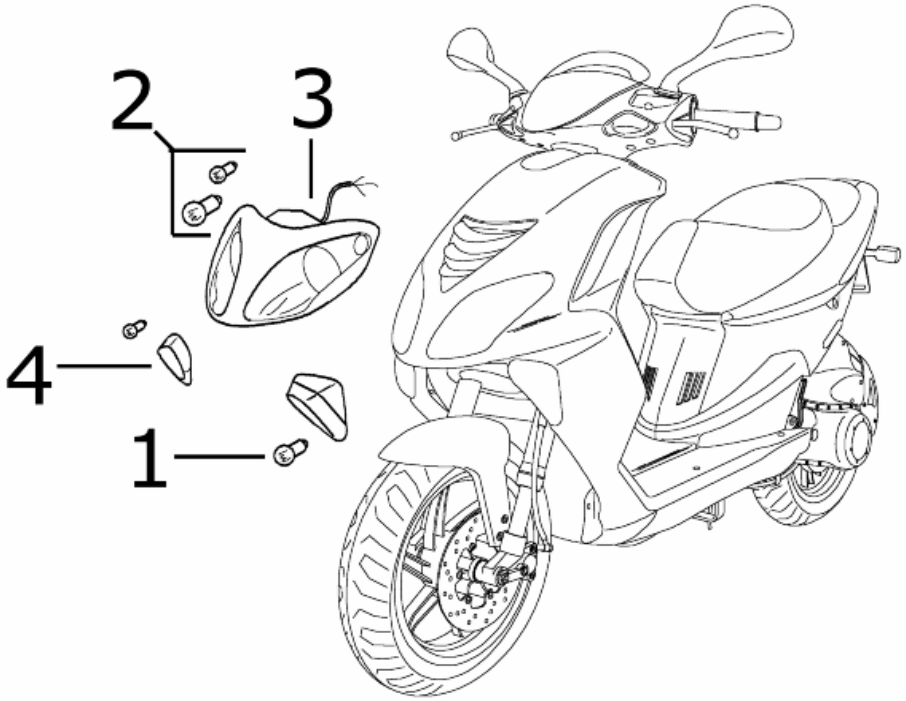
Instrument panel



INSTRUMENT UNIT AND HANDLEBAR COVER

	Code	Action	Duration
1	005014	Odometer - Replacement	
2	004018	Handlebar front section - Replacement	
3	004019	Handlebar rear section - Replacement	
4	005078	Odometer glass - Replacement	

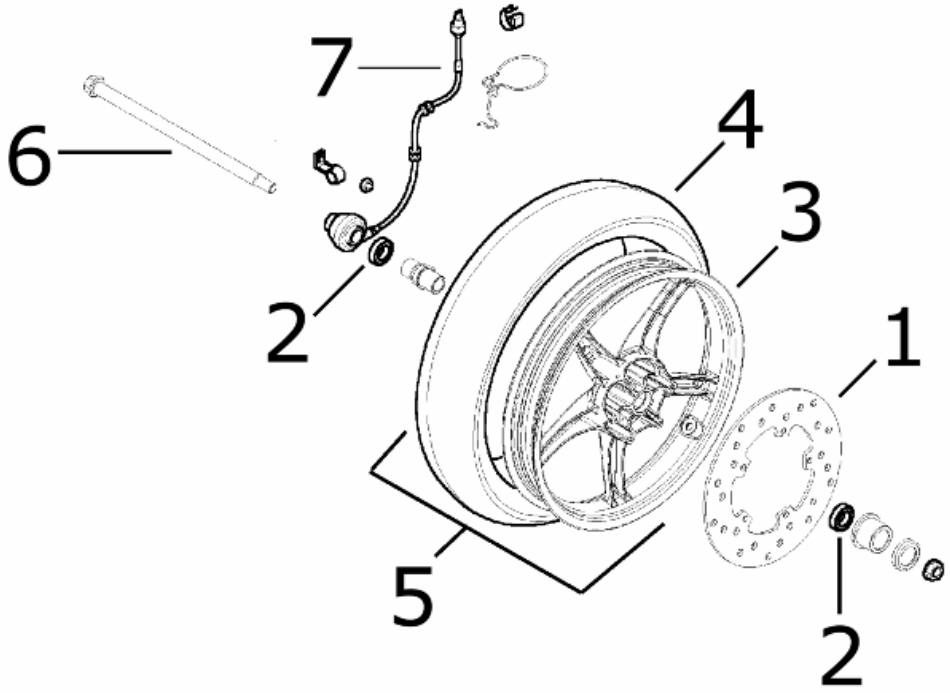
Turn signal lights



FRONT LIGHT

	Code	Action	Duration
1	005067	Front turn indicator bulb - Replacement	
2	005008	Front headlamp bulbs - Replacement	
3	005002	Front headlamp - change	
4	005012	Front turn indicator - Replacement	

