



WORKSHOP MANUAL

633499



Runner Purejet



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

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WORKSHOP MANUAL

Runner 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.



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CHARACTERISTICS

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Rules

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

Safety rules

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

Maintenance rules

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

Vehicle identification

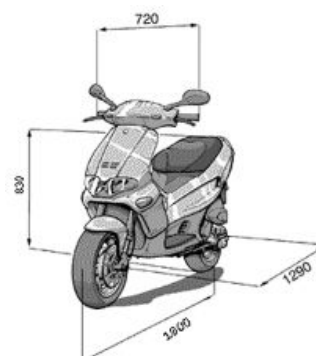
Frame prefix: ZAPC 3610000001001

Engine prefix: ZAPC361M

Dimensions and mass

DIMENSIONS

Specification	Desc./Quantity
Total vacuum weight gear sequence	93 kg.
Max width	720 mm.
Max length	1800 mm.
Wheelbase	1290 mm.
Seat height	830 mm.



Engine

ENGINE

Specification	Desc./Quantity
Type	single-cylinder, two-stroke
Number of cylinders	1
Bore	40
Stroke	39.3 mm
Cubic capacity	49.40 cc
Compression ratio	11.5 : 1 (±0.9)
Throttle body	20 Bing 71/20/104
Engine idle	2000 g/min.
Air filter	sponge impregnated in fuel mixture (fuel + 50% oil)
Starting system	electric starter
Lubrication	By oil leakage through pump with flow rate varying according to the engine speed and throttle opening.
Fuel supply	Air-assisted direct fuel injection into the combustion chamber. The electric pump is controlled by the injection ECU.
Inlet	By means of a compression valve on the casing
Max power (to the wheel)	
Max torque (to the wheel)	
Cooling system	Through circulation of cooling liquid

Transmission

TRANSMISSION

Specification	Desc./Quantity
Transmission	With Automatic variator with expandable pulleys, V belt, automatic clutch, reduction gear.

Capacities

CAPACITY

Specification	Desc./Quantity
Fuel tank (including reserve ~3 l)	~ 12 l
Oil mixer tank (indicative value)	~1,8 l
Rear hub	~75 cc
Cooling circuit	~ 0.90 l

Electrical system

ELECTRICS

	Specification	Desc./Quantity
1	Type of ignition	Electronic ignition with H.V. coil controlled by the ECU
2	Ignition advance (before the top dead centre)	Variable integrated to the injection system
3	Spark plug	CHAMPION RG6YCA
4	Battery	12V - 9Ah
5	Fuse	N° 2 da 15A, N° 2 da 7,5A
6	Generator	In star three-phase alternating current

Frame and suspensions

FRAME

Specification	Desc./Quantity
Chassis type	Welded tubular steel chassis with stamped sheet reinforcements
Sospensione anteriore	Forcella idraulica a steli rovesciati
Corsa forcella anteriore	73 mm
Avancorsa	66 mm
Sospensione posteriore	Monoammortizzatore idraulico, molla elicoidale coassiale. Attacco motore telaio con braccetto oscillante
Rear suspension stroke	60 mm

Brakes

BRAKES

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

Wheels and tyres

WHEELS AND TIRES

Specification	Desc./Quantity
Front tire dimension	120/70-12"
Rear tire dimension	130/70-12"
Pressione pneumatici Circles	Ruota anteriore: 1,6 bar / Ruota posteriore: 1,8 bar 3,50 x 12" (light alloy)

N.B.

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

Tightening Torques

COPPIE DI SERRAGGIO IN N·M PER TIPO DI MATERIALE SERRATO

Name	Torque in Nm
Ø Vite acc. 8,8 M4 su plastica con distanziali metallici	2
Ø Vite acc. 8,8 M4 su ottone, rame, alluminio e loro leghe	2
Ø Vite acc. 8,8 M4 Ferro, acciaio	3
Ø Vite acc. 8,8 M5 su plastica con distanziali metallici	4
Ø Vite acc. 8,8 M5 su ottone, rame, alluminio e loro leghe	4
Ø Vite acc. 8,8 M5 Ferro, acciaio	6
Ø Vite acc. 8,8 M6 su plastica con distanziali metallici	6,5
Ø Vite acc. 8,8 M6 su ottone, rame, alluminio e loro leghe	6,5
Ø Vite acc. 8,8 M6 Ferro, acciaio	10,5
Ø Vite acc. 8,8 M7 su ottone, rame, alluminio e loro leghe	10,5
Ø Vite acc. 8,8 M7 Ferro, acciaio	17
Ø Vite acc. 8,8 M8 su ottone, rame, alluminio e loro leghe	16
Ø Vite acc. 8,8 M8 Ferro, acciaio	26
Ø Vite acc. 8,8 M10 Ferro, acciaio	52
Ø Vite acc. 8,8 M12 Ferro, acciaio	100
Ø Vite acc. 8,8 M14 Ferro, acciaio	145

GRUPPO STERZO

Name	Torque in Nm
Upper steering ring nut	30 ÷ 40
Lower steering ring-nut	50 ÷ 60 (therefore to loosen by 90 ÷ 100)
Handlebars stud *	65 ÷ 70

GRUPPO TELAIO

Name	Torque in Nm
Swinging arm - engine pin*	33 ÷ 41
Frame - swing arm bolt *	33 ÷ 41

Name	Torque in Nm
Shock-absorber - frame nut *	20 ÷ 25
Shock-absorber - engine bolt *	33 ÷ 41
Wheel axle pin*	100 ÷ 125
Stand pin	18.5 ÷ 19
Stand screws	18.5 ÷ 19

*: Bloccaggi di sicurezza.

SOSPENSIONE ANTERIORE

Name	Torque in Nm
Dado forcella*	20 ÷ 25
Fork screw	20 ÷ 25
Front wheel axle *	45 ÷ 50

*: Bloccaggi di sicurezza.

FRENO ANTERIORE

Name	Torque in Nm
Brake fluid pump - hose fitting	13 to 18 Nm
Brake fluid pipe-calliper fitting	20 ÷ 25
Support calliper tightening screw*	20 ÷ 25
Front disc tightening screw*	12 ÷ 15
Oil bleed screw	7 to 10 Nm

*: Bloccaggi di sicurezza.

FRENO POSTERIORE

Name	Torque in Nm
Calliper tightening screw	20 ÷ 25
Brake fluid tube- calliper	13 ÷ 18
Brake fluid pump - hose fitting	13 to 18 Nm
Disc tightening screw	6 ÷ 6.5
Rear wheel axle	100 ÷ 125
Rear wheel hub screw	20 ÷ 25
Oil bleed screw	7 to 10 Nm

N.B.

PER ASSICURARE UNA CORRETTA COPPIA DI BLOCCAGGIO, LUBRIFICARE I DADI PRIMA DEL MONTAGGIO.

GRUPPO MOTORE

Name	Torque in Nm
Head tightening nut	10 ÷ 11
Vite spurgo liquido refrigerante	1 ÷ 2
Sensore temperatura	6 ÷ 8
Temperature sensor at the ECU	18 ÷ 22
Crankcase closure screw	12 ÷ 13
Transmission cover closing screw	12 ÷ 13
Pick-up screw	3 ÷ 4
Stator screw	3 ÷ 4
Vite raccordo aspirazione	7 ÷ 8
Starter screw	12 ÷ 13
Mixer screw	3 ÷ 5
Rear hub cap screw	12 ÷ 13
Driving pulley nut	40÷ 44*
Driven pulley nut	40÷ 44*

Name	Torque in Nm
Oil drain rear hub screw	3 ÷ 5
Clutch nut	55 ÷ 60
Mixer strip screw	3 ÷ 4
Ignition spark plug	11 ÷ 14
Head union screw	3 ÷ 4
Flywheel cover screw	1 ÷ 2
Flywheel tightening nut	40 ÷ 44*
Transmission strip cap screw	3 ÷ 4
Transmission cooling cap screw	3 ÷ 4
Water pump rotor	0.5 ÷ 0.4
Muffler -cylinder nut	9 ÷ 11
Engine - muffler screw	22 ÷ 24
Fuel injector to the head studs	3 ÷ 4
Crankcase compressor studs	3 ÷ 4

* Impiegare dadi nuovi.

Overhaul data

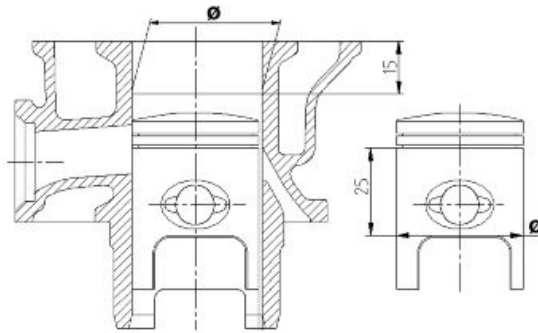
Assembly clearances

Cylinder - piston assy.

THE DIAMETER OF THE CYLINDER MUST BE MEASURED 15MM FROM THE HEAD RESTING LEVEL.

ACCOPIAMENTO TRA PISTONE E CILINDRO

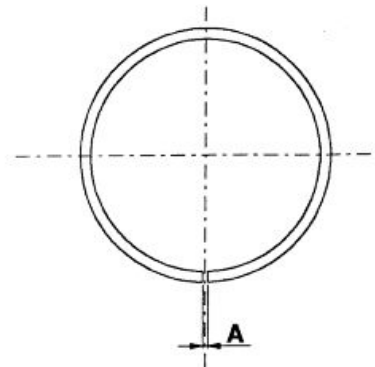
Name	Initials	Cylinder	Piston	Play on fitting
Cilindro	M	39,997-40,004	39,943-39,95	0,047-0,061
Cilindro	N	40,004-40,011	39,95-39,957	0,047-0,061
Pistone	O	40,011-40,018	39,957-39,964	0,047-0,061
Pistone	P	40,018-40,025	39,964-39,971	0,047-0,061
Cilindro 1° mag-giorazione	M1	40,197-40,204	40,143-40,15	0,047-0,061
Cilindro 1° mag-giorazione	N1	40,204-40,211	40,15-40,157	0,047-0,061
Pistone 1° mag-giorazione	O1	40,211-40,218	40,157-40,164	0,047-0,061
Pistone 1° mag-giorazione	P1	40,218-40,225	40,164-40,171	0,047-0,061
Cilindro 2° mag-giorazione	M2	40,397-40,404	40,343-40,35	0,047-0,061
Cilindro 2° mag-giorazione	N2	40,404-40,411	40,35-40,357	0,047-0,061
Pistone 2° mag-giorazione	O2	40,411-40,418	40,357-40,364	0,047-0,061
Pistone 2° mag-giorazione	P2	40,418-40,425	40,364-40,371	0,047-0,061



Piston rings

ANELLI DI TENUTA

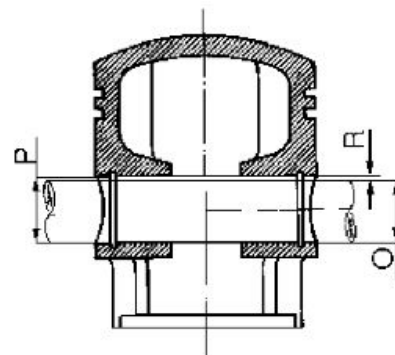
Name	Description	Dimensions	Initials	Quantity
Anello di tenuta		40	A	0,10 ÷ 0,25
Anello di tenuta 1° Magg.		40,2	A	0,10 ÷ 0,25
Anello di tenuta 2° Magg.		40,4	A	0,10 ÷ 0,25



Crankcase - crankshaft - connecting rod

PISTON - TEST PROBE

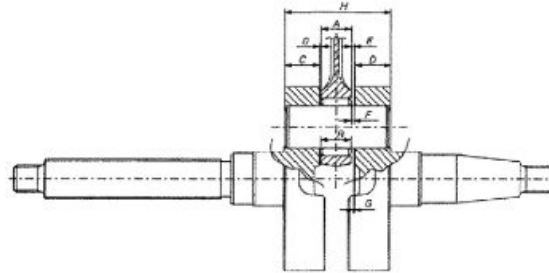
Name	Description	Dimensions	Initials	Quantity
Piston		Ø 12 +0.007 +0.012	P	0.002 ÷ 0.011
Test probe		Ø 12 +0.005 +0.001	Q	0.002 ÷ 0.011



AXIAL PLAY CONNECTING ROD - CRANKSHAFT

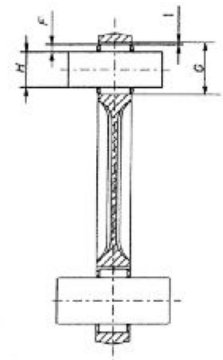
Name	Description	Dimensions	Initials	Quantity
Connecting rod		11.75 0 -0.05	A	0.25 ÷ 0.50

Name	Description	Dimensions	Initials	Quantity
Shoulder washer		0.5 ±0.03	G	0.25 ÷ 0.50
Semi-shaft, trans. side		13.75 +0.04 0	C	0.25 ÷ 0.50
Semi-shaft, fly-wheel side		13.75 +0.04 0	D	0.25 ÷ 0.50
Spacer tool		40.64	H	0.25 ÷ 0.50
Casing		11.8 0 -0.35	B	0.20 ÷ 0.75
Shoulder washer		0.5 ±0.03	G	0.20 ÷ 0.75
Semi-shaft, trans. side		13.75 +0.04 0	C	0.20 ÷ 0.75
Semi-shaft, fly-wheel side		13.75 +0.04 0	D	0.20 ÷ 0.75
Spacer tool		40.64	H	0.20 ÷ 0.75



ROD SMALL END - ROLLER CASING - TEST PROBE

Name	Description	Dimensions	Initials	Quantity
Connecting rod		∅ 17 +0.011 0.001	G	0.002 ÷ 0.012
Roller casing		∅ 2.5 0 0.007	F	0.002 ÷ 0.012
Test probe		∅ 12 + 0.005 + 0.001	H	0.002 ÷ 0.012



FITTING CATEGORY ROD SMALL END - ROLLER CASING - TEST PROBE

Name	Description	Dimensions	Initials	Quantity
Rod small end	Cat. 3	∅ 17		+ 0.011 + 0.007
Rod small end	Cat. 2	∅ 17		+ 0.007 + 0.003
Rod small end	Cat. 1	∅ 17		+0.003 -0.001
Roller casing	Cat. 1	∅ 2.5		0 -0.002

Name	Descrip tion	Dimens ions	Initials	Quantit y
Roller casing	Cat. 2	Ø 2.5		-0.002 -0.004
Roller casing	Cat. 3	Ø 2.5		-0.004 -0.006
Roller casing	Cat. 1 Optional	Ø 2.5		-0.001 -0.003
Roller casing	Cat. 2 Optional	Ø 2.5		-0.003 -0.005
Roller casing	Cat. 3 Optional	Ø 2.5		-0.005 -0.007
Test probe				+0.005 +0.001

Slot packing system

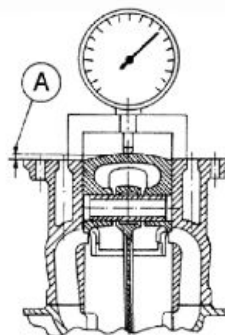
Montare il cilindro senza installare la guarnizione alla base.

Applicare un comparatore centesimale sull'attrezzo e azzerarlo su un piano rettificato.

Montare l'attrezzo sulla sommità del cilindro fissandolo con due dadi ai prigionieri, rispettando la coppia di serraggio e portare il pistone al P.M.S.

Lo spessore della guarnizione da montare cambierà secondo il valore rilevato.

A tale scopo sono fornite n°3 guarnizioni aventi i seguenti spessori:



Specific tooling

020272Y Piston position check tool

Locking torques (N*m)

Locking head nuts: 10 ÷ 11 N·m

SHIMMING SYSTEM

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

Products

TABELLA PRODOTTI CONSIGLIATI

Product	Description	Specifications
AGIP ROTRA 80W-90	Rear hub oil	SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications

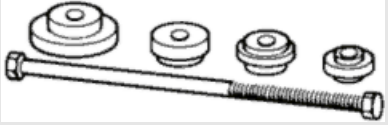

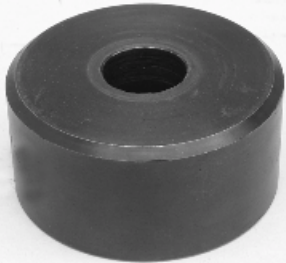




Product	Description	Specifications
AGIP CITY HI TEC 4T	Oil for flexible transmission lubrication (acceleration control, mixer and odometer)	Synthetic oil that passes SAE 5W-40, API SL, ACEA A3, JASO MA specifications
AGIP CITY HI TEC 4T	Oil for air filter sponge	Synthetic oil that passes SAE 5W-40, API SL, ACEA A3, JASO MA specifications
AGIP GP 330	Grease for brake control levers, throttle, stand	White calcium complex soap-based spray grease with NLGI 2; ISO-L-XBCIB2
AGIP CITY TEC 2T	Mixer oil	synthetic oil for 2-stroke engines: JASO FC, ISO-L-EGD
AGIP GREASE MU3	Grease for odometer transmission gear case	Soap-based lithium grease with NLGI 3; ISO-L-XBCHA3, DIN K3K-20
AGIP BRAKE 4	Brake fluid	FMVSS DOT4 Synthetic fluid
AGIP GREASE SM 2	Grease for compensating ring	NLGI 2; ISO-L-XBCHB2, DIN KF2K-20 Molybdenum disulphide grease and lithium soap
AGIP GREASE PV2	Grease for control levers on the engine	White anhydrous-calcium based grease to protect roller bearings; temperature range between -20 °C and +120 °C; NLGI 2; ISO-L-XBCIB2
AGIP PERMANENT PLUS	Coolant	Monoethylene glycol antifreeze fluid, CUNA NC 956-16
AGIP GREASE SM 2	Greasing the driven pulley bushing	Soap-based lithium grease with NLGI 2 Molybdenum Disulphide; ISO-L-XBCHB2, DIN KF2K-20

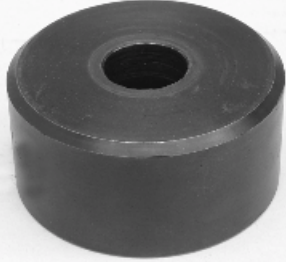

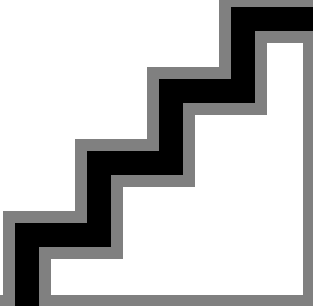

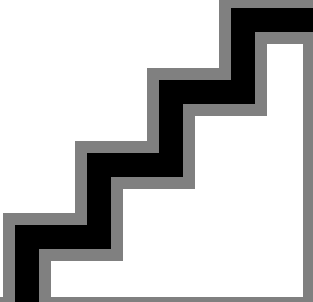
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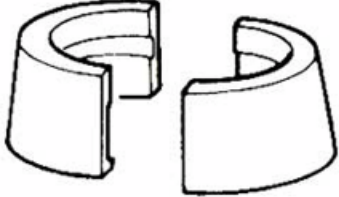
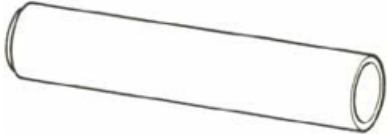




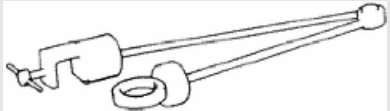
TOOLING







TOOL

TOOLING

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

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

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

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

Stores code	Description
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020169Y

Water pump crankshaft fitting and removal spanner



020170Y

Water pump/mixer command gear extractor



020171Y

Punch for driven pulley roller bearing



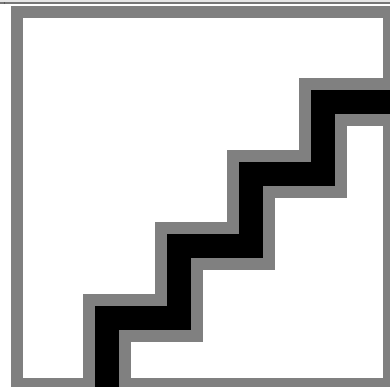
020209Y

Spring hook



020265Y

Bearing fitting base



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

Stores code

Description

020332Y

Digital rev counter



020334Y

Multiple battery charger



020335Y

Magnetic support for dial gauge



020340Y

Flywheel and transmission oil seals fitting punch



020357Y

32 x 35 mm adaptor

020358Y

37x40-mm adaptor

020359Y

42x47-mm adaptor



020362Y

12-mm guide

Stores code	Description
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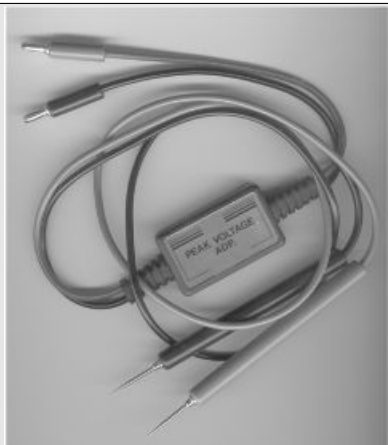
020363Y

20 mm guide



020409Y

Multimeter adaptor - Peak voltage detection



020376Y

Adaptor handle



020412Y

15 mm guide



020439Y

17 mm guide



020444Y

Test probe removal / fitting tool

Stores code	Description
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020456Y

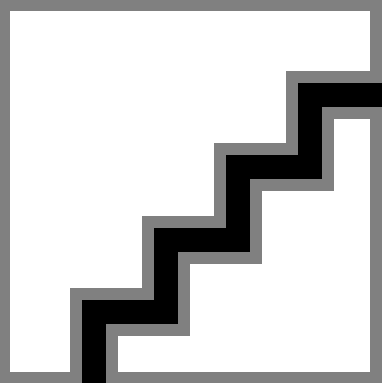
Ø 24 mm adaptor



020451Y	Start-up crown lock	
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020452Y

Tube for removing and refitting the driven pulley shaft





020460Y	Scooter diagnosis and tester	
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020481Y

Control unit interface wiring



Stores code	Description	
020565Y	Flywheel lock calliper spanner	 A black metal tool with a long handle and a curved, open end designed for gripping a flywheel lock.
020469Y	Reprogramming kit for scooter diagnosis tester	 A diagnostic kit including a black box with the 'PIAGGIO' logo, a small electronic module, and several cables with connectors.
020614Y	Diagnostic tester programming software	 Two CD-ROMs in jewel cases, one of which is partially open, showing the disc with the 'PIAGGIO' logo.
020615Y	Carbon dam ring fitting kit	 A white cylindrical plastic cap and a long, polished metal tube, likely used for fitting a carbon dam ring.
020616Y	Fuel pressure control kit	 A black flexible hose with metal fittings at both ends and a circular pressure gauge attached to one end.
020617Y	Air pressure check kit	 A circular pressure gauge mounted on a square metal base with a handle, used for checking air pressure.

Stores code	Description	
020620Y	Water pump impeller stop	 A black metal L-shaped component with a flat rectangular base and a cylindrical protrusion on the vertical leg.
020621Y	HV cable extraction adaptor	 A black cable with a cylindrical body and a small rectangular connector at the end.

INDEX OF TOPICS

MAINTENANCE

MAIN

Purejet engines use a very lean air-petrol mixture when running at idle, with its effective percentage varying as a function of the engine temperature and power absorption.

The throttle body supplies large amounts of air and the idle speed is kept at 2,000 rpm by adequately leaning down the mixture through the adjustment of the fuel injection timing.

The effective exhaust gases are leaned down even further by the additional air used for the cleaning phase. The exhaust pipe is fitted with the special outlet for the gas collection kit.

Measuring the CO concentration at idle, values close to 0% (0.1-0.2%) will be found.

It is therefore necessary to carefully clean and calibrate the gas analyser.

These figures may be used for diagnostic purposes only as no carburetion adjustment is possible.

Maintenance chart

EVERY 2 YEARS

Action

Brake fluid - change

Coolant - change

AT 1,000 KM

Action

Hub oil level - Check / Replace

Oil mixer/throttle linkage - adjustment

Steering - adjustment

Brake control levers - greasing

Brake fluid level - check

Safety locks - check

Electrics - Check

Tyre pressure and wear - check

Vehicle and brake test - road test

AT 5,000 KM , 25,000 KM , 35,000 KM , 55,000 KM

Action

Hub oil level - Check / Replace

Spark plug - replacement

Oil mixer/throttle linkage - adjustment

Brake control levers - greasing

Brake pads - check condition and wear

Brake fluid level - check

Coolant level - check

Electrics - Check

Tyre pressure and wear - check

Vehicle and brake test - road test

AT 10,000 KM , 50,000 KM

Action

Hub oil level - Check / Replace

Spark plug - replacement

Fuel filter - replacement

Air filter - clean

Action

Oil mixer/throttle linkage - adjustment
Variator rollers- Check wear
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid level - check
Coolant level - check
Transmission elements - lubrication
Safety locks - check
Suspensions - check
Electrics - Check
Headlight - adjustment check
Tyre pressure and wear - check
Vehicle and brake test - road test

AT 15,000 KM , 45,000 KM

Action

Hub oil level - Check / Replace
Spark plug - replacement
Oil mixer/throttle linkage - adjustment
Driving belt - replacement
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid level - check
Coolant level - check
Transmission elements - lubrication
Safety locks - check
Suspensions - check
Electrics - Check
Headlight - adjustment check
Tyre pressure and wear - check
Vehicle and brake test - road test

AT 20,000 KM , 40,000 KM

Action

Hub oil level - Check / Replace
Spark plug - replacement
Fuel filter - replacement
Air filter - clean
Oil mixer/throttle linkage - adjustment
Variator rollers- Check wear
Mixer belt - replacement
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid level - check
Coolant level - check
Transmission elements - lubrication
Safety locks - check
Suspensions - check
Electrics - Check
Headlight - adjustment check
Tyre pressure and wear - check

Action

 Vehicle and brake test - road test

AT 30.000 KM**Action**

 Hub oil level - Check / Replace

 Spark plug - replacement

 Fuel filter - replacement

 Air filter - clean

 Transmission gas mixer- adjust

 Driving belt - replacement

 Variator rollers- Check wear

 Steering - adjustment

 Brake control levers - greasing

 Brake pads - check condition and wear

 Brake fluid hoses - replacement

 Brake fluid level - check

 Coolant level - check

 Transmission elements - lubrication

 Safety locks - check

 Suspensions - check

 Electrics - Check

 Headlight - adjustment check

 Tyre pressure and wear - check

 Vehicle and brake test - road test

AT 60,000 KM**Action**

 Hub oil level - Check / Replace

 Spark plug - replacement

 Fuel filter - replacement

 Air filter - clean

 Transmission gas mixer- adjust

 Driving belt - replacement

 Variator rollers- Check wear

 Mixer belt - replacement

 Steering - adjustment

 Brake control levers - greasing

 Brake pads - check condition and wear

 Brake fluid hoses - replacement

 Brake fluid level - check

 Coolant level - check

 Transmission elements - lubrication

 Safety locks - check

 Suspensions - check

 Electrics - Check

 Headlight - adjustment check

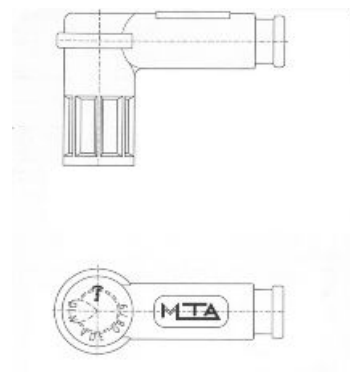
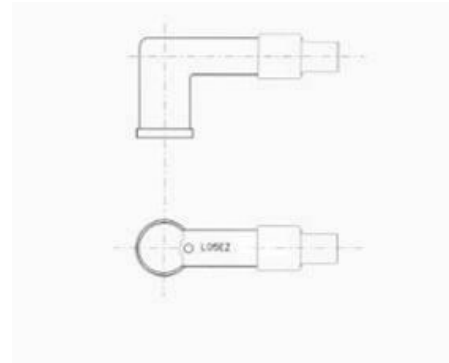
 Tyre pressure and wear - check

 Vehicle and brake test - road test

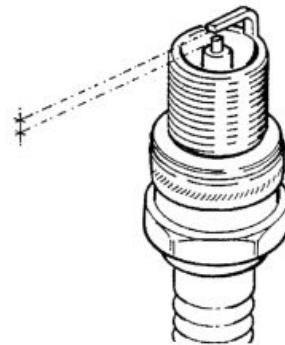
Spark plug

We inform you that, in order to avoid water infiltrations through the spark plug cap, the following modifications have been introduced:

1. The following parts have been discontinued:
 - a) Spark plug cap
 - b) Spark plug protective collar
2. A new spark plug cap has been introduced



- Disconnect the lug of the spark plug and remove it.
- Examine it carefully and if the insulation coating is splintered or damaged, replace it.
- Measure the distance between the electrodes using a feeler gauge and if necessary regulate it by carefully bending the external electrode.
- Ensure the seal washer is in good condition.
- Fit the spark plug, screw it on by hand and secure it with a spark plug spanner to the prescribed torque.



Characteristic

Electrode gap

0.6 ÷ 0.7 mm

Recommended spark plug

RG 6 YCA

Locking torques (N*m)

Spark plug: 11 ÷ 14 Nm

Hub oil

Replacement

- Remove the oil charging cap.
- Unscrew the oil drain plug "B" and allow the oil to flow out completely.
- Rescrew the drain plug "B" and refill the engine with oil until it touches the full hole (approx. 75cc.).
- The level must correspond to the second notch starting from the bottom as shown in the picture.

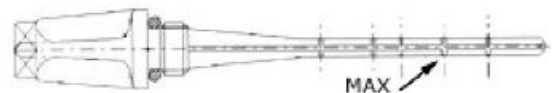
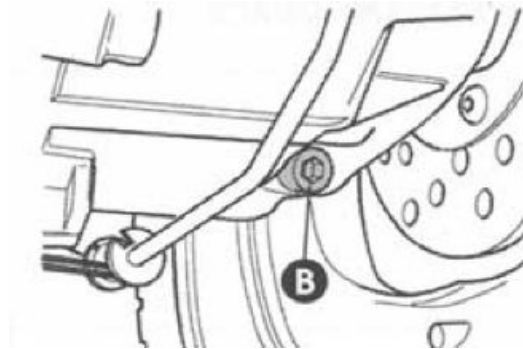
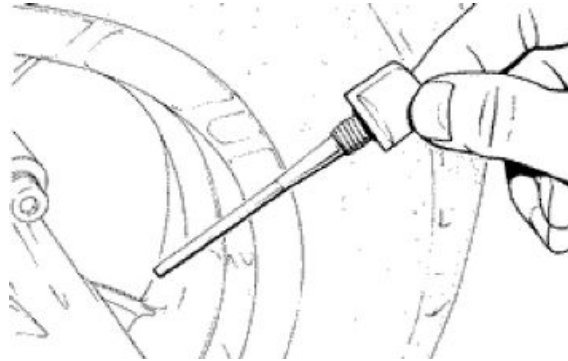
WARNING

DO NOT REMOVE THE OIL PLUG STRAIGHT AFTER AN ACTIVITY WITH THE ENGINE AT FULL SPEED AND /OR WITH THE ENGINE RUNNING. THE OVERHEATED OIL COULD LEAK WITH DANGER OF BURNS

Recommended products

AGIP ROTRA 80W-90 Rear hub oil

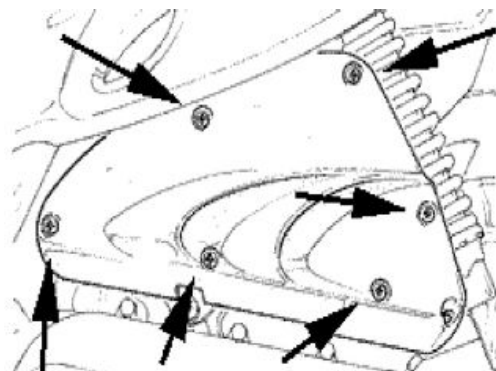
SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications



Air filter

Removal

- Remove the 6 screws shown in the picture.



Cleaning

- Wash with soap and water.
- Dry.

- Impregnate with fuel mixture of 50% fuel and oil.

CAUTION

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

Recommended products

AGIP CITY HI TEC 4T Oil for air filter sponge

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

Fuel filter

To access the fuel filter remove the

- left side.
- Remove the filter from its support
- Disconnect the tube from the fuel tank taking care to arrange a bowl to collect the fuel present in the tank. Please note the tank is not fitted with a tap.

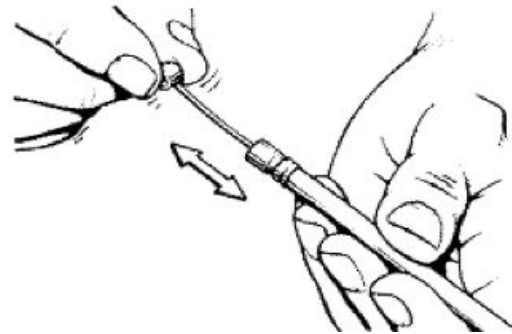


See also

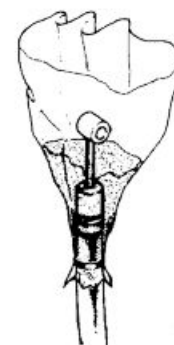
[Side fairings](#)

transmissions

After mounting the transmissions, check that they move perfectly within the sheath.



- Lubricate the cable with the recommended product, applying a plastic bag as shown in the picture.
- If the cable does not move perfectly due to possible fraying replace both the cable and the sheath.

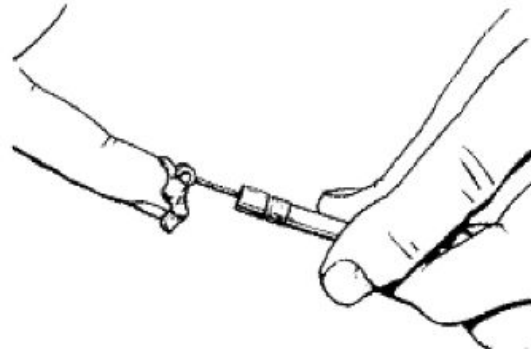


Recommended products

AGIP CITY HI TEC 4T Oil for flexible transmission lubrication (acceleration control, mixer and odometer)

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

Grease the ends of the cable.



Transmission adjustment

Set the command cables:

Mix cable: see the following procedure "Mixer Timing".

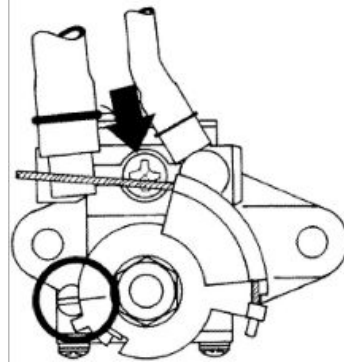
Gas cable: adjust so there is no play in the sheathes.

Splitter command cable: adjust so there is no play in the gas knob.

All transmissions must be regulated so there is no play in the sheathes.

Mixer timing

Use the transmission register to adjust, with the gas command released and the position of mixer lever as shown in the picture.



N.B.

TO VERIFY THE CORRECT TIMING OF THE MIXER IT IS NECESSARY TO REMOVE THE AIR CONDUIT OF THE TRANSMISSION COVER.

CAUTION

WHEN REMOVING OR WHERE THERE IS NO MORE OIL IN THE TANK, PROCEED WITH THE BLEEDING ACTIVITIES OF THE MIXER AS FOLLOWS: WITH THE MIXER MOUNTED ON THE VEHICLE AND WITH THE ENGINE OFF, DISCONNECT THE MIXER TUBE FROM THE CARBU-RETTOR AND LOOSEN THE BLEED VALVES (SEE ARROW IN PICTURE) UNTIL OIL STARTS TO FLOW. TIGHTEN THE SCREW, START THE ENGINE AND WAIT FOR OIL TO COME OUT FROM THE DELIVERY TUBE TO THE CARBURETTOR (ALREADY DISCONNECTED).

Reconnect the delivery tube to the carburettor and secure it with the appropriate clamp.

When doing this step, pour a small amount of the recommended product into the intake or in the blade holder.

Recommended products

AGIP CITY TEC 2T Mixer oil

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

Cooling system

Level check

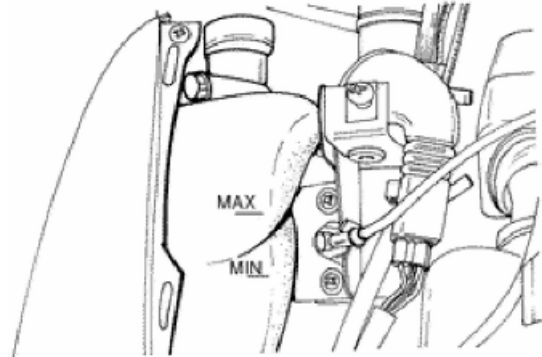
- Remove the front grille
- Check that the coolant level is between the min and max reference marks.

Top up with recommended coolant, if necessary.

Recommended products

AGIP PERMANENT PLUS Coolant

Monoethylene glycol antifreeze fluid, CUNA NC 956-16



See also

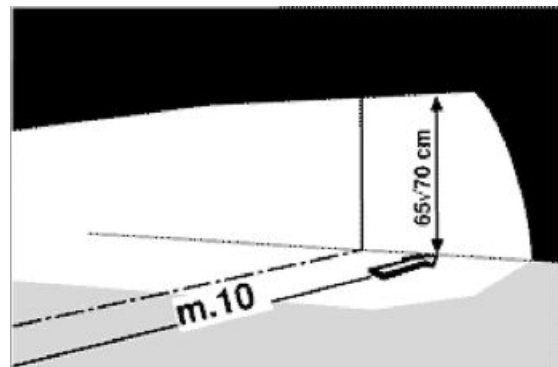
[Legshield](#)

Headlight adjustment

Place the vehicle with the driver on level ground 10 m from a white screen in the shadows (see side picture) and ensure the vehicle axle is perpendicular to the screen.

Trace a horizontal line on the screen with a ground height of 65 ÷ 67 cm; start the engine and block the gas knob so the vehicle stays still, switch on the headlight, engage the lower beam and direct it so the horizontal demarkation line between the area in shadow and lit up area does not go above the horizontal line traced on the screen.

To access the adjusting screw of the headlight remove the front cowling. Loosen the screw with star notch. Before directing the headlight check the tires are inflated to the correct pressure.



INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

Engine

Engine overheating

ENGINE OVERHEATING

Possible Cause	Operation
No coolant in the cooling circuit	Restore the level
Incorrect air bleeding	Repeat the operation
Thermostat remains closed	Replace
Fluid leak in the radiator	Replace the radiator
Loss of fluid from the system	Servicing the system
Coolant leaks from crankcase draining hole	Replace coolant sealing ring on half-crankcase from transmission-side
Shaft support bearings water rotor command and mixer locked.	Replace the shaft complete with bearing
Breakage of mixer belt	Replace belt

Transmission and brakes

Clutch grabbing or performing inadequately

FAULTY CLUTCH

Possible Cause	Operation
Tear or irregular functioning	Ensure the masses move at the touch of a finger and return as normal. Ensure there is no grease on the masses. Ensure the seals work correctly (area of work at the centre). Ensure the clutch bell is not scored. Check: Rpm at start of drag: 4,000 revs per min. Rpm on full throttle with rear wheel braked (3"÷ 6" max.): 7000 - 7500 revs per min.

WARNING

NEVER ALLOW THE ENGINE TO REV WITHOUT THE CLUTCH BELL.

Insufficient braking

BRAKE SYSTEM

Possible Cause	Operation
Insufficient braking	Check wear of brake pads (1.5 mm MIN). Check brake discs are not worn, scored or deformed. Check the correct level of liquid in the pumps and replace brake fluid if necessary. Check there is no air in the circuits; if necessary, bleed the air.

Possible Cause	Operation
	Check that the front brake calliper moves in axis with the disc.
Brake disc slack or distorted	Check the locking of the brake disc screws; use a dial gauge and a wheel mounted on the vehicle to measure the axial shift of the disc.
Fluid leakage in hydraulic braking system	Elastic fittings, piston seals or brake pump breakdown, replace

Brakes overheating

OVERHEATING BRAKES

Possible Cause	Operation
Defective sliding of pistons	Check calliper and replace any damaged part.
Brake disc slack or distorted	Check the brake disc screws are locked; use a dial gauge and a wheel mounted on the vehicle to measure the axial shift of the disc.
Clogged compensation holes on the pump	Clean carefully and blast with compressed air
Swollen or glued rubber gaskets	Replace gaskets.

Electrical system

Battery

BATTERY

Possible Cause	Operation
Battery	The battery is the electrical device in the system that requires the most frequent inspections and thorough maintenance. Frequently check that the fluid level fully covers the plates; otherwise, restore the level adding distilled water (never use natural water, even if it is drinking water) and check fluid density at the same time. If the vehicle is not used for some time (1 month or more) the battery needs to be recharged periodically. The battery tends to discharge completely within three months. If the battery is fitted on a motorcycle, be careful not to invert the connections, keeping in mind that the black ground wire is connected to the negative terminal while the red wire is connected to the terminal marked+.

N.B.

KEEP IN MIND THAT THE VEHICLE CANNOT RUN WITHOUT A BATTERY AND THAT THE BATTERY MUST NEVER BE DISCONNECTED WHILE THE VEHICLE IS RUNNING.

Turn signal lights malfunction

PROBLEMS WITH ELECTRICAL SYSTEM

Possible Cause	Operation
Oil check doesn't work	Check the turn indicator device and wiring.

Possible Cause

Operation

Turn indicators not working

Check the turn indicator device and wiring.

Steering and suspensions

Heavy steering

STEERING HARDENING

Possible Cause

Operation

Steering hardening

Check the tightness of the upper ring-nut. If irregularities continue to appear in rotating the steering even after making the adjustments, check the housings where the ball bearings rotate: replace if not fitted.

Excessive steering play

EXCESSIVE STEERING PLAY

Possible Cause

Operation

Excessive steering backlash

Check the tightening of the top ring nut. If irregularities continue in turning the steering even after making the above adjustments, check the seats in which the ball bearings rotate: replace if they are recessed.

Noisy suspension

NOISY SUSPENSION

Possible Cause

Operation

Noisy suspension

If the front suspension is noisy, check: the efficiency of the front suspension, the condition of the ball bearings and relevant lock-nuts, the limit switch rubber stoppers and the movement sleeves.

Suspension oil leakage

SUSPENSION GREASE LEAKS

Possible Cause

Operation

Suspension grease leaks

Replace the sealing rings.

OIL LEAKAGE FROM SUSPENSION

Possible Cause

Operation

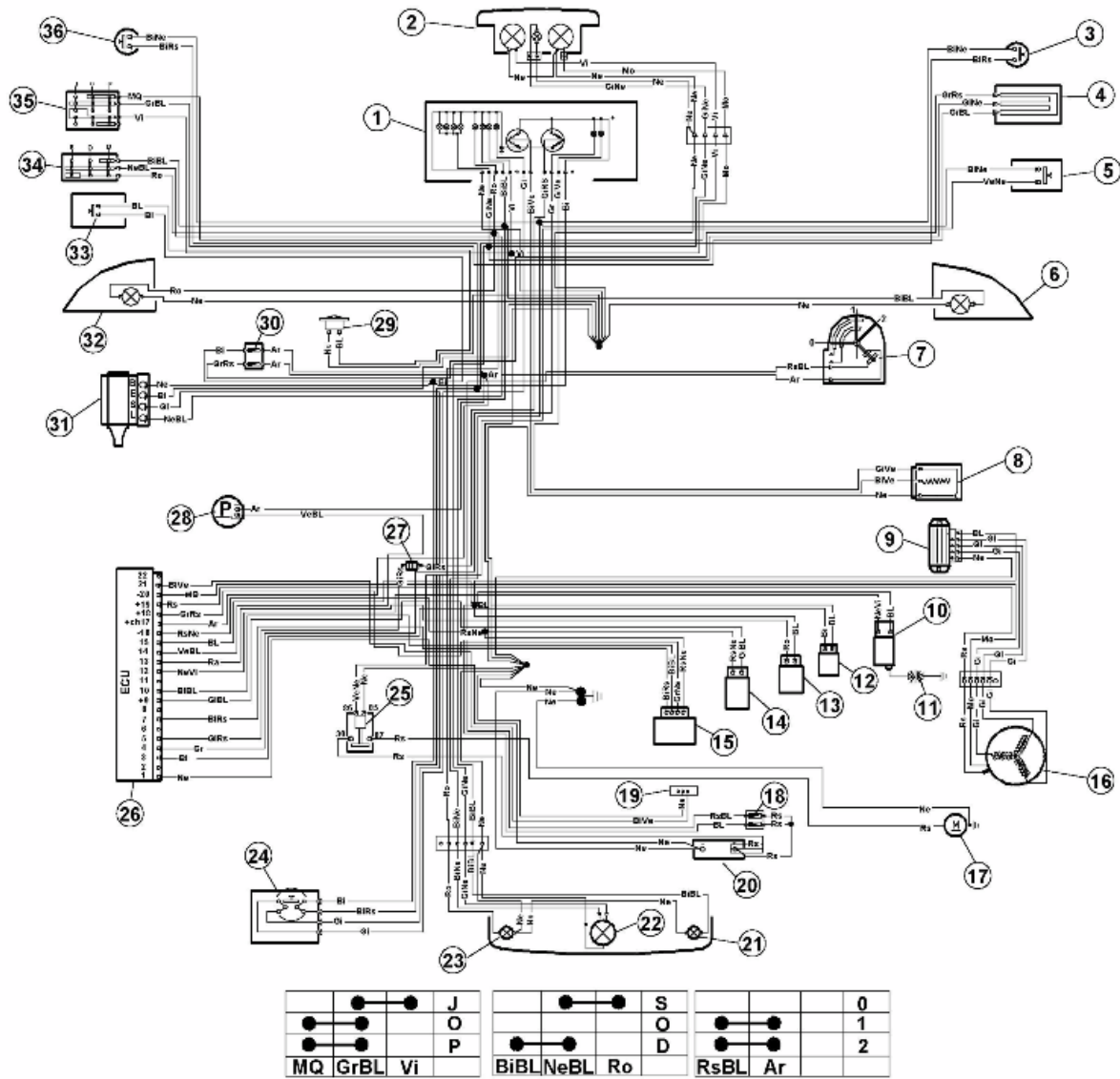
Oil leakage from suspension

Replace the damper.

