



PIAGGIO®

WORKSHOP MANUAL

633265



NRG Power Purejet



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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

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INDEX OF TOPICS

CHARACTERISTICS

CHAR

Rules

This section describes general safety rules for any interventions to be performed on the vehicle.

Safety rules

- Should it be necessary to keep the engine running while servicing, make sure that the area or room is well ventilated, and use special exhaust fans, if required. Never let the engine running in closed rooms. In fact, exhaust gases are toxic.
 - The battery electrolyte contains sulphuric acid. Protect your eyes, cloths and skin. Sulphuric acid is highly corrosive; in the event of contact with your eyes or clothes, rinse thoroughly with water and consult a doctor immediately.
 - The battery produces hydrogen, a gas that can be highly explosive. Do not smoke and avoid sparks and flames when close to the battery, especially during recharge.
 - Fuel is highly flammable, and in some conditions it can be explosive. Do not smoke in the working area, and avoid free flames or sparks.
 - Clean the brake pads in a well ventilated environment, directing the compressed air jet so as to not intake the dust produced by the wear of the friction material. Even though the latter contains no asbestos, dust inhalation is harmful.
-

Safety 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 specific tools designed for this vehicle.
 - Always use new gaskets, sealing rings and split pins upon reassembly.
 - After removal, clean the components using non-flammable or low fire-point solvent. Lubricate all working surfaces before reassembly, except for conical couplings.
 - After reassembly, check that all components have been installed properly and that they are in good working order.
 - For removal, overhaul and reassembly operations use only tools provided with metric measures. Metric bolts, nuts and screws are not interchangeable with coupling members with English measurement. Using improper coupling members and tools may impair the vehicle.
 - Should any interventions to the vehicle electric system be required, check that the electrical connections - especially earth and battery connections - have been implemented properly.
-

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
Displacement	49,40 cm ³
Compression ratio	9,4÷10,4:1
Throttle body	BING Ø18mm
Engine idle	1800 ÷ 2000 g/min.
Air filter	Sponge, impregnated with mixture (50% Selenia Air Filter Oil and 50% lead-free fuel).
Starter system	starter motor/kick-start.
Cooling system	forced air
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
TRANSMISSIONS

Specification	Desc./Quantity
Transmission	Expanding pulley type automatic speed variator with vee belt, automatic clutch and gear final drive.

Capacities
CAPACITIES

Specification	Desc./Quantity
Rear hub oil	Quantity: ~75cc
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 lead (before dead centre point)	Variable (integrated with injection)
Recommended spark plug type	CHAMPION RG6YCA
Battery 12V-9Ah	
Main fuse	20A
Generator	Three phase AC

Frame and suspensions
FRAME AND SUSPENSIONS

Specification	Desc./Quantity
Type	Welded steel pipes with pressed sheet metal stiffening
Front suspension	Upside-down telescopic hydraulic fork
Front suspension travel	75 mm
Rear suspension	with coil spring and coaxial hydraulic shock absorber. Swinging arm engine/frame coupling.

Brakes**BRAKES**

Specification	Desc./Quantity
Front brake	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
Top steering ring-nut (safety torque)	35÷40 N·m
Lower steering ring-nut (safety torque)	8÷10 N·m
Handlebars fixing bolt (safety torque)	45÷50 N·m

FRAME ASSEMBLY

Name	Torque in Nm
Swing arm - engine bolt (safety torque)	33 ÷ 41
Frame - swing arm bolt (safety torque)	64÷72
Shock-absorber - frame nut (safety torque)	20 ÷25 N·m
Shock-absorber - engine bolt (safety torque)	33÷41 N·m
Rear wheel axle (safety torque)	104÷126 N·m
Centre-stand - engine securing bolt	18÷19 N·m
Side-stand fixing screw	12÷20 N·m
Side-stand mounting bracket fixing screw	15÷20 N·m
Rear rim fixing screw	20÷25

FRONT SUSPENSION

Name	Torque in Nm
Front wheel axle nut (safety torque)	45÷50 N·m

Name	Torque in Nm
Wheel axle lock nut screw	6÷7
Lower stanchion screw	15÷20 N·m
Hydraulic damper shaft nut	15÷18

FRONT BRAKE

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 fixing screw	7÷10 N·m
Brake hose bracket on fork	5÷6,5
Brake fluid pump - hose joint	13÷18
Brake fluid hose - calliper joint	20÷25 N·m
Calliper fixing screw	20÷25
Disk fixing screw (safety torque - apply LOCTITE THREADLOCK MEDIUM TYPE 243)	6÷7 N·m
Fluid breathing screw	7÷10 N·m
Calliper mating screw	20÷25 N·m

REAR BRAKE

Name	Torque in Nm
Calliper - crankcase fixing screws	20÷25
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 fixing screw	7÷10 N·m
Brake fluid pump - hose joint	13÷18
Brake fluid hose - calliper joint	20÷25 N·m
Fluid breathing screw	7÷10 N·m

ENGINE UNIT

Name	Torque in Nm
Clutch drum nut	40÷44 N·m
Clutch securing ring-nut	55÷60 N·m
Drive pulley - crankshaft lock nut	40÷44 N·m
Starter lever screw	12÷13 N·m
Flywheel nut	40÷44 N·m
Flywheel fan screws	3 ÷4 N.m
Half-crankcase coupling screw	12÷13 N·m
Exhaust/crankcase fixing bolts	22÷24 N·m

Name	Torque in Nm
Air-box/crankcase fixing screw	4÷5 N·m
Cylinder head nuts	10÷11 N·m
Temperature ECU sensor	18÷22 N·m
Termistore	6÷8 N·m
Starter motor screws	12÷13 N·m
Spark plug	25÷30 N·m
Hub oil drain cap	3÷5 N·m
Hub oil dipstick	Manual
Rear hub cover screws	12÷13 N·m
Transmission cover screws	12÷13 N·m
Intake manifold screws	8÷9 N·m
Flywheel volute fixing screws	1÷2 N·m
Cylinder shroud fixing screws	3,5÷5 N·m
Stator fixing screw	3÷4 N·m
Pick-up fixing screw	4÷5 N·m
Mixer fixing screw	3÷4 N·m
Brake lever-engine screw	12÷13 N·m

Overhaul data

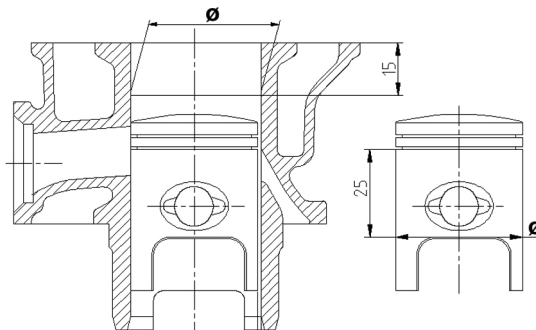
Assembly clearances

Cylinder - piston assy.

CONNECTION PISTON AND CYLINDER

Name	Play	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
1st oversize fitting	</>	O1	40,211-40,218	40,157-40,164	0,047-0,061

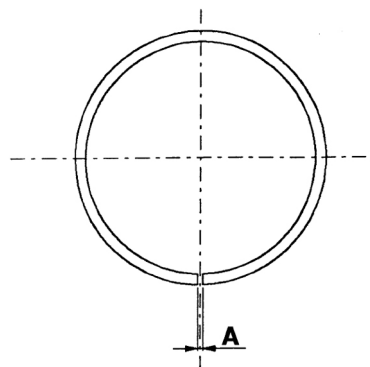
Name	Play	Initials	Cylinder	Piston	Play on fitting
1st oversize fitting	</>	P1	40,218-40,225	40,164-40,171	0,047-0,061
2nd oversize fitting	</>	M2	40,397-40,404	40,343-40,35	0,047-0,061
2nd oversize fitting	</>	N2	40,404-40,411	40,35-40,357	0,047-0,061
2nd oversize fitting	</>	O2	40,411-40,418	40,357-40,364	0,047-0,061
2nd oversize fitting	</>	P2	40,418-40,425	40,364-40,371	0,047-0,061



Piston rings

PISTON RINGS

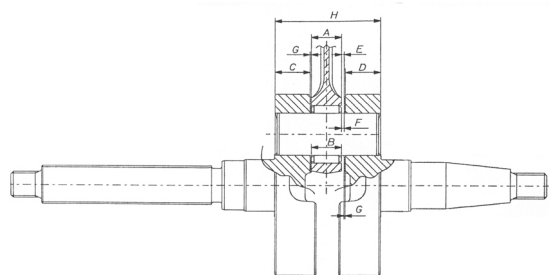
Name	Description	Dimensions	Initials	Quantity
Compression lining		40	A	0,10 ÷ 0,25
Compression lining 1° greater		40,2	A	0,10 ÷ 0,25
Compression lining 2° greater		40,4	A	0,10 ÷ 0,25



Crankcase - crankshaft - connecting rod

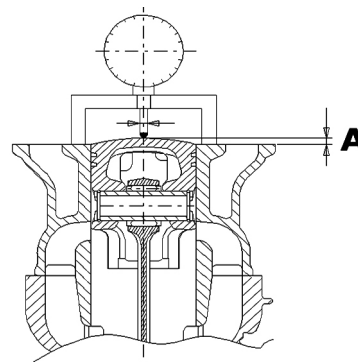
END PLAY BETWEEN CRANKCASE, CRANKSHAFT, AND CONNECTING ROD

Name	Description	Dimensions	Initials	Quantity
Connecting rod		11,750-0,05	A	Play E = 0,25 ÷ 0,50
Packing washer		0,5 ± 0,03	G	Play E = 0,25 ÷ 0,50 - Play F 0,20 ÷ 0,75
Half shaft transmission side		13,75+0,040	C	Play E = 0,25 ÷ 0,50 - Play F 0,20 ÷ 0,75
Half shaft flywheel side		13,75+0,040	D	Play E = 0,25 ÷ 0,50 - Play F 0,20 ÷ 0,75
Spacing between shoulders		40,64	H	Play E = 0,25 ÷ 0,50 - Play F 0,20 ÷ 0,75
Cage		11,80-0,35	B	F = 0,20 ÷ 0,75



Slot packing system

- Fit the cylinder without positioning the base gasket
- Position a dial gauge on the special tool and zero it on rectified surface.
- Fix the tool on the top of the cylinder using two nuts to fix it to the studs and then bring the piston to T.D.C.
- The gasket thickness to be adopted varies with the measurement. For this reason gaskets with three different thicknesses are available as spares.



Specific tooling

020272Y Tool for checking the position of the piston

SLOT PACKING SYSTEM

Name	Measure A	Thickness
Packing	2,80 ÷ 3,04	0,4
Packing	3,04 ÷ 3,24	0,6
Packing	3,25 ÷ 3,48	0,8

Products

TABLE OF RECOMMENDED PRODUCTS

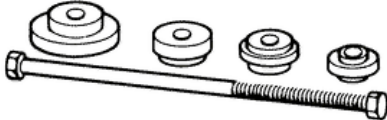





Product	Description	Specifications
TUTELA MATRYX MOTO RIDER	Oil for rear hub	Oil synthetic multidegree SAE 75W/85 API GL4
SELENIA HI Scooter 2 Tech	Oil for flexible transmission lubrication (acceleration control, mixer and km counter)	Oil for two-stroke motors
SELENIA Air Filter Oil	Oil for air filter sponge	Mineral oil with specific additive for ingreasing the ISO VG 150
SELENIA HI Scooter 2 Tech	Mixer Oil	Synthetic oil that passes API TC ++ specifications
TUTELA TP1	Grease for brake control lever, gas	NLGI 1-2 calcium soap based white spray grease
TUTELA MRM 2	Grease for the phonic wheel turning ring	Molybdenum disulphide grease and lithium soap
TUTELA TOP 4	Brake fluid	Synthetic fluid SAE J1703, NHTSA 116 DOT 4, ISO 4925
MONTBLANC MOLYBDENUM GREASE	Grease for driven pulley shaft compensating ring and mobile driven pulley sliding seat	Molybdenum bisulphide grease
TUTELA ZETA 2	Grease for steering, seats of pin and swing arm	Lithium soap and zinc oxide grease NLG12






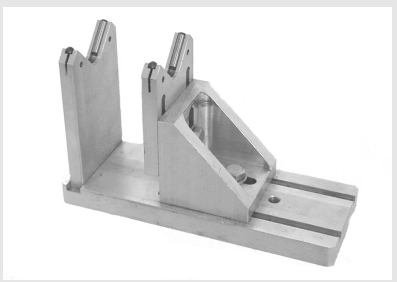
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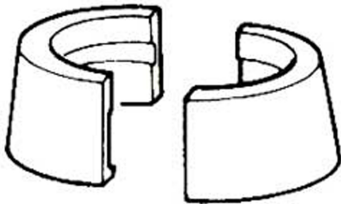
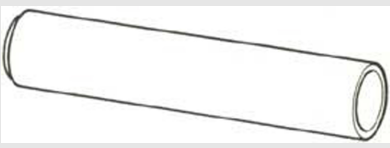


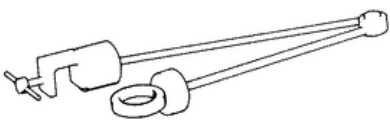
TOOLING

TOOL



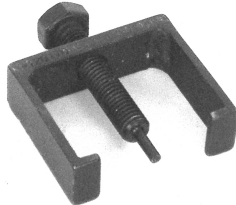


TOOLING




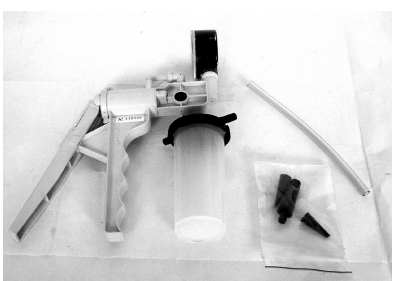

Stores code	Description	
001330Y	Steering seat installer, to be fitted with parts: 001330Y009-For lower seat, 001330Y013-For upper seat	
001467Y006	20-mm pliers	
001467Y007	Bell for bearings external Ø 54 mm	
001467y008	17 mm pliers (driven pulley bearings)	
001467Y009	Bell for bearings external Ø 50 mm	
001467Y013	15-mm pliers	

Stores code	Description	
001467Y014	15 mm pliers	
001467Y017	Bell for bearings external Ø 39 mm	
001467y021	11 mm bearing clip	
001467y029	Bell	
002465Y	Pliers for snap rings	
020074Y	Crankshaft aligning tool	

Stores code	Description	
020080y	Drift for extracting 12 mm bearings 12 mm	
004499y	Bearing extractor	
004499y007	Half rings	
006029y	Drift for fitting thrust ring seats on steering tube	
020004Y	Drift for removing thrust rings from steering head tube	
020055Y	Steering tube ring nut spanner	
020150Y	Support for air heater "METABO HG 1500/2"	

Stores code	Description	
020151Y	Air heater "METABO HG 1500/2"	
020162y	Flywheel extractor	
020163y	Crankcase splitting plate	
020164y	Half-pulleys fixing sheath	
020166y	Piston rings fixing tool	

Stores code	Description	
020168y	Oil seal fitting drift on half-crankcase	
020169Y	Water pump drive shaft spanner	
020170y	Estrattore ingranaggio comando pompa acqua/miscelatore	
020171Y	Drift for driven pulley roller bearings	
020209Y	Spring hook	

Stores code	Description	
020265y	Bearing fitting stand	
020272Y	Tool for checking the position of the piston	
020325y	Pliers for brake-shoe springs	
020329Y	Pump MITYVAC	
020330Y	Timing light for two- and four-stroke engines	

Stores code

Description

020331Y

Digital multimeter



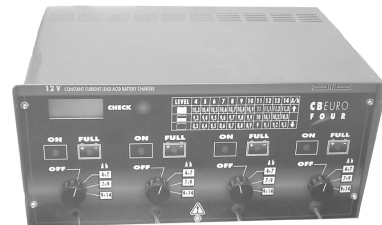
020332Y

Digital rpm counter



020334Y


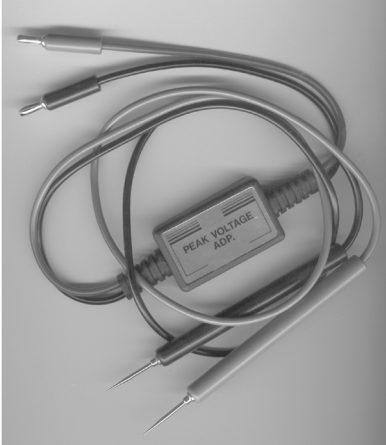


Multiple battery charger


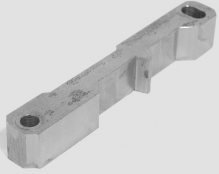


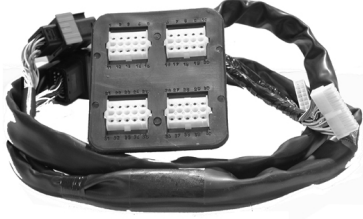







020335Y




Magnetic stand and comparator



Stores code	Description	
020340Y	Punch for fitting oil guard mag- neto and transmission	
020357Y	32 x 35 mm adaptor	
020358y	37 x40 adaptor	
020359Y	42 x 47 mm hub bearing fitting adaptor	
020362Y	12 mm guide	
020363Y	20mm guide	
020409Y	Multimeter adapter (Peak voltage measurement)	
020376Y	Handle for punches	
020412Y	15 mm guide	
020439Y	17 mm guide	

Stores code	Description	
020444Y	Wrist-pin removal / fitting tool	
020456Y	Ø 24 mm adaptor	
020451y	Drive pulley stop spanner	
020452y	Driven pulley shaft fitting/re- moving tube	
020460Y	Tester and scooter diagnosis	
020481Y	Control unit interface wiring	

Stores code	Description	
020565Y	Compass flywheel stop spanner	
020469Y	Reprogramming kit	
020614y	Diagnosis tester programming software	
020615y	Tool for carbon dam ring:	
020616y	Fuel pressure control kit	

Stores code	Description	
020617y	Chek air presurre kit	
020620y	Water pump impeller stop	
020621y	H.V. cable signal adapter:	

INDEX OF TOPICS

MAINTENANCE

MAIN

Maintenance chart
EVERY 2 YEARS
Action

 Brake fluid - Change

 Cooling Fluid - Replacement

AT 1000 KM OR 4 MONTHS

50'

Action

 Hub Oil - Replacement

 Oil mixer/throttle linkage - Adjust

 Speedometer cable - Grease

 Steering - Adjust

 Brake levers - Grease

 Brake fluid level - Check

 Nuts, bolts and fasteners - Check

 Electrical system and battery - Check

 Tires-inflation 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 - Change

 Air filter - cleaning

 Oil mixer/throttle linkage - Adjust

 Cooling fluid level - Check

 Brake levers - Grease

 Brake pads - Check condition + wear

 Brake fluid level - Check

 Electrical system and battery - Check

 Tires-inflation and wear - Check

 Vehicle and brake test - Road test

AT 10000 KM OR 24 MONTHS AND 50000 KM

95'

Action
Hub Oil - Replacement
Spark plug/spark gap - replacement
Air filter - cleaning
Idle speed/Fuel (*) - Adjust
Oil mixer/throttle linkage - Adjust
Variator rollers - Change
Speedometer cable - Grease
Transmission Belt - Check
Cooling fluid level - Check
Steering - Adjust
Brake levers - Grease
Brake pads - Check condition + wear
Brake fluid level - Check
Transmissions - Lubricate
Nuts, bolts and fasteners - Check
Suspensions - Check
Electrical system and battery - Check
Headlight - Adjust
Tires-inflation 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/spark gap - replacement
Air Filter - Cleaning
Oil mixer/throttle linkage - Adjust
Transmission Belt - Replacemen
Cooling fluid level - Check
Brake levers - Grease
Brake pads - Check condition + wear
Brake fluid level - Check
Electrical system and battery - Check

Action

Tires-inflation and wear - Check

SAS box (sponge) (**) - Clean

Vehicle and brake test - Road test

*(**) See rules in the «Secondary Air System» section***AT 20000 KMS AND 40000 KMS**

120'

Action

Hub Oil - Replacement

Spark plug/Electrode gap - Change

Air filter - cleaning

Idle speed/Fuel (*) - Adjust

Cylinder cooling system - Check/Clean

Oil mixer/throttle linkage - Adjust

Transmission Belt - Check

Variator rollers - Change

Fule-oil mixer belt - Change

Cooling fluid level - Check

Radiator - External cleaning/Check

Speedometer cable - Grease

Steering - Adjust

Brake levers - Grease

Brake pads - Check condition + wear

Brake fluid level - Check

Transmissions - Lubricate

Nuts, bolts and fasteners - Check

Suspensions - Check

Electrical system and battery - Check

Headlight - Adjust

Tires-inflation and wear - Check

Vehicle and brake test - Road test

() See CO regulation in the «Adjusting the engine idle» section***AT 30000 KM**

130'

Action

Hub Oil - Replacement

Spark plug/spark gap - replacement

Air filter - cleaning

Idle speed/Fuel (*) - Adjust

Oil mixer/throttle linkage - Adjust

Transmission Belt - Replacemen

Variator rollers - Change

Cooling fluid level - Check

Speedometer cable - Grease

Steering - Adjust

Brake levers - Grease

Brake pads - Check condition + wear

Braking circuit hose - Replacement

Brake fluid level - Check

Transmissions - Lubricate

Nuts, bolts and fasteners - Check

Suspensions - Check

Electrical system and battery - Check

Headlight - Adjust

Tires-inflation and wear - Check

SAS box (sponge) (**) - Clean

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 - Replacement

Spark plug/spark gap - replacement

Air filter - cleaning

Idle speed/Fuel (*) - Adjust

Oil mixer/throttle linkage - Adjust

Transmission Belt - Replacemen

Variator rollers - Change

Fule-oil mixer belt - Change

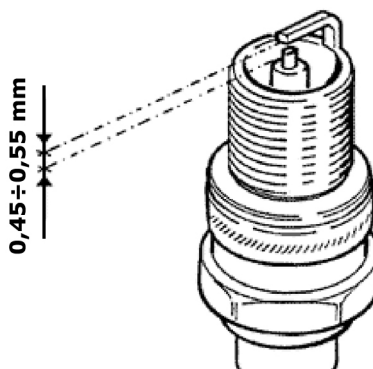
Action

Cooling fluid level - Check
Radiator - External cleaning/Check
Speedometer cable - Grease
Steering - Adjust
Brake levers - Grease
Brake pads - Check condition + wear
Braking circuit hose - Replacement
Brake fluid level - Check
Transmissions - Lubricate
Nuts, bolts and fasteners - Check
Suspensions - Check
Electrical system and battery - Check
Headlight - Adjust
Tires-inflation and wear - Check
SAS box (sponge) (**) - Clean
Vehicle and brake test - Road test

(*) See CO regulation in the «Adjusting the engine idle» section> (**) 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 REMOVAL MUST BE CARRIED OUT WITH THE ENGINE COLD. THE SPARK PLUG MUST BE REPLACED EVERY 5,000 KM. THE USE OF NON APPROVED ELECTRONIC IGNITION DEVICES OR SPARK PLUGS OTHER THAN THE PRESCRIBED MODEL MAY SERIOUSLY DAMAGE THE ENGINE.

Characteristic**Recommended spark plug type**

CHAMPION RG6YCA

Electric characteristic**Electrode gap**

0,55÷0,65 mm

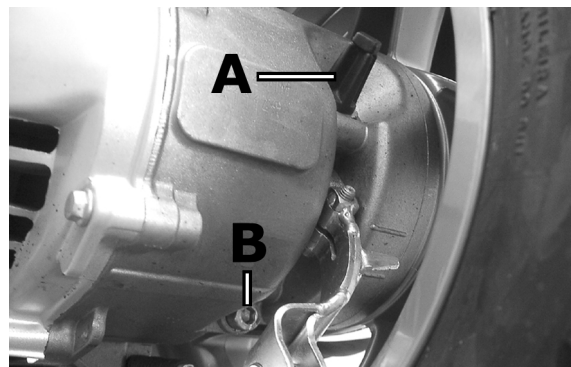
Locking torques (N*m)

Spark plug 25 - 30 Nm

Hub oil**Check**

To check the level, proceed as follows:

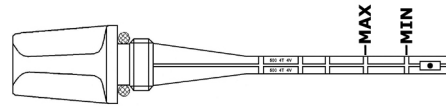
- 1) Rest the vehicle onto its centre-stand, on flat ground;
- 2) Remove dipstick «A»; dry it with a clean cloth and reinsert it, using the whole thread;
- 3) Remove the dipstick and check the oil mark reaches just below the second notch from the bottom;
- 4) Screw the dipstick back in with the correct torque.



Recommended products

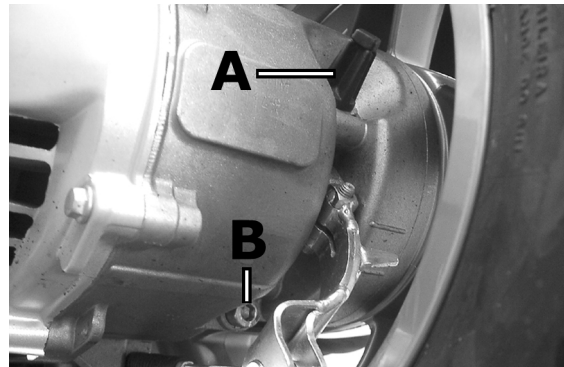
TUTELA MATRYX MOTO RIDER Oil for rear hub

Oil synthetic multidegree SAE 75W/85 API GL4



Replacement

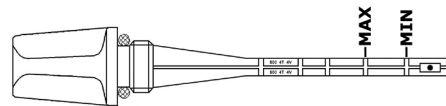
- Remove oil filler cap «A».
- Loosen oil draining cap «B» and allow for the system to drain completely.
- Refit the draining cap and refill the hub with the prescribed oil.



Characteristic

Rear hub oil

~ 85 cc



Air filter

- Remove the cleaner plug by unloosening the 6 fixing screws. Remove the filtering element.

Cleaning:

- Wash with water and neutral soap.
- Dry with a clean cloth and small jets of compressed air.
- Soak with a 50% fuel/oil mixture.
- Let the filtering element drain and then squeeze it with your hands without crushing it.
- Let it dry and refit it. Mineral oil with special additives to increase its adhesiveness ISO VG 150



CAUTION

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

Recommended products**Selenia Air Filter Oil Air filter sponge oil**

Mineral oil with specific additives to increase adhesion ISO VG 150

Checking the ignition timing

-Adjust the control cables:

Mixer cable: see "Mixer timing" procedure, below.

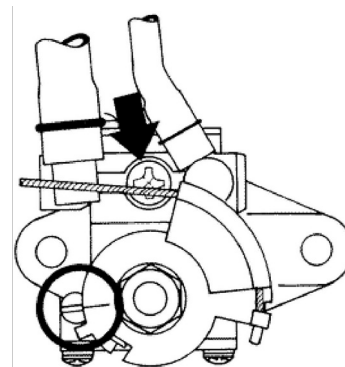
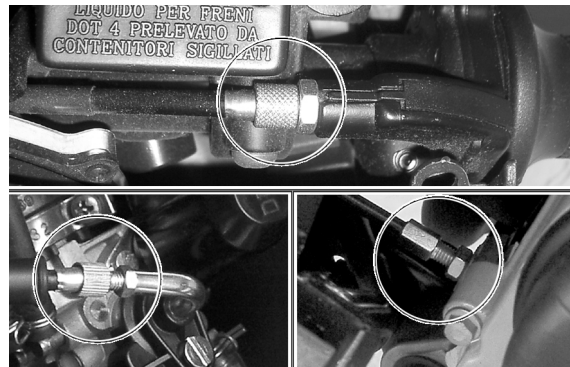
Throttle cable: adjust the screw on the carburettor so that there is no play on the sheath.

Splitter control cable: adjust the screw on the throttle grip on the handlebar so that there is no play on the twist grip.

All cables must be adjusted so that there is no play on their sheaths.

Mixer timing

- Adjust via the transmission screw on the crankcase, with the throttle cable released, the reference machined on the rotating plate which must be aligned to that shown on the mixer body as indicated in the figure. While performing this operation the engine must be fed with a 2% oil-fuel mixture (at least 0.5 litres if the tank is empty).

**CAUTION**

WHEN RUNNING OUT OF OIL OR REMOVING THE OIL TANK, FOLLOW THE MIXER BLEEDING OPERATIONS AS FOLLOWS: REFILL THE OIL TANK, WITH THE MIXER FITTED ONTO THE ENGINE, AND THE ENGINE NOT RUNNING, DETACH THE MIXER TUBE FROM THE CARBURETTOR AND LOOSEN THE BLEED SCREW (SEE ARROW IN FIGURE) UNTIL OIL STARTS FLOWING OUTWARDS. RECONNECT THE INLET TUBE TO THE CARBURETTOR,

FIXING IT WITH THE APPROPRIATE METALLIC CLAMP.

Recommended products

SELENIA HI Scooter 2 Tech Mixer Oil

Synthetic oil that passes API TC ++ specifications

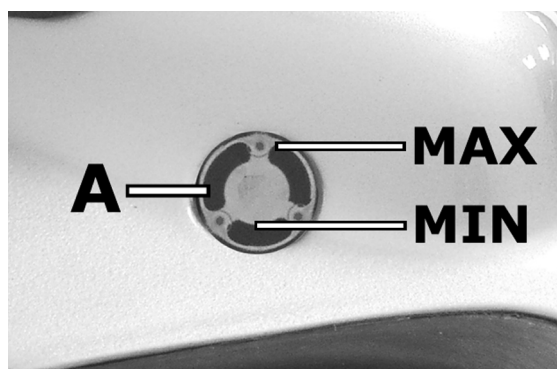
Braking system

Level check

Proceed as follows:

- Rest the vehicle onto its centre-stand and align the handlebars;
- Check the liquid level through the inspection hole «A».

A certain decrease in the liquid level is due to the wear of the pads.



Top-up

Use the following procedure:

Loosen the two screws, remove the reservoir cap, remove the gasket and top up only with the prescribed fluid without exceeding the maximum level.

CAUTION

USE ONLY DOT 4 BRAKE FLUID.

CAUTION

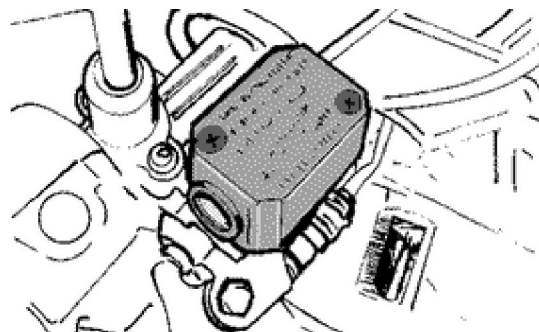
KEEP THE BRAKE FLUID AWAY FROM THE SKIN, THE EYES AND CLOTHING. IN CASE OF CONTACT, RINSE GENEROUSLY WITH WATER.

CAUTION

THE BRAKE FLUID IS HIGHLY CORROSIVE. TAKE CARE NOT TO SPILL IT ON THE PAINTWORK.

CAUTION

THE BRAKE FLUID IS HYGROSCOPIC, I.E. IT



ABSORBS HUMIDITY FROM THE AIR. IF THE HUMIDITY CONTAINED IN THE FLUID EXCEEDS A GIVEN CONCENTRATION, THE BRAKING ACTION BECOMES INSUFFICIENT. NEVER DRAW THE FLUID FROM OPEN OR PARTLY EMPTY CONTAINERS. UNDER NORMAL CLIMATIC CONDITIONS THE FLUID SHOULD BE RENEWED EVERY 20,000 KM, OR IN ANY CASE EVERY TWO YEARS.

N.B.

CHANGE THE BRAKE FLUID AND BLEED THE SYSTEM AS DESCRIBED IN CHAPTER BRAKING SYSTEM

Recommended products

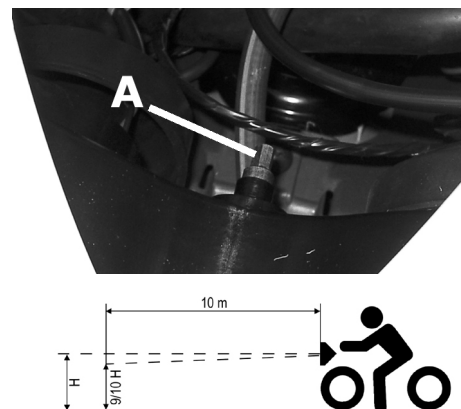
TUTELA TOP 4 Brake fluid

Synthetic fluid SAE J1703, NHTSA 116 DOT 4, ISO 4925

Headlight adjustment

Proceed as follows:

1. Position the vehicle in riding conditions, and with the tyres inflated at the prescribed pressure, on a horizontal surface 10 m away from a half-lit white screen, ensuring the vertical axis of the vehicle is perpendicular to the screen;
2. Turn on the headlight and check the distance between the ground and the horizontal line which separates the lit area from the dark region, is no more than $\frac{9}{10}$ and not less than $\frac{7}{10}$ of the height of the headlight, measured from the ground;
3. If this is not the case, adjust the headlight via screw «A», which may be reached by removing the front grid.



WARNING

THE PROCEDURE DESCRIBED ABOVE COMPLIES WITH THE "EURONORM" CONCERNING THE MAX. AND MIN. HEIGHT OF THE LIGHT BEAM OF A

ROAD VEHICLE. PLEASE CHECK WITH THE LOCAL AUTHORITIES FOR WHAT REQUIREMENTS MUST BE FULFILLED IN EVERY SINGLE COUNTRY WHERE THE VEHICLE IS TO BE USED.

INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

This section is for finding solutions to solve problems.

A list of possible causes is provided for each problem and related operations.

Engine

Poor performance

POOR PERFORMANCE

Possible Cause	Operation
Fuel pump defective or vacuum tube damaged	Replace pump or tubing
Fuel filter dirty or clogged	Clean the coupling filter
Excessive carbon deposits on cylinder ports and in combustion chamber	Decoke
Poor compression: worn compression rings or cylinder	Check parts and replace if necessary
Silencer clogged by excessive carbon deposits	Replace silencer and check carburation and mixer timing
Air filter clogged or dirty	Clean
Clutch slippage	Check and if necessary replace the centrifugal weights and/or clutch housing
Defective sliding of movable pulleys	Check parts and replace if necessary. Lubricate the driven pulley with Montblanc-Molibdenum Grease (drg. 498345).
Worn driving belt	Replace
Rollers worn, presence of oil, dirt	Clean the variator; replace rollers if worn

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
Faulty clutch	Check springs/weight of friction and clutch housing pan

Starting difficulties

DIFFICULTY IN STARTING

Possible Cause	Operation
Fuel pump defective or vacuum tube damaged	Replace pump or tubing
Battery is down	Check the battery charge condition. If the battery shows signs of sulfation, replace it. Before installing the new battery, charge it for eight hours with a current corresponding to 1/10 of the capacity of the battery
Wrong fuel specifications	Drain the fuel and then refuel
Spark plug defective, or electrode gap incorrect	Clean; adjust electrode gap or replace, always using recommended spark plugs. Please keep in mind that most engine problems result from the use of inappropriate spark plugs
Intake duct cracked or not sealing	Replace intake duct and check its sealing with crankcase and carburettor
Cleaner-carburettor union damaged	Replace

Excessive oil consumption/Exhaust smoke

EXCESSIVE OIL CONSUMPTION/SMOKE FROM EXHAUST

Possible Cause	Operation
Excessive carbon deposits on cylinder ports and in combustion chamber	Decoke

Engine tends to cut-off at idle

ENGINE IDLE

Possible Cause	Operation
The reed valve does not close	Check / replace the reed pack
Spark plug faulty	Replace spark plug with an equivalent part having the prescribed heat grade. Check electrodes gap

Transmission and brakes

Clutch grabbing or performing inadequately

BRAKES

Possible Cause	Operation
Clutch slippage or irregular operation	Ensure shoes open and close freely Check no grease is present on the shoes Check the shoes' contact surface against the drum is thicker in the centre and equivalent on all three shoes

Possible Cause

Operation

Check the drum is not abnormally scratched or worn
 Never let the engine run without clutch drum

Insufficient braking

BRAKE SYSTEM FAULT

Possible Cause

Operation

Insufficient braking force

The rear brake (drum brake) is adjusted by setting the relative registers (on the wheel), remembering that the wheels must turn freely when the brake levers are fully released.
 The braking action should start when brake levers are pulled at 1/3 of their travel.
 Check wear of brake pads. If there are problems that cannot be overcome simply by normal adjustment of the control linkages, proceed to inspect the pads and front brake disc, the shoes and the rear drum.
 If surfaces are excessively worn or scored, replace the affected parts as necessary

Air bubbles in the braking hydraulic system

Carefully bleed the hydraulic system (spring action of the brake lever should not be felt)

Fluid leakage

Spring connections, piston gaskets or brake pump failure. Replace

Worn fluid

Change the front brake fluid and restore correct level in the pump

Noisy brake

Check pads and/or shoes wear

Brakes overheating

BRAKE OVERHEATING

Possible Cause

Operation

Defective piston sliding

Check the caliper and replace any damaged parts

Deformed brake disc

Use a comparator to check the disc planarity with the wheel correctly mounted

Electrical system

Battery

BATTERY

Possible Cause	Operation
Battery	This one component of the system needs checking more frequently and servicing more carefully than any other. If the vehicle is to stand idle for any length of time (one month or longer), the battery will need recharging periodically. The battery discharges completely over a period of around 5 - 6 months. When fitting the battery to the vehicle, take care not to switch the connections: the black earth lead is connected to the negative terminal and the red lead to the positive terminal marked +. To charge the battery, follow the instructions described in Chapter ELECTRICAL EQUIPMENT.

Steering and suspensions

Rear wheel

POOR ROAD HANDLING

Possible Cause	Operation
Suspensions faulty	Check integrity and operation of rear shock-absorber and/or front fork. Replace or overhaul front fork and/or replace rear shock absorber if faulty
Tyres damaged or low inflating pressure	Check tyre inflation pressure and tread. Inflate at correct pressure or replace
Front and/or rear suspension fixings loosen	Check tightening torques between frame, swing-arm, and engine, and those between wheels, hubs, and/or axle. Check the torque on the steering lock-nuts.

Heavy steering

STEERING STIFF

Possible Cause	Operation
Unacceptable tightening	Check the tightening torque of the upper and lower collar. If the steering fails to turn smoothly even when correctly tightened, inspect the bearing races and replace if they show signs of uneven wear

Excessive steering play

EXCESSIVE STEERING PLAY

Possible Cause

Operation

Excessive steering play

Check the tightening torque of the upper and lower collar.
If the steering fails to turn smoothly even when correctly tightened, inspect the bearing races and replace if they show signs of uneven wear

Noisy suspension

NOISY SUSPENSIONS

Possible Cause

Operation

Front suspension components damaged

Check for the absence of noise coming from the fork during compression and rebound. If necessary, overhaul the fork. Ensure the wheel spins freely and without any noise; otherwise replace the wheel bearings.

Rear suspension components damaged

Check for the absence of noise coming from the fork during compression and rebound. If necessary, check the tightening torques on the swing-arm and the absence of oxidations, or replace the shock-absorber. Ensure the wheel spins freely and without any noise; otherwise replace the final gearing train.

Suspension oil leakage

OIL LOSS FROM SUSPENSION

Possible Cause

Operation

Shock-absorber faulty

Replace the shock-absorber assembly

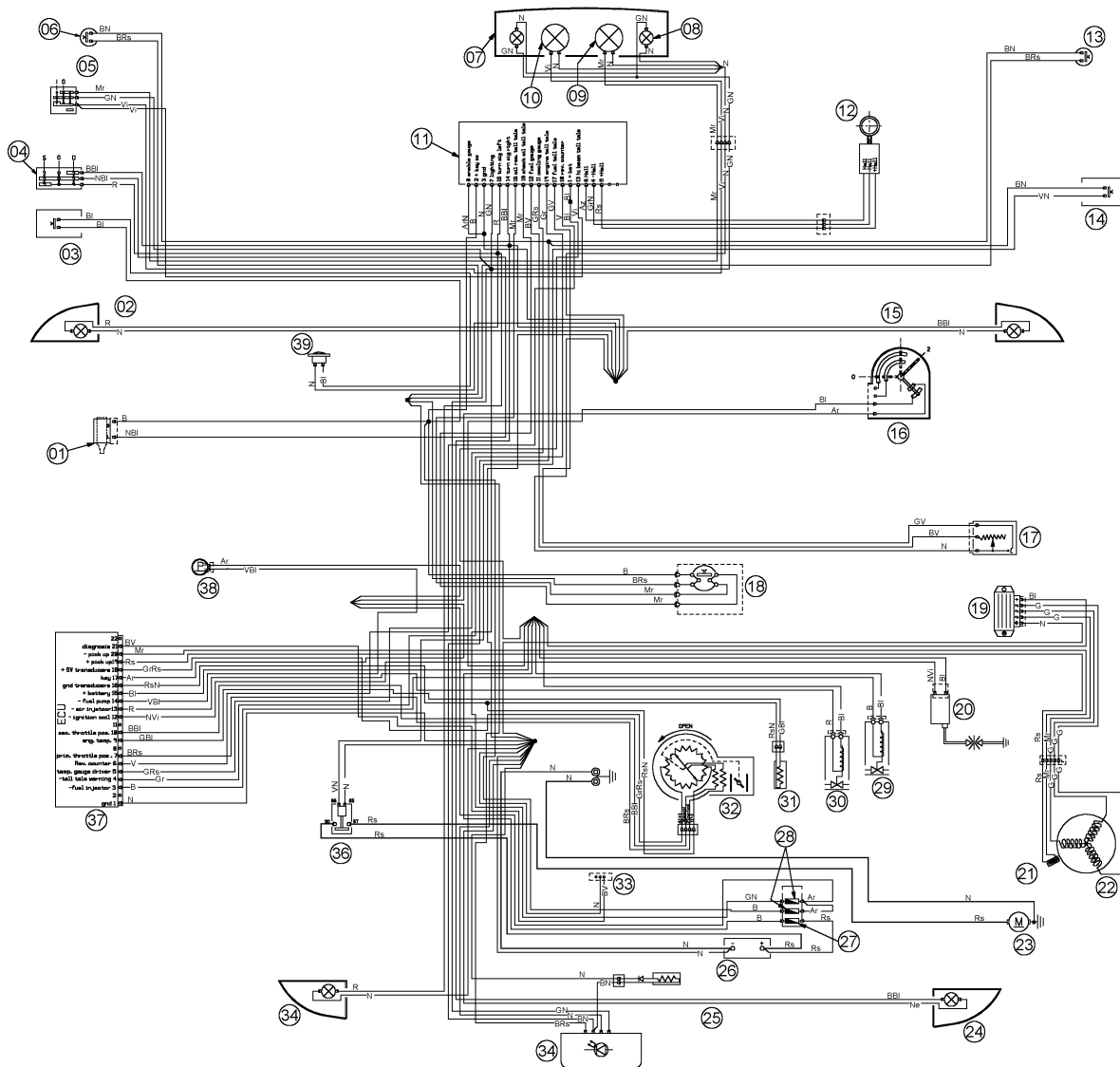
Inner fork hydraulic damper damaged

Replace the hydraulic damper

INDEX OF TOPICS

ELECTRICAL SYSTEM

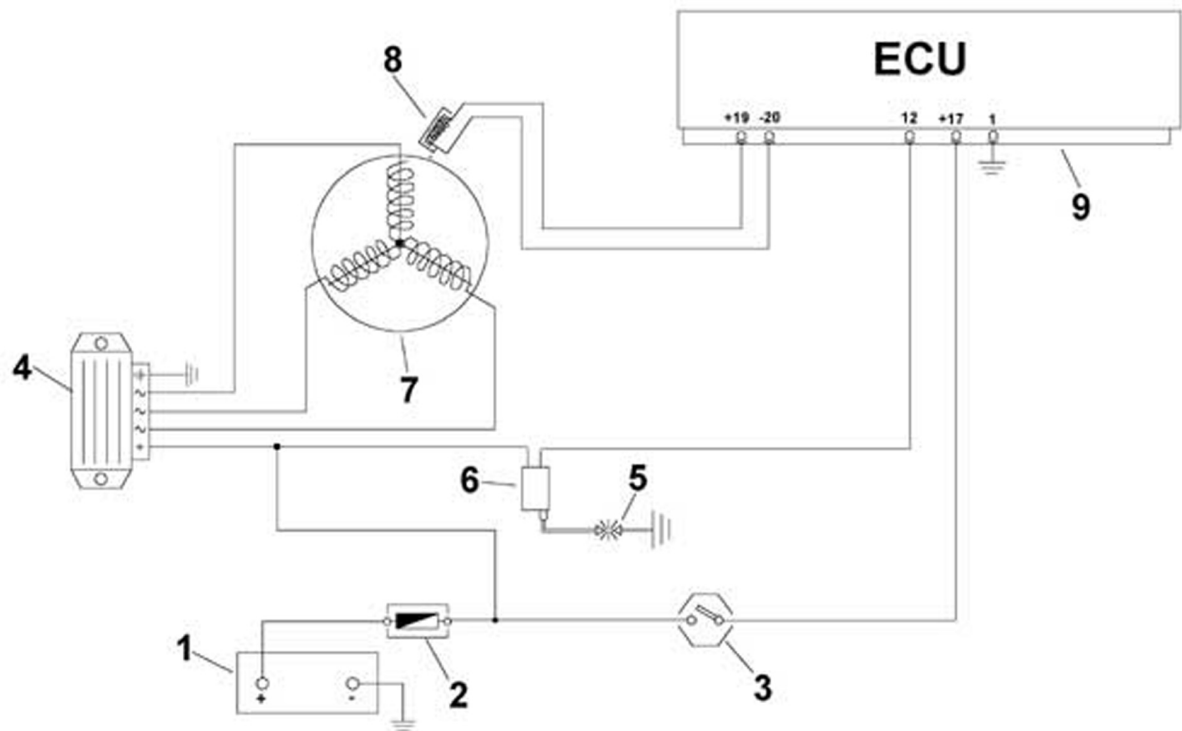
ELE SYS



Blinker switch device Front left indicator with lamp Horn button Turn indicator selector. High/low beam selector. Rear brake stop button Complete headlight 2 lamps for parking light 12V-3W Lamp for dipped beam light 12V - 35W Lamp for high beam light 12V - 35W Instrument unit Rpm-timing sensor Front brake stop button Start button Front right indicator with lamp Key switch Fuel warning light transmitter Oil mix lamp control Voltage regulator H.T. coil Pick-up Magneto Starter motor Front right indicator with lamp Complete resistance Battery 12V-9A Fuse 20A Fuse 5A Petrol injector Air injector Water temperature sensor Throttle body sensor Output for diagnostics Complete taillight Rear left indicator with lamp Starter relay Electronic cpu Fuel pump Horn