Front wheel



FRONT WHEEL

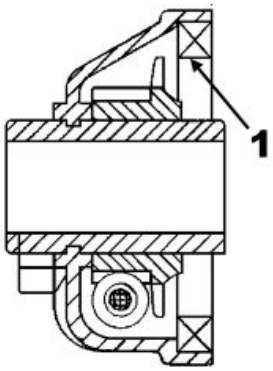
	Code	Action	Duration
1	002041	Front brake disc - Replacement	
2	003040	Front wheel bearings - Replacement	
3	003037	Front wheel rim- Replacement	
4	003047	Front tyre - Replacement	
5	004123	Front wheel - Replacement	
6	003038	Front wheel axle - Replacement	
7	005089	Tone wheel - Replacement	

Grease tone wheel or drive

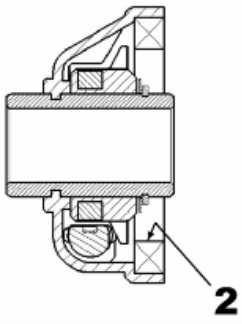
Please take note that the code has been introduced:

900001 - Tone wheel / drive greasing - 15'.

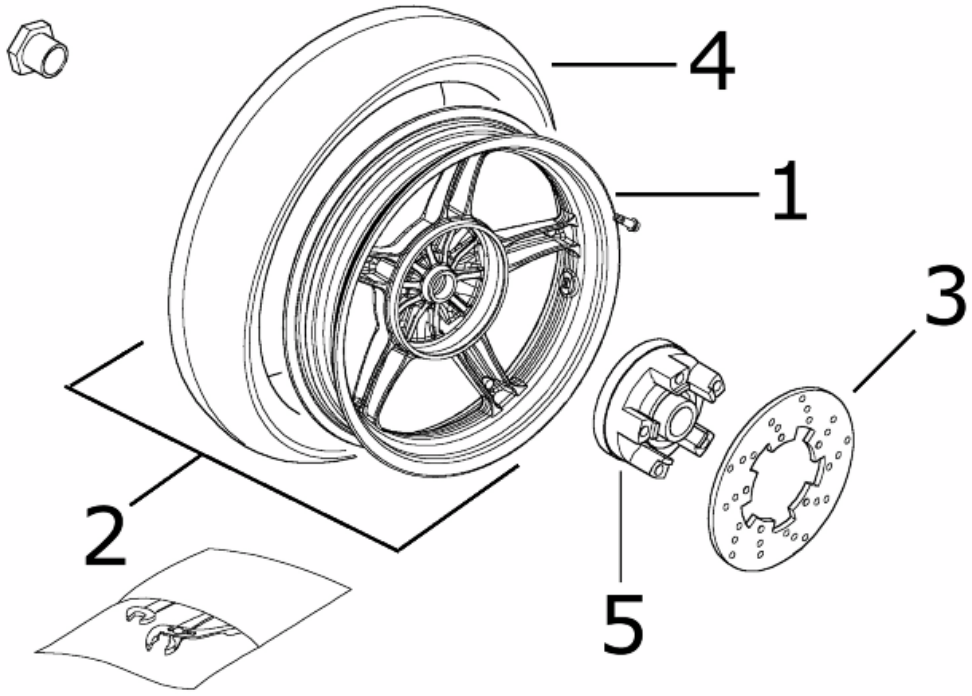
Never mistake the codes 002011 (movement sensor replacement) and 005089 (tone wheel replacement) in the event of noise of the indicated components. The grease recommended is TUTELA MRM 2 (soap-based lithium grease with Molybdenum disulphide).