INDEX OF TOPICS

ELECTRICAL SYSTEM

ELE SYS



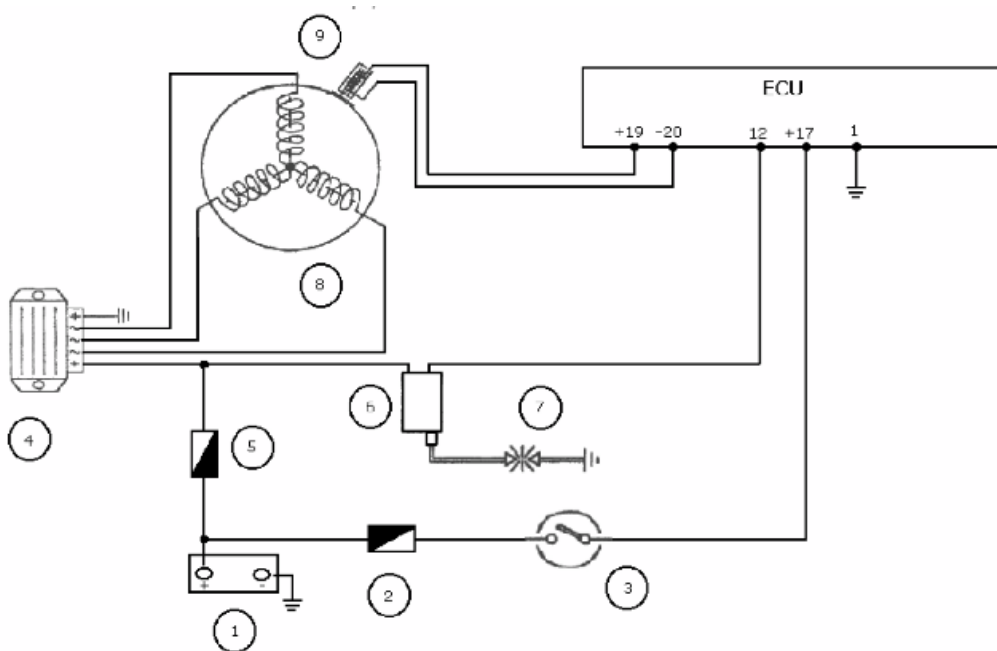
ELECTRICS

	Specification	Desc./Quantity
1	Instrument panel	
2	Headlight assembly	
3	Stop switch on front brake	
4	Plug with contacts	
5	Starter button	
6	Right front turn indicator	
7	Ignition key-switch	
8	Fuel level sender	
9	Voltage regulator	
10	Coil	
11	Spark plug	
12	Fuel injector	
13	Air injector	
14	Water temperature sensor	
15	Throttle body pos.	
16	Flywheel magneto	

	Specification	Desc./Quantity
17	Starter motor	
18	15A fuse	
19	Diagnostics outlet	
20	Battery	
21	Lampada per lampeggiatori	
22	Stop light bulb	
23	Direction indicator bulb	
24	Oil mix warning light com.	
25	Start-up relay	
26	Electronic control unit	
27	Resistance	27Ω
28	Fuel pump	
29	Horn	
30	7,5A fuse	
31	Turn signal switch	
32	Left front turn indicator	
33	Horn button	
34	Commutatore lampeggiatori	
35	Light switch	
36	Rear stop light switch	

Conceptual diagrams

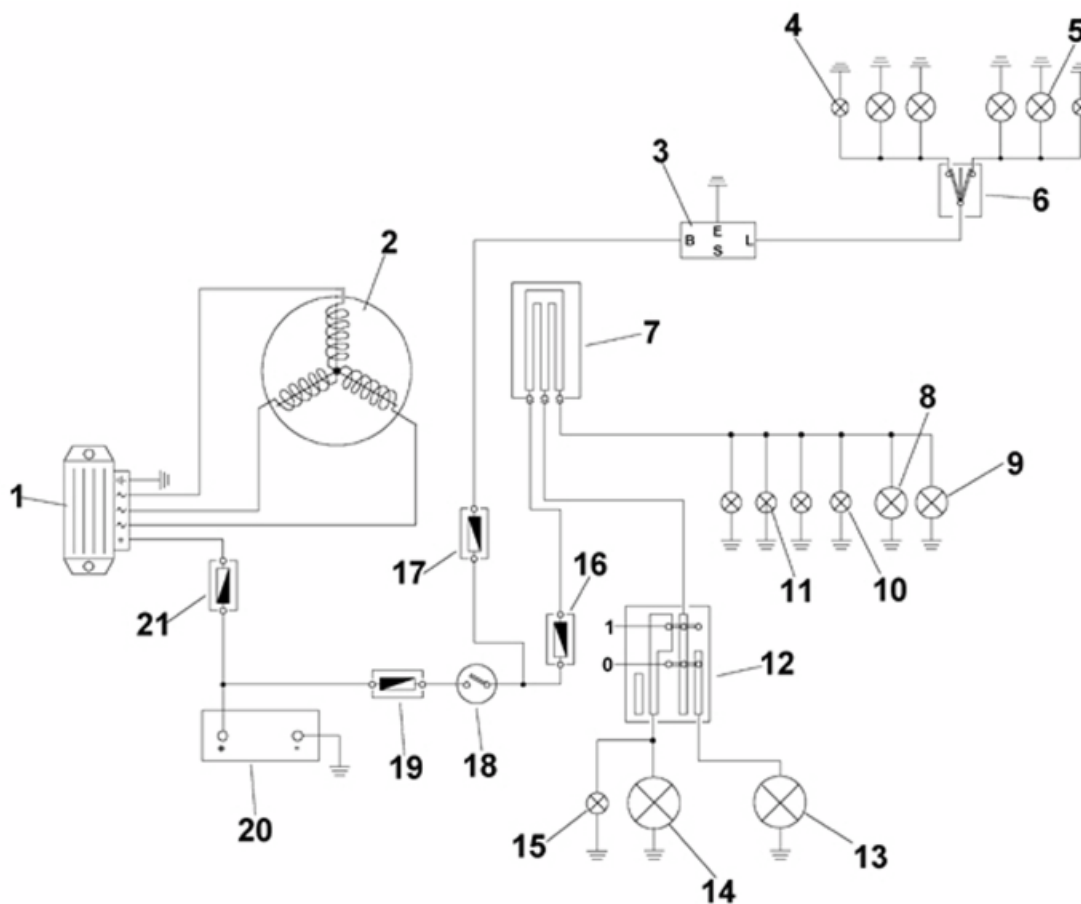
Ignition



IGNITION SECTION

	Specification	Desc./Quantity
1	Battery	12V - 9Ah
2	Fuse	15A
3	Key switch contacts	
4	Voltage regulator	
5	15A fuse	
6	HV coil	
7	Ignition spark plug	
8	Flywheel magneto	
9	Pick - up	

Headlights and automatic starter section

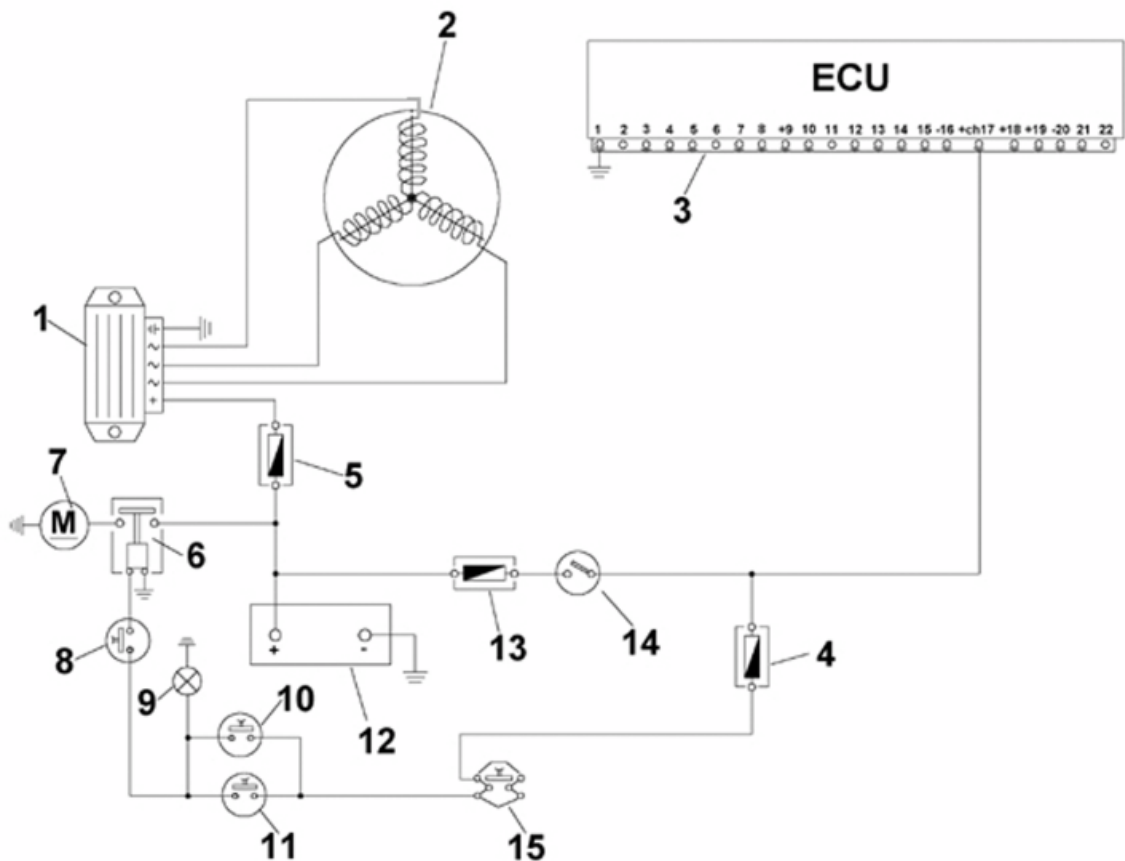


HEADLIGHTS AND TURN INDICATORS

	Specification	Desc./Quantity
1	Voltage regulator	
2	Flywheel magneto	
3	Turn indicator device com.	
4	2 turn indicator warning light bulbs	12V-2w
5	4 turn indicator lamps	12V-10w
6	Turn signal switch	
7	Plug with contacts	
8	Parking light bulb	12V-5W

	Specification	Desc./Quantity
9	Rear positioning bulbs	12V 5W
10	Service light warning light	12V-12W
11	3 bulbs for lighting instrument	12V 1,2W
12	Light switch	
13	Low beam bulb	12V-35W
14	High beam bulb	12V-55W
15	High-beam warning light	12V - 1.2W
16	Fuse	7,5A
17	7.5A	
18	Key switch contacts	
19	Fuse	15A
20	Battery	
21	Fuse	15A

Battery recharge and starting

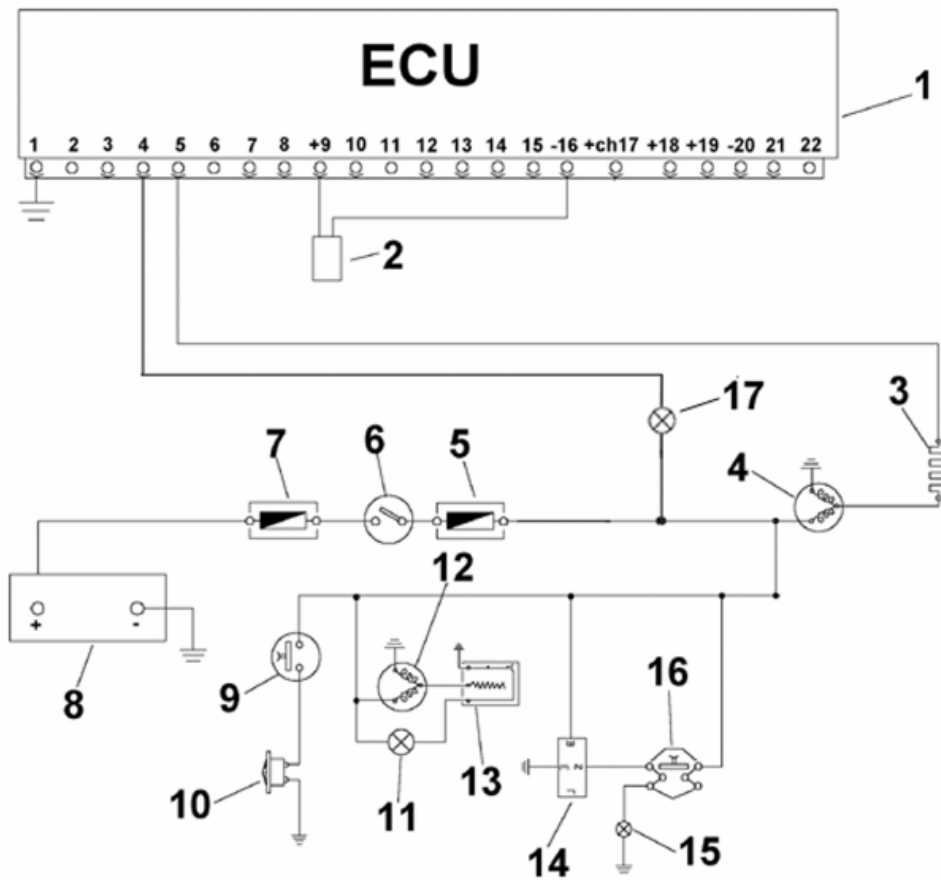


RECHARGING BATTERY AND START SECTION

	Specification	Desc./Quantity
1	Voltage regulator	
2	Flywheel magneto	
3	CPU	
4	7,5A fuse	
5	15A fuse	
6	Starter remote control	
7	Starter motor	

	Specification	Desc./Quantity
8	Starter button	
9	Brake light filament	12V-21W
10	Front brake stop light switch	
11	Rear stop light switch	
12	Battery	12V - 9Ah
13	Fuse	15A
14	Key switch contacts	
15	Low-oil warning light switch	

Level indicators and enable signals section

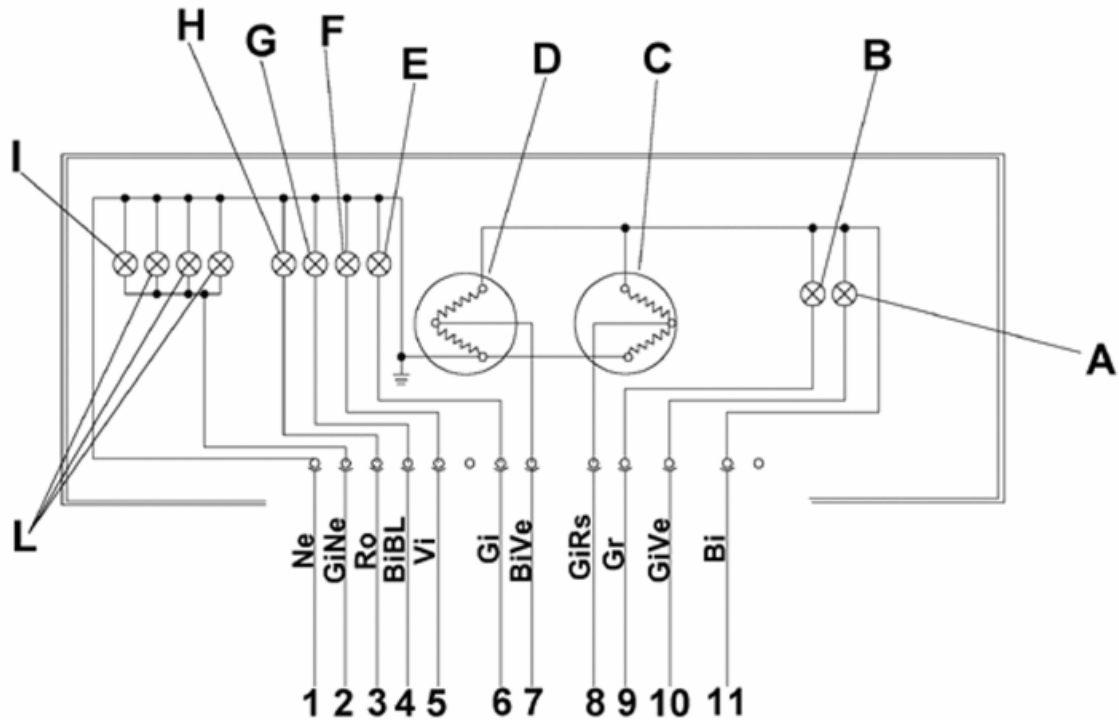


LEVEL INDICATORS AND HORN SCHEME

	Specification	Desc./Quantity
1	CPU	
2	Water temperature sensor	
3	Resistance	27Ω 0,5W
4	Water temperature gauge	
5	7,5A fuse	
6	Key switch contacts	
7	Fuse	15A
8	Battery	12V - 9Ah
9	Horn button	
10	Claxon in c.c.	
11	Fuel reserve light	

	Specification	Desc./Quantity
12	Fuel indicator	
13	Fuel level sending unit	
14	Turn indicator device com.	
15	Oil warning light	
16	Oil mix warning light com.	
17	Diagnostic light	

Instruments and warning lights control board



CONTROL PANEL FOR INSTRUMENTS AND WARNING LIGHTS

	Specification	Desc./Quantity
1	Ground lead	
2	Plug with contacts	
3	Left turn indicator	
4	High beam switch	
5	Low-oil warning light switch	
6	Fuel level sending unit	
7	ECU	
8	ECU	
9	Fuel level sender	
10	Turn indicator device com.	
11	Low fuel warning light	
12	Diagnostic light	
13	Water thermometer	
14	Fuel gauge	
15	Low-oil warning light	
16	High-beam warning light	
17	Rhs turn signal warning light	
18	Lhs turn signal warning light	

	Specification	Desc./Quantity
19	Headlamp warning light	
20	Instrument lighting	

Checks and inspections

Battery recharge circuit

The recharge circuit has a three phase generator with permanent magneto.

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

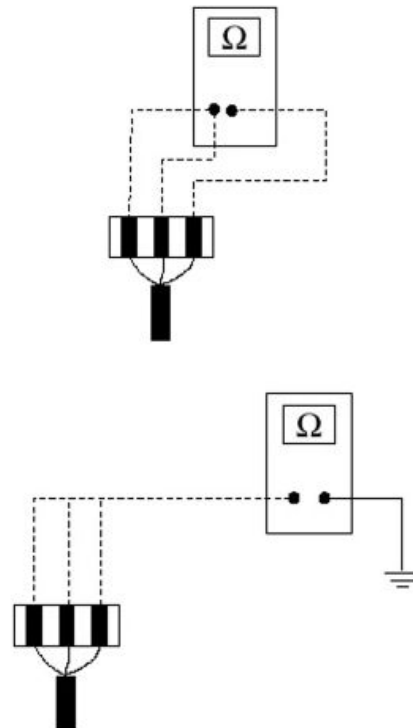
Stator check

Disconnect the connector from the voltage regulator and check for continuity between each yellow wire with the other two.

Ohm value: 0.7 - 0.9 Ohm.

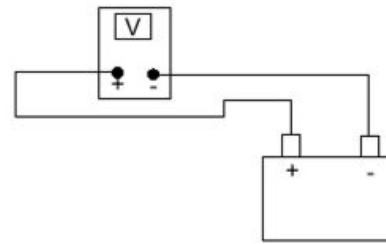
Also check that each yellow wire is isolated from the ground.

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



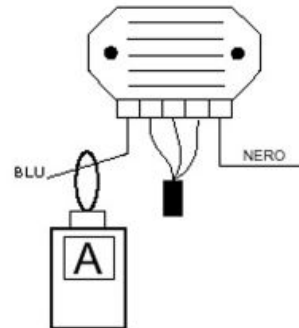
Voltage regulator check

With the battery fully charged, measure the voltage in the battery poles with engine at high speed. The voltage must not exceed 15.2 volt. If higher voltage is found, replace the regulator. At voltage less than 13 volt, proceed with checks on the stator and relevant wiring.



Recharge system voltage check

Connect an ammeter induction clamp to the voltage regulator positive cable. Measure the battery voltage and turn on the lights with the engine off and wait until the voltage settles at around 12 volts. Start the engine and measure the current distributed by the circuit with the lights on and engine at high rpm. If the current value is less than 10A, repeat the test using a new regulator and/or stator instead.



Starter motor

Specifications

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

Tests to perform to check the electrical starter

Static test

- Remove the left side panel.
- Check the resistance of the induced brush unit.
- Reference value: < or equal to 1 Ohm
- Use a lift to adequately support the vehicle.
- Remove the stand and support.



- Use a multimeter to check the continuity of the positive and negative power supply cable.
 - Make sure the connections are good.
- If no faults are found, replace the starter.

Specific tooling

020331Y Digital multimeter

Dynamic tests

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

Voltage < or equal to 12.5 V.

Check the density of the electrolyte of each element.

Bé = $30 \div 32$

Specific weight: $1.25 \div 1.26$

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



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



N.B.

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

Specific tooling

020460Y Scooter diagnosis and tester



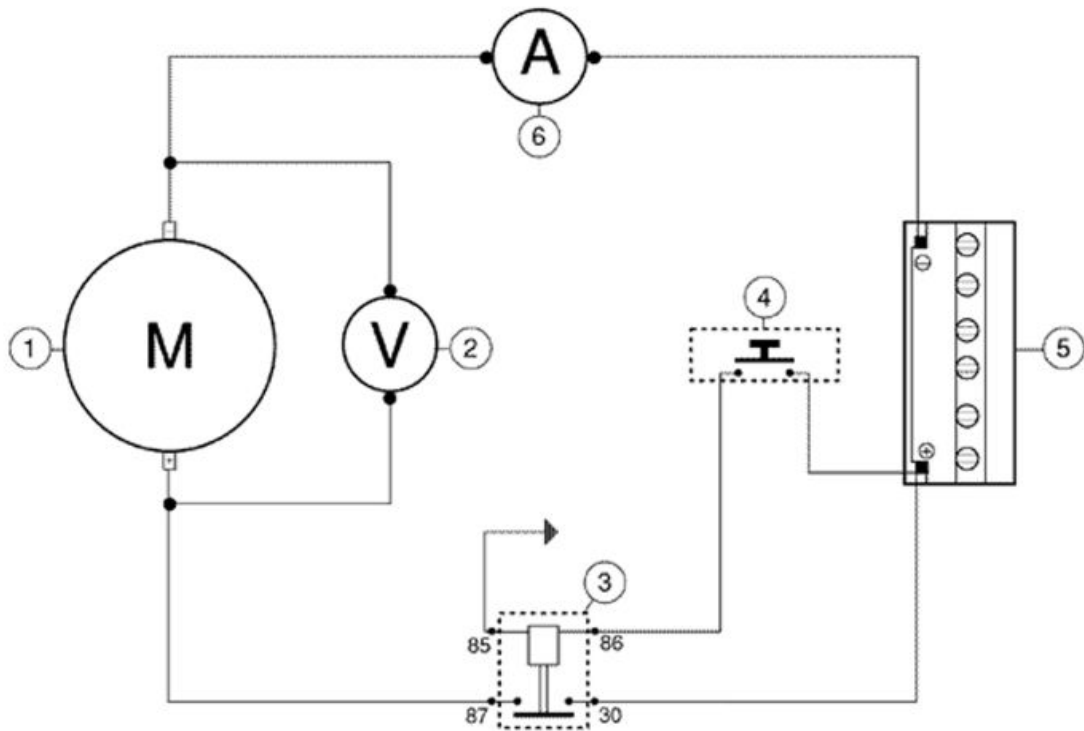


Carry out a no-load absorption test.

Remove the transmission cover.

Remove the starter pinion.

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



STARTER MOTOR

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

See also

- [Centre-stand](#)
- [Side fairings](#)

Turn signals system check

The turn indicator circuit is managed by an intermittent device. If there are any problems with this circuit check:

- The 7,5A fuse indicated in the photograph after removing the front cowling.
- Using a multimeter, that the BLACK-BLUE cable to the turn indicator connector has a voltage of +12V
- To check the efficiency of the bulbs, apply a tension of +12V to the WHITE-BLUE cable of the indicator switch for the right bulbs and to the PINK cable for the left bulbs.



See also

[Legshield](#)

level indicators

Composed of fuel level transmitter, analogical reading instrument and fuel reserve light.

If problems occur check:

- The fuel reserve light
- The 7,5A fuse in the photograph after having removed the front casing



The WHITE cable of the instrument group has a voltage of +12V

Using the current meter, the ohmic values of the fuel level transmitter moving the arm with the floater.

Limit values:

position of empty tank = $87 \div 97 \Omega$

position of $\frac{1}{2}$ empty tank = $34 \div 42 \Omega$

position of full tank < 7Ω

See also

[Legshield](#)

The oil mix warning light performs a timed check of 3" every time the key is turned to ON. The check is managed by the turn indicator device which applies a voltage of 12 v to the oil warning light bulb. If on turning the key to ON the control is not carried out check:

- Bulb efficiency
- The 7,5A fuse shown in the photograph after removing the front casing.



- Using a multimeter and turning the key to ON that the 2 YELLOW cables of the oil mix command light have a voltage of +12V

- The efficiency of the oil mix command light.

To access the oil mix command light remove the rear hold. Remember that the voltage of +12V to the 2 YELLOW cables of the oil mix command light lasts 3" from the moment the key is turned to ON.

See also

[Legshield](#)
[Rear rack](#)

Lights list

The lighting system turns on when the key is turned to ON.

It is possible to select the high beams using the light switch.

If there are problems with the lighting system check:

- Bulb efficiency
- The 7,5A fuse shown in the picture removing the front casing



- Check using a multimeter that the GREY-RED cable of the plug with contacts has a voltage of +12V

- Check the GREY-BLUE cable of the light switch has a voltage of +12V

- Check efficiency of light switch
- Ensure the presence of earth to the bulb carriers.

See also

[Legshield](#)

Dry-charge battery

WARNING

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

COMING INTO CONTACT WITH EYES OR SKIN, WASH ABUNDANTLY WITH WATER FOR APPROX. 15 MIN. AND SEEK IMMEDIATE MEDICAL ATTENTION.

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

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

ALWAYS WEAR EYE PROTECTION WHEN WORKING IN THE PROXIMITY OF BATTERIES. KEEP OUT OF REACH OF CHILDREN

Characteristic

Battery

12V-9Ah

Commissioning dry-charge batteries:

- 1) Once the short closed tube and caps are removed, add sulphuric acid to the elements, of a type for batteries with a specific gravity of 1.26, corresponding to 30° Bé at a temperature of at least 15°C until reaching the upper level.
- 2) Let it sit for two hours.
- 3) Use the specific battery charger (single or multiple) to charge to an intensity equal to around 1/10 of the capacity until the voltage has reached a value of around 2.7 V per element. The density of the acid should be about 1.27, corresponding to 31° Bé, and the values have stabilised. The duration of the charging operations must be 15 - 20 hours.
- 4) Once the charging is complete, level out the acid (add **distilled water** or remove excess acid), put on the caps and clean carefully.
- 5) Once these operations have been completed, install the battery on the vehicle, correctly following the connections described in point 3) «**Battery charging**».

WARNING

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

Specific tooling

020333Y Single battery charger

020334Y Multiple battery charger

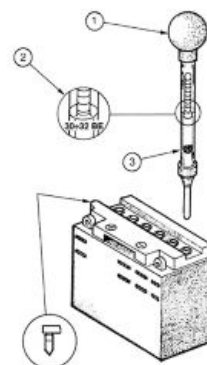
Battery maintenance

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

The maintenance rules are:

1) Check the level of the electrolyte

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



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

2) Check the charge

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

CHECKING ELECTROLYTE DENSITY

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

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

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

The discharge limit of each element is 1.8V.

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

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

3) Recharging the battery

WARNING

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

Normal charging on the bench is done with the specific battery charger (single or multiple), positioning the battery charger selector on the type of battery to recharge at a current of 0.9A for around 6 ÷ 8 hours. The connections with the power supply source must be made by connecting the corresponding poles (+ with + and - with -). The battery caps must be removed during charging.

Specific tooling

020333Y Single battery charger

020334Y Multiple battery charger

4) Cleaning the battery

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

CAUTION

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

CAUTION

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

CAUTION

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

CAUTION

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

INDEX OF TOPICS

ENGINE FROM VEHICLE

ENG VE

Removal of the engine from the vehicle

- Remove the side panels

- Remove the muffler

Remove the rear brake line clamps on the transmission cover as shown in the figure



- Loosen the 5 rear wheel clamping screws to remove the brake calliper

- Remove the brake calliper using the 2 screws shown in the figure.



- Remove the gas control cable from the throttle body



- Remove the generator cable connector



Remove the fuel connectors from the fuel injector, as follows:

- Press the union pipe downwards
- Hold the pipe downwards and pull the safety ring upwards
- Extract the connector from the fuel injector

If the connector is difficult to extract, do not force it too much and combine the rotation movement with pushing-pulling stresses.



_____ 05



-
- Remove the screw fixing the fuel piping clamp to the engine on the flywheel side



-
- Remove the electric connectors from the fuel and air injector



-
- Remove the electric connector from the throttle body
 - Remove the plastic clamp connecting the electric cable of the throttle body to the air pipe shown in the figure



- Remove the belt cooling cover



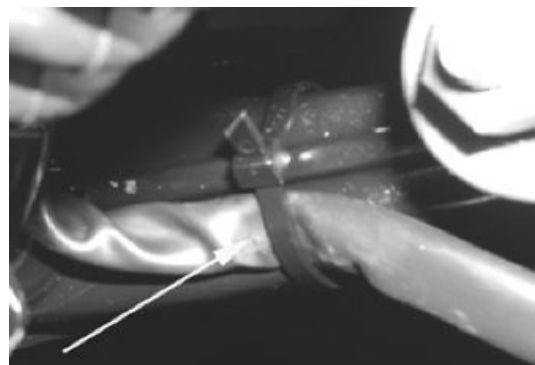
- Release the mixer control cable using the special hole as shown

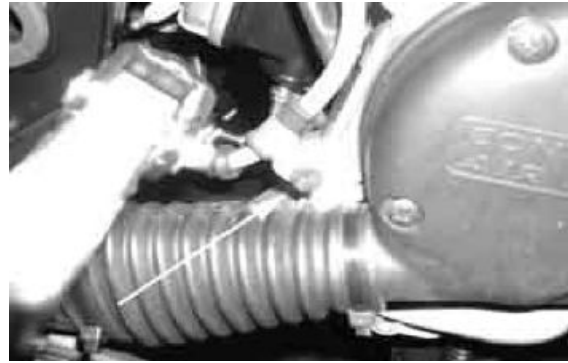


- Remove the starter wiring from the relay and from the grounding wire
- Remove the plastic clamp connecting the starter wiring to the swinging arm



- Remove the screw fixing the fuel piping clamp to the engine on the transmission side





- Remove the coolant temperature sensor connector



- Remove the cooling system piping from the engine and discharge the fluid
- Remove the air filter sucking sleeve
- Remove the lower suspension fixing



- Use two 17 mm Allen wrenches to remove the engine/swinging arm fixing pin
- Remove the oil mixer pipe from the tank



- To refit, perform the operations in the reverse direction and ensure that the electric wiring is properly fixed to components such as: air injector, fuel injector, throttle body, generator, coolant temperature sensor.
- Carefully clean the connectors removing any dirt and foreign material
- Respect the clamps of the fuel lines to the engine.
- Make sure that the fuel line connectors are perfectly inserted in the injector
- Check that the rubber buffers installed on the fuel lines are properly placed to prevent damage to the lines caused by rubbing.

CAUTION

THE FUEL PRESSURE IN THE SUPPLY SYSTEM IS APPROX. 4 BAR. REPLACE THE FUEL LINES IF DAMAGED.

Locking torques (N*m)

Swinging arm /engine: 33 - 41 Nm Rear brake calliper: 20 - 25 Nm Rear wheel: 20 - 25 Nm Lower shock absorber clamp: 33 - 41 Nm



See also

[Side fairings](#)

INDEX OF TOPICS

ENGINE

ENG

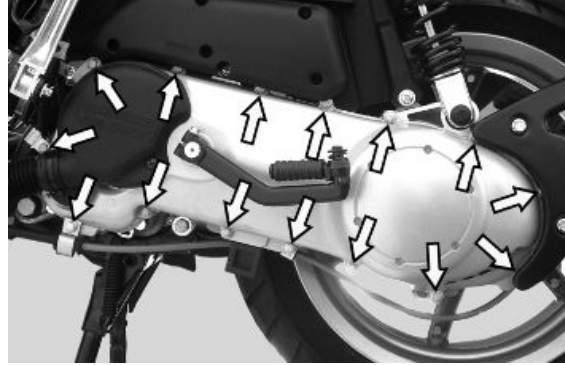
Automatic transmission

Transmission cover

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

N.B.

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

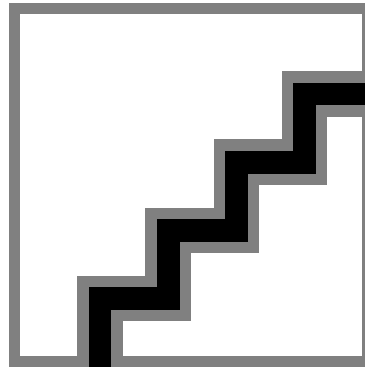


Removing the driven pulley shaft bearing

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

N.B.

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



Refitting the driven pulley shaft bearing

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

N.B.

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

CAUTION

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

Removing the driven pulley

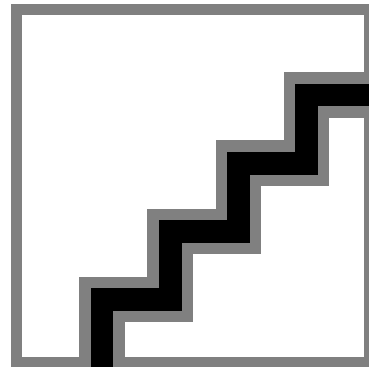
- Lock the clutch bell housing with the specific tool.
- Remove the nut, the clutch bell housing and the whole of the driven pulley assembly.

N.B.

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

Specific tooling

020565Y Flywheel lock calliper spanner



Inspecting the clutch drum

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

Characteristic

Clutch bell diameter/standard value

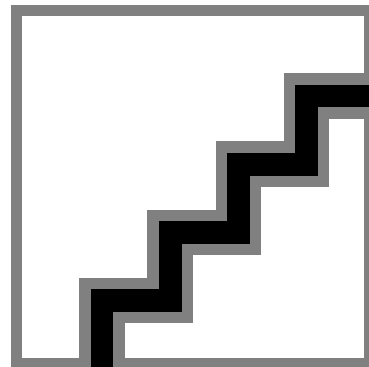
Ø 107+0.2 +0 mm

Clutch bell diameter/max. value allowed after use

Ø 107.5 mm

Eccentricity measured /max.

0.20 mm

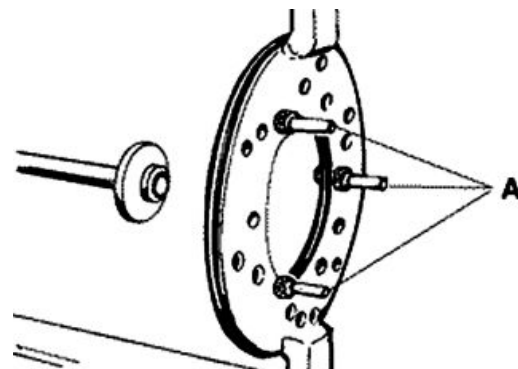


Removing the clutch

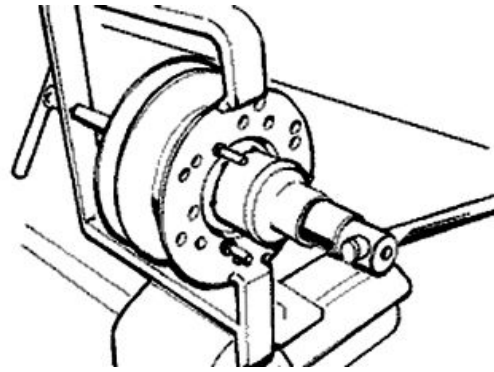
- Equip the tool with long pins screwed into position «A» from the outside, insert the entire driven pulley in the tool and put the central screw under stress.

CAUTION

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



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



Specific tooling

020444Y Tool for fitting/ removing the driven pulley clutch

Inspecting the clutch

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

N.B.

UPON RUNNING-IN, THE MASSES MUST EXHIBIT A CENTRAL CONTACT SURFACE AND MUST NOT BE DIFFERENT FROM ONE ANOTHER.

VARIOUS CONDITIONS CAN CAUSE THE CLUTCH TO TEAR.

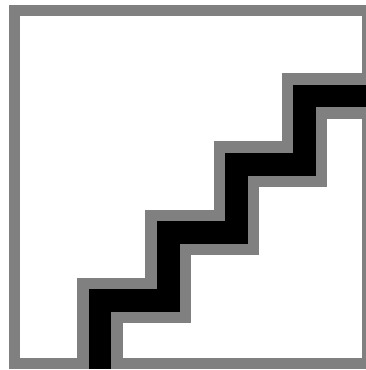
CAUTION

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

Characteristic

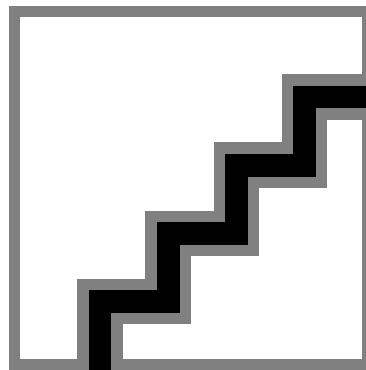
Check minimum thickness

1 mm

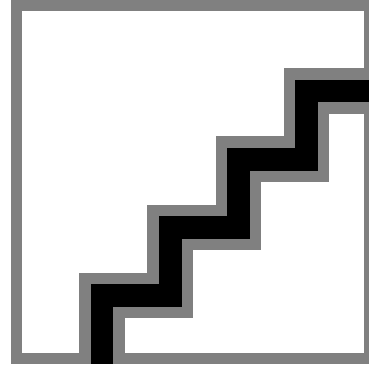


Pin retaining collar

- Remove the collar with the aid of 2 screwdrivers.



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



Removing the driven half-pulley bearing

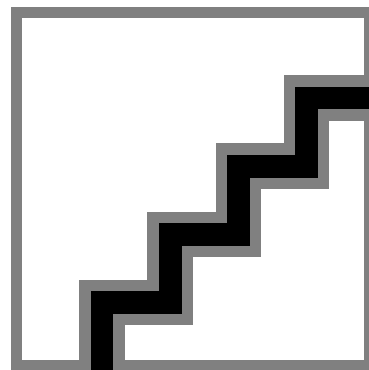
- Remove the roller bearing with the special extractor inserted from the bottom of the fixed half-pulley.

CAUTION

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

Specific tooling

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



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

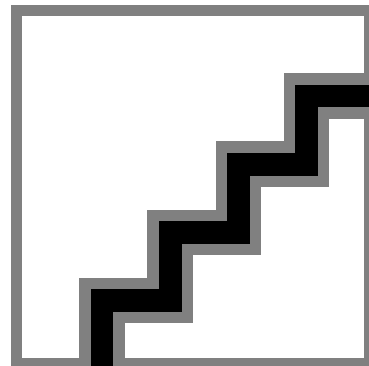
N.B.

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

Specific tooling

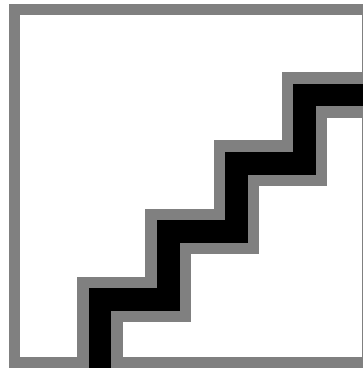
020376Y Adaptor handle

020363Y 20 mm guide



Inspecting the driven fixed half-pulley

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



Characteristic

Stationary driven half-pulley/Standard diameter

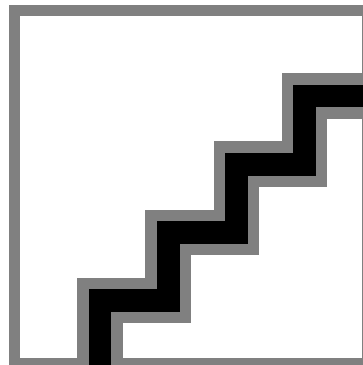
Ø 33.965 to 33.985 mm

Stationary driven half-pulley / Minimum diameter admitted after use

Ø 33.96 mm

Inspecting the driven sliding half-pulley

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

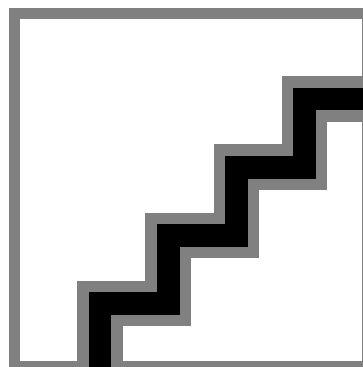


Characteristic

Mobile driven half-pulley/ Maximum diameter allowed

Ø 34.08 mm

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



Recommended products

AGIP GREASE SM 2 Grease for the tone wheel revolving ring

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

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

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

Recommended products

AGIP GREASE SM 2 Grease for the tone wheel revolving ring

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

Refitting the driven half-pulley bearing

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

CAUTION

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

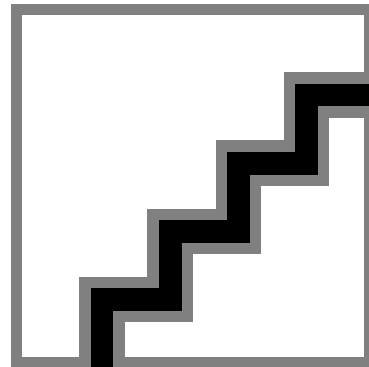
Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020362Y 12 mm guide

020171Y Punch for Ø 17 mm roller case

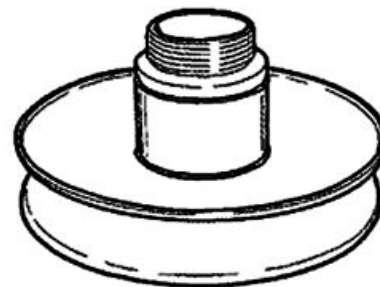


Refitting the driven pulley

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

CAUTION

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



- Check that pins and collar are not worn, refit pins and collar.
- Use a bent tip oiler to lubricate the pulley unit with approx. 6 gr grease. This operation must be performed through one of the holes into the bushing until the grease starts leaking from the opposite hole. This procedure is necessary to prevent the presence of grease beyond the O-ring.

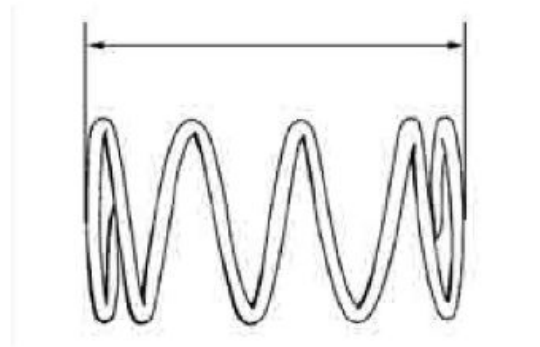
Recommended products

AGIP GREASE SM 2 Grease for odometer transmission gear case

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

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

Characteristic
Standard length:
 110 mm

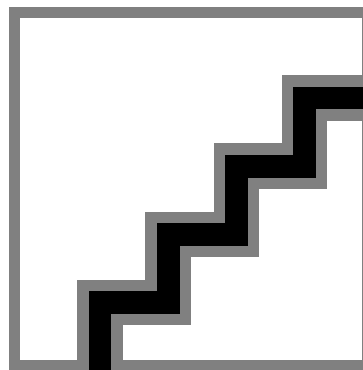


Inspecting the clutch spring

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

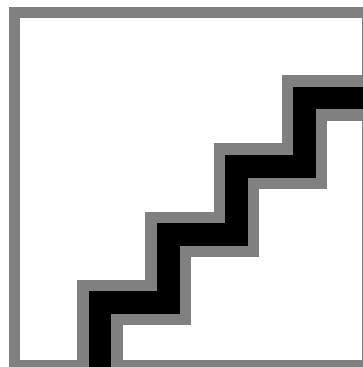
Characteristic
Standard length
 118 mm

Minimum length allowed after use
 XXXX



Refitting the clutch

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

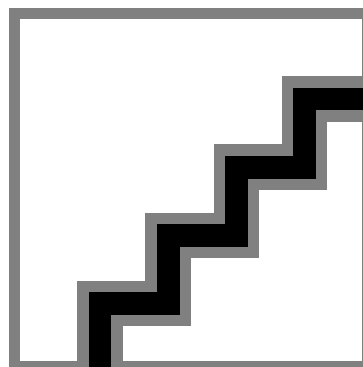


- Reassemble the nut securing the clutch and tighten to the prescribed torque.

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

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

Locking torques (N*m)



Nut locking clutch unit on pulley 55 ÷ 60 Nm

Refitting the driven pulley

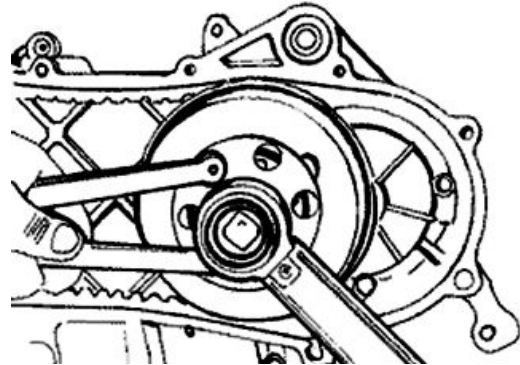
- Refit the driven pulley assembly, the clutch bell and the nut using the specific tool.

Specific tooling

020565Y Flywheel lock calliper spanner

Locking torques (N*m)

Locking torque: 40 ÷ 44 N·m



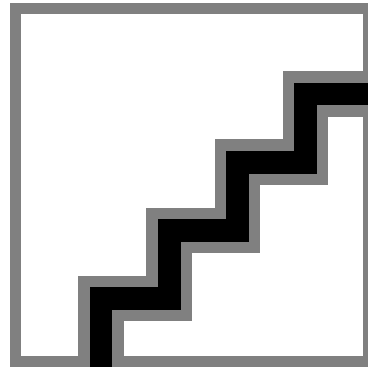
Drive-belt

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

Characteristic

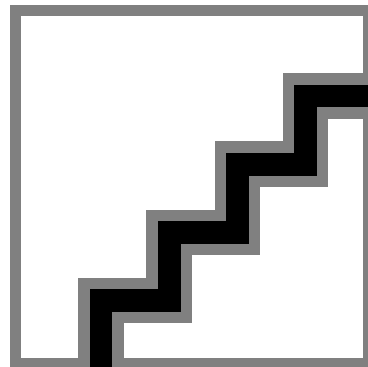
Transmission belt/Minimum width

17.5 mm



Removing the driving pulley

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



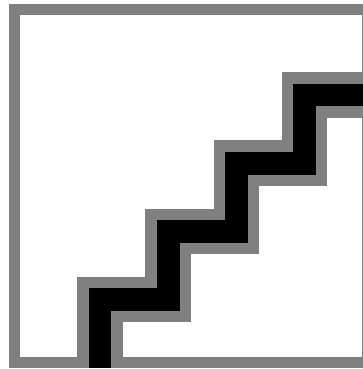
- Remove the belt, washer and remove the mobile half-pulley with its bushing, being careful that the rollers and contrast plate fitted loosely on it do not come off.

Specific tooling

020451Y Start-up crown lock

Inspecting the rollers case

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



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

CAUTION

DO NOT LUBRICATE OR CLEAN THE BUSHING.