Conceptual diagrams

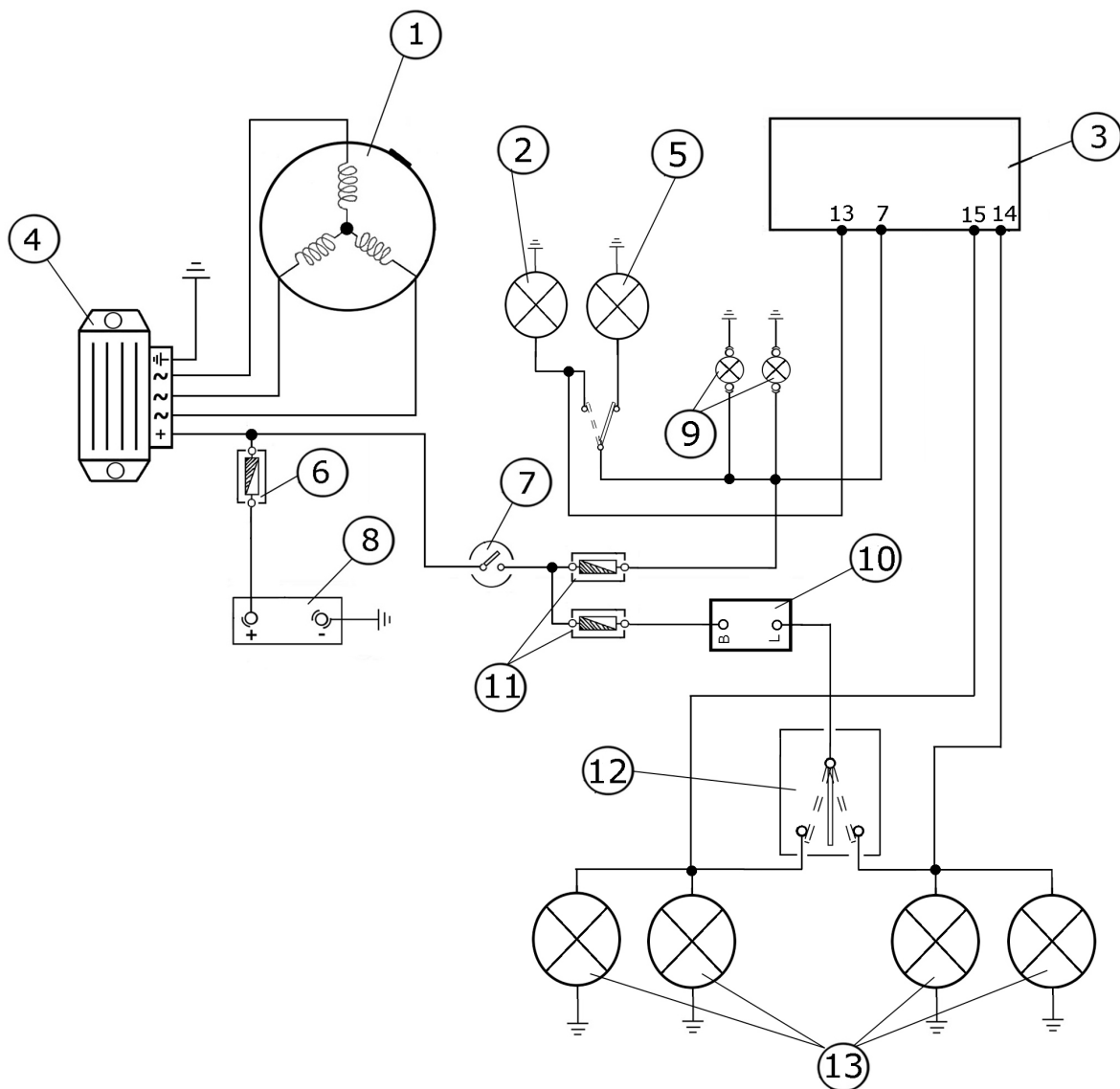
Ignition



IGNITION

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

Headlights and automatic starter section

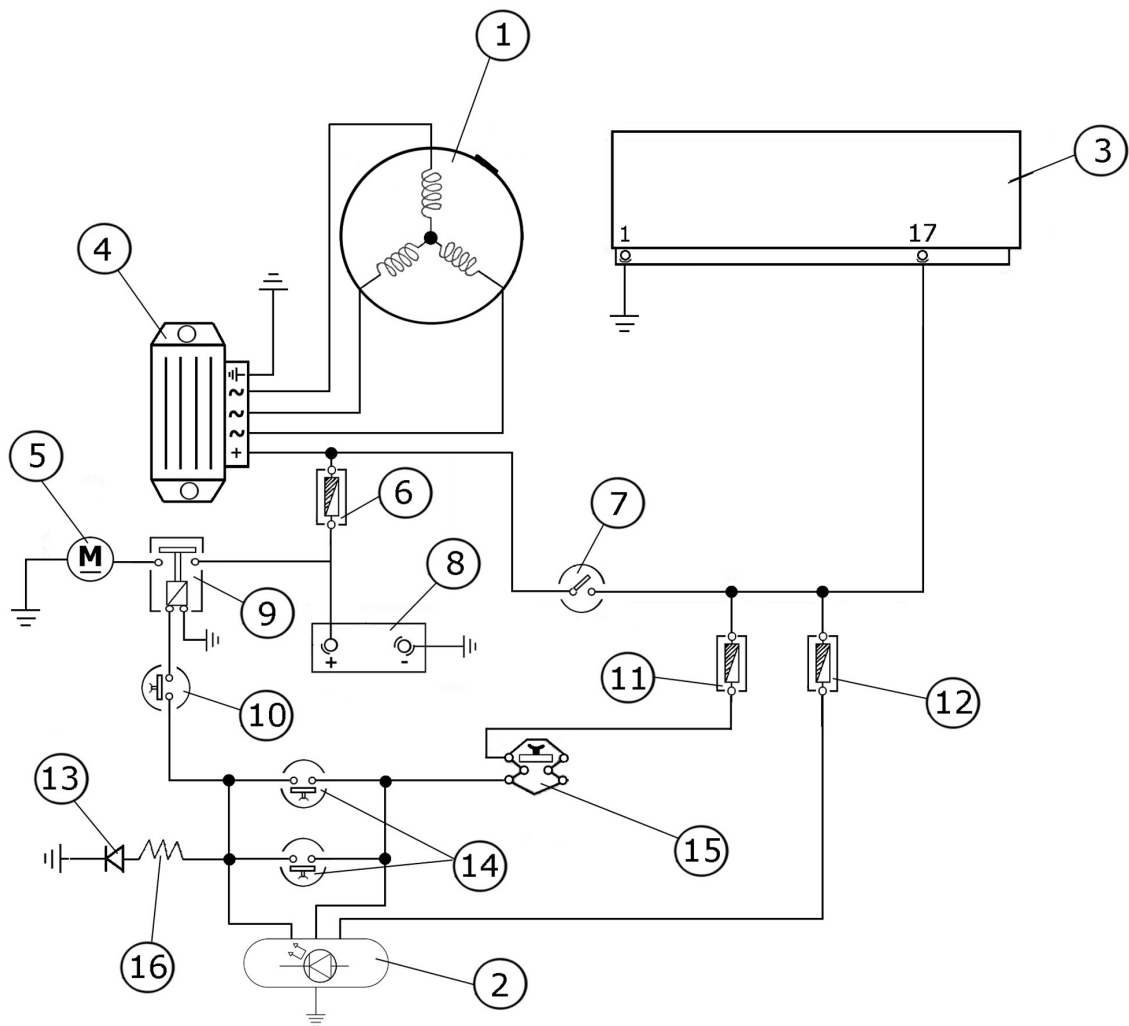


LIGHTS AND TURN INDICATORS

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

	Specification	Desc./Quantity
8	Battery	12V - 9Ah
9	Front sidelight bulb	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

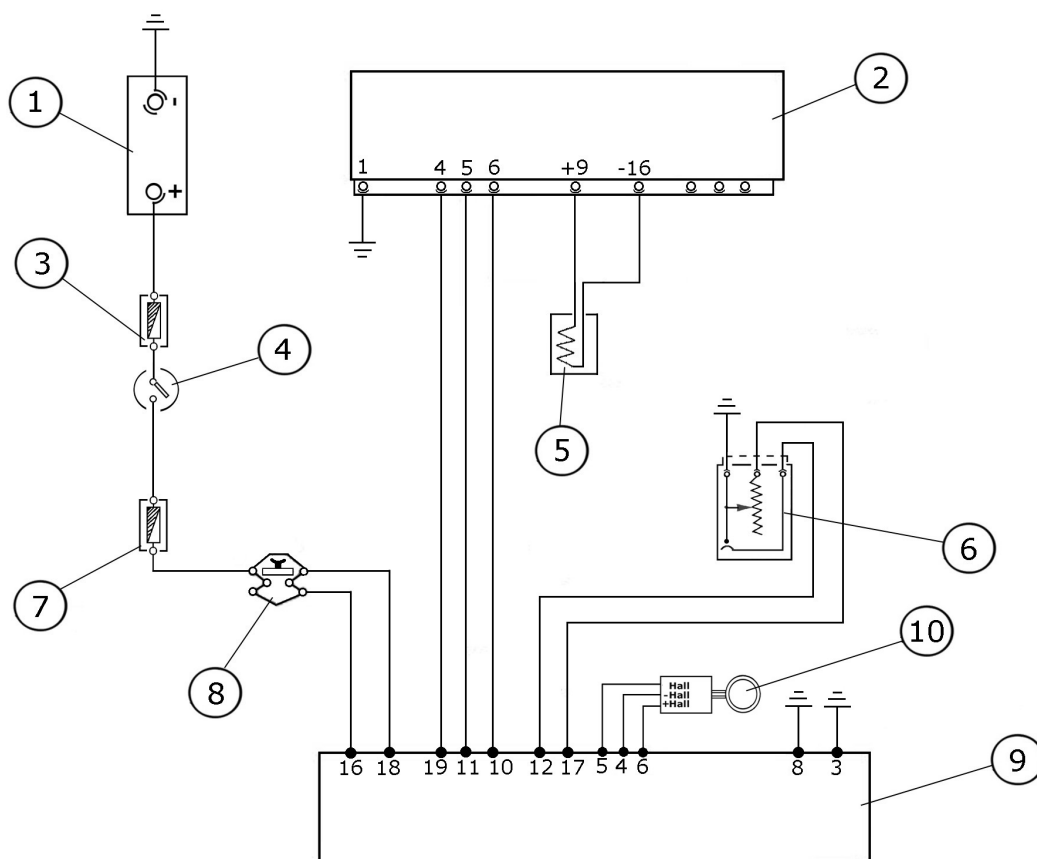
Battery recharge and starting



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	Heater control device	
8	Battery	12V - 9Ah
9	Starter relay	
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

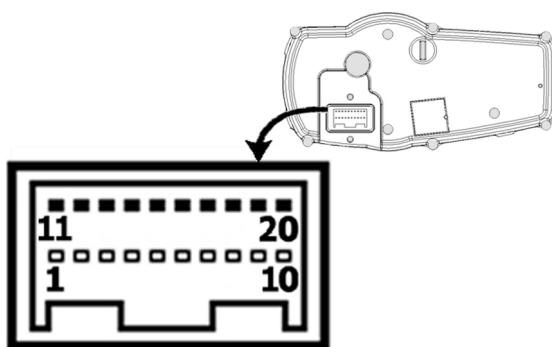
Level indicators and enable signals section



CONSENSUSES AND LEVEL INDICATORS

	Specification	Desc./Quantity
1	Battery	12V - 9Ah
2	CPU	
3	Fuse 20A	
4	Heater control device	
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	+ Under-key	
3	Earth	
4	Wheel speed earth	
5	Wheel speed power supply	
6	Wheel speed signal	
7	Dashboard light and headlight warning light	
8	Temperature instrument signal	
9	Not connected	
10	Tachometer signal	
11	Temperature instrument earth	
12	Fuel level signal	
13	High-beam warning light	
14	+ r.h.s. turn signal light	
15	+ l.h.s. turn signal light	
16	Low-oil warning light	
17	Fuel reserve indicator	
18	Oil lamp check output	
19	Injection lamp	
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.

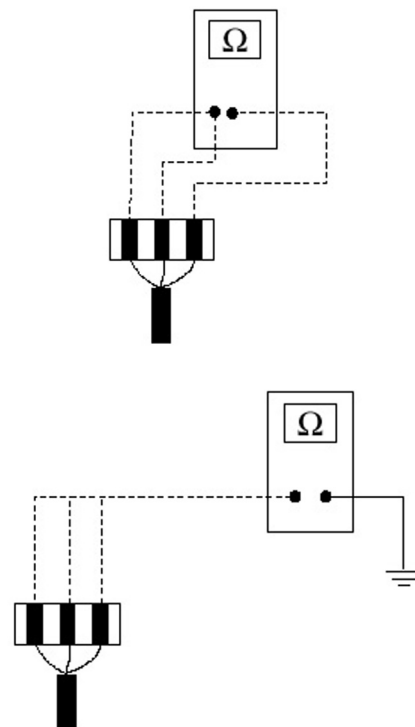
Stator check

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.

Then check that each yellow wire is isolated from the earth.

If non-conforming values are found, repeat the checks on the stator, if further additional incorrect values occur, replace the stator or repair the wiring.



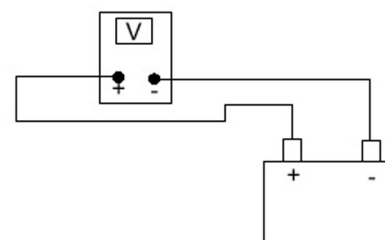
Voltage regulator check

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.

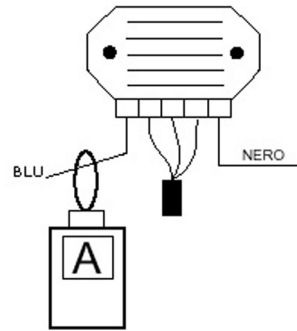
If voltages under 14 volts are found, carry out the checks for the stator and related wiring.



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 seen from pinion side.
- Connection to engine with pinion and sprocket wheel on transmission side crankshaft.
- Control with button

Tests to be carried out to check the electrical starter motor

Static test

Remove the left side panel.

Check the resistance of the induced brush unit.

Reference value: < or equal to 10 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 motor.

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 electrolyte density of each element.

Bé = 30 ÷ 32

Specific weight: 1.25 ÷ 1.26

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



- Connect the tester.
- Connect an ammeter induction clamp to the negative power supply cable of the starter motor.
- Disconnect the petrol 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 motor absorption.
- Absorption at drag rpm: from 15 to 25A.
- Drag rpm: from 500 to 550 rpm

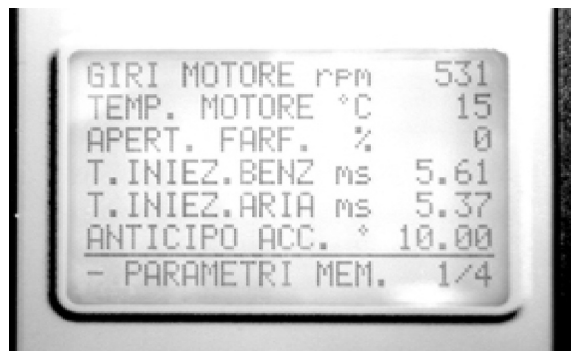


N.B.

THE VALUE OF DECLARED RPM IS THAT INDICATED BY THE TESTER

Specific tooling

020460Y Tester and scooter diagnosis



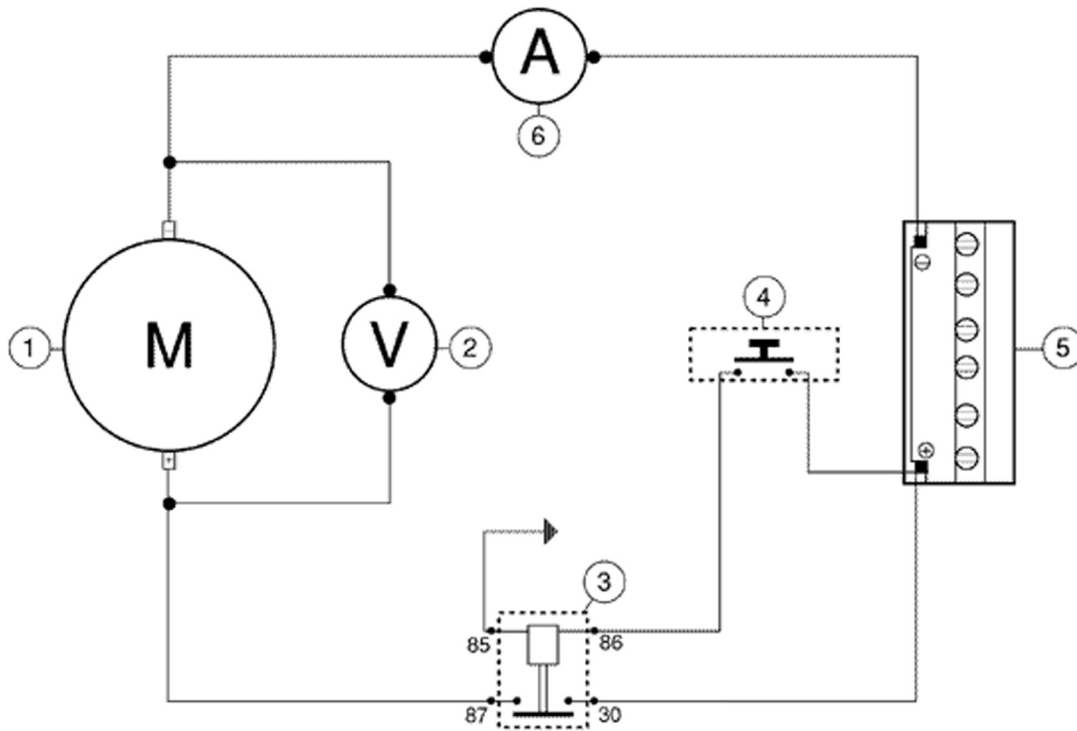
Carry out a no-load absorption test.

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

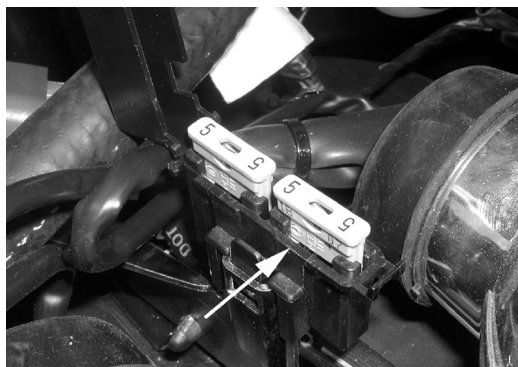
Specification	Desc./Quantity
Starter motor	
Voltmeter	
Starter motor contactor	
Start button	
Battery 12V-9Ah	
Ammeter	

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

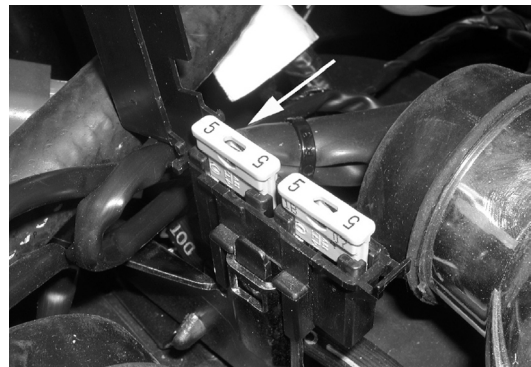
[Air duct](#)

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](#)

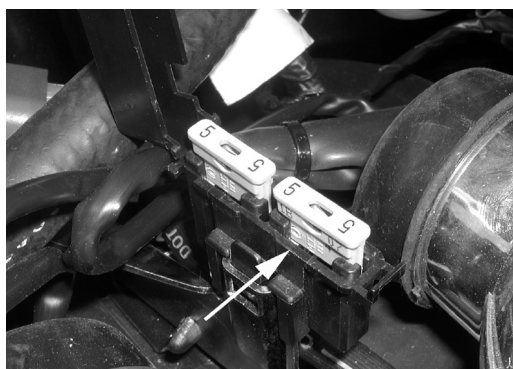
Lights list

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 to 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

RECHARGING THE BATTERY FOLLOWING OPEN-CIRCUIT STORAGE

1) Checking the voltage

Before installing the battery on the vehicle, measure the open-circuit voltage with an ordinary multimeter.

- If the voltage exceeds 12.60 V, the battery can be installed without recharging.
-

- If the voltage is less than 12.60 V, recharge the battery as described at item 2).

2) Constant-voltage charging method

- Constant voltage: 14.40-14.70 V
- Initial charging current: 0.3-0.5 x rating
- Charging time:
- Recommended 10-12 hrs

Minimum 6 hrs

Maximum 24 hrs

3) Constant-current charging method

- Initial charging current: 1/10 of rating
- Charging time: Maximum 5 hrs

WARNING

WHEN THE BATTERY IS DEEPLY DISCHARGED (FAR BELOW 12.6V), 5 HOURS' RECHARGING MAY NOT BE ENOUGH TO OBTAIN OPTIMUM PERFORMANCE. IN THESE CONDITIONS, HOWEVER, TO AVOID DAMAGING THE BATTERY BEYOND REPAIR, IT IS ESSENTIAL NOT TO RECHARGE IT FOR MORE THAN 8 CONSECUTIVE HOURS.

Dry-charge battery

WARNING

THE BATTERY ELECTROLYTE IS POISONOUS AS IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID; HENCE AVOID ANY CONTACT WITH EYES, SKIN OR CLOTHES. IF COMING INTO CONTACT WITH EYES OR SKIN, WASH ABUNDANTLY WITH WATER FOR APPROX. 15 MINS. AND SEEK IMMEDIATE MEDICAL ATTENTION.

IN THE EVENT OF ACCIDENTAL INGESTION OF THE LIQUID, IMMEDIATELY DRINK LARGE QUANTITIES OF MAGNESIUM MILK, BATTERED EGG OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.

BATTERIES PRODUCE EXPLOSIVE GASES; KEEP CLEAR OF FREE FLAMES, SPARKS OR CIGARETTES; VENTILATE THE AREA WHEN RECHARGING INDOORS.

ALWAYS WEAR EYE PROTECTION WHEN WORKING IN THE PROXIMITY OF BATTERIES.

KEEP CLEAR FROM THE 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 weight of 1.26, corresponding to 30° Bé at a temperature not under 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 2.7V per element, the density of the

acid is around a value of 1.27, corresponding to 31° Bé and that these values have stabilised. The duration of the charging operations must be 15 - 20 hours.

4) Once the charging is finished, fill up the water (using **distilled water** or if in excess removing the 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

AFTER INSTALLING THE BATTERY AND IN ORDER TO PROVIDE A VENT FOR THE GASES FORMING INSIDE IT, REPLACE THE SHORT CLOSED TUBE NEXT TO THE POSITIVE (+) TERMINAL WITH THE CORRESPONDING LONG OPEN TUBE WHICH IS PRESENT ON THE VEHICLE. CHECK THAT THE TUBE SLOTS ARE TURNED TO THE BATTERY SIDE

Specific tooling

020333Y Single battery charger

020334Y Multiple battery charger

Battery maintenance

The battery is an electrical device which requires careful inspection and diligent maintenance. The maintenance rules are:

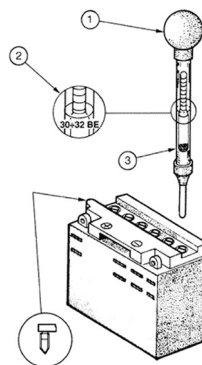
1) Check the level of the electrolyte

Check regularly that the electrolyte level is at upper level. Top up only with distilled water.

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

2) Checking 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 the 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 a certain period of time (1 month or longer) the battery must be periodically recharged.

The battery will completely discharge in three months. If the battery is to be refitted on the vehicle be careful not to invert the connections, remember that the earth (**black**) wire needs to be connected to the **-negative** terminal, while the other **red** wire is connected to the terminal marked with the **+ positive** sign.

3) Recharging the battery

WARNING

BEFORE RECHARGING THE BATTERY, REMOVE THE PLUGS OF EACH ELEMENT. KEEP SPARKS AND FREE FLAMES AWAY FROM THE BATTERY WHILE RECHARGING. REMOVE THE BATTERY FROM THE VEHICLE DISCONNECTING THE NEGATIVE TERMINAL FIRST.

Normal charging on the bench is to be effected 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 leads (+ with + and - with -). The caps must be removed during battery 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 HAVING A CAPACITY GREATER THAN THE RECOMMENDED VALUE. THE USE OF A FUSE OF UNSUITABLE CAPACITY MAY RESULT IN SERIOUS DAMAGES TO THE WHOLE VEHICLE OR EVEN CULMINATE IN A FIRE.

CAUTION

IN THE EVENT OF URGENT NEED THE CHARGING TIME CAN BE DECREASED TO 5-6 HOURS.

CAUTION

DRINKING WATER CONTAINS MINERAL SALTS THAT CAN BE EXTREMELY HARMFUL TO THE BAT-

TERY: ONLY USE DISTILLED WATER.

CAUTION

CHARGE THE BATTERY BEFORE USE TO ENSURE OPTIMUM PERFORMANCE. FAILURE TO SUITABLY CHARGE THE BATTERY BEFORE ITS FIRST USE AT A LOW ELECTROLYTE LEVEL WILL CAUSE AN EARLY FAILURE OF THE BATTERY.

INDEX OF TOPICS

ENGINE FROM VEHICLE

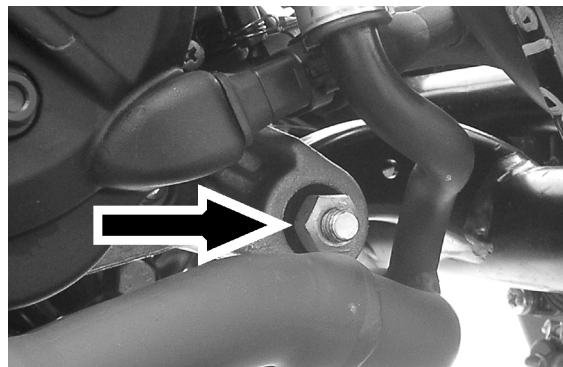
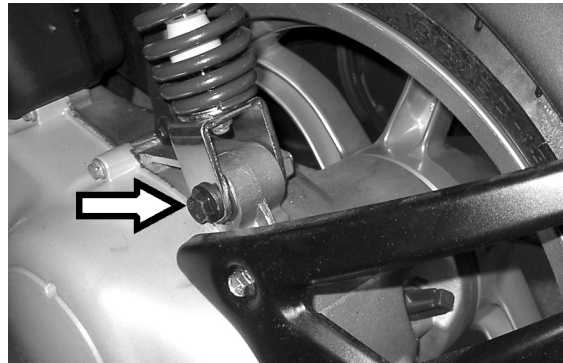
ENG VE

Removal of the engine from the vehicle

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

Locking torques (N*m)

Oscillating arm pin - engine 33 ÷ 41 Shock absorber - engine bolt 33÷41 N·m Rear wheel spindle nut 104 ÷ 126



INDEX OF TOPICS

ENGINE

ENG

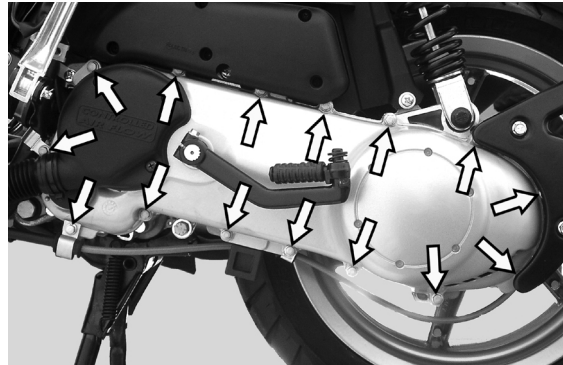
Automatic transmission

Transmission cover

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

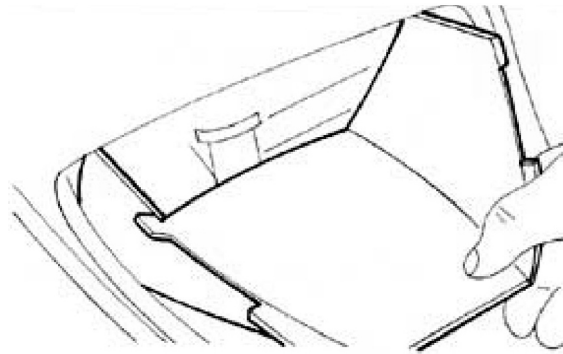
N.B.

THE CRANKCASE IS RESTRAINED BY THE TIGHT FITTING BETWEEN THE SHAFT OF THE DRIVEN HALF-PULLEY AND THE BEARING HOUSED ONTO THE CRANKCASE.



Air duct

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

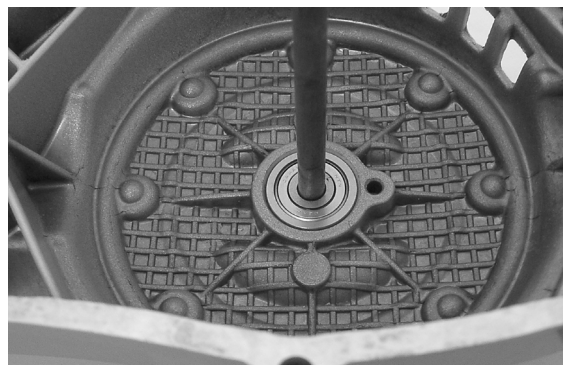


Removing the driven pulley shaft bearing

- Slightly heat the crankcase on the inside to avoid damaging the painted surface. Remove the bearing using the driven pulley shaft or a pin of the same diameter.

N.B.

IF THIS IS DIFFICULT A GENERIC 8 MM EXTRACTOR FOR INNER PARTS CAN BE USED.



Refitting the driven pulley shaft bearing

- After slightly heating the crankcase on the inside, fit the bearing using a bush of the same diameter
-

as the bearing outer race.

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 ASSEMBLY CAN ALSO BE REMOVED WITH THE DRIVE PULLEY IN PLACE.



Specific tooling

020565Y Compass flywheel stop spanner

Inspecting the clutch drum

- To verify that the bell clutch is not usurata or damaged.
- To measure the inner diameter of the bell clutch.

Characteristic

Clutch bell diameter/standard value

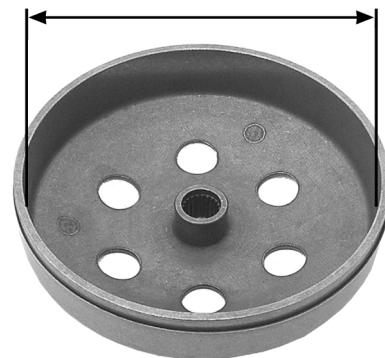
Ø 107+0,2 +0 mm

Clutch bell diameter/max. value allowed after use

Ø 107,5 mm

Found eccentricity /max.

0,20 mm



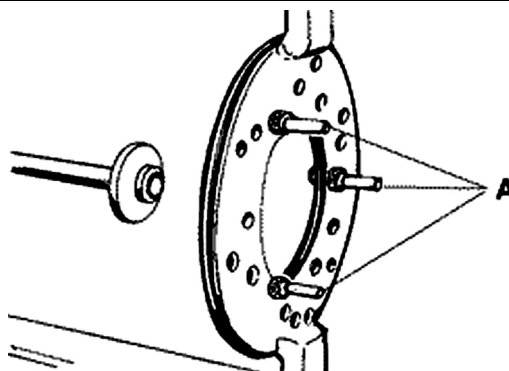
Removing the clutch

- Fit the tool with the long pins screwed on from

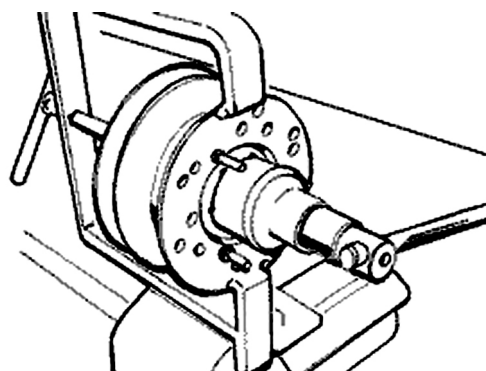
the outside in positions «A». Insert the driven pulley assembly into the tool and tighten the central screw.

CAUTION

OVERTIGHTENING OF THE CENTRAL SCREW CAUSES THE DISTORTION OF THE TOOL.



- Using a 34 mm socket wrench, remove the clutch locknut.
- Loosen the central screw, unloading the spring of the driven pulley assembly.
- Separate the components.

**Specific tooling**

020444Y Driven half pulley spring compressor tool

Inspecting the clutch

- Check the thickness of the clutch mass friction material.
- The masses must exhibit no traces of lubricants; in that case, 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. DIFFERENT CONDITIONS MAY CAUSE THE CLUTCH TEARING.

CAUTION

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

Characteristic

Check . Minimum thickness

1 mm

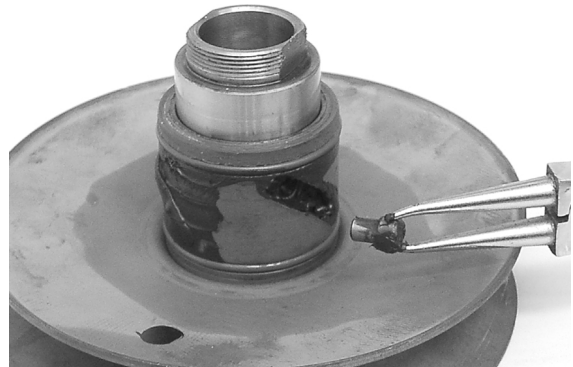


Pin retaining collar

- Remove the collar with the aid of two screwdrivers.



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



Removing the driven half-pulley bearing

- Remove the roller bearing using the specific extractor inserted from the lower side of the stationary half pulley

CAUTION

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

Specific tooling

001467y029 Bell



- Remove the snap ring from the roller bearing.
- Remove the roller bearing from the side of the clutch using the specific device.

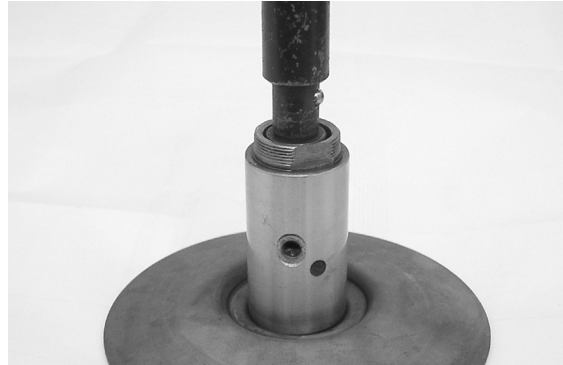
N.B.

ADEQUATELY SUPPORT THE HALF PULLEY TO PREVENT THE DRIVE BELT SLIDING SURFACE FROM BEING DISTORTED.

Specific tooling

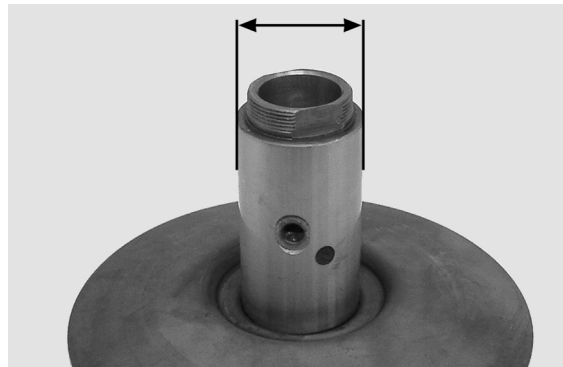
020376Y Handle for punches

020363Y 20mm guide



Inspecting the driven fixed half-pulley

- Make sure there are no signs of wear on the work surface of the belts, if there are replace the half pulley.
- Make sure the bearing do not show signs of unusual wear.
- Measure the external diameter of the pulley bushing.



Characteristic

Standard diameter

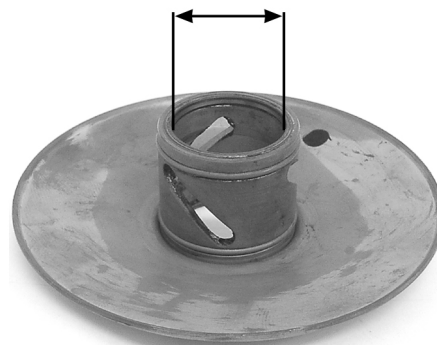
Ø 33,965 ÷ 33,985 mm

Stationary driven half pulley/ Minimum diameter allowed after use

Ø 33,96 mm

Inspecting the driven sliding half-pulley

- Remove the two inner seal rings and the two O-rings.
- Measure the inside diameter of the movable half pulley bushing.



Characteristic

Maximum allowable diameter

Ø 34,08 mm

- Check the belt contact surfaces.

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

- Assemble the half pulley on the bushing.

Recommended products

TUTELA MRM 2 Grease for the phonic wheel turning ring

Molybdenum disulphide grease and lithium soap



- 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 carried out through one of the holes inside the bushing until grease comes out of the opposite hole. This operation is necessary to avoid the presence of grease beyond the O-rings.

Recommended products

TUTELA MRM 2 Grease for the phonic wheel turning ring

Molybdenum disulphide grease and lithium soap

Refitting the driven half-pulley bearing

- Fit a new ball bearing with the specific tools.

- Fit the ball bearing circlip.

- Fit the new roller bearing so that the lettering is visible from the outside.

CAUTION

ADEQUATELY SUPPORT THE HALF PULLEY TO AVOID DAMAGING THE THREADED END WHILE FITTING THE BEARINGS.



Specific tooling

020376Y Handle for punches

020456Y Ø 24 mm adaptor

020362y 12 mm guide

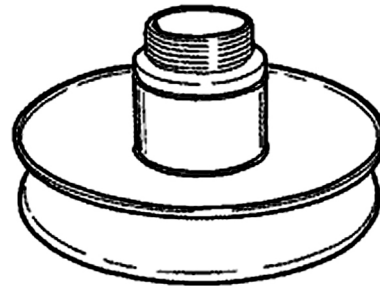
020171y Roller bearing drift

Refitting the driven pulley

- Check the surfaces contacting with the belt.
- Insert the new oil guards and the O-Rings on the mobile half-pulley.
- Fit the pulley on the bushing.

CAUTION

WHILE FITTING THE MOVABLE 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 operation is required to avoid the presence of grease above the O-Rings.

Recommended products

TUTELA MRM2 Grease for driven pulley bushing and mobile driven pulley seat

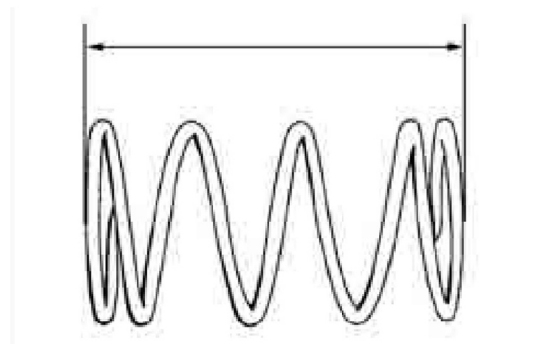
Bisulphide soap grease with Molybdenum NLGI2

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

Characteristic

Standard length:

110 mm

**Inspecting the clutch spring**

- Make sure that the driven pulley contrast spring is not deformed.
- Minimum length allowed after use

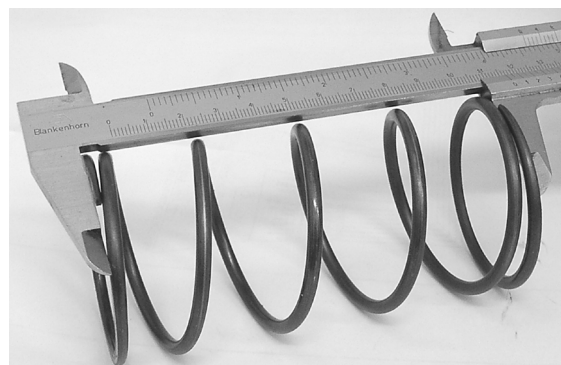
Characteristic

Standard length

118 mm

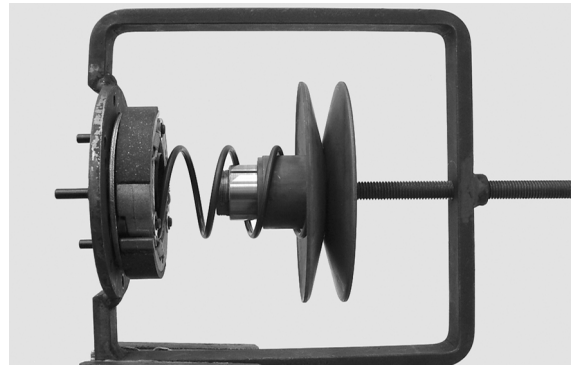
Limit after use

XXXX



Refitting the clutch

- Preassemble the driven pulley unit with spring, sheathing and clutch.
- Position the spring with the plastic shielding supporting the clutch
- Insert the parts in the device and preload the spring, being careful not to damage the plastic sheathing and the end of the threaded shank.



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

CAUTION

TO AVOID DAMAGING THE CLUTCH NUT, USE A SOCKET WRENCH WITH A SMALL BEVEL.

CAUTION

POSITION THE UNBEVELLED SURFACE OF THE NUT IN CONTACT WITH THE CLUTCH.



Locking torques (N*m)

Nut locking clutch assembly on pulley 55 ÷ 60 Nm

Refitting the driven pulley

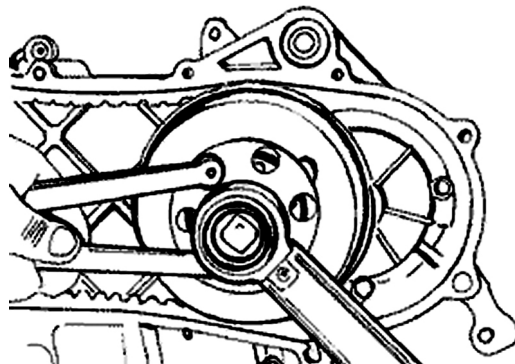
- Refit the driving pulley unit, the clutch bell and the nut using the specific tool.

Specific tooling

020565Y Compass flywheel stop spanner

Locking torques (N*m)

Tightening torque: 40 ÷ 44 N·m



Drive-belt

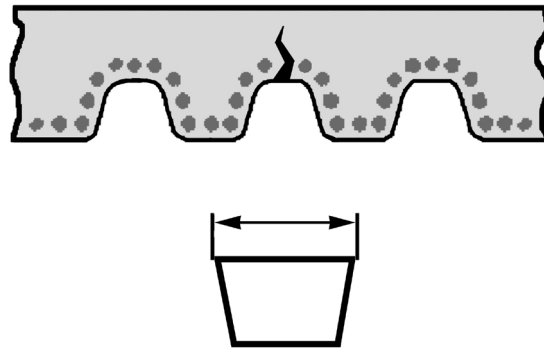
- Make sure the transmission belt is not damaged

and does not have cracks in the toothed grooves.

- Check the width of the belt.

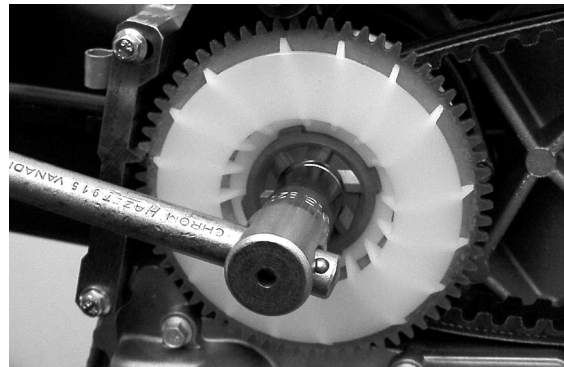
Characteristic transmission belt/Minimum width

17,5 mm



Removing the driving pulley

- Lock the pulley with the specific tool.
- Remove the central nut with the related washer, then remove the drive and the plastic fan.
- Remove the fixed half pulley.



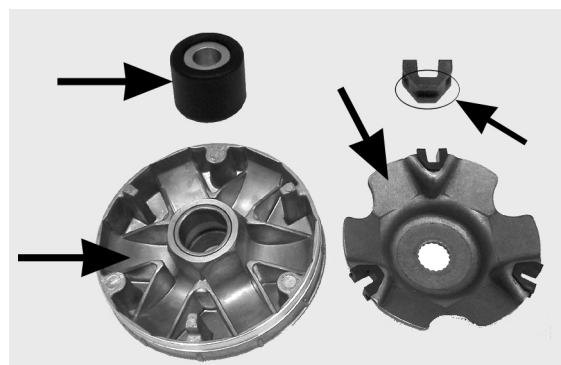
- Remove the belt, washer and remove the mobile half pulley with its bushing, being careful of the rollers and contrast plate fitted loosely on it.

Specific tooling

020451y Drive pulley stop spanner

Inspecting the rollers case

- 1) Make sure that the bushing and sliding rings on the mobile pulley are not lined or deformed.
- 2) Check the track where the rollers slide on the contact pulley, there should not be any signs of wear and check the conditions of the belt contact surfaces on the half pulleys (mobile and stationary).
- 3) Make sure that the rollers do not have marked facing on the sliding surfaces and that the metal insert does not protrude from the edges of the



plastic cover.

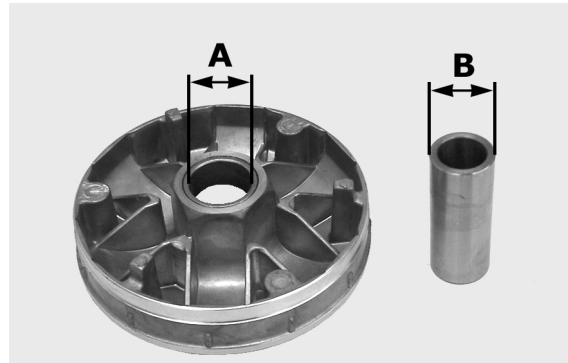
4) Make sure that the contact plate sliding blocks are intact.

- Check that the internal bronze 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 BRONZE BUSHING.



Characteristic

Maximum allowable diameter:

20,12 mm

Standard diameter:

20,021 mm

Sliding pulley brass/ Diameter maximum:

XXX mm

Sliding pulley brass/ Standard diameter:

XXX mm

Refitting the driving pulley

- Manually move the mobile driven pulley by pulling it towards the clutch unit and insert the belt keeping the rotation direction of the first assembly.

N.B.

IT IS ALWAYS A GOOD IDEA TO FIT THE BELT SO THAT THE WORDS ARE LEGIBLE IN CASE THE BELT DOES NOT SHOW AN ASSEMBLY DIRECTION.



- Reassemble the unit parts (roller housing unit with bushing, washer, stationary half pulley, belt

cooling fan with intake, washer and nut).

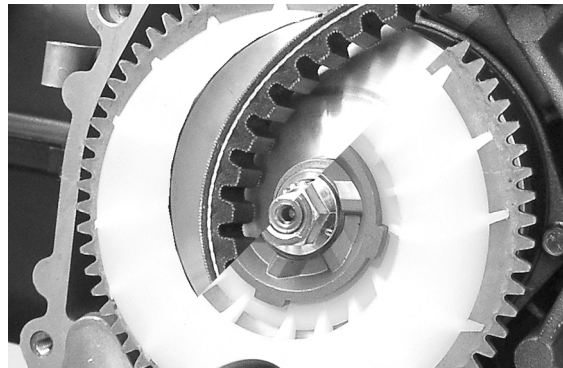
- Tighten the nut to a torque of 20 Nm and then finally tighten 90° with the specific tool preventing rotation of the drive pulley.