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



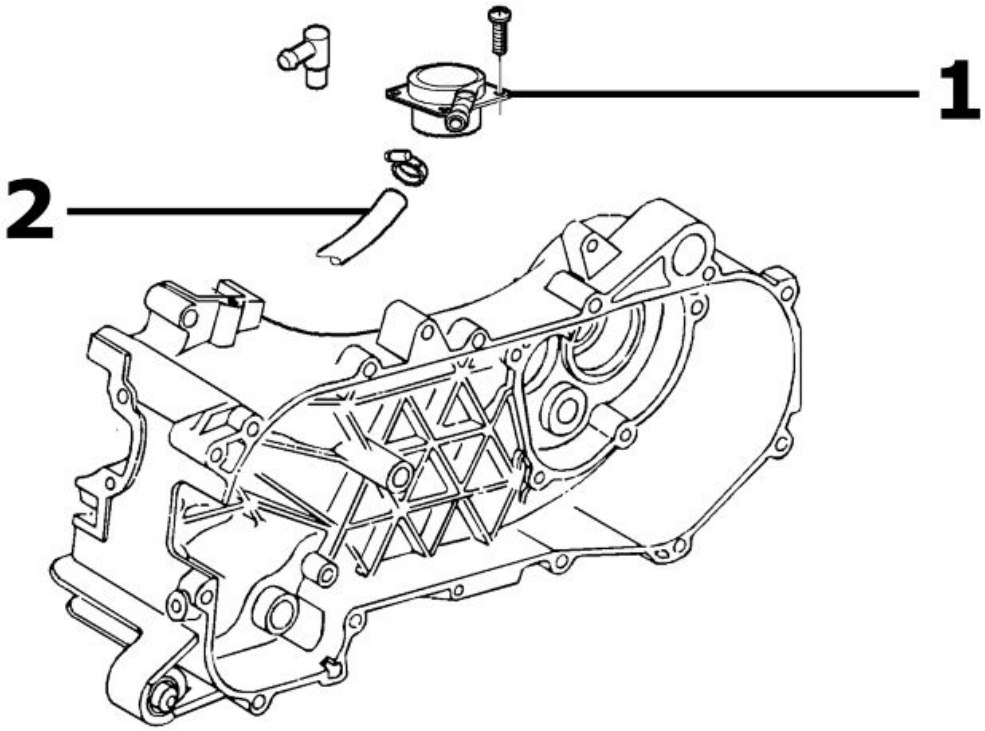
Rear wheel



REAR WHEEL

	Code	Action	Duration
1	001071	Rear wheel rim - replace	
2	001016	Rear wheel - Replacement	
3	002070	Rear brake disc - Replacement	
4	004126	Rear wheel tyre - Replacement	
5	002028	Rear wheel hub - Replacement	

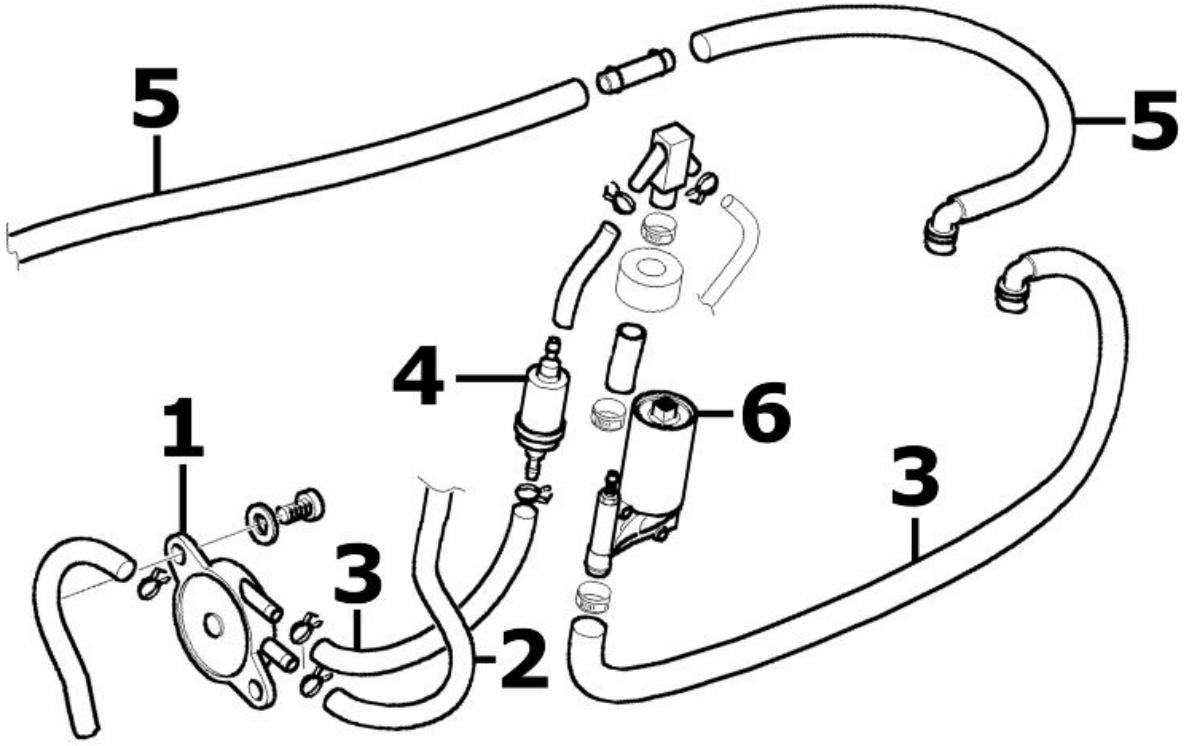
compressore aria



AIR COMPRESSOR

	Code	Action	Duration
1	001168	Air compressor - Replacement	
2	004160	Compressed air hose - Replacement	