Characteristic

Driving pulley / Maximum diameter:

20.12 mm

Driving pulley/ Standard diameter:

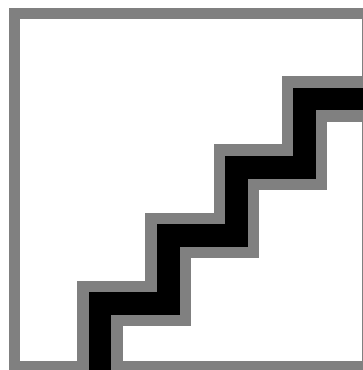
20.021 mm

Driving pulley bushing/ Diameter maximum:

XXX mm

Driving pulley bushing/ Standard diameter:

20 -0.020/-0.041mm

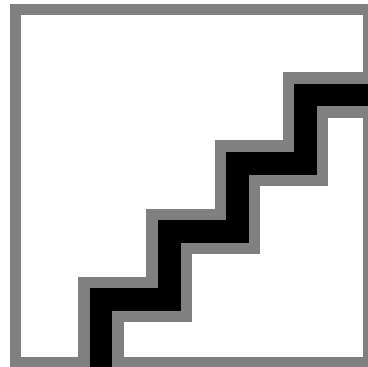


Refitting the driving pulley

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

N.B.

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



- Refit the particular components of the assembly (roller container assembly with bushing, limiting washer, stationery half-pulley, cooling fan belt with drive, washer and nut).

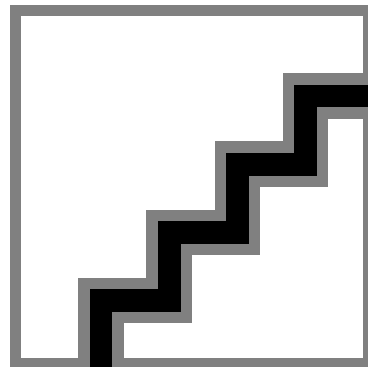
- Tighten the lock nut to torque 20 Nm and then perform a final 90° lock preventing the rotation of the drive pulley with the specific tooling.

N.B.

REPLACE THE NUT WITH A NEW ONE AT EVERY REFIT

CAUTION

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



Specific tooling

020451Y Start-up crown lock

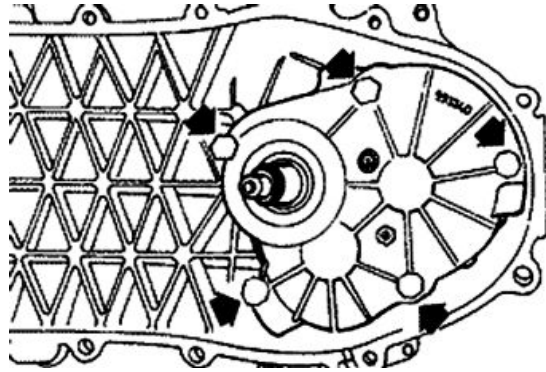
Locking torques (N*m)

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

End gear

Removing the hub cover

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

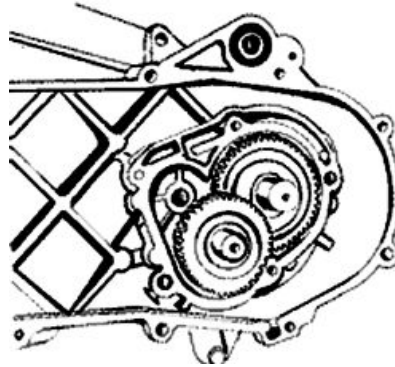


See also

[Refitting the clutch](#)

Removing the wheel axle

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



Removing the wheel axle bearings

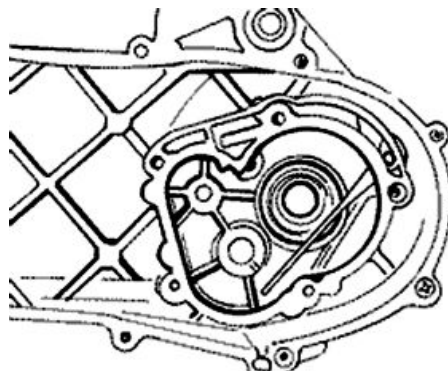
- Remove the oil seal and the seeger ring.
- Remove the bearing by pushing from the outside towards the inside of the gear compartment, using the appropriate punch.

Specific tooling

020363Y 20 mm guide

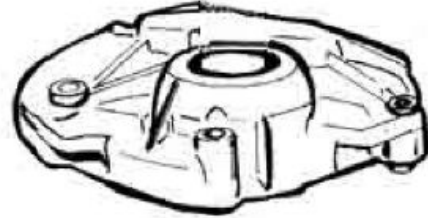
020376Y Adaptor handle

020358Y 37x40-mm adaptor



Removing the driven pulley shaft bearing

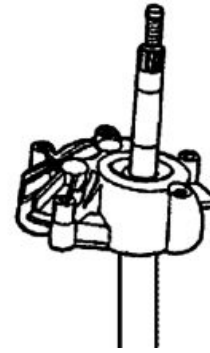
- Remove the seeger ring inside the cover.
- Remove the oil seal from the outside.
- Remove the centring dowels and position the cover on a plane.
- Position the special tool on the internal track of the bearing and remove said bearing with the aid of a press.



Specific tooling

020452Y Tube for removing and refitting the driven pulley shaft

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

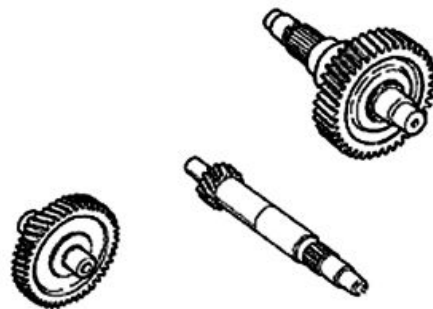


Specific tooling

020452Y Tube for removing and refitting the driven pulley shaft

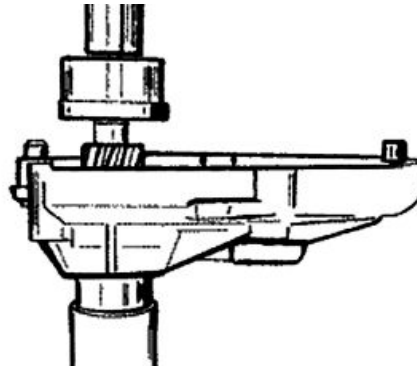
Inspecting the hub shaft

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



Refitting the driven pulley shaft bearing

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



Specific tooling

020452Y Tube for removing and refitting the driven pulley shaft

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

N.B.

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

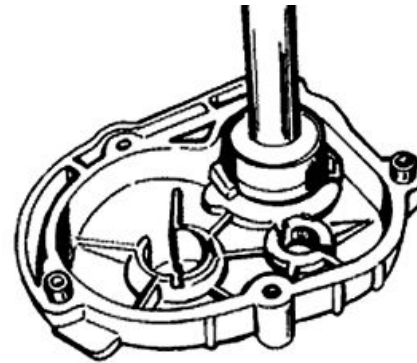
Specific tooling

020151Y Air heater

020376Y Adaptor handle

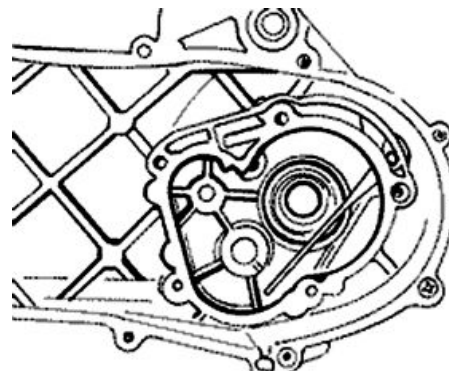
020439Y 17 mm guide

020358Y 37x40-mm adaptor



Refitting the wheel axle bearing

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



Specific tooling

020151Y Air heater

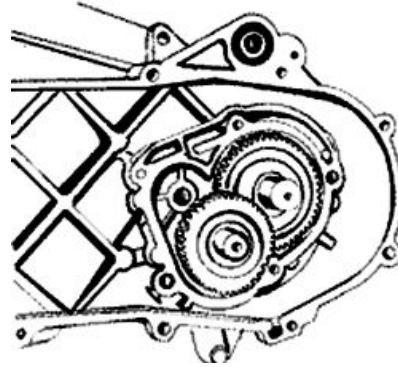
020376Y Adaptor handle

020363Y 20 mm guide

020359Y 42x47-mm adaptor

Refitting the hub cover

- Refit the complete wheel axis.
- Refit the intermediate gear being careful of the two shim adjustments.
- Apply LOCTITE 510 for surfaces on the hub cover and refit it with the complete pulley shaft.
- Insert the 5 screws and tighten them to the prescribed torque.

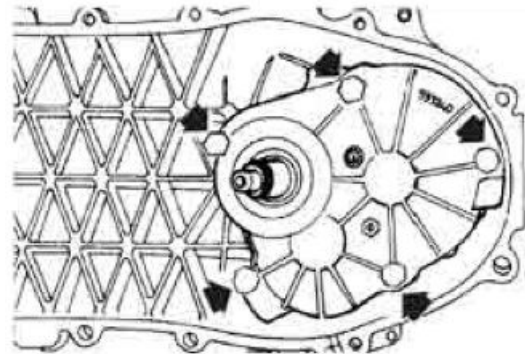


N.B.

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

Locking torques (N*m)

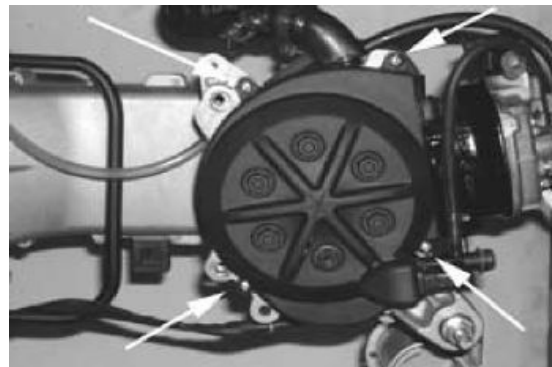
Locking torque: 11 to 13 Nm



Flywheel cover

Removing the stator

- Remove the flywheel cover.



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

Specific tooling

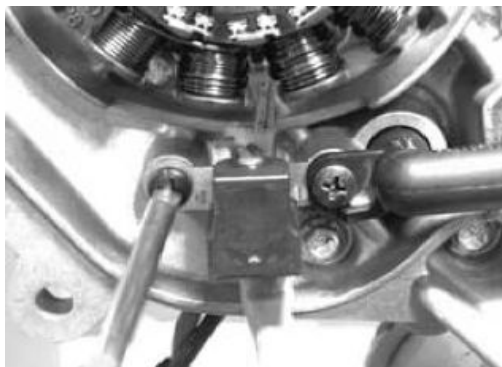
020565Y Flywheel lock calliper spanner



-
- Use a specific extractor to remove the flywheel

Specific tooling**020162Y Flywheel extractor**

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



-
- Remove the coolant inlet duct



-
- Remove the two stator fixing screws
 - Remove the stator with wiring and revolution sensor

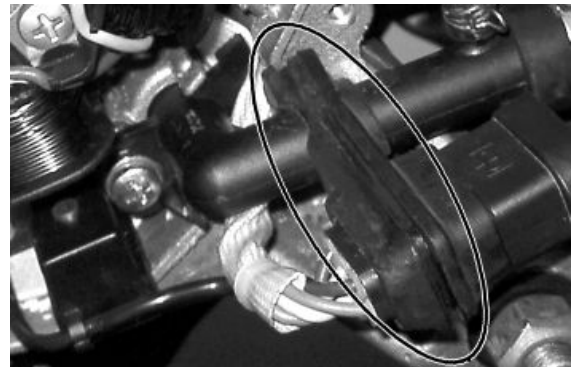
Locking torques (N*m)**Flywheel nut 40 to 44 N.m**

Refitting the stator

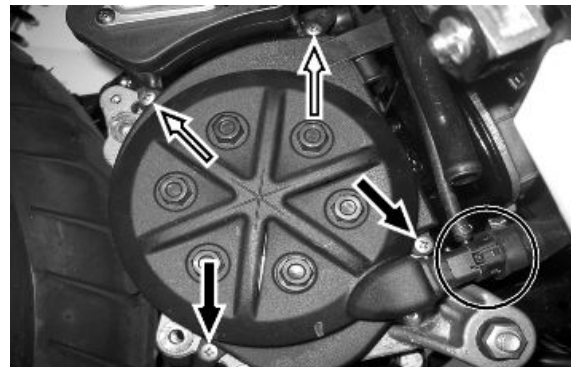
- To refit, perform the removal procedures in the reverse direction.
-

Refitting the flywheel cover

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

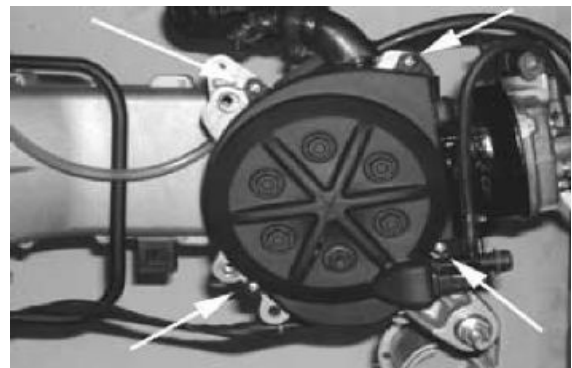


- Keeping the flywheel connector rubber clamp on the coolant inlet hose, refit the flywheel cover paying attention in inserting the strap in the groove.
- Tighten the 4 studs, noting that the two longer golden screws are inserted in the 2 top holes and are also responsible for restraining the secondary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



Cylinder assy. and timing system

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



Removing the cylinder head

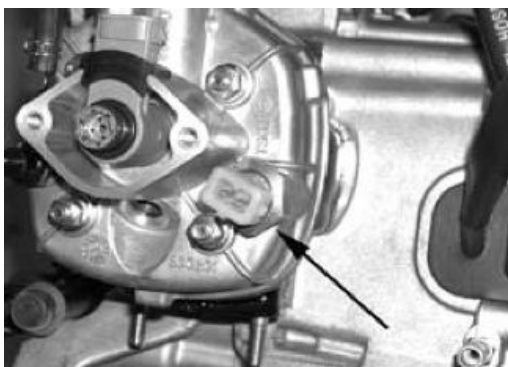
- Use a TORX 20 wrench to remove the air feeding line from the injection head as shown in the figure.



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



- Remove the spark plug
- Remove the temperature sensor shown in the figure



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

N.B.

BE CAREFUL NOT TO DAMAGE THE INJECTOR PLASTIC SUPPORT

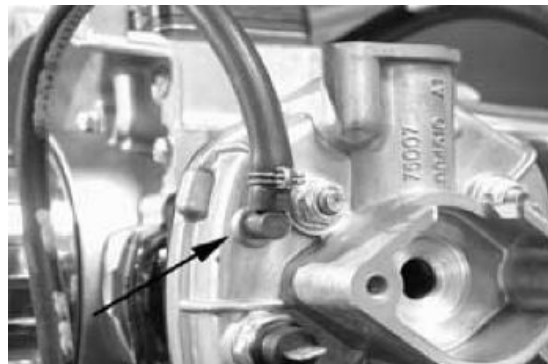




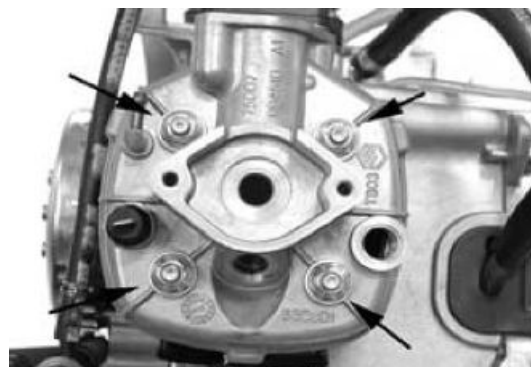
- Remove the coolant outlet union from the head with the relevant O-ring, using the two screws, as shown in the figure.



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



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



Removing the cylinder - piston assy.

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



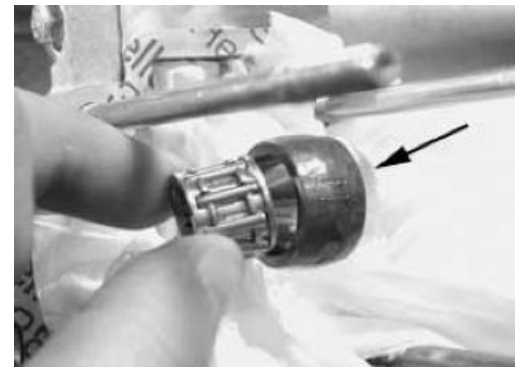
- Remove the 2 plug stops by a screwdriver inserted into the special slits on the piston
- Remove piston pin and remove the piston

N.B.

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



- Remove the roller from the connecting rod as shown in the figure



- Remove the piston sealing rings

CAUTION

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

N.B.

BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.

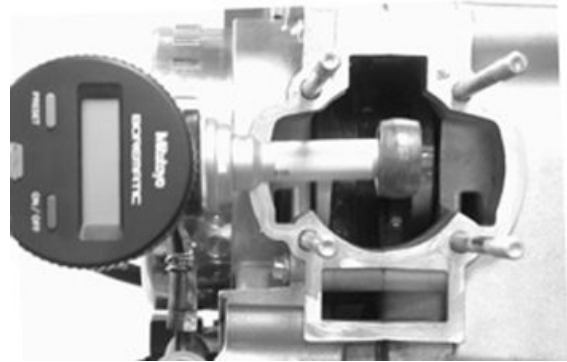


Inspecting the small end

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

N.B.

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



Characteristic

Rod small end: standard diameter

17 +0.011-0.001

Rod small end: maximum allowable diameter

17,060 mm

Inspecting the wrist pin

- Check the wrist pin external diameter using a micrometer

Characteristic

Wrist pin: standard diameter

12 +0.005 +0.001 mm



Inspecting the piston

- Measure the bearings on the piston using a bore meter

- Calculate the piston-pin coupling clearance.

Characteristic

Wrist pin housing: standard diameter

12 +0.007 +0.012

Wrist pin housing: standard clearance

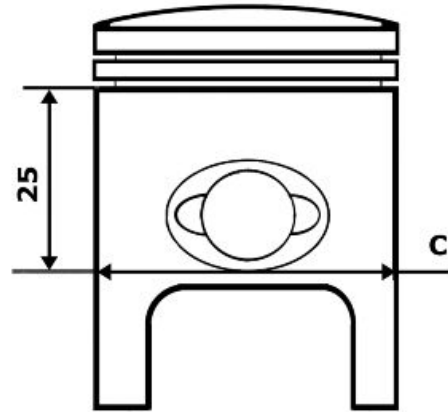
0.002 ÷ 0.011 mm



- Measure the outer diameter of the piston, perpendicular to the pin axis.

- Take the measurement in the position shown in the figure

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



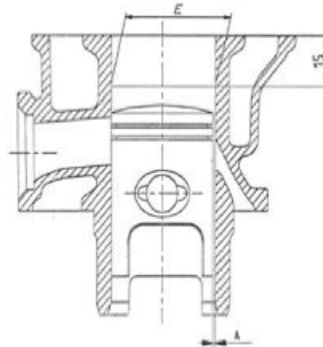
See also

[Cylinder - piston assy.](#)

Inspecting the cylinder

- Check that the cylinder exhibits no seizure. If it does, replace or adjust it, while respecting the allowable oversizes.

- Use a bore meter to measure the cylinder inside diameter according to the directions shown in the figure.



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

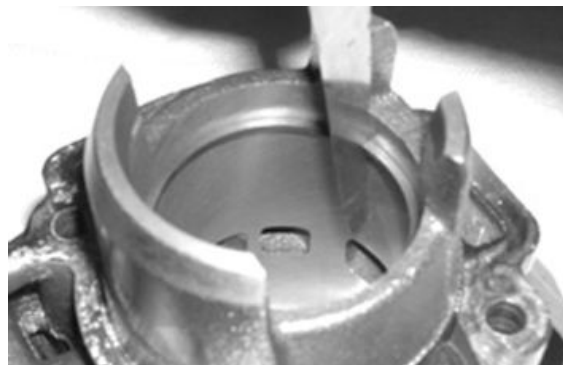
To classify the fitting, refer to the tables.

See also

[Cylinder - piston assy.](#)

Inspecting the piston rings

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



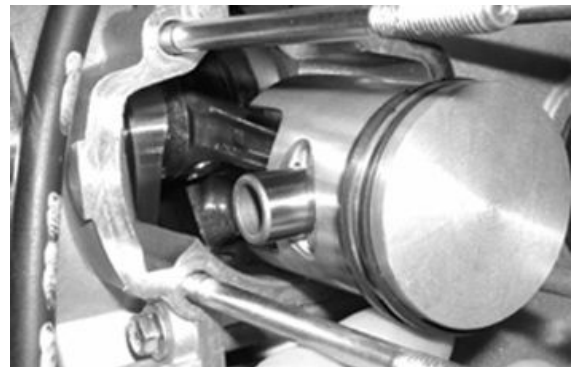
- If the values are higher than those prescribed on the chart, replace the rings

Removing the piston

- Insert the roller in the connecting rod



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



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



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

Specific tooling

020166Y Pin lock fitting tool



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

Specific tooling

020166Y Pin lock fitting tool



Choosing the gasket

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



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

Set the dial gauge.

Check that tracer slides smoothly.

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

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



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

Measure the difference with the reset value.

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

Remove the specific tool and the cylinder.

Specific tooling

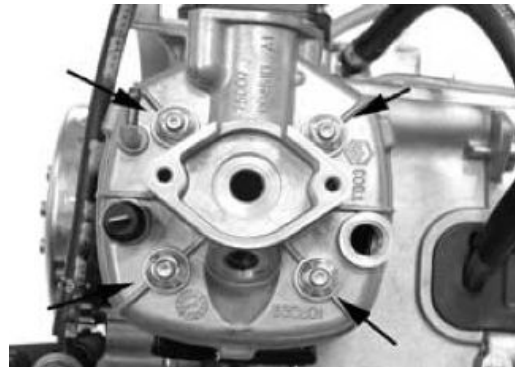
020272Y Piston position check tool

See also

[Cylinder - piston assy.](#)

Refitting the head and timing system components

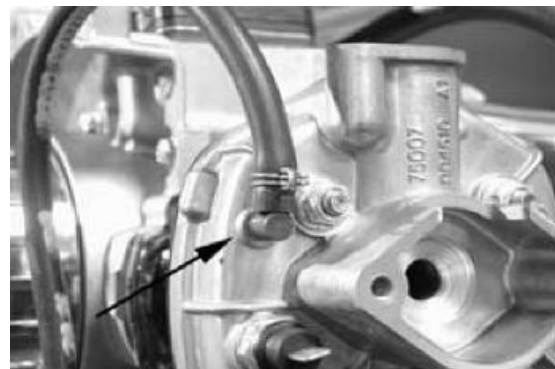
- Carefully clean the head, removing any carbon residues
- Check the perfect condition of the fitting surfaces
- Check that the O-rings are not broken, otherwise replace them
- Screw the 4 head fixing nuts and tighten them in crossed sequence to the prescribed torque



Locking torques (N*m)

Head fixing nuts: 10 ÷ 11 Nm

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



- Check that the O-Ring is in good working condition.
- Fit the coolant outlet union on the head with relevant O-ring by tightening 2 screws to the prescribed torque.



Locking torques (N*m)

Coolant outlet union fixing screws: 3 ÷ 4 Nm

- Introduce the air injector into the head.



- Refit the dust cover onto the air injector.

N.B.

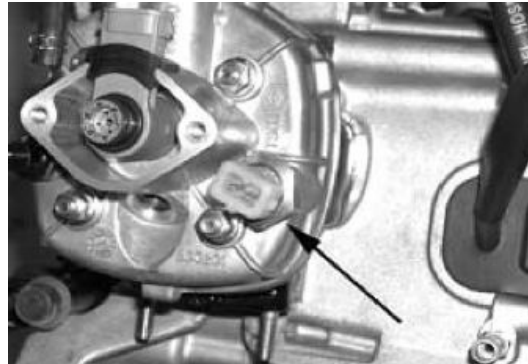
NOTE THAT WHEN THE AIR INJECTOR IS RE-FITTED, THE CARBON DAM O-RING MUST BE NEW. IF A NEW AIR INJECTOR IS FITTED, THE NEW CARBON DAM RING IS ALREADY PRESENT. IF THE OLD AIR INJECTOR IS FITTED, THE CARBON DAM REQUIRES REPLACEMENT.



- Fit the spark plug
- Refit the temperature sensor shown in the figure and tighten to the prescribed torque.

Locking torques (N*m)

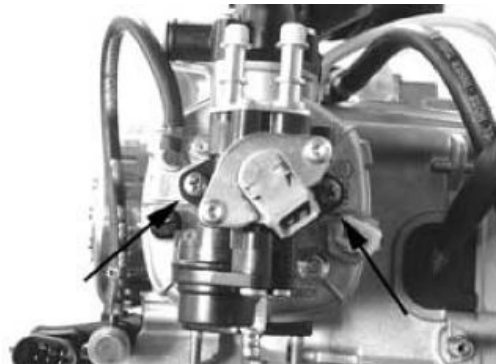
Temperature sensor 18 ÷ 22 Nm Spark plug: 11 ÷ 14 Nm



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

Locking torques (N*m)

Injection head fixing screw: 3 ÷ 4 Nm



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



See also

[air injector circuit](#)

Air Injection

Carbon - dam replacement

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



Specific tooling

020615Y Carbon dam ring fitting kit

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



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



Specific tooling

020615Y Carbon dam ring fitting kit

Crankcase - crankshaft

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

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

See also

[Cylinder assy. and timing system](#)

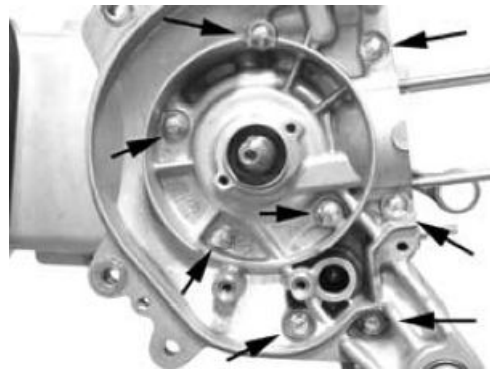
[Removing the driving pulley](#)

[Removal](#)

[Removing the driven pulley](#)

Splitting the crankcase halves

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



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



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



N.B.

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

Specific tooling

020151Y Air heater

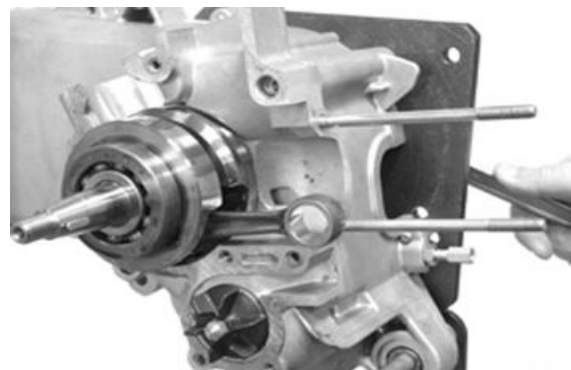
020163Y Crankcase splitting plate

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



Removing the crankshaft

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



Specific tooling

020163Y Crankcase splitting plate

Removing the crankshaft bearings

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



N.B.

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

Specific tooling

004499Y Camshaft bearing extractor

004499Y007 Half rings

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

Specific tooling

001467Y006 Pliers to extract 20 mm bearings

001467Y007 Driver for OD 54 mm bearing



Refitting the crankshaft bearings

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



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

N.B.

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



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

N.B.

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

Specific tooling

020265Y Bearing fitting base



008119Y009 Tube to assemble shafts and axles

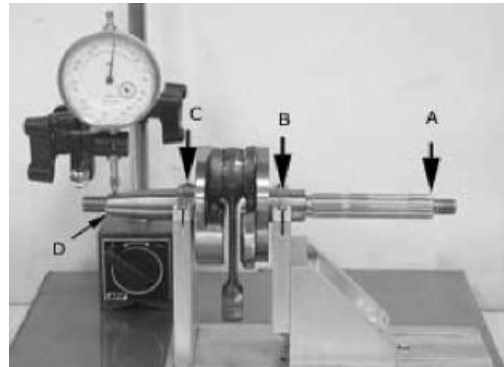
Inspecting the crankshaft components

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



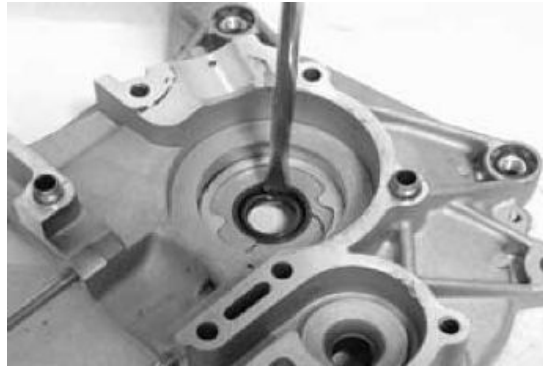
Inspecting the crankshaft alignment

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

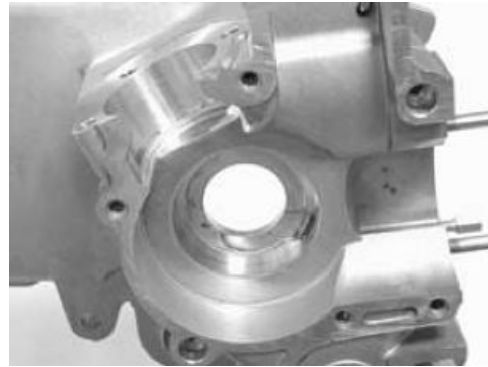
**Specific tooling****020335Y Magnetic support for dial gauge****020074Y Support base for checking crankshaft alignment**

Inspecting the crankcase halves

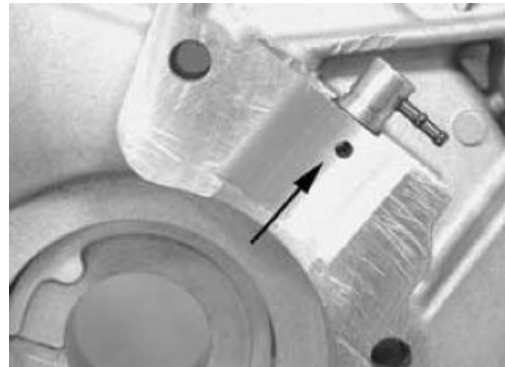
- Remove the oil seals from both crankcase halves using a screwdriver.



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



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

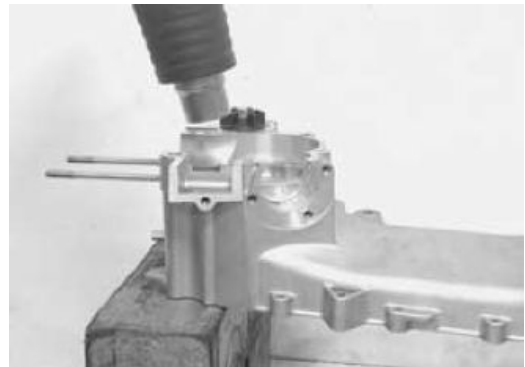


Refitting the crankshaft

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

N.B.

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



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

N.B.

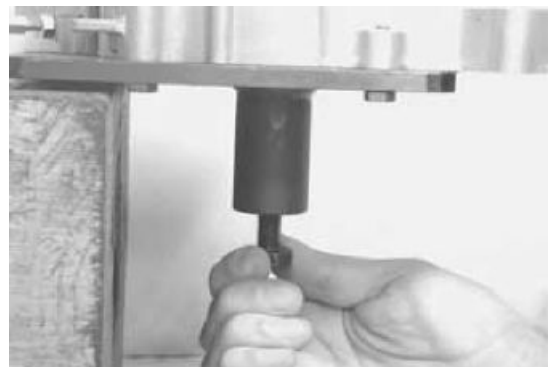
CHECK THAT THE CONNECTING ROD IS PLACED ACCORDING TO THE CYLINDER AXIS. IF ASSEMBLY IS UNSUCCESSFUL, START OVER FOLLOWING THE HEATING RULES AND BEING CAREFUL TO THE SHAFT INSERTION MOVEMENT. DO NOT LUBRICATE THE SHAFT SINCE THE CRANKCASE HALF FITTING SURFACES MAY BE SOILED.



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

N.B.

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



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

Recommended products**Loctite 510 Liquid sealant**

Gasket



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



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

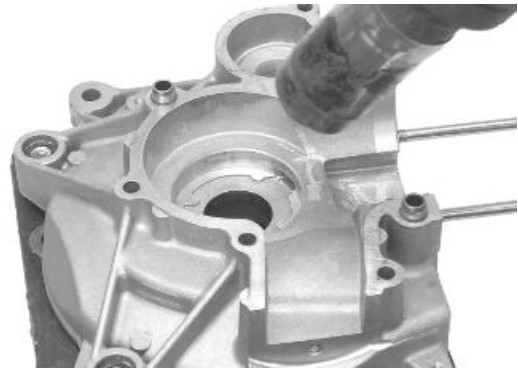
N.B.**WEAR GLOVES WHEN HANDLING THE CRANKCASE HALF. DO NOT USE RAGS FOR THIS OPERATION.**

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

Locking torques (N*m)**Crankcase closing screws: 12 -13 Nm**

Refitting the crankcase halves

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



Recommended products

Loctite 510 Liquid sealant

Gasket

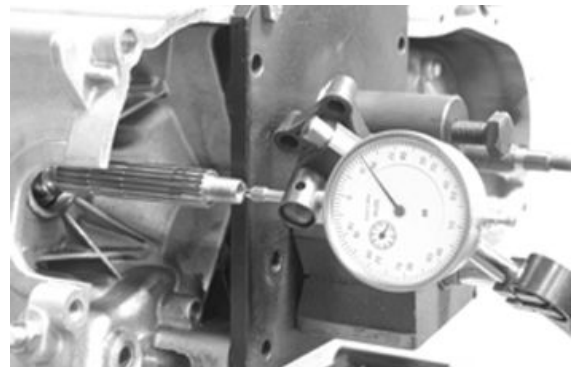
- Keeping the half crankcase on the transmission side, insert the flywheel side half crankcase with a clean precise movement
- Insert at least three clamping screws and tighten up rapidly
- Insert the other 5 screws and tighten them to the specified torque.



Locking torques (N*m)

crankcase coupling screws 11 - 13

- Move the crankcase separation plate in a position back from the one indicated in the figure
 - Install the special magnetic support with dial gauge at the end of the crankshaft
 - Check the axial clearance of the crankcase
- If this is not within the maximum limit allowed, repeat the crankcase coupling procedure



Specific tooling

020335Y Magnetic support for dial gauge

Characteristic

Axial clearance with warm crankcase

0.10 ÷ 0.12 mm

Axial clearance with cold crankcase

0.06 to 0.08 mm

Limit value with cold crankcase

0.02 ÷ 0.03 mm

Air compressor

Removal

Air compressor removal

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



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



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



Overhaul

Air compressor check

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



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

Characteristic

Standard axial play:

XXX

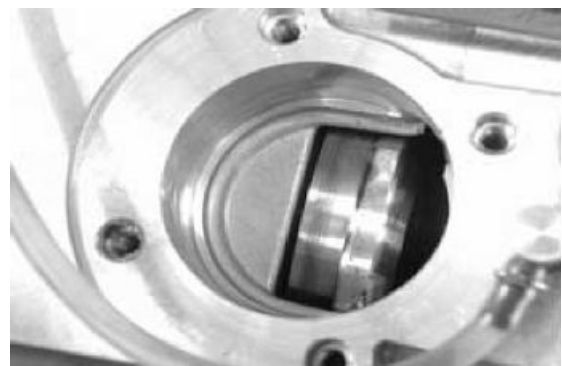
Allowable limit after use:

XXX

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



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



Refitting

Air compressor refitting

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



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

Locking torques (N*m)

Air compressor fixing screws: 3 - 4 Nm



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



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



Lubrication

Crankshaft oil seals

Refitting

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

N.B.

USE OF THE TOOL IS NOT COMPATIBLE WITH THE MOUNTED KEY

Specific tooling

020340Y Flywheel and transmission oil seals fitting punch



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

Specific tooling

020340Y Flywheel and transmission oil seals fitting punch



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



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

Oil pump

Removal

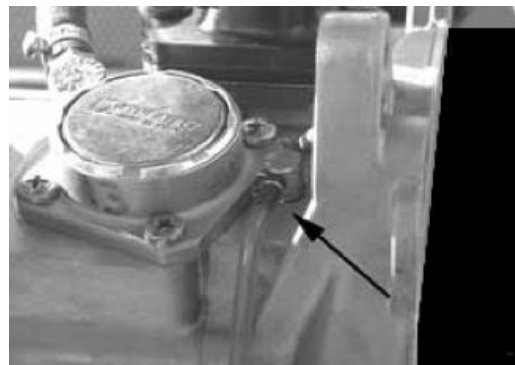
- Remove the transmission cover
- Remove driving pulley
- Remove the 2 screws shown in the figure



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



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



See also

[Removing the driving pulley](#)
[Removing the driving pulley](#)

Refitting

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



INDEX OF TOPICS

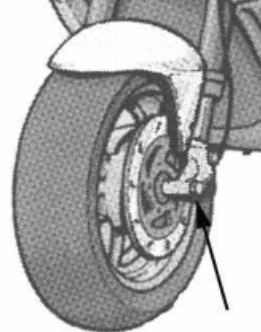
SUSPENSIONS

SUSP

Front

Removing the front wheel

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



Front wheel hub overhaul

- Remove the front wheel
- Keep the wheel level by means of two wooden wedges
- With the appropriate pliers and tool remove the wheel bearing on the side the rpm indicator detects movement, as shown in the photograph

Specific tooling

001467Y014 Pliers to extract \varnothing 15-mm bearings

001467Y009 Driver for OD 42 mm bearings



- Remove the internal spacer
- Use appropriate handle, adaptor and guide and hit with a mallet to extract the bearing and the spacer bushing on the brake disk side; insert handle on the side the rpm indicator detects movement, as shown in the photo

Specific tooling

020376Y Adaptor handle

020456Y \varnothing 24 mm adaptor

020412Y 15 mm guide



-
- Check that the bearings do not show flaws or jamming. If there is, replace it.
 - Check that the internal spacer does not show abnormal wear. If there is, replace it.
 - With a hot air gun heat the seat of the bearing on the brake calliper side
 - With an appropriate tool remove the bearing on the brake disk side
 - Insert the spacer bushing on the brake disk side



Specific tooling

020376Y Adaptor handle

020357Y 32 x 35 mm adaptor

020412Y 15 mm guide



-
- With a hot air gun heat the seat of the bearing on the side the rpm indicator detects movement
 - Insert the internal spacer with the centring ring facing to the brake disk side, as shown in the photo
 - Use an appropriate tool to insert the bearing on the rpm indicator movement detector side



Specific tooling

020376Y Adaptor handle

020357Y 32 x 35 mm adaptor

020412Y 15 mm guide

See also

[Removing the front wheel](#)

Refitting the front wheel

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

Locking torques (N*m)

Wheel fixing nut 40 to 50 N.m

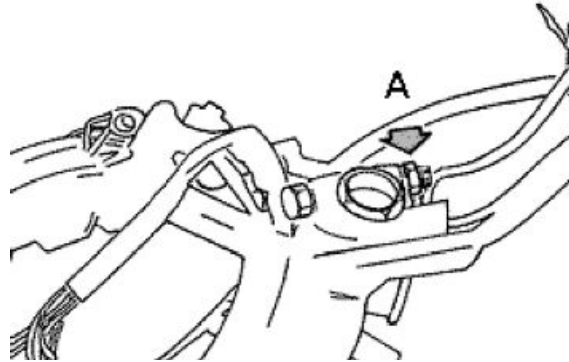
Handlebar

Removal

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

N.B.

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

**See also**

[Front handlebar cover](#)
[Rear handlebar cover](#)

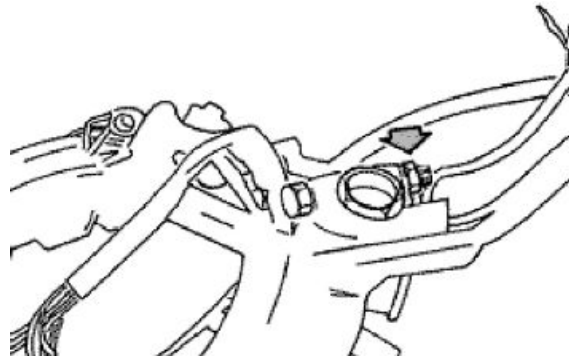
Refitting

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

Recommended products

AGIP GREASE PV2 Grease for control levers on the engine

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

**Locking torques (N*m)**

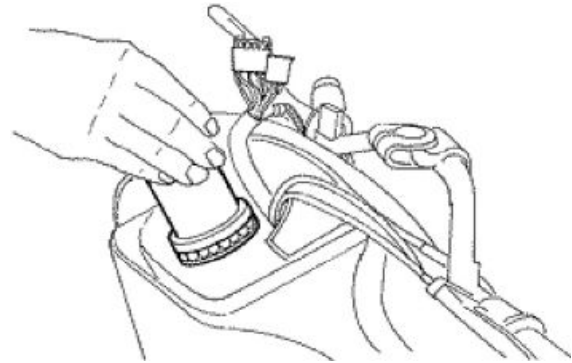
Locking torque: 65 to 70 N•m

Front fork

Removal

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

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



Specific tooling

020055Y Wrench for steering tube ring nut

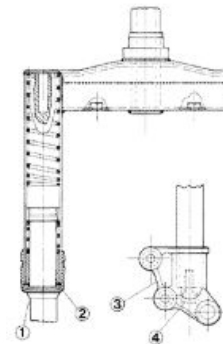
See also

- [Removal](#)
- [Front mudguard](#)
- [Front handlebar cover](#)
- [Rear handlebar cover](#)

Overhaul

Replacing o-ring

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



Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

Removing rod

- Remove the dust guard (1) using a screwdriver to prise it out.

- Remove the seeger (2) and remove the power pipe.

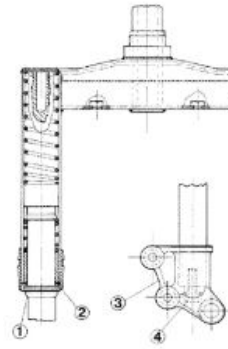
N.B.

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

Recommended products

AGIP GREASE MU3 Grease for odometer transmission gear case

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

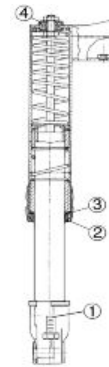


Removing damper

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

- Using nut 4, remove the spring stem and bushing. The damper is an integral part of the stem and cannot therefore be overhauled, so if you need to work on the damper (loss of fork oil), carry out the operations mentioned above and replace the shock absorber-stem unit.

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



Specific tooling

020150Y Air heater support

020151Y Air heater

Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

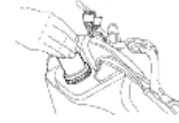
Locking torques (N*m)

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

Refitting

Lubricate the seats and the balls with the grease recommended.

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



Specific tooling

020055Y Wrench for steering tube ring nut

Recommended products

AGIP GREASE PV2 Grease for control levers on the engine

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

Locking torques (N*m)

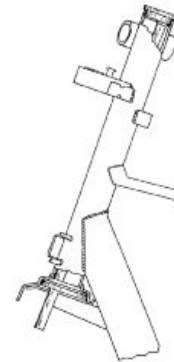
Locking torque: 50 to 60 Nm

Steering column

Removal

Removing upper and lower frame area

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



Specific tooling

020004Y Punch for removing fifth wheels from headstock

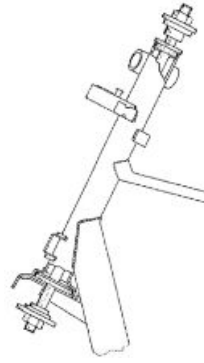
Refitting

Refitting lower and upper area on the frame

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

Specific tooling

001330Y Tool for fitting steering seats



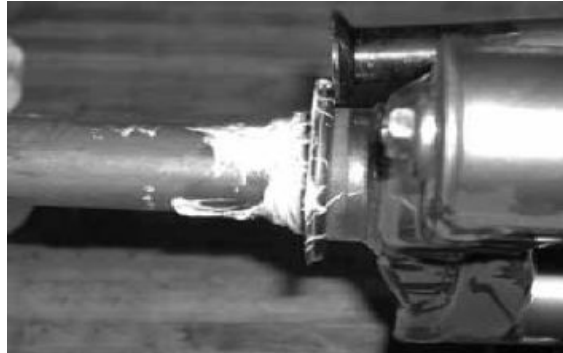
Steering bearing

Removal

Bearing housing on the fork overhaul

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

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



Specific tooling

020004Y Punch for removing fifth wheels from headstock

Always use a new fifth wheel seat on refitting.

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

Specific tooling

006029Y Punch for fitting fifth wheel seat on steering tube



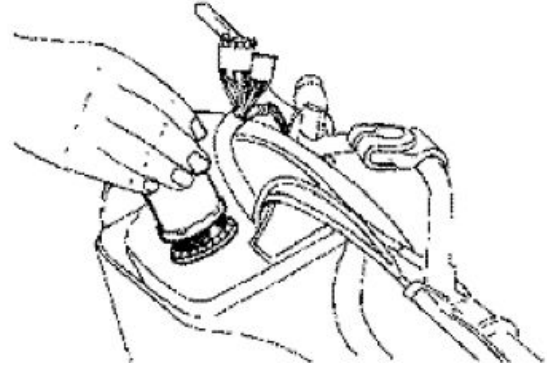
Steering wheel ring nut removal

- Remove the handlebar.
- Remove the cover of the steering collar shown in the figure
- Remove the collar of the steering bearing using the specific tool



Specific tooling

020055Y Wrench for steering tube ring nut



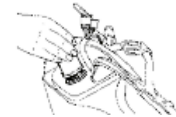
See also

- [Front handlebar cover](#)
- [Rear handlebar cover](#)

Refitting

Steering wheel ring nut refitting

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



Specific tooling

020055Y Wrench for steering tube ring nut

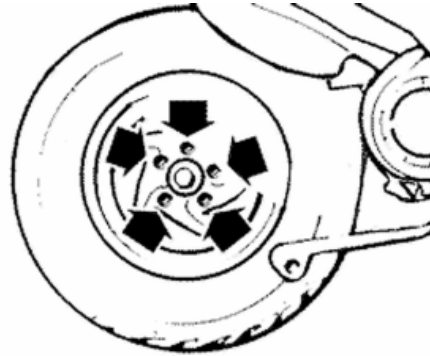
Locking torques (N*m)

Locking torque: 30 to 40 Nm

Rear

Removing the rear wheel

- Remove the wheel loosening the five clamps.



Refitting the rear wheel

- On refitting, tighten to the prescribed torque in a cross over pattern.