N.B.

REPLACE THE NUT WITH A NEW ONE EVERY TIME THE PARTS ARE REASSEMBLED

CAUTION

IT IS VERY IMPORTANT THAT WHEN THE DRIVE PULLEY IS SECURED THAT THE BELT IS FREE INSIDE IT, TO AVOID INCORRECTLY TIGHTENING IT WITH LATER DAMAGE TO THE ENGINE SHAFT MM SCALE.



Specific tooling

020451y Drive pulley stop spanner

Locking torques (N*m)

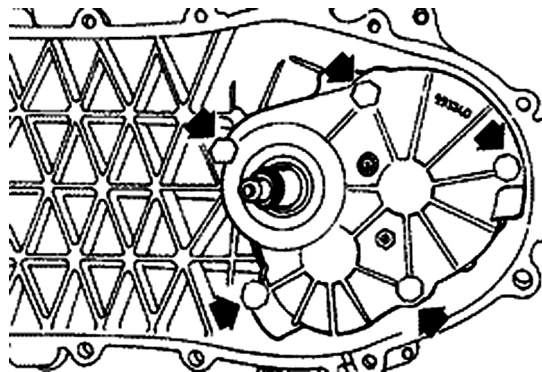
Tightening torque plus angle 18 ÷ 20 + 90°

N.m

End gear

Removing the hub cover

- Remove the transmission cover.
- Remove the Driven pulley removal
- Discharge the rear hub oil.
- Remove the 5 screws indicated in the figure.
- Remove the hub cover with pulley shaft.



See also

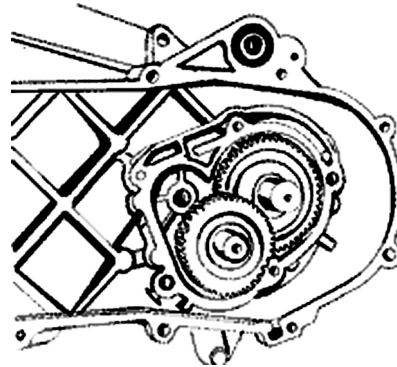
[Refitting the clutch](#)

Removing the wheel axle

- Remove the idler gear and the wheel spindle

with the related gear.

- While removing the idler gear, pay attention to the related shoulders.



Removing the wheel axle bearings

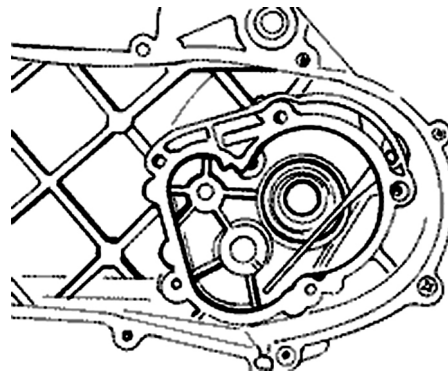
- Remove the oil seal and the seeger ring.
- Remove the bearing by pushing it with the specially designed drift from the outside towards the inside of the gear compartment.

Specific tooling

020363Y 20mm guide

020376Y Handle for punches

020358y 37 x40 adaptor

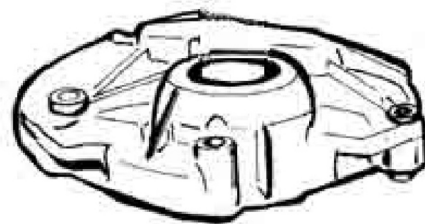


Removing the driven pulley shaft bearing

- Remove the seeger ring from inside the cover.
- Remove the oil seal from the outside.
- Remove the two dowel bolts and place the cover on a horizontal surface.
- Position the specific tool on the inner race of the bearing and expel the bearing with the aid of a press.

Specific tooling

020452y Driven pulley shaft fitting/removing tube

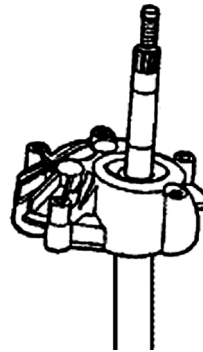


-
- Position the specific tube on the inner race of the bearing and on the pulley shaft teeth side as

shown in the figure. Expel the driven pulley shaft with the aid of a press.

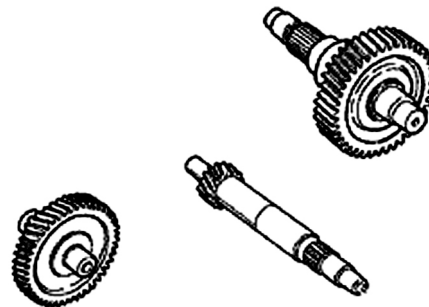
Specific tooling

020452y Driven pulley shaft fitting/removing tube



Inspecting the hub shaft

- Check the three shafts for wear or distortion of the toothed surfaces, the bearing housings and the oil seal housings.
- Replace any damaged parts.
- Check that the mating surface is not dented or distorted.
- If any anomalies are found, replace the hub cover.

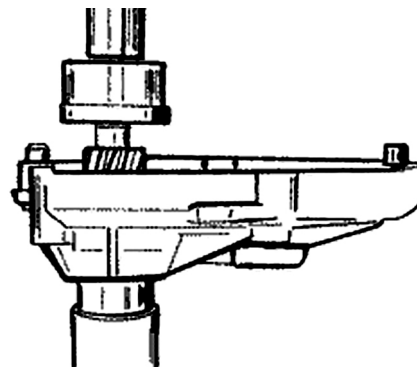


Refitting the driven pulley shaft bearing

- Using the specific tool under the press, support the inner race of the bearing on the outside of the hub cover. Fit the driven pulley shaft.
- Fit the oil seal so it is flush with the cover.

Specific tooling

020452y Driven pulley shaft fitting/removing tube



- Heat the hub cover and insert the bearing using the specific punch.
- Fit the elastic ring with the concave part on the bearing side.

N.B.

FIT THE BALL BEARING WITH THE SHIELD FA-

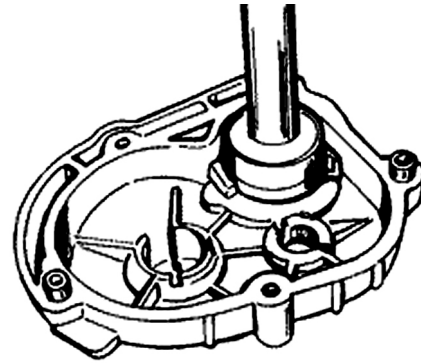
CHANGING THE OIL SEAL.**Specific tooling**

020151Y Air heater "METABO HG 1500/2"

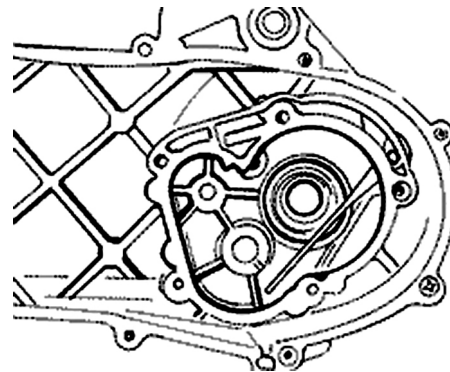
020376Y Handle for punches

020439Y 17 mm guide

020358y 37 x40 adaptor

**Refitting the wheel axle bearing**

- Heat the crankcase on the clutch side with the thermal gun.
- After lubricating the bearing outer plate, fit the bearing using the specially designed adaptor with the aid of a hammer.
- Fit the seeger ring and the oil ring using the 42x47 adaptor and the handle.

**Specific tooling**

020151Y Air heater "METABO HG 1500/2"

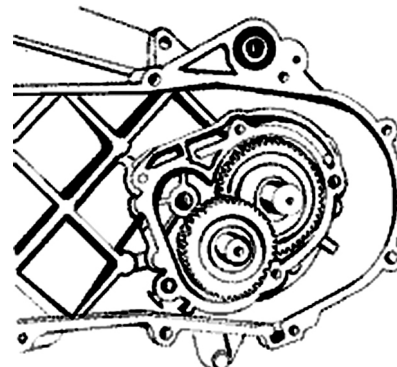
020376Y Handle for punches

020363Y 20mm guide

020359Y 42 x 47 mm hub bearing fitting adaptor

Refitting the hub cover

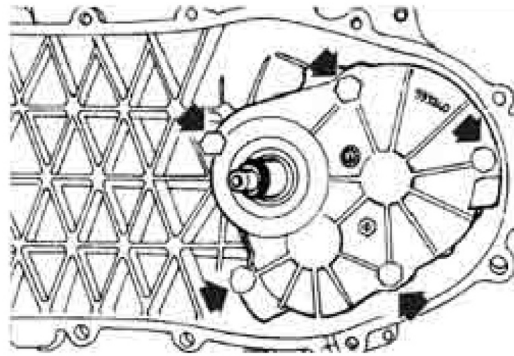
- Refit the wheel axis.
- Refit the intermediate gear.
- Apply LOCTITE 510 on the hub cover and refit it with pulley shaft.
- Insert the 5 screws and tighten them at the prescribed torque.

**N.B.****BEFORE FITTING A NEW GASKET, REMOVE ANY**

RESIDUES OF THE OLD GASKET FROM THE MATING SURFACES OF THE HUB COVER AND THE CRANKCASE HALF.

Locking torques (N*m)

Tightening torque: 11 ÷ 13 N·m



Flywheel cover

Removing the stator

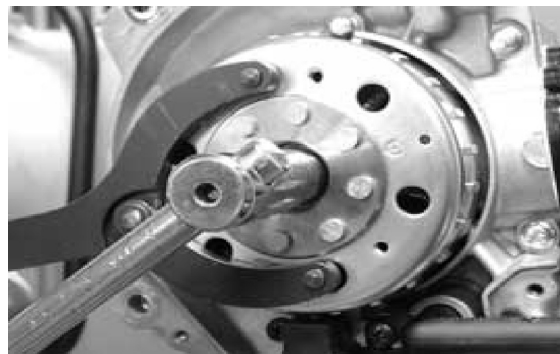
- Remove the flywheel cover



- Use a specific compass wrench and a 15 mm hexagon wrench to remove the flywheel fixing nut

Specific tooling

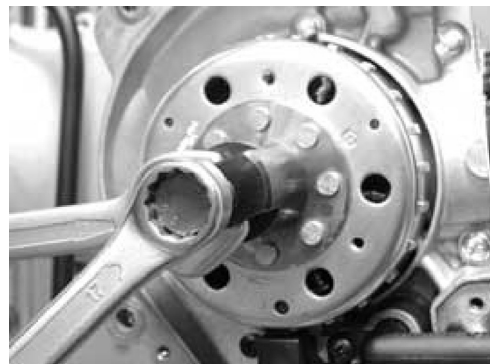
020565Y Compass flywheel stop spanner



- Use a specific extractor to remove the flywheel

Specific tooling

020162y Flywheel extractor



-
-
- Remove the two screws fixing the revolution 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 $40 \div 44$ N.m

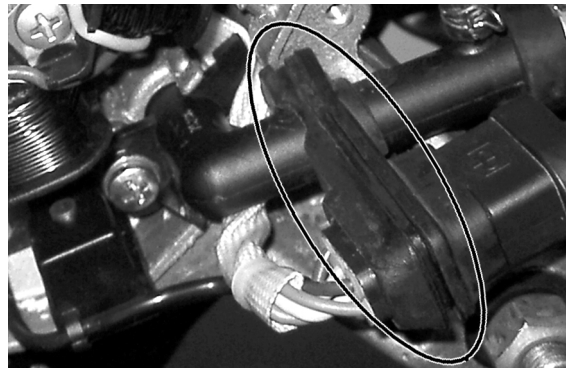


Refitting the stator

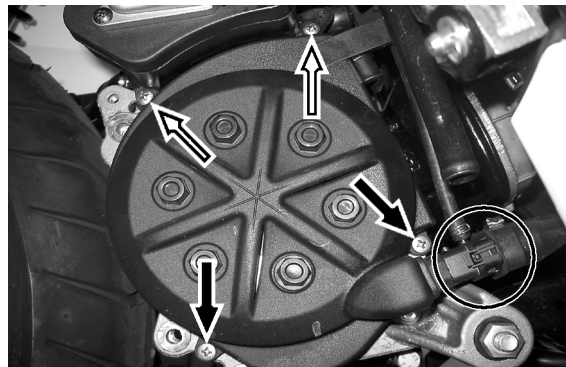
- To refit, perform the reverse operations

Refitting the flywheel cover

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

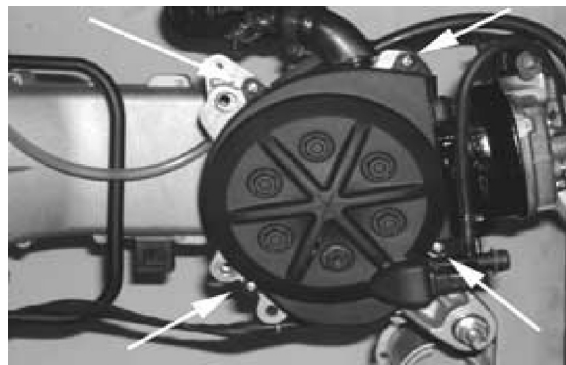


- Keeping the flywheel connector rubber clamp on the coolant inlet hose, refit the flywheel cover paying attention in inserting the strap in the groove.
- Tighten the 4 fixing screws noting that the two longer screws are to be inserted in the 2 top holes and are also responsible for restraining the secondary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



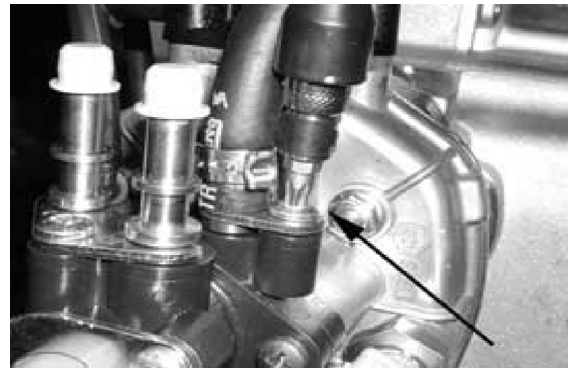
Cylinder assy. and timing system

- Remove the flywheel cover by the 4 screws shown in the figure.

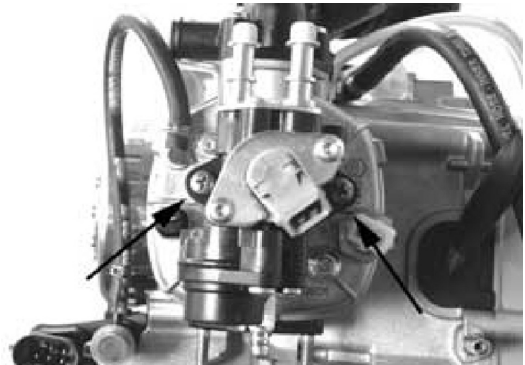


Removing the cylinder head

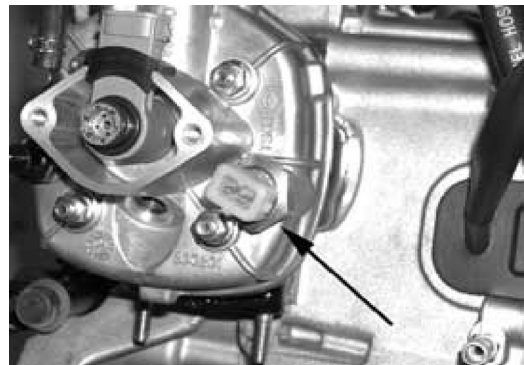
- Use a wrench TORX 20 to remove the air feeding pipe from the injection head as shown in the figure



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



- Remove the 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**

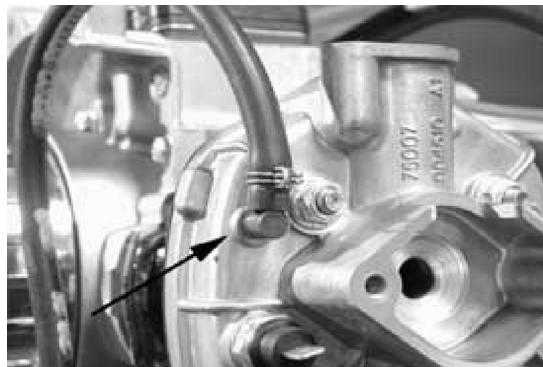




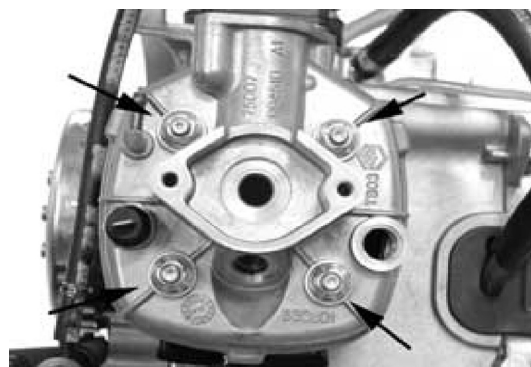
- Remove the coolant outlet union from the head with relevant O-ring by the screws, as shown in the figure



- Remove the head inside recirculation duct as shown in the figure



- Remove the head by the 4 screws as shown in the figure



Removing the cylinder - piston assy.

- Remove the cylinder holding the piston in order

to prevent damages



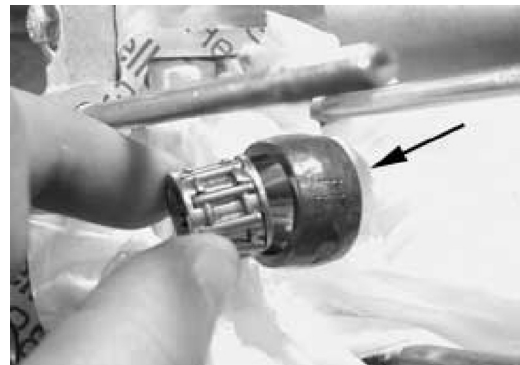
- Remove the 2 plug stops by a screwdriver inserted into the special slits on the piston
- Remove piston pin and remove the piston

N.B.

CLOSE THE CYLINDER HOUSING MOUTH ON THE CRANKCASE WITH PAPER OR WITH A CLOTH 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.



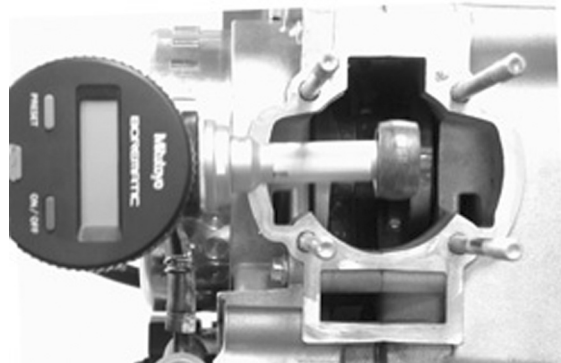
Inspecting the small end

- Using an inside micrometer, measure the small

end diameter

N.B.

IF THE SMALL END DIAMETER EXCEEDS THE MAXIMUM ALLOWABLE VALUE, OR IF IT SHOWS SIGNS OF WEAR OR OVERHEATING, PROCEED TO REPLACE THE CRANKSHAFT AS DESCRIBED IN THE CHAPTER "CRANKCASE AND CRANK-SHAFT".



Characteristic

Standard diameter

17 +0,011-0,001

Max. allowable diameter

17,060

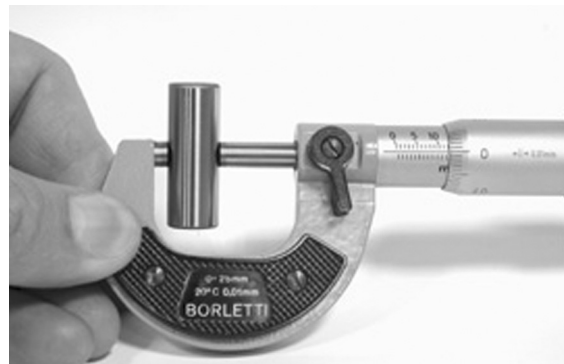
Inspecting the wrist pin

- Check the wrist pin external diameter using a micrometer

Characteristic

Wrist pin: standard diameter

12 +0,005 +0,001 mm



Inspecting the piston

- Using a suitable instrument measure the piston diameter
- Evaluate the piston-wrist pin fitting clearance

Characteristic

Wrist pin housing: standard diameter

12 +0,007 +0,012

Wrist pin housing: standard tolerance

0,002 ÷ 0,011 mm



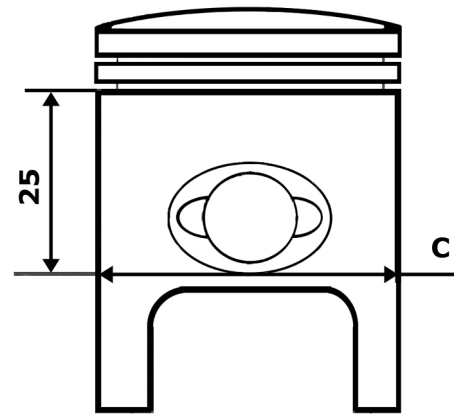
- Measure the external diameter of the piston ac-

cording to a direction orthogonal to the pin axis

- Carry out the measurement at the location

shown in the figure

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

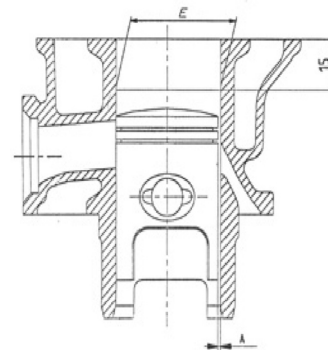


See also

[Cylinder - piston assy.](#)

Inspecting the cylinder

- Check that the cylinder exhibits no seizure. If so, replace or adjust
- Use a bore meter to measure the cylinder inside diameter according to the directions shown in the figure.

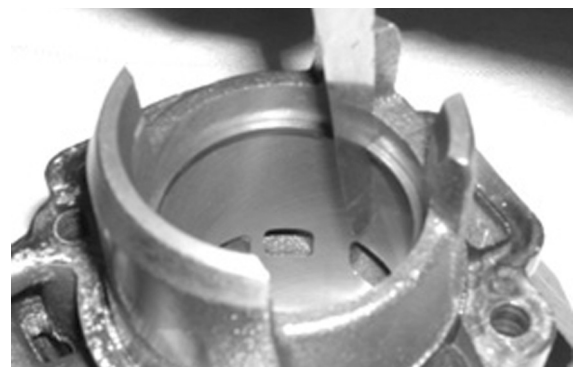


- Check that the coupling surface with the head is not worn or deformed

To classify the coupling, refer to the Fitting clearance.

Inspecting the piston rings

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



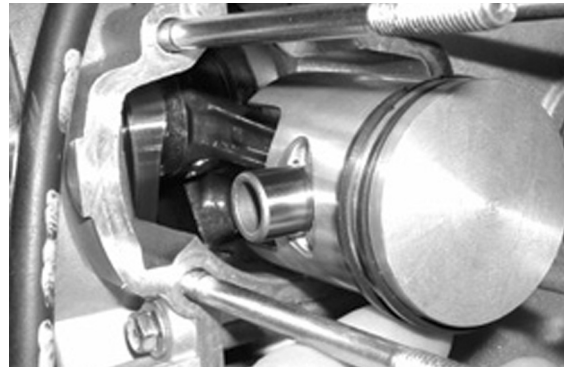
- If the values are higher than those prescribed, Fitting clearance replace the rings

Removing the piston

- Insert the roller in the connecting rod



- Fit piston and plug on the connecting rod, with piston facing the outlet



- Insert the plug stop ring in the specific tool with the aperture in the position shown on the tool, as in the figure



- Place the plug stop ring into position by punch

Specific tooling

020166y Piston rings fixing tool



- Fit the plug stop as shown in the figure

Specific tooling

020166y Piston rings fixing tool



Choosing the gasket

- Temporarily fit the cylinder on the piston without gasket.
- Fit a comparator on the specific tool, using the short union as shown in the figure.



- Use a reference plane to reset the comparator with a pre-load of a few millimetres.
 - Fix the comparator.
 - Check the perfect sliding of the tracer.
 - Fit the tool on the cylinder without changing the comparator position.
 - Lock the tool by the nuts used to secure the head.
-
- Turn the engine shaft to the P.M.S. (comparator 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.

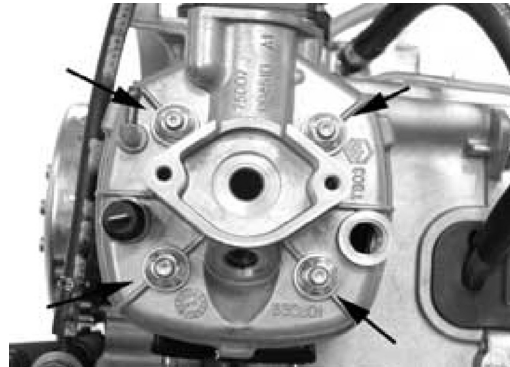


Specific tooling

020272Y Tool for checking the position of the piston

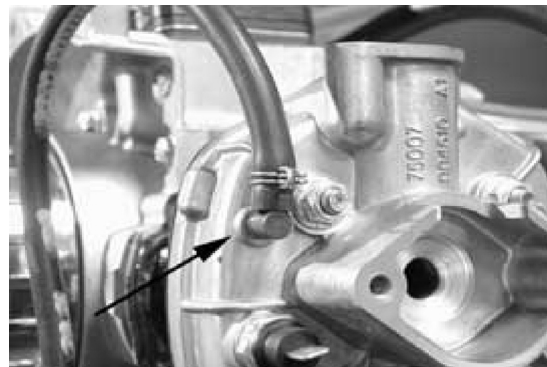
Refitting the head and timing system components

- Carefully clean the head removing any carbon residues
- Check the integrity of the coupling surfaces
- Check that the O-rings are not broken, or 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 conditions
- Fit the coolant outlet union on the head with relevant O-ring by tightening 2 screws at 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.

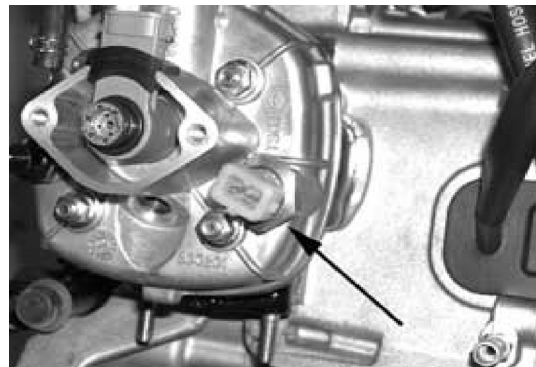
NOTE THAT WHEN THE AIR INJECTOR IS REFITTED, THE CARBON DAM SEALING RING MUST BE NEW. IF A NEW AIR INJECTOR IS FITTED, THE NEW CARBON DAM RING IS ALREADY PRESENT. IF THE OLD AIR INJECTOR IS FITTED, CARBON-DAM REPLACEMENT



- Fit the plug
- Refit the temperature sensor and tighten at the prescribed torque

Locking torques (N*m)

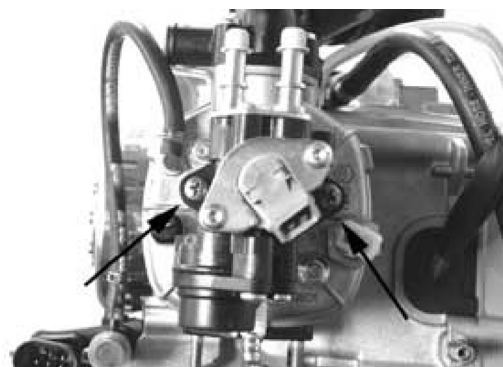
Temperature sensor: 18 ÷ 22 Nm Plug: 11 ÷ 14 Nm



- Refit the injection head including the fuel injector and pressure regulator and tighten at the prescribed torque

Locking torques (N*m)

Injection head fixing screw: 3 ÷ 4 Nm



- Use a wrench TORX 20 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.
- Proceed in more steps to favour a correct widening of the ring as shown in the figure.

**Specific tooling****020615y Tool for carbon dam ring:**

- Place the specific tool with the step facing the injector, as shown in the figure



- Use the specific tool to tighten the carbon dam ring seat as shown in the figure.
- Act in more 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 Tool for carbon dam ring:

Crankcase - crankshaft

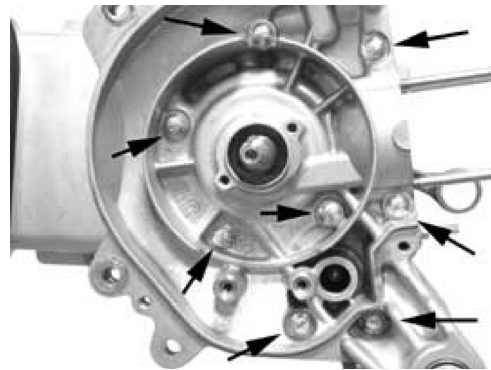
- Remove Flywheel and Stator
- Remove Driving pulley removal
- Remove the Driven pulley removal
- Remove the mixer Mixer
- Remove the throttle body with manifold, diaphragm, gasket and blade support
- Remove the volumetric compressor
- Remove the Thermal unit
- Remove the starter motor

See also

[Removing the driving pulley](#)
[Removing the driven pulley](#)
[Removal](#)
[Cylinder assy. and timing system](#)

Splitting the crankcase halves

- Remove the 8 half-case fixing screws shown in the figure



- Insert the guard on the motor shaft as shown in the figure



- Use the specific tool to remove the half-case on the flywheel side. Place the tool being careful to correctly centre it

- Use a 17 mm hexagon wrench to remove the half-case on the flywheel side.

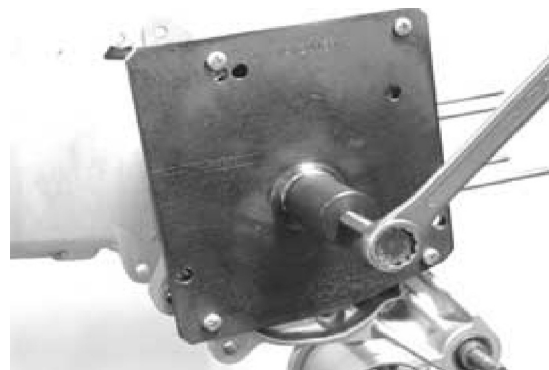
N.B.

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

Specific tooling

020151Y Air heater "METABO HG 1500/2"

020163y Crankcase splitting plate



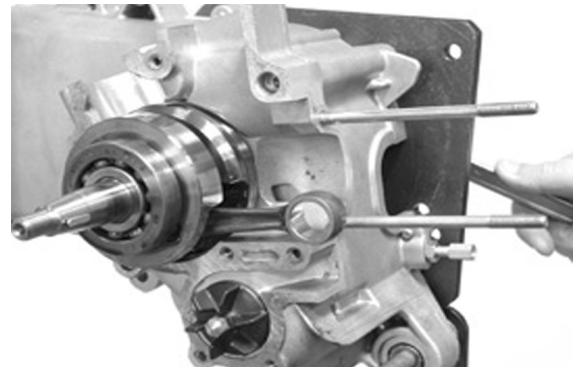
- Install the specific tool with relevant guard on the transmission side half-case. Use no. 4 M6 screws with suitable length

- Use a 17 mm hexagon wrench to remove the motor shaft from the transmission side half case.



Removing the crankshaft

- Install the special tool onto the transmission-side half-crankcase using four M6 screws of 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 half-cases or on the motor shaft
- Use the specific tool to remove any bearings left on the motor shaft

N.B.

HALF-RINGS MUST BE INSERTED ON THE BEARINGS BY HITTING THEM WITH A HAMMER.

Specific tooling

004499y Bearing extractor

004499y007 Half rings



- Use the specific tool to remove any bearings left on both half-cases

Specific tooling

001467Y006 20-mm pliers

001467Y007 Bell



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 oil amount (approx. 1L)



- Heat the container by a thermal gun progressively, until you reach an oil temperature of approx. 150°.
- Check the temperature using a multimeter provided with thermal probe



N.B.

IF THE BEARINGS ARE IMMERSSED INTO HOT OIL, THEY WOULD BE IMMEDIATELY DAMAGED.

- Place the motor shaft on the special support
- Alternately introduce the 2 bearings to place them in abutment
- If required, use a specific pipe to ensure the bearing abutment

N.B.

THIS OPERATION SHOULD BE PERFORMED QUICKLY AND WITH PRECISE MOVES. OTHERWISE, PROCEED FROM THE BEGINNING.



Specific tooling

020265y Bearing fitting stand

008119y009 Tube (shaft fitting tool)

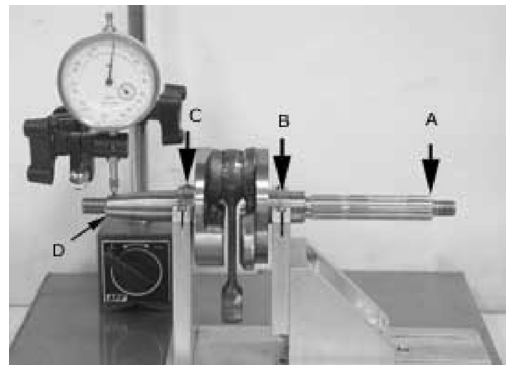
Inspecting the crankshaft components

- Check for any unusual wear on the track of the eccentric.
- For checking with the comparator see the section «Checking crankshaft alignment»



Inspecting the crankshaft alignment

Using the appropriate specific tools, check the eccentricities of the surfaces of diameters «A»-«B»-«C» are within 0.03 mm (top reading limit for the dial gauge clock); check also the eccentricity of diameter «D», for which a maximum misalignment of 0.02 mm is allowed. In the event that the eccentricities are not too far off the prescribed values, **straighten** the crankshaft by acting with a wedge in between the counterweights or by using vice (with aluminium mouth guards) according to your needs.



Specific tooling

020335Y Magnetic stand and comparator

020074Y Crankshaft aligning tool

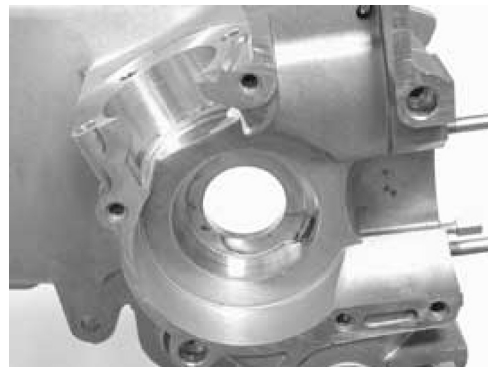
Inspecting the crankcase halves

- Remove the oil guards from both half-cases us-
-

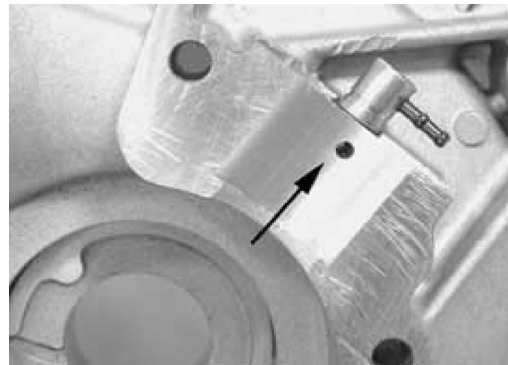
ing a screwdriver



- Clean the coupling surfaces removing Loctite residues and residues of the cylinder paper seal
- For this operation, use specific products available on the market. Avoid any method that may impair the case coupling surfaces
- To facilitate this operation, remove the impeller. Please note that the threading is left handed
- Check the coupling surfaces and the bearing and oil guard capacity



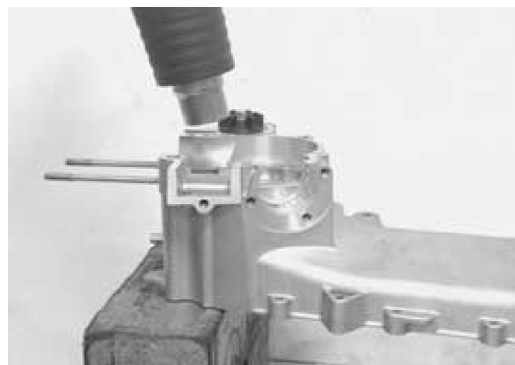
- Check the cleaning and efficiency of the pump case oil supply unidirectional pump
- Check the correct installation of the reference dowels



Refitting the crankshaft

- Place the transmission side half-case on two wooden supports
- Refit the water pump impeller (note that the threading is left handed)
- 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 MOTOR SHAFT

- Insert the motor shaft by a firm movement until the bearing reaches the limit switch

N.B.

CHECK THAT THE CONNECTING ROD IS PLACED ACCORDING TO THE CYLINDER AXIS. IF ASSEMBLY IS UNSUCCESSFUL, REPEAT FROM THE BEGINNING COMPLYING WITH THE HEATING RULES AND BEING CAREFUL TO THE SHAFT INSERTION MOVEMENT. DO NOT LUBRICATE THE SHAFT SINCE THE HALF-CASE COUPLING SURFACES MAY BE SMEARED



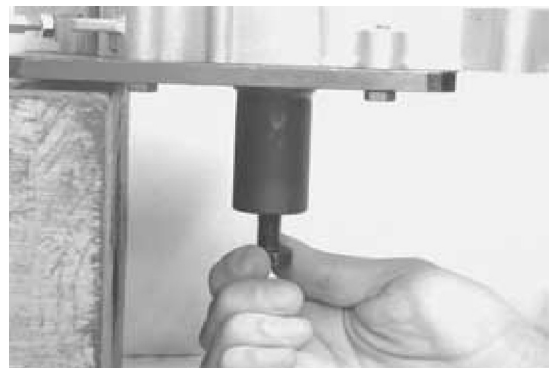
- Let the half-case temperature settle with the motor shaft temperature

- Install the specific case separation plate again without installing the motor shaft protection -

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 CASE BEARING POSITION

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

Recommended products

Loctite 510 Packing fluid

Packing



- Prepare what needed to close the half-case (screws, wrench).
- Heat the half case on the flywheel side using the thermal gun, with the same procedure of the transmission side half case.



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

N.B.

WEAR GLOVES WHEN HANDLING THE HALF-CASE. 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)

Case closing screws: 12 -13 Nm

Refitting the crankcase halves

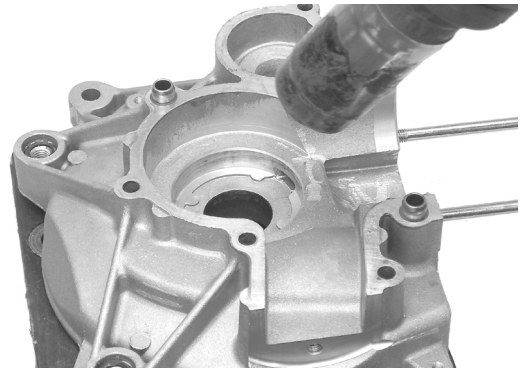
- Prepare the mating plane by applying a thin layer of LOCTITE 510, after cleaning the surface with an adequate solvent (e.g. acetylene trichloride).

-
- Heat the flywheel-side half-crankcase using a heat gun.

Recommended products

Loctite 510 Packing fluid

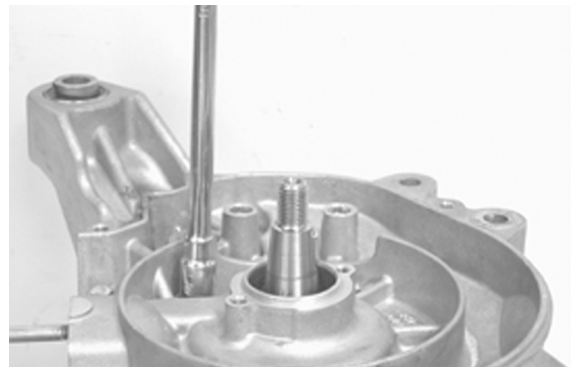
Packing



-
- Keeping the transmission-side half-crankcase in horizontal position, vigorously and accurately insert the flywheel-side half-crankcase.

- Insert at least 3 fixing screws and tighten them quickly.

- Insert the other 5 screws and tighten them at the prescribed torque.



Locking torques (N*m)

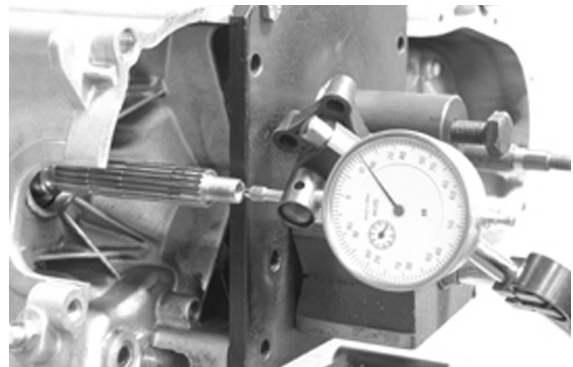
Crankcase fixing screws 11 - 13

-
- Move the crankcase splitting plate backwards as shown in the figure.

- Install the special magnetic mounting with its dial gauge, at the end of the crankshaft.

- Check the crankshaft axial play.

- If the measurements do not match those prescribed, repeat the crankshaft reassembly operation.



Specific tooling

020335Y Magnetic stand and comparator

Characteristic

Axial play with warm crankcase

0,10 ÷ 0,12 mm

Axial play with cold crankcase

0,06 ÷ 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 cover



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





Overhaul

Air compressor check

- Checks the presence of any strange wear, traces of overheating on the roller contacting with the eccentric, as shown in the figure



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

Characteristic

Standard axial backlash:

XXX

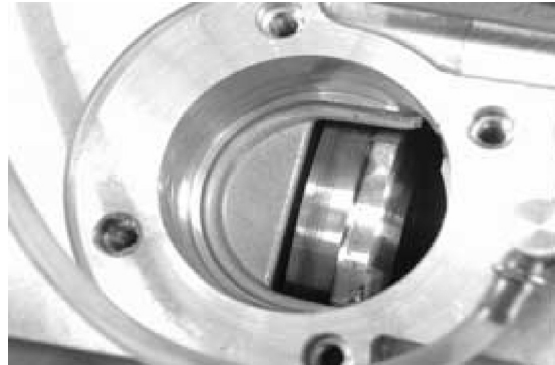
Allowable limit after use:

XXX

- Check that the sealing ring exhibits no breakage or squashing



-
-
- Remove the flywheel cover.
 - Turn the motor shaft to check that the eccentric track exhibits no strange wear or overheating traces.



Refitting

Air compressor refitting

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



- Refit the sealing ring
- Refit the 4 fixing screws at the prescribed torque

Locking torques (N*m)

Air compressor screw locking torque: 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

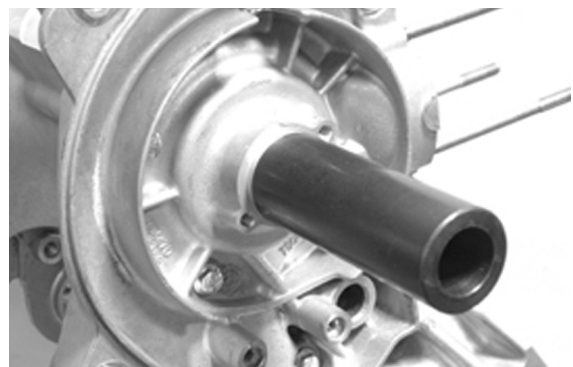
- Install a new oil guard on the flywheel side using the specific tool punch. The flywheel side oil guard can be recognised by the smaller diameter.

N.B.

THE TOOL CANNOT BE USED WHEN THE WRENCH IS FITTED

Specific tooling

020340Y Punch for fitting oil guard magneto and transmission



- Install a new oil guard on the transmission side using the specific tool provided with adapter ring. The transmission side oil guard can be recog-

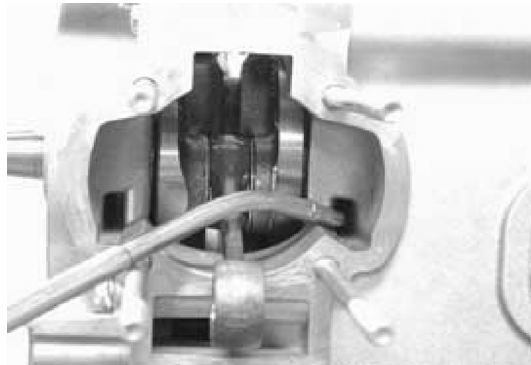
nised by the larger diameter

Specific tooling

020340Y Punch for fitting oil guard magneto and transmission



- Lubricate bearings and connecting rod head using oil 2T

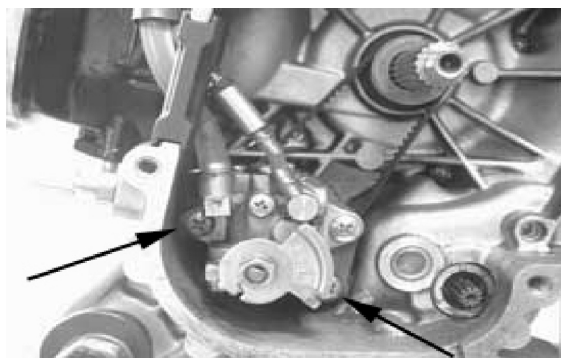


- Refit the thermal unit
- Refit the compressor
- Refit the throttle body
- Refit the flywheel - stator
- Refit the mixerRefit the duct pulley
- Refit the motor pulley

Oil pump

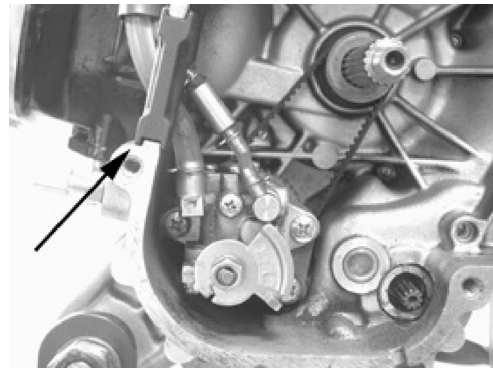
Removal

- Remove the transmission cover
- Remove Driving pulley removal
- Remove the 2 screws shown in the figure

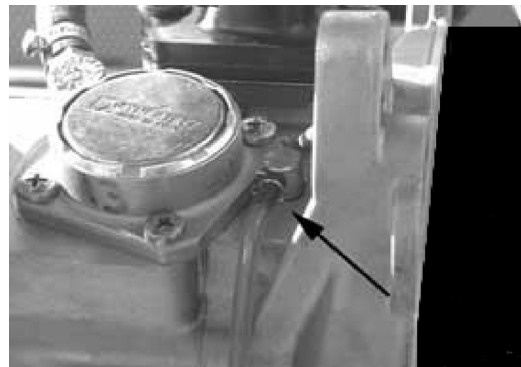


-
- Remove the pipe gasket from the case as

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 reverse operations.
- Perform purging after refitting, acting on the screw shown in the figure



INDEX OF TOPICS

PURE JET INJECTION



Introduction

INTRODUCTION EMS injection system

The injection system is with integrated injection and ignition.