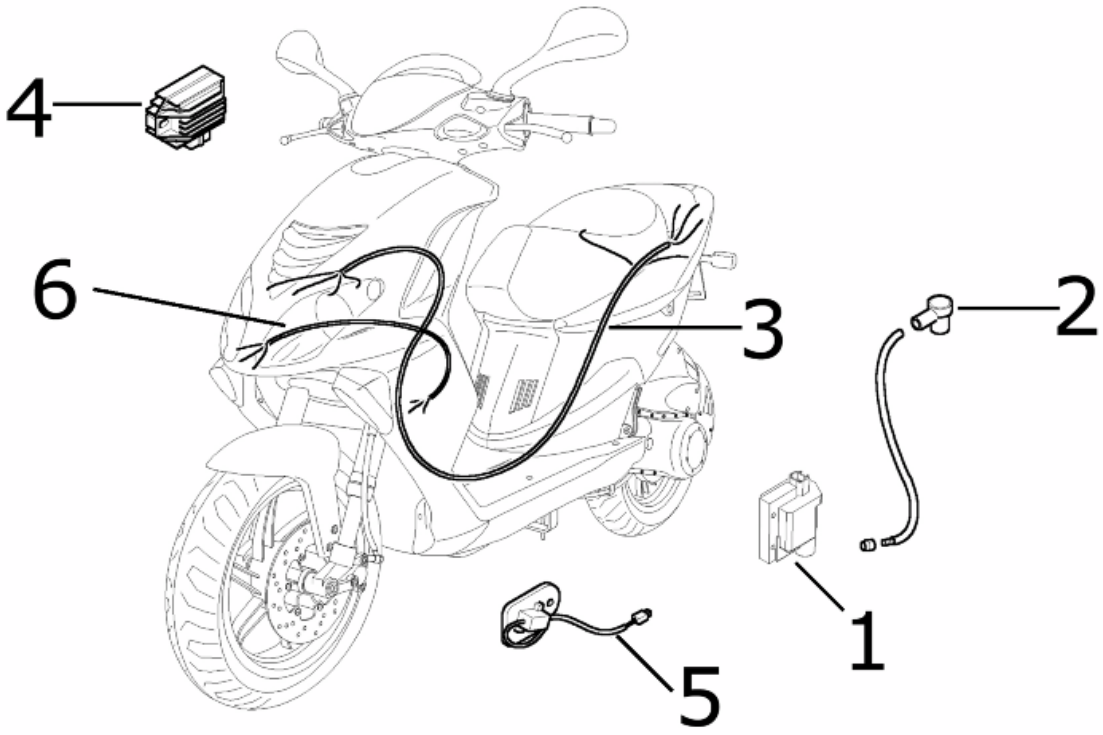
Fuel pump



FUEL PUMP

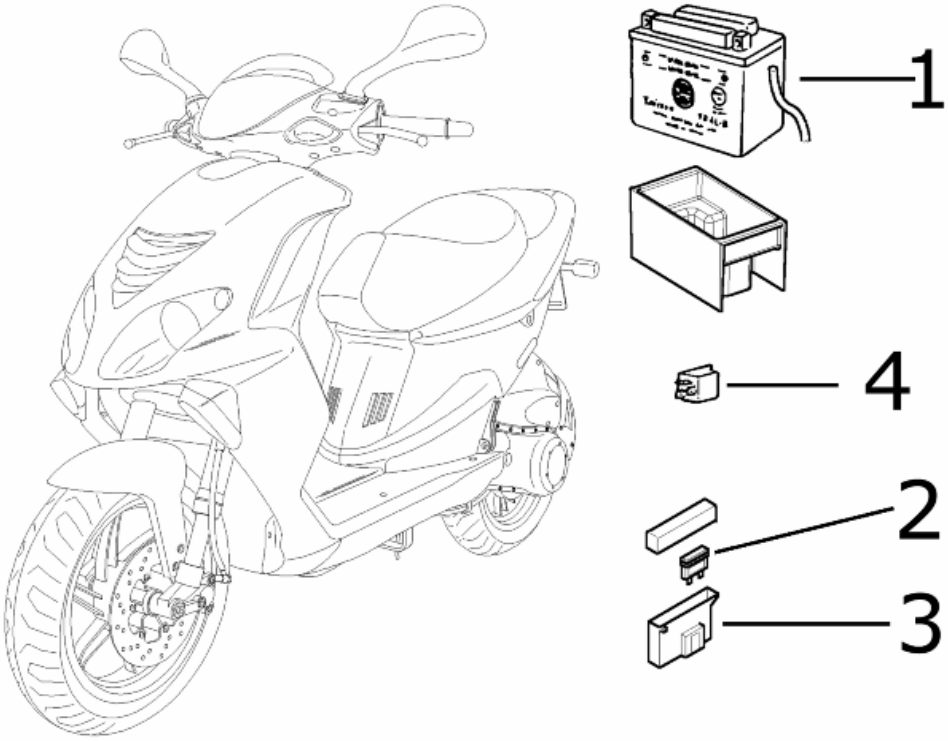
	Code	Action	Duration
1	004073	Fuel pump - Replacement	
2	004137	Injector pump pipe - Replacement	
3	004086	Petrol pump depression tube - Replacement	
4	004072	Fuel filter - Replacement	
5	004138	Fuel reverse pipe - Replacement	
6	001048	Injection pump - Replace	

Electric devices



ELECTRICS

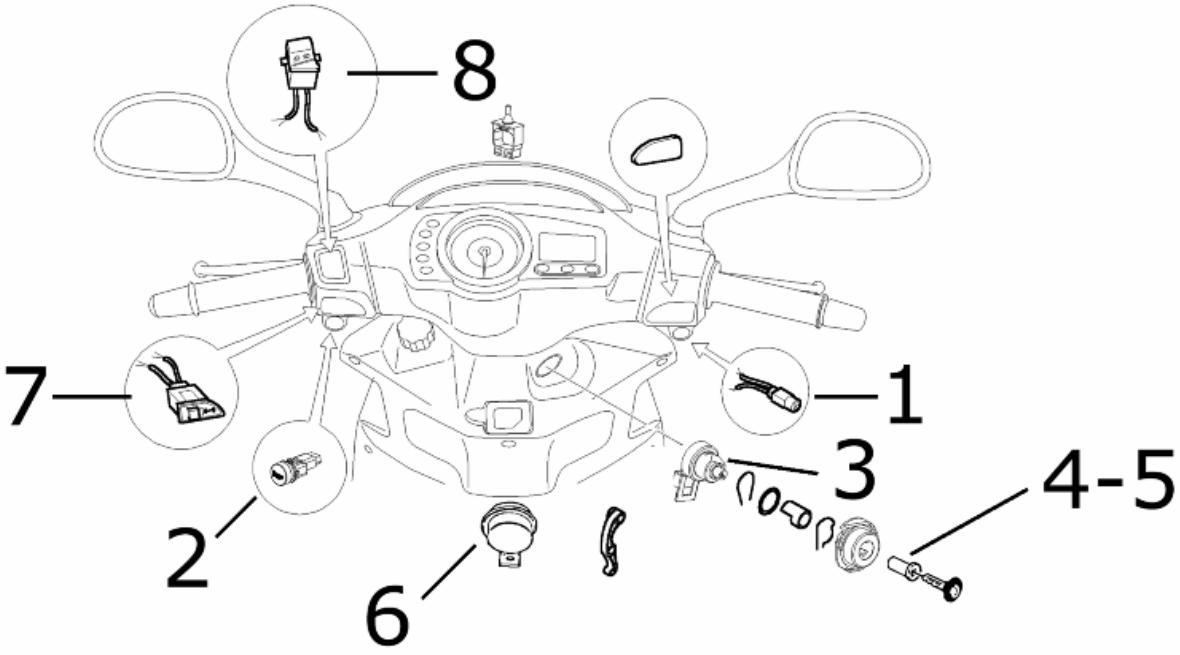
	Code	Action	Duration
1	001023	Control unit - Replacement	
2	001094	Spark plug cap - Replacement	
3	005001	Electrical system - Replacement	
4	005009	Voltage regulator - replace	
5	005136	Resistance - Replacement	
6	005044	Front lights cable unit- Replacement	



BATTERY

	Code	Action	Duration
1	005007	Battery - Replacement	
2	005024	Battery fuse - Replacement	
3	005025	Fuse holder - Replacement	
4	005011	Start-up remote control switch - Replacement	