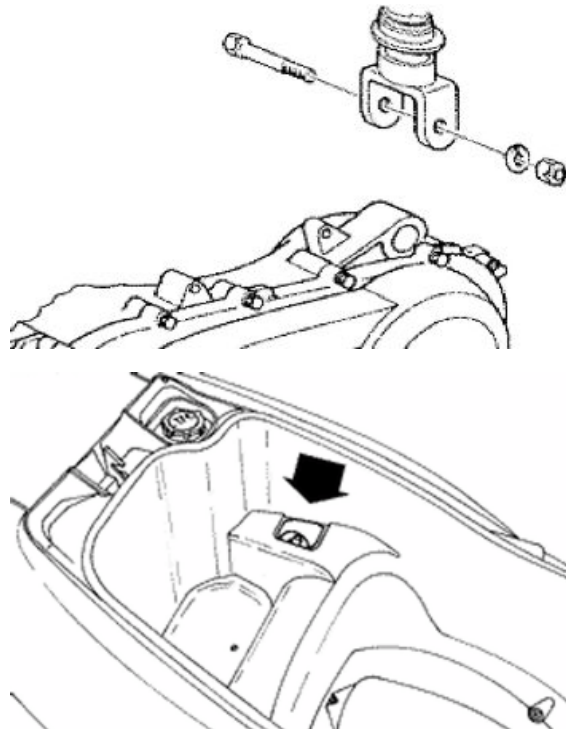
Locking torques (N*m)

Rear wheel: 20 - 25 Nm

Shock absorbers

Removal

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



Refitting

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

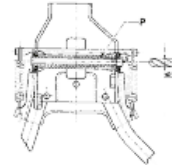
Locking torques (N*m)

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

Centre-stand

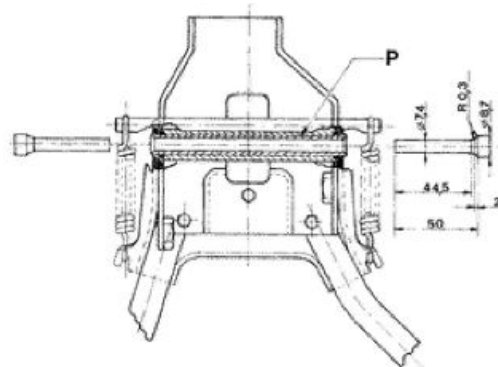
Expulsion of kickstand bracket fastening pin

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



Fitting and caulking the kickstand pin to the bracket

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



N.B.

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

Replacing full kickstand

- Loosen the three screws shown in the diagram.
- When refitting, secure to the prescribed torque.



Locking torques (N*m)

Stand screw torque 18.5 to 19 Nm

INDEX OF TOPICS

PURE JET INJECTION

INJ PJ

Introduction

EMS injection system

The injection system has an incorporated injection and ignition.

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

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

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

Further correction is made according to the following parameter:

coolant temperature.

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

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

The fuel injection circuit consists of:

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

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

The power supply circuit consists of:

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

The ignition circuit consists of:

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

The ECU controls the ignition with an optimum control of the advance and of the coil core dwell time.

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

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

The injection system achieves these results by:

- Air washing of the 2T cycle
- Stratified load
- Fine spray of the load through pneumatic injection

These results are obtained without impairing the delivery features of torque and power

If any input signals are missing, acceptable engine performance is ensured to allow the user to reach the garage.

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

- Fuel pump
- H.V. coil
- Injectors
- TPS (Throttle Position Sensor)

The ECU is supplied with a auto-diagnostic system and informs the user by the light on the instrument panel. The signals are given in two ways:

- Flashing light
- Steady light

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

A steady light indicates the presence of a fault that usually requires the engine be stopped. If the engine is functional, slow down and proceed as quickly as possible with the necessary checks.

precautionary measures

1. Before fixing any part of the injection system, check any registered faults. Never disconnect the battery before checking for faults.
2. The power supply system is pressurised at 250 ÷ 800 KPa (2.5 ÷ 8 BAR). Before disconnecting the snap on attachment of a fuel line, check that there are no free flames and do not smoke. Act with caution to prevent spraying in the eyes.
3. When fixing electric components, operate with battery connected only when actually required.
4. When functional checks are performed, check that the battery voltage is more than 12V.
- 5. When washing the vehicle, be careful of the electric components and wiring.**
6. When an ignition fault is detected, start the checks from the battery and the injection system connections.
7. Before disconnecting the ECU connector, perform the following steps in the order shown: Set the switch to "OFF" then disconnect the battery. Failure to comply with this rule may damage the ECU.

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

9. To prevent damage, disconnect and reconnect the ECU system connectors only if required. Before reconnecting, check that the connectors are dry.

10. During electrical checks, do not force the tester tips into the connectors. Do not perform tests not specifically required by the manual. Perform electrical checks using the interface wiring specific tool.

11. At the end of every check performed with the diagnostic tester, protect the system connector with the cap. Failure to comply with this rule may damage the ECU.

12. Before reconnecting the quick couplings of the power supply system, check that the terminals are perfectly clean.

13. During repairs, do not remove the compressed air line clamps. If required, replace the rubber hose.

14. If you have to remove the air injector, replace the carbon dam sealing ring.

15. Do not perform voltage checks on the spark plug when it is not fitted on the head. Power supply voltages are very high. Hazard of dangerous electric shock. In addition, the air - fuel mixture leaking from the spark plug may cause fire.

16. Do not switch to «ON» during repair procedures when the tank is empty. While on the road, do not use the reserve if it could deplete the fuel.

17. Do not disconnect the battery leads when the engine is running.

18. If the fuel is completely depleted, refuel with at least 4 litres. This will enable safe triggering of the fuel pump

Specific tooling**020481Y Control unit interface wiring**

troubleshooting

suggestions for diagnosis

1 A failure of the injection system may most probably depend on the connections rather than the components.

Before troubleshooting the injection system, perform the following checks:

1. Power supply

Battery voltage

Burnt fuse

Connectors

2. Ground to frame

3. Air supply

Volumetric compressor

Supply line

4. Fuel supply

Faulty fuel pump

Dirty fuel filter

Fuel supply vent clogged

5. Ignition system

Faulty spark plug

Faulty coil

Faulty screened cap

6. Suction circuit

Air filter dirty

7. Others

Incorrect reset of the gas valve position sensor

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

Check the connections as follows:

1. check that the terminals are not bent.

2. check that the connectors are properly engaged.

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

3 Check the entire system before replacing the ECU

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

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

Inappropriate instruments may damage the ECU.

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

autodiagnosis

Self-diagnosis

The injection system is provided with a self-diagnostic function.

The system recognises faults by analysing and comparing electric signals. This recognises a missing signal and an unexpected signal.

Depending on the case, the ECU can use base parameters set in the program, thus allowing an acceptable operation of the engine. Otherwise it may limit the engine performance to force idle operation only.

For faults relating to the essential system components, vehicle safety is ensured, although engine performance cannot be guaranteed. For example, when a fault to the ignition system is detected, injection is also disabled, thereby safeguarding the catalyser.

The auto-diagnostic system also warns the driver. Faults are reported according to three priority levels:

AUTO-DIAGNOSTIC

Specification	Desc./Quantity
PRIORITY 1	Flashing injection indicator. This signal identifies abnormalities that could cause serious damage to the engine or stopping of the vehicle if the vehicle continues to be used.
PRIORITY 2	Steady injection indicator. This denotes faults that impair the vehicle use since the engine can stop or remain idle.
PRIORITY 3	This priority level denotes faults not reported to the driver by the injection indicator. Faults can be perceived by the evident fault of the engine (i.e. the revolutions do not increase) or by indication of: - Coolant temperature indicator not efficient - Injection indicator always off or always on

menù diagnosis tester**Menu of the diagnostic tester**

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

Specific tooling**020460Y Scooter diagnosis and tester**

The diagnostic tester is provided with a base setting menu.

To select the various functions, proceed as follows:

1. Press «ESC» and «OK» and keep them pressed while enabling the battery power.
2. The display shows the following menu: ECU DIAGNOSTIC, LINK TO PC, CONTRAST SET, LANGUAGE SET, BUZZER SET, VERSION
3. Select ECU diagnostic
4. Select the software for the PUREJET system
5. Wait until the modules are loaded
6. The diagnostic tester is ready for use. The selected software will stay in memory also for the next uses

N.B.

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

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

- PARAMETERS
- ERRORS
- PARAMETERS STORED
- ERROR CLEARING
- ACTIVE DIAGNOSTIC

- TPS RESET
- CALIBRATION
- ECU INFORMATION

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

- To connect the scooter diagnostic tester, raise the seat
- Remove the battery cover
- Remove the cover from the diagnostics plug
- Connect it to the diagnostic tester wiring



- Connect the power supply cable with battery terminals to the diagnostic tester
- Connect the terminals to the battery respecting the polarity: RED (+) - BLACK (-)

N.B.

FAILURE TO DO SO MAY PERMANENTLY IMPAIR THE DIAGNOSTIC TESTER

N.B.

IF THE VEHICLE BATTERY IS USED, THERE IS NO NEED TO ATTACH THE BLACK TERMINAL TO THE NEGATIVE TERMINAL ON THE BATTERY.



- To disconnect the tester, remove the terminals from the battery
- Remove the connector from the diagnostic outlet
- Reapply the protection cap to the diagnostic outlet to prevent dirt from depositing on the contacts
- Refit the battery cover

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

PARAMETERS

Specification	Desc./Quantity
ENGINE RPM	Displays the regime of the engine in all conditions, including the start-up
ENGINE TEMP. °C	Indicates the coolant temperature
THROTTLE OPEN. %	Indicates the % of opening of the throttle valve
T. FUEL INJECT. MS	Time of opening the fuel injector
AIR INJECTION T. MS	Time of opening the air injector (air- fuel spray)
ADVANCE IGN. °	Advance ignition in degrees before the TDC
VOLTAGE SENSOR V	Denotes the voltage of the TPS sensor
TEMP. ENGINE V	Denotes the voltage of the coolant temperature indicator
TPS1 OUTPUT V	Indicates the TPS1 voltage indicator
TPS2 OUTPUT V	Indicates the TPS2 voltage indicator
TPS1 RESET V	Indicates the reset voltage of the TPS1 indicator (voltage referring to the ground)
TPS2 RESET V	Indicates the reset voltage of the TPS2 indicator (voltage referring to the positive 5V)
VOLT. BATT. V	Indicates the power supply voltage of the ECU (normally identical to the power of the vehicle battery)
T. OF DWELL MS	Indicates the core dwell time of the H.V. coil
MIN RPM	Indicates the number of engine revolutions set in the ECU for checking the minimum
INST. CONS.L/H	Indicates instantaneous fuel consumption
D. CYCLE CONS. %	Indicates the ratio in % between the time in "ON" and the time in "OFF" of the consumption meter control indicator (this vehicle is not fitted with this instrument)
ENGINE STATUS	Displays the status of the engine: STALL (stopped) CRANK (start up) IDLE (minimum) RUN (gear) ORC (limit on revolutions in progress)
RUNNING HOURS	Displays the engine running time (in hours)
S.T. FUEL PUMP.	Denotes the status of the fuel pump (OFF - ON)
TPS TO RESET	Indicates the need to repeat the reset of the TPS indicators (YES- NO)

ERRORS

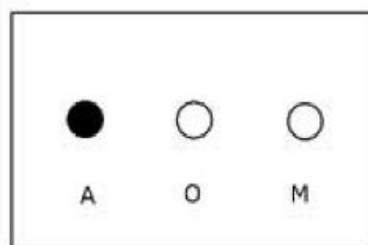
Specification	Desc./Quantity
G11 P0115	Engine temperature indicator: the voltage of the coolant temperature indicator is near 0V (short circuit) or 5V (open circuit). <u>Temperature indicator off</u> Light off

Specification	Desc./Quantity
G11 P0217	Engine temperature high: the coolant temperature signal voltage has reached too low voltages. They denote a very high temperature, higher than what can be indicated by the instrument panel. Flashing light
G20 P1120 TPS OFFSET	The voltage of TPS signals is not as expected. <u>Engine is in 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> Flashing light
G21 P1124 TPS1 OFFSET	TPS1 signal is not as expected. <u>Light off</u>
G21 P1125 TPS1	TPS1 signal missing. Voltages close to 0V (short circuit) Voltages 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 Flashing light
G30 P1560 voltage sensor	The TPS sensor and coolant temperature sensor supply voltage are not as expected. <u>Light off</u>
G30 P1561 Sensor 2	TPS voltage sensor and coolant temperature sensor are not as expected (high temperature). <u>Engine remains at forced idle</u> <u>Light on</u>
G40 P0219 Runaway rpm	The engine has reached excessive rpm. <u>Light on</u>
G40 P0335 Rpm pickup	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 engine idle or during start up, the automatic transmission or the clutch has required an excess driving force. The fault is registered when the engine management is not as expected for 3 consecutive times. <u>Light off</u>
G50 P0251 Fuel injector	The ECU has detected an interruption in the injector circuit. The fault can only be recognised in the presence of phase - rpm <u>Light on</u>
G50 P0350 H.V. coil	The ECU has detected an interruption in the HV coil primary supply circuit. The fault can only be recognised in the presence of phase - rpm. <u>Engine without injection</u>

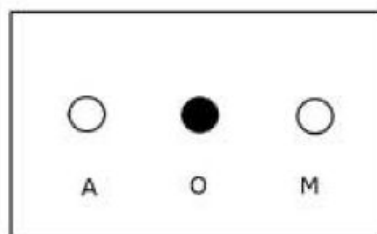
Specification	Desc./Quantity
G60 P0230 Fuel pump	The ECU has detected an interruption or short circuit on the power supply line of the pump. Light on
G60 P0650 Check lamp.	The ECU has detected an interruption or short circuit on the injection indicator supply. Open circuit: indicator always off Circuit to ground: light always on
G60 P1561 Temp. indicator	The ECU has detected an interruption or a short circuit on the temperature indicator circuit. Light off
G60 P1160 Air injector	The ECU has detected an interruption in the injector circuit. The fault can only be recognised in the presence of phase - rpm Light on

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

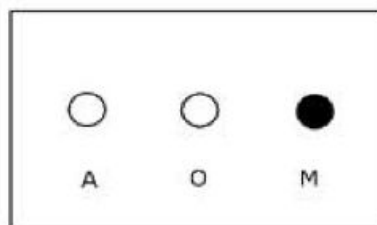
- Dot on the column marked «A». The fault is «CURRENT» and present during the check



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



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



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

Parameters stored

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

The diagnostic tester can contain a single memorisation.

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

Error clearing

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

Active diagnosis

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

The components involved are:

ACTIVE DIAGNOSTICS

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

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

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

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

Resetting the TPS

This function allows combining the throttle body with the ECU.

Calibration

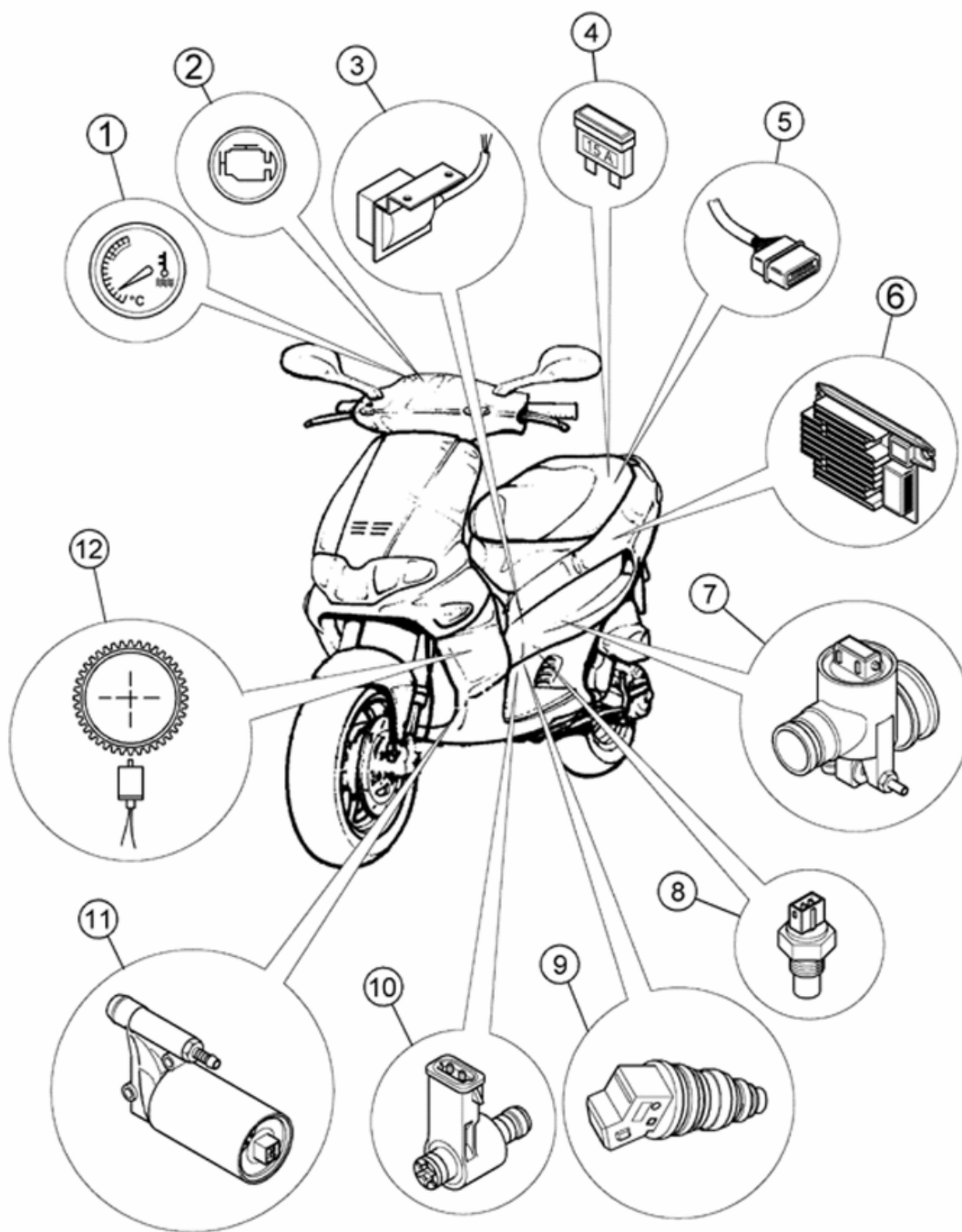
This function makes it possible to insert new calibrations to the ECU with the product developments.

ECU information

The tester displays the following information:

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

component layout

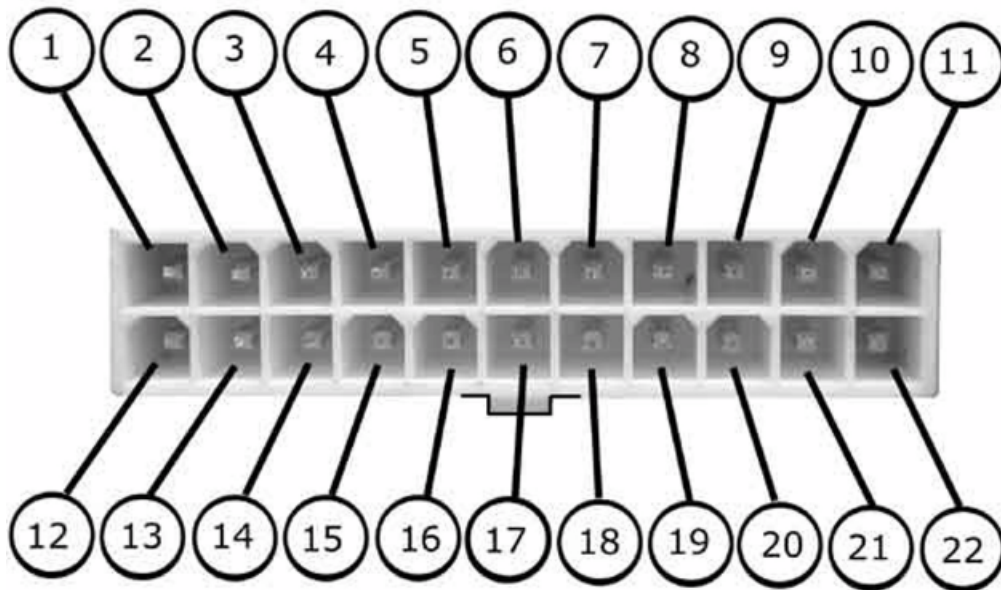


POSITION OF COMPONENTS

	Specification	Desc./Quantity
1	Temperature sensor	
2	"WARNING" light	
3	HV coil	
4	N° 2 15 A fuses	
5	Diagnostic socket	
6	EMS electronic injection control unit	
7	Throttle body	
8	Coolant temperature sensor	

	Specification	Desc./Quantity
9	Fuel injector	
10	fuel pump	
11	Flywheel - rpm timing sensor	

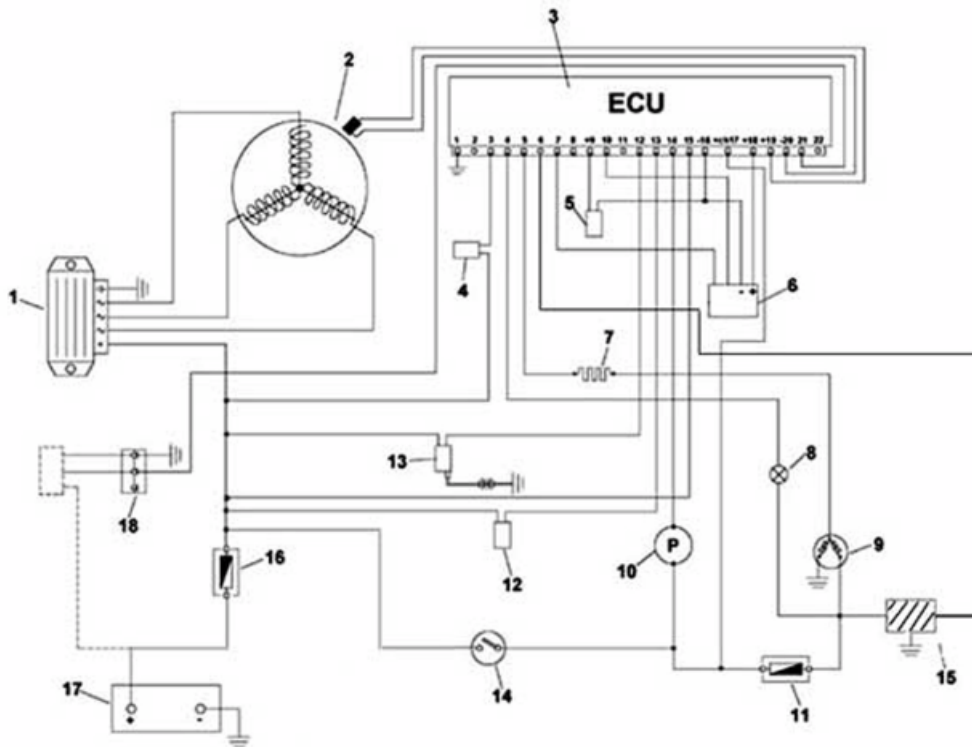
terminal layout on cpu



- 1 - Ground
- 2
- 3 - Fuel injector (negative)
- 4 - To diagnostic indicator (negative)
- 5 - Coolant temperature indicator (button negative)
- 6
- 7 - TPS 1 signal
- 8
- 9 - Coolant temperature sensor (positive)
- 10 - TPS 2 signal
- 11
- 12- H.V. 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

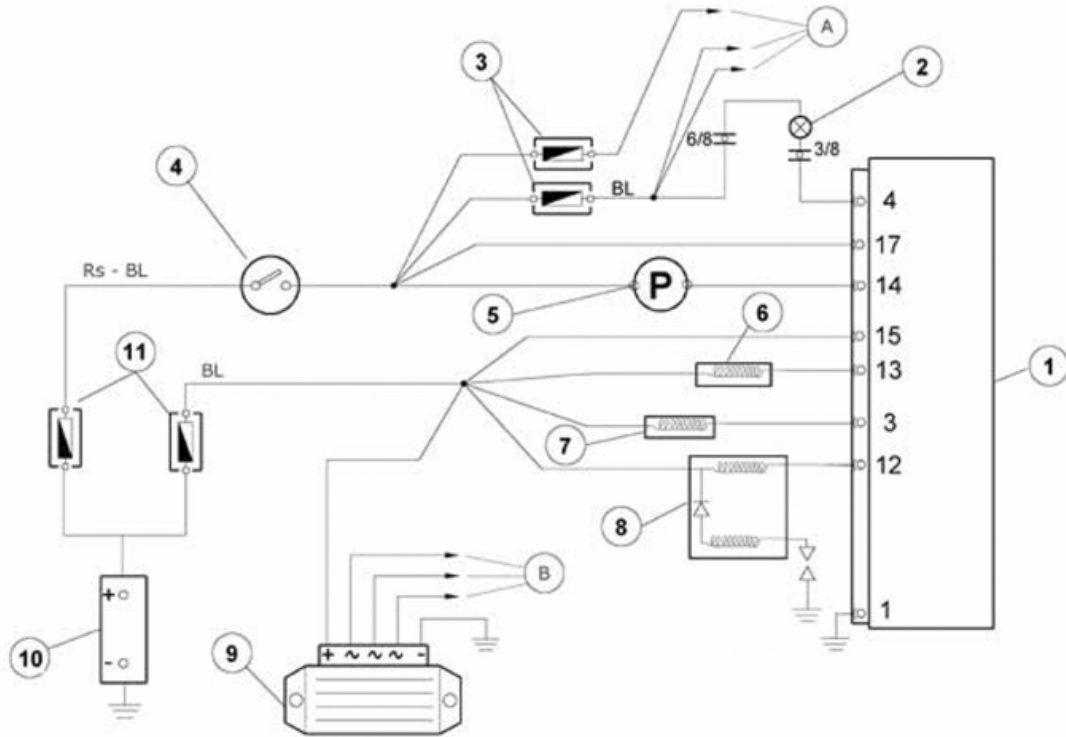


EMS SYSTEM DIAGRAM

	Specification	Desc./Quantity
1	Voltage regulator	
2	Flywheel magneto pick - up	
3	ECU	
4	Fuel injector	
5	Water temperature sensor	
6	Throttle body pos.	
7	Resistor 27 Ohm x 0.5W	
8	Diagnostic light	
9	Water temp. indicator	
10	Fuel pump	
11	7.5A	
12	Air injector	
13	H.V. coil	
14	Key switch contacts	
15	Fuse	15A
16	Fuse	15A
17	Battery	

	Specification	Desc./Quantity
18	Diagnostics outlet	

cpu power circuit



INJECTION ECU POWER SUPPLY CIRCUIT

	Specification	Desc./Quantity
1	ECU	
2	Injection warning light	
3	7.5A	
4	Ignition key-switch	
5	Fuel pump	
6	Air injector	
7	Fuel injector	
8	HV coil	
9	Voltage regulator	
10	Battery	12V - 9Ah
11	Fuse	15A
12	To services	
13	To flywheel magneto	

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

Check the following conditions:

- Ignition light on steady
- Fuel pump activated for approx. 4-5 seconds

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

2- The ECU supplies are currently present.

GO TO point 9

N.B.

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

3- The ignition light is flashing.

GO TO point 5

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

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

GO TO point 7 GO TO point 8

Specific tooling**020460Y Scooter diagnosis and tester**

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

GO TO point 13

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

- engine temperature

- TPS

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

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

GO TO point 10

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

YES point 15 NO point 16

Specific tooling**020460Y Scooter diagnosis and tester**

10- Measure the battery voltage.

GO TO point 11

GO TO point 12

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

GO TO point 15

12- The battery voltage is between 8.5 and 14.5 V

GO TO point 18

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

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

GO TO point 19

Specific tooling

020460Y Scooter diagnosis and tester

15- Check the charger.

GO TO point 17

16- The ECU supplies are conform.

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

GO TO point 20

18- Check the main supply.

GO TO point 20

19- Check the power supply to panel.

GO TO point 20

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

- Remove the two 15 A fuses
- Disconnect the connector from the ECU
- Connect the specific tool to the vehicle installation, not connecting the ECU
- Re-connect the two 15 A fuses

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

GO TO point 21

Specific tooling

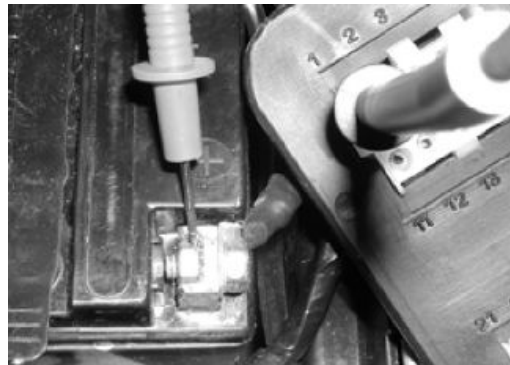
020481Y Control unit interface wiring

21- Check on the ground connection.

Check the ground connection on pin n°1 by using the multimeter.

1 - battery positive = battery voltage

YES point 22 NO point 23



22- The ground line is efficient.

GO TO point 24

23- Check and restore where necessary the direct ground line to the battery.

GO TO point 21

24- Check the main supply.

Check the presence of battery positive voltage on pin 15.



1 - 15 = battery voltage

YES point 25 NO point 26

25- The supply is conform.

26- Check the efficiency of the 15A fuse and of the connections to the fuse-holder (red - blue)

YES point 27 NO point 28

27- Restore the continuity of the line connecting fuse with pin 15 (blue cable)

GO TO point 24

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

- Air injection
- Fuel injection
- H.V. core.
- Voltage adjuster

GO TO point 29

29- Remove the burnt fuse. Check the mass insulation of the pin 15 supply line

1 - 15 = Ohm infinite

YES point 31 NO point 30

30- Restore the wiring insulation.

GO TO point 29

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

1 - 15 = V battery

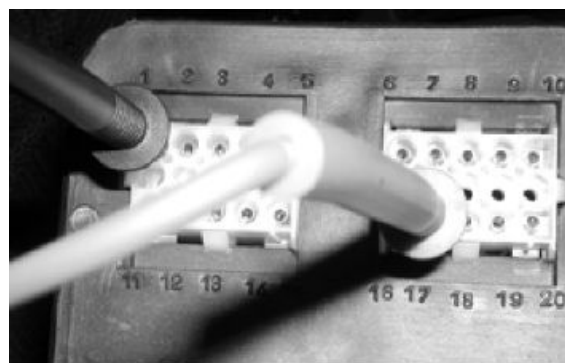
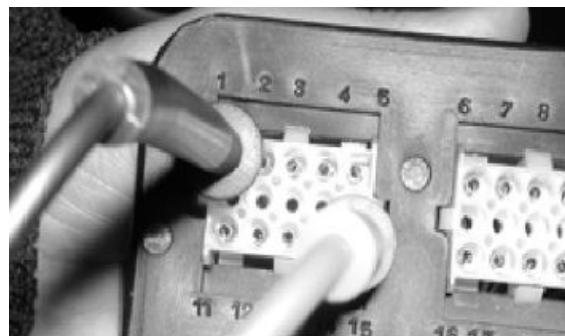
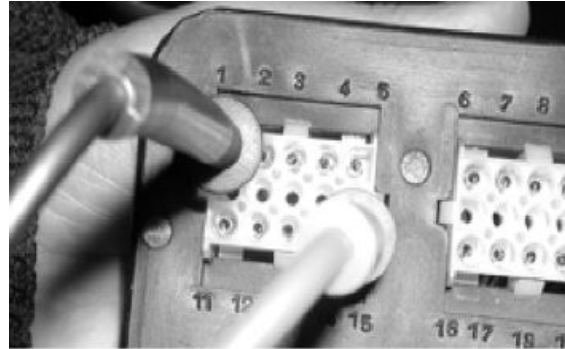
YES point 33 NO point 32

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

GO TO point 31

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

- air injector



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

GO TO point 24

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

- 1 - 17 = battery voltage (switch on «ON»)
- 1 - 17 = 0V (switch on «OFF»)

YES point 35 NO point 36

35- The ECU power supply to panel is conform.

36- Check the efficiency of the 15A 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 specific tool from the ECU
- Remove the 2 7.5 A fuses
- Remove the connector of the fuel pump

GO TO point 41

Specific tooling

020481Y Control unit interface wiring

41- Remove the burnt 15A fuse. Check the mass insulation of the supply line of pin 17 with the switch on «ON»

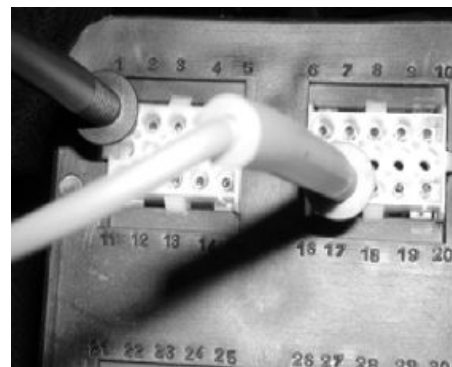
1 - 17 = Ohm infinite

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

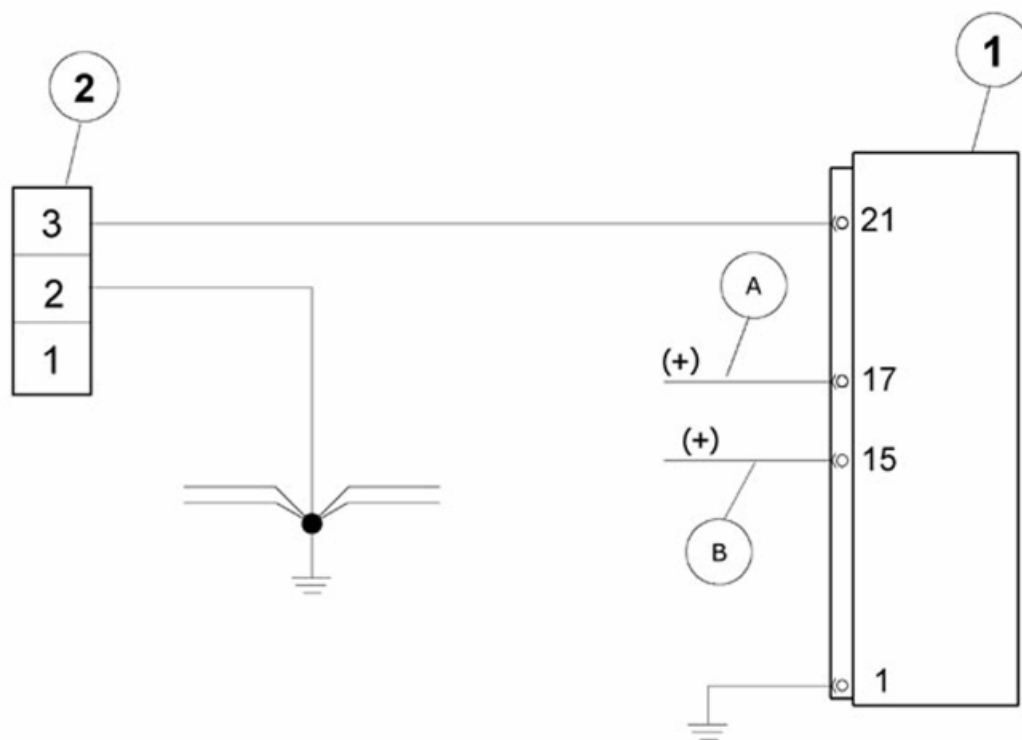
44- If the fuse is again burnt. Check the wiring more accurately and, if necessary, replace the ECU

GO TO point 34

45- Make a good visual check of the wiring to avoid possible causes for short circuits. Reconnect the 7.5 A fuses. If there are no anomalies, check any possible short circuits or absorbance on the supply circuit of the fuel pump.

GO TO point 34

diagnosis tester connection circuit



COMPONENTS LAYOUT:

1 ECU

2 Diagnostic outlet

A + Under-panel

B + Fixed

Connect the scooter diagnostic tester.

Enter the main menu and select a function.

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

Specific tooling

020460Y Scooter diagnosis and tester

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

YES point 3 NO point 2

2. Restore the connection.

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

GO TO point 4

4. Check the ECU supplies.

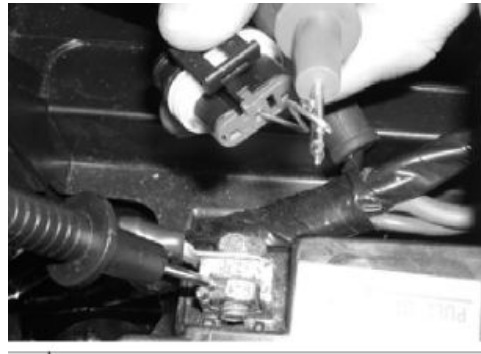
GO TO point 5

5. Disconnect tester from diagnostic connector.

Check the continuity of the ground line between diagnostic connector and vehicle mass.

Diagnostic connector Pin «2» - Battery negative = continuity

YES point 7 NO point 6



6. Restore the continuity of the ground line.

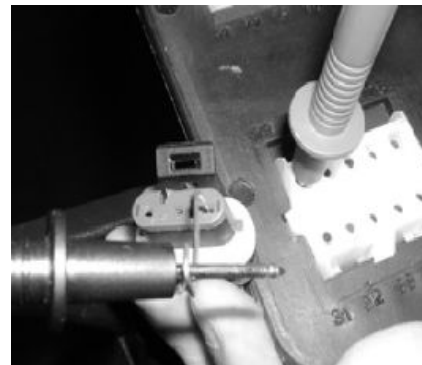
7. Connect the interface wiring.

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

Pin 3 = diagnostic connector

Pin 21 = continuity

YES point 9 NO point 8



Specific tooling

020481Y Control unit interface wiring

8. Restore the wiring continuity.

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

(Keep the ECU disconnected)

21 - 15 > 1MΩ

21 - 1 > 1MΩ

YES point 11 NO point 10





10. Restore the wiring connection.

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

Injection lamp circuit

THERMIC: 1 - 4

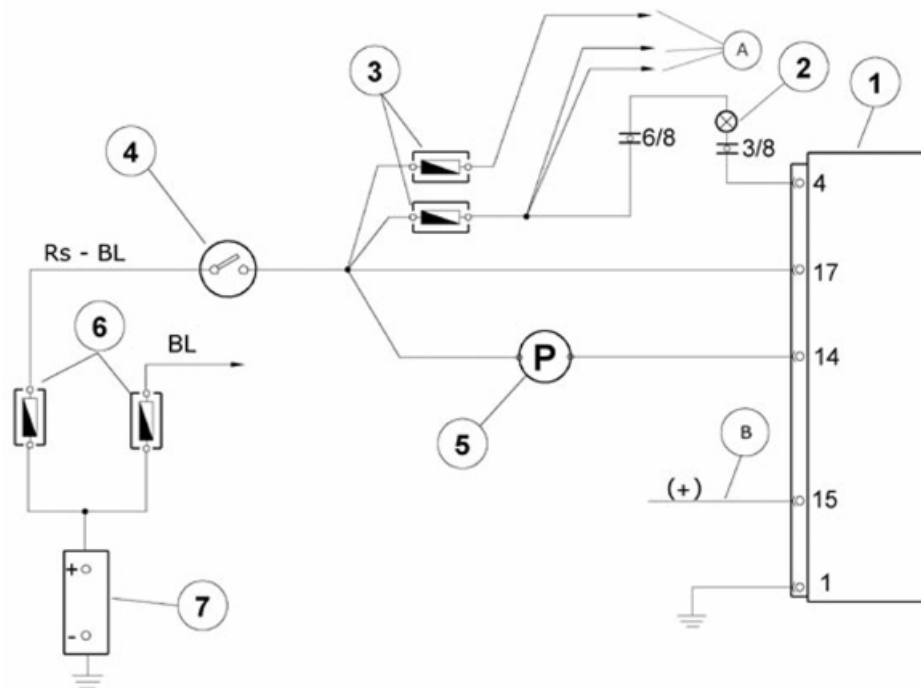
CONDITIONS: Key selector set to «ON», engine off

STANDARD: Less than 0.1 V

THERMIC: 1 - 4

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

STANDARD: Battery voltage



1 ECU

2 Injection indicator

- 3 Fuses 7.5A
- 4 Key switch
- 5 Fuel pump
- 6 Fuses 15A
- 7 Battery 12V 9Ah
- A Ai services
- B + Fixed

The injection indicator should turn on every time you switch to "ON" while the engine is started. When the self-diagnosis detects a fault, it commands the lighting of the indicator according to the priority level:

- PRIORITY 1 = ON, FLASHING
- PRIORITY 2 = ON, SOLID

See self-diagnosis

The indicator lighting is commanded by the ECU by the negative management. The ECU functions may be checked in case of need.

Use the scooter diagnostic tester to select the "active diagnoses" function.

Enable the "check - lamp" diagnosis with the switch set to "ON" and engine off. The indicator lamp, normally on, will turn off for a moment, thereby confirming the ECU operation.

The self-diagnosis indicator function is also active on the injection indicator circuit

Specific tooling

020460Y Scooter diagnosis and tester

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

CHECK LAMP

YES point 3 NO point 2

Specific tooling

020460Y Scooter diagnosis and tester

2. Control circuit and lamp are efficient
3. Any faults in current status would be perceived before connecting the diagnostic circuit. To check the circuit, proceed as follows.

GO TO point 4

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

- 1 - 4 = battery voltage
- lamp off



Specific tooling

020481Y Control unit interface wiring

5. Remove the 7.5A 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 (5/5) - White (6/8) = battery voltage with switch to "ON"

SI punto 10 NO punto 9



9. Positive power to panel missing. This comes from the switch and the 7.5A 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

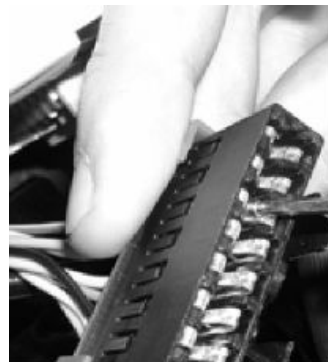
YES point 12 NO point 11

11. Replace the lamp.

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

GREY (3/8) - pin 4 = 0Ohm (continuity)

If there is no continuity, restore the wiring.

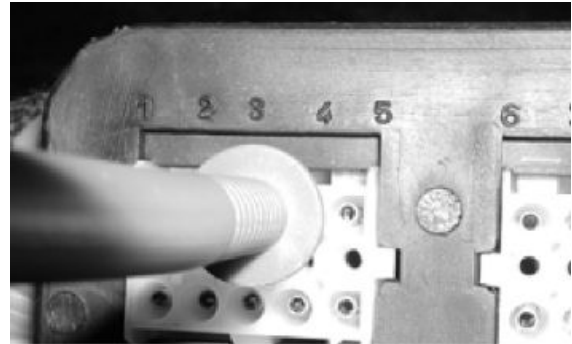




13. Battery voltage is missing and the lamp is on. Access the instrument unit and disconnect the 8-pin connector. Check the ground insulation of the connection line .

1 - 4 > 1M Ω

In case of faults, restore the wiring.



See also

[autodiagnosis](#)

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

TERMINALS: 16 (-) - 18 (+)

CONDITIONS: Key switch set to «ON»

STANDARD VALUES: 5V

TERMINALS: 16 - 7

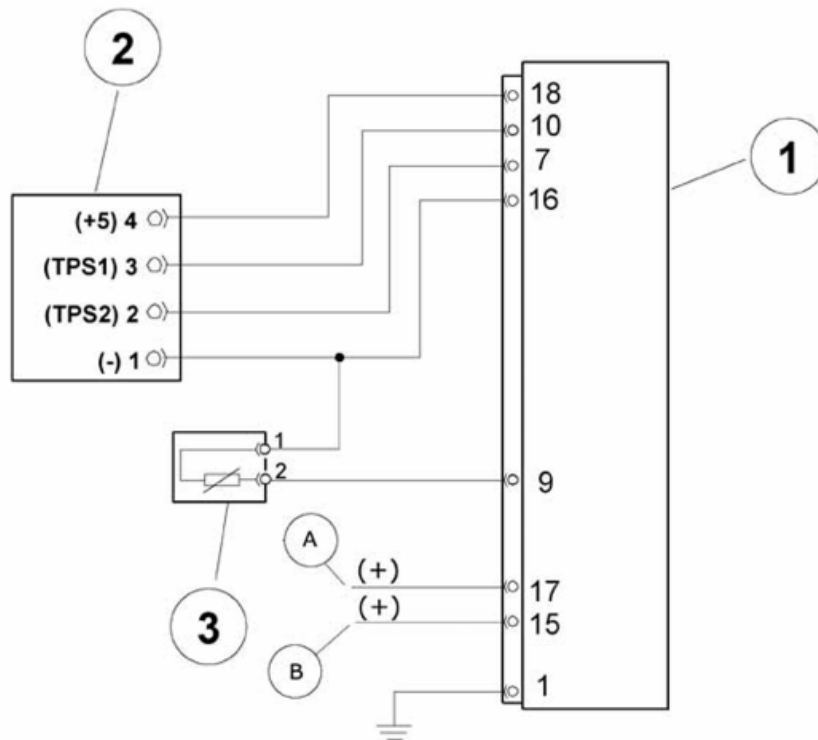
CONDITIONS: Key switch set to «ON», opening the gas gradually

STANDARD VALUES: V= progressive increase

TERMINALS: 16 - 10

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

STANDARD VALUES: V= progressive decrease



COMPONENTS LAYOUT

1 ECU

2 TPS (Throttle Position Sensor)

3 Coolant temperature sensor

A + 12V under panel

B + 12V fixed

The gas valve position sensor (TPS) is an integral part of the throttle body, and therefore it cannot be removed. The sensor receives 5V power supply (measured electronically) by the ECU. The 5 V power supply is used for both the TPS sensor circuit and for the coolant temperature sensor circuit. The TPS sensor is of the dual track type, i.e., with two resistive tracks that generate two opposite signals defined as TPS1 and TPS2. Signal TPS1 increases with the gas valve opening increase. Signal TPS2 decreases with the gas valve opening increase. The two signals will therefore be equivalent in a single point, corresponding to mean opening (50%). The two signals are converted into a percentage value of opening of the gas valve. The dual track system allows a greater control, since signals TPS1 and TPS2 are compared to each other and to a reference map. When TPS signals missing, or not matching what expected, are detected, the auto-diagnostic is started and the relevant fault is coded. Faults are reported according to three priority levels. TPS signals along with the rpm - phase signal are the basis references for the integrated injection - ignition system functionality.

The check of the gas valve position sensor and relevant circuit can be performed using scooter diagnostic testers.

Specific tooling

020460Y Scooter diagnosis and tester

For the check, proceed as follows.

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

THROTTLE OPEN. %

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

TPS1 OUTPUT = V

TPS2 OUTPUT = V

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

TPS1 - Increases progressively

TPS2 - Decreases progressively

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

N.B.

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

TPS1 ZERO = V

TPS2 ZERO = V

TPS TO REST = (NO - YES)

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

Select the errors function.

Check the following errors and relevant ISO codes:

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

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

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

1. Install the interface wiring ECU.

Specific tooling

020481Y Control unit interface wiring

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

GO TO point 2

2. Use a multimeter to check the wiring continuity.

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

N° 2 (TPS) - 7 (ECU) = Ohm Continuity

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

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

YES point 4 NO point 3

3. Restore or replace the wiring.

GO TO point 2

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

1 - 16 > 1 MOhm

1 - 7 > 1 MOhm

1 - 10 > 1 MOhm

1 - 18 > 1 MOhm

YES point 6 NO point 5

5. Replace or restore the wiring.

GO TO point 4

6. Check the wiring positive insulation.

N.B.