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

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

Carburation and ignition are managed 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 to 2000 RPM for any temperature of use, by suitably managing the air injector controls, fuel injector and HV coil. Carburation therefore changes according to the use temperature.

During running, the carburation is managed on the basis of the engine rpm signals, of the coolant temperature, of the gas valve position in relation to preset mapping.

The fuel injection circuit consists of:

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

The injector support is connected by two pipes provided with quick coupling. The continuous circulation avoids the fuel boiling. The pressure regulator is placed in output of the injector support. The fuel pump is controlled by the ECU for the vehicle safety.

The power supply circuit consists of:

- Volumetric compressor with unidirectional valve controlled by the eccentric on the engine shaft
- Hose connecting to the injector support
- Pressure regulator
- Air injector

The ignition circuit consists of:

- ECU - HV coil.
- HV cable Screened cap
- 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 obtained 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 circuits:

- 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 the fault.
2. The power supply system is pressurised at 250 ÷ 800 KPa (2.5 ÷ 8 BAR). Before disconnecting the quick coupling of a pipe, check that there are no free flames and do not smoke. Avoid spraying in your eyes.
3. When fixing electric components, operate with connected battery 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 to 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 operations in the order shown: Set the switch to "OFF", 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 damages, disconnect and reconnect the ECU system connectors only if required. Before reconnecting, check that the connectors are dry.
10. During electric checks, do not force the tester tips into the connectors. Perform electric checks using the interface wiring specific tool.
11. At the end of every check performed with the diagnosis 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 fixing, do not remove the compressed air hose clamps. If that is 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 plug when it is not fitted on the head. Power supply voltages are very high. Hazard of dangerous electric discharges. In addition, the air - fuel mixture leaking from the plug may cause fire
16. Do not switch to «ON» when the tank is empty. While on the road, do not use the reserve with the risk of finishing the fuel.
17. Do not disconnect the battery leads when the engine is running.
18. If the fuel finishes, refuel with at least 4L so as to be sure that the fuel pump triggers

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

Feeding duct

4. Fuel supply

Faulty fuel pump

Dirty fuel filter

Fuel supply vent clogged

5. Ignition system

Faulty plug

Faulty coil

Faulty screened cap

6. Suction filter

7. Others

Reset of the gas valve position sensor wrong

2 Injection system faults may depend on 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 Use a multimeter for troubleshooting, 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 $\pm 2\%$.

menù diagnosis tester

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

Specific tooling

020460Y Tester and scooter diagnosis

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 DIAGNOSIS, LINK TO PC, CONTRAST SET, LANGUAGE SET, BUZZER SET, VERSION
3. Select ECU diagnosis
4. Select the software for system PUREJET
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.

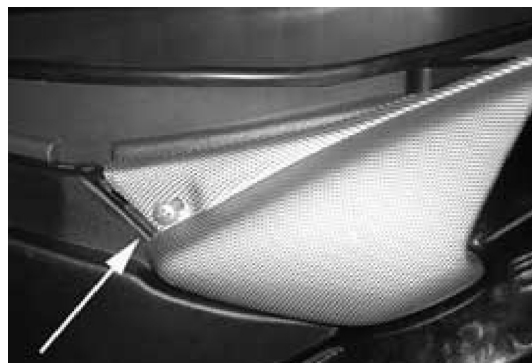
IF THE SCOOTER DIAGNOSTIC TESTER IS NOT LOADED WITH THE SYSTEM SOFTWARE, UPGRADE BY: A PC, A PROGRAMMING KIT . AND THE SOFTWARE TO LOAD.. SET THE DIAGNOSTIC TESTER TO FUNCTION «LINK TO PC» IN THE MENU.

The main menu has the following functions:

- PARAMETERS
- ERRORS
- PARAMETERS STORED
- ERROR CLEARING
- ACTIVE DIAGNOSES
- TPS RESET
- CALIBRATION
- ECU INFORMATION

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

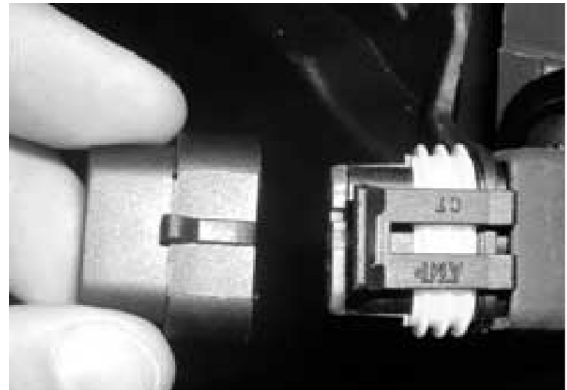
- Lift the saddle to connect the scooter diagnostic tester
- Remove the LH detail shown in the figure



- Extract the tap from the support clip



- Remove the cap from the diagnostic tap



- 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 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
RPM	Display the engine operation in all conditions, including starting
ENGINE TEMP °C	Indicates the coolant temperature
THR.OPEN. %	Denotes the throttle valve opening %
FUEL INJ. T. mS	Fuel injector opening time
AIR INJ. T mS	Air injector opening time (air-fuel spray)
IGN. ADVANCE °	Ignition advance in degrees before PMS
SENSOR VOLT. V	Denotes the TPS sensor power supply voltage
ENGINE TEMP. V	Denotes the voltage value of the coolant temperature signal
TPS1 OUTPUT V	Denotes the TPS1 signal voltage
TPS2 OUTPUT V	Denotes the TPS2 signal voltage
TPS1 ZERO V	Denotes the TPS1 signal reset voltage (referred to ground)
TPS2 ZERO V	Denotes the TPS2 signal reset voltage (to positive 5V)
BATT. VOLT.. V	Denotes the ECU power supply voltage (normally equal to the battery voltage)
T. DWELL MS	Denotes the HV coil core dwelling time
IDLE RPM	Denotes the engine rpm set in the ECU for idle control
CONS. IST. L/H	Denotes fuel consumption
D. CYCLE CONS. %	Denotes the ratio in % between the ON time and the «OFF» time of the consumption gauge control time (this instrument is not provided on this vehicle)
ENGINE STATUS	Displays the engine status: STALL (stationary) CRANK (starting) IDLE (idle) RUN (running)
OPERAT. HOURS H	Displays the engine working hours
S.T. FUEL PUMP	Denotes the fuel pump status (OFF - ON)
TPS TO RESET	Denotes the need of repeating the reset of TPS

Specification	Desc./Quantity
	signals (YES - NO)

All parameters can be displayed selecting the 4 pages. In case of need, it is possible to store all parameters to the tester pressing «TAB» when desired. The parameters remain stored as long as the diagnostic tester is powered.

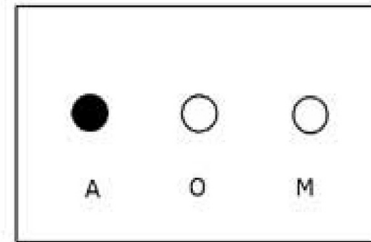
<u>ERRORS</u>	
Specification	Desc./Quantity
G11 P0115	Engine temperature sensor: the coolant temperature signal voltage is close to 0V (short circuit) or to 5V (open circuit). <u>Temperature indicator off</u> Indicator off
G11 P0217	Engine temperature high: the coolant temperature signal voltage has reached too low voltages. They denote a very high temperature, higher than what can be indicated by the instrument panel. <u>Flashing light</u>
G20 P1120 TPS OFFSET	The voltage of TPS signals is not as expected. <u>Engine to idle.</u> <u>Light on</u>
G20 P1123 TPS	TPS signals missing Voltage close to 0V (short circuit) Voltage close to 5V (open circuit) <u>Engine to forced idle</u> <u>flashing light</u>
G21 P1124 TPS1 OFFSET	TPS1 signal is not as expected <u>Light off</u>
G21 P1125 TPS1	TPS1 signal missing. Voltage close to 0V (short circuit) Voltage close to 5V (open circuit) <u>Light on</u>
G22 P1127 TPS2 OFFSET	TPS2 signal is not as expected. <u>Light off</u>
G22 P1128 TPS2	TPS2 signal missing Voltage close to 0V (short circuit) Voltage close to 5V (open circuit) <u>Light on</u>
G30 P0560 Battery voltage	ECU power supply voltage is below 8.5V or is too high <u>Flashing light</u>
G30 P1560 Sensor voltage	The TPS sensor and coolant temperature sensor supply voltage is not conforming.

Specification	Desc./Quantity
	<u>Light off</u>
G30 P1561 Sensor 2	TPS sensor and coolant temperature sensor power supply voltage is not conforming (high temperature). <u>Engine to forced idle</u> <u>Light on</u>
G40 P0219 Runaway rpm	Circuit check Engine has reached excessive rpm. <u>Light on</u>
G40 P0335 Rpm pick-up	The ECU cannot properly recognise the rotation speed or the engine phase point. <u>Engine with stall</u> <u>Light on</u>
G40 P0700 Belt CVT	With idle engine or during start up, the automatic transmission or the clutch have required an excess driving force. The fault is registered when the engine management is not as expected for 3 consecutive times. <u>Light off</u>
G50 P0251 Fuel injector	Circuit check The ECU has detected an interruption in the injector circuit. The fault can only be recognised in the presence of phase - rpm <u>Light on</u>
G50 P0350 HV 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 <u>Engine without injection</u> <u>Light on</u>
G60 P0230 Fuel pump	The ECU has detected an interruption or short circuit on the pump power supply circuit <u>Light on</u>
G60 P0650 Check lamp.	The ECU has detected an interruption or short circuit onj the injection indicator supply. <u>Open circuit: indicator always off</u> <u>Circuit to ground: Clrcuit to ground: light always on</u>
G60 P1561 Temp. indicator	The ECU has detected an interruption or a short circuit on the temperature indicator circuit. <u>Light off</u>
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 <u>Light on</u>

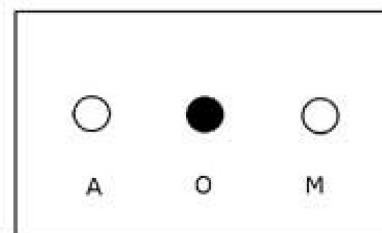
Faults are reported by a dark dot on one of the

reference columns. The recognition occurs in 3 modes:

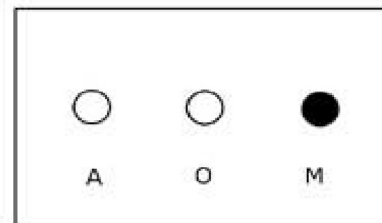
Dot on the column marked «A». the fault is «CURRENT»



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 BY A SINGLE CHANGE. THAT IS, THE «CURRENT» AND «STORED» CONDITIONS CANNOT COEXIST

Stored parameters

This function allows displaying previously stored parameters.

As already said in the parameters description, storage occurs by pressing TAB when desired.

The tester can contain a single storage, automatically deleted when the tester is switched off.

Error clearing This function allows clearing the faults and any codes registered by the self-diagnosis of the ECU.

Active diagnosis

This function is very useful for performing an efficiency check of the main system components and

relevant circuits.

The concerned components are:

ACTIVE DIAGNOSIS

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

When the various diagnoses 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 the transmission of the command but cannot check the actual efficiency of the circuit under test.

Resetting the TPS

This function allows combining the throttle body with the ECU.

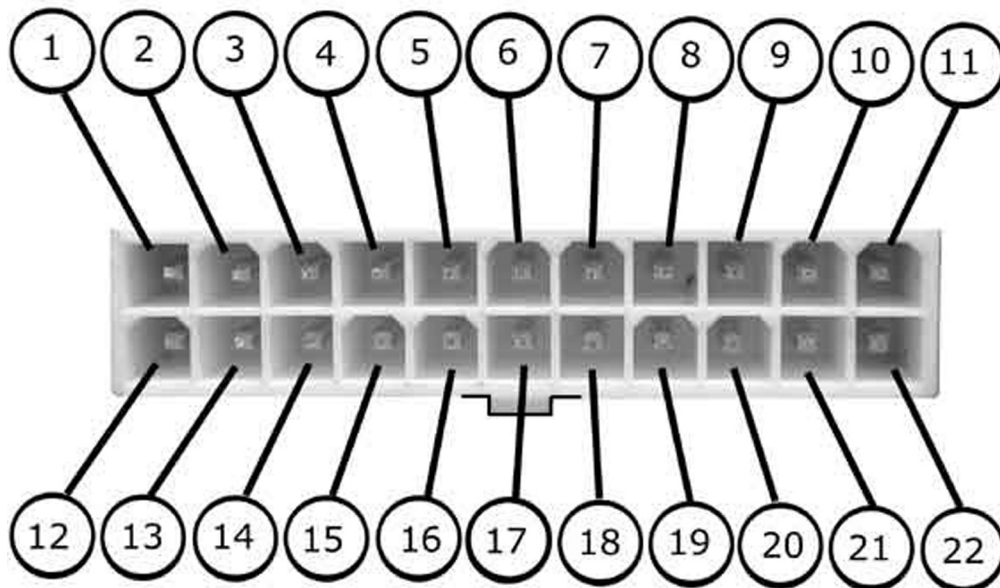
Calibration

This function allows adding new calibrations to the ECU with the product developments. ECU information

The tester allows displaying 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

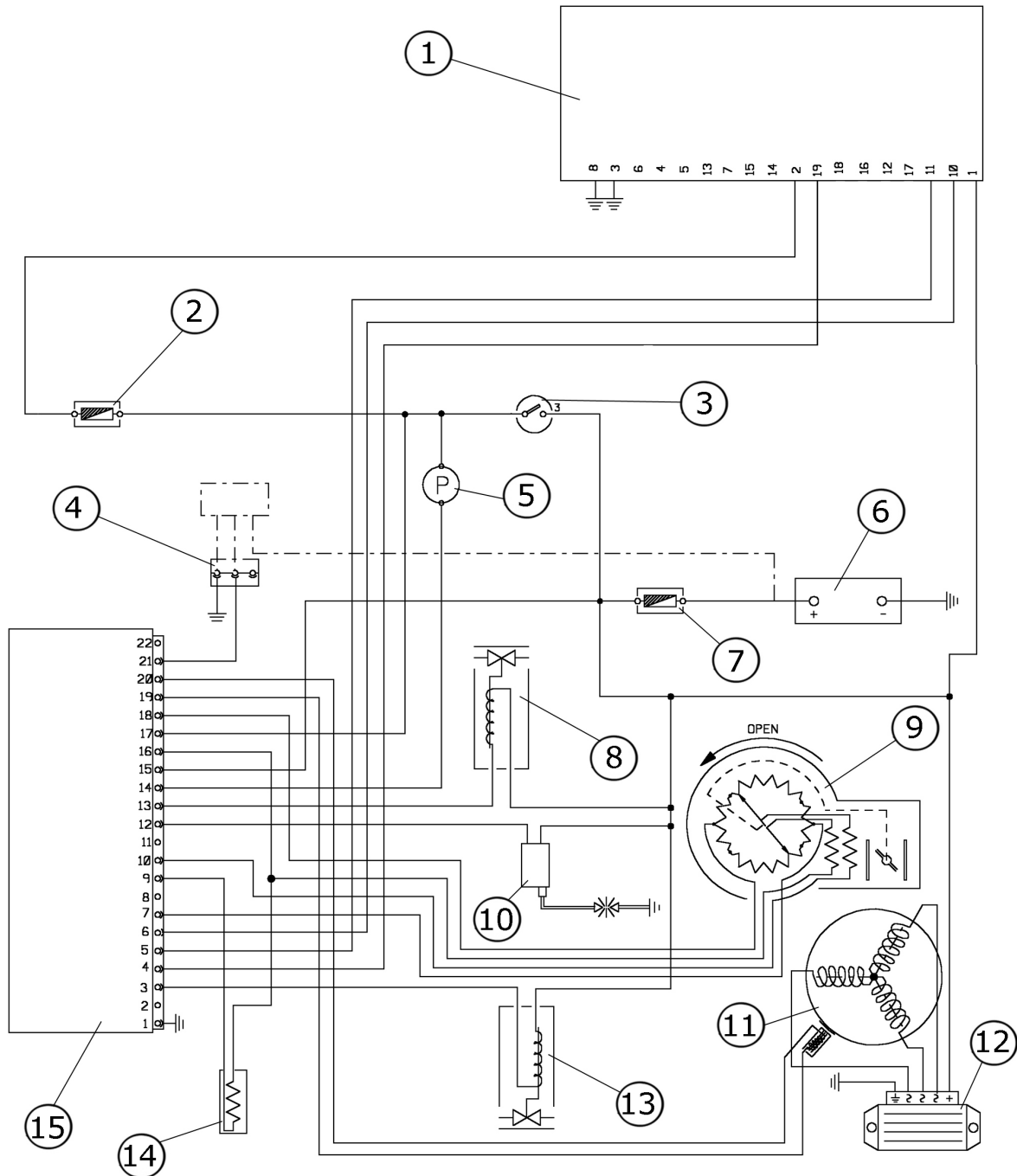


- 1 - Ground
- 2
- 3 - Fuel injector (negative)
- 4 - To diagnosis indicator (negative)
- 5 - Coolant temperature indicator (button negative)
- 6 - Analogue rev. counter signal
- 7 - Signal TPS 1
- 8
- 9 - Coolant temperature sensor (positive)
- 10 - SignalTPS 2
- 11
- 12 - HV coil (negative)
- 13 - 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

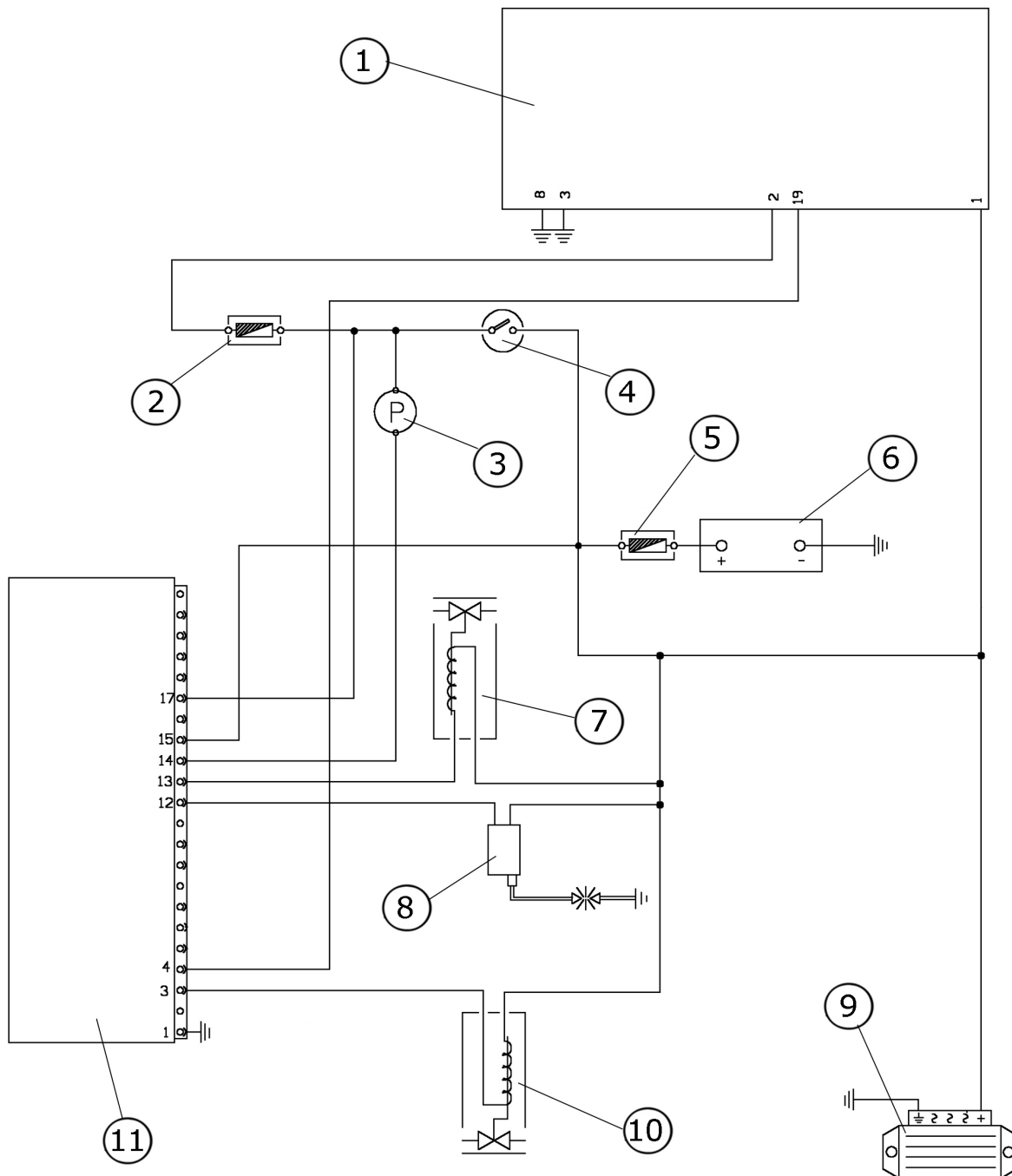


EMS SYSTEM

	Specification	Desc./Quantity
1	Digital instrument unit	
2	Fuse 5A	

	Specification	Desc./Quantity
3	Heater control device	
4	EMS diagnostic socket	
5	Fuel pump	
6	Battery	12V - 9Ah
7	Fuse 20A	
8	Air injector	
9	Throttle position sensor	
10	H.T. coil	
11	Flywheel magneto	
12	Voltage regulator	
13	Petrol injector	
14	Water temperature sensor	
15	Injection electronic control unit	

cpu power circuit



ECU POWER SUPPLY CIRCUIT

	Specification	Desc./Quantity
1	Digital instrument unit	
2	Fuse 5A	
3	Fuel pump	
4	Heater control device	
5	Fuse 20A	

	Specification	Desc./Quantity
6	Battery	12V - 9Ah
7	Air injector	
8	H.T. coil	
9	Voltage regulator	
10	Petrol injector	
11	Injection electronic control unit	

1-Turn the key switch on «ON» position Check the following conditions:

- Ignition indicator fixedly open
- Fuel pump activated for approx. 4-5 seconds

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

2- The ECU supplies are currently present.

GO TO point **9**

N.B.

HAVING TURNED TO ON, ALL SERVICES HAVE BEEN ACTIVATED. IF THERE ARE ANY ANOMALIES, REFER TO SECTION «VEHICLE ELECTRICAL INSTALLATION».

3- The ignition indicator is blinking.

GO TO point **5**

4- The ignition indicator is does not switch on and the pump is correctly activated. Make all checks foreseen in the section related to the ignition

5- Connect the diagnosis tester of scooter Select the «errors» function and check any possible anomalies that are signalled in current status.

GO TO point **7** GO TO point **8**

Specific tooling

020460Y Tester and scooter diagnosis

6-The fuel pump did not start, but the ignition spy has normally switched on. Make all checks foreseen in the section relating to «pump supply»

GO TO point **13**

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

- engine temperature
- TPS Make all checks reported in the relating sections The ECU supply is conform

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

GO TO point **10**

9- Connect the diagnosis tester of the scooter. Select the «errors» function. Check any anomalies re-

lating to «battery voltage in memorised status»

YES point **15** NO point **16**

Specific tooling

020460Y Tester and scooter diagnosis

10- Measure the battery voltage.

GO TO point **11**

GO TO point **12**

11- Voltage is lower than 8,5 V. Re-charge the battery.

GP 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.. To make a complete check, execute a check as described at point «A»

14- The ignition spy did not switch on. When connecting the diagnosis testes, you get the information: «the ECU does not respond, check all connections».

GO TO point **19**

Specific tooling

020460Y Tester and scooter diagnosis

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

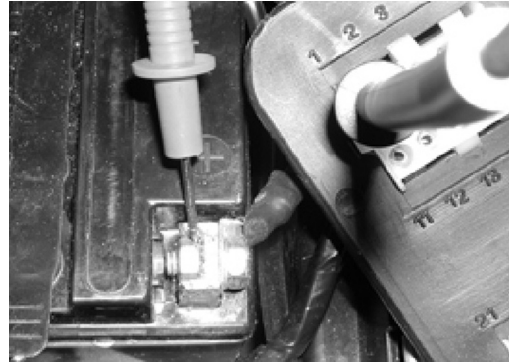
020481Y Control unit interface wiring

21- Check the mass presence

Check the mass presence on pin n°1 by using the multi-metre

1 - battery positive = battery voltage

YES point **22** NO point **23**



22- The mass line is efficient.

GO TO point **24**

23- Check and, in case, restore, the mass line that is direct 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)

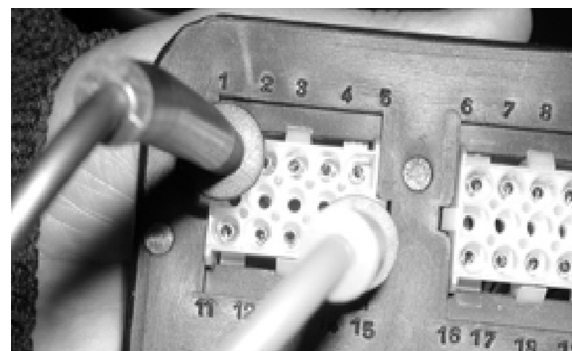
YES point **27** NO point **28**

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**

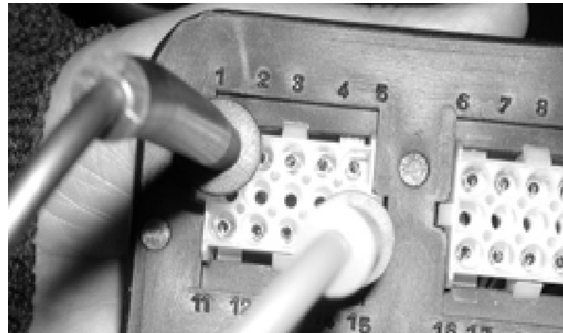
30- Restore the wiring insulation.

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 anomalies, check any possible short circuits in the lines connecting the following components:

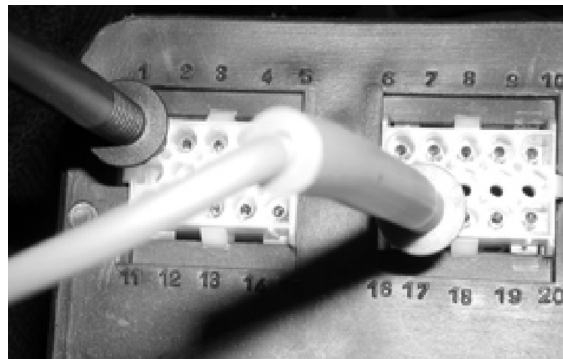
- Air injector
- Fuel injector
- H.V. coil
- Voltage adjuster

GO TO point **24**

34- After confirmation of the correct main supply (point 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**

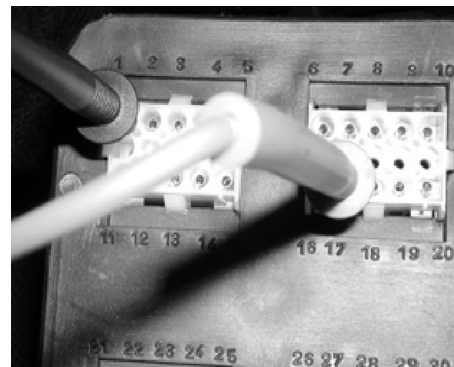
43- Re-connect the specific tool with the ECU

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**



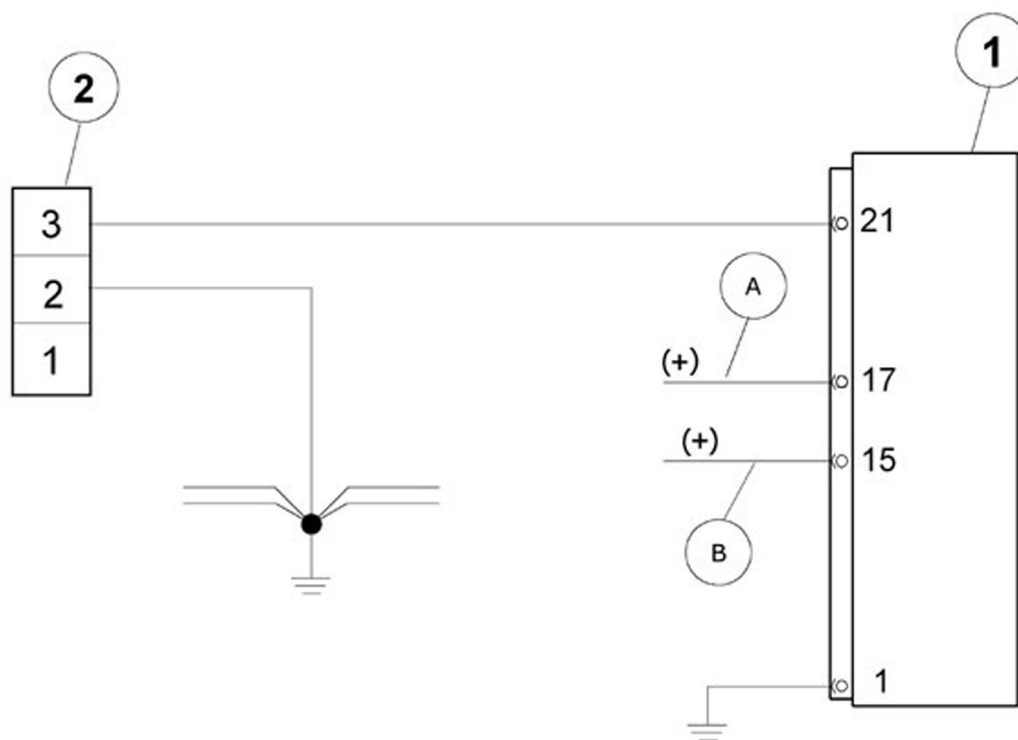
44- If the fuse is again burnt. Check the wiring more accurately and, if necessary, replace the ECU

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



1 ECU

2 Diagnostic outlet

A + Under-panel

B + Fixed

Connect Palmtop menu

Enter the main menu and select a function.

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

Specific tooling

020460Y Tester and scooter diagnosis

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 anomaly persists, make the following checks:

GO TO point 4

4. Check the ECU supplies.

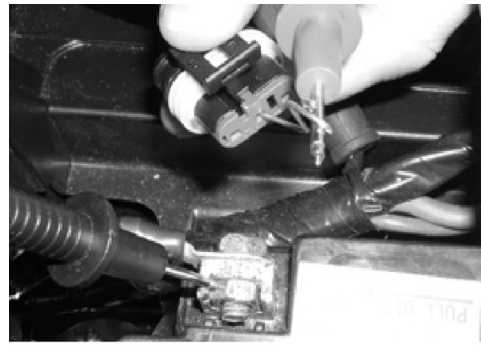
GO TO point 5

5. Disconnect tester from diagnosis connector.

Check the continuity of the mass line between diagnosis connector and vehicle mass..

Diagnosis connector Pin «2» - Battery negative = continuity

YES point 7 NO point 6



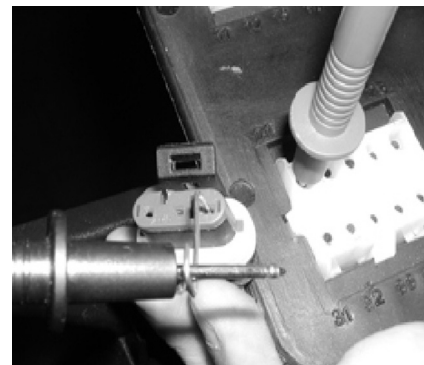
6. Restore the continuity of the mass line.

7. Connect the interface wiring ill.

Do not connect the wiring with the ECU. Check the continuity of the line between diagnosis connector and ECU.

Pin «3» diagnosis connector

Pin 21 = continuity



Specific tooling

020481Y Control unit interface wiring

8. Restore the continuity of the wiring.

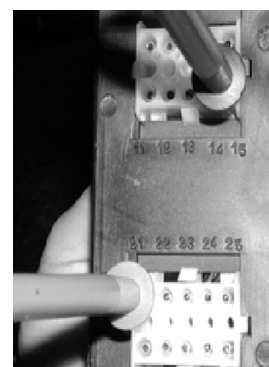
9. Check the insulation of the line connecting the diagnosis connector with the ECU.

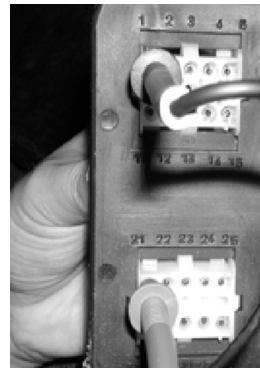
(Keep the ECU disconnected)

21 - 15 > 1MΩ

21 - 1 > 1MΩ

YES point 11 NO point 10





10. Restore the wiring connection.

11. The diagnosis tester connection is conform. If the problem persists, check the diagnosis tester and the ECU, if necessary.

Injection lamp circuit

THERMIC: 1 - 4

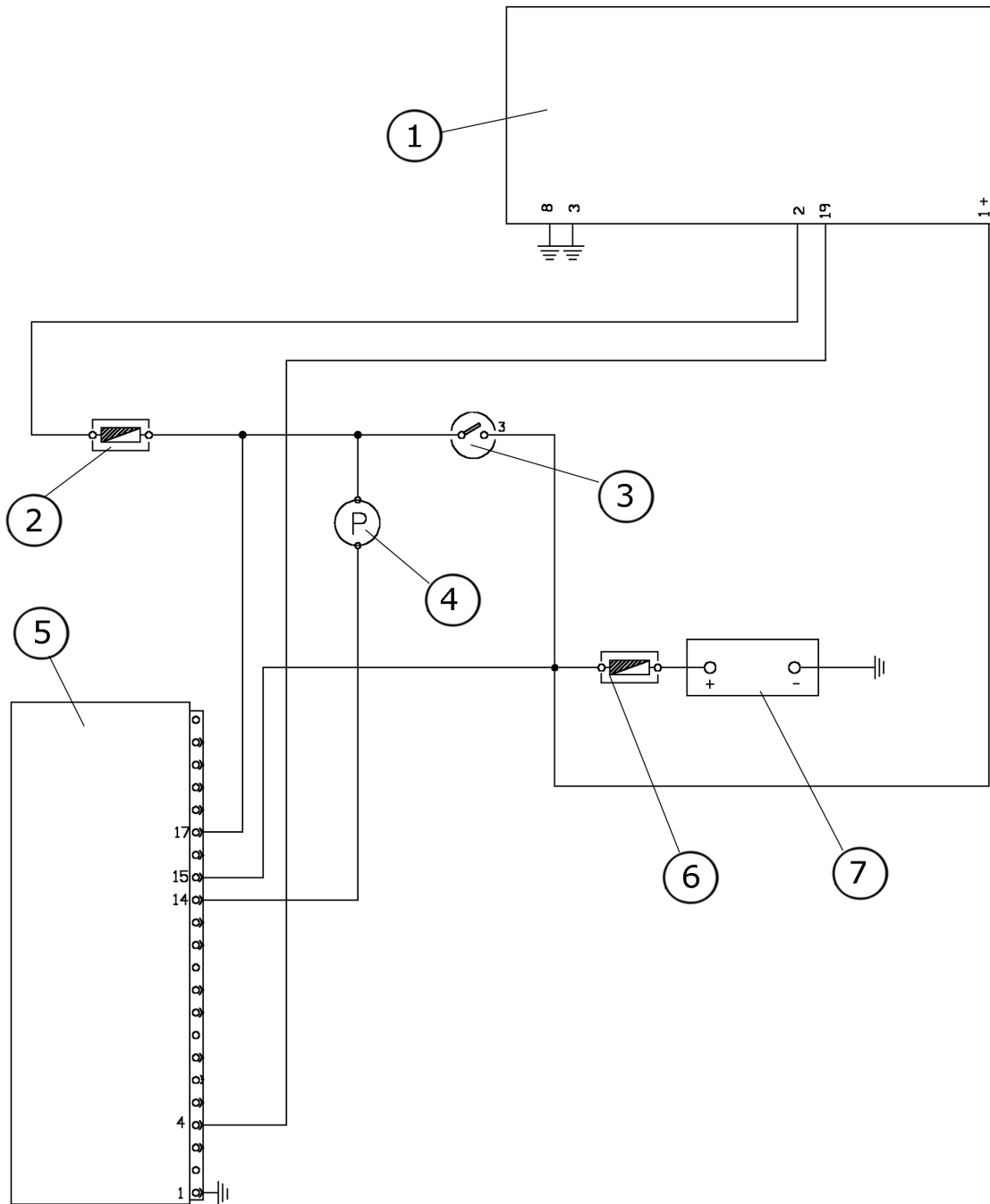
CONDITIONS: Key selector set to «ON», engine off

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	Heater control device	
4	Fuel pump	
5	Injection electronic control unit	
6	Fuse 20A	

	Specification	Desc./Quantity
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 Tester and scooter diagnosis

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 Tester and scooter diagnosis

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



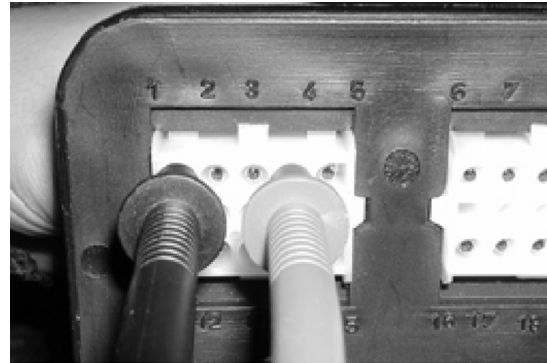
Specific tooling

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**

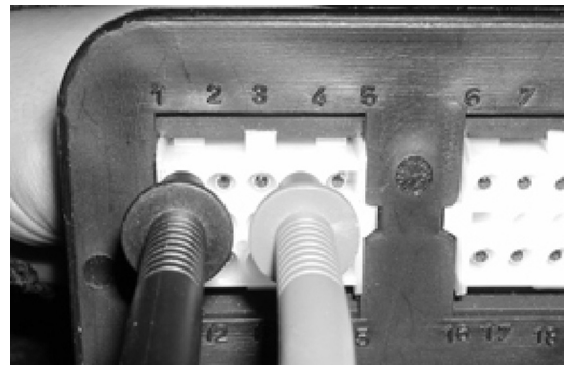


6. The lamp control circuit is efficient.

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**

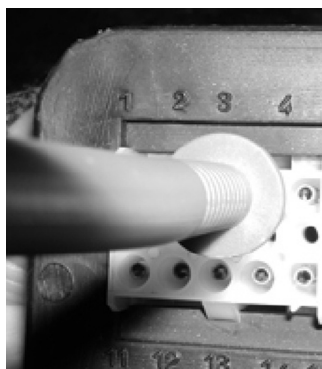
11. Replace the lamp.

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.

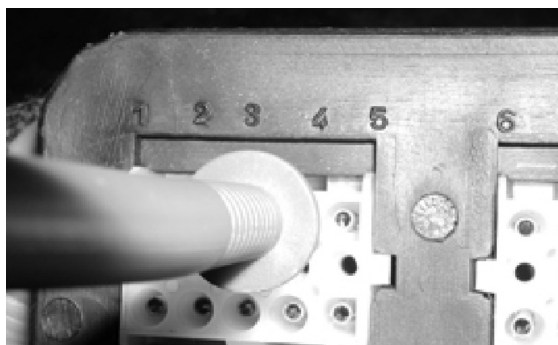


13. Battery voltage is missing and the lamp is on.

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.



See also

[autodiagnosis](#)

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

TERMINAL: 16 (-) - 18 (+)

CONDITIONS: Key switch set to «ON»,

VALORI STANDARD: 5V

TERMINALI: 16 - 7

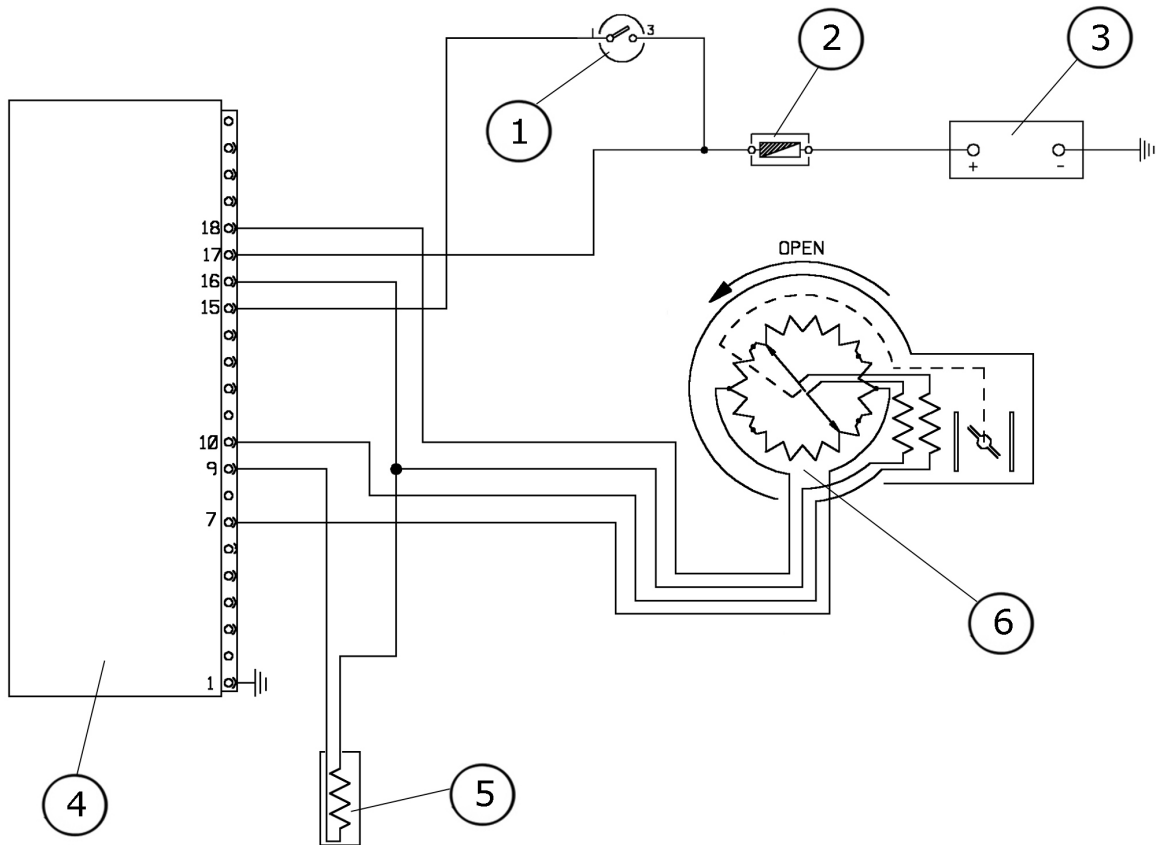
CONDITIONS: Key switch set to «ON», open gas progressively

STANDARD: V= progressive increase

TERMINAL: 16 - 10

CONDITIONS: Key switch set to «ON», open gas progressively

STANDARD: V= progressive decrement



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

	Specification	Desc./Quantity
1	Heater control device	
2	Fuse 20A	
3	Battery	12V - 9Ah
4	Injection electronic control unit	
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 activ-

ated 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 Tester and scooter diagnosis

For the check, proceed as follows. Connect the diagnostic tester to the vehicle. Select the parameters function. The following values are reported:

APERT. FARF.%

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

Le tensioni visualizzate indicano l'entità dei segnali TPS1 e TPS2. 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 REASON	ENGINE BEHAVIOUR	INJECTION INDICATOR
P1123 TPS	Both TPS signals missing. Acknowledgement occurs when voltages are	Forced idle	Flashing

		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 - ON to allow switching to the stored status.		
P1125	TPS1 signal missing. Acknowledgement occurs when the signal voltage is	close to: 0V = short circuit 5V = open circuit	Free	On
P1128	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 is not conforming			Off

P1561 (*)	The TPS sensor and temperature	Forced idle	Off
SENSOR	sensor power supply voltage is not con-		
VOLTAGE2	forming. Too high voltages may be re-		
	cognised..		

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

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 CONNECTED BATTERY, 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.

Reciprocal insulation > 1 MW

16 - 7 - 10 - 18

Check the connector efficiency.

YES point 10 NO point 9

9. Replace or restore the wiring.

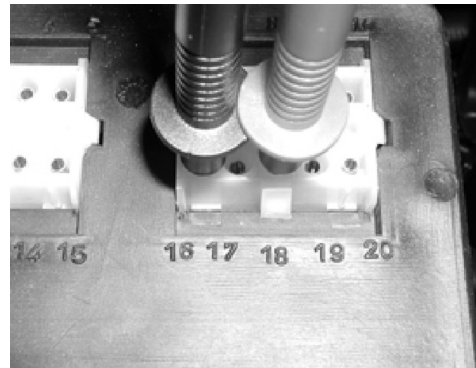
GO TO point 8

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

Check the TPS sensor power supply.

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

YES point 12 NO point 11



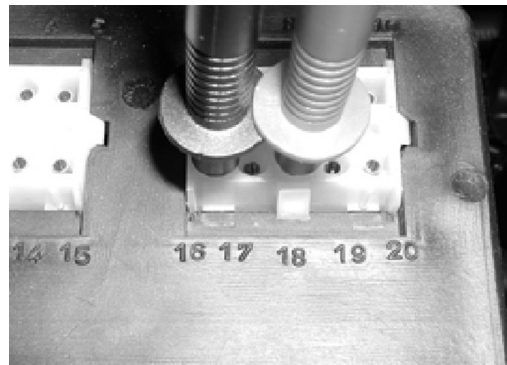
11. Carefully check the ECU power supply, Replace the ECU if required.

GO TO point 10

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

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

YES point 14 NO point 13



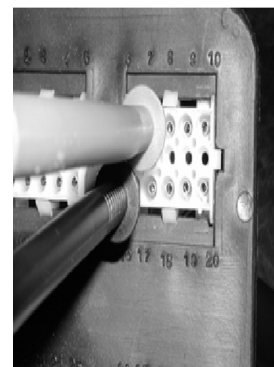
13. Voltage measured: 0 V or much lower than 5 V. Check the connector and replace the throttle body, if required.

GO TO point 12

14. Measure the voltage of TPS1 and TPS2

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

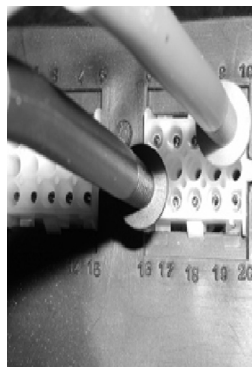
16 - 10 = V TPS2 (decreasing with opening from



4.5 to 0.5V)

Voltage variations must be progressive with gas opening, without stall or trenf 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.

GO TO point **14**

16. Check that the voltage values of signals TPS1 and TPS2 mesured 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 Tester and scooter diagnosis

17. When slightly different voltage values are found, check the ECU connector are replace the ECU if required

18. TPS sensor and circuit are conforming.

See also

[menù diagnosis tester](#)

T.P.S. signal reset

The throttle body is supplied with gas valve and is precalibrated. Pre-calibration consists in the regulation of the gas valve

minimum opening, to obtain a fixed air capacity in fixed 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 obtain higher engine performance, rpm increase is not obtained by consequence of the gas valve opening increase, but it is enabled by the ECU.