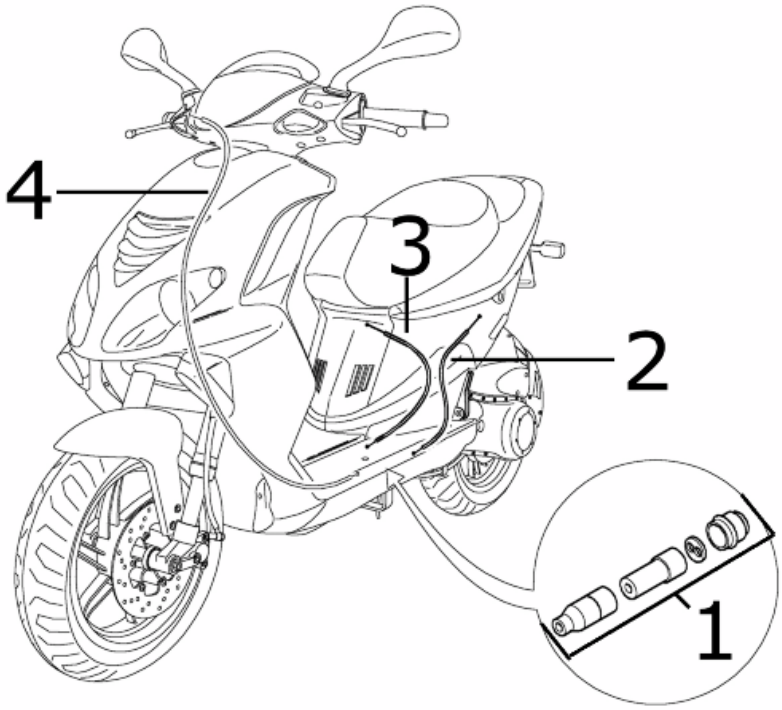
Electronic controls



ELECTRICAL COMMANDS

	Code	Action	Duration
1	005041	Starter button - Replacement	
2	005040	Horn button - Replacement	
3	005016	Key switch - Replacement	
4	004096	Lock series - Replacement	
5	004010	Antitheft lock - replace	
6	005003	Horn - Replacement	
7	005006	Light switch or turn indicators - Replacement	
8	005039	Headlight switch - replace	