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

1 - 16 = 0 Volt

1 - 7 = 0 Volt

1 - 10 = 0 Volt

1 - 18 = 0 Volt

YES point 8 NO point 7

7. Restore or replace the wiring.

GO TO point 6

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

16 - 7 - 10 - 18

Reciprocal insulation > 1 MW

Check the connector efficiency.

YES point 10 NO point 9

9. Replace or restore the wiring.

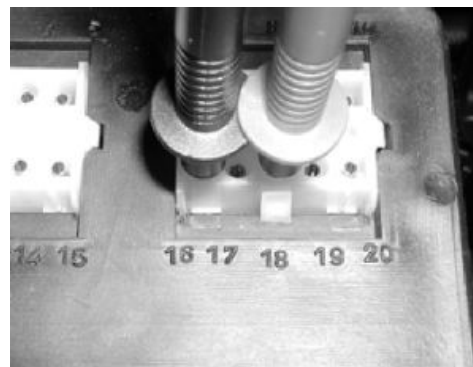
GO TO point 8

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

Check the TPS sensor power supply.

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

YES point 12 NO point 11



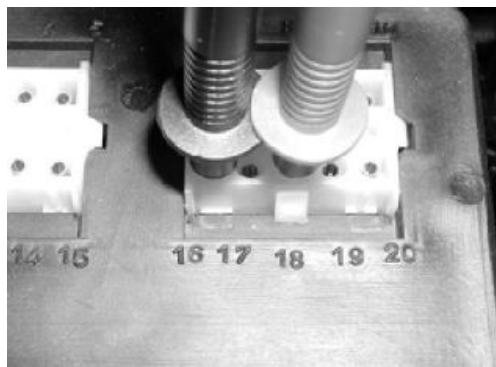
11. Carefully check the ECU power supply. Replace the ECU if required.

GO TO point 10

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

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

YES point 14 NO point 13



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

Replacement

Resetting

GO TO point 12

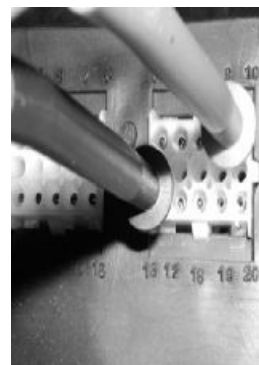
14. Measure the voltage of the TPS1 and TPS2

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

16 - 10 = V TPS2 (decreasing with the opening from 4.5 to 0.5V)

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

YES point 16 NO point 15



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

Replacement

Resetting

GO TO point 14

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

YES point 18 NO point 17

Specific tooling

020481Y Control unit interface wiring

020460Y Scooter diagnosis and tester

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

18. TPS sensor and circuit meet specs.

See also[menù diagnosis tester](#)

T.P.S. signal reset

The throttle body is supplied with gas valve and is precalibrated. Precalibration entails regulating the minimum opening of the gas valve to obtain a certain flow of air under preset reference conditions. Pre-calibration results in an optimum air capacity for the engine management during start up or during idle running, and at any possible temperature during the use of the vehicle. This is allowed by the electronic management of the engine and by its capacity to work with very lean air - fuel mixtures. In fact, pre-calibration results in an air capacity which, with idle and hot engine, is much higher than the actual requirements.

To achieve higher engine performance, increased rpm are not due to the gas valve opening increase, but are enabled by the ECU.

When the ECU perceives a slight increase in the gas valve opening, it enables the engine to fast rotation and excludes the idle and the CUT OFF management.

This result can be obtained by recovering the pre-calibration and keying tolerances of the TPS sensor on the throttle body.

This occurs by resetting the signals TPS1 and TPS2, i.e., by reporting the voltage values TPS1 and TPS2 corresponding to the pre-calibration position to the ECU.

These voltage values will be recognised as suitable by the ECU only if falling within the design default ranges.

The throttle body pre-calibration register is sealed with paint and must not be tampered with.

The signals TPS1 and TPS2 may be reset as follows:

- Automatic reset
- Manual reset

Specific tooling**020460Y Scooter diagnosis and tester**

automatic T.P.S. reset**AUTOMATIC RESET**

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

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

1- Connect the scooter diagnostic tester

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

GO TO point 2

GO TO point 4

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

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

GO TO point 3

3. Carry out the manual reset procedure.

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

GO TO point 5

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

TPS1 OUTPUT V 0.64

TPS2 OUTPUT V 4.27

TPS1 ZERO V 0.64

TPS2 ZERO V 0.72

The voltage reported here corresponds to a possible condition.

GO TO point 6

6. Check the following conditions:

TPS1 OUTPUT = TPS1 ZERO

TPS2 OUTPUT + TPS2 ZERO = 5V

YES point 7 NO point 8

7. The TPS reset meets specs.

8. Repeat the reset procedure using the manual mode.

Specific tooling

020460Y Scooter diagnosis and tester

Manual T.P.S. reset

MANUAL RESET

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

- The throttle body has not been tampered in pre-calibration
- The throttle body connector is properly inserted
- The control transmission is properly installed and adjusted

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

1- Connect the scooter diagnostic tester

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

GO TO point 2

2. Check for possible errors

Wait

GO TO point 3

GO TO point 4

3. Errors present

Cancel all errors

Press a key

GO TO point 5

4. No errors

Press a key

GO TO point 6

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

GO TO point 1

6. TPS reset in process

Wait

GO TO point 7

7. Key «OFF»

Press a key

GO TO point 8

8. Check the abut of the throttle body

Push OK to proceed

GO TO point 9

9. Wait

GO TO point 10

10. Key on «ON»

Press a key

GO TO point 11

11. Wait

GO TO point 12

12. Check for possible errors

Wait

GO TO point 13

13. No errors

Press a key

GO TO point 14

14. Wait

GO TO point 15

15. TPS resetting successful

Press a key

GO TO point 16

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

rpm-timing sensor circuit

TERMINALS: 19 - 20

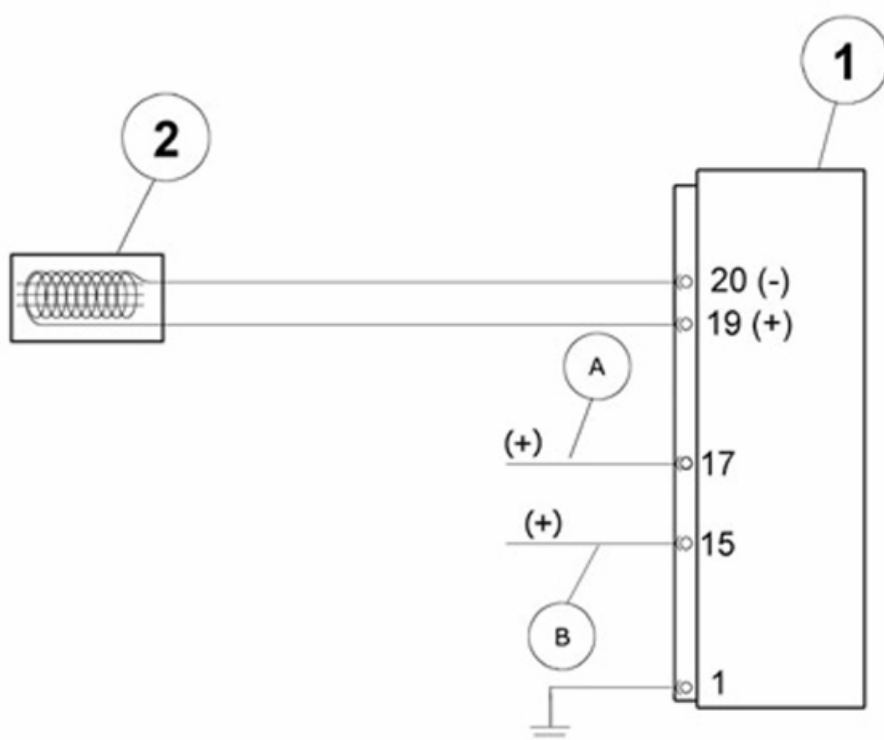
CONDITIONS: Engine driven by the starter (500-600 RPM)

STANDARD VALUES: V = 3.5 - 4

TERMINALS: 19 - 20

CONDITIONS: Idle engine

STANDARD VALUES: V = 11 - 12



COMPONENTS LAYOUT

1 Injection ECU

2 Pick - up

3 + to panel

4 + fixed

This integrated ignition and injection system requires a prompt perception of the running speed and of the crankshaft angular position. The ECU must control the following upon each engine cycle:

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

Every actuator is controlled with a specific timing. Control is made possible by the phase - rpm signal, coming from a phonic wheel obtained on the outer diameter of the flywheel magneto rotor. The flywheel is divided into 24 sectors and is provided with 23 teeth controlling the gap variations to the pick - up core. The latter is of the reluctance variation type, and is supplied with its own magnetism and produces alternating voltage. During the flywheel rotation, each tooth changes the core magnetic activity and generates a complete alternance, in a sequence of every 15°, thereby allowing precise measurement of the rotation speed also at a periodical level. The angular position is perceived by the alternance separated by the 30° of rotation due to the missing tooth. The electrical lines connecting to the ECU are polarised to control correct timing. The positive peak of the signal is separate from the negative by about 2° of rotation.

The ECU self-diagnostic checks the phase - rpm signal even though the activity is limited to the recognition of any signal irregularities in an engine cycle. In these cases, ignition losses may occur and be signalled to the driver by a steady light. A sharp interruption of the signal causes the engine to shut down and the fault is not perceived by the self-diagnostic system. When the phase - rpm signal is missing, the following actuators are not controlled:

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

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

P0335 PICK UP RPM

YES point 2

GO TO point 3

Specific tooling

020460Y Scooter diagnosis and tester

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

GO TO point 4

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

GO TO point 4

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

GO TO point 5

Specific tooling

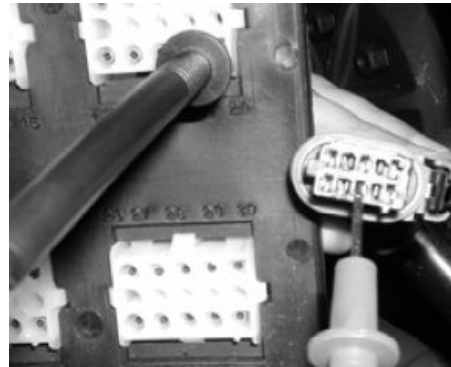
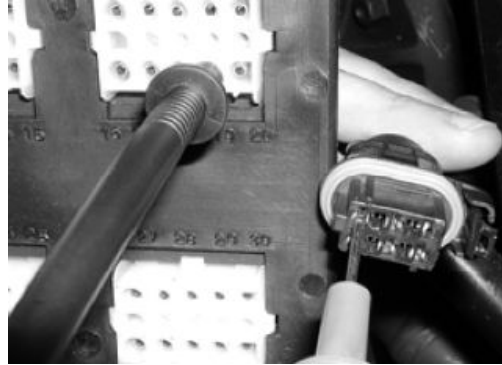
020481Y Control unit interface wiring

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

19 - red lead= Ohm continuity

20 - brown lead= Ohm continuity

YES point 7 NO point 6



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

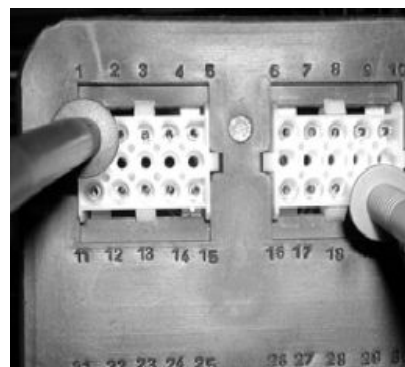
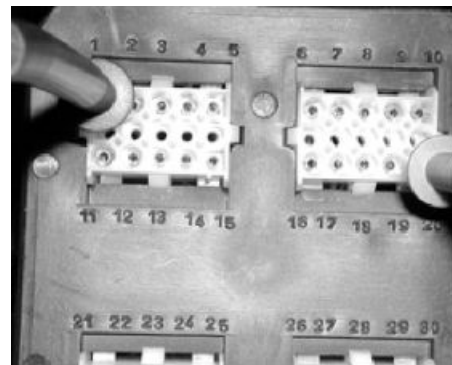
GO TO point 5

7. Check the ground insulation of the lines

1 - 19 > 1M Ω

1 -20 > 1M Ω

YES point 9 NO point 8



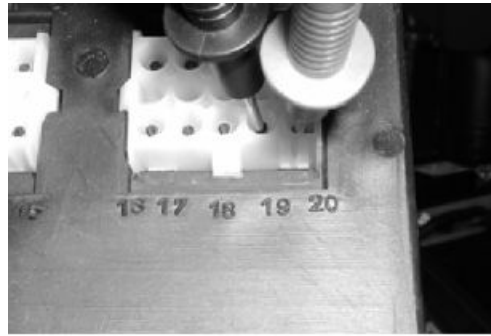
8. Restore the insulation or replace the wiring.

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.

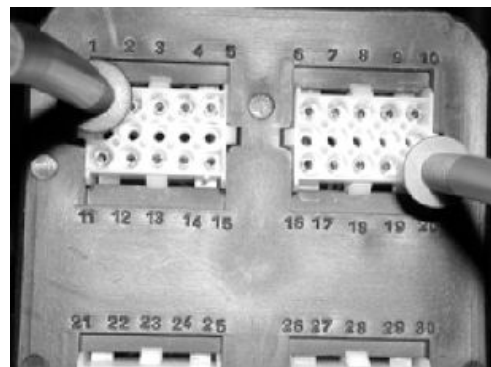
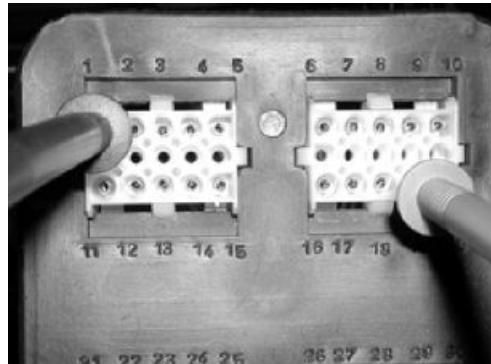
1 - 19 = 0V

1 - 20 = 0V

YES point 13 NO point 12

N.B.

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



12. Restore the insulation or replace the wiring.

GO TO point 11

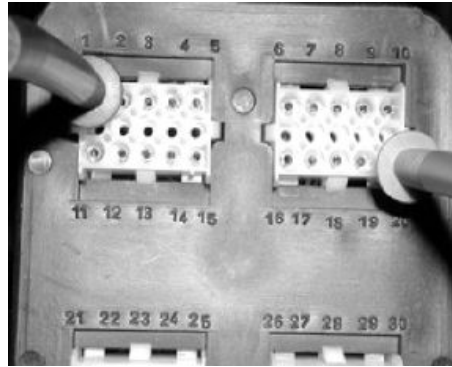
13. Connect the flywheel connector and repeat the insulation checks from earth and from positive.

1 - 19 > 1M Ω

1 - 20 > 1 M Ω

YES point 15 NO point 14





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

GO TO point 17

15. Check the phase - rpm sensor resistance

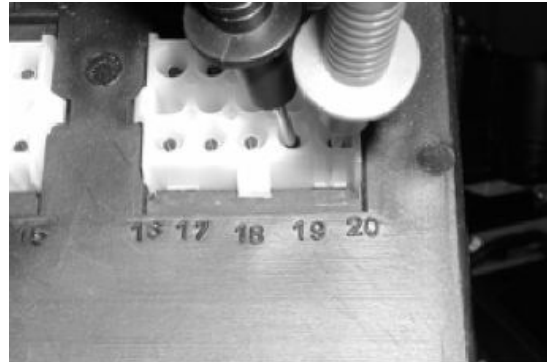
19 - 20 = Ohm..... at 20°

(detected 106.7W)

YES point 17 NO point 16

N.B.

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



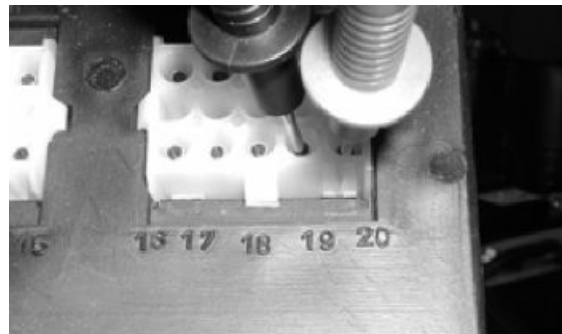
16. When out of tolerance resistive values are detected, replace the stator with phase - rpm sensor.

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

19 - 20 = 3.5 , 4 V ~

(at 500 - 600 RPM)

YES point 19 NO point 18



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

GO TO point 17

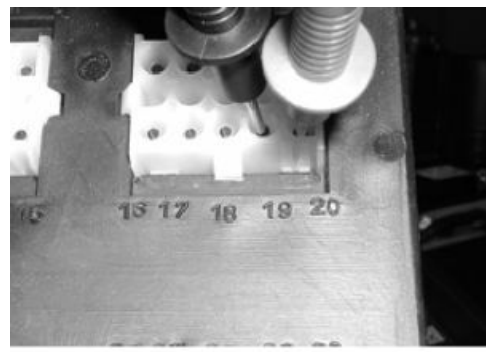
19. Connect the interface wiring to the ECU. Check the alternated voltage upon start up and at idle.

19 - 20 = 3.5 - 4 V~

(start up)

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

YES point 21 NO point 20



20. If voltages are very different, replace the ECU

GO TO point 19

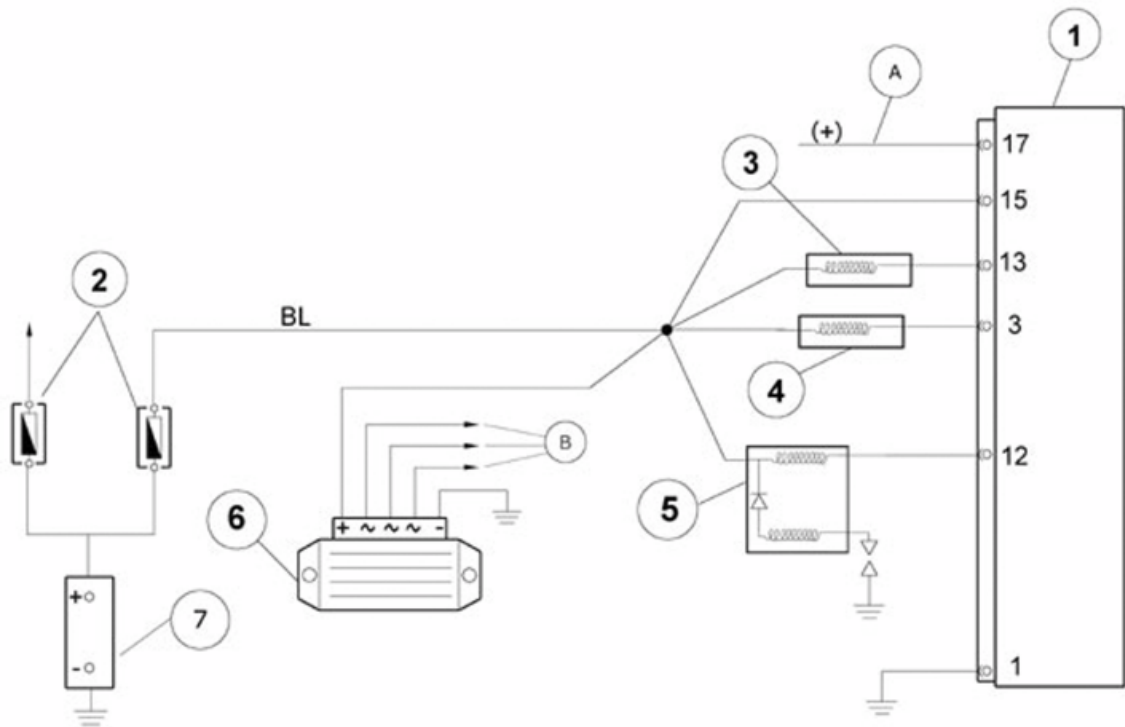
21. The phase - rpm sensor and relevant circuit are efficient.

H.T. coil circuit

TERMINALS: 1 - 12

CONDITIONS: Engine stopped, switch in any position

STANDARD VALUES: Battery voltage



COMPONENTS LAYOUT

- 1 ECU
- 2 15A fuses
- 3 Air injector
- 4 Fuel injector
- 5 H.V. coil
- 6 Key switch
- 7 12V 9Ah Battery

A + under panel

B AI magnet flywheel

The injection system integrated with the inhection is inductive. Ignition is managed based on two parameters:

- Ignition advance
- Core dwelling time (DWELL)

The ignition advance curve is optimised in function of the engine rpm and load, perceived through the signals TPS1 and TPS2.

The core dwelling time is optimised in function of the power required to the HV coil. Of course, longer dwelling times are used during start up.

The ECU self-diagnosis also checks the coil power supply circuit, detecting interruptions or short circuits. The check is only carried out in the presence of rpm - phase signals (engine running). Any fault is reported to the driver by the solid turning on of the injection indicator. In addition, for safety reasons, the injector power supply is interrupted. To reset the function, switch to "ON" "OFF" "ON". The fault is registered, with the possibility of switching to "emergency"

CIRCUIT DIAGNOSIS

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

GO TO point 2

Specific tooling

020460Y Scooter diagnosis and tester

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

YES point 3 NO point 4 NO point 5

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

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

GO TO point 2

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

GO TO point 2

CHECKING THE auto-diagnostic MESSAGE

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

P0350 H.V. COIL

YES point 3 YES point 4 NO point 2

Specific tooling

020460Y Scooter diagnosis and tester

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

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

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

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

- Uncertain contacts
- Lacking insulation

CHECKING THE ELECTRIC CIRCUIT

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

GO TO point 2

Specific tooling

020481Y Control unit interface wiring

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

1 - blue cable (positive) = battery voltage

YES point 4 NO point 3

N.B.

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



3. Check the efficiency of the 15A fuse. If necessary, restore the wiring. See ECU supply on page 5-41 .

GO TO punto 2

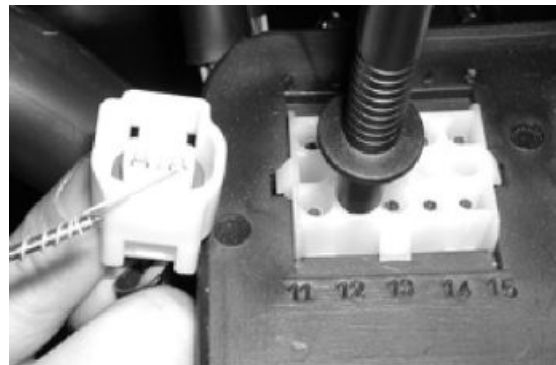
4. Check the continuity of the control line of the coil.

12 - violet - black = continuity

YES point 6 NO point 5

N.B.

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



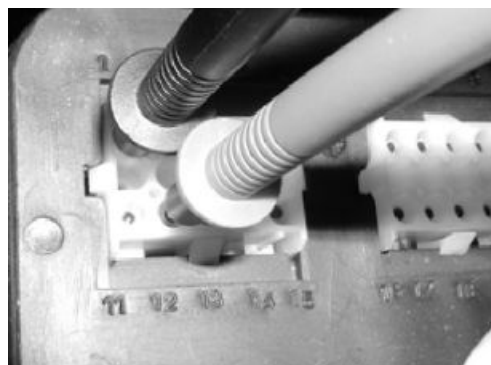
5. Restore the wiring.

GO TO point 4

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

1 - 12 = 0V

YES point 8 NO point 7



7. Restore the wiring

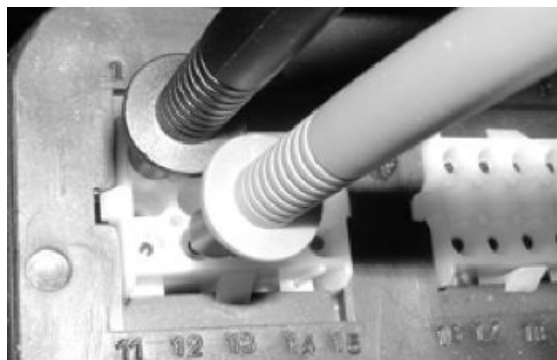
GO TO point 6

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

1 - 12 > 1M Ω

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 \pm 0.03 Ω at 23°C

YES point 12 NO point 11



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

GO TO point 10

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

Standard value > 1M Ω

YES point 14 NO point 13



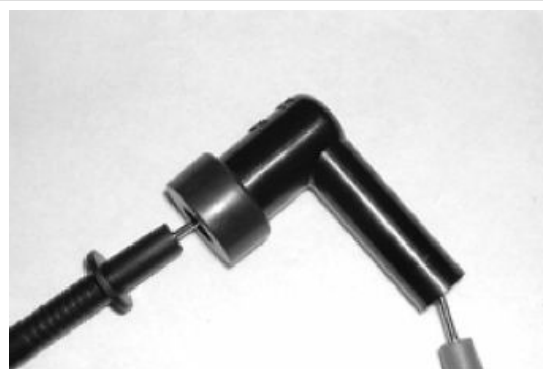
13. If lower values are detected, replace the H.V. coil.

GO TO point 12

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

Standard value = 5 K Ω \pm

YES point 16 NO point 15



15. Replace the screened cap.

GO TO point 14

16. Reconnect the following components:

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

GO TO point 17

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

1 - 12 = 300V (peak)

Minimum allowable voltage ³ 200V (peak)

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

YES point 18 NO point 19

N.B.

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

Specific tooling

020331Y Digital multimeter

020409Y Multimeter adaptor - Peak voltage detection

18. The system is efficient, check timing.

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

T. OF DWELL =

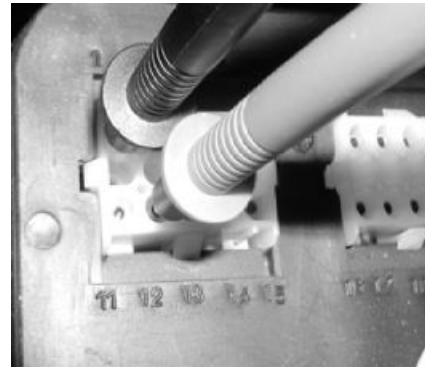
6 ms (start-up)

2 ÷ 3 ms (idle)

YES point 20 NO point 21

20. Replace the H.V. coil

21. Replace the ECU



ignition timing check

The ignition advance is electronically determined on the basis of the ECU parameters. For this reason, it is not possible to state reference values based on the engine rpm.

The ignition advance value can be detected by the parameters function of the diagnostic tester. The degrees displayed in the parameters function may be checked for matching with the actual ignition command degrees.



The following is required for this check:

- Diagnostic tester
- Stroboscopic lamp
- Adapter for the H.V. cable signal

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



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



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

N.B.

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

Specific tooling

020460Y Scooter diagnosis and tester

020330Y Stroboscopic light for timing control

020621Y HV cable extraction adaptor

compressed air system

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

The system consists of the following components:

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

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

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

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

GO TO point 2

N.B.

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

Specific tooling

020617Y Air pressure check kit

2- Remove the following electrical connectors:

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

Remove the ignition spark plug.

GO TO point 3

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

Engine rpm > or = 500 RPM

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

YES point 5 NO point 4 NO point 6





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

GO TO point 3

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

YES point 16 NO point 8

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

YES point 7 NO point 8

7- Replace the volumetric compressor.

GO TO point 3

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

YES point 9 YES point 10 NO point 11

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

GO TO point 3

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

GO TO point 3

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

YES point 13 NO point 12

12- Restore the seals or replace the hose.

GO TO point 3



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

GO TO point 14

GO TO point 15

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

GO TO point 3

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

GO TO point 3

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

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

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

GO TO point 17

Specific tooling

020460Y Scooter diagnosis and tester

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

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

N.B.

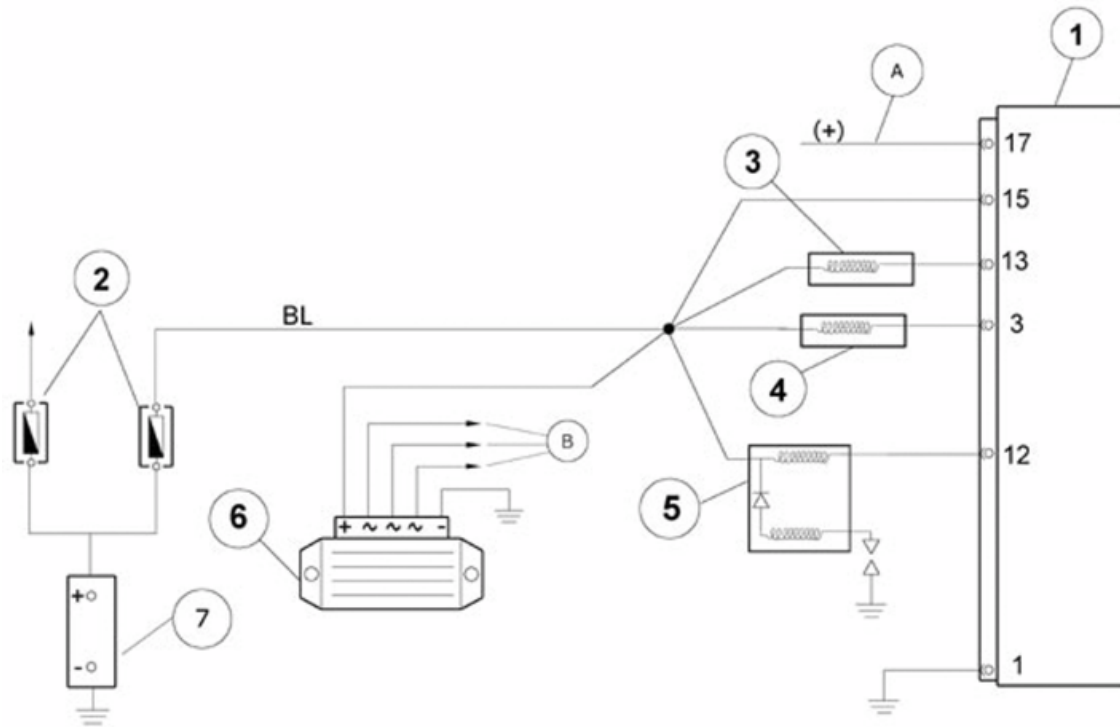
AIR PRESSURE DURING THE ENGINE OPERATION IS FAIRLY CONSTANT SINCE THE INCREASE OF CAPACITY OF THE PUMP IN RELATION TO THE INCREASE OF RPM IS PARTLY COMPENSATED BY THE LONGER OPENING TIME OF THE AIR INJECTOR. TO CONFIRM THIS, CHECK THAT THE PRESSURE INCREASES UP TO ABOUT 8 BAR (800 KPA) AFTER SWITCHING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

air injector circuit

TERMINALS: 1 - 13

CONDITIONS: Engine stopped, switch in any position

STANDARD VALUES: Battery voltage



COMPONENTS LAYOUT:

- 1 ECU
- 2 Fuses 15A
- 3 Air injector
- 4 Fuel injector
- 5 H.V. coil
- 6 Voltage regulator
- 7 12V - 9Ah battery
- A + under panel
- B To the magnet flywheel

The air injector is the main component of the electro-pneumatic injection. For convenience, the injector called air injector even though it actually injects an air and fuel mixture. Direct fuel injection transported by compressed air allows obtaining a fine nebulisation of the mixture into the cylinder. The ECU controls the air injector, checking its time and opening. This allows obtaining better results with reference to polluting emissions and consumption. The ECU self-diagnosis also checks the air injector circuit. Faults are recognised in case of circuit interruption or short circuit to earth and to positive. Any fault is reported to the driver by the solid lighting of the injection indicator light. In case of fault, the engine cannot operate. The fault is only recognised when the rpm - phase signal is present. For this reason, in the event of fault, the storage switches from "current" status to "occurred" status, when the engine stops. To check the air injector electronic circuit, proceed as follows.

1- Connect the scooter diagnostic tester. Select "active diagnosis"

GO TO point 2

Specific tooling

020460Y Scooter diagnosis and tester

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

YES point 3 NO point 4 NO point 5

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

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

GO TO point 2

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

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

P1160 AIR INJECTOR.

GO TO point 7

YES point 8 YES point 9

Specific tooling

020460Y Scooter diagnosis and tester

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

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

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

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

GO TO point 11

Specific tooling

020481Y Control unit interface wiring

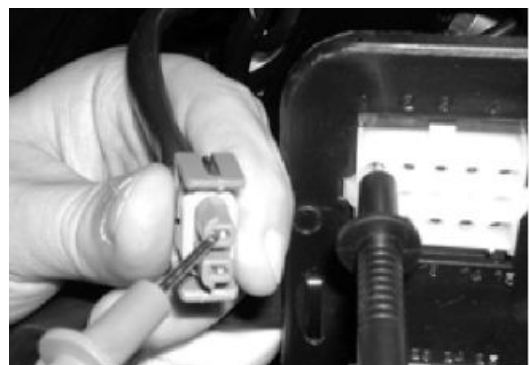
11 - Check the battery positive voltage to the blue lead of the power supply connector of the air injector.

1 - blue lead (positive) = V battery

YES point 13 NO point 12

N.B.

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



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

GO TO point 11

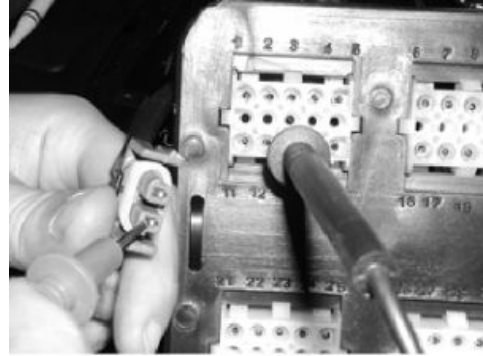
13- Check the continuity of the air injector control line.

13 - pink (injector connector) = continuity

YES point 15 NO point 14

N.B.

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



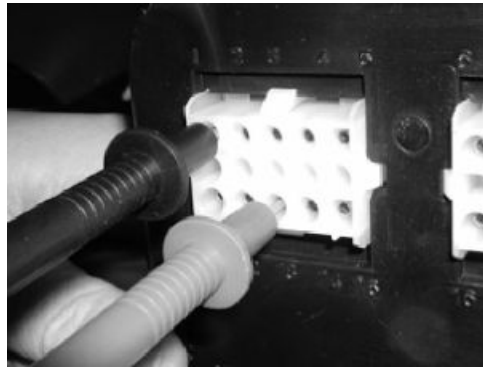
14- Restore the wiring.

GO TO point 13

15- Check the air injector control line positive insulation.

1 - 13 = 0V

YES point 17 NO point 16



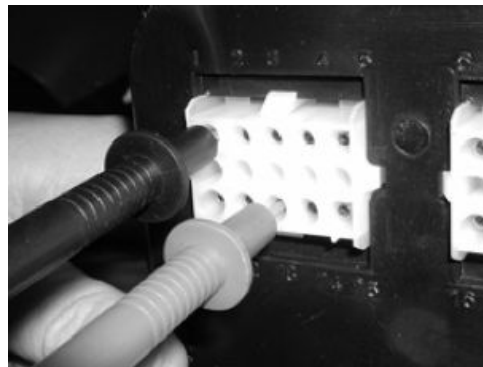
16- Restore the wiring.

GO TO point 15

17- Check the air injector control line negative insulation.

1 - 13 > or = 1MΩ

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



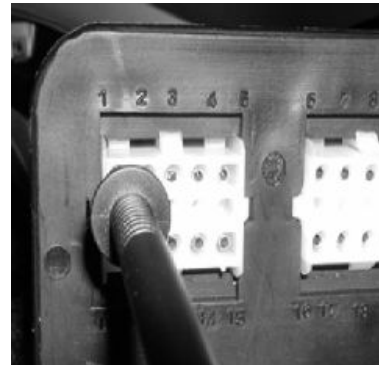
20- If very different resistive values are detected, replace the air injector.

GO TO point 19

21- Check the air injector winding negative insulation.

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

YES point 23 NO point 22



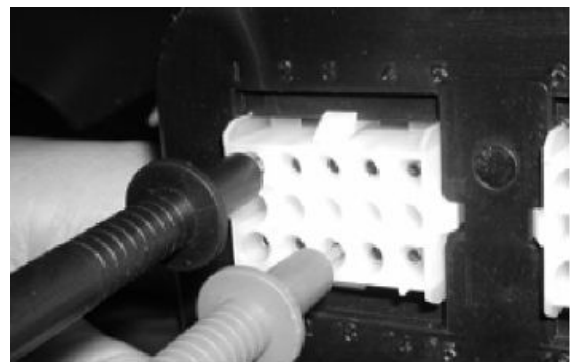
22- Replace the air injector.

GO TO point 21

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

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

YES point 25 NO point 24



Specific tooling

020481Y Control unit interface wiring

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

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

AIR INJECTION T. mS =

6 ÷ 7 mS (start up at 20° C)

~ 1.6 mS (idle at 20° C)

~ 1.4 mS (idle at 60° C)

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

fuel pump circuit

TERMINALS: 1 - 14

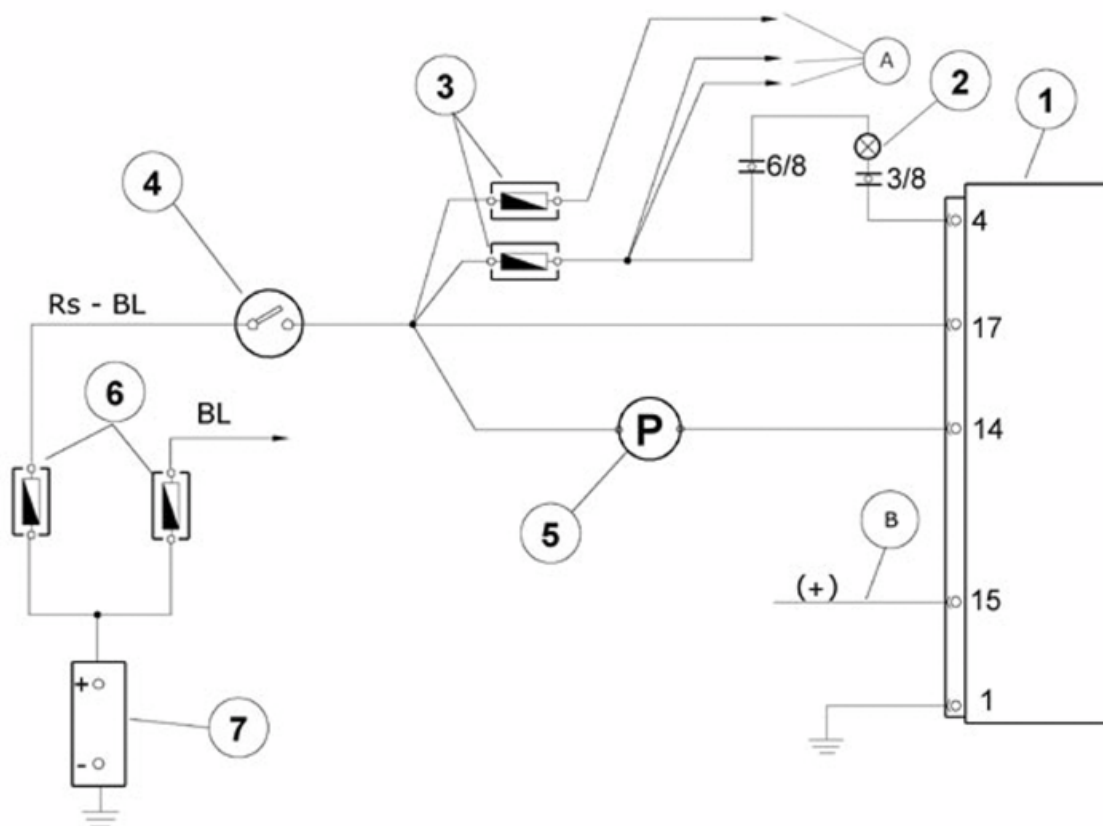
CONDITIONS: Switch in «ON» position after the engine timing

STANDARD VALUES: less than 0.1 V

TERMINALS: 1 - 14

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

STANDARD VALUES: Battery voltage



COMPONENTS LAYOUT:

- 1 ECU
- 2 Injection indicator
- 3 Fuses 7.5A
- 4 Key switch
- 5 Fuel pump
- 6 Fuses 15A
- 7 Battery 12V 9Ah
- A To services
- B + Fixed

The fuel pump is a piston type supplied with a constant current motor. It was designed to supply high pressures with small capacities and low absorption, and is therefore suitable for use on reduced capacity motors. Given the low absorption, the pump is directly supplied by the ECU without the use of remote control switches. The pump is fed for 4-5 seconds after the switch is turned "ON", this enables the circuit to be drained and the old fuel to be drained from the boiler inside the injector supports. Successive pump management will be in combination with the with the presence of the revs phase signal. This guarantees the safety of the vehicle in the case of an accident. The ECU auto diagnosis also checks the pump's electric circuit. An anomaly is recognised in the case that a circuit is interrupted or if there is a short circuit. The anomaly is recognised with priority level 3, which means that it is registered by the auto diagnosis but not indicated by the ignition of the injection warning light. This anomaly naturally leads to a lack of motor function and is easily recognisable on an acoustic level by the lacking pump rotation.

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

YES point 3 NO point 2

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

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

YES point 4 NO point 5

4- The pump control circuit is efficient.

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

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

GO TO point 7

Specific tooling

020460Y Scooter diagnosis and tester

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

YES point 8 NO point 9 NO point 10

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

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

GO TO point 7

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

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

PO230 FUEL PUMP.

YES point 13 YES point 14 NO point 12

Specific tooling

020460Y Scooter diagnosis and tester

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

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

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

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

GO TO point 16

Specific tooling

020481Y Control unit interface wiring

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

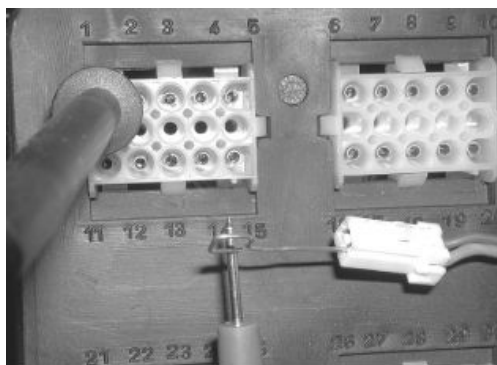
1 - ORANGE = battery voltage

NO point 17

GO TO point 18

N.B.

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



17- Check the efficiency of the 15A fuse and key switch. If necessary, restore the wiring.

GO TO point 16

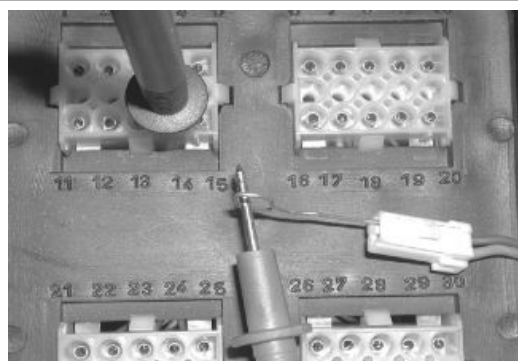
18- Check the continuity of the control line of the fuel pump.

14 - green/blue (fuel pump conn.)= continuity

YES point 20 NO point 19

N.B.

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



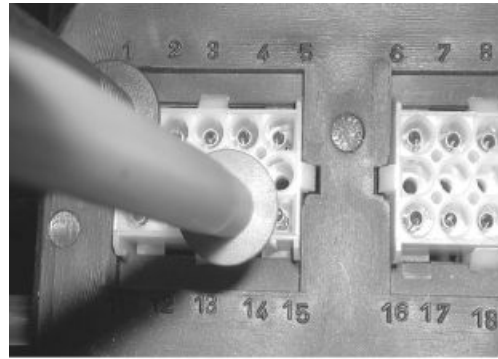
19 - Restore the wiring.

GO TO point 18

20 - Check the fuel pump control line positive insulation.

1 - 14 = 0V

YES point 22 NO point 21



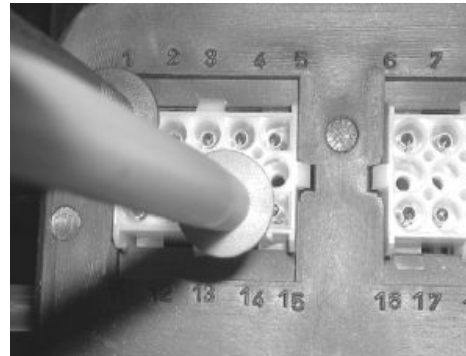
21- Restore the wiring.

GO TO point 20

22 - Check the fuel pump control line negative insulation.

1 - 14 = 1 MOhm

YES point 24 NO point 23



23- Restore the wiring.

GO TO point 22

24- Check the fuel pump winding continuity.

Standard resistance =Ohm (50hm measured)

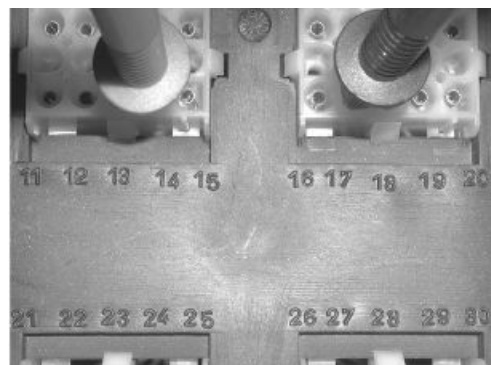
N.B.