When the ECU perceives a slight increase in the gas valve opening, it enables the engine to fast ro-

tation 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 default design 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 Tester and scooter diagnosis

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 in a manner 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 management.

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

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

Connect the diagnosis tester of the scooter. Select the «parameters» function and visualise the indicator showing the «TPS to be zeroed»

GO TO point 2

GO TO point 4

2. The diagnosis tester says YES. Check that::

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

GO TO point **3**

3. Carry out the manual zeroing procedure.
4. The diagnosis tester says NO. The zeroing procedure was successful..

GO TO point **5**

5. For a further confirmation, check the following indications of the parameters functio:.

TPS1 OUTPUT V 0,64

TPS2 OUTPUT V 4,27

TPS1 ZERO V 0,64

TPS2 ZERO V 0,72

The voltage reported here correspond 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 zeroing is conform.
8. Repeat the zeroing procedure using the manual mode.

Specific tooling

020460Y Tester and scooter diagnosis

azzeramento T.P.S. manuale

MANUAL RESET

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

- 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 diagnosis tester of the scooter

Select «TPS ZEROING» on the menu. By using this procedure, the following indications are visualised.

GO TO point **2**

2. Check possible Errors

Wait

GO TO point **3**

GO TO point **4**

3. Errors

Cancel all errors

Enter a key

GO TO point **5**

4. Cancel all errors No errors

Enter a key

GO TO point **6**

5. Check the self-diagnosis content and carry out the necessary repairs

GO TO point **1**

6. TPS zeroing in process

Wait

GO TO point **7**

7. Key «OFF»

Enter 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»

Enter a key

GO TO point **11**

11. Wait

GO TO point **12**

12. Check possible errors

Wait

GO TO point **13**

13. No errors

Enter a key

GO TO point **14**

14. Wait

GO TO point **15**

15. TPS zeroing successful

Enter 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 are in conformance with the instructions on (value automatic zeroing)

rpm-timing sensor circuit

TERMINALS: 19 - 20

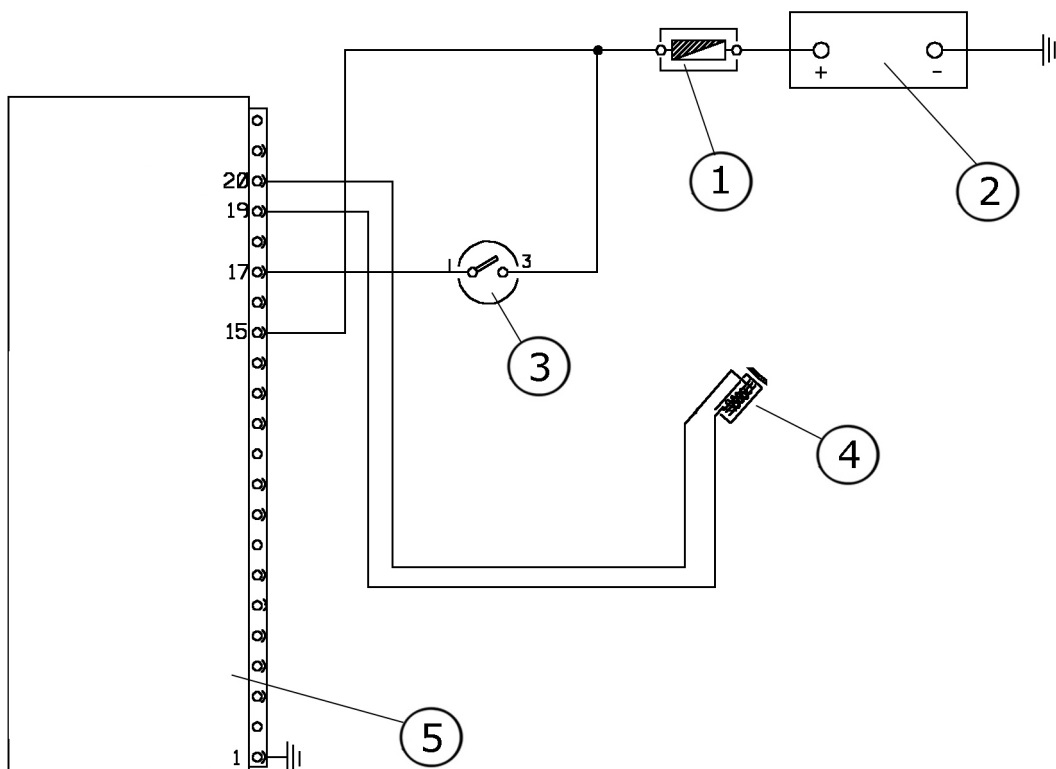
CONDITIONS: Engine cranked by the starter motor (500-600 RPM)

STANDARD: V = 3,5 - 4

TERMINALS: 19 - 20

CONDITIONS: Idle engine

STANDARD: V = 11 - 12



RPM-TIMING SENSOR

	Specification	Desc./Quantity
1	Fuse 20A	
2	Battery	12V - 9Ah
3	Heater control device	

	Specification	Desc./Quantity
4	Pick - up	
5	Injection electronic control unit	

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 menu on function «errors». Check the presence of the error:

P0335 PICK UP RPM

Specific tooling

020460Y Tester and scooter diagnosis

2. The ECU has detected instability of the phase rpm signal. Proceed as follows, independently 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 magnet flywheel.

GO TO point 5

Specific tooling

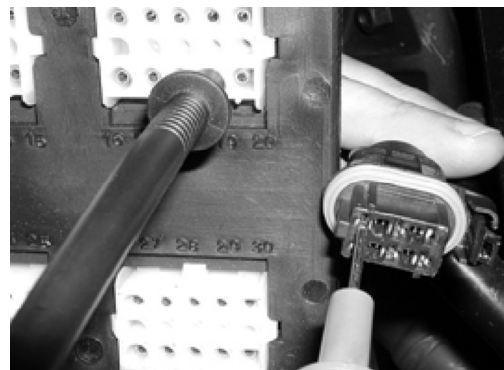
020481Y Control unit interface wiring

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.

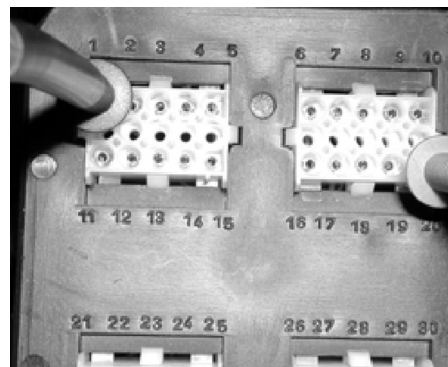
GO TO point 5

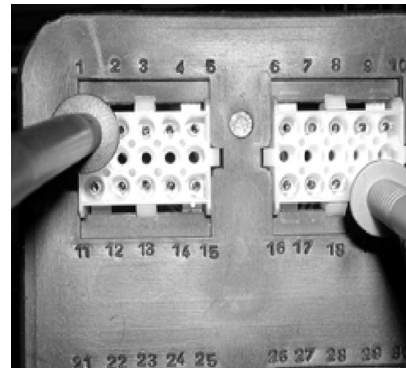
7. Check the ground insulation of the lines

1 - 19 > 1M Ω

1 - 20 > 1M Ω

YES point 9 NO point 8





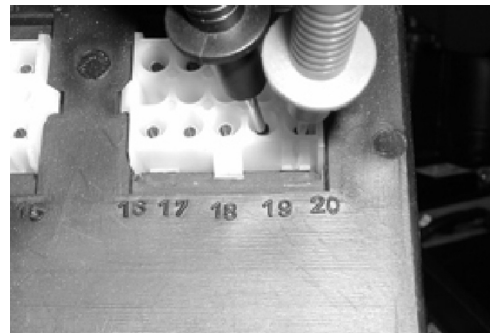
8. Restore the insulation or replace the wiring.

GO TO point 7

9. Check the reciprocal insulation of the lines

19 - 20 > 1M Ω

YES point 11 NO point 10



10. Restore the insulation or replace the wiring.

GO TO point 9

11. Check the line positive insulation.

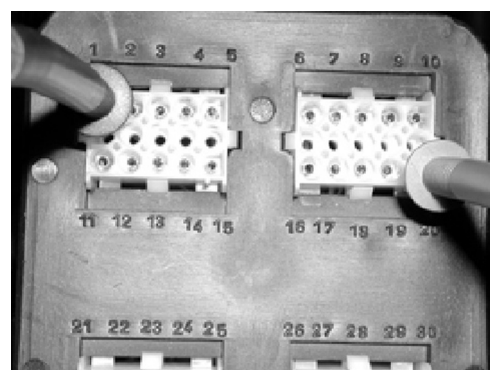
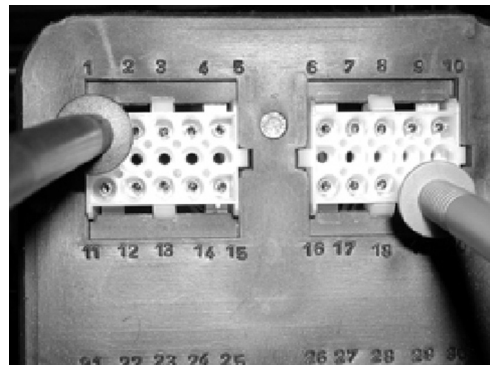
1 - 19 = 0V

1 - 20 = 0V

YES point 13 NO point 12

N.B.

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



12. Restore the insulation or replace the wiring.

GO TO point 11

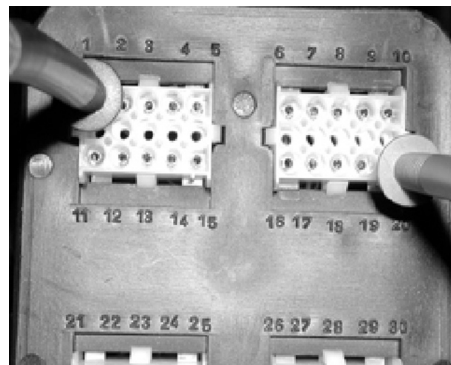
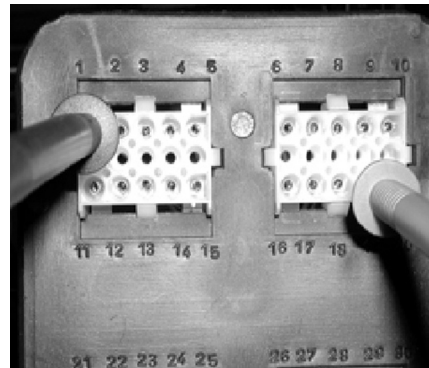
13. Connect the flywheel connector and repeat

the insulation checks from earth to positive.

1 - 19 > 1 MOhm

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 resistances

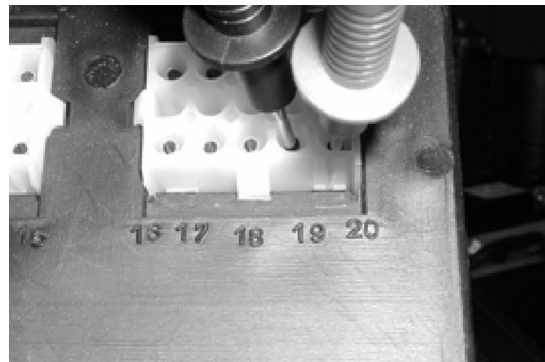
19 - 20 = Ohm..... at 20°

(detected 106,7W)

YES point 17 NO point 16

N.B.

IF THE CHECK IS PERFORMED WITH HOT ENGINE, RESISTIVE VALUES WILL BE HIGHER



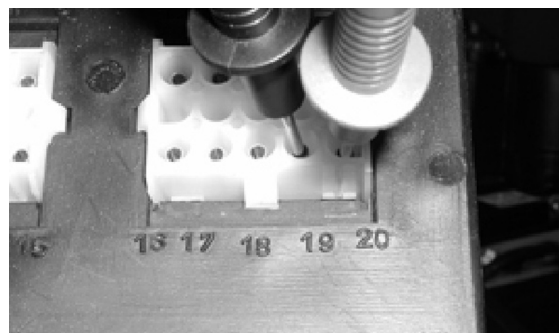
16. When out of tolerance resistive values are detected, replace the stator with phase - rpm sensor.

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

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)

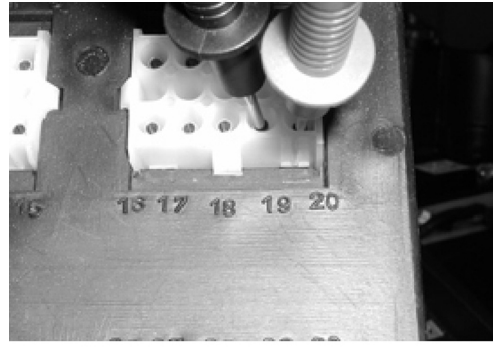
19 - 20 = 11 - 12 V~ (idle)

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.

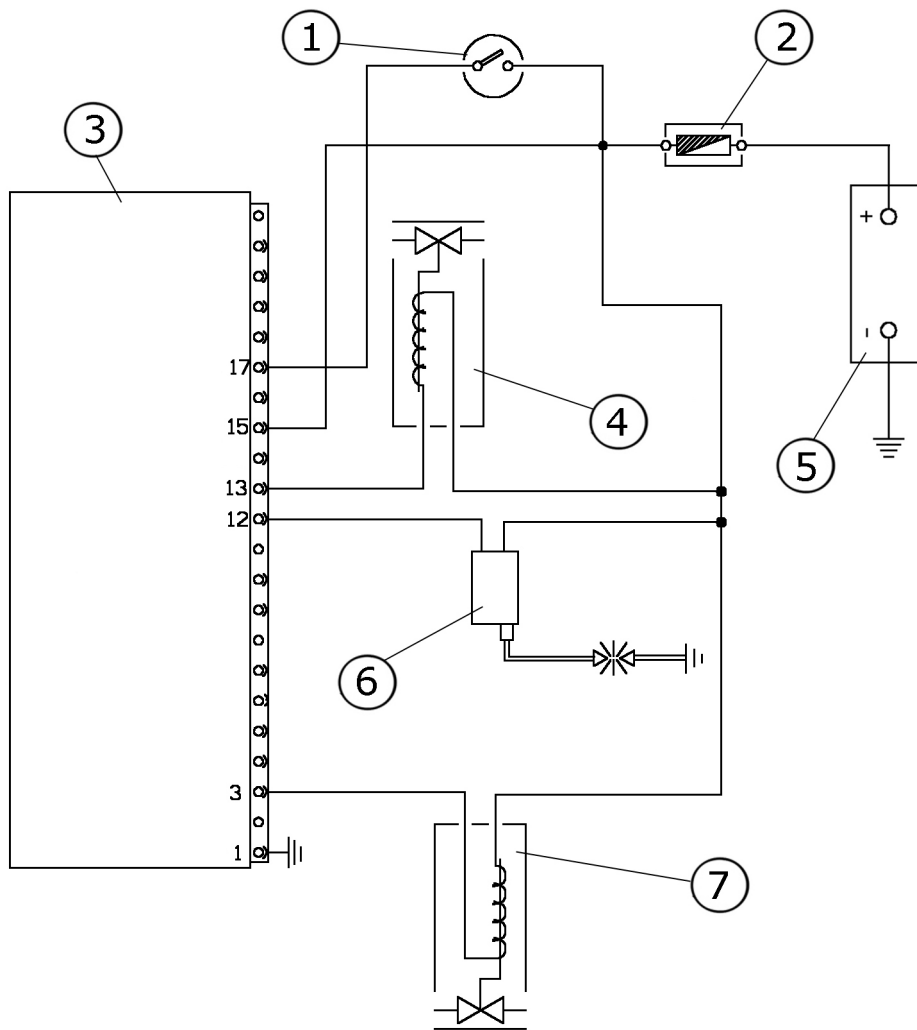


H.T. coil circuit

TERMINALS: 1 - 12

CONDITIONS: 1 - 12 Engine off, switch in any position

STANDARD: Battery voltage



PETROL INJECTION CIRCUIT

Specification	Desc./Quantity	
1	Heater control device	
2	Fuse 20A	
3	Injection electronic control unit	
4	Air injector	
5	Battery	12V - 9Ah
6	H.T. coil	
7	Petrol 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 diagnosis tester III. Select function «active diagnoses»

GO TO point 2

Specific tooling

020460Y Tester and scooter diagnosis

2. Start the diagnosis of H.T. coil. Check if 5 ignitions are started. 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. To be more sure, make the self-diagnosis control to detect possible errors in memorized status

4. No sparks present, even if the result is: "test successful". Proceed with the circuit check. If there are no anomalies, replace the ECU

GO TO point 2

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

GO TO point 2

CHECKING THE SELF-DIAGNOSIS CONTENT

1. Connect the diagnosis tester III. Select "errors" on the menu and 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 Tester and scooter diagnosis

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

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

3. Error on the H.V. coil in current status. Check the circuit

4. Error on the H. V. coil in «occurred» status or memorised status.. Check the circuit. Possible problems:

- Unsafe contacts
- Lacking insulation

CHECKING THE ELECTRIC CIRCUIT

1. Connect the interface wiring ill. 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

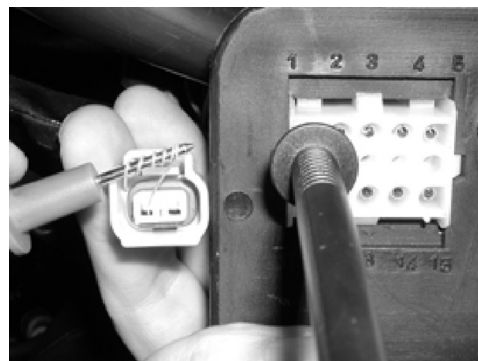
2. Check that there is a battery positive voltage on the connector supplying the primary with the commuter assuming any position.

1 - blue lead (positive) = battery

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

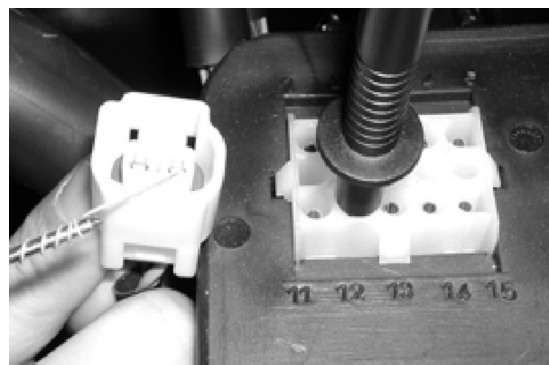
4. Check the continuity of the control line of the coil.

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 CON-



NECTOR

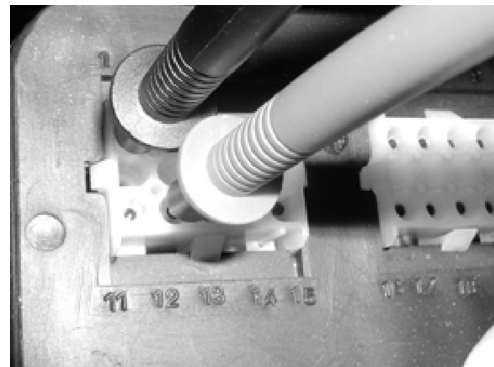
5. Restore the wiring.

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

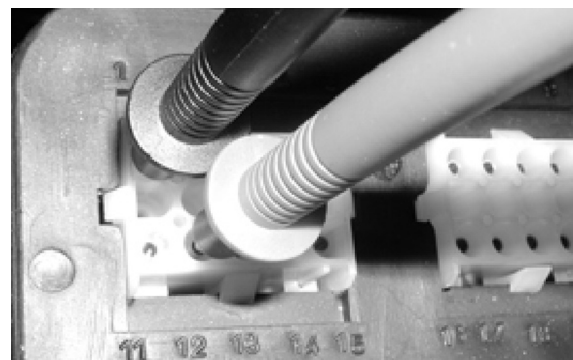
GO TO point 6

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

1 - 12 > 1MΩ

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 Ω a 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 insulation - from the mass - 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 > 1MΩ

YES point 14 NO point 13



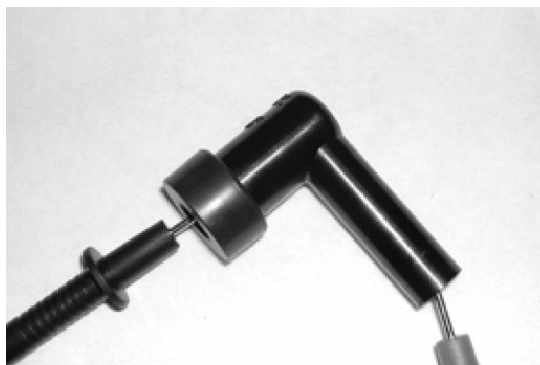
13. If lower values are detected, replace the H.V. coil.

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. Re-connect the following components:

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

GO TO point 17

17. With the engine at the minimum, measure the induced voltage that is produced by the H.V. coil primary. In this case, use the digital multi-metre and the peak voltages adaptor.

minimum admitted voltage³ 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 adapter (Peak voltage measurement)

18. The installation is efficient, check timing.

19. If the detected voltage is much lower than the minimum admitted, check the magnetisation time reported in the «parameters» function of the diagnosis tester

T. DI DWELL =

6 ms (start-up)

2 ÷ 3 ms (at minimum)

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 HV cable signal
- Remove the flywheel cover. Adjust the adapter for detecting the HV cable signal to a position between the 4th and the 5th reference and install it between the plug and the 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 idle engine, 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 P.M.S.



If the advance values do not match, check the ECU and the rpm - phase sensor.

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 P.M.S.

Specific tooling

020460Y Tester and scooter diagnosis

020330Y Timing light for two- and four-stroke engines

020621y H.V. cable signal adapter:

compressed air system

Direct injection in the cylinder allows proper mixture carburation.

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 feeding duct of the injectors and install the air pressure control kit

GO TO point **2**

N.B.

BE VERY CAREFUL TO THE CLEANING OF PARTS AND TO THE PROPER CONNECTION OF UNIONS.

ANY IMPURITY MAY DAMAGE THE AIR INJECTOR. AVOID REMOVING THE RUBBER PIPE FROM THE BRASS PIPE HOLDERS. IF REQUIRED, REPLACE THE PIPE.

Specific tooling

020617y Chek air presurre 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 = 4BAR

YES point 5 NO point 4 NO point 6



4- The engine rpm and pressures are lower than what specified. Check battery and start up system

GO TO point 3

5- Engine rpm and pressure are conforming.

Check that pressure remains constant over time

YES point 16 NO point 8

6- Engine rpm are conforming and pressure is lower than what specified. Check that pressure remains constant 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 support.

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 support.

GO TO point **3**

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

YES point **13** NO point **12**

12- Restore the seals or replace the pipe.

GO TO point **3**

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

GO TO point **14**

GO TO point **15**

14- Pressure decreases with the same trend. Check the seals on the injector support, 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:

- HV coil
- Fuel injector
- Air injector

Use the diagnostic tester dwg. 020460Y to fix the faults registered during pressure check.

GO TO point **17**

Specific tooling

020460Y Tester and scooter diagnosis

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

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

N.B.

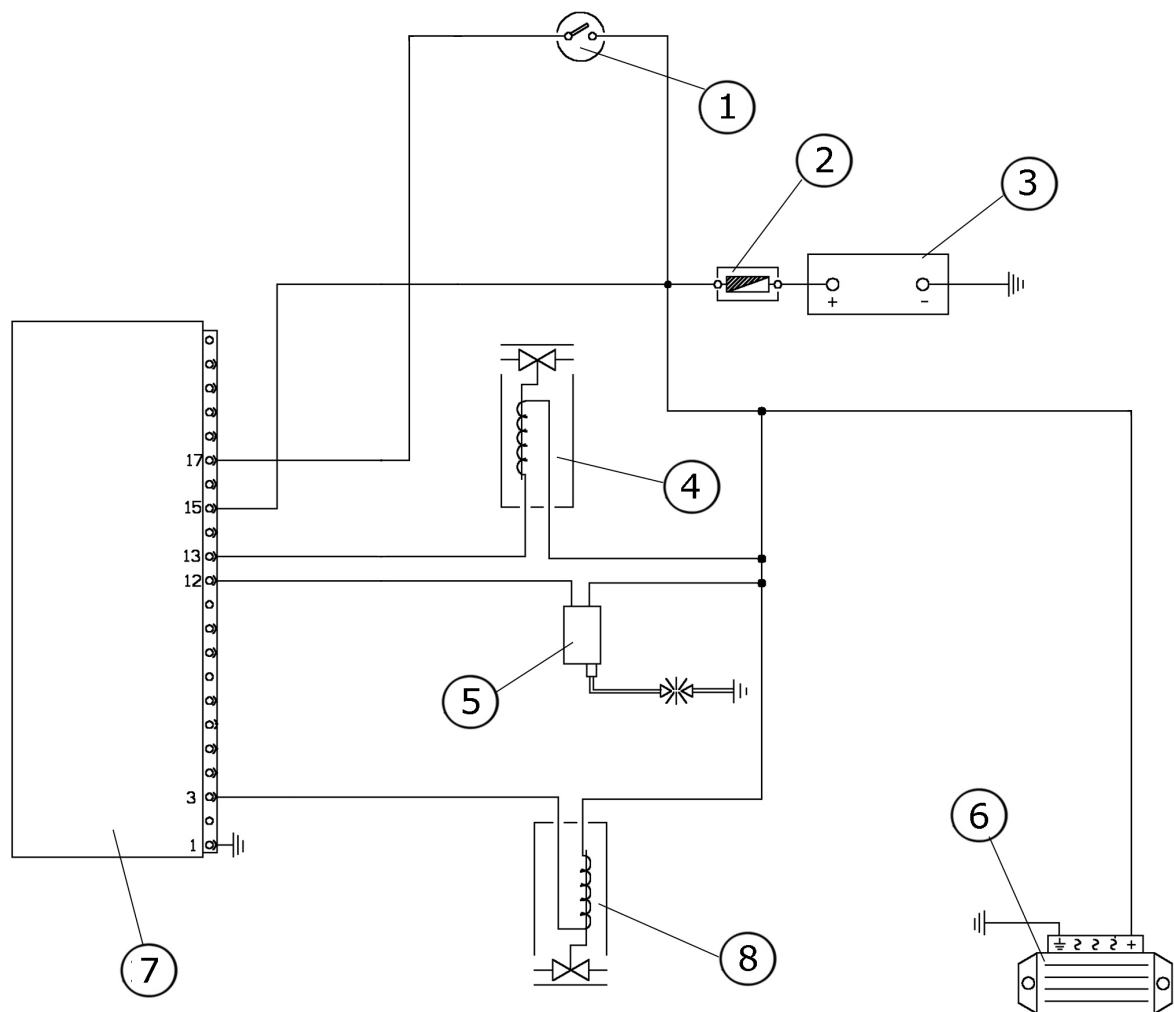
AIR PRESSURE DURING THE ENGINE OPERATION IS QUITE CONSTANT SINCE THE INCREASE OF CAPACITY OF THE PUMP IN RELATION TO THE INCREASE OF RPM IS PARTLY COMPENSATED BY THE LONGER OPENING TIME OF THE AIR INJECTOR. SWITCHING TO «OFF» WHEN THE ENGINE IS RUNNING AT HIGH RPM, THE PRESSURE INCREASES UP TO APPROX. 8 BAR (800 KPA).

air injector circuit

TERMINALS: 1 - 13

CONDITIONS: Engine off, switch in any position

STANDARD: Battery voltage



AIR INJECTOR

	Specification	Desc./Quantity
1	Heater control device	

	Specification	Desc./Quantity
2	Fuse 20A	
3	Battery	12V - 9Ah
4	Air injector	
5	H.T. coil	
6	Voltage regulator	
7	Injection electronic control unit	
8	Petrol 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 Tester and scooter diagnosis

2- Enable the air injector diagnosis. 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 for 5 times and the tester has returned "test finished successfully". The air injector and relevant circuit are currently efficient. For safety, proceed checking the self-diagnosis to highlight any errors in stored status.

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

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 Tester and scooter diagnosis

7- No error present. The injector electrical part is 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 unsafe 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

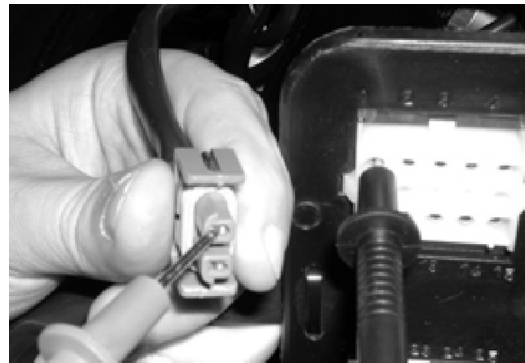
11 - Check the battery positive voltage to the blue lead of the air injector power supply connector.

1 - blue lead (positive) = V battery

YES point 13 NO point 12

N.B.

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



12- Check the efficiency of fuse 20A and restore the wiring if required See ECU power supply on GO TO point 11

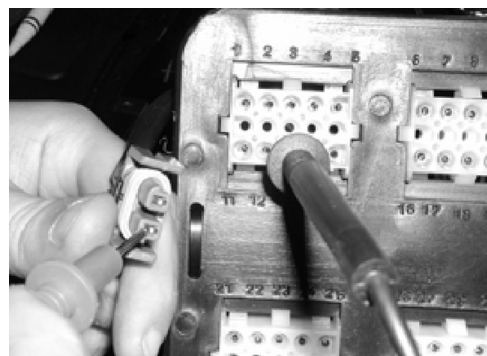
13- Check the continuity of the air injector control line

13 - pink (injector connector) = continuity

YES point 15 NO point 14

N.B.

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



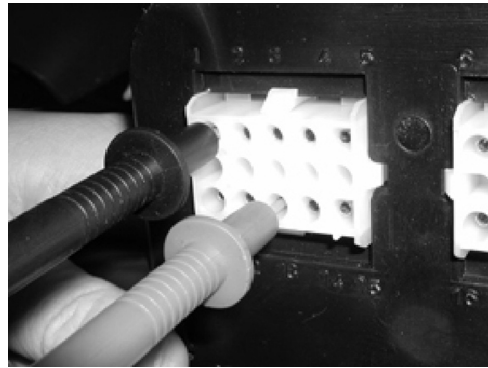
14- Restore the wiring.

GO TO Point 13

15- Check the air injector control line positive insulation.

1 - 13 = 0V

YES point 17 NO point 16



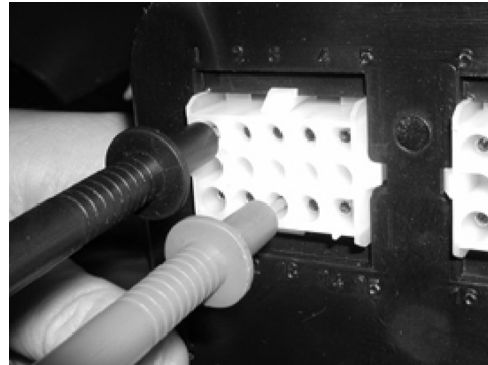
16- Restore the wiring.

GO TO point 15

17- Check the air injector control line negative insulation.

1 - 13 > or = 1M Ω

YES point 19 NO point 18



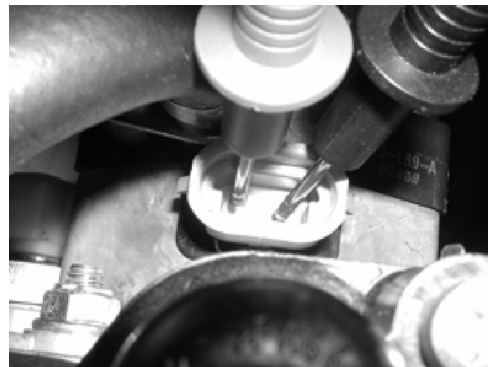
18- Restore the wiring.

TO GO point 17

19- Check the air injector winding resistance

standard value= ... Ω

YES point 21 NO point 20



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

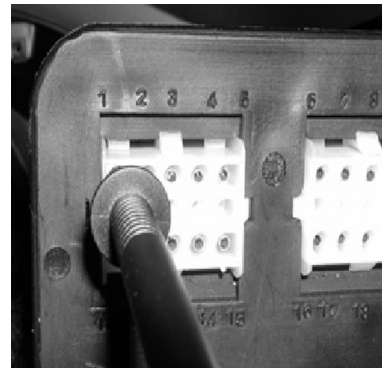
GO TO point 19

21- Check the air injector winding negative insulation.

1 - any pin of the injector > or = 1M Ω

YES point 23 NO point 22





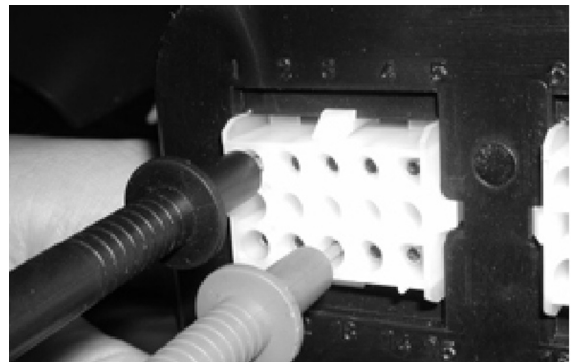
22- Replace the air injector,.

GO TO point **21**

23- Connect the specific tool 020481Y 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. 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 diagnosis. Odd opening times always depend on the ECU operation.

fuel pump circuit

TERMINALS: 1 - 14

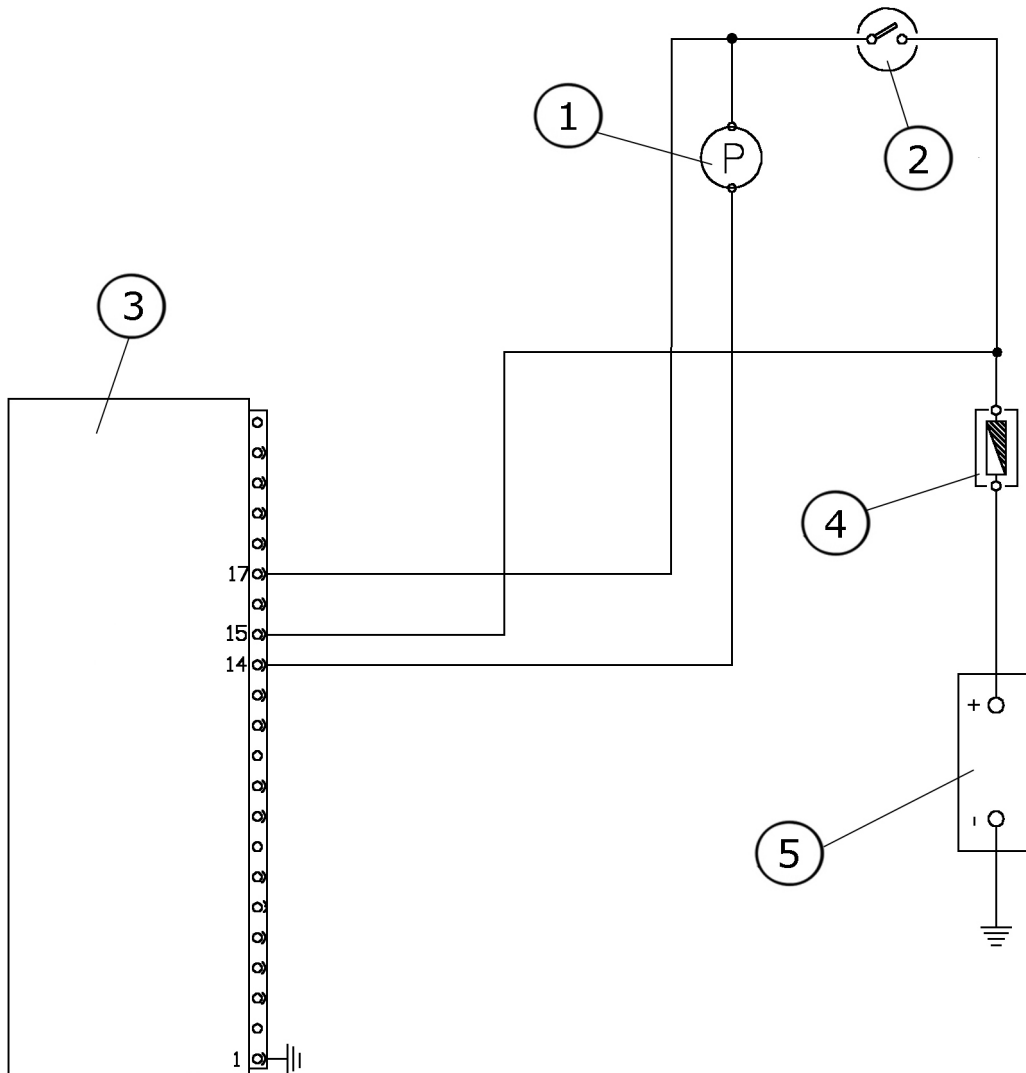
CONDITIONS: Switch in «ON» position after the motor timing

VALORI STANDARD: Below 0,1 V

TERMINALS: 1 - 14

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

STANDARD: Battery voltage

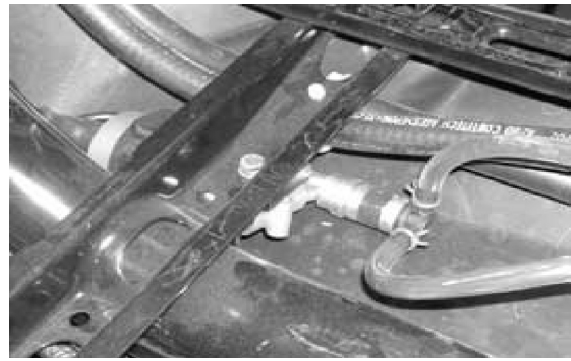


FUEL PUMP CIRCUIT

	Specification	Desc./Quantity
1	Fuel pump	
2	Heater control device	
3	Injection electronic control unit	
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 pump 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 autodiagnosis 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 autodiagnosis 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.

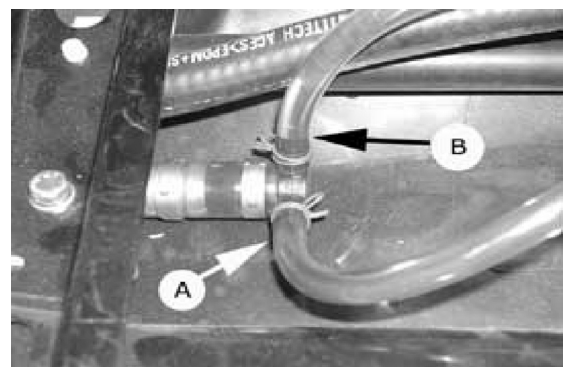
- In order to gain access to the fuel pump it is necessary to remove the foot rest board

- A connection is present at the pump entrance with 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, acoustically check the activation of the pump for 4-5 seconds

YES point 3 NO point 2

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

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

YES point 4 NO point 5

4- The pump control circuit is efficient.

5- Check the auto-diagnosis and the revsphase signal circuit.

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

Specific tooling

020460Y Tester and scooter diagnosis

7- Check that the tank is adequately topped up and proceed with the activation of the «petrol pump» diagnosis. Acoustically check 10 consecutive activations of around 4 seconds of the petrol pump.

Check the outcome on the diagnosis tester.

YES point 8 NO point 9 NO point 10

8- The petrol pump was activated 10 times and the tester gave the «test successfully completed» outcome. The pump and the relative circuit are currently efficient. For greater certainty, proceed with the autodiagnosis check in order to highlight any errors in memorized state

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

GO TO point 7

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

11- Connect the scooter diagnosis tester select the «errors» function. Check for the presence of error

PO230 PETROL PUMP..

YES point 13 YES point 14 NO point 12

Specific tooling

020460Y Tester and scooter diagnosis

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- Petrol pump error in occurred or memorized state. Proceed with the check on the pump and the control circuit, paying particular attention to false contacts or uncertain insulation.

14- Petrol 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

Specific tooling

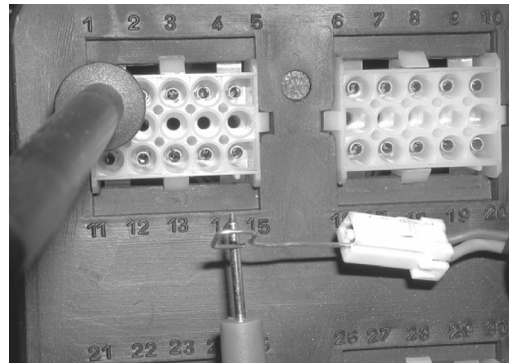
020481Y Control unit interface wiring

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

N.B.

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



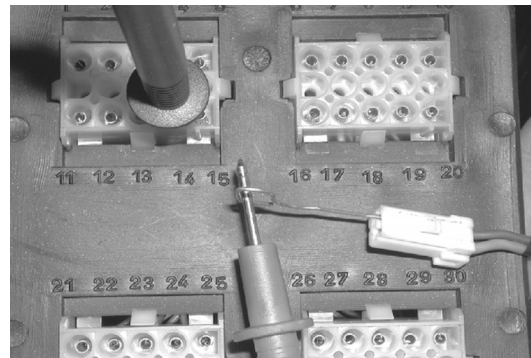
17- Check the efficiency of the 20 A fuse, the key switch and restore the wiring.

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.



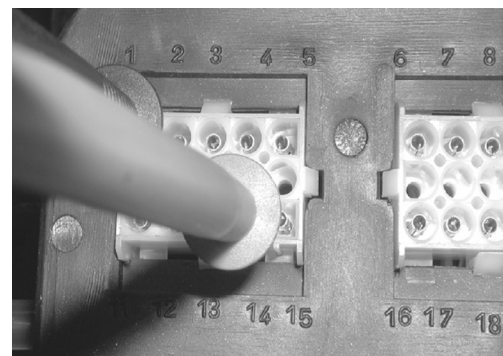
19 - Restore the wiring.

GO TO point **18**

20 - Check the petrol pump control line positive insulation.

1 - 14 = 0V

YES point **22** NO point **21**



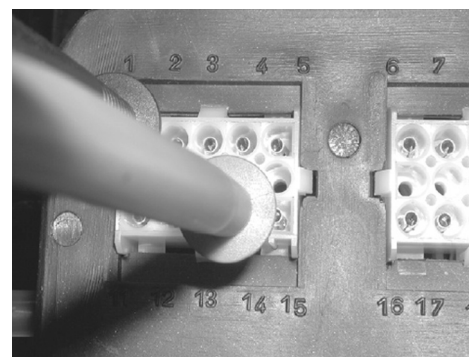
21- Restore the wiring.

GO TO point **20**

22 - Check the petrol 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 petrol pump winding continuity.

Standard resistance =Ohm (50hm measured)

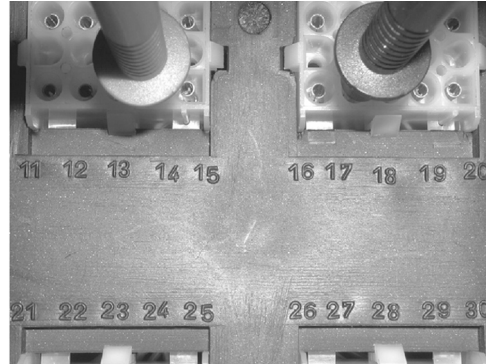
N.B.

IF THE CHECK IS CARRIED OUT ON A NEW PUMP, IT IS POSSIBLE TO MEASURE HIGHER RESISTANCE VALUES DUE TO THE FACT THAT THE MANIFOLD HAS NOT BEEN BROKEN IN.

If there are any difficulties in carrying out the check directly on the pump, it is possible to proceed with the check through the wiring. Reconnect the petrol pump connector and measure the resistance between the specific tool's pins, keeping the switch in the «OFF» position.

14 - 17 =Ohm (50hm measured)

YES point 26 NO point 25



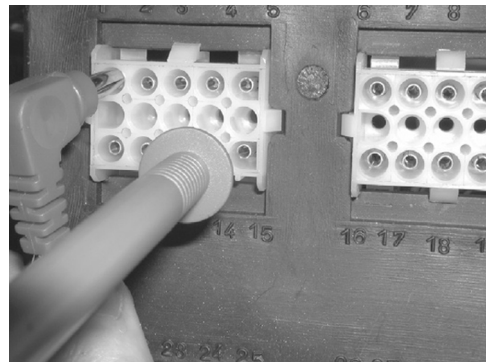
25- A resistance of around 0W indicates the presence of a short circuit. A resistance significantly greater than the standard values indicates low conductivity. In these cases proceed with the replacement of the pump.

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 connected to earth.

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 the case of an error verified in the «required» or «memorized» state, repeat the activation of the pump several times in order to distinguish any anomalies deriving from a manifold that is not perfectly efficient.

GO TO point 29

GO TO point **30**

29- Some hesitations are present. Check the connectors more carefully and proceed with the replacement of 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 revs - phase (motor in rotation) signal is present). Replace the ECU if there are any anomalies.

GO TO point **31**

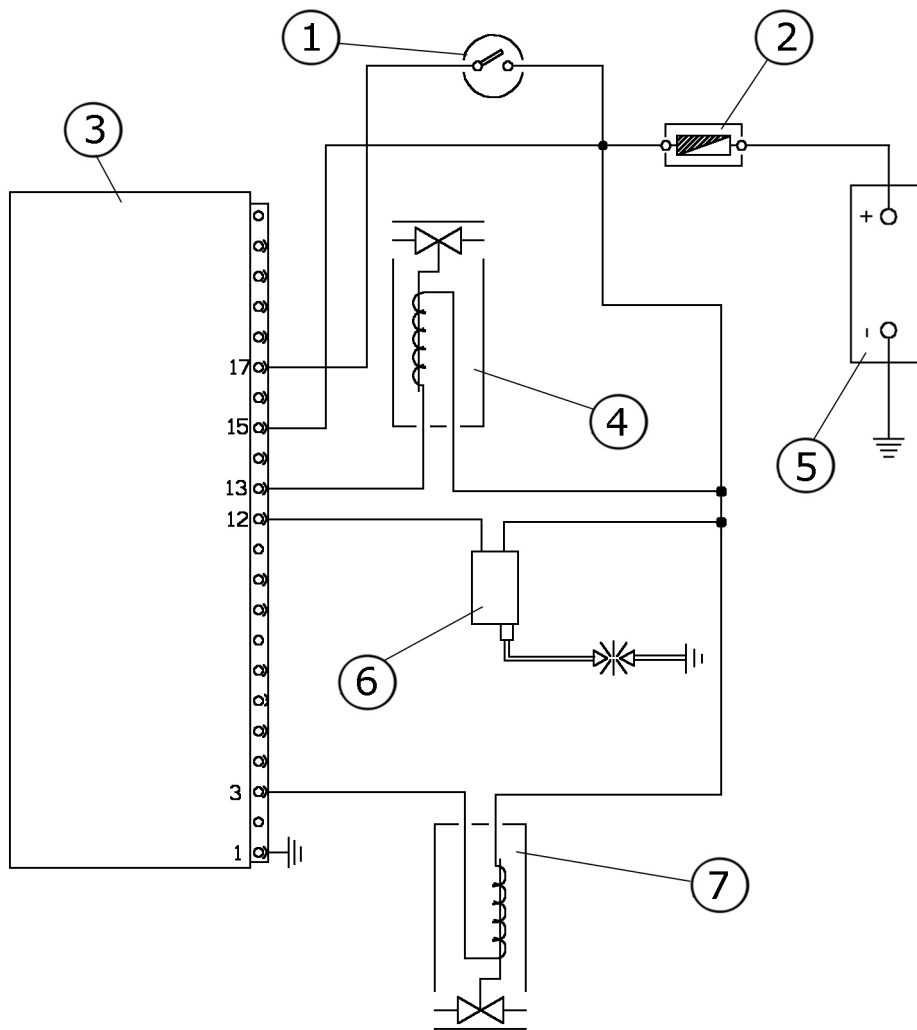
31- For a more complete petrol pump check, it is best to proceed with the checks on the current absorbed and the hydraulic characteristics of the pump.

petrol injector circuit

TERMINALS: 1 - 3

CONDITIONS: Motor still, switch in any position

STANDARD: Battery voltage



PETROL INJECTION CIRCUIT

Specification	Desc./Quantity	
1	Heater control device	
2	Fuse 20A	
3	Injection electronic control unit	
4	Air injector	
5	Battery	12V - 9Ah
6	H.T. coil	
7	Petrol 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 en-

gine 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 Tester and scooter diagnosis

2- Activate the petrol injector diagnosis. Acoustically check 5 petrol injector activations. Check the diagnosis tester response.