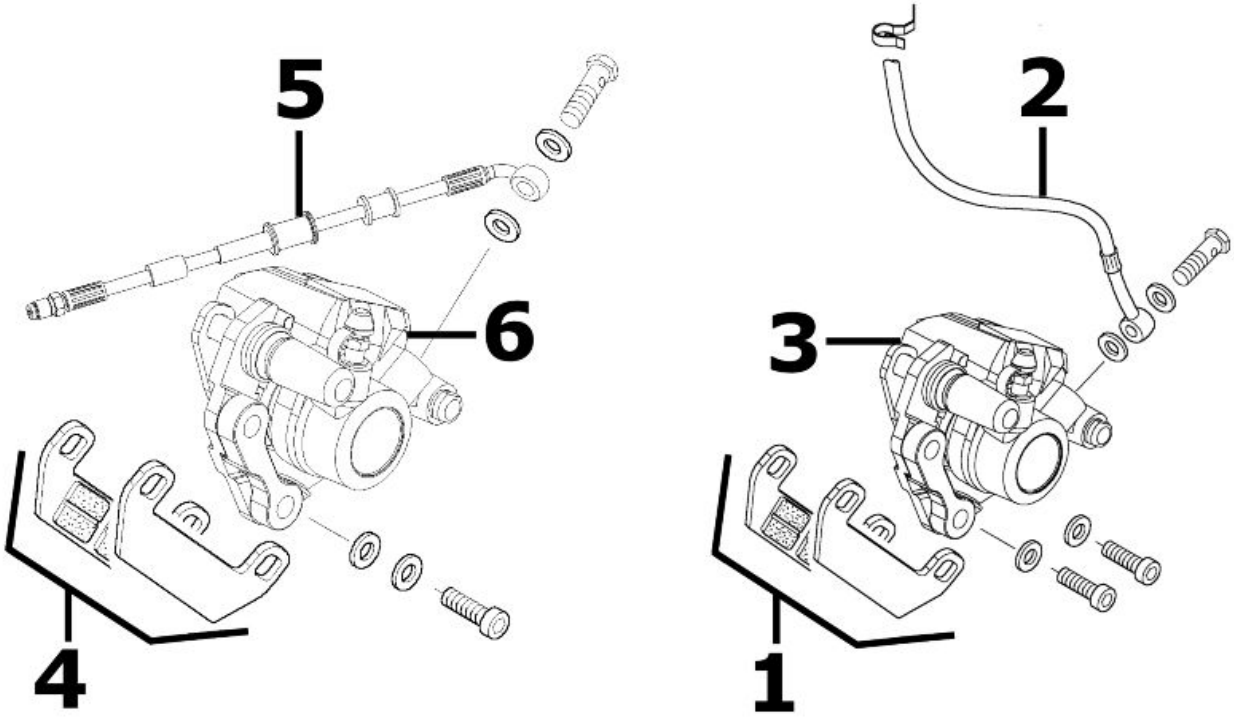
Transmissions



SPLITTER

	Code	Action	Duration
1	002012	Splitter - Replacement	
2	002058	Mix / splitter transmission complete - Replacement	
3	002057	Carburettor / splitter transmission complete - Replacement	
4	002054	Throttle or splitter transmission complete - Replacement	

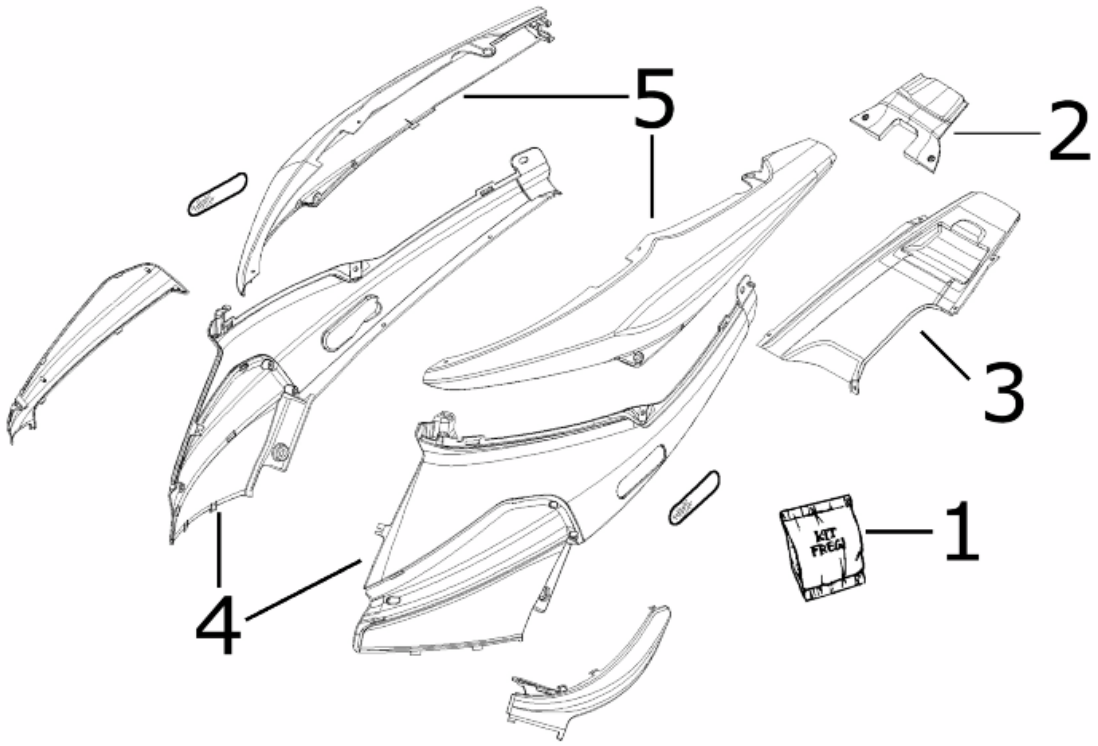
Brake callipers



BRAKE CALLIPERS

	Code	Action	Duration
1	002007	Front brake pads - Replacement	
2	002021	Front brake piping - Replacement	
3	002039	Front brake calliper - Replacement	
4	002002	Rear brake pads - Replacement	
5	002020	Rear brake disc piping - Replacement	
6	002048	Rear brake calliper - Replacement	