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

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

14 - 17 =Ohm (50hm measured)

YES point 26 NO point 25



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

GO TO point 24

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

1 - 14 (bridged) = pump activated

YES point 28 NO point 27

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

GO TO point 24

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

GO TO point 29

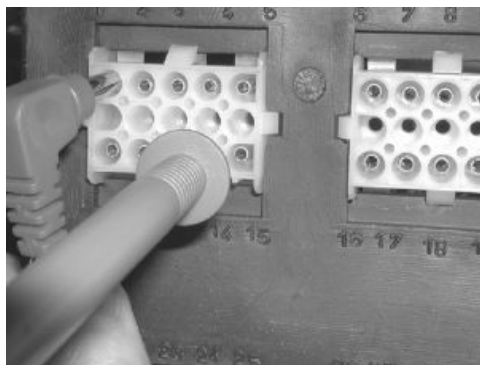
GO TO point 30

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

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

GO TO point 31

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

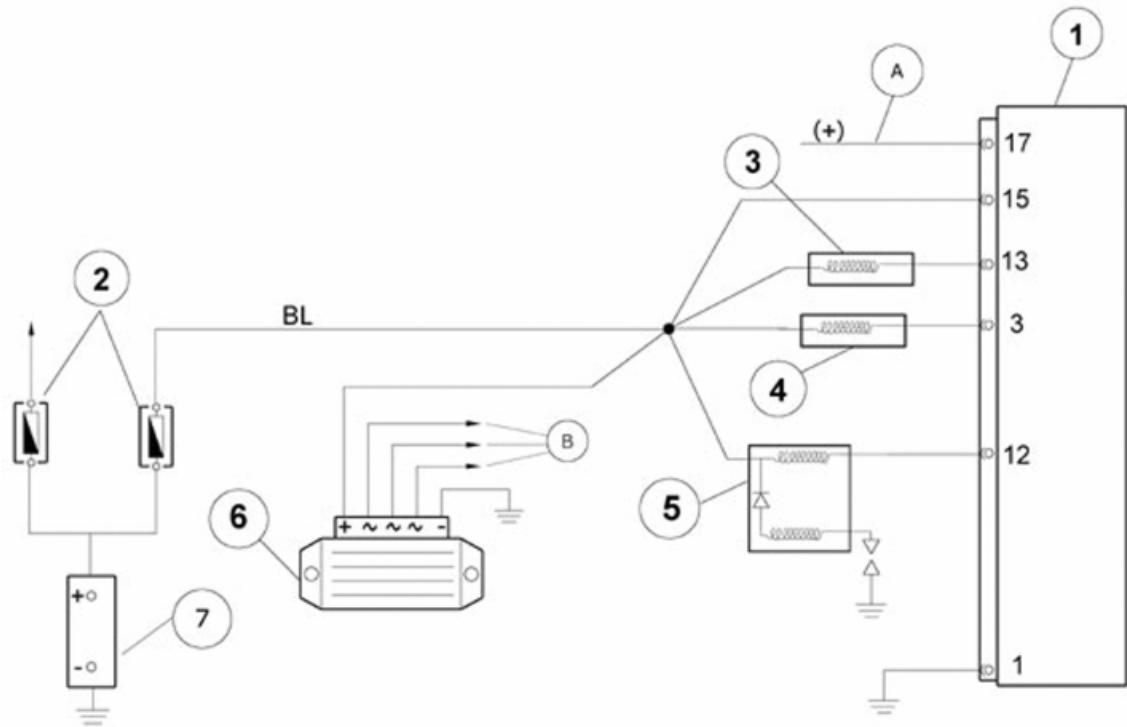


petrol injector circuit

TERMINALS: 1 - 3

CONDITIONS: Engine stopped, switch in any position

STANDARD VALUES: Battery voltage



COMPONENTS LAYOUT:

- 1 ECU
- 2 15A fuses
- 3 Air injector
- 4 Fuel injector
- 5 Bobina A.T.
- 6 Key switch
- 7 12V - 9Ah battery
- A+ under panel
- B To the magnet flywheel

The petrol injector receives the pressurized fuel through the supply system. The ECU commands the injector, controlling both the time and the opening moment. The fuel is injected into the compressed air chamber, thereby forming the rich air petrol mixture to be injected into the cylinder through the air injector. The petrol injector prepares the mixture when the petrol injection is completed. The petrol injector function is always very important in all the motor function phases, but particularly during idling speed and start-up. The ECU auto diagnosis also check the petrol injector control circuit. The anomaly is recognised in the case or circuit interruption or a short circuit, both towards the earth and the positive. Any anomaly is indicated to the driver through the fixed ignition of the injection warning light. With the anomaly present, the motor is unable to function. The anomaly is only recognised when the revs-phase signal is present, that is to say when the ECU controls the injector openings. It is for this reason that with the anomaly present, the recognition passes from the "actual" state to "required" state in the moment in which the motor stops.

GO TO point 2

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

Specific tooling

020460Y Scooter diagnosis and tester

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

YES point 3 NO point 4 NO point 5

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

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

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

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

YES point 8 YES point 9 NO point 7

Specific tooling

020460Y Scooter diagnosis and tester

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

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

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

1. Disconnect the interface wiring. Omit the connection to the ECU. Disconnect the air injector connector.

GO TO point 2

2. Check the battery positive voltage to the blue lead (1) of the fuel injector power supply connector.

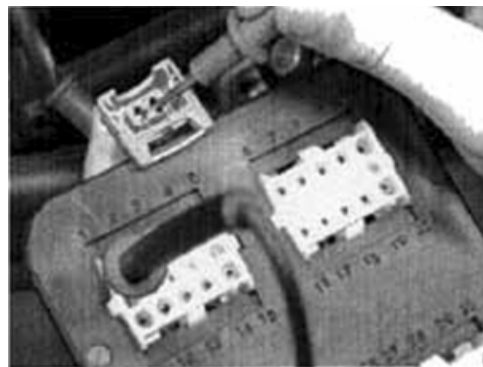
1 - blue lead (positive) = battery voltage

(any position of the switch)

NO point 3 YES point 4

N.B.

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



Specific tooling

020481Y Control unit interface wiring

3. Check the efficiency of fuse 15A and restore the wiring if necessary.

GO TO point 2

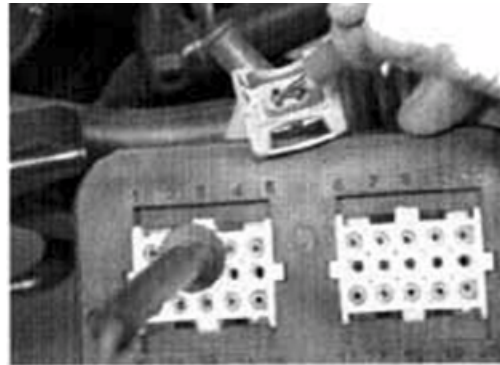
4. Check the continuity of the fuel injector control line

3 - white = continuity

NO point 5 YES point 6

N.B.

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



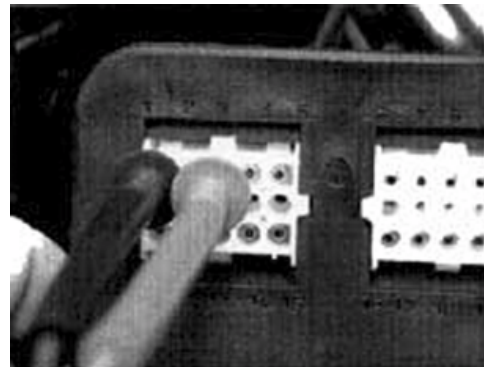
5. Restore the wiring

GO TO point 4

6. Check the fuel injector control line positive insulation

1 - 3 = OV

NO point 7 YES point 8



7. Restore the wiring

GO TO point 6

8. Check the fuel injector control line negative insulation

1 - 3 > or = 10hm

NO point 9 YES point 10



9. Restore the wiring

GO TO point 8

10. Check the fuel injector winding resistance

Standard value =Ohm (~ 2 Ohm measured)

NO point 11 YES point 12



11. If different resistive values are detected, replace the fuel injector mounting
12. Check the fuel injector winding negative insulation.

1 - any pin of the injector > or = 10 Ohm

NO point 13 YES point 14



13. Replace the air injector mounting

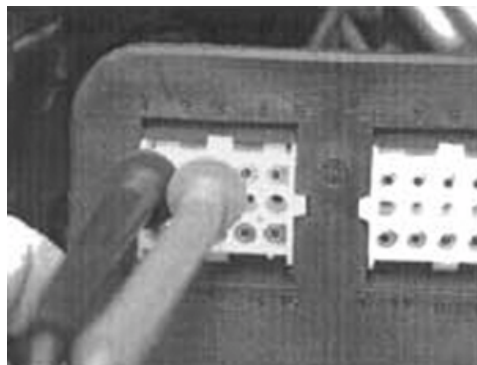
GO TO point 12

14. Connect the specific tool to the ECU. Connect the fuel injector connector. Check the presence of voltage to the ECU.

1 - 3 battery voltage (engine off and any position of the switch)

NO point 15 YES point 16

- 15 - Voltage is close to 0V and the injector is open. Check the control line insulation. Replace the ECU if necessary



Specific tooling

020481Y Control unit interface wiring

16. The fuel injector control circuit is efficient. While the engine is running, the opening time of the fuel injector can be displayed through the indication given in the "PARAMETERS" menu of the scooter diagnostic tester.

T. FUEL INJECTION (mS) =

about 6 mS (start-up at 20°C)

about 1.8 mS (idle at 20° C)

about 1.6 + 1.5 mS (idle at 60° C)

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

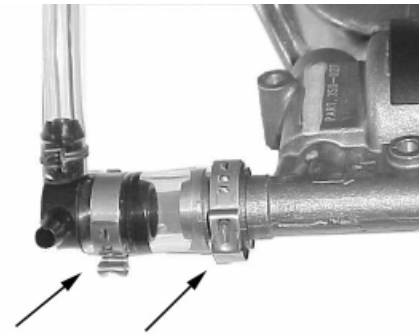
Specific tooling

020460Y Scooter diagnosis and tester

coolant temperature sensor circuit

Warning:

We inform you that some engine malfunctions have recently been dealt with erroneously by replacing the fuel pump without first checking the correct fitting of the clamps (shown in the picture). Therefore, before replacing the pump follow the procedure given below:



1. using a palmtop or a manometer carry out the inspections outlined in the workshop manual (see the Injection-Fuel supply system section in the Engine chapter);
2. ensure the clamps, **part no. CM001905**, fixing the L-shaped fitting to the pump, are tightened correctly (see picture);
3. ensure there are no other faults or leaks due to deformations or abrasions to the connection hose;
4. replace the fuel pump.

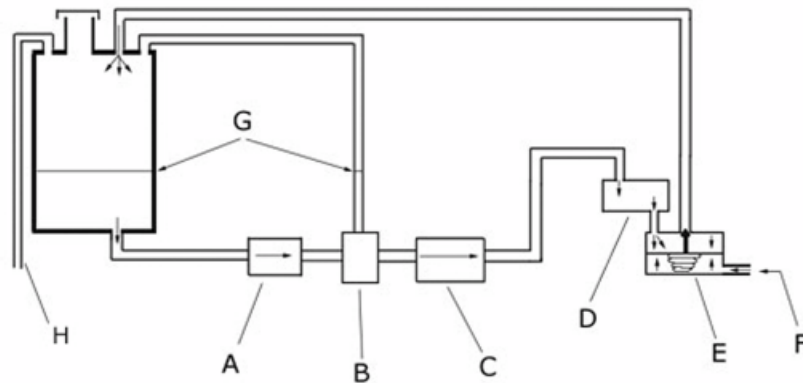


DIAGRAM OF FUEL SUPPLY SYSTEM

	Specification	Desc./Quantity
1	Fuel filter	
2	Shunt	
3	Fuel supply pump	
4	Injector	
5	Pressure regulator	
6	Compressed air inlet	
7	Fuel level	
8	Tank ventilation	

The first section of the fuel supply system on the fuel injection version of the Runner consists of an outlet fitting located in the lower half of the tank. Fuel flows through the transparent-type paper filter and to the shunt, just before the pump. The shunt is attached to the bleed tube leading to the upper-half of the tank. The principle of communicating reservoirs guarantees the bleeding of the pump intake right from the first refill. The pump must not be started before the tank has been filled. Failure to comply with this rule may result in seizure of the pump. The fuel pump is installed at an angle so to improve the efficiency of the automatic intake bleeding. Downstream of the pump is the circuit designed to operate under pressure. The connection between the pump and the injector mounting consists of a preformed plastic hose provided with quick-fit fittings. Before removing-attaching the fittings, follow the operations described in "ENGINE FROM THE VEHICLE" chapter. Failure to comply with these rules may result in the failure of the fuel injector or risk of fire to the vehicle. The circuit under pressure includes the fuel injector and pressure regulator seals. The regulator has the aim of keeping the fuel injection pressure constant at 2.5 BAR (250 kPa). As the fuel injector injects compressed air into the chamber, the real fuel pressure is due to the air temperature plus 2.5 BAR (250 kPa), e.g. For example:

AIR PRESSURE = 5.5 BAR

FUEL PRESSURE = 8 BAR

When the system is working efficiently, the fuel quantity injected is only a function of the variations in ignition timing. The supply circuit continues through the return duct from the injector mounting to the tank. The attachment to the injector mounting is always of the quick-fit type. As this section of the circuit is downstream the pressure regulator, it will constantly be at ambient pressure. The fittings to the injector mounting are identified by the following markings:

FI = INLET

FO = OUTLET

The circuit provides continuous fuel flow with the tank to guarantee the uninterrupted cooling and ventilation of the injector mounting and, therefore, a more constant fuel preparation. When refilling the system after maintenance or repair operations, 10 - 11 pump cycles are required to bleed the entire circuit. During normal use, before start-up, it is advisable to use the initial timing. To guarantee the reliability of the fuel supply system's components, suggestions given for the fuel filter should be observed. Using a vehicle with a dirty fuel filter may damage the fuel pump as a result of the bleed duct remaining empty and, therefore, allowing the intake of air.

1. Attach the interface wiring. Omit the ECU attachment.

GO TO point 2

Specific tooling

020481Y Control unit interface wiring

2. Attach the air pressure control kit.

GO TO point 3

N.B.

TOOL INSTALLATION RESULTS IN CANCELLATION OF THE INTAKE AIR PRESSURE. DURING THE SUBSEQUENT INSPECTIONS, RUN THE STARTER ONLY WHEN EXPLICITLY STATED IN THE PROCEDURE.

Specific tooling

020617Y Air pressure check kit

3. Attach the fuel pressure control kit onto the supply line.

The installation may be carried out either at the pump outlet or at the injector mounting inlet.

GO TO point 4

N.B.

BEFORE INSTALLATION, CAREFULLY BLOW THE DUCTS OF THE SPECIAL TOOL. ANY IMPURITY MAY DAMAGE THE FUEL INJECTOR. DETACH AND REATTACH THE QUICK-FIT FITTINGS AS PRESCRIBED.

Specific tooling

020616Y Fuel pressure control kit

4. Using a multimeter set onto ammeter mode, jump pins 14 and 1 on the interface wiring.

14 = Positive rod

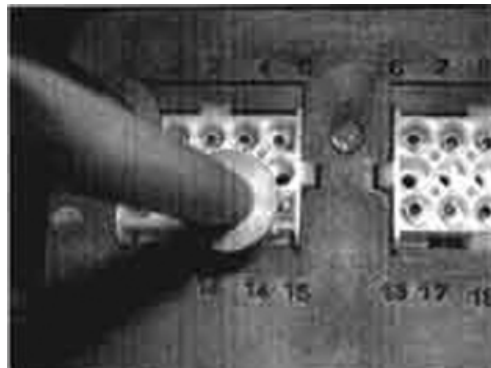
1 = Negative rod

With battery voltage over 12V, activate the fuel pump by turning the key-switch onto «ON».

GO TO point 5

N.B.

BEFORE INSTALLATION, CAREFULLY BLOW THE DUCTS OF THE SPECIAL TOOL. ANY IMPURITY MAY DAMAGE THE FUEL INJECTOR. DETACH AND REATTACH THE QUICK-FIT FITTINGS AS PRESCRIBED.



Specific tooling

020331Y Digital multimeter

020481Y Control unit interface wiring

5. Let the system bleed for a few seconds and check the following:

Fuel pressure = 2.5 BAR

Absorbed current = 0.25 - 0.30 A

NO point 6 NO point 9 NO point 7 YES point 12

6. Pressure is too low. Absorbed current is too high.

The pump does not turn properly.

Replace the pump.

GO TO point 5

7. Pressure is too low.

Absorbed current is below specs.

The pump turns with low torque.

GO TO point 8

8. Using a flat-ended caliper slowly shut the special tool hose on the injector mounting side.

Check that the distributed pressure and absorbed current are within specs.

NO point 10 YES point 11

Specific tooling

020616Y Fuel pressure control kit



9. Pressure and absorbed current are both above specs.

The pressure regulator requires a pressure above specs.

Replace the injector mounting assembly with the pressure regulator.

GO TO point 5

10. Distributed pressure and absorbed current are below specs.

The pump rotates with too low a torque and the flow rate is reduced.

Replace the pump

GO TO point 5

11. The pressure regulator requires a pressure below specs.

Replace the injector mounting assembly with the pressure regulator.

GO TO point 5

12. Using flat-ended pliers gradually shut the special tool hose on the injector mounting side.

With battery voltage above 12V, check the following:

Fuel pressure => 9 BAR

Absorbed current -0.45A

(Max allowed 0.8A)

NO point 13 YES point 14

Specific tooling

020616Y Fuel pressure control kit



13. The pump cannot guarantee pressures above standard operating conditions.

Replace the fuel pumps.

GO TO point 12

14. Detach the fuel return duct and prepare an adequate container for the collection of fuel.

Keeping the ammeter attached to pins 1 - 14 on the interface wiring, run the pump for one minute while turning the key-switch to «ON» (record the time taken for the fuel to reach the container).

Check the following conditions:

Fuel quantity supplied in 1 minute at a pressure of 2.5 BAR: approximately 125 cm³

Admissible limit:.....cm³

NO point 15 YES point 16

15. The return flow rate is below specs.

Check and replace the fuel filter if necessary.

If necessary, check the tank flow rate.

GO TO point 14

N.B.

WHEN THE FUEL FILTER IS VERY DIRTY, AIR MAY BE SUCKED THROUGH THE BLEED DUCT. THIS CAN DAMAGE THE FUEL PUMP.



16. Detach the special tool ammeter.

Reattach the ECU connector.

Reattach the return duct to the tank.

Start the engine and check the following conditions:

Injection air pressure = 5 - 5.5 BAR

Fuel pressure = 7.5 - 8 BAR

NO point 17 NO point 18 YES point 19



17. The fuel pressure is not to spec.

The pressure regulator is not calibrated.

Replace the injector mounting assembly with the pressure regulator.

18. The air and fuel pressure is not to spec.

Carry out the inspections outlined in the compressed air system section.

19. The system is capable of providing the correct fuel supply pressure.

N.B.

THE PRESSURE FIGURES SHOWN REFER TO A WARM ENGINE. WITH THE ENGINE COLD AND AT IDLE THE PRESSURE FIGURES MAY BE LOWER BY 0.5 BAR, DUE TO LONGER INJECTION CYCLES. REVVING UP WITH THE ENGINE HOT^a OR JUST AFTER START UP, AIR BUBBLES MAY BE FOUND IN THE RETURN DUCT TO THE TANK. THIS IS NORMAL, AS A RESULT OF THE INJECTOR OPERATION IN THE PRESENCE OF PRESSURE PULSES.

20. Shut down the engine and check that pressures are maintained.

NO point 21 NO point 22 YES point 25

N.B.

WHEN THE SWITCH IS TURNED TO «OFF», THE PUMP AND INJECTOR STOP WORKING, AND THE ENGINE CONTINUES TO RUN ON ITS MOMENTUM UNTIL IT STOPS. THIS CAUSES A SIGNIFICANT INCREASE IN THE AIR PRESSURE, WHICH IS NOT ACCOMPANIED BY ANY RISE IN THE FUEL PRESSURE. ENSURE THAT PRESSURES REMAIN CONSTANT IN TIME.

21. Both pressures decrease rapidly in time and the fuel settles at 2.5 BAR.

Check the sealing of the compressed air system.

22. The air pressure remains constant.

The fuel pressure decreases rapidly.

Bring the pressure back up into the system by starting the engine.

Shut down the engine and, at the same time, close the rubber hose on the injector mounting side, using flat-ended pliers.

Check that the fuel pressure remains constant.

NO point 23 YES point 24

Specific tooling

020616Y Fuel pressure control kit

23. The fuel pressure does not remain constant.

The one-way valve attached to the pump does not seal properly.

Replace the fuel pump.

GO TO point 20

24. The fuel pressure remains constant.

If the seal failure is not followed by noticeable engine malfunctions, it may be due to a leak toward the fuel return circuit, caused by the pressure regulator or its O-Ring.

Any pressure loss not observed from the outside may lead to operational faults caused by an excessively rich fuel mixture.

Replace the injector mounting assembly together with the pressure regulator.

GO TO point 20

25. The air and fuel pressures remain constant with time.

All system components guarantee a good seal.



GO TO point 26

N.B.

A NOTICEABLE PRESSURE LOSS WHICH OCCURS ONLY AFTER A FEW HOURS IS NORMAL.

26. When the fuel supply system is working effectively, it is possible to carry out the hydraulic check of the fuel injector.

Remove the injector mounting from the engine.

Install the fuel pressure diagnostic kit between the supply line and the mounting inlet fitting.

Using a length of fuel line, connect the outlet fitting to the tank.

Install the interface wiring omitting the ECU attachment.

Jump pins 14 - 1 and activate the pump by turning the key-switch onto «ON».

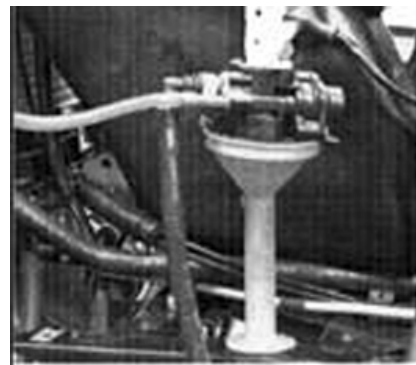
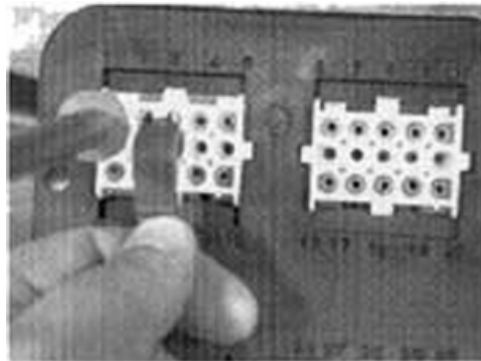
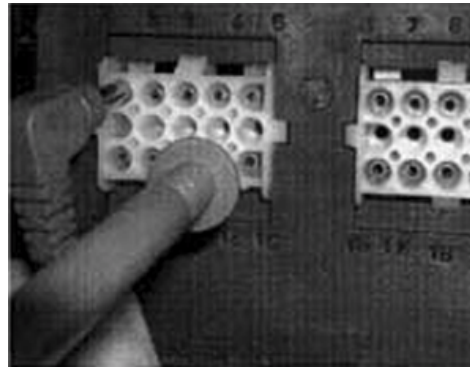
Let the system bleed and ensure the injector is leak-free.

Max allowed = oozes, no drip before 15 seconds.

NO point 27 YES point 28

27. If leaks are found from the injector or its O-Ring, these should have been spotted during the system seal check.

Replace the injector mounting assembly.



28. Prepare a measuring container.

Keep the fuel pump supplied.

Let the fuel injector open for 15 seconds by jumping pins 3 -1.

Measure the fuel output from the injector:

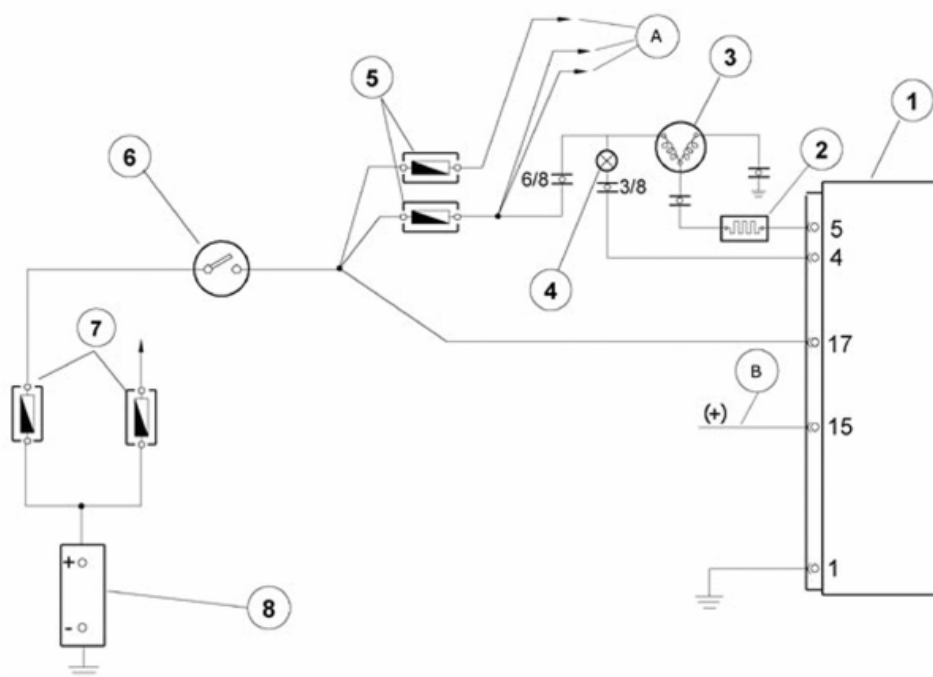
standard distribution - 14 cm³ (pressure 2.5 BAR) in 15 seconds

NO point 29 YES point 30

29. If not-to-spec flow rates are found, replace the injector mounting assembly.

30. The fuel injector is in working order.

coolant temperature sensor circuit



COMPONENTS LAYOUT

1 ECU

2 Resistor 27 Ohm 0.5W

3 Coolant temperature indicator

4 Injection indicator

5 Fuses, 7.5A

6 Key switch

7 Fuse, 15A

8 Battery 12V 9Ah

A To the services

B + Fixed

INDEX OF TOPICS

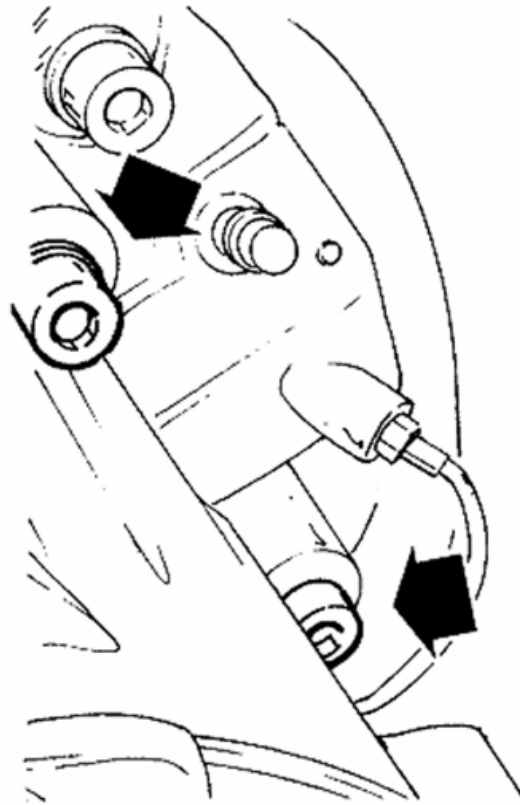
BRAKING SYSTEM

BRAK SYS

Rear brake calliper

Removal

- Disconnect the hydraulic union collecting the oil in an appropriate container.
- Loosen the two support calliper clamps.



Refitting

- On refitting, work in the reverse order and respect the indicated torques.

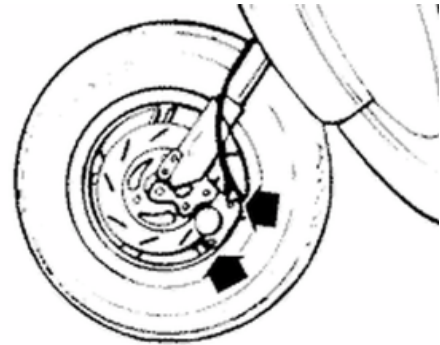
Locking torques (N*m)

Rear brake calliper: 20 - 25 Nm

Front brake calliper

Removal

- Disconnect the oil line from the calliper, collecting the oil in a container.
- Remove the clamps highlighted in the diagram.
- On refitting tighten the bolts to the prescribed torque.
- Perform bleeding procedure on the system.



Overhaul

- Remove the calliper assembling bolts and take out the internal bodies and components. If necessary, in order to make it easier to take out the plungers, inject (shorts blasts of) compressed air through the brake fluid pipe.
- Check that the cylinders of the internal and external body of the calliper do not show scratches or signs of erosion; otherwise, replace the entire calliper.

CAUTION

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

Refitting

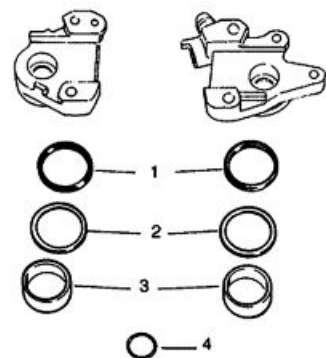
Insert in the calliper body:

- sealing rings (1-2);
- small pistons(3);
- place the OR seal in a calliper body (4).
- Join the internal and external body with the assembly bolts. Refit pads and bleed air (see preceding paragraphs).
- Position the calliper on the disc and lock to the mounting by tightening the bolts.
- Tighten the union on the calliper to the prescribed torque.

Before fitting, the parts must be perfectly clean and **free of traces of oil, diesel fuel, grease, etc..**

They should be washed thoroughly in denatured alcohol before proceeding.

The sealing rings must be immersed in the liquid used; the use of protective **PRF1** is allowed.



CAUTION

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

Locking torques (N*m)

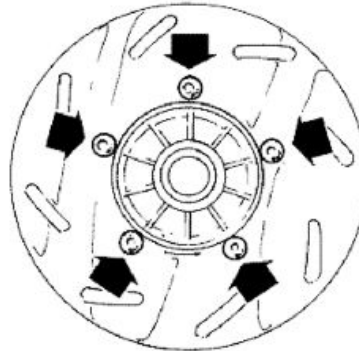
Screw tightening calliper to the support 20 ÷ 25 Calliper union: 20 ÷ 25 N*m

REFITTING FRONT BRAKE CALLIPER

Specification	Desc./Quantity
DUST PROTECTOR CASING	
SEALING RINGS	
SMALL PISTONS	
O-RING SEAL	

Rear brake disc**Removal**

- Remove muffler and wheel.
- Remove both support calliper clamps, without disconnecting the hydraulic union.
- To allow the calliper to exit from its housing, detach the spring which blocks the hydraulic line under the transmission protection crankcase.
- Rectify the split pin, remove the plastic cover and unscrew the wheel axle nut keeping the disc blocked.
- Loosen the five clamps and remove the disc.

**Refitting**

- On refitting perform the operations in reverse order applying the recommended threadlock to the five disc clamps.
- Tighten the disc screws to the prescribed torque in a crossover pattern.
- Tighten the wheel axle nut to the prescribed torque.

Recommended products**Loctite 242 product description**

Apply LOCTITE medium type 242 threadlock

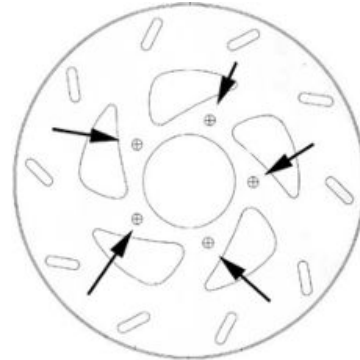
Locking torques (N*m)

Disc screws torque $6 \div 6,5 \text{ N}\cdot\text{m}$ Wheel axle nut torque $100 \div 125 \text{ N}\cdot\text{m}$

Front brake disc

Removal

- Remove the front wheel loosening the axle clamp.
- Unscrew five disk clamps.



Refitting

- On refitting, position the disc correctly, making sure to turn it in the right direction and apply medium threadblock.

Recommended products

Loctite 242 product description

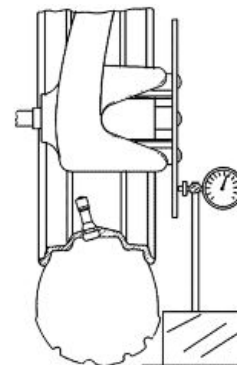
Apply LOCTITE medium type 242 threadlock

Locking torques (N*m)

Disc tightening screw $6 \div 7 \text{ N}\cdot\text{m}$

Disc Inspection

- Remove the wheel and check any out of level of the disc using the specific tool.
- The measurement revealed must be within 0.1 mm. If the measurement, is greater replace the disc and repeat the test.
- If the problem continues check and if necessary replace the wheel rim.



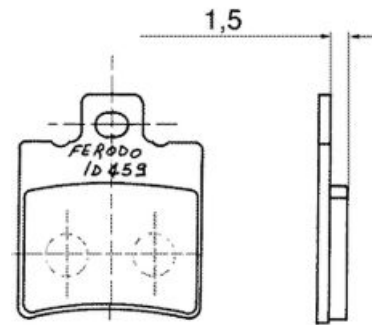
Specific tooling

020335Y Magnetic support for dial gauge

Front brake pads

Removal

- To facilitate this operation remove the two calliper fixings. With the calliper detached from its support but still connected to the brake fluid line, remove the plastic cover by prising it with a screwdriver.
- Remove the outside circlip from the brake pad pin, the leaf spring and the pads.
- Renew the pads when friction facing thickness is less than 1.5 mm.



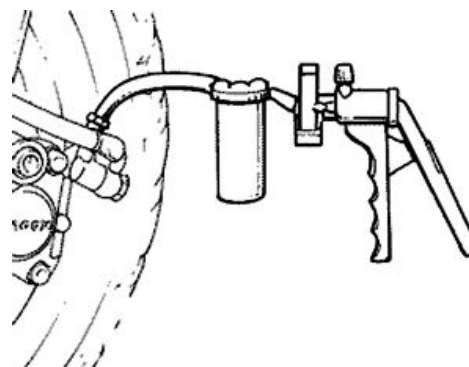
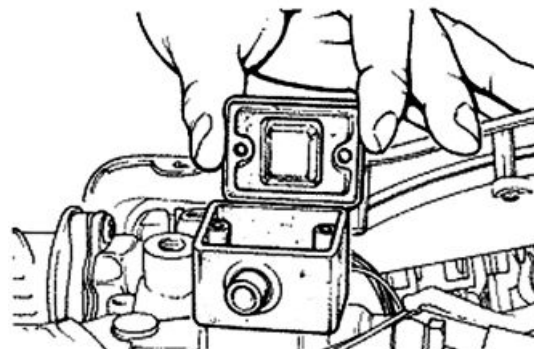
Refitting

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

Fill

Front

- With the bleed valve closed, fill the system to the maximum level with brake fluid.
 - Loosen the bleed valve.
 - Apply the tube of the specific tool to the bleed valve.
- To bleed the circuit you must supply the reservoir constantly with oil while pumping the Mityvac pump until there is no more air leaving the circuit. The operation is concluded when the bleed screw delivers only oil and no air.
- Close the bleed screws.
 - When you have finished the above procedure, tighten the bleed screw to the prescribed torque.



N.B.

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

CAUTION

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

N.B.

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

WARNING

- BRAKING CIRCUIT FLUID IS HYGROSCOPIC. IT ABSORBS HUMIDITY FROM THE SURROUNDING AIR.

IF THE LEVEL OF HUMIDITY IN THE BRAKING FLUID EXCEEDS A GIVEN VALUE, BRAKING EFFICIENCY WILL BE REDUCED.

THEREFORE, ALWAYS USE FLUID FROM SEALED CONTAINERS.

UNDER NORMAL DRIVING AND CLIMATIC CONDITIONS YOU SHOULD CHANGE THIS LIQUID EVERY TWO YEARS.

IF THE BRAKES ARE USED INTENSELY AND/OR IN HARSH CONDITIONS, CHANGE THE FLUID MORE FREQUENTLY.

CAUTION

WHEN CARRYING OUT THE OPERATION, BRAKE FLUID MAY LEAK FROM BETWEEN THE BLEED SCREW AND ITS SEAT ON THE CALLIPER.

CAREFULLY DRY THE CALLIPER AND DEGREASE THE DISC SHOULD THERE BE OIL ON IT.

Specific tooling

020329Y MityVac vacuum-operated pump

Recommended products

AGIP BRAKE 4 Brake fluid

FMVSS DOT4 Synthetic fluid

Locking torques (N*m)

Oil bleed screw 8÷12

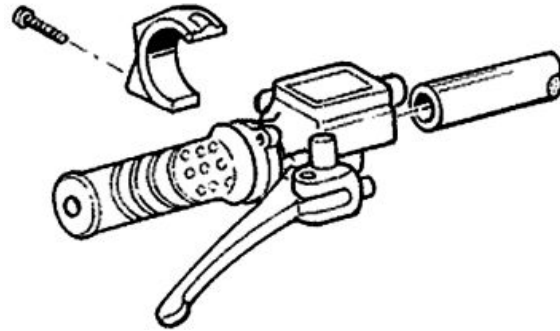
Front brake pump

- After removing the front and rear handlebar cover, loosen the two clamps on the kickstand (see picture).
- Disconnect the tube, collecting the brake oil in a container.

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

Locking torques (N*m)

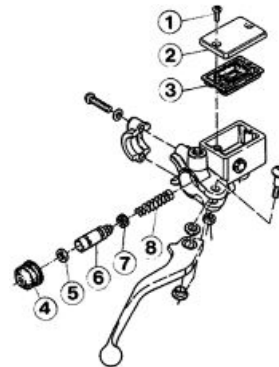
Hydraulic line torque 13 ÷ 18 N•m



Removal

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

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



CAUTION

- THE PRESENCE OF BRAKE FLUID ON THE DISC OR BRAKE PADS REDUCES THE BRAKING EFFICIENCY.

IN THIS CASE, REPLACE THE PADS AND CLEAN THE DISC WITH A HIGH-QUALITY SOLVENT.

CONTACT WITH BRAKE FLUID WILL DAMAGE PAINTED SURFACES.

RUBBER PARTS SHOULD NEVER BE LEFT IN ALCOHOL FOR LONGER THAN 20 SECONDS.

AFTER WASHING, THE PIECES MUST BE DRIED WITH A BLAST OF COMPRESSED AIR AND A CLEAN CLOTH.

THE SEALING RINGS MUST BE IMMERSSED IN THE OPERATING LIQUID.

Refitting

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

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

1 - Tank cap screw.

2. Tank cover.

3. Diaphragm.

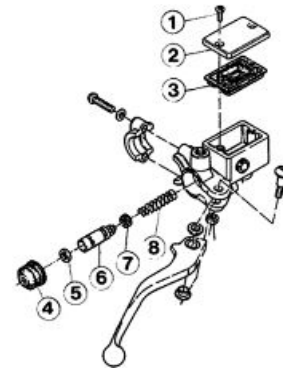
4. Bellows.

5. Sealing ring.

6. Piston.

7. Gasket.

8. Spring.



INDEX OF TOPICS

COOLING SYSTEM

COOL SYS

Water pump - overhaul

- Remove the rpm sensor /coolant delivery hose clamp
- Remove the transmission cover
- Remove the mixer
- Position the tool as shown in the picture

N.B.

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



Specific tooling

020620Y Water pump impeller stop

- Remove the mixer/water pump drive-belt with the two crown wheels



- Remove the snap ring of the pump bearing stay
- Remove the steel washer



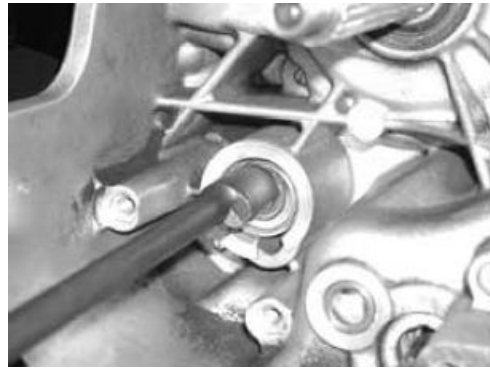
- Using the air heater, warm up the crankcase in the area around the water pump bearings as shown in the picture.



- Using the special tool, loosen the impeller shaft turning the spanner clockwise (left-handed thread)
- As the thread is fully disengaged, extract the shaft using pliers.

Specific tooling

020169Y Water pump crankshaft fitting and removal spanner



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

Specific tooling

020209Y Spring hook



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



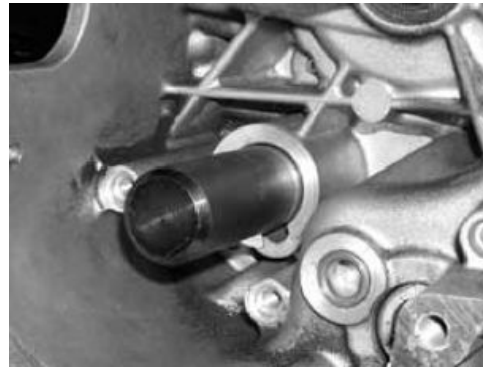
- Use a new oil seal to refit
- Position the new oil seal on the special tool with the main lip facing the bearings as shown in the picture



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

Specific tooling

020168Y Water seal punch mount on half-crankcase



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

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

Recommended products

AGIP GREASE MU3 Grease for odometer transmission gear case

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



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

N.B.

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

Specific tooling

020169Y Water pump crankshaft fitting and removal spanner

See also

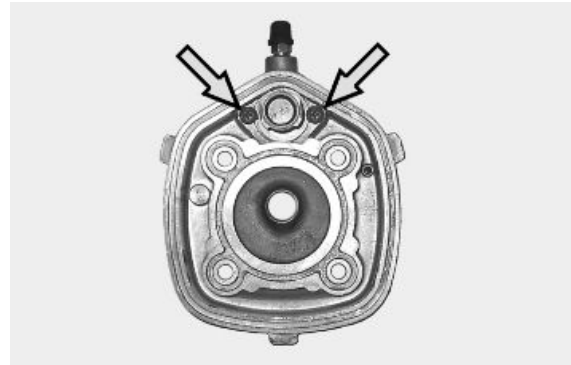
[Removal rpm-timing sensor circuit](#)



Thermostat

Removal

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



Check

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

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 thermal gun.

Check the thermostat opening start temperature:

Heat up until the thermostat is completely open.

- 3) Replace the thermostat if not working properly.

CAUTION

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

Specific tooling

020331Y Digital multimeter

020151Y Air heater

Characteristic

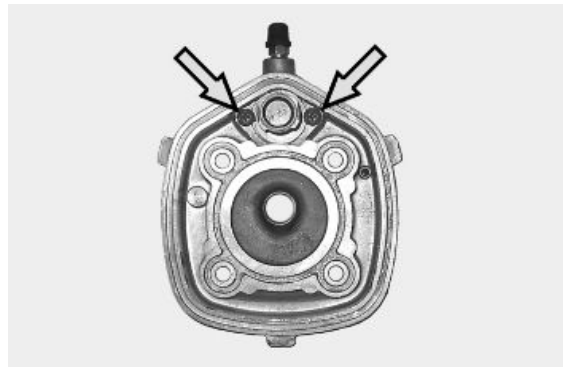
Thermostat check: Opening start temperature

60±2°C



Refitting

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



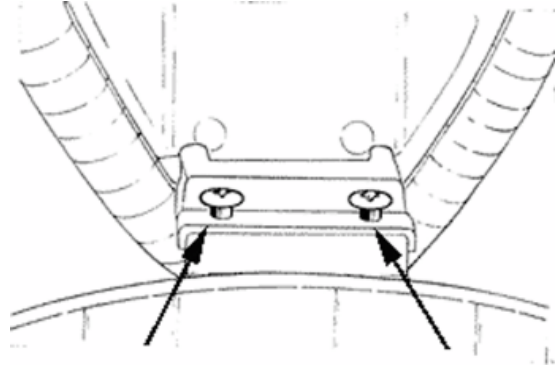
INDEX OF TOPICS

CHASSIS

CHAS

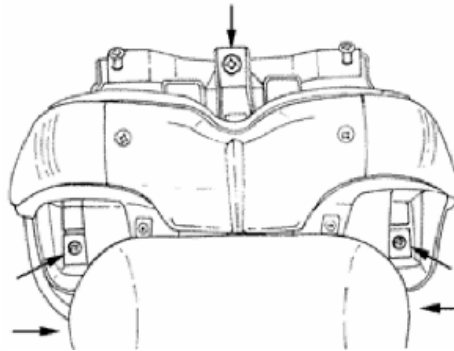
Seat

- Remove the two screws shown in the picture.



Rear rack

- Remove the side fairings
- Remove the three screws shown in the picture

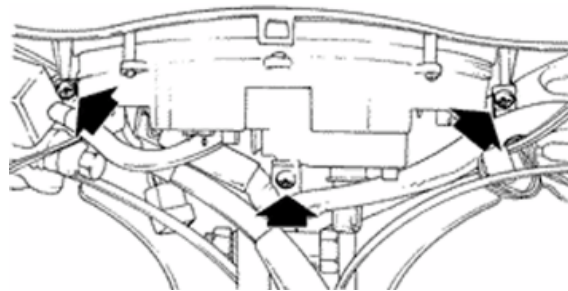


See also

[Side fairings](#)

Rear handlebar cover

- Remove the three screws, disconnect the electrical connections and the odometer transmission.



Front handlebar cover

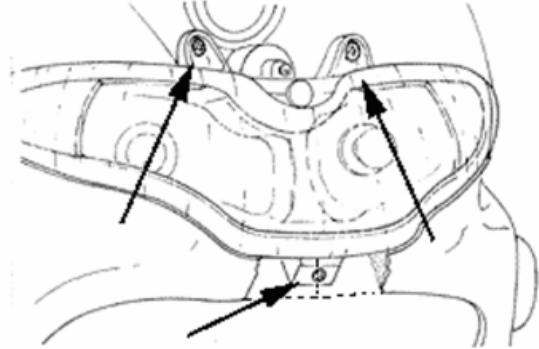
- Remove the two screws shown in the picture, unhook the joint in the upper part of the handlebar cover between the front and rear part. Pull the front



part upwards to prevent damaging the plastic joints, .

Headlight assy.

- Remove the front grill
- Remove the three screws shown in the picture and disconnect the electrical connections.

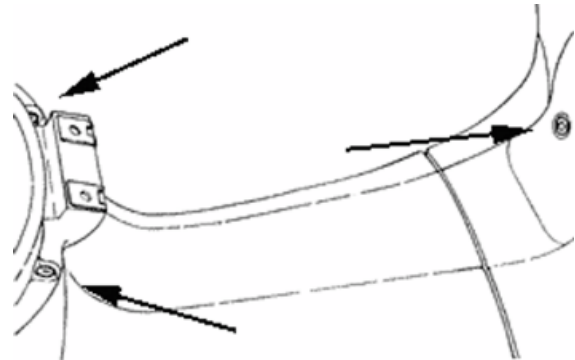


See also

[Legshield](#)

Frame central cover

- Remove the front shield
- Loosen the three screws shown in the picture. Remove the fuel, expansion chamber plugs and finally detach the cable for opening the refueling chamber. To remove the cover raise the rear part first.

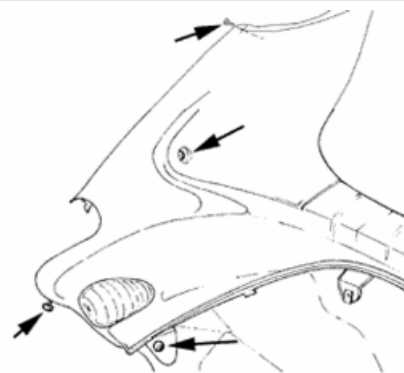


See also

[Legshield](#)

Legshield

- Remove the side
- Remove the front headlight
- To remove, loosen the 4 screws shown in the picture, disconnect the electric connections of the turn indicators. The front shield is formed of two perfectly symmetrical parts.

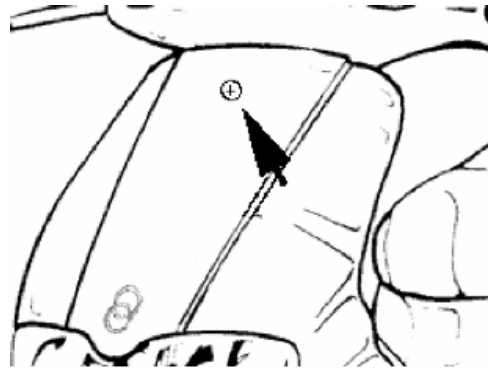


See also

[Side fairings](#)

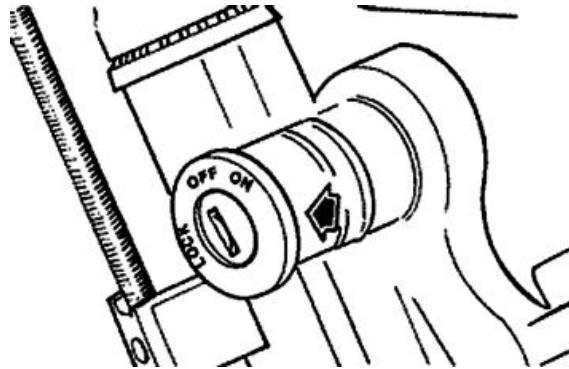
Headlight assy.