YES point 3 NO point 4 NO point 5

3- The petrol injector was activated 5 times and the tester gave the «test completed successfully» outcome. The petrol injector and the relative circuit are efficient. For further certainty, proceed with the auto diagnosis test in order to avoid any errors in the memorized state.

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

5- The petrol injector remained inactive and the tester gave the «test completed successfully» outcome. Proceed with the petrol injector circuit check.

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

YES point 8 YES point 9 NO point 7

Specific tooling

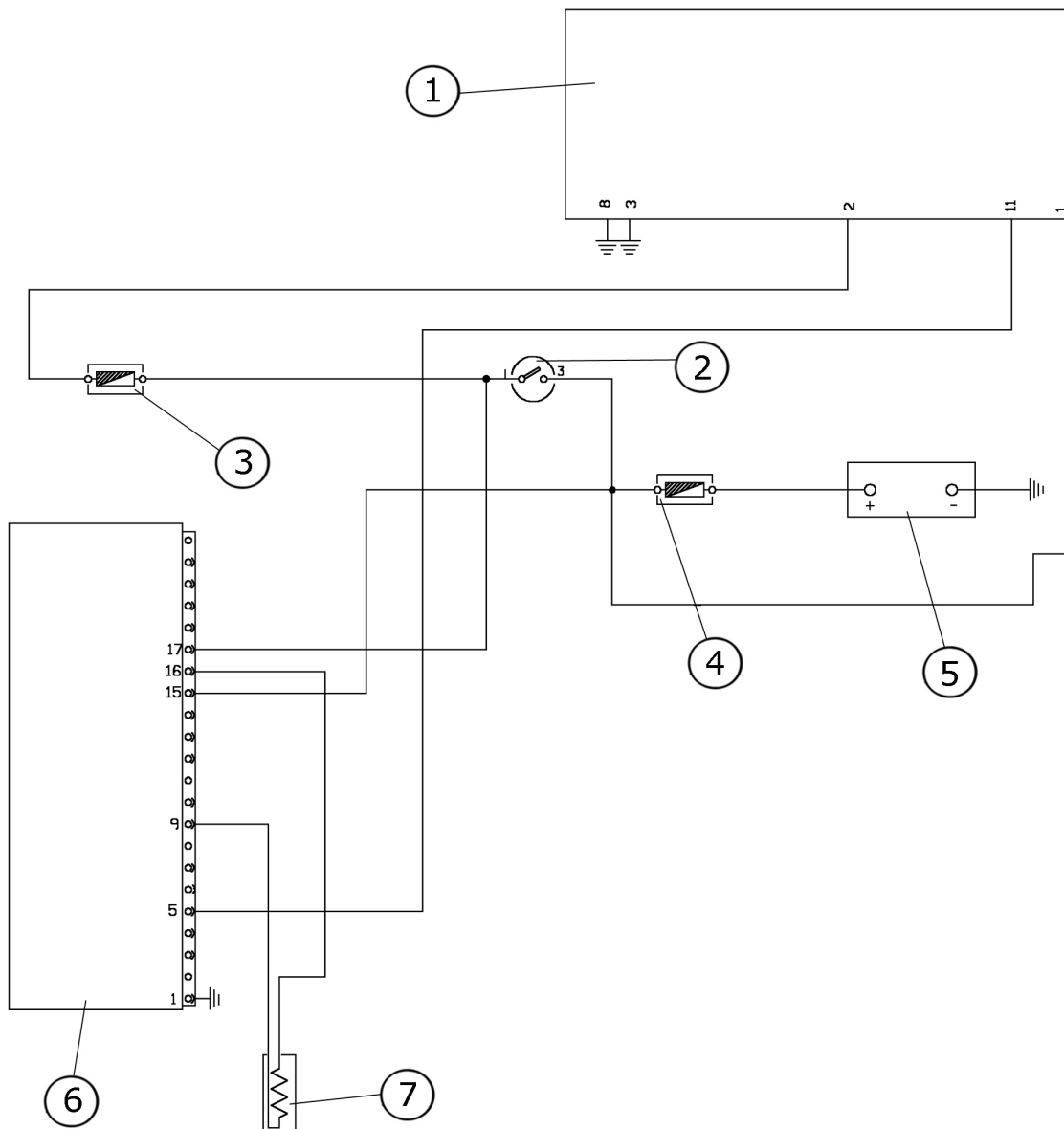
020460Y Tester and scooter diagnosis

7- No error reported. The injector electric part is sufficient. Proceed to the injector hydraulic inspections.

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

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

coolant temperature sensor circuit



COOLANT TEMPERATURE SENSOR

	Specification	Desc./Quantity
1	Digital instrument unit	
2	Heater control device	
3	Fuse 5A	
4	Fuse 20A	
5	Battery	12V - 9Ah
6	Injection electronic control unit	
7	Coolant temperature sensor	

INDEX OF TOPICS

SUSPENSIONS

SUSP

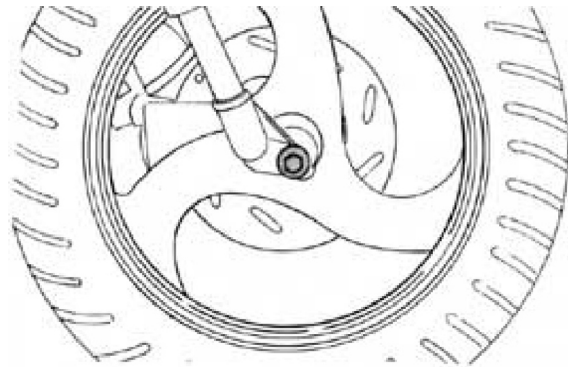
Sospensioni anteriore

This section describes the operations which can be carried out on the suspensions.

Front

Removing the front wheel

- Rest the vehicle so that the front wheel is lifted from the ground.
- Using two 18 mm spanners, remove the front wheel axle.



Refitting the front wheel

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

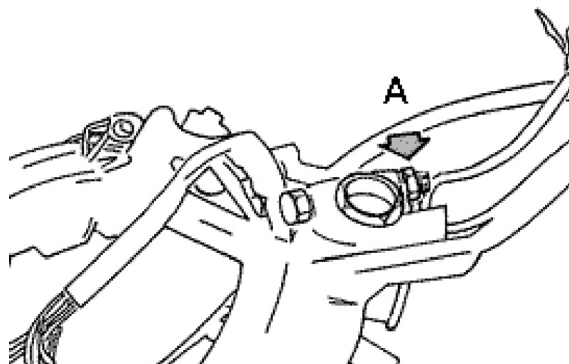
Handlebar

Removal

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

N.B.

IF THE HANDLEBAR IS BEING REMOVED ONLY TO ALLOW FOR THE REMOVAL OF THE STEERING, IT IS SUFFICIENT TO TILT THE HANDLEBAR FORWARD, THUS AVOIDING DAMAGING THE CABLES.



Refitting

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

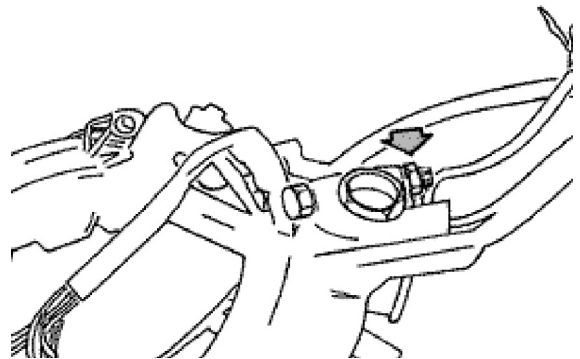
Recommended products

ZETA 2 Grease for steering wheel bearings and pin seats

Lithium soap and zinc oxide grease NLG12

Locking torques (N*m)

Tightening torque $65 \div 70$ N*m

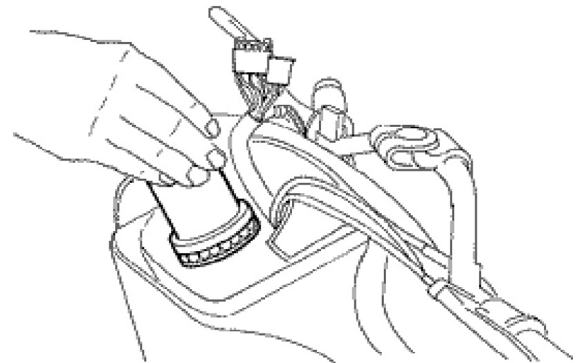


Front fork

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 lock-nut, using the special tool, lean the vehicle on one side and extract the steering column.

**Specific tooling**

020055Y Steering tube ring nut spanner

Overhaul**Rod disassembly**

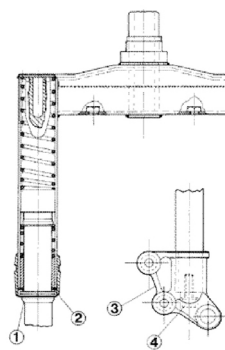
-
- Remove dust cover (1) using a screwdriver as a lever.
 - Remove split ring (2) and force the tube out.

N.B.

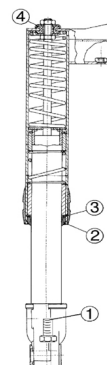
GREASE SPRINGS AND SPACERS BEFORE REFITTING, WITH A MINIMUM OF GREASE (~ 3 GR.)

Recommended products**JOTA 3 FS Speedometer transmission**

Lithium soap grease NLGI 33

**Disassemble damper**

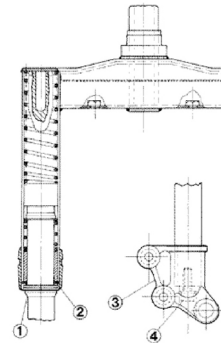
- Remove fixing screw 1 from the stanchion bracket, by warming it up with the special heating gun. Then, remove split rings 2 and 3.
- Remove nut 4 and stanchion, spring, and spacers. The damper is built into the stanchion and cannot be overhauled. Therefore, in the eventuality of a need to intervene on the damper (i.e. loss of oil from the fork), follow the above operations and replace the stanchion.
- When refitting, tighten at the prescribed torque and apply the recommended threadlock on the nut.

**Specific tooling****020150Y Support for air heater "METABO HG 1500/2"****020151Y Air heater "METABO HG 1500/2"****Recommended products****Loctite 243 Thread-Brake**

Medium Loctite Thread-Brake 243

Locking torques (N*m)**Fixing screw - stanchion bracket 20 ÷ 25 N·m****Nut tightening torque 20 ÷ 25 N·m****Replace seal ring**

- Remove the wheel axle.
- Remove screw (4).
- Remove shoe (3).
- Remove dust cover (1).
- Insert a new seal ring after lubricating the inner ring walls and by paying attention not to damage it.
- Insert the shoe applying the recommended product on the clean surface.
- Lock screw (4).



Recommended products

Loctite 243 Thread-Brake

Medium Loctite Thread-Brake 243

Refitting

- Lubricate housing and spheres with the recommended grease.
- Tighten at the prescribed torque and turn the spanner anticlockwise by $90^\circ \div 100^\circ$.

Specific tooling

020055Y Steering tube ring nut spanner

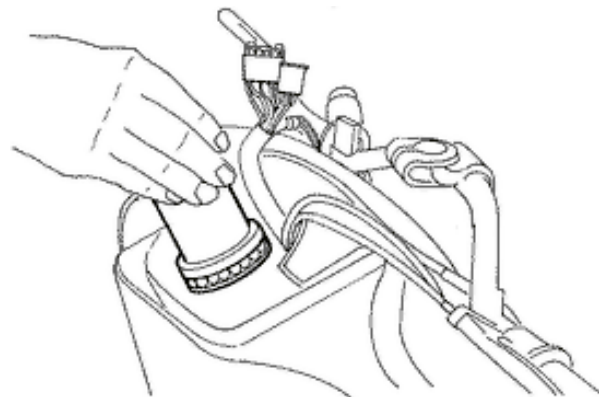
Recommended products

ZETA 2 Grease for steering wheel bearings and pin seats

Lithium soap and zinc oxide grease NLG12

Locking torques (N*m)

Locking torques $50 \div 60$ N·m

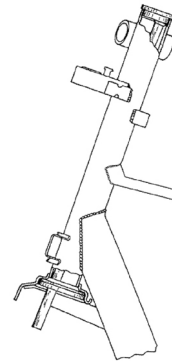


Steering column

Removal

Lower and upper races from frame removal

-
-
- Only remove the housings in the event of actual need.
 - Using the special tool, remove the top bearing housing inserting the tool from underneath the steering housing as shown in the figure.
 - Insert the drift from above the steering housing and remove the lower ring-nut housing.



Specific tooling

020004Y Drift for removing thrust rings from steering head tube

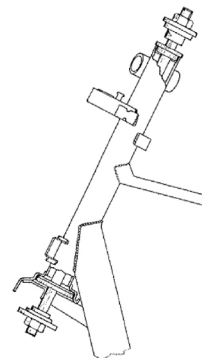
Refitting

Lower and upper races from frame refitting

-
-
- Using the special tool, refit the top and bottom housings on the frame.

Specific tooling

001330Y Steering seat installer, to be fitted with parts: 001330Y009-For lower seat, 001330Y013-For upper seat



Steering bearing

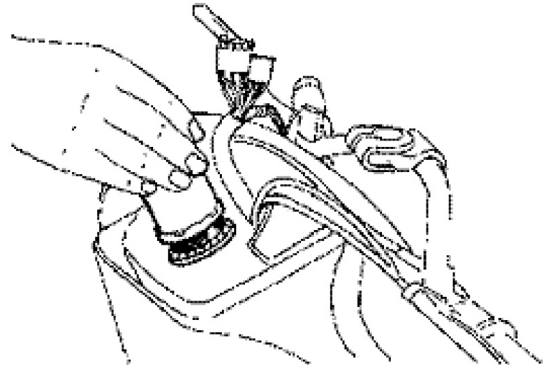
Removal

Disassemble steering locking ring nut

-
-
- Remove the handlebar.
 - Remove the steering bearing ring nut using the special tool.

Specific tooling

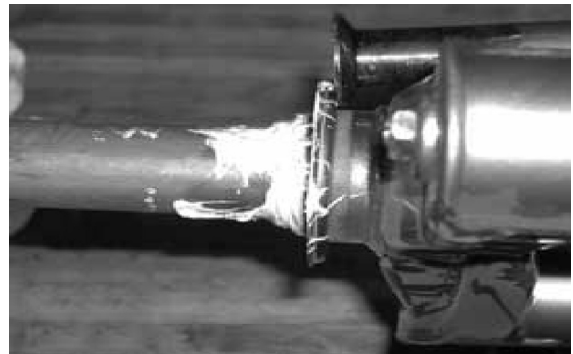
020055Y Steering tube ring nut spanner



Overhaul slew ring seat on fork

Check the condition of the bearing housing on the fork (steering column), In the event of anomalies, replace it.

- Adequately support the fork.
- Using the special tool, remove the bearing housing on the steering column as shown in the picture, with a light mallet.



Specific tooling

020004Y Drift for removing thrust rings from steering head tube

When refitting, always use a new bearing housing.

- Using the special tool, refit the bearing housing, with the aid of a light mallet, pushing home as shown in the figure.

Specific tooling

006029y Drift for fitting thrust ring seats on steering tube



Refitting

Rimontaggio ghiera di bloccaggio sterzo

- After tightening the first ring-nut, tighten the

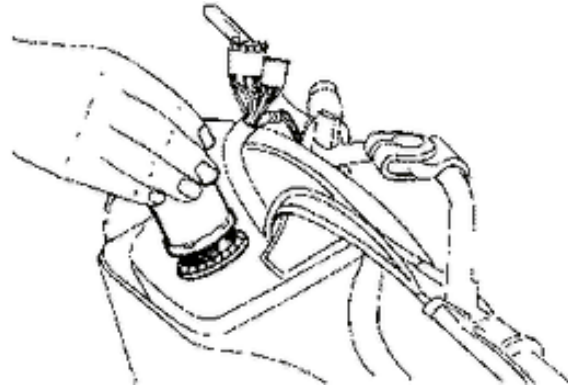
second one using the special tool.

Specific tooling

020055Y Steering tube ring nut spanner

Locking torques (N*m)

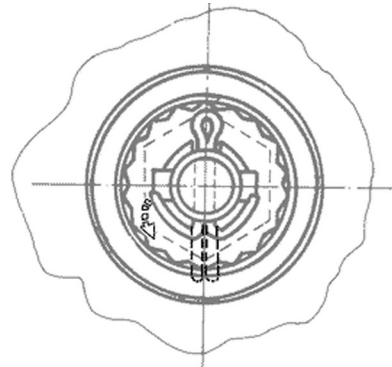
Tightening torque 30 ÷ 40 N·m



Rear

Removing the rear wheel

- Prise off the hub cap by levering against the brake drum with a screwdriver
- Straighten the split pin and remove the cap.
- Unscrew the wheel spindle nut and remove the wheel.
- On reassembly, tighten the spindle nut to the prescribed torque.



WARNING

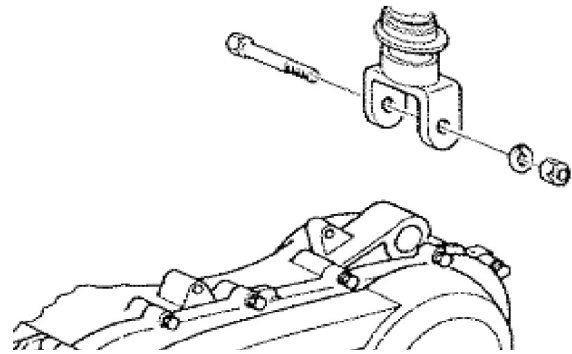
ALWAYS REASSEMBLE WITH NEW SPLIT PINS.

Shock absorbers

Removal

To replace the shock absorber just remove the battery door to access and remove the nut anchoring the shock absorber to the chassis. Then remove the stud bolt anchoring the shock absorber to the engine.





Refitting

When reassembling tighten the shock absorber / chassis nut and shock absorber / engine stud bolt to the prescribed torques.

Locking torques (N*m)

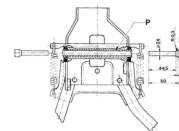
Shock absorber/frame nut $20 \div 25$ N·m Shock absorber/engine pivot pin $33 \div 41$ N·m

Centre-stand

Assembly and staking of stand pivot pin to bracket

- Stake the end of pin «P» using the two punches shown in the figure.

- The stand should turn freely on its pivot after this operation.



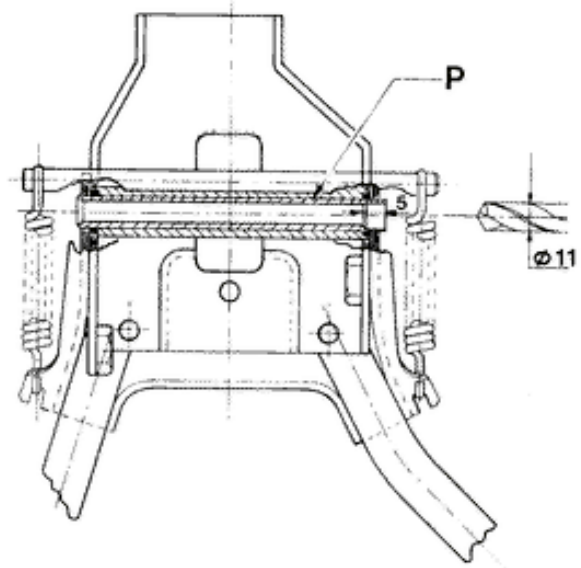
N.B.

REASSEMBLE THE STAND USING NEW O-RINGS AND A NEW PIN. GREASE THE SPRING ATTACHMENT POINTS AND THE PIN.

Expelling stand pivot pin from bracket

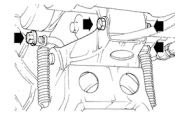
- Disassemble the stand bracket from the engine.

- Drill to a depth of 5 mm from one side in order to remove pivot pin «P».



Changing the complete stand

- Remove the 2 screws shown in the figure.
- On reassembly, tighten to the prescribed torque.



Locking torques (N*m)

Stand bracket screws $18,5 \div 19$ N·m

INDEX OF TOPICS

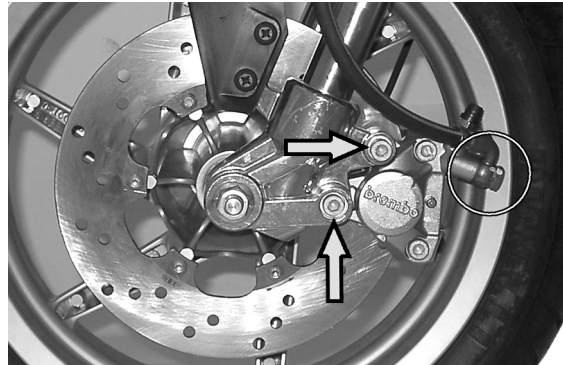
BRAKING SYSTEM

BRAK SYS

Front brake calliper

Removal

- Check the conditions of the brake cable, sealing and joint. In the presence of losses of liquid from the calliper and/or system components, it is necessary to replace the components themselves.
- Detach the fluid tube from the calliper collecting it in a container.
- Remove the 2 fixings highlighted in the figure.



Overhaul

- Remove the calliper assembly bolts and take out the internal parts from both bodies. If necessary, use short blasts of compressed air through the brake fluid passage to facilitate expulsion of the pistons.
- Make sure the cylinders of the calliper inner and outer bodies are not scratched or eroded. If they are, renew the entire calliper.

CAUTION

ALL INTERNAL COMPONENTS MUST BE RENEWED AT EACH CALLIPER OVERHAUL.

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 MUST NOT BE LEFT IN ALCOHOL FOR MORE THAN 20 SECONDS.
AFTER WASHING, DRY THE PARTS WITH COMPRESSED AIR AND A CLEAN CLOTH**

Locking torques (N*m)

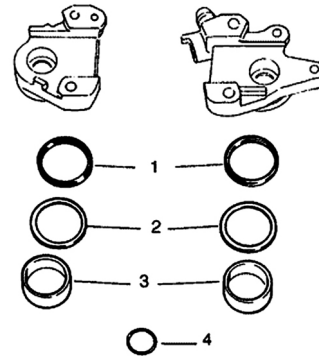
Calliper mating screw **20÷25 N·m** Fluid breathing screw **7÷10 N·m**

1 DUST SEALS

2 OIL SEALS

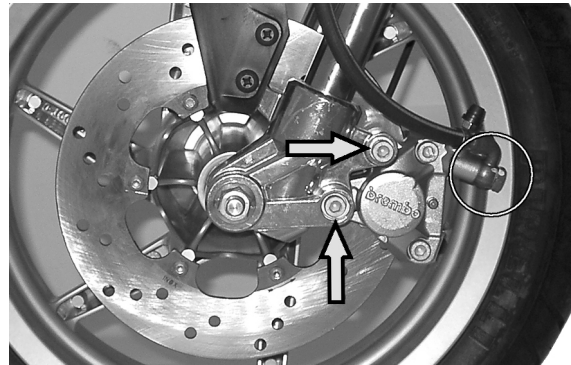
3 PISTONS

4 O-RING



Refitting

- Refit the calliper on the bracket and tighten the screws at the prescribed torque.
- Refit the tubing with its joint and new copper seals.
- Breathe air from the circuit.



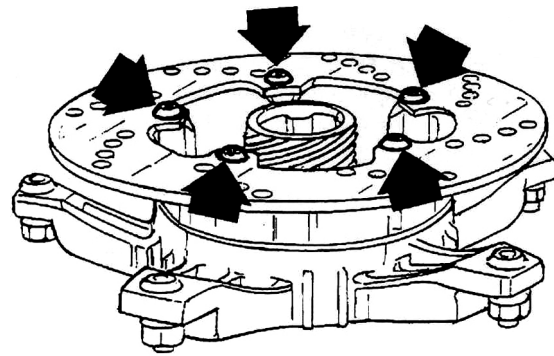
Locking torques (N*m)

Brake tube union **20 ÷ 22 Nm** Calliper - crank-case fixing screws **20÷25** Fluid breathing screw **7÷10 N·m**

Front brake disc

Removal

- Remove the wheel by removing the spindle fixings.
- Unscrew the 6 disc fixing screws.



Refitting

- When reassembling, ensure the disc is positioned correctly in relation to the direction of rotation.

Locking torques (N*m)

Disc screws: $8 \div 12$

Disc Inspection

It is very important to inspect the disc; this must be perfectly clean and free from rust, oil, grase, and other dirt, and must not present any deep scratches.

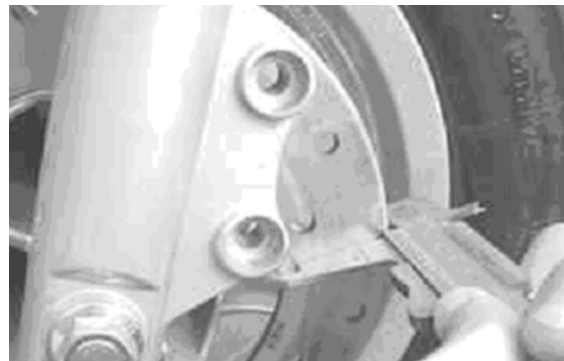
Characteristic

Thickness of front disc (new)

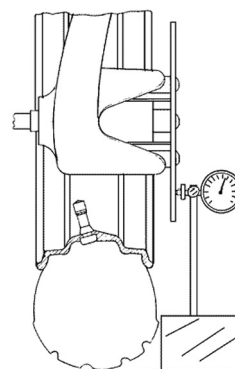
4,0 mm

Min allowable worn disc thickness (front)

3,5 mm



- With the aid of the special tool measure the planar misalignment of the disc with the wheel mounted on the vehicle. This, measured near the outer edge of the disc, must be less than 0.1 mm.
- In the event that measured value does not match the prescribed one, remove the front wheel (Front/Rear Suspen-



sion Chapter) and check the misalignment of the disc. The measure value must be less than 0.1 mm. If this is higher, replace the disc and perform the same test again.

- If the problem cannot be solved by replacing the disc, check and eventually replace the wheel hub.

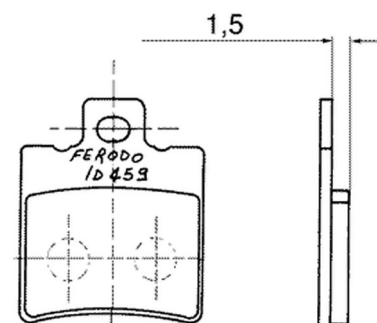
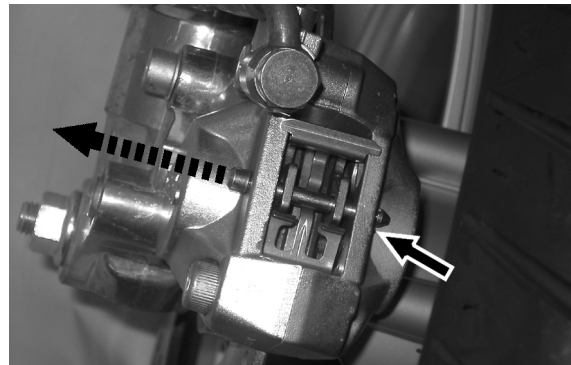
Specific tooling

020335Y Magnetic stand and comparator

Front brake pads

Removal

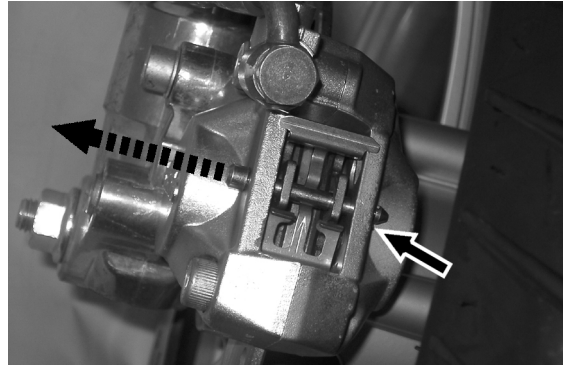
- Remove the pin split ring located at the back of the calliper body.
- Remove the pin, paying attention in recovering the spring, hence remove the pads.
- The pads must be replaced if the working thickness is less than 1.5 mm



Refitting

- To reassemble perform the above steps in reverse order. Position the leaf spring with the ar-

row facing up.



Fill

Front

-With the bleed valve closed, fill the system to the maximum level with brake fluid.

- Loosen the bleed valve.

- Apply the Mityvac vacuum pump tube to the bleed valve.

To bleed the circuit you must supply the reservoir constantly with brake fluid while pumping the Mityvac pump until there are no more air bubbles in the circuit.

The operation is concluded when the bleed valve delivers brake fluid and no air.

- Close the bleed valve.

When you have finished the above procedure, tighten the bleed screw to the prescribed torque.

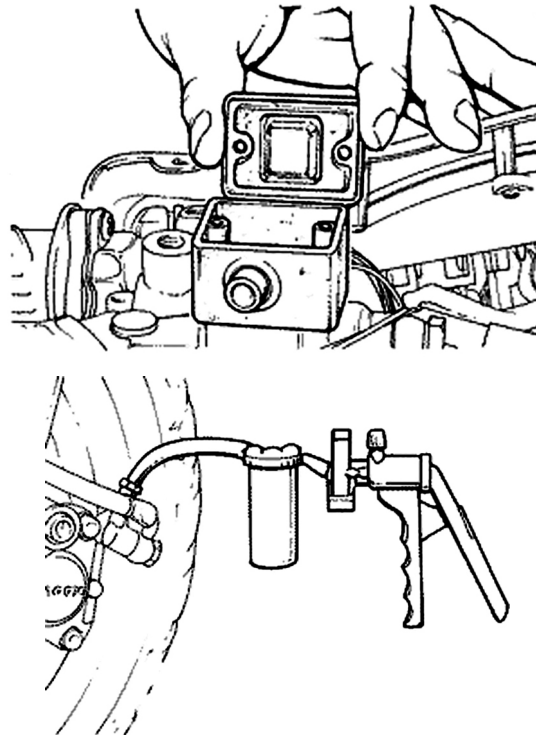
N.B.

IF YOU FIND YOU CANNOT ELIMINATE THE AIR, EXAMINE ALL THE UNIONS IN THE CIRCUIT.

IF YOU DON'T FIND ANY LEAKS, SEEK THE FAULT IN THE VARIOUS SEALS ON THE MASTER CYLINDER AND BRAKE CALLIPER PISTONS.

CAUTION

DURING THIS PROCEDURE THE VEHICLE MUST BE ON THE STAND ON A LEVEL AND HORIZONTAL.



AL FLOOR.

N.B.

DURING THE BLEED PROCEDURE, CHECK THE FLUID LEVEL IN THE MASTER CYLINDER RESERVOIR FREQUENTLY TO PREVENT THE RISK OF AIR ENTERING THE CIRCUIT THROUGH THE MASTER CYLINDER.

WARNING

BRAKE FLUID IS HYGROSCOPIC. I.E. IT TENDS TO ABSORB MOISTURE FROM THE SURROUNDING AIR.
IF THE LEVEL OF MOISTURE IN THE FLUID EXCEEDS A GIVEN VALUE, BRAKING EFFICIENCY WILL BE REDUCED.
THEREFORE, ALWAYS USE FLUID FROM SEALED CONTAINERS.
IN NORMAL RIDING AND CLIMATIC CONDITIONS THE BRAKE FLUID SHOULD BE CHANGED EVERY 2 YEARS.
IF THE BRAKES ARE USED INTENSELY AND/OR IN HARSH CONDITIONS, CHANGE THE FLUID MORE FREQUENTLY.

CAUTION

DURING THE ABOVE PROCEDURES BRAKE FLUID MAY LEAK FROM BETWEEN THE BLEED SCREW AND ITS SEAT ON THE CALIPER.
DRY THE CALLIPER CAREFULLY AND DEGREASE THE DISC TO REMOVE ALL TRACES OF BRAKE FLUID.

Specific tooling

020329Y Pump MITYVAC

Recommended products

TUTELA TOP 4 Brake fluid

Synthetic fluid SAE J1703, NHTSA 116 DOT 4,
ISO 4925

Locking torques (N*m)

Oil drainage screw 8 ÷ 12

Front brake pump

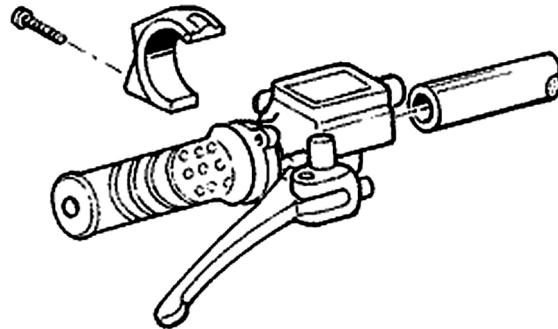
- After removing the front and rear handlebar cover remove the two U clamp fixing screws (see fig-

ure).

- Disconnect the brake tube and allow the brake fluid to flow into a receptacle.

- To reassemble perform the steps in reverse order.

- Tighten the brake tube connection to the prescribed torque and bleed the system.



Locking torques (N*m)

Brake tube connection 20 ÷ 25 Nm

Removal

- Drain the brake fluid from the circuit through the bleeding screw on the calliper. Actuate the brake lever until the fluid stops flowing out.

- Remove the master cylinder from the handlebar, take off the brake lever and proceed to remove the brake cylinder.

1 - Reservoir cover screw

2 - Reservoir cover

3 - Membrane

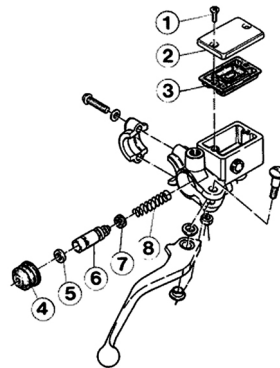
4 - Bellows

5 - Sealing ring

6 - Piston

7 - Gasket

8 - Spring



CAUTION

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

CAUTION: BRAKE FLUID CAN DAMAGE PAINTWORK.

DO NOT LEAVE RUBBER PARTS IN ALCOHOL FOR MORE THAN 20 SECONDS.

AFTER WASHING, DRY THE PARTS WITH A BLAST OF COMPRESSED AIR AND A CLEAN CLOTH.

SEALING RINGS MUST BE IMMERSSED IN BRAKE FLUID.

Refitting

Before reassembly, the parts must be perfectly clean and bear no traces of oil, diesel fuel, grease, etc.. They must therefore be washed thoroughly in denatured alcohol before proceeding.

- Perform the disassembly steps in reverse order, taking care to installed rubber parts correctly to ensure an oiltight seal.

1 - Reservoir cover screw

2 - Reservoir cover

3 - Membrane

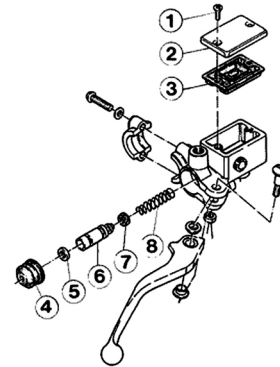
4 - Bellows

5 - Sealing ring

6 - Piston

7 - Gasket

8 - Spring



INDEX OF TOPICS

COOLING SYSTEM

COOL SYS

System bleed

Fill up the circuit through the expansion tank up to the max level mark. Secure a rubber hose to the bleed joint on the head and insert it inside the expansion tank filler hole. Loosen the joint and, if necessary, top-up with fresh coolant. Start up the engine and wait until only coolant exits the hose, hence tighten the joint on the cylinder head. Shut the engine down, top-up with coolant and hence replace the expansion tank filler cap. Warm the engine up to its operational temperature so to eliminate any air bubble within the main circuit. Shut the engine off, let it cool down and hence check the coolant level in the expansion tank reaches the max mark; top-up as necessary.



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.

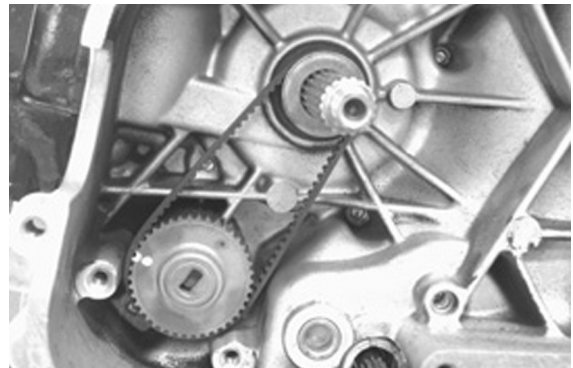
WHEN SECURING THE TOOL PAY ATTENTION NOT TO OVERLOAD THE PLASTIC IMPELLER.



Specific tooling

020167y Impeller retaining spanner

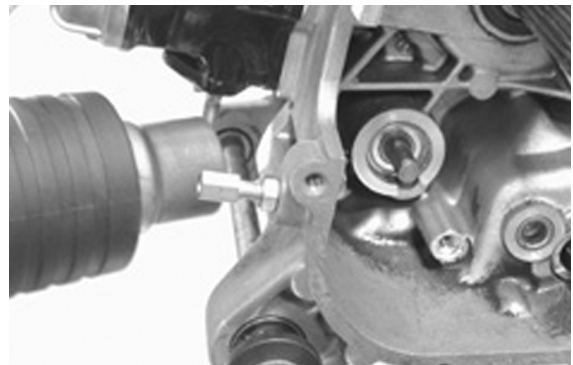
-
- Remove the mixer/water pump drive-belt with the two sprockets



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



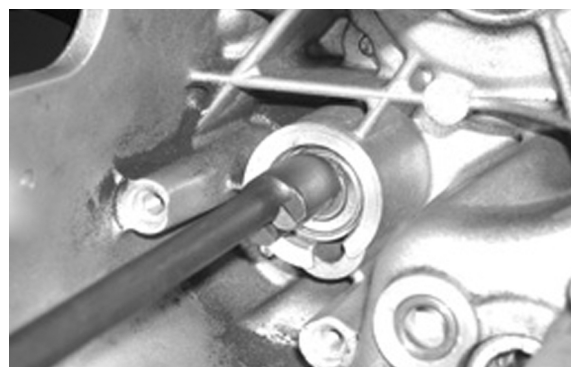
-
- Using the air heater, warm up the crankcase in the area around the water pump bearings as shown in the picture.



-
- 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 drive shaft spanner

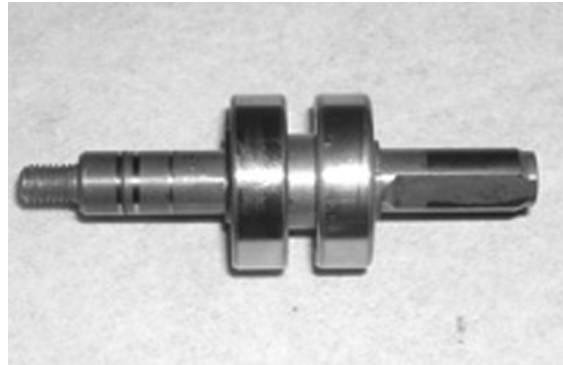


-
- Using the special hook, remove the split ring from its housing as shown in the picture.

Specific tooling

020209Y Spring hook

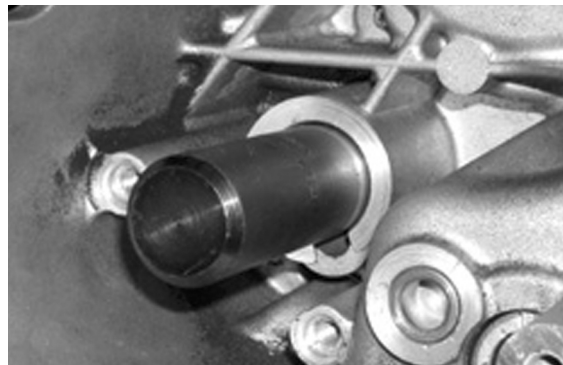
- Ensure the shaft is not abnormally worn and the bearings not noisy. Otherwise, replace shaft and bearings
- Carefully clean oil seal and bearing housings



- For refitting use a new oil seal
- 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 Oil seal fitting drift on half-crankcase**

- Insert the shaft, with bearings, in its housing by pushing and turning it at the same (turn anti-clockwise for tightening)
- Turn it rapidly until the thread reaches the end.
- Should this operation prove difficult, do not carry on; instead, start over by reheating the crankcase

**N.B.**

THE NON OBSERVATION OF THIS RULE MAY RESULT IN DAMAGE TO THE THREAD OF THE COP-

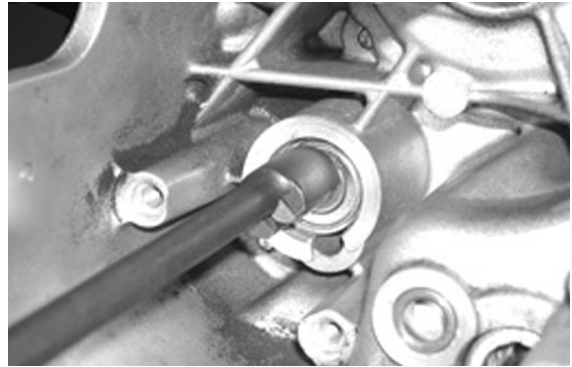
PER INSERT ON THE IMPELLER, OR THE SEPARATION OF THIS FROM THE IMPELLER ITSELF.

Specific tooling

020169Y Water pump drive shaft spanner

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

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



Recommended products

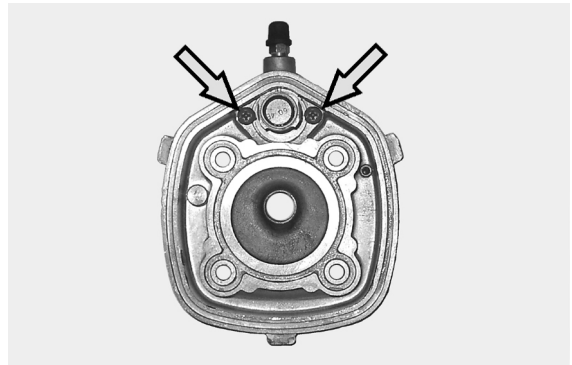
JOTA 3 FS Speedometer transmission

Lithium soap grease NLGI 33

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 ensure the thermostat is not damaged.
- 2) Fill a metallic container with approx. 1 litre of water.

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

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



Heat up the bowl using the air heater.

Check the thermostat opening start temperature:

Heat up until the thermostat is completely open.

3) Replace the thermostat if not working properly.

CAUTION

AVOID CONTACT BETWEEN THERMOSTAT AND CONTAINER AND BETWEEN THERMOMETER AND CONTAINER FOR A CORRECT TEST PERFORMANCE.

Specific tooling

020331Y Digital multimeter

020151Y Air heater "METABO HG 1500/2"

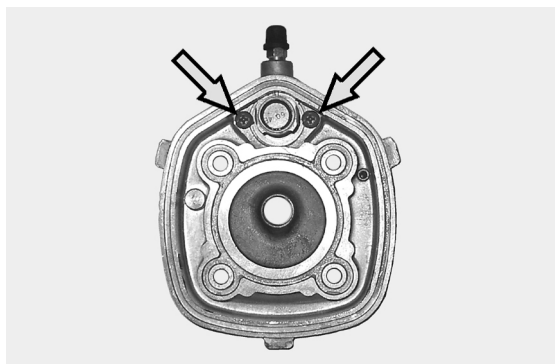
Characteristic

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.



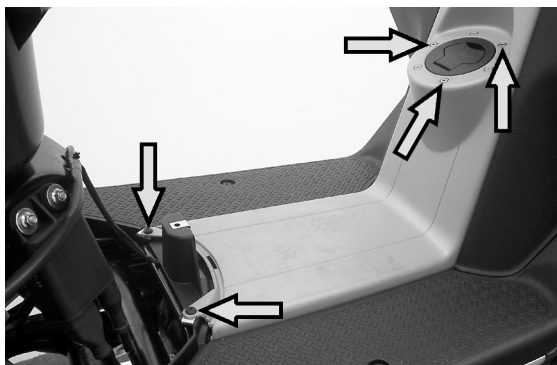
INDEX OF TOPICS

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.

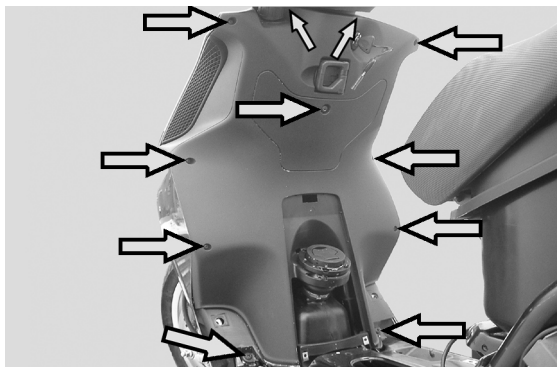


See also

[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.

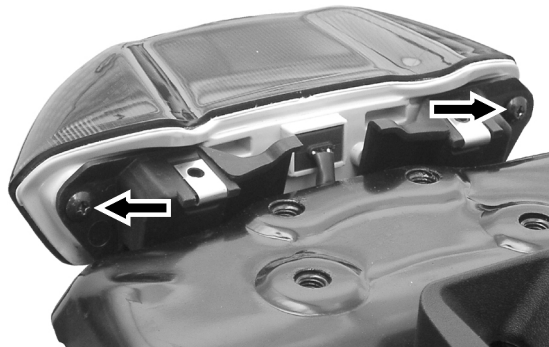


See also

[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.