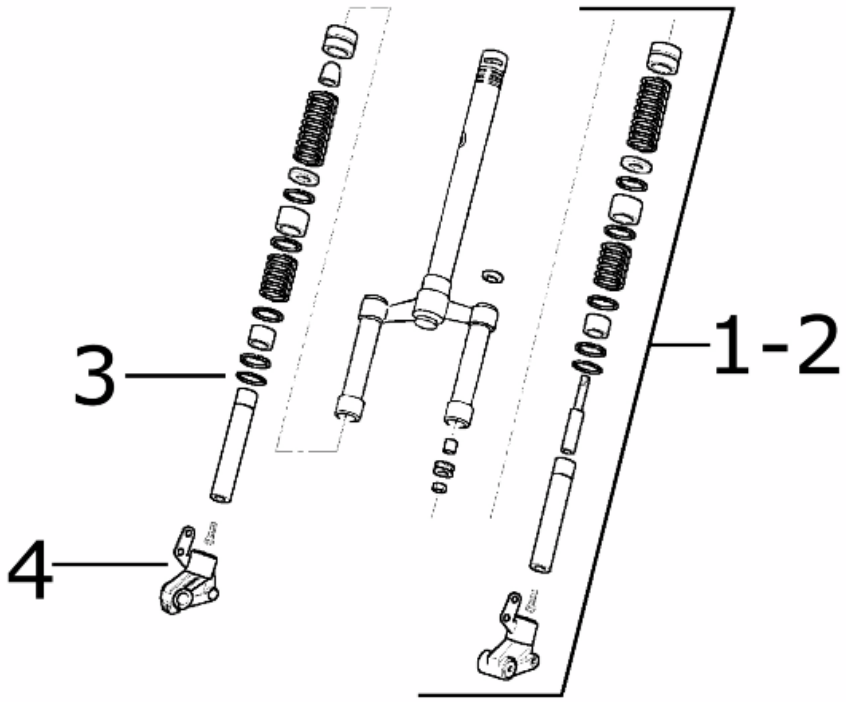
Rear side fairings



REAR COVERS

	Code	Action	Duration
1	004159	Plates / Stickers - Replacement	
2	004056	Upper rear light cover - Replacement	
3	004036	Lower chassis cover - Replacement	
4	004085	Fairing (1) - Replacement	
5	004129	Rear fairing - Replacement	

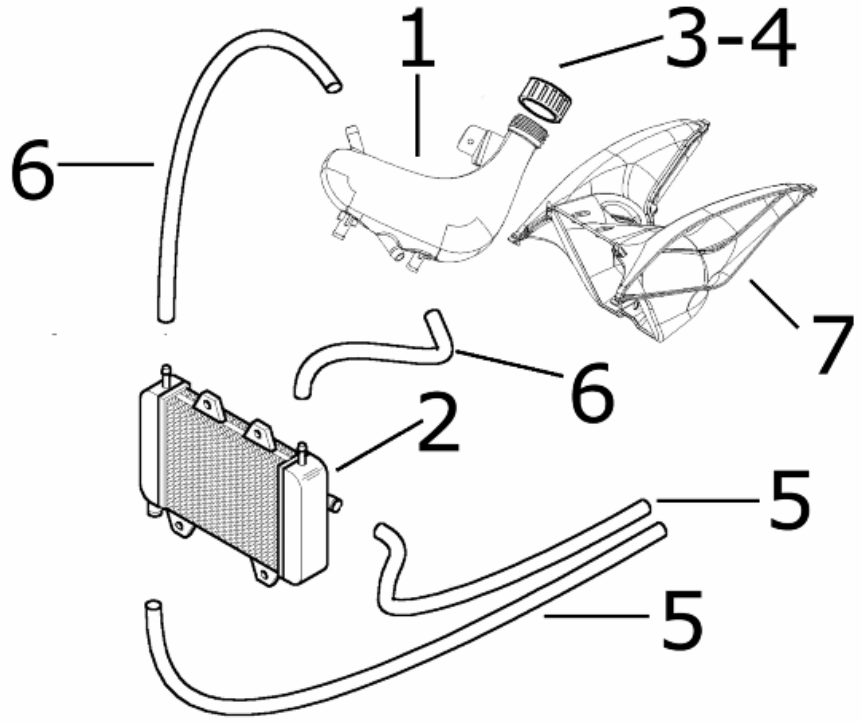
Front suspension



FORK

	Code	Action	Duration
1	003010	Front suspension - Service	
2	003051	Complete fork - replace	
3	003048	Fork oil seal - Replacement	
4	003041	Fork stanchion - Replacement	

Cooling system



COOLING SYSTEM

	Code	Action	Duration
1	007001	Expansion tank - Replacement	
2	007002	Water cooler - Replacement	
3	001052	Coolant and air bleed - Replacement	
4	007024	Expansion tank cap - Replacement	
5	007013	Expansion tank / radiator connecting hose - Replacement	
6	007003	Delivery line and coolant return - Replacement	
7	001170	Air duct - Replacement	