- Remove the screw shown in the figure and remove the grill, pulling it upward and then out.



Removing the ignition key-switch when on *off*

- Remove central cover .
- Insert a small centre-punch through the hole shown by the arrow in the figure and push until the retaining tooth on the master cylinder is released: whilst keep the punch pressed against the tooth, extract the lock body and master cylinder.

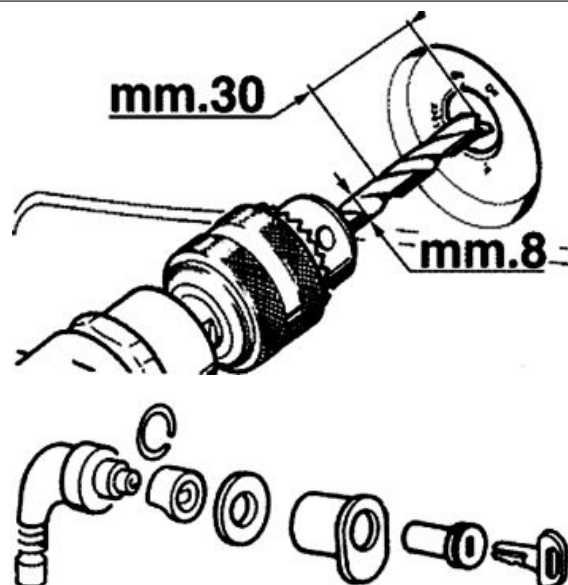


See also

[Legshield](#)

Removing the ignition key-switch when on *lock*

- Remove the shield.
- Remove the switch of the key switch.
- Make a hole on the block using a drill as shown in the figure.
- Insert the wheel cylinder with the key and with the anchoring tab facing down halfway on the lock body taking care that the insertion phase of the key is oriented matching "ON" (the only position that enables the cylinder to get into the lock body); now turn the key leftwards to "OFF" and at the same time press until the cylinder is completely in.

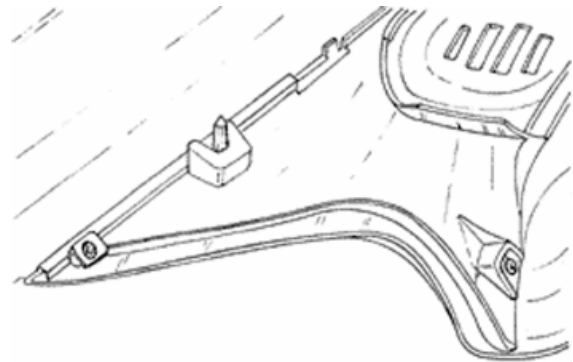


See also

Legshield

Footrest

- Remove the side
- Remove the two screws and loosen the joints very carefully



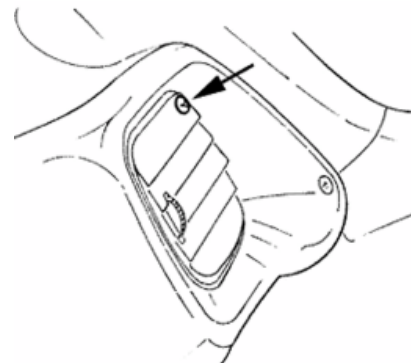
See also

[Side fairings](#)

Side fairings

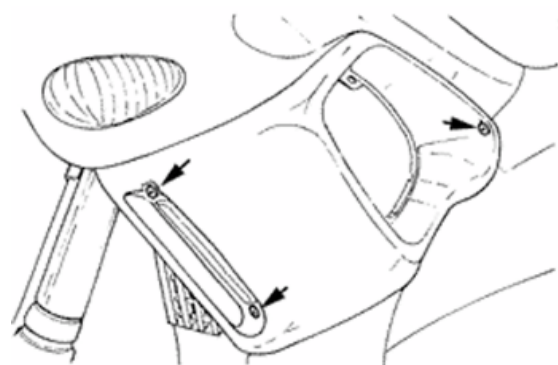
Air grid

- Remove the screws and detach the air conveyor grille from the side.



Air conveyor

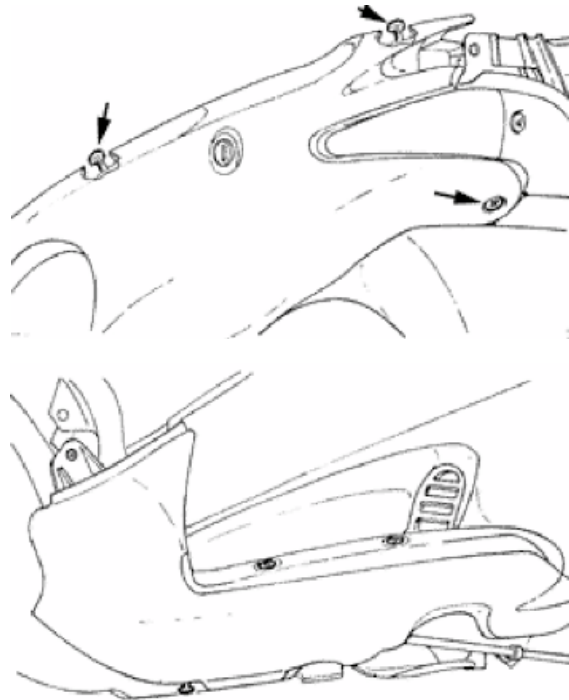
- Remove the air grille
- Loosen the screws shown in the picture.



See also

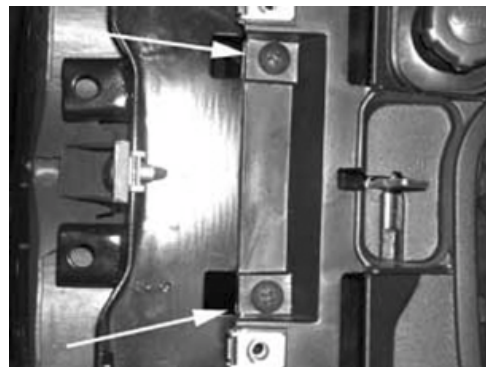
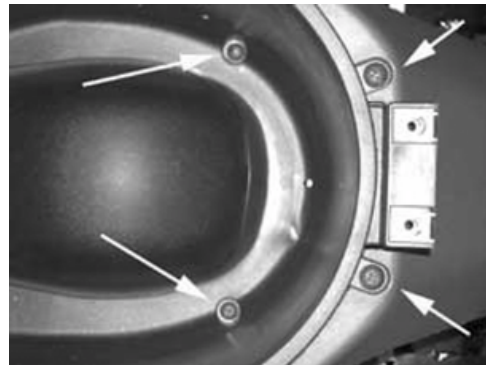
[Side fairings](#)

- Remove the rear grille
- Remove the air conveyor
- To remove the side panel, remove the two rear screws, the screw on the rim of the seat, the screw located near the conveyor, the two screws located on the footrest, the screw located under the footrest and the screw to connect with the front panel.



Helmet bay

- Remove the battery
- Remove saddle
- Remove side
- Remove the fuel tank oil mix cap
- Remove the electrical cables inside the battery compartment.
- Remove the 4 screws shown in the picture on the front part of the helmet compartment.
- Remove the 2 screws indicated in the picture on the rear part of the helmet compartment.



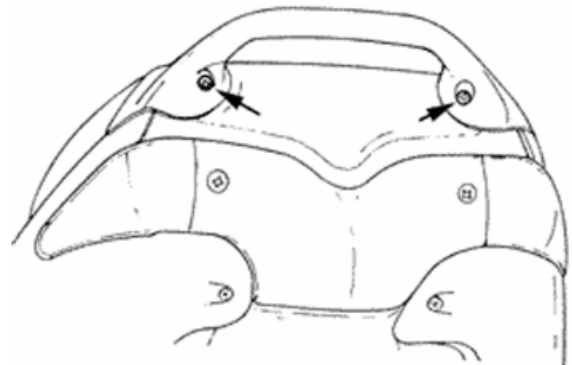
See also

[Seat](#)
[Side fairings](#)

spoiler

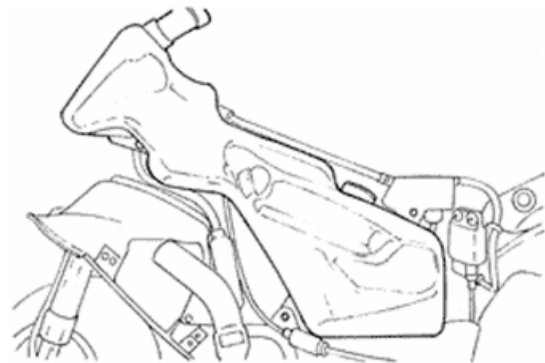
Rear spoiler

Remove the 2 built-in hexagonal head screws.



Fuel tank

- Remove central cover
- Loosen the three screws highlighted in the picture, disconnect the piping and the electrical connections being careful not to let gasoline spill out.



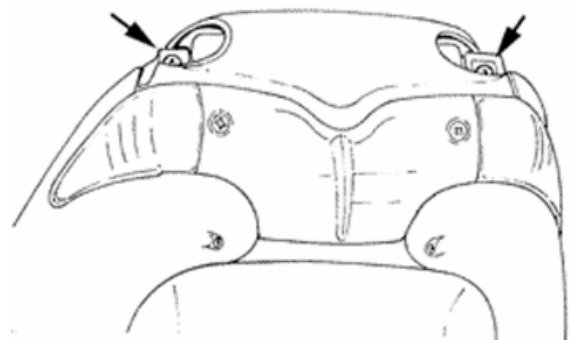
See also

[Frame central cover](#)

Rear central cover

Rear closure element

- Remove the rear spoiler
- Loosen the two screws and remove the element.

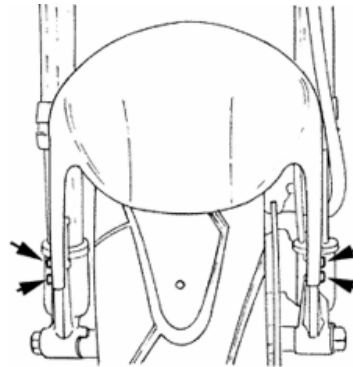


See also

[spoiler](#)

Front mudguard

Loosen the four screws fixing the fender to the fork.



Radiator fan

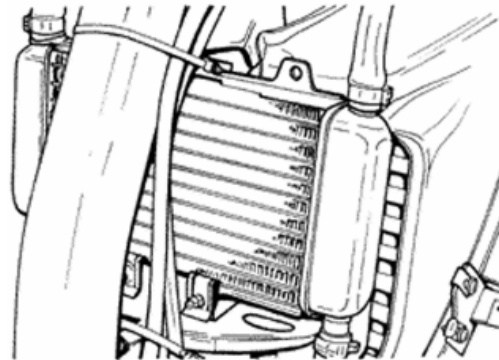
- Remove Central cover
- Remove the three radiator fastening screws and the radiator tube clips. The radiator contains liquid so wait for the engine to be cooled down completely to avoid serious burns before removing it.
- On refitting use the specific pliers for the clips.

Specific tooling

020544y Pliers for clamps

See also

[Frame central cover](#)

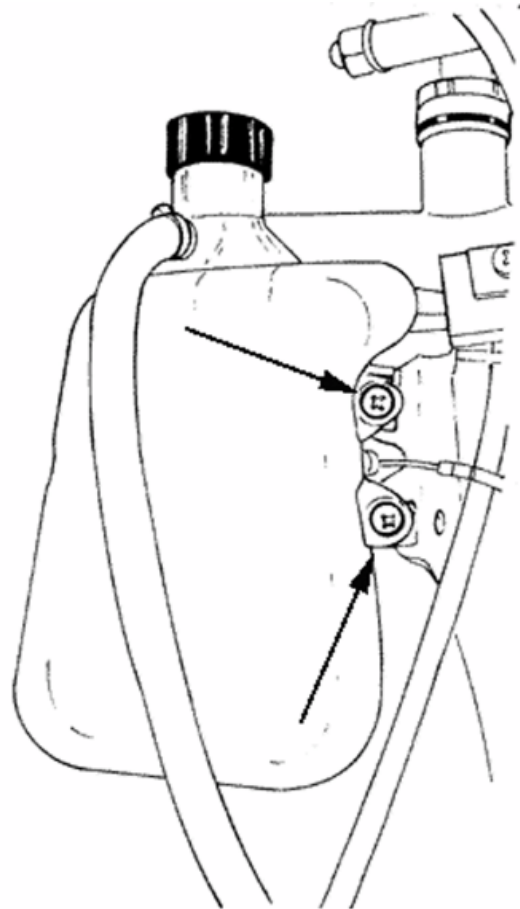


Expansion tank

- Remove the front shield
- Unscrew the two screws shown in the picture and remove the piping.

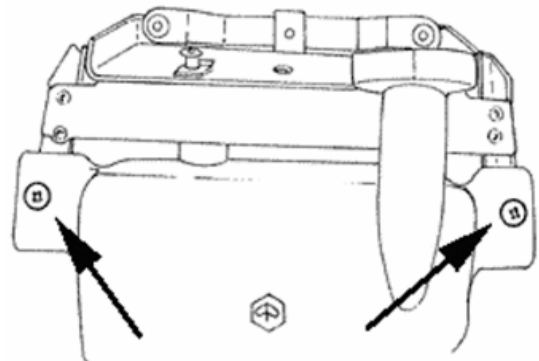
CAUTION

DO NOT ALLOW THE COOLANT TO DRIP.



Mixture oil tank

- Remove helmet carrier compartment
- Remove the two screws shown in the picture
- Disconnect the cabling from the oil mix level transmitter
- Disconnect the oil pump from the tank.

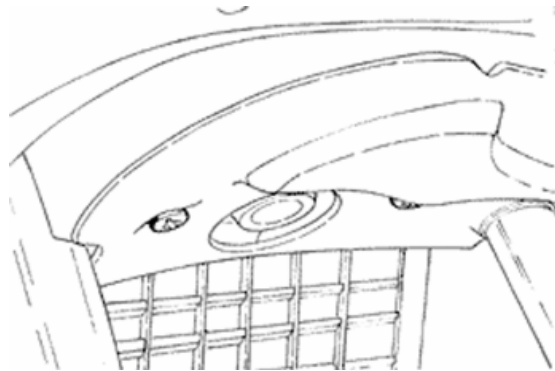


See also

[Helmet bay](#)

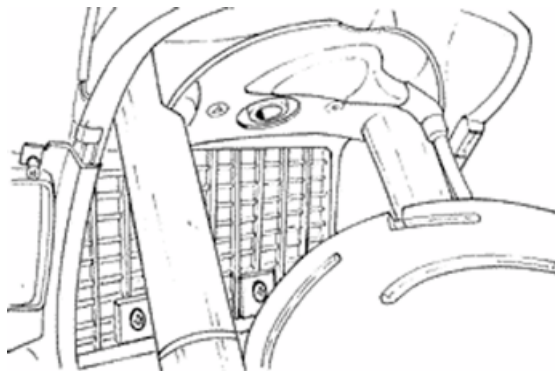
Front central cover

- Remove the two screws indicated in the picture.



Lower cover

- To remove this element it is necessary to remove the Fork removal
- Loosen the three screws shown in the picture and also remove the screw which fixes the air duct for the cooling transmission.



See also

[Removal](#)

INDEX OF TOPICS

PRE-DELIVERY

PRE DE

Aesthetic inspection

Appearance checks:

- Paintwork
 - Fitting of plastics
 - Scratches
 - Dirt
-

Tightening torques inspection

Fastenings check

- All tightening torques
 - External fairing screws
-

Electrical system

Electrical system

- Fill the battery with battery acid, charge it with a suitable charger.
- Key switch
- Low beam lights, high beam lights, warning lights, parking lights
- Headlight adjustment
- Rear light
- Stop light (possibly front and rear brake)
- Turn indicators and relevant warning lights
- Lighting up speedometer and instruments
- Horn
- Starter button

CAUTION

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

WARNING

BEFORE RECHARGING THE BATTERY, REMOVE THE CAPS OF EACH CELL. KEEP OPEN FLAMES OR SPARKS AWAY FROM THE BATTERY DURING CHARGING. REMOVE THE BATTERY FROM THE SCOOTER, DISCONNECTING THE NEGATIVE TERMINAL FIRST.

CAUTION

WHEN INSTALLING THE BATTERY, ATTACH THE POSITIVE LEAD FIRST AND THEN THE NEGATIVE LEAD.

WARNING

BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH EYES, SKIN AND CLOTHING. IN CASE OF CONTACT WITH EYES OR SKIN, RINSE WITH ABUNDANT WATER FOR ABOUT 15 MINUTES AND SEEK MEDICAL ATTENTION AT ONCE.

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

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

KEEP OUT OF THE REACH OF CHILDREN

CAUTION

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

Levels check

Check levels

- Brake fluid level
 - Oil change level
 - Oil mix level
-

Road test

- Cold start.
 - Speedometer check.
 - Throttle check.
 - Riding stability.
 - Front and rear brake efficiency.
 - Front and rear shock-absorbers.
 - Unusual noises.
 - Hot engine restart.
 - Leakages (after trial run).
-

Static test

- Tyre pressure
- Operation of all locks.
- Fitting mirrors and accessories.
- Equipment, instruction manual, warranty certificate and customer assistance document.

CAUTION

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

CAUTION

NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES OR TYRES MAY BURST.

WARNING

BE VERY CAREFUL WHEN HANDLING FUEL.

Functional inspection

- Brake lever excursion.
-

- Throttle excursion and adjustment.
 - Homogeneous steering turning.
-

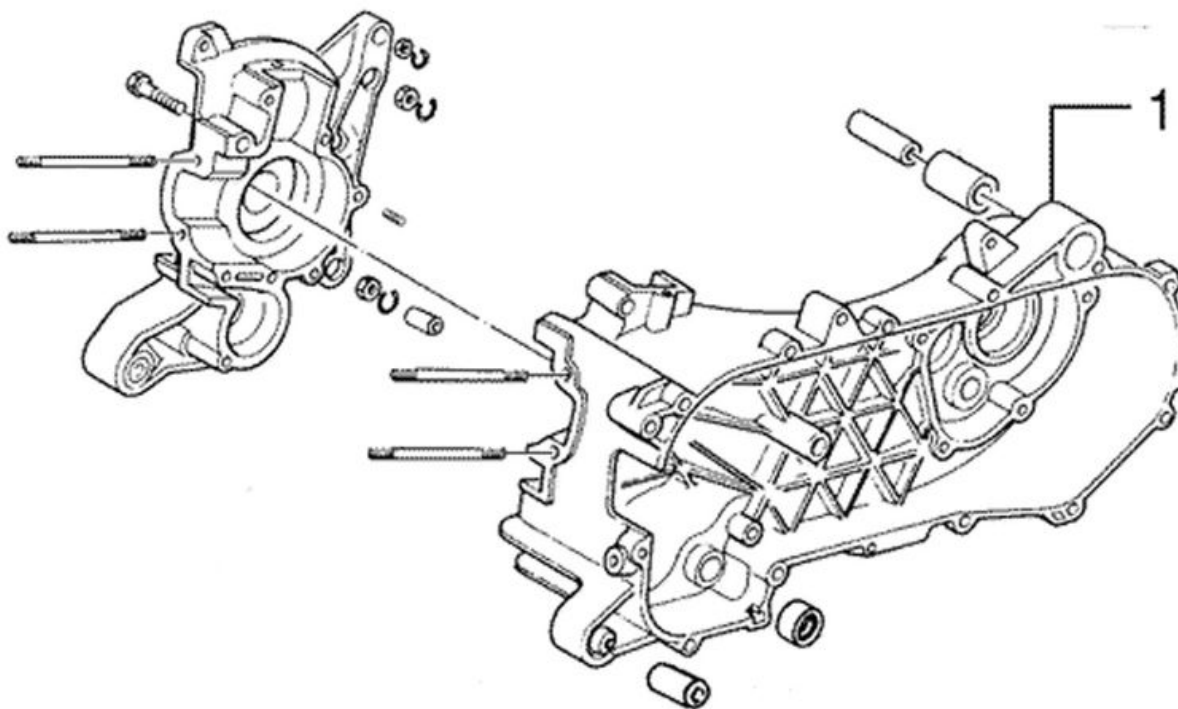
INDEX OF TOPICS

TIME

TIME

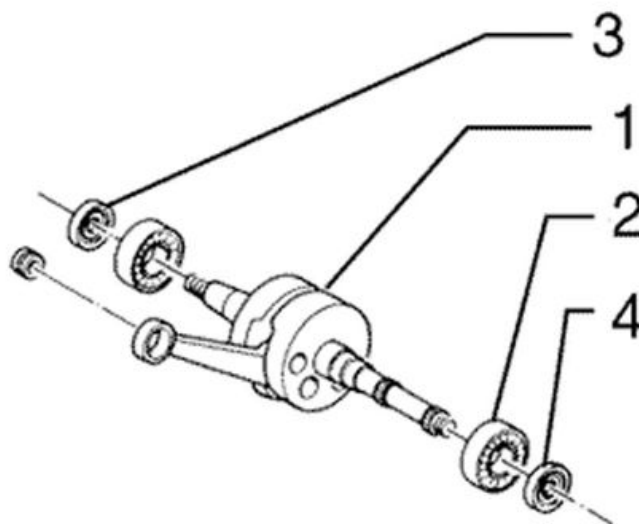
Engine
ENGINE

	Code	Action	Duration
1	001001	Eng. from frame - Removal and refit	
2	003057	Engine retainer - Tighten nuts	

Crankcase**CRANKCASE**

	Code	Action	Duration
1	001133	Engine crankcase- Replacement	

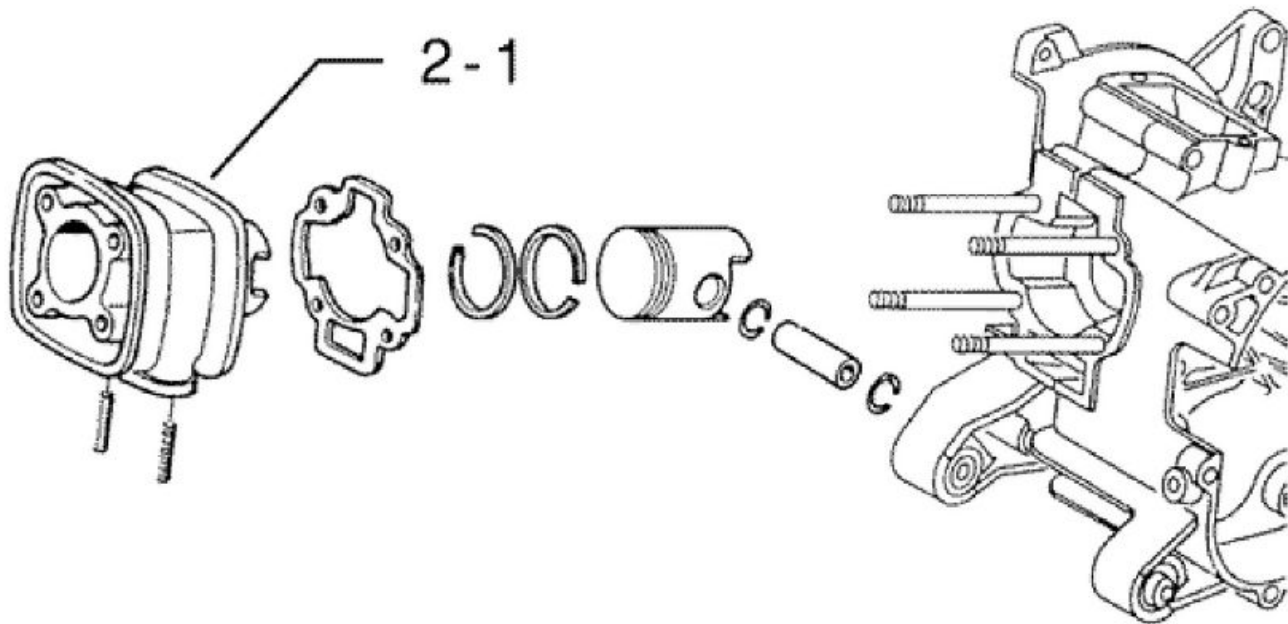
Crankshaft



CRANKSHAFT

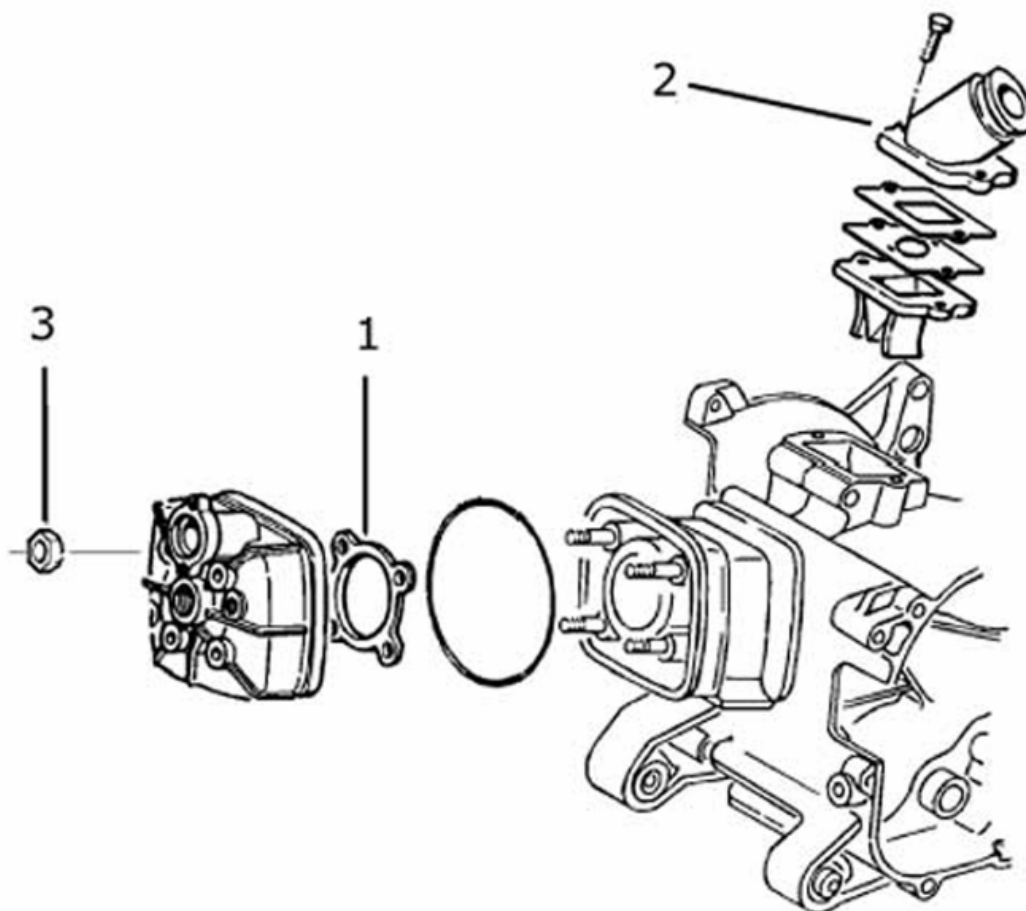
	Code	Action	Duration
1	001117	Crankshaft - Replacement	
2	001118	Bench bearings - Replacement	
3	001099	Oil seal flywheel side- Replacement	
4	001100	Oil seal clutch side - Replacement	

Cylinder assy.

**PISTON - CYLINDER - TEST PROBE ASSEMBLY**

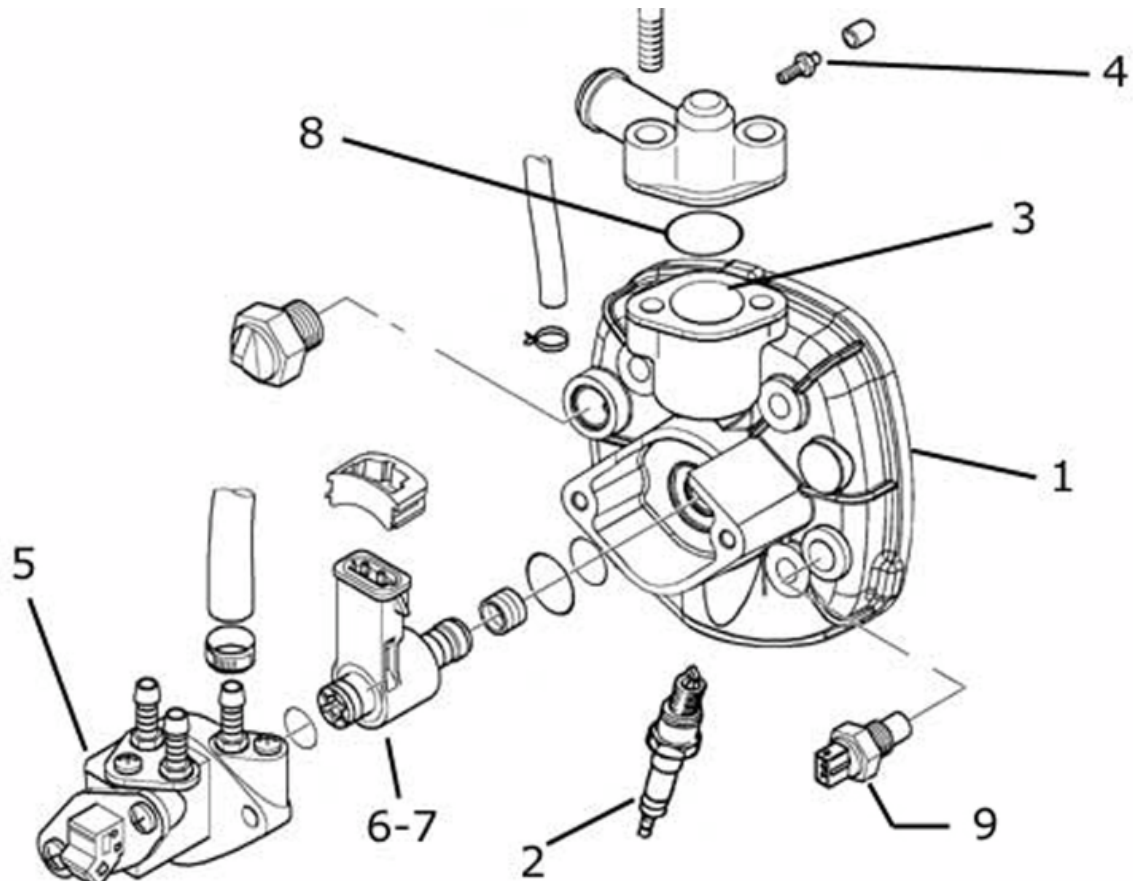
	Code	Action	Duration
1	001002	Cylinder-Piston - Replacement	
2	001107	Cylinder/piston - Service / clean	

Cylinder head assy.



INLET MANIFOLD - HEAD

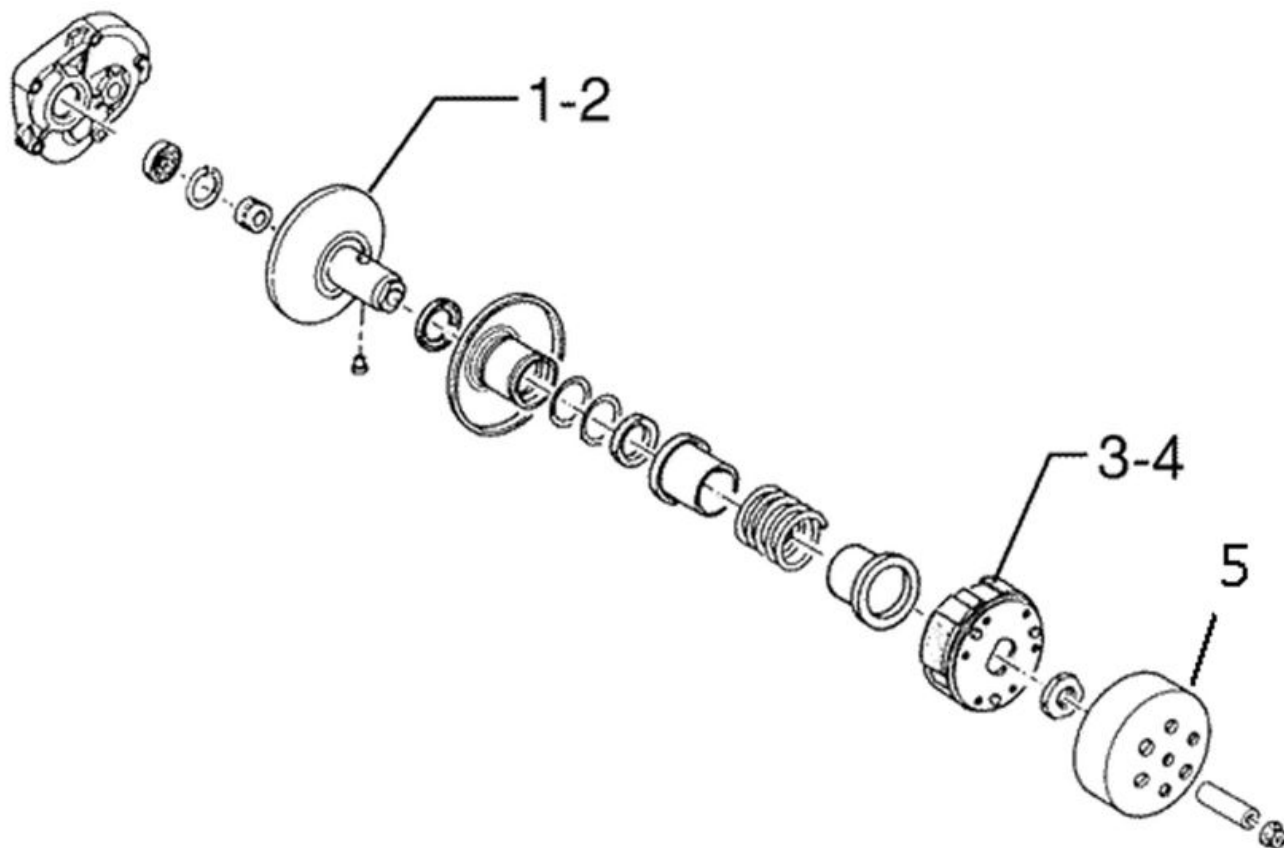
	Code	Action	Duration
1	001056	Head gasket - Replacement	
2	001013	Inlet manifold- Replacement	
3	003056	Head/cylinder - Nuts tightening	



INJECTOR SUPPORT

	Code	Action	Duration
1	001126	Head - Replacement	
2	001093	Spark plug - Replacement	
3	001057	Thermostat - Replacement	
4	007010	Bleed valve - Replacement	
5	005110	Fuel injector mounting - Replacement	
6	005111	Air injector - Replacement	
7	005112	Air injector - Service	
8	001061	O-Ring tube coolant delivery- Replacement	
9	001083	Thermistor - Replacement	

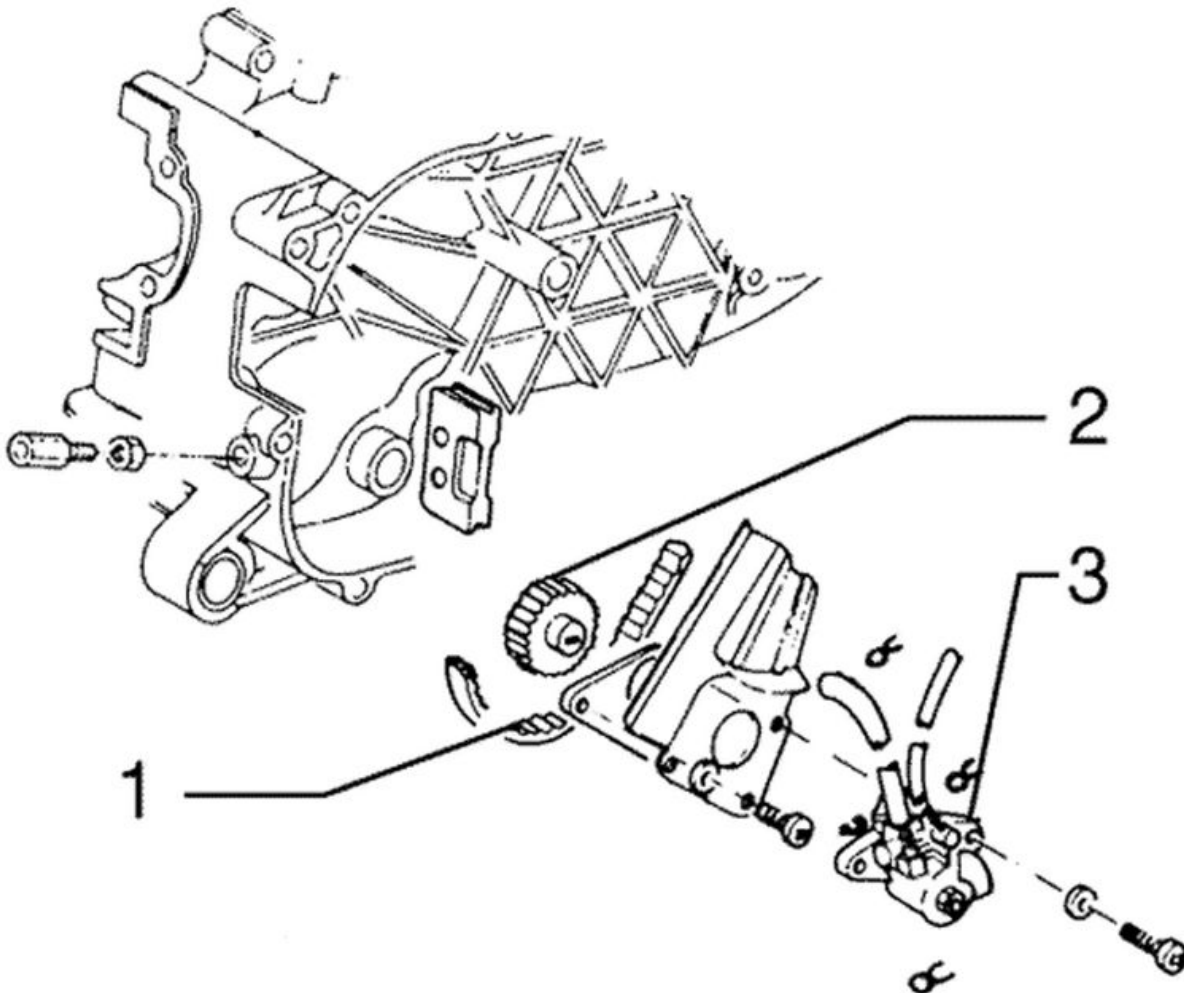
Driven pulley



DRIVEN PULLEY

	Code	Action	Duration
1	001110	Driven pulley- Replacement	
2	001012	Driven pulley - Service	
3	001022	Clutch - Replacement	
4	003072	Clutch assembly - Check wear	
5	001155	Clutch bell - Replacement	

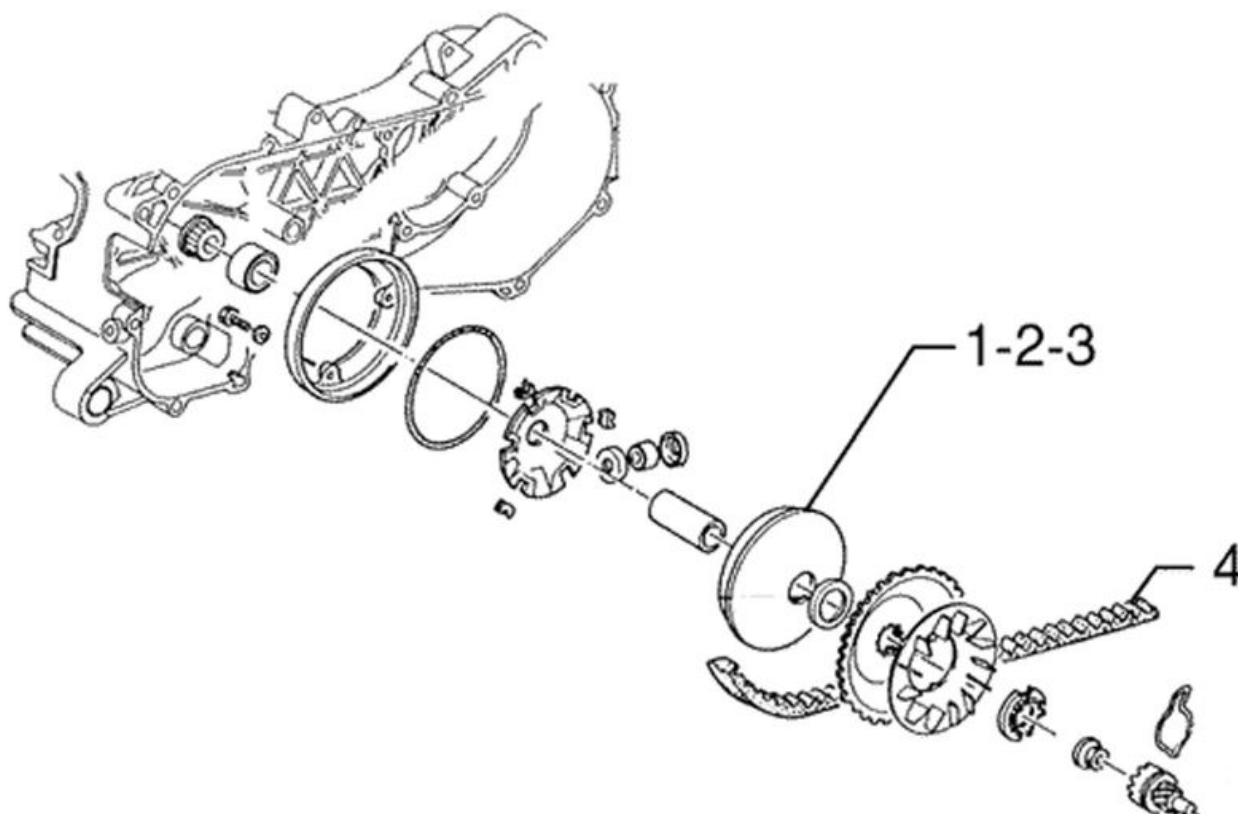
Oil pump



OIL PUMP

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

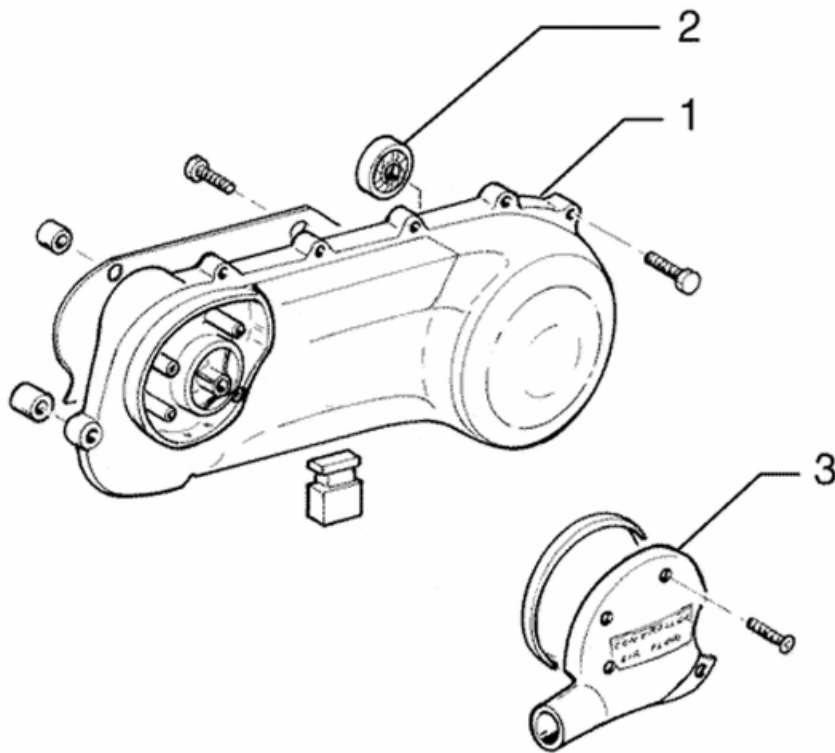
Driving pulley



DRIVING PULLEY

	Code	Action	Duration
1	001086	Driving half-pulley - replace	
2	001066	Driving pulley- Removal and refit	
3	001066	Driving pulley - Service	
4	001011	Driving belt - Replacement	

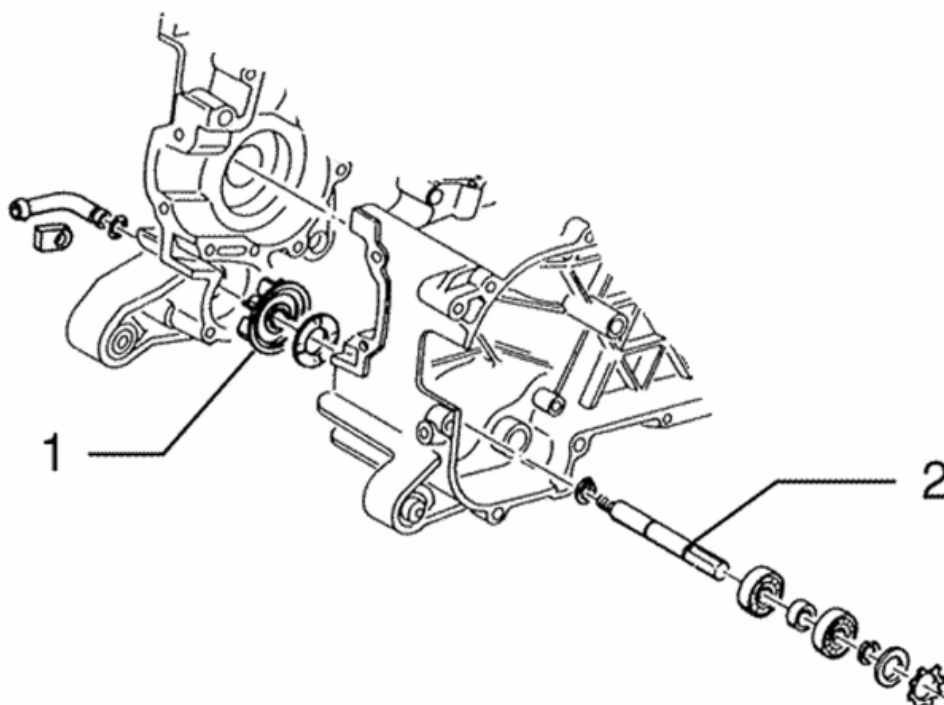
Transmission cover



TRANSMISSION COVER - FEMALE SCREW

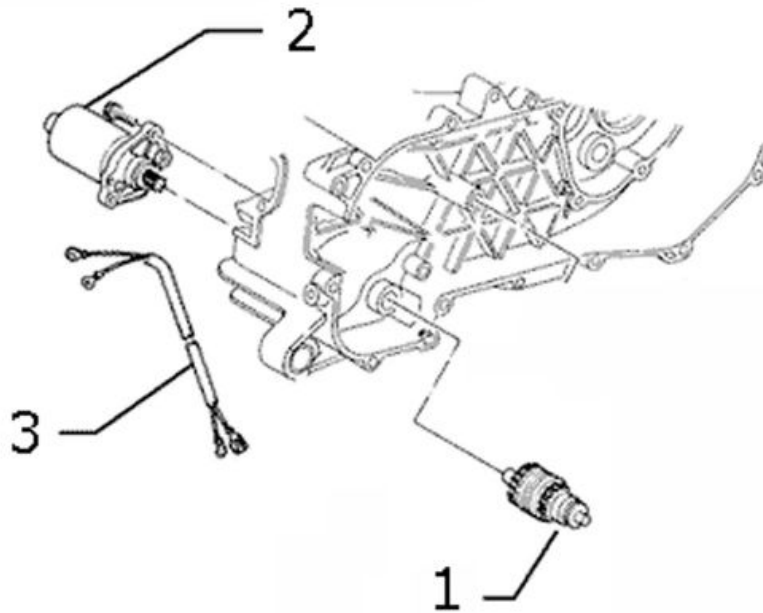
	Code	Action	Duration
1	001096	Transmission crankcase cover - Replacement	
2	001135	Transmission cover bearing - Replacement	
3	001131	Transmission air intake - Replacement	