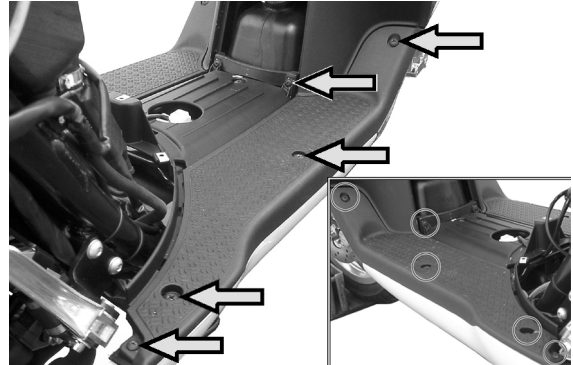


See also

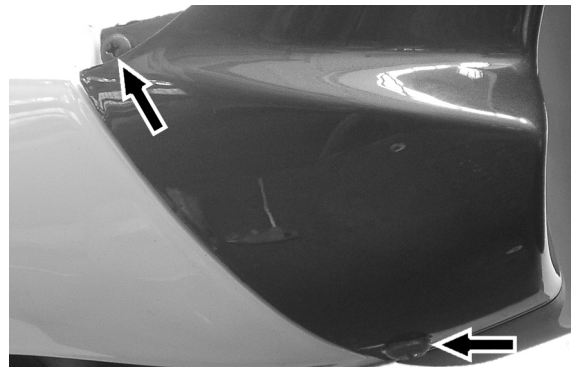
Side fairings

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.

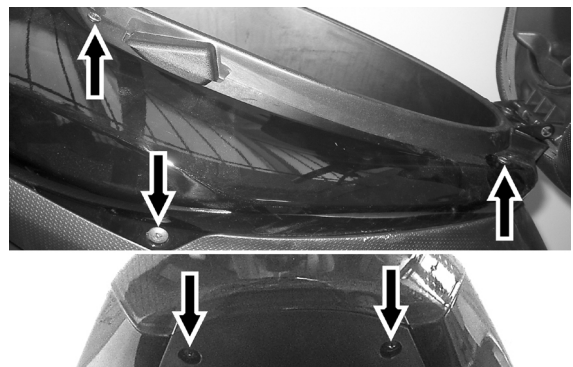


See also

[Frame central cover](#)

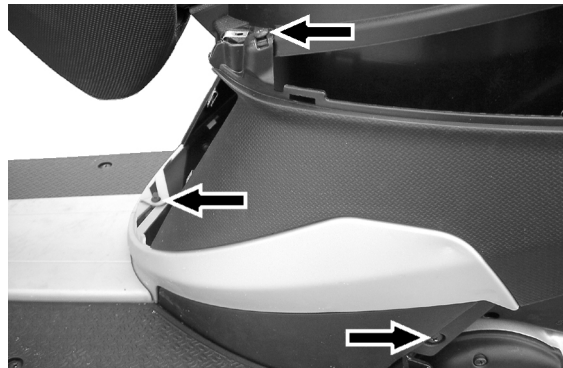
Side fairings

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



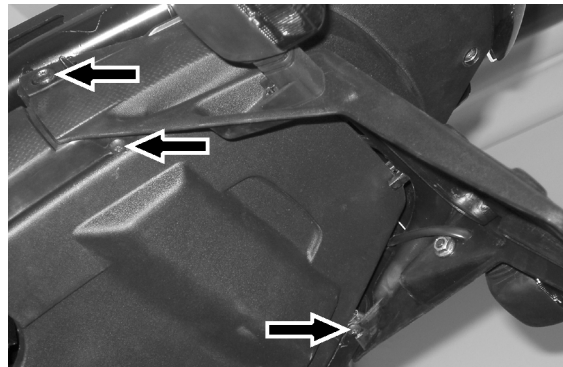
- Remove the lower fairings, removing the 2 side screws and the central joining screw located underneath the
-

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.

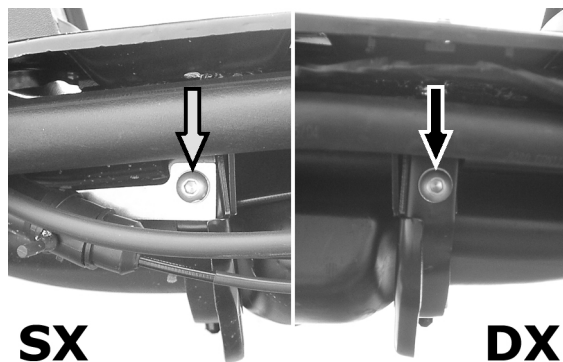


See also

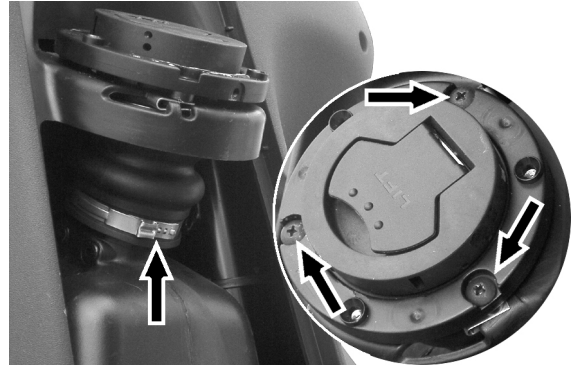
[Side fairings](#)

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](#)

INDEX OF TOPICS

PRE-DELIVERY

PRE DE

Aesthetic inspection

Predelivery checks:

- Paintwork
 - Mating of plastics
 - Scratches
 - Dirt
-

Tightening torques inspection

V>Locks Inspection

- Safety locks
- Fixing screws

Safety locks:

Rear shock absorber top tightening

Rear shock absorber bottom tightening

Front wheel axle nut

Wheel hub nut

Oscillating arm pin - Chassis

Oscillating arm pin - Engine

Chassis arm-engine arm pin

Handlebar locking nut

Steering wheel lower ring nut

Steering wheel upper ring nut

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ELECTRICAL SYSTEM



Electric System:

- Master switch
- Headlights: upper beams, dipped beams, side/taillights , stop lights and relevant light indicators
- Headlight setting according to the regulations in force
- Rear light, parking light, stop light - Front and rear stop switches
- Direction indicators and relevant lights - Instrument panel lights
- Instruments: fuel and temperature indicator
- Instrument unit indicator lights
- Horn
- Starter

CAUTION

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

WARNING

BEFORE RECHARGING THE BATTERY, REMOVE THE PLUGS OF EACH ELEMENT. KEEP SPARKS AND FREE FLAMES AWAY FROM THE BATTERY WHILE RECHARGING. REMOVE THE BATTERY FROM THE VEHICLE DISCONNECTING THE NEGATIVE TERMINAL FIRST.

CAUTION

WHEN INSTALLING THE BATTERY, FIRST FIX THE POSITIVE CABLE AND THEN THE NEGATIVE CABLE.

WARNING

THE BATTERY ELECTROLYTE IS POISONOUS AND CAUSES SEVERE BURNS AS IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH THE EYES, THE SKIN AND CLOTHING. IN CASE OF CONTACT WITH THE EYES OR THE SKIN, RINSE GENEROUSLY WITH WATER FOR ABOUT 15 MINUTES AND IMMEDIATELY SEEK MEDICAL ATTENTION. IN CASE OF INGESTION, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR VEGETABLE OIL. IMMEDIATELY SEEK MEDICAL ATTENTION. BATTERIES PRODUCE EXPLOSIVE GASES. KEEP THEM AWAY FROM OPEN FLAMES, SPARKS AND CIGARETTES. IF THE BATTERY IS CHARGED IN A CLOSED PLACE, TAKE CARE TO ENSURE ADEQUATE VENTILATION. ALWAYS PROTECT THE EYES WHEN WORKING CLOSE TO BATTERIES. KEEP OUT OF REACH OF CHILDREN

CAUTION

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

INDEX OF TOPICS

LEVELS CHECK



Level check

- Hydraulic braking system fluid level
 - Rear hub oil level
 - Engine coolant level
-

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ROAD TEST



Road test:

- Cold starting
 - Operation of instruments
 - Operation of throttle control
 - Stability during acceleration and braking
 - Operation of front and rear brakes
 - Operation of front and rear suspensions
 - Abnormal noise from vehicle
-

INDEX OF TOPICS

STATIC TEST



Static inspection after test on the road:

- Hot start
- Starter operation
- Idle speed hold (by turning the handlebar)
- Even steering wheel rotation
- Leaks, if any

CAUTION

CHECK THE INFLATING PRESSURES WHEN THE TYRES ARE AT AMBIENT TEMPERATURE.

CAUTION

NOT EXCEED THE RECOMMENDED INFLATING PRESSURES AS THE TYRES MAY BURST.

INDEX OF TOPICS

FUNCTIONAL INSPECTION



Functional Check:

Braking system (hydraulic)

- Lever stroke

Braking system (mechanical)

- Lever stroke

Clutch

- Proper performance check

Engine

- Gas control stroke check
 - Miscellaneous
 - Document check
 - Check of chassis no. and engine no.
 - Ancillary tools
 - Plate assembly
 - Check of locks
 - Tyre pressure check
 - Installation of rear-view mirrors and optional fixtures
-

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TIME

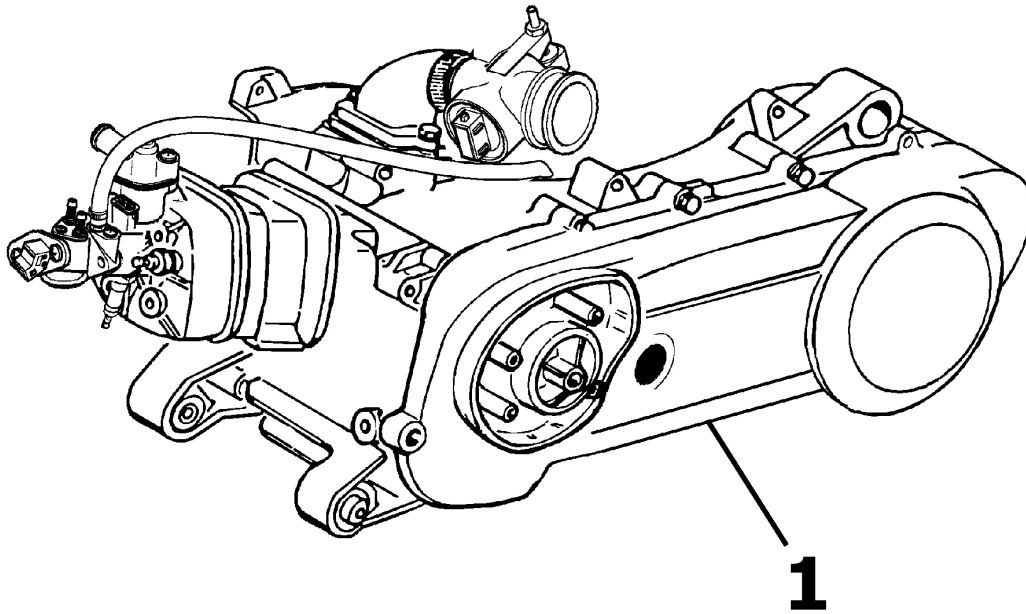
TIME

This section describes the amount of time it takes for repair operations.

The description, code and amount of time for each operation are indicated.



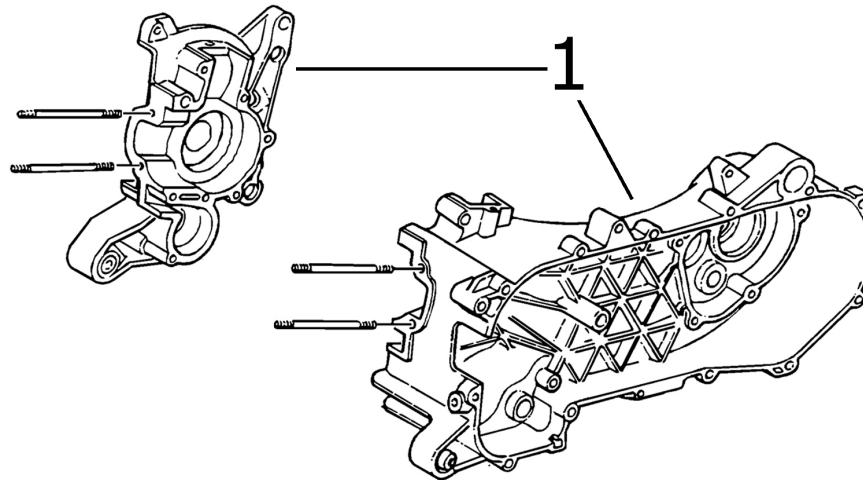
Engine



ENGINE

	Code	Action	Duration
1	001001	Engine from chassis - Replacement	

Crankcase



CRANKCASE

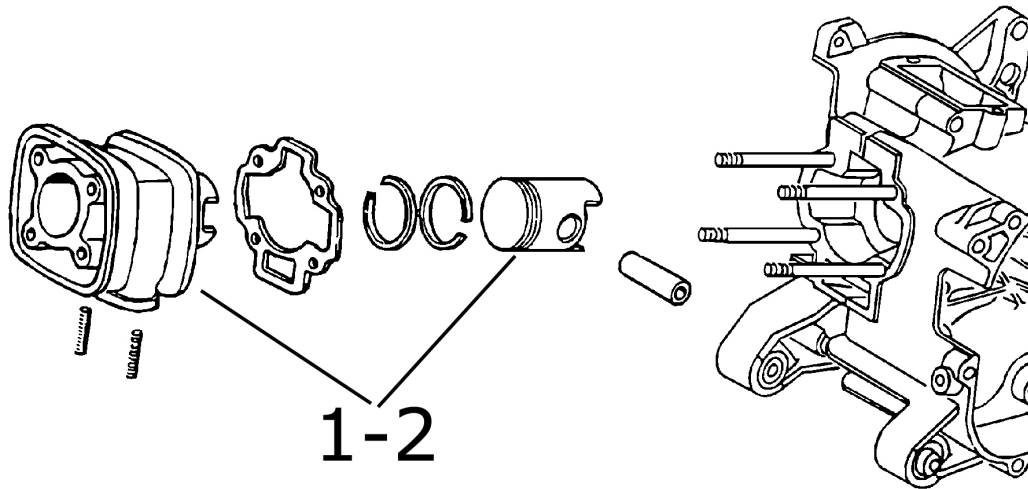
	Code	Action	Duration
1	001133	Engine crankcase - Replacement	

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	

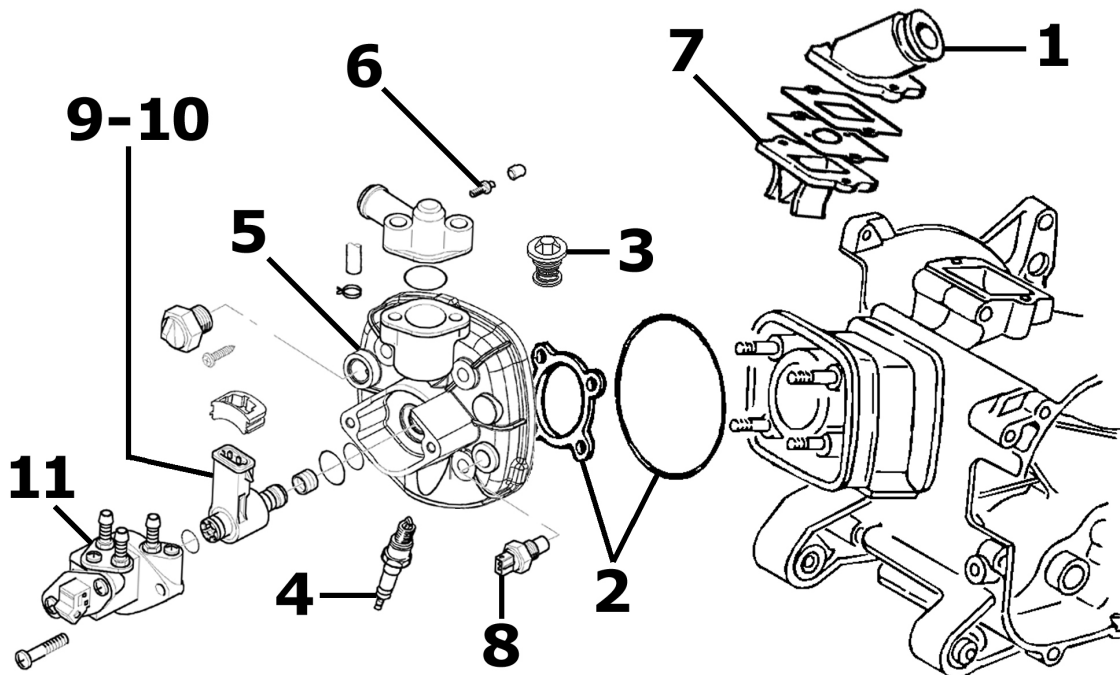
Cylinder assy.



CYLINDER / PISTON

	Code	Action	Duration
1	001002	Cylinder / Piston - Replacement	
2	001107	Cylinder, piston - Overhaul/ Cleaning	

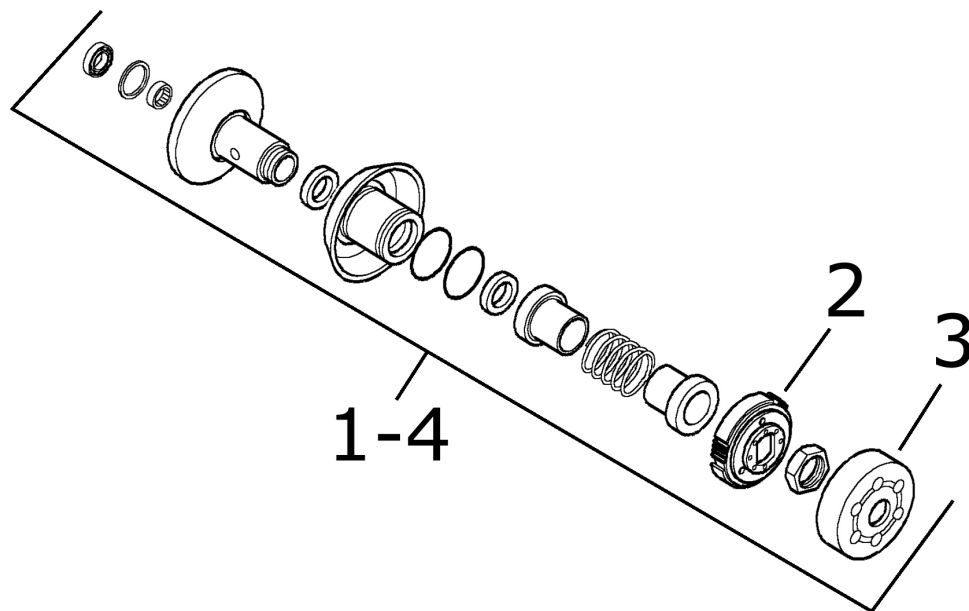
Cylinder head assy.



HEAD UNIT

	Code	Action	Duration
1	001013	Intake manifold - Replacement	
2	001056	Head gasket - Replacement	
3	001057	Thermostat - Replacement	
4	001093	Spark plug - Replacement	
5	001126	Head - Replacement	
6	007010	Bleed valve - Replacement	
7	001178	Reed valve assembly - Replacement	
8	001083	Thermistore - Replacement	
9	005111	Air injector - Replace	
10	005112	Air injector - Overhall	
11	005110	Petrol injector support - Replace	

Driven pulley

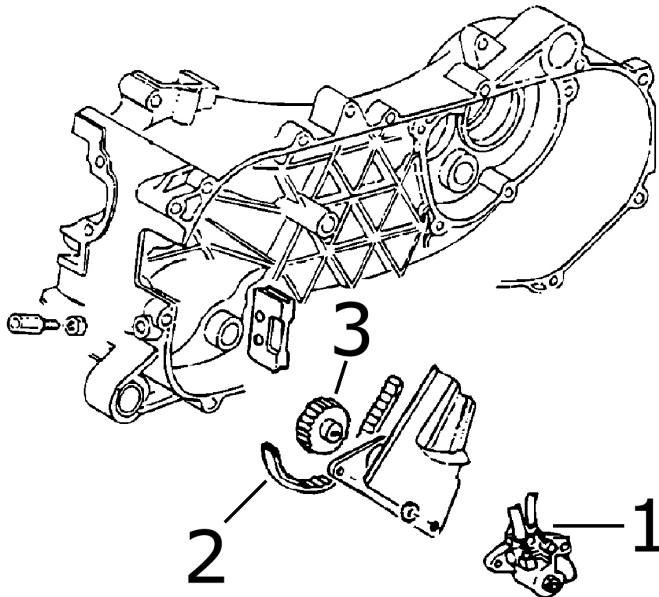


DRIVEN PULLEY

	Code	Action	Duration
1	001110	Driven pulley - Replacement	
2	001022	Clutch - Replacement	

	Code	Action	Duration
3	001155	Clutch bell housing - Replacement	
4	001012	Driven pulley - Overhaul	

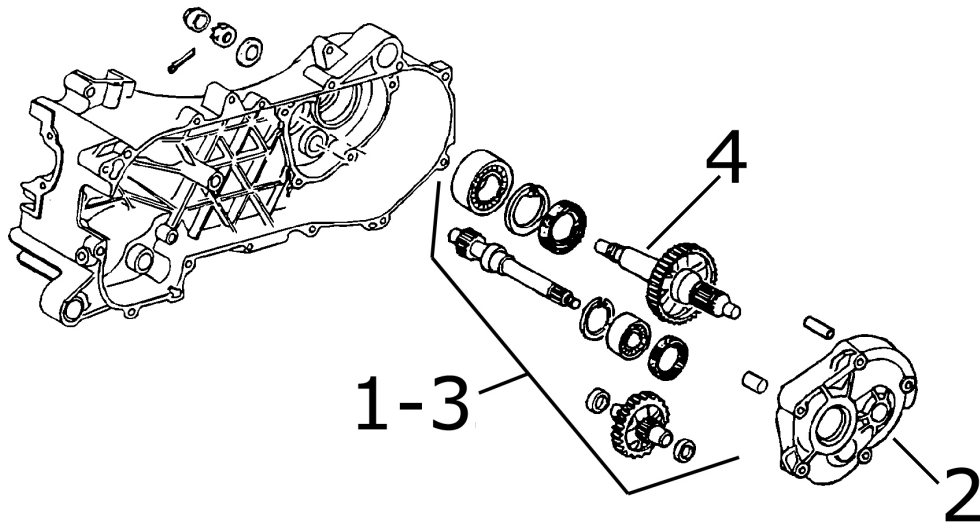
Oil pump



MIX OIL PUMP

	Code	Action	Duration
1	001018	Mixer - Replacement	
2	001019	Mixer belt - Replacement	
3	001028	Mixer drive gear - Replacement	

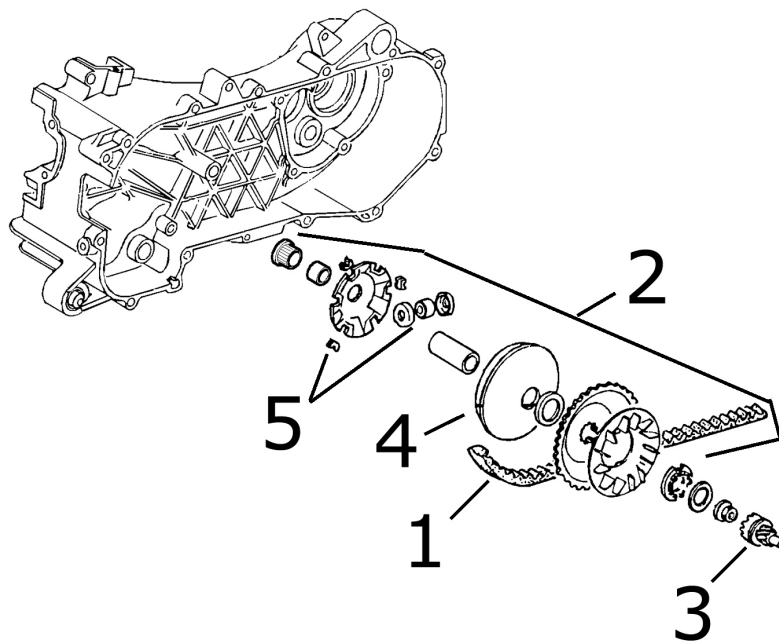
Final gear assy.



FINAL GEAR ASSY

	Code	Action	Duration
1	001010	Reduction gear - Overhaul	
2	001156	Reduction gear cover - Replacement	
3	003065	Gearcase oil - Replacement	
4	004125	Rear wheel axle - Replacement	

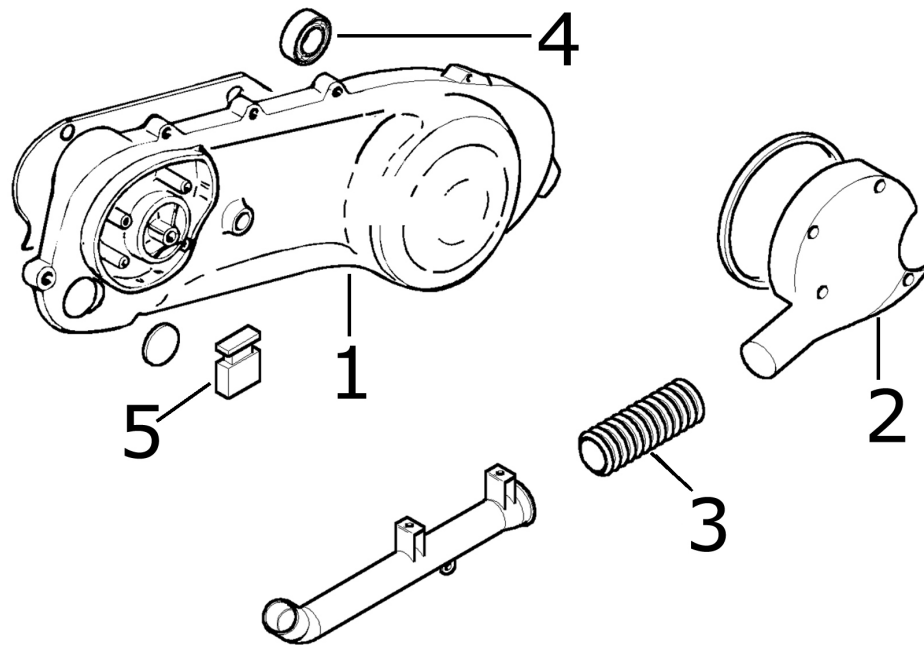
Driving pulley



DRIVING PULLEY

	Code	Action	Duration
1	001011	Driving belt - Replacement	
2	001066	Driving pulley - Removal and re-assembly	
3	001017	Starter pinion - Replacement	
4	001086	Driving half pulley - Replacement	
5	001177	Rollers / Variator track shoes - Replacement	

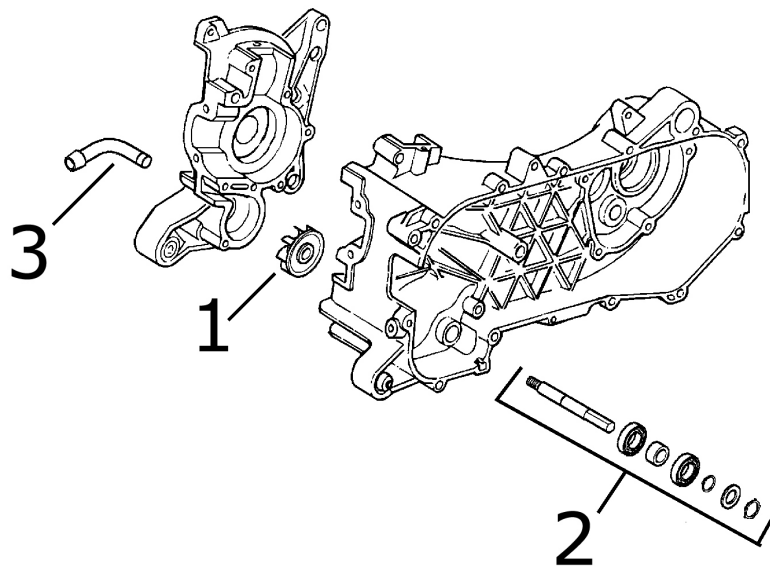
Transmission cover



TRANSMISSION COVER

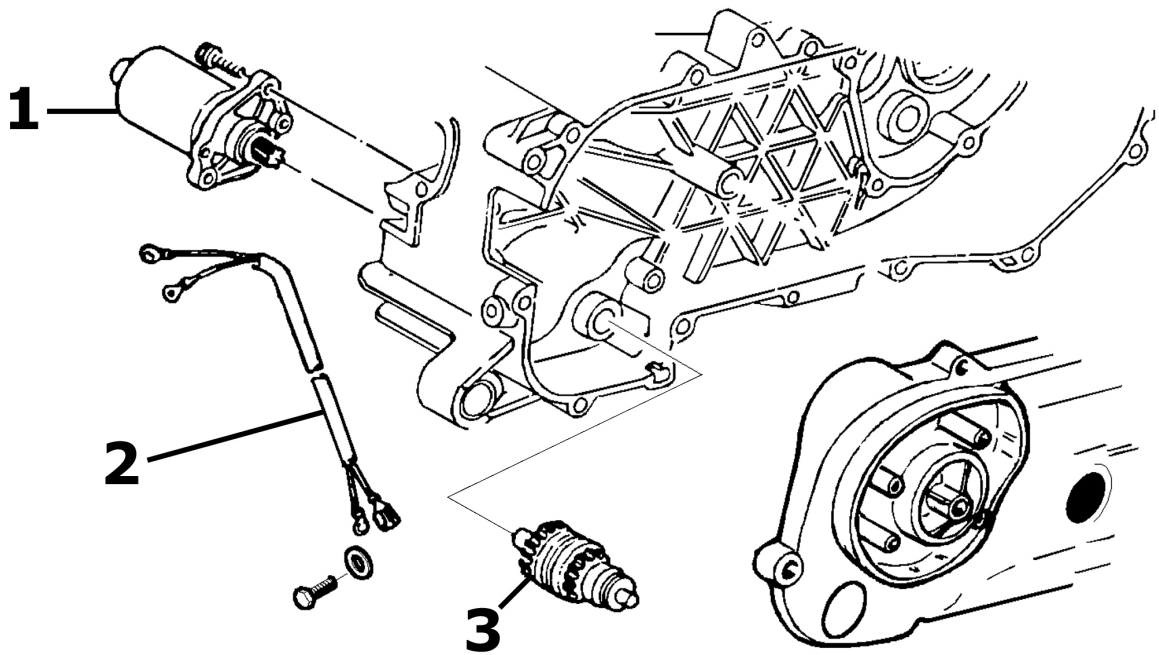
	Code	Action	Duration
1	001096	Transmission casing cover - Replacement	
2	001131	Transmission air inlet - Replacement	
3	001132	Transmission air intake tube - Replacement	
4	001135	Transmission cover bearing - Replacement	
5	004179	Centre stand buffer - Replacement	

Pompa acqua

**WATER PUMP**

	Code	Action	Duration
1	001113	Water pump - Replacement	
2	001062	Water pump control shaft - Replacement	
3	007019	Water pump/backflow hose connecting tube - Replacement	

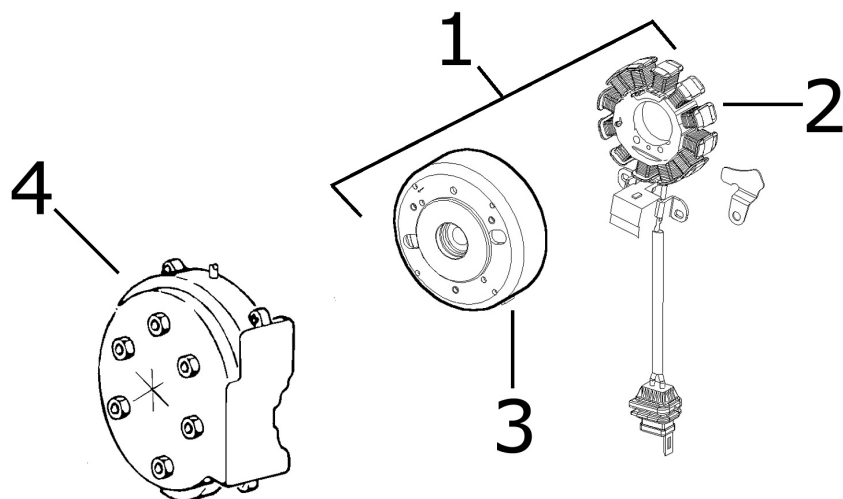
Starter motor



STARTER MOTOR

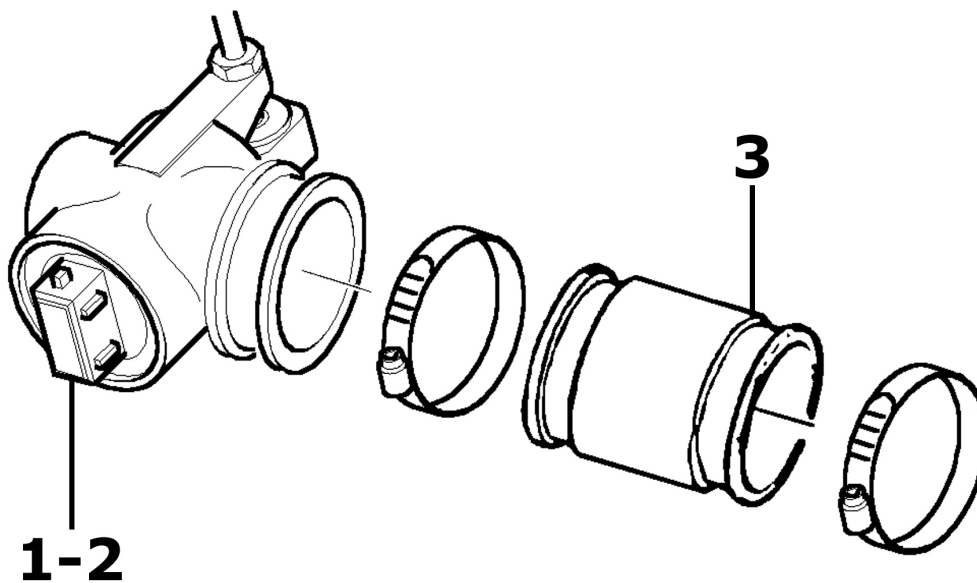
	Code	Action	Duration
1	001020	Starter motor - Replacement	
2	005045	Starting motor cables - Replacement	
3	001017	Starter pinion - Replacement	

Flywheel magneto



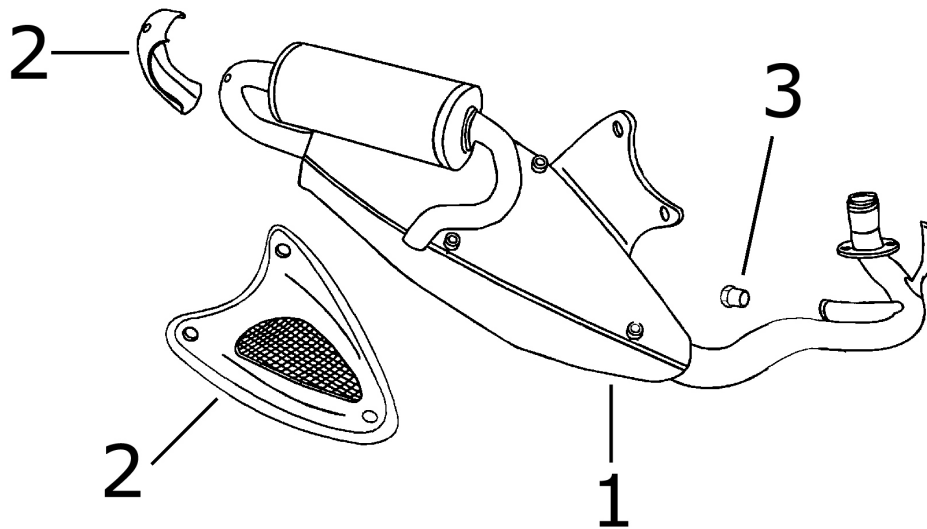
FLYWHEEL

	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	Carburettor filter manifold - Replacement	

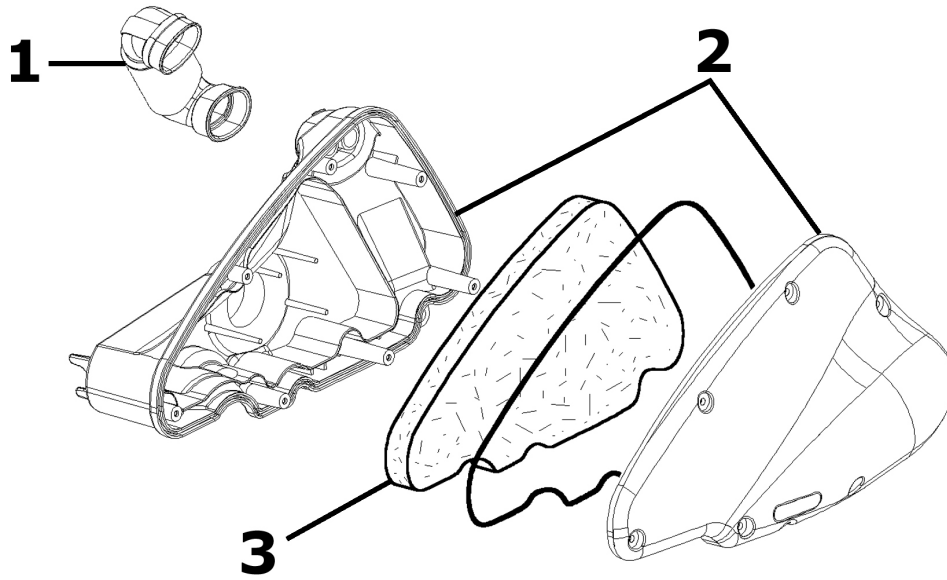
Exhaust pipe



SILENCER

	Code	Action	Duration
1	001009	Silencer - Replacement	
2	001095	Silencer guard - Replacement	
3	001136	Exhaust emissions - Adjustment	

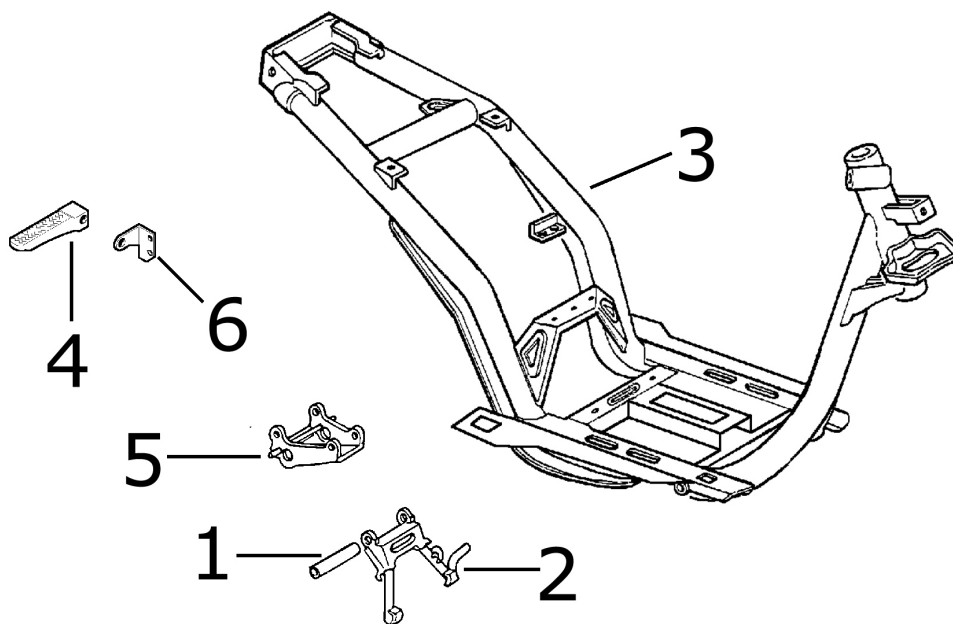
Air cleaner



AIR PURIFIER

	Code	Action	Duration
1	001027	Filter bellow - Replacement	
2	001015	Air filter box - Replacement	
3	001014	Air Filter - Replacement/Cleaning	

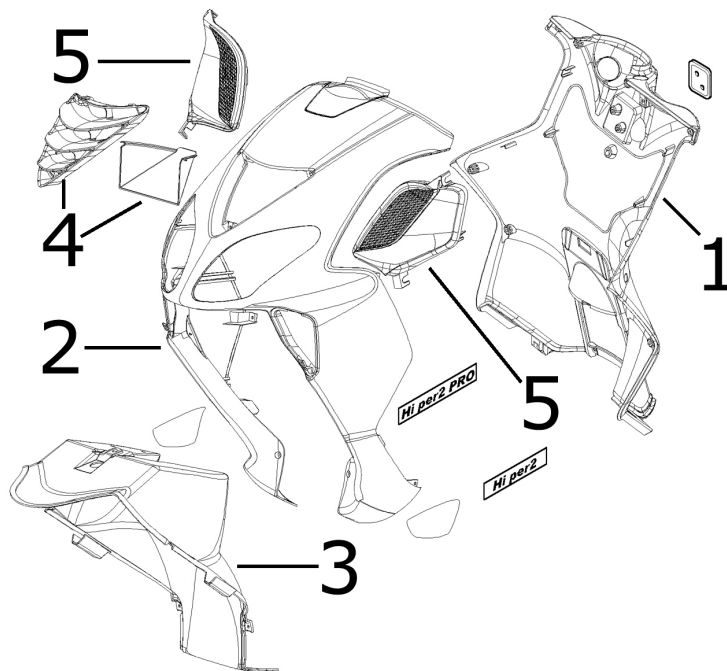
Frame



FRAME

	Code	Action	Duration
1	001053	Centre stand pin - Replacement	
2	004004	Stand - Replacement	
3	004001	Frame - Replacement	
4	004015	Footboards - Replacement	
5	004171	Stand support plate - Replacement	
6	004143	Foot-peg mounting bracket - Replacement	

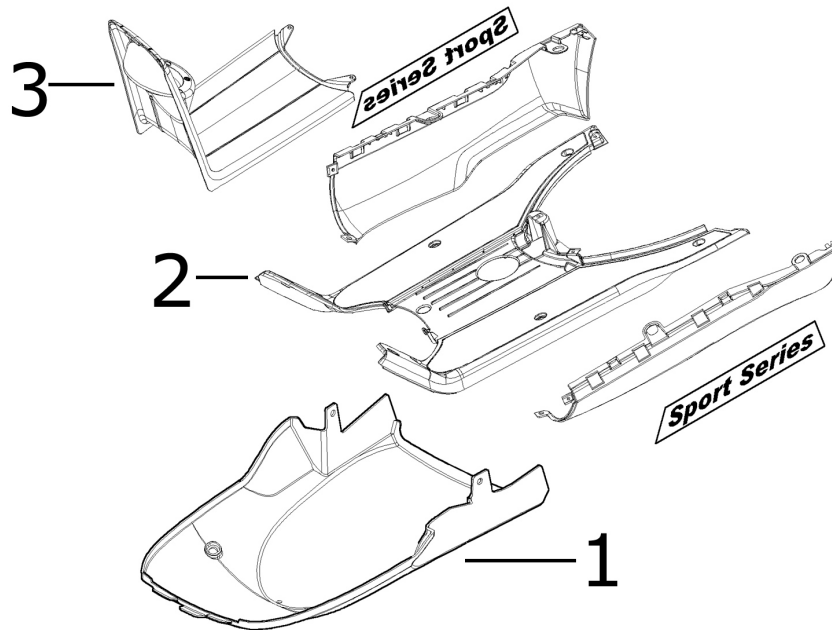
Legshield spoiler



FRONT SHIELD

	Code	Action	Duration
1	004065	Knee-guard - Replacement	
2	004064	Front shield - Replacement	
3	003087	Wheel compartment - Replacement	
4	004167	Radiator grid/cover - Replacement	
5	004176	Cooling vent - Replacement	

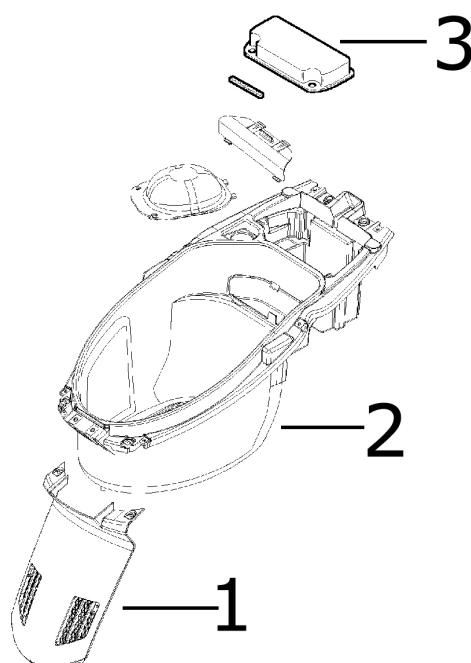
Side fairings



CENTRAL COVER

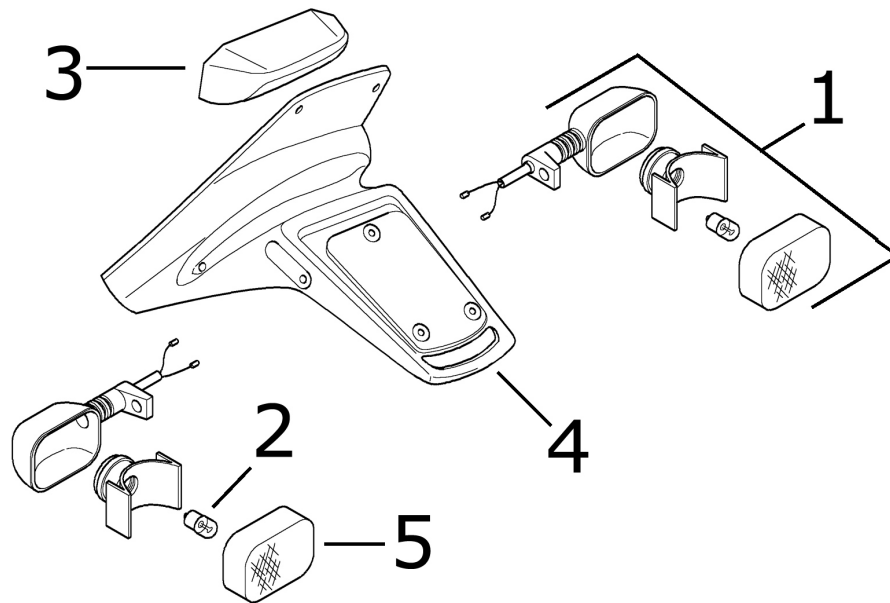
	Code	Action	Duration
1	004053	Spoiler - Replacement	
2	004178	Footrest - Replacement	
3	004011	Chassis central cover - Replacement	

Underseat compartment

**HELMET COMPARTMENT**

	Code	Action	Duration
1	004059	Spark plug inspection flap - Replacement	
2	004016	Helmet compartment - Replacement	
3	005046	Battery cover - Replacement	

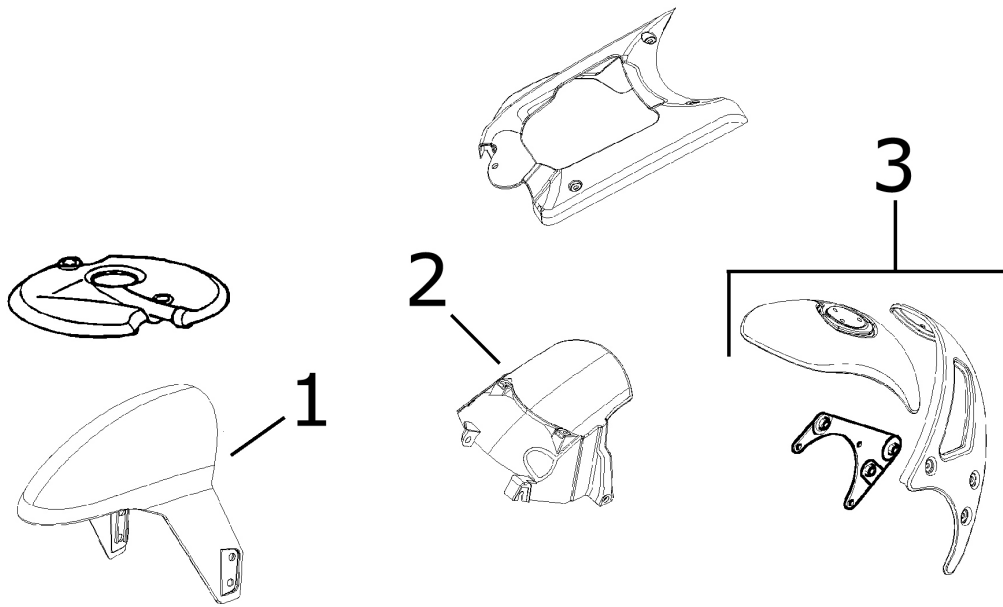
Plate holder



LICENSE PLATE HOLDER

	Code	Action	Duration
1	005022	Rear turn signal light - Replacement	
2	005068	Rear turn indicator bulb - Replacement	
3	005005	Rear light - Replacement	
4	005023	Taillight mounting bracket - Replacement	
5	005091	Direction indicators plastic cover - Replacement	

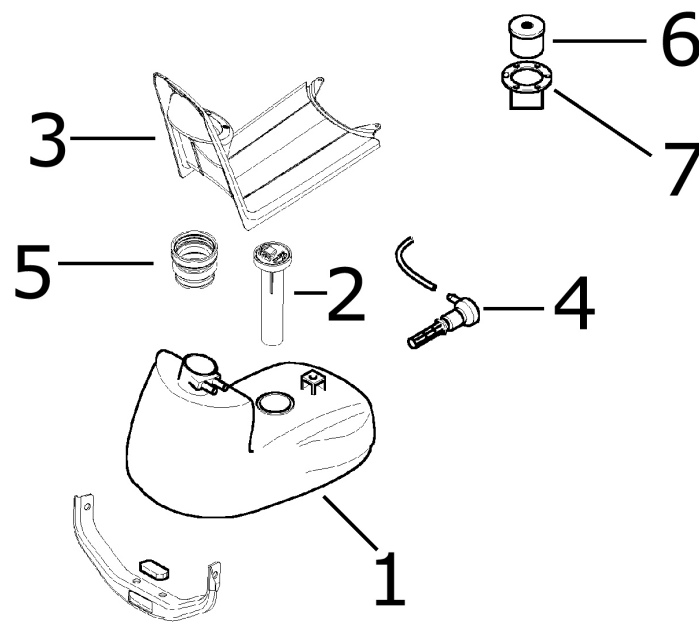
Mudguard



MUDGUARDS

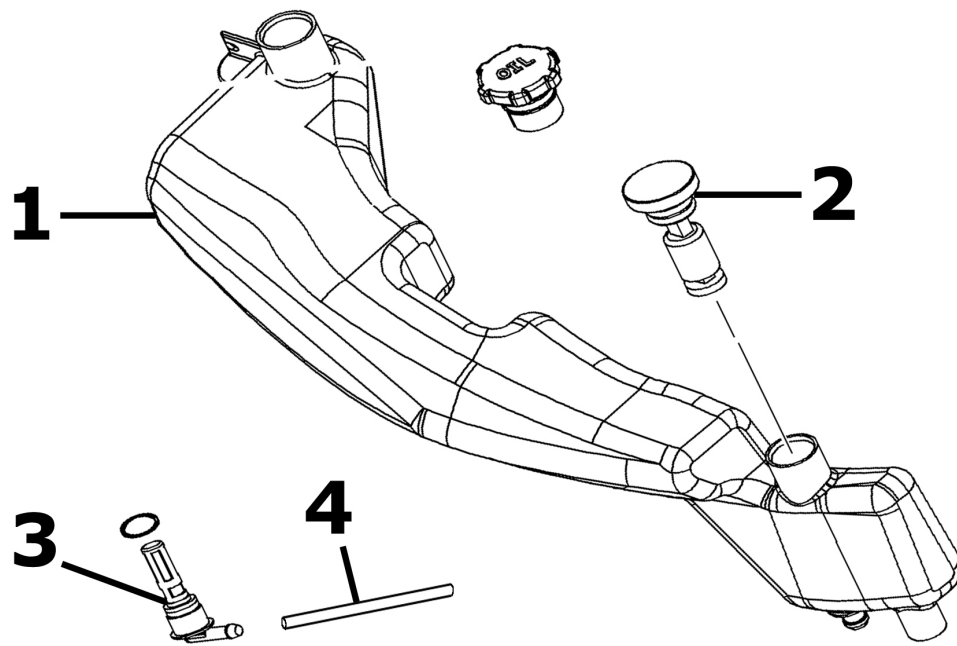
	Code	Action	Duration
1	004009	Rear mudguard - Replacement	
2	004052	Bumper - Replacement	
3	004002	Front mudguard - Replacement	

Fuel tank

**FUEL TANK**

	Code	Action	Duration
1	004005	Fuel tank - Replacement	
2	005010	Tank float - Replacement	
3	004011	Chassis central cover - Replacement	
4	004072	Fuel filter - Replacement	
5	004110	Fuel tank hose - Replacement	
6	004168	Fuel filler cap - Replacement	
7	004170	Tank filler - Replacement	

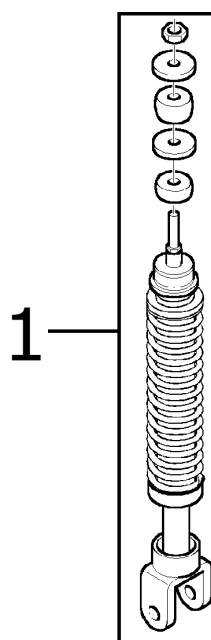
Tank oil



OIL TANK

	Code	Action	Duration
1	004017	Oil tank - Replacement	
2	005018	Oil tank float - Replacement	
3	004095	Oil tank tap - Replacement	
4	004091	Oil tank line - Replacement	

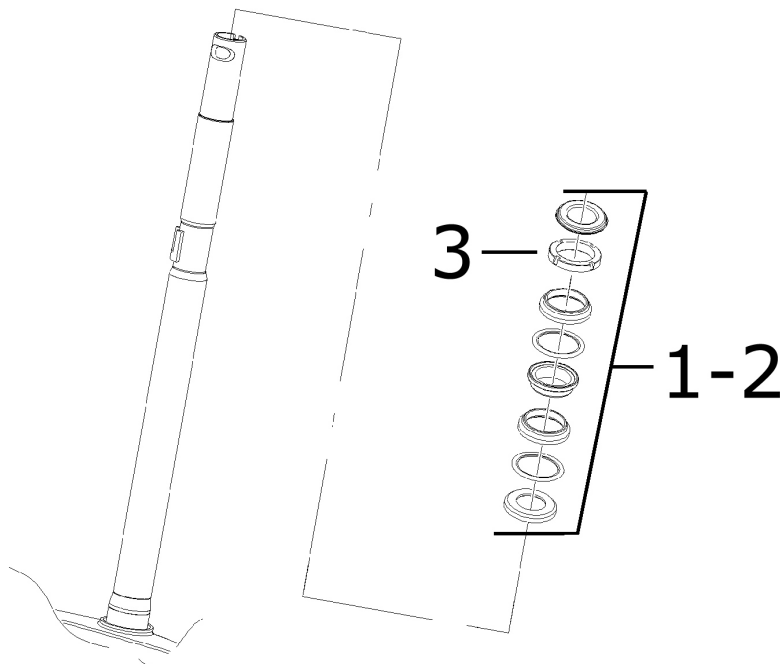
Rear shock-absorber



REAR SHOCK-ABSORBER

	Code	Action	Duration
1	003007	Rear shock absorbers - Replacement	

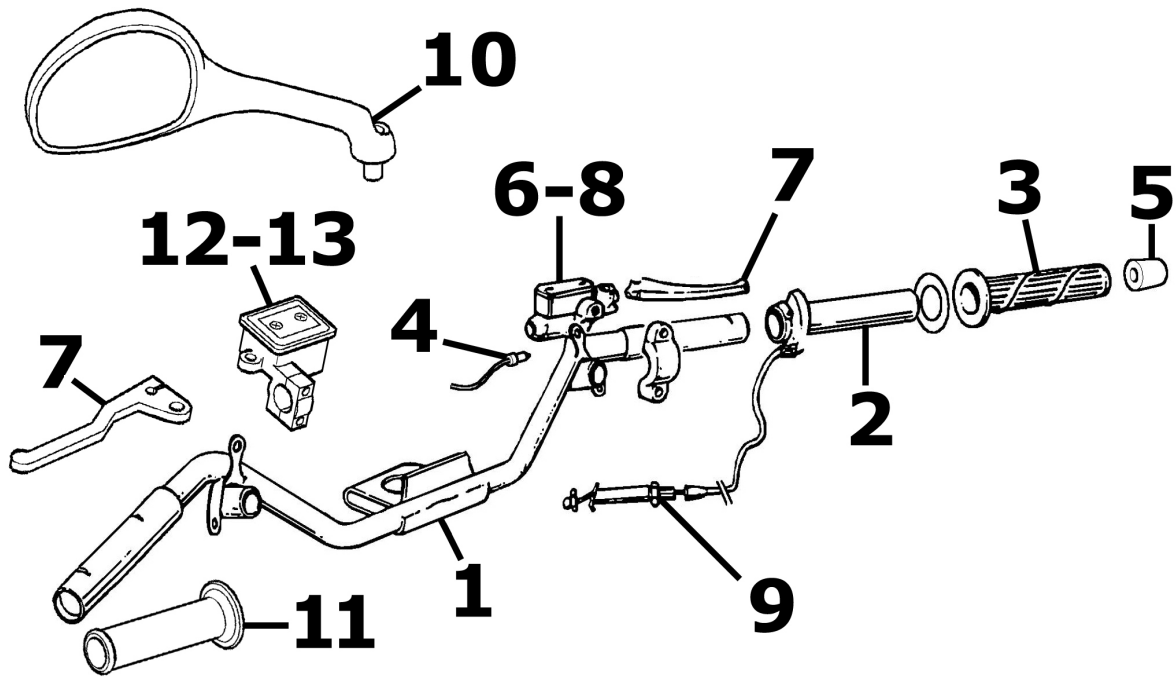
Steering column bearings



STEERING COLUMN BEARINGS

	Code	Action	Duration
1	003002	Steering fifth wheels - Replacement	
2	003073	Steering play - Adjustment	
3	004119	Bearing / Upper steering bearing - Replacement	

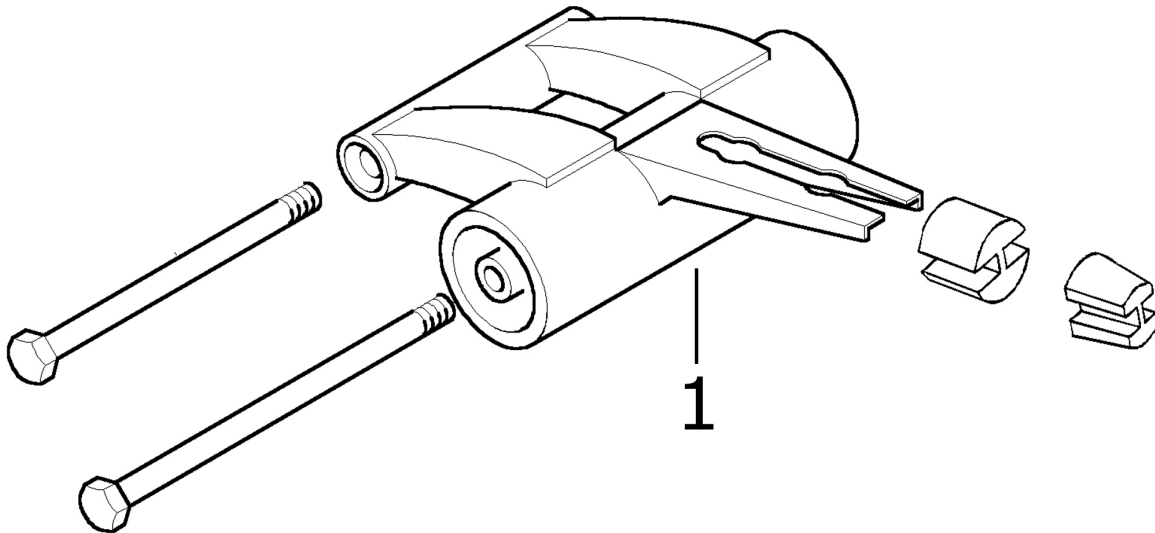
Handlebar components



HANDLEBAR COMPONENTS

	Code	Action	Duration
1	003001	Handlebar - Removal and re-fitting	
2	002060	Complete gas control - Replacement	
3	002059	Right knob - Replacement	
4	005017	Stop light switch - Replacement	
5	003059	Balance weight - Replacement	
6	002024	Front brake pump - Replacement	
7	002037	Complete gas control - Replacement	
8	002047	Front brake liquid and circuit bleeding - Replacement	
9	003061	Throttle cable - Adjustment	
10	004066	Rearview mirrors - Replacement	
11	002071	Left knob - Replacement	
12	002067	Rear brake pump - Replacement	
13	002080	System bleeding and rear brake oil - Replacement	

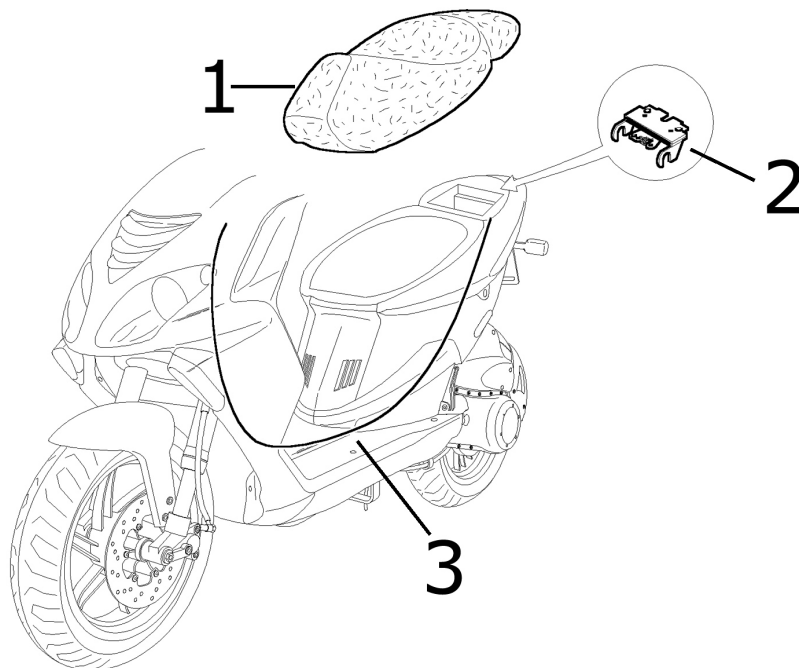
Swing-arm



SWING-ARM

	Code	Action	Duration
1	001072	Engine/chassis fixing oscillating arm - Replacement	

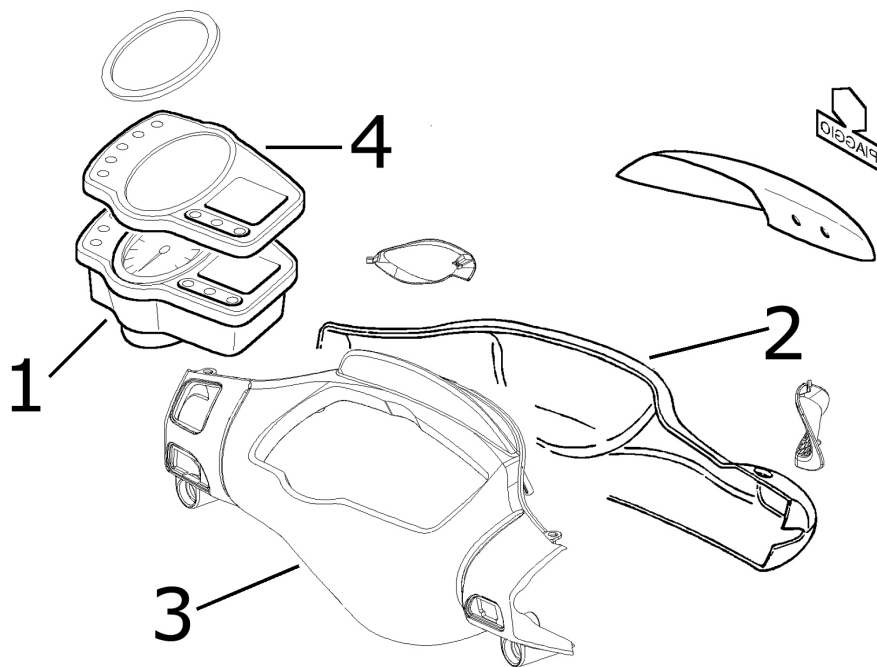
Seat



SADDLE

	Code	Action	Duration
1	004003	Saddle - Replacement	
2	004054	Seat lock hook - Replacement	
3	002083	Seat opening cable - Replacement	

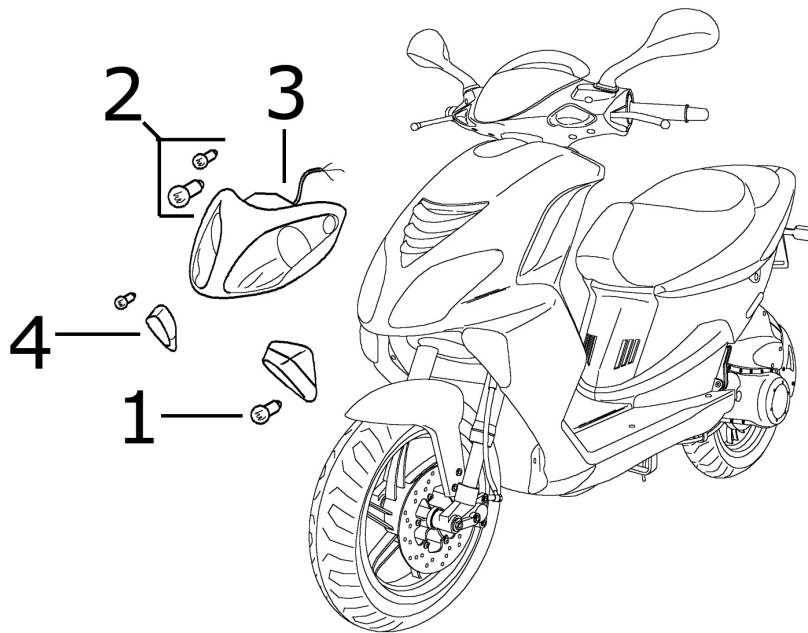
Instrument panel



DASHBOARD AND HANDLEBAR COVERS

	Code	Action	Duration
1	005014	Odometer - Replacement	
2	004018	Handlebar front section - Replacement	
3	004019	Handlebar rear part - Replacement	
4	005078	Odometer plastic cover - Replacement	

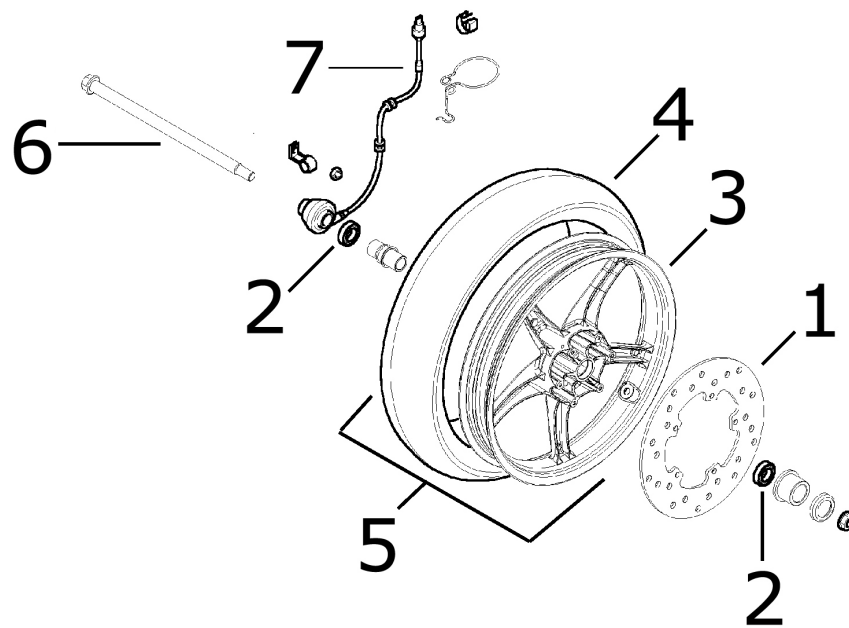
Turn signal lights



FRONT HEADLIGHTS

	Code	Action	Duration
1	005067	Front direction indicator bulb - Replacement	
2	005008	Front headlights - Replacement	
3	005002	Headlight - Replacement	
4	005012	Front turn signal light - Replacement	

Front wheel



FRONT WHEEL

	Code	Action	Duration
1	002041	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	Fifth wheel - Replacement	

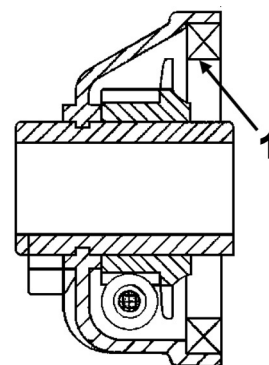
Encoder/speedometer transmission greasing

Please take note that the code has been introduced:

900001 - encoder/speedometer transmission greasing - 15'.

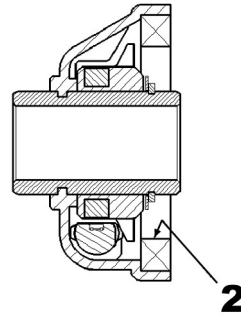
It is recommended not to use erroneously the codes 002011 (speedometer transmission replacement) and 005089 (encoder replacement) in the event of noise of the indicated components.

The grease recommended is TUTELA MRM 2

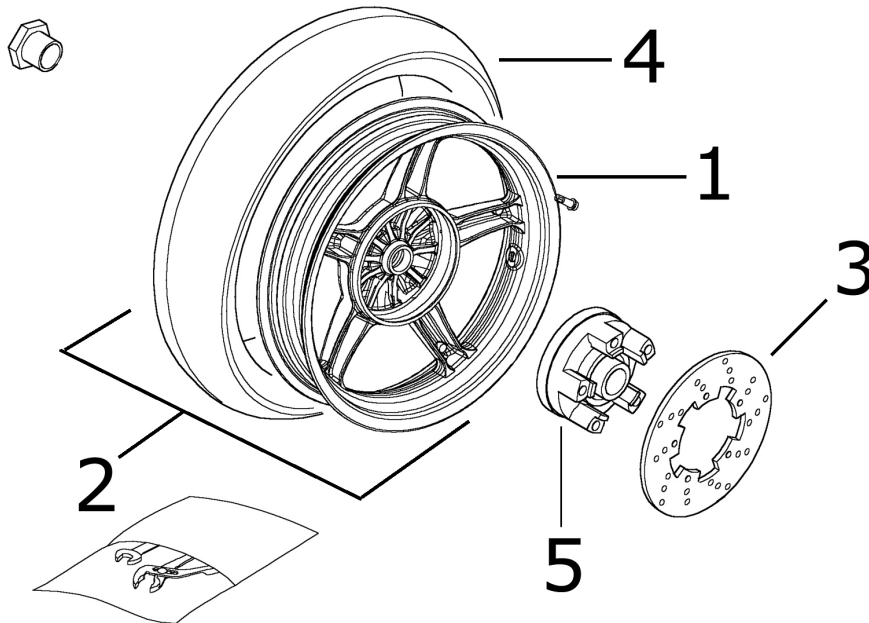


(molybdenum bisulphide grease and lithium soap).

The following is to show, by means of an arrow, the area that has to be increased (1 - Speedometer transmission, 2 - Encoder).



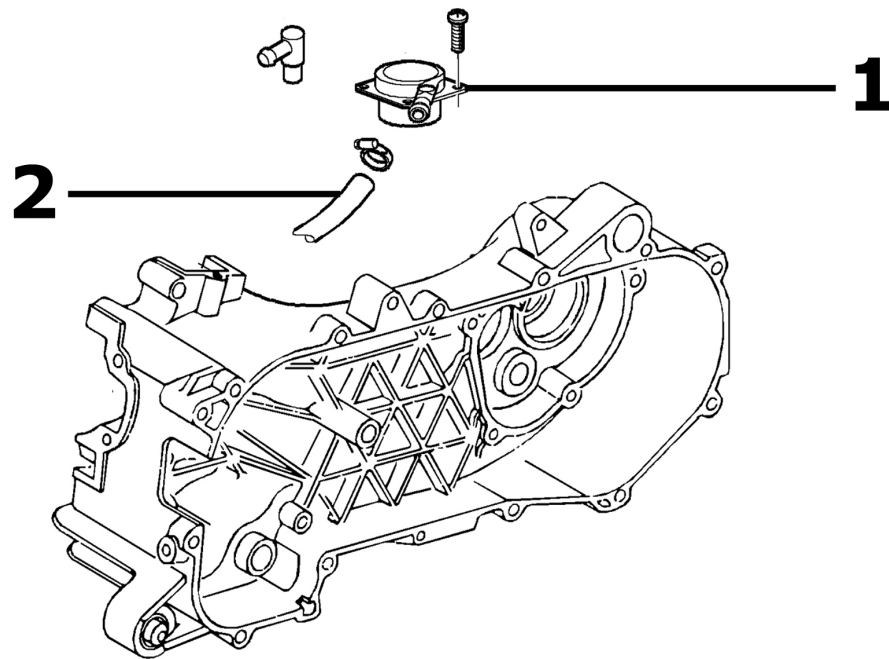
Rear wheel



REAR WHEEL

	Code	Action	Duration
1	001071	Rear wheel rim - Replacement	
2	001016	Rear wheel - Replacement	
3	002070	Rear disc brake - Replacement	
4	004126	Rear tyre - Replacement	
5	002028	Rear wheel hub - Replacement	

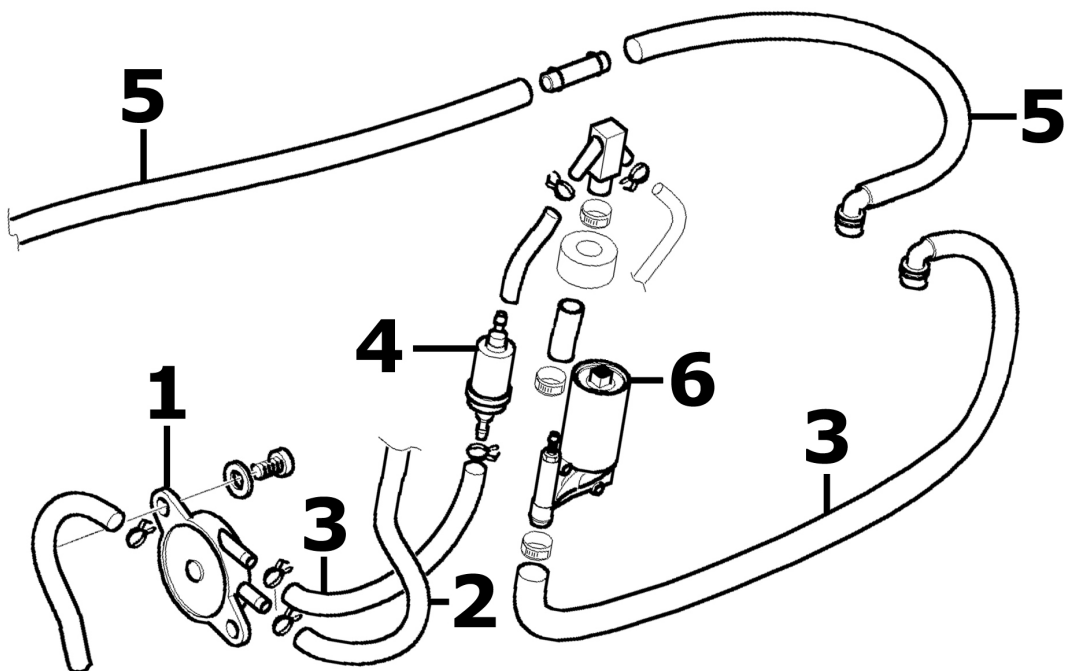
compressore aria



AIR COMPRESSOR

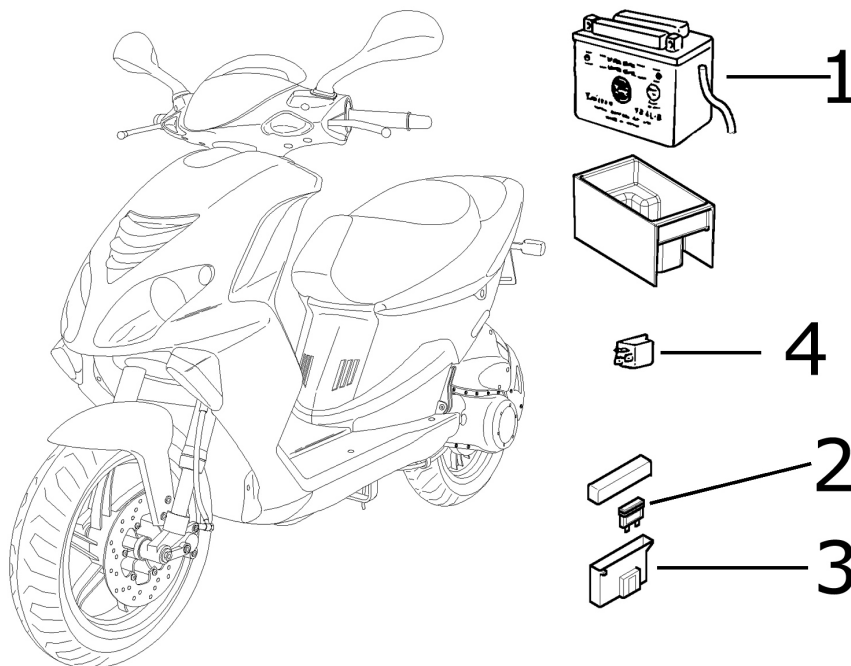
	Code	Action	Duration
1	001168	Air compressor - Replacement	
2	004160	Air compressed piping - Sostituzione	

Fuel pump

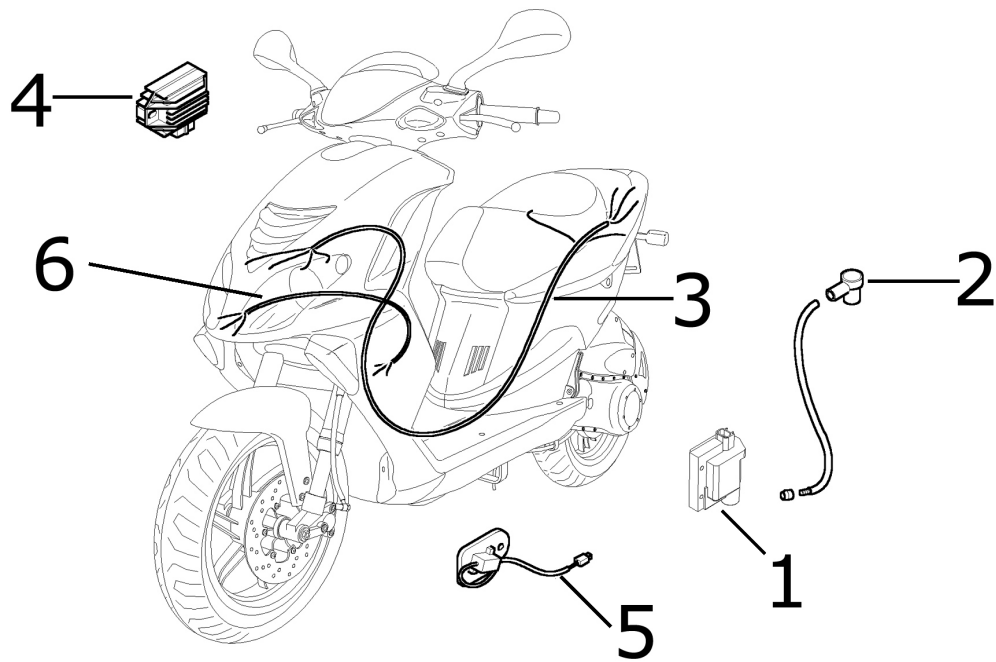


FUEL PUMP

	Code	Action	Duration
1	004073	Fuel pump - Replacement	
2	004137	Pump injector hose - Replace	
3	004086	Injector/carburettor-pump pipe - Replacement	
4	004072	Fuel filter - Replacement	
5	004138	Fuel return hose - Replace	
6	001048	Injection pump - Replace	

Electric devices**BATTERY**

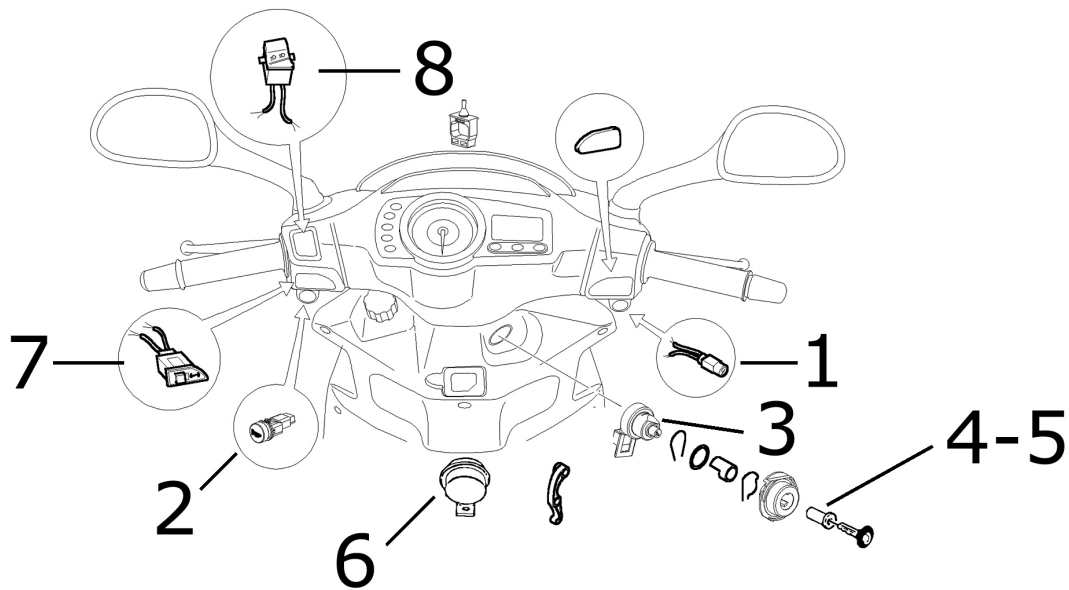
	Code	Action	Duration
1	005007	Battery - Replacement	
2	005024	Battery fuse - Replacement	
3	005025	Fuse holder - Replacement	
4	005011	Start-up remote control switch - Replacement	



ELECTRIC CIRCUIT

	Code	Action	Duration
1	001023	Controller - Replacement	
2	001094	Spark plug cap - Replacement	
3	005001	Electric circuit - Replacement	
4	005009	Voltage regulator - Replacement	
5	005136	Resistor - Replacement	
6	005044	Cable harness - Replacement	

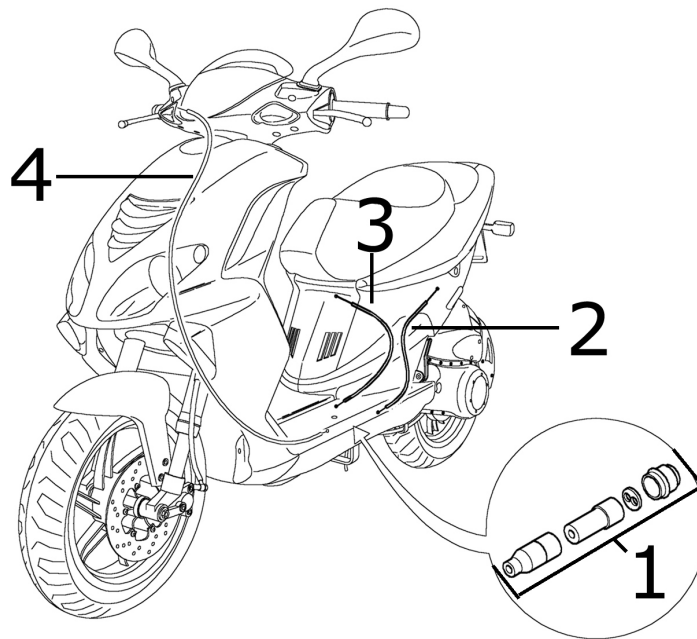
Electronic controls



COMMANDOS ELECTRICAL

	Code	Action	Duration
1	005041	Starter button - Replacement	
2	005040	Horn button - Replacement	
3	005016	Key switch - Replacement	
4	004096	Locks series - Replacement	
5	004010	Lock - Replacement	
6	005003	Electric horn - Replacement	
7	005006	Lights or flashlights switch - Replacement	
8	005039	Light switch - Replacement	

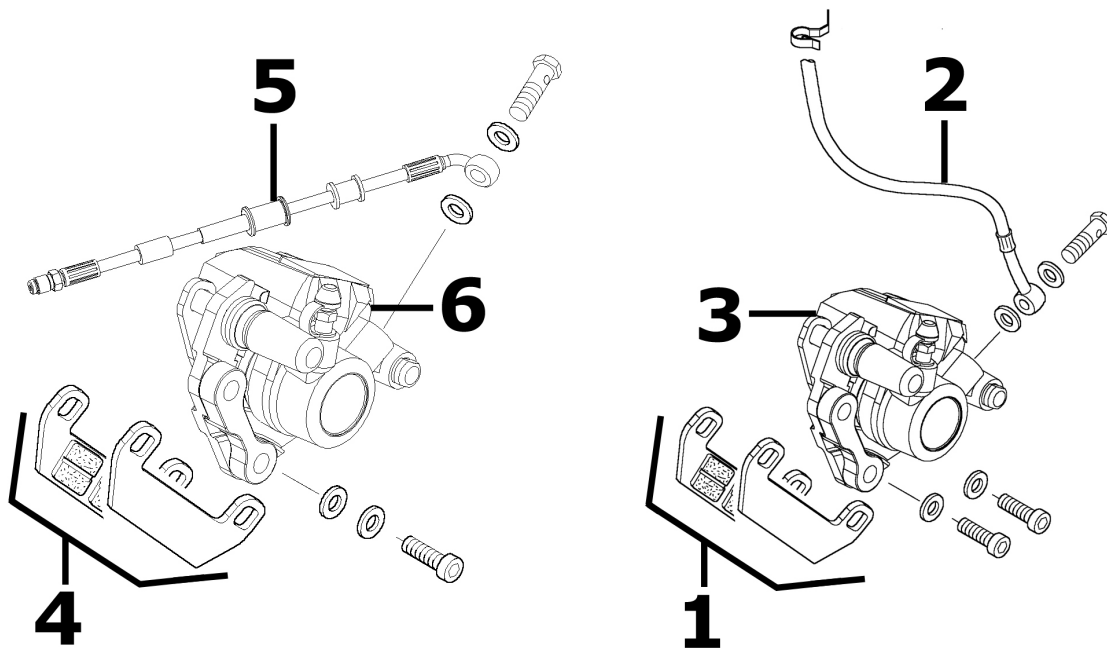
Transmissions



SPLITTER

	Code	Action	Duration
1	002012	Splitter - Replacement	
2	002058	Mixer splitter cable assembly - Replacement	
3	002057	Splitter-carburettor cable assembly - Replacement	
4	002054	Throttle or splitter cable assembly - Replacement	

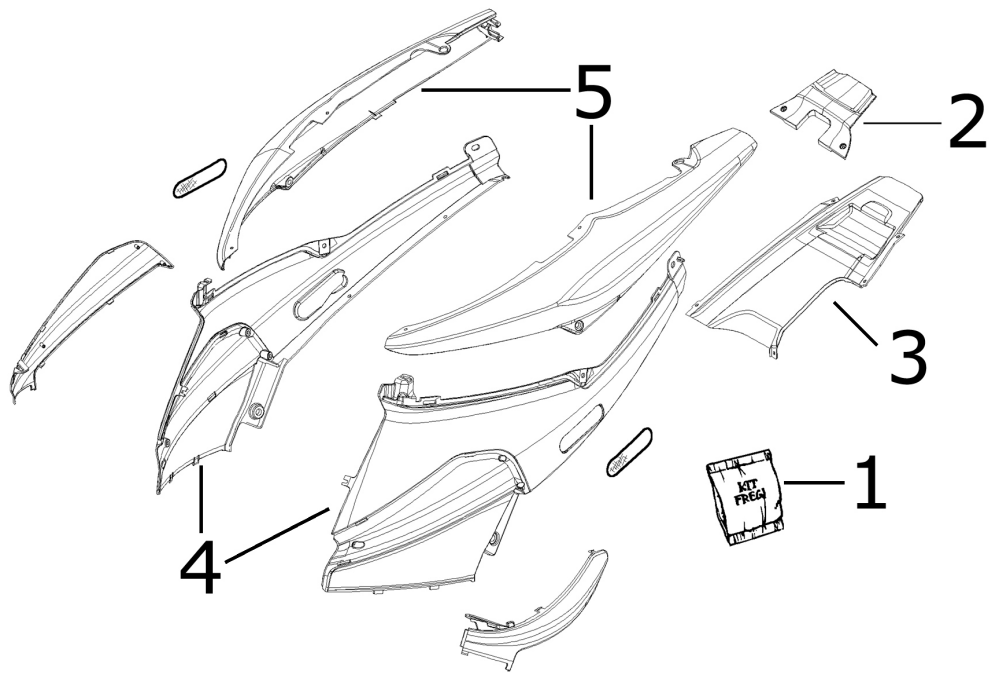
Brake callipers



BRAKE CALLIPERS

	Code	Action	Duration
1	002007	Front brake pads - replacement	
2	002021	Front brake line - Removal and refitting	
3	002039	Brake caliper - Removal and refitting	
4	002002	Rear brake pads - Replacement	
5	002020	Rear brake piping - Replacement	
6	002048	Rear brake caliper - Replacement	

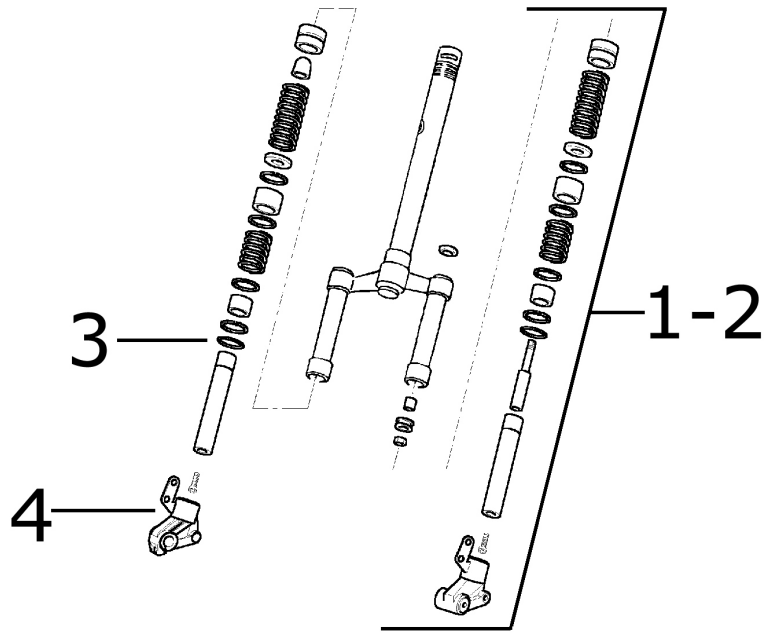
Rear side fairings



REAR SIDE FAIRINGS

	Code	Action	Duration
1	004159	Plates / Stickers - Replacement	
2	004056	Rear headlight top cover - Replacement	
3	004036	Bottom chassis cover - Replacement	
4	004085	Side panel (1) - Replacement	
5	004129	Rear side - Replacement	

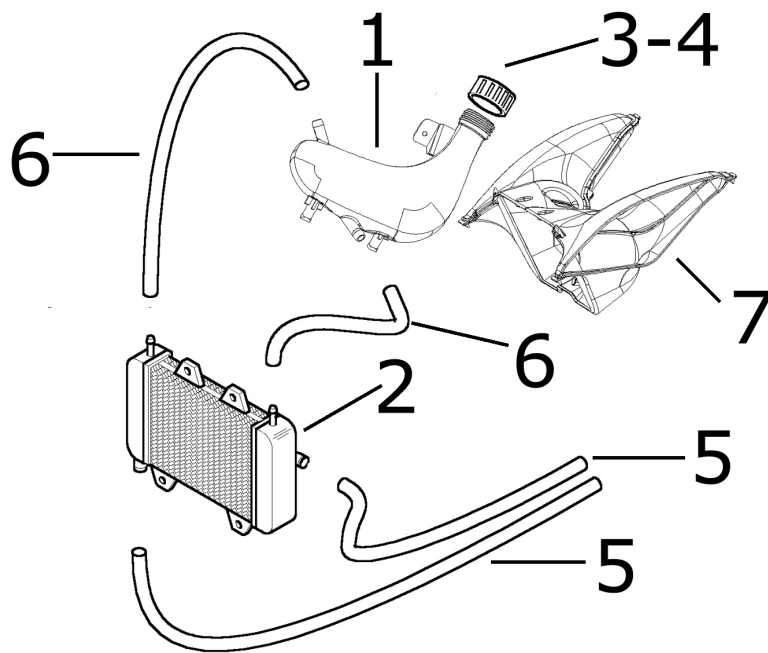
Front suspension



FORK

	Code	Action	Duration
1	003010	Front suspension - Overhaul	
2	003051	Fork assembly - Replacement	
3	003048	Fork oil seal - Replacement	
4	003041	Stanchion shoe - Replacement	

Cooling system



COOLING SYSTEM

	Code	Action	Duration
1	007001	Expansion tank - Replacement	
2	007002	Water radiator - Replacement	
3	001052	Coolant and air vent - Replacement	
4	007024	Expansion tank cap - Replacement	
5	007013	Expansion tank/radiator connection pipe - Replacement	
6	007003	Coolant delivery and return pipe - Repl.	
7	001170	Air duct - Replacement	