Water pump



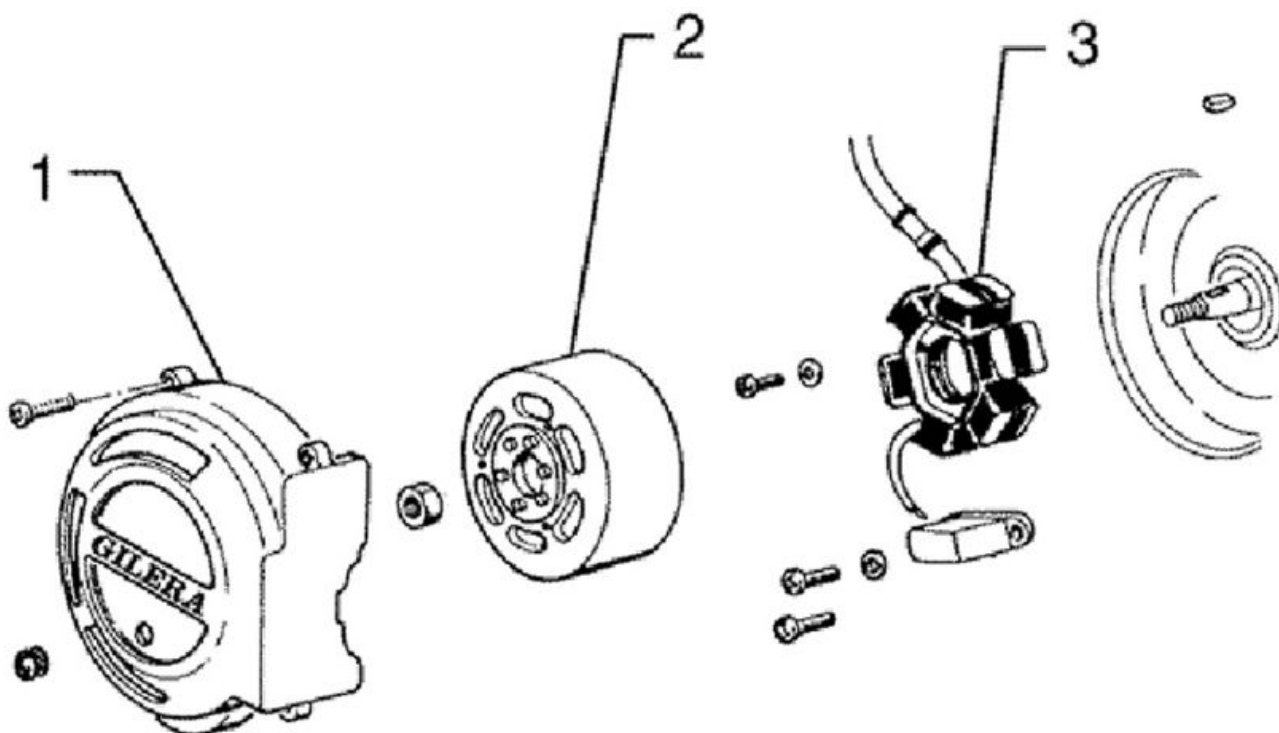
WATER PUMP

	Code	Action	Duration
1	001113	Water pump - Replacement	
2	001062	Pump command shaft - Removal and refit	

Starter motor**STARTER**

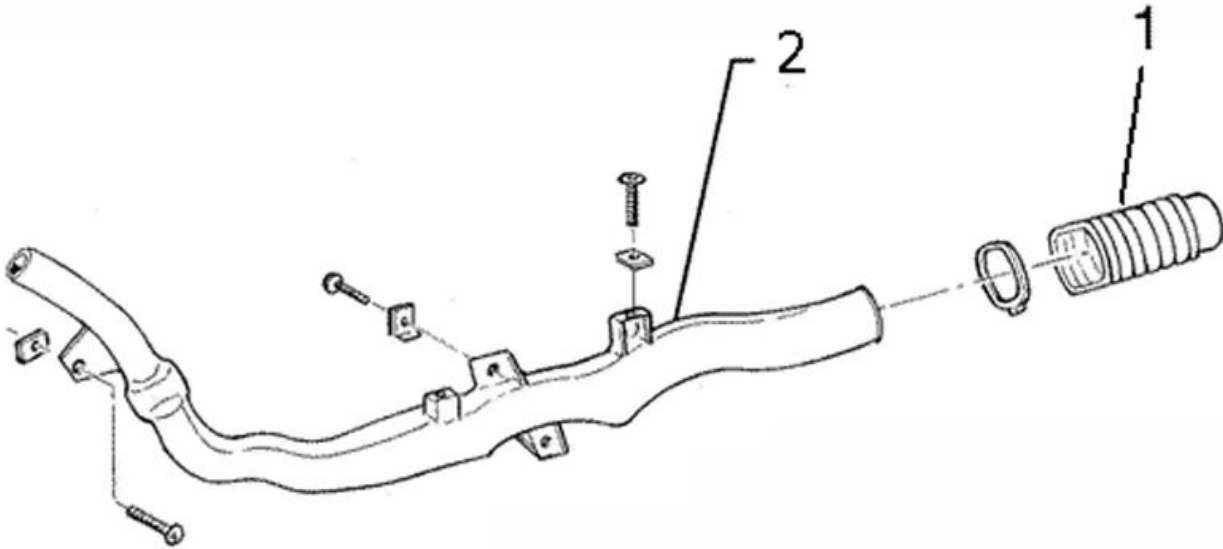
	Code	Action	Duration
1	001017	Starter pinion - Replacement	
2	001020	Starter motor - change	
3	005045	Starter cable assembly - Replacement	

Flywheel magneto



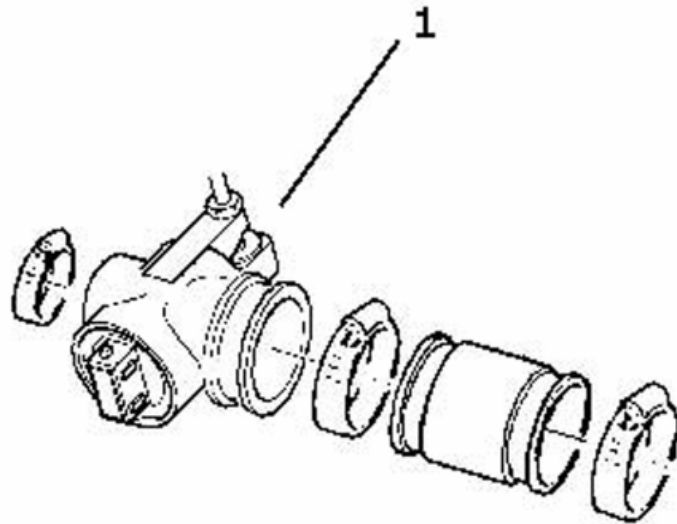
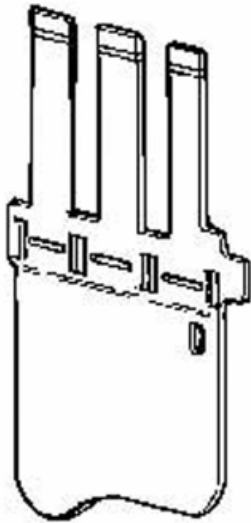
MAGNETO FLYWHEEL

	Code	Action	Duration
1	001087	Flywheel cover - Replacement	
2	001058	Flywheel - Replacement	
3	001067	Stator - Removal and refit	

Belt cooling duct**BELT REFRIGERATION TUBE**

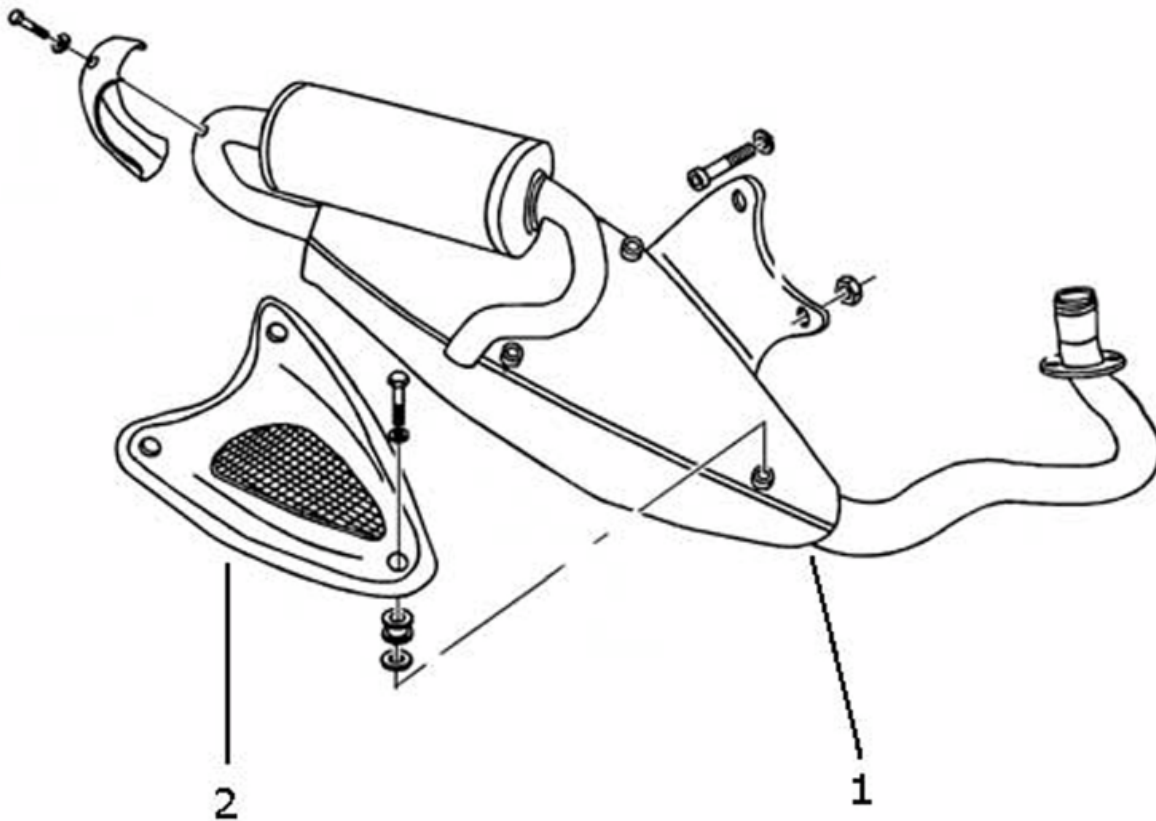
	Code	Action	Duration
1	001132	Transmission air intake pipe - Replacement	
2	001131	Transmission air intake - Replacement	

Butterfly valve



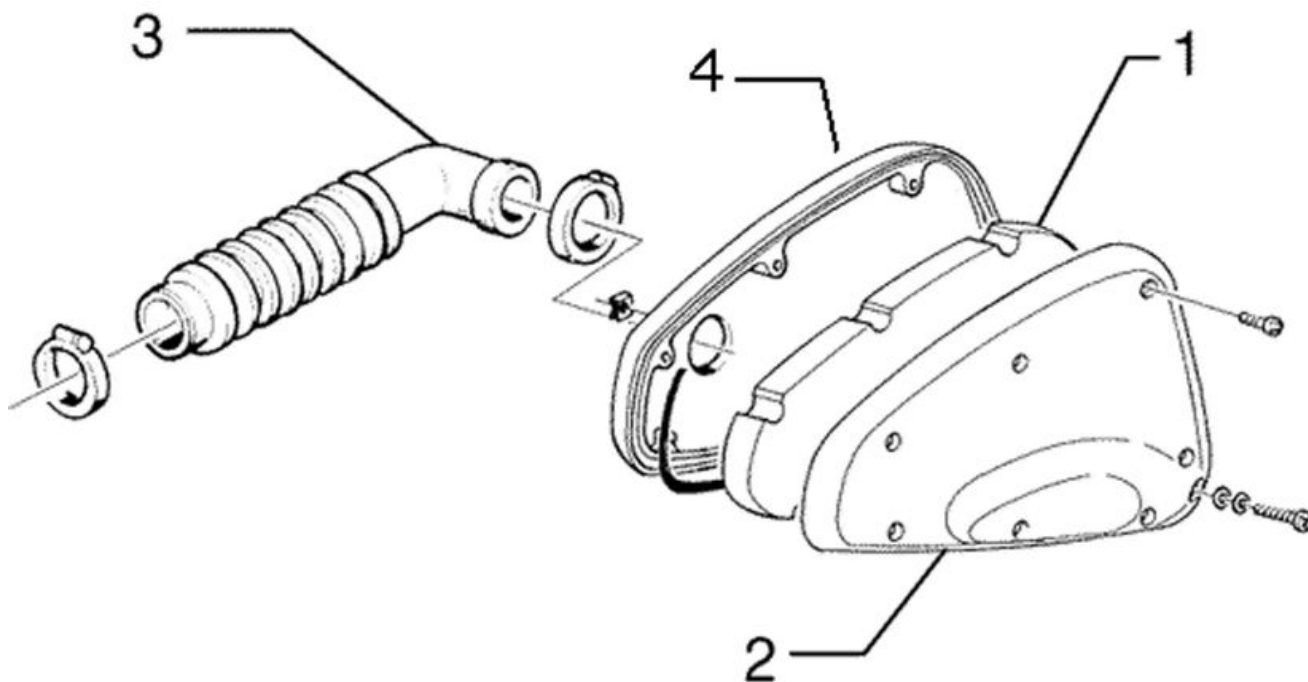
THROTTLE BODY

	Code	Action	Duration
1	001166	Throttle body	

Exhaust pipe**MUFFLER**

	Code	Action	Duration
1	001009	Muffler - Replacement	
2	001095	Muffler guard - Replacement	

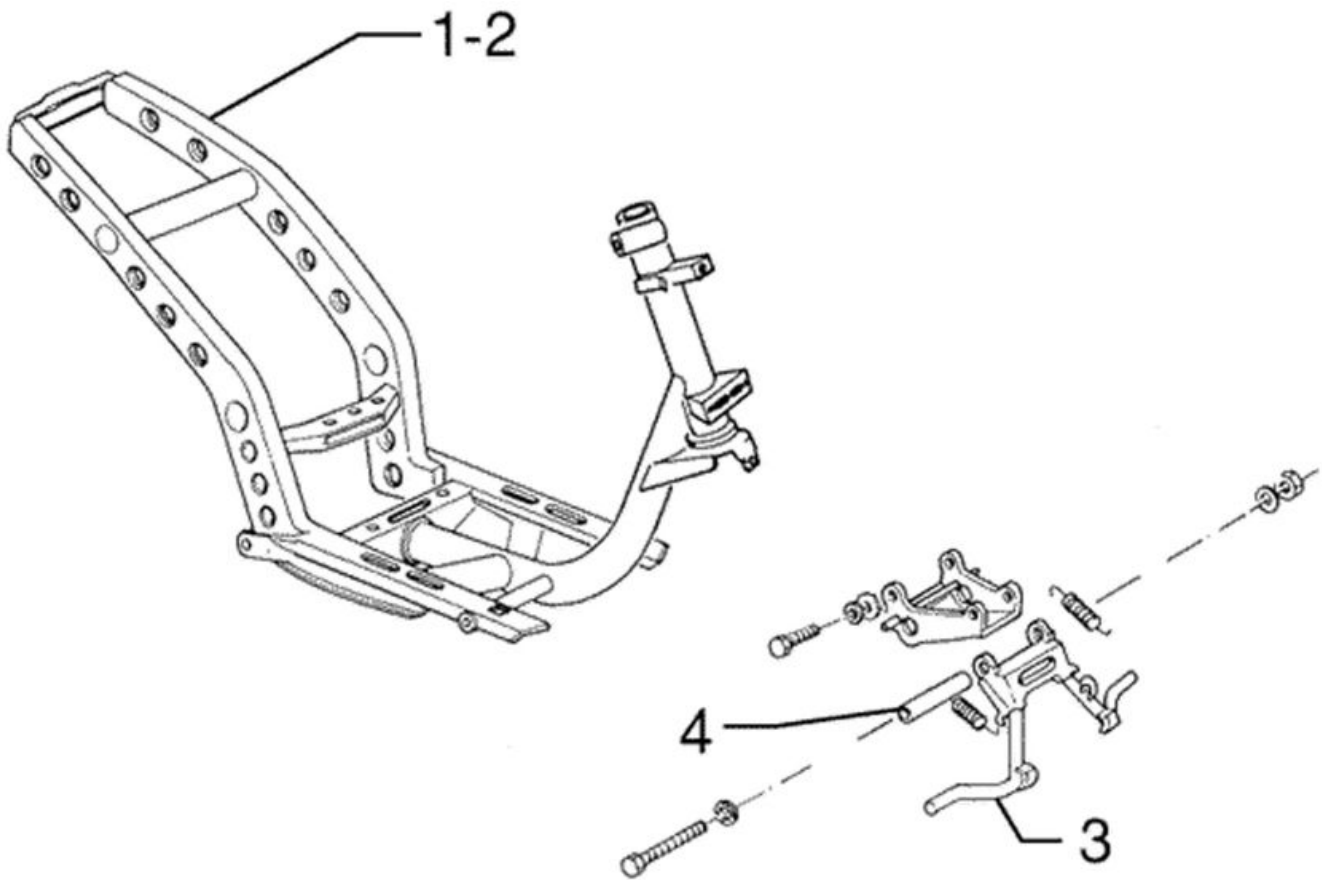
Air cleaner



AIR CLEANER

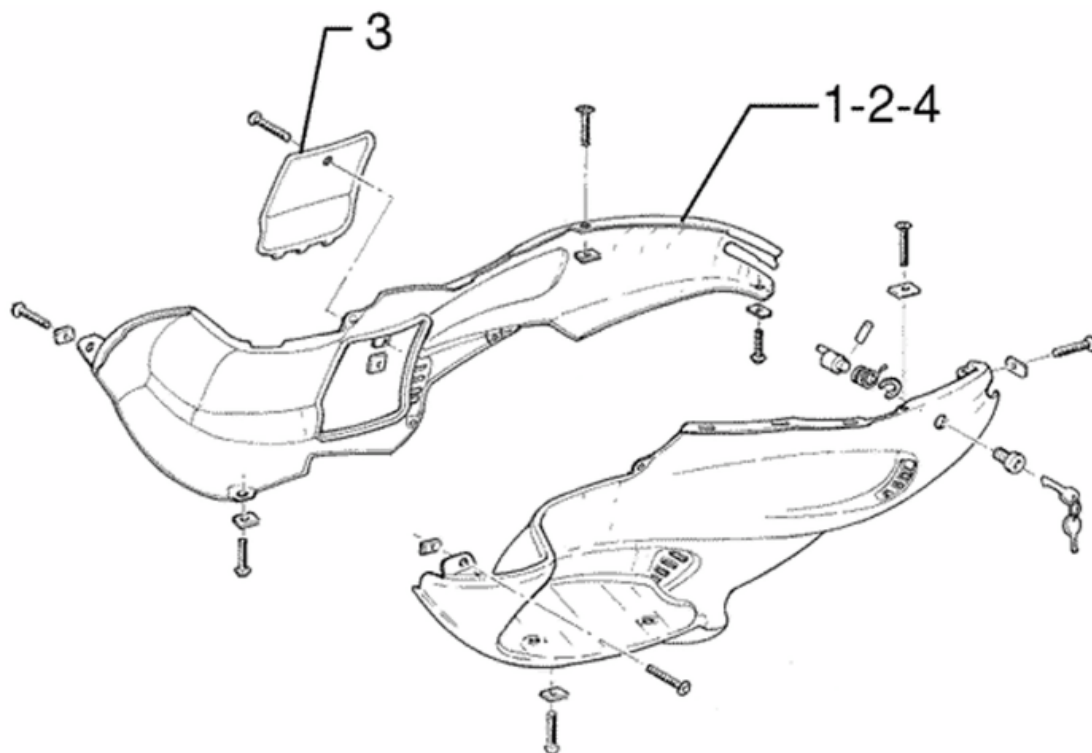
	Code	Action	Duration
1	001014	Air filter - Replacement	
2	001015	Air filter box - Replacement	
3	001027	Bodywork / cleaner union- Replacement	
4	004122	Cleaner / Throttle body union - Replacement	

Frame

**KICKSTAND FRAME**

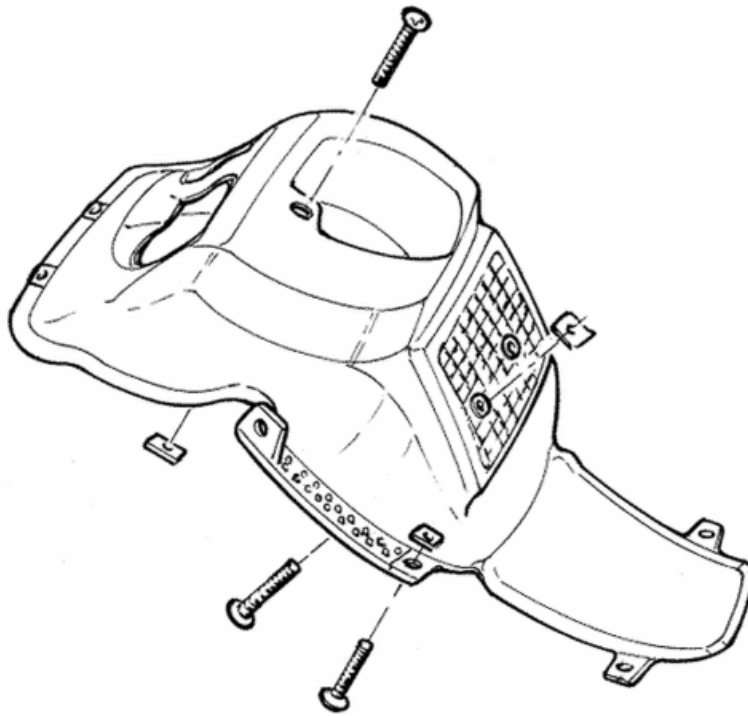
	Code	Action	Duration
1	004001	Frame- Replacement	
2	006001	Frame - Painting	
3	004004	Kickstand - Replacement	
4	001053	Stand bolt - Replacement	

Side fairings



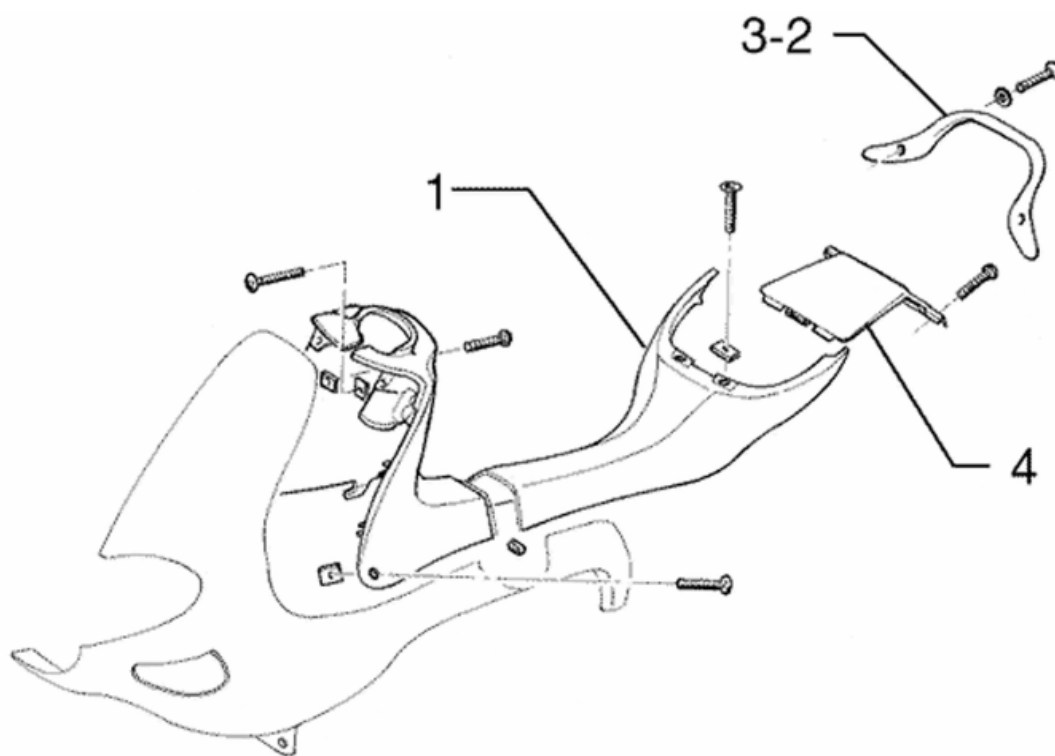
SIDE FAIRING

	Code	Action	Duration
1	004085	Fairing (1) - Replacement	
2	004012	Rear fairings - Removal and refitting	
3	004059	Spark plug inspection flap - Replacement	
4	006008	Rear side panel - Replacement	

Rear cover**LOWER SHIELD FAIRING**

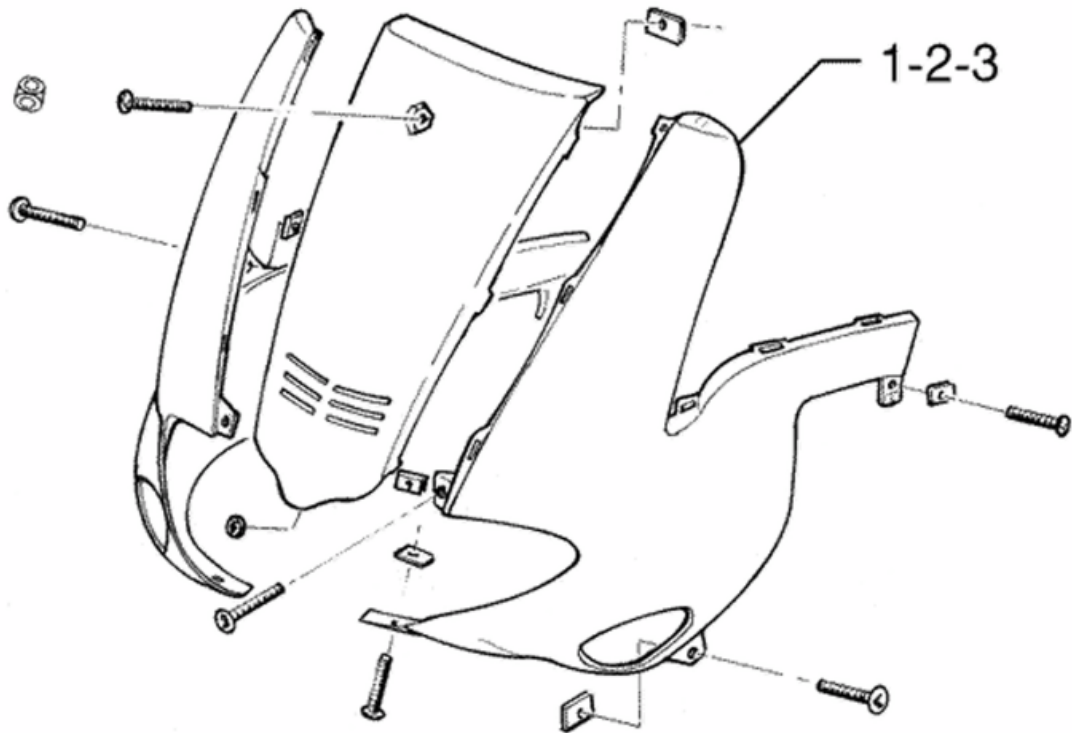
	Code	Action	Duration
1	004022	Shield lower section - Replacement	

Central cover



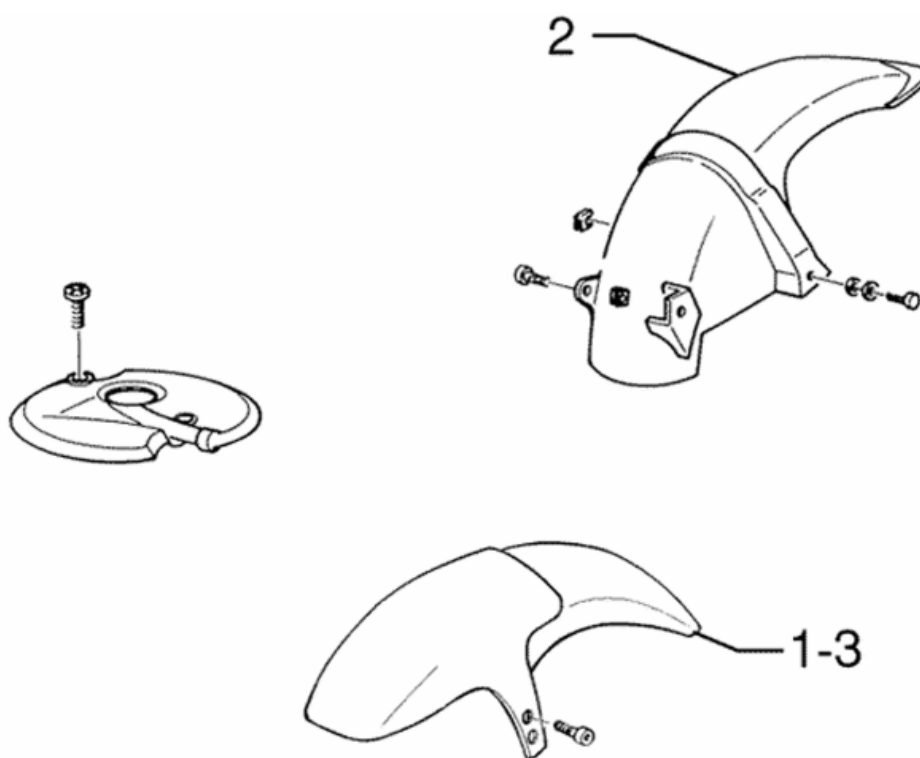
CENTRAL FAIRING

	Code	Action	Duration
1	004011	Central chassis cover - Replacement	
2	004068	Passenger handgrip - Replacement	
3	004056	Upper rear light cover - Replacement	
4	006040	Passenger handle - Paintwork	

**CENTRAL FAIRING**

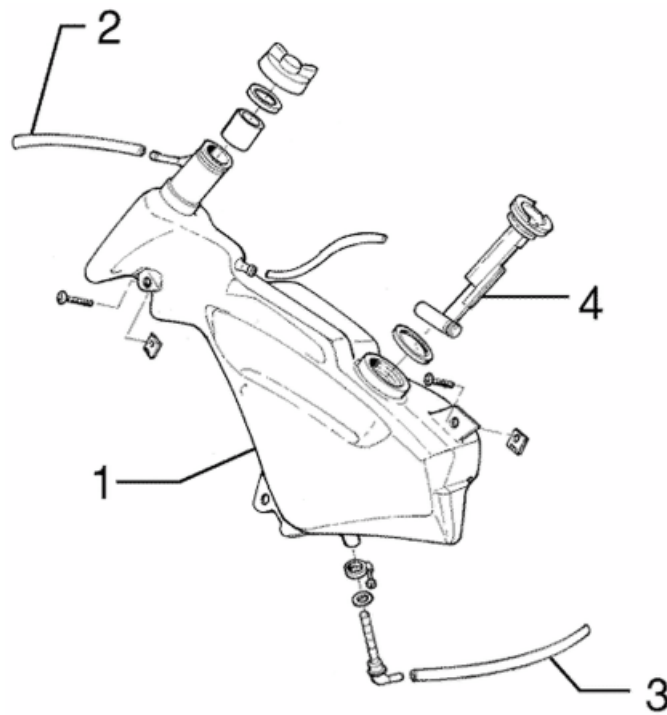
	Code	Action	Duration
1	004132	Semishield - Paintwork	
2	004133	Semishields- Replacement	
3	006039	Semishield - Replacement	

Mudguard



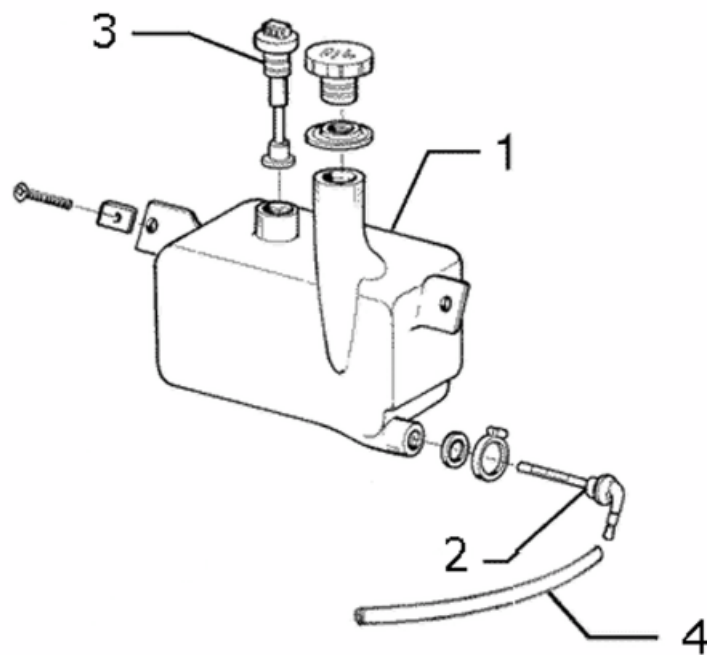
REAR AND FRONT MUDGUARD

	Code	Action	Duration
1	004009	Rear mudguard - Replacement	
2	004002	Front mudguard - Replacement	
3	006003	Mudguard - Painting	

Fuel tank**FUEL TANK**

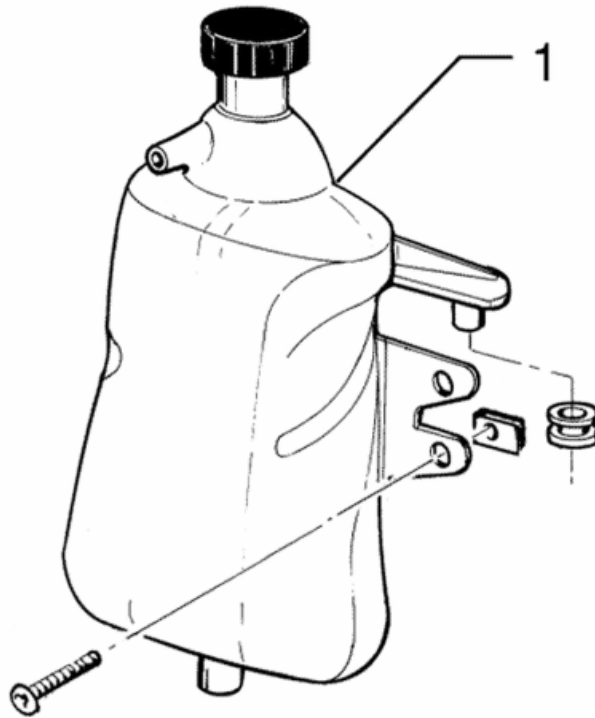
	Code	Action	Duration
1	004005	Fuel tank - Replacement	
2	004109	Fuel tank breather - Replacement	
3	004110	Fuel tank hose - Replacement	
4	005010	Tank float - Replacement	

Tank oil



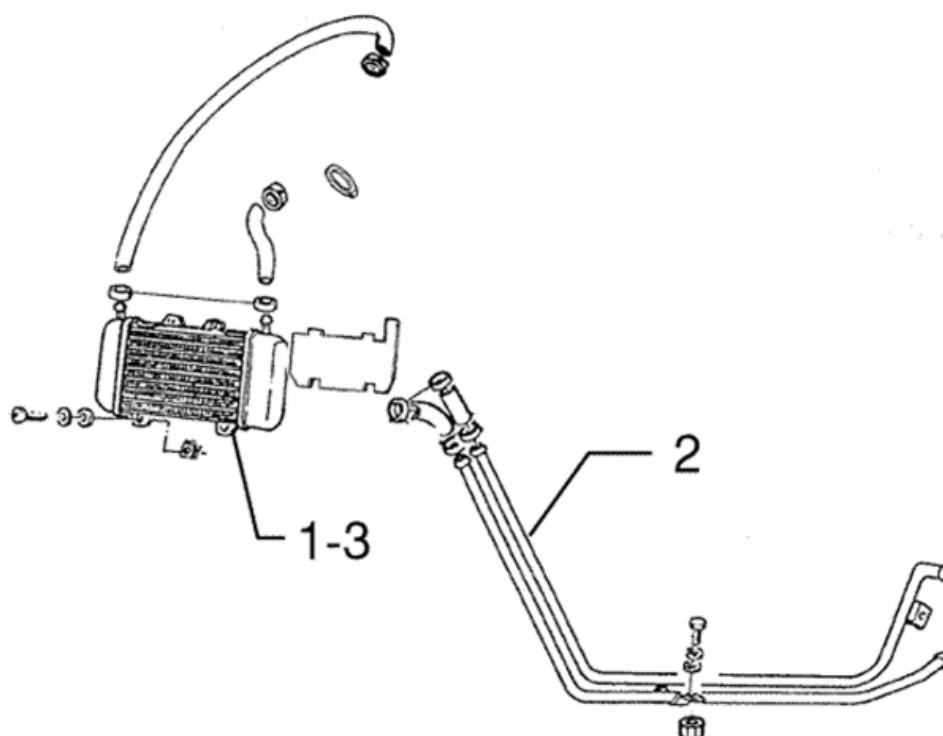
OIL TANK MIXER - DEGASSER

	Code	Action	Duration
1	004017	Oil reservoir - Replacement	
2	004095	Oil reservoir cock - Replacement	
3	005018	Oil reservoir float - Replacement	
4	004091	Oil reservoir hose - Replacement	

Expansion tank**EXPANSION TANK**

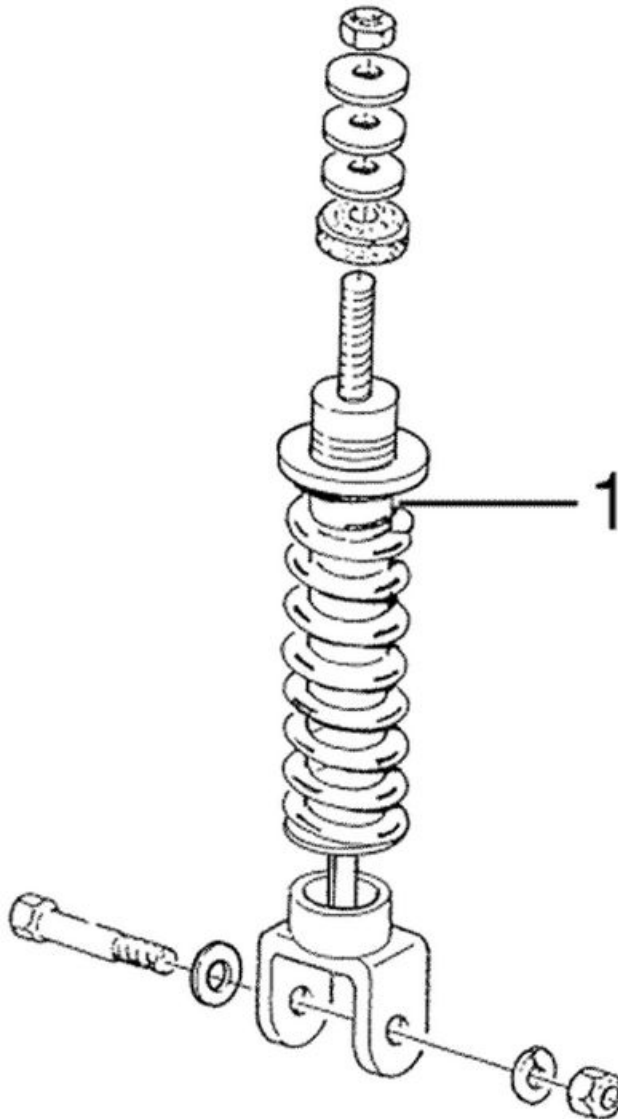
	Code	Action	Duration
1	007001	Expansion tank - Replacement	

Radiator



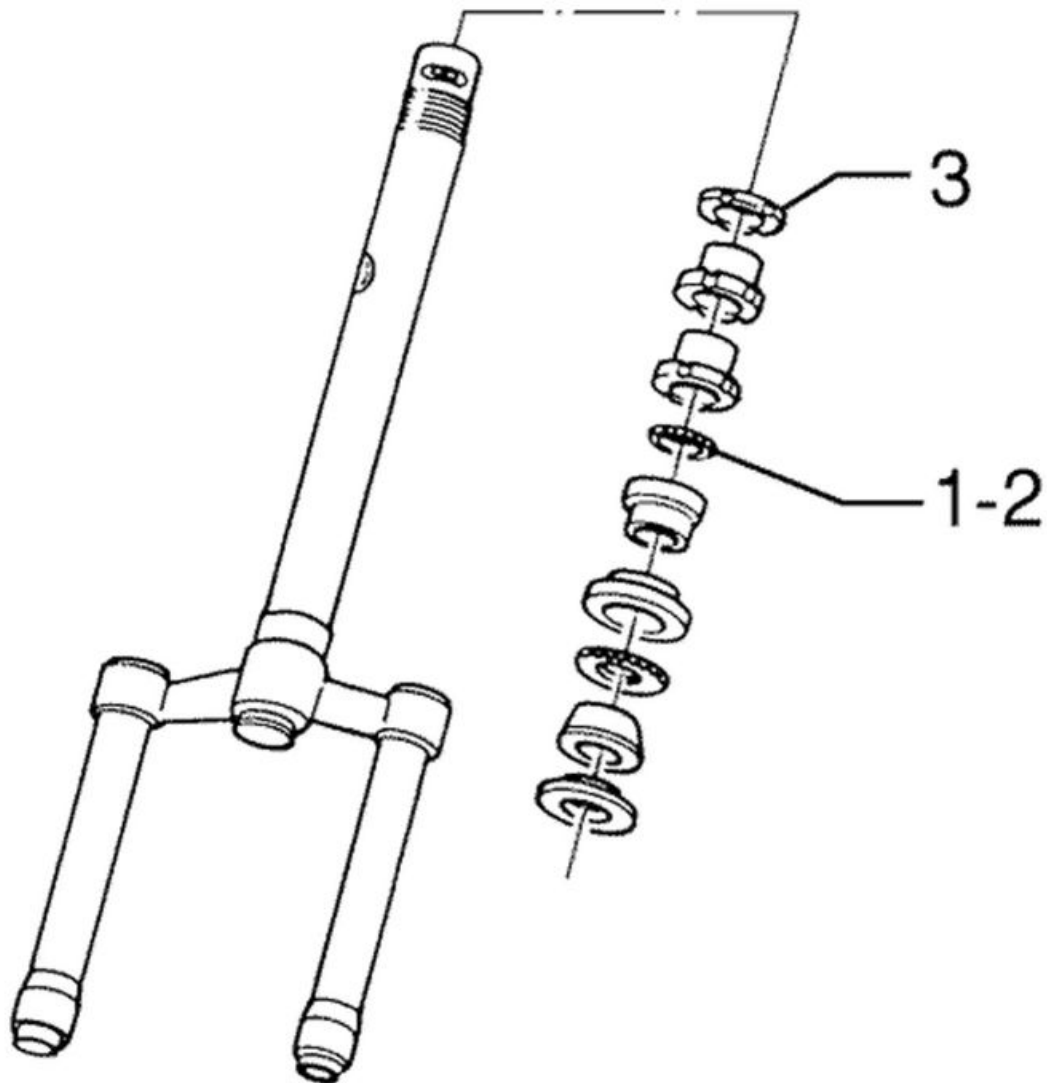
RADIATOR

	Code	Action	Duration
1	007002	Water cooler - Replacement	
2	007003	Coolant delivery and return pipe - Replacement	
3	001052	Coolant - Replacement	

Rear shock-absorber**REAR SHOCK ABSORBER**

	Code	Action	Duration
1	003007	Rear shock absorber - Removal and refit	

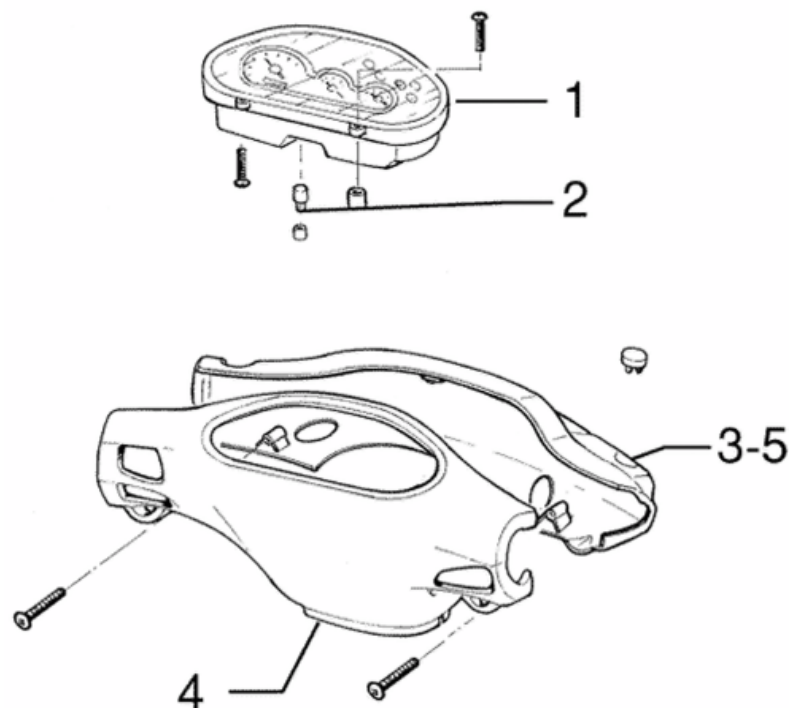
Steering column bearings



STEERING THRUST WASHER

	Code	Action	Duration
1	004119	Bearing / upper steering fifth wheel - Replacement	
2	003002	Steering thrust washer - Replacement	
3	003073	Steering clearance - Adjustment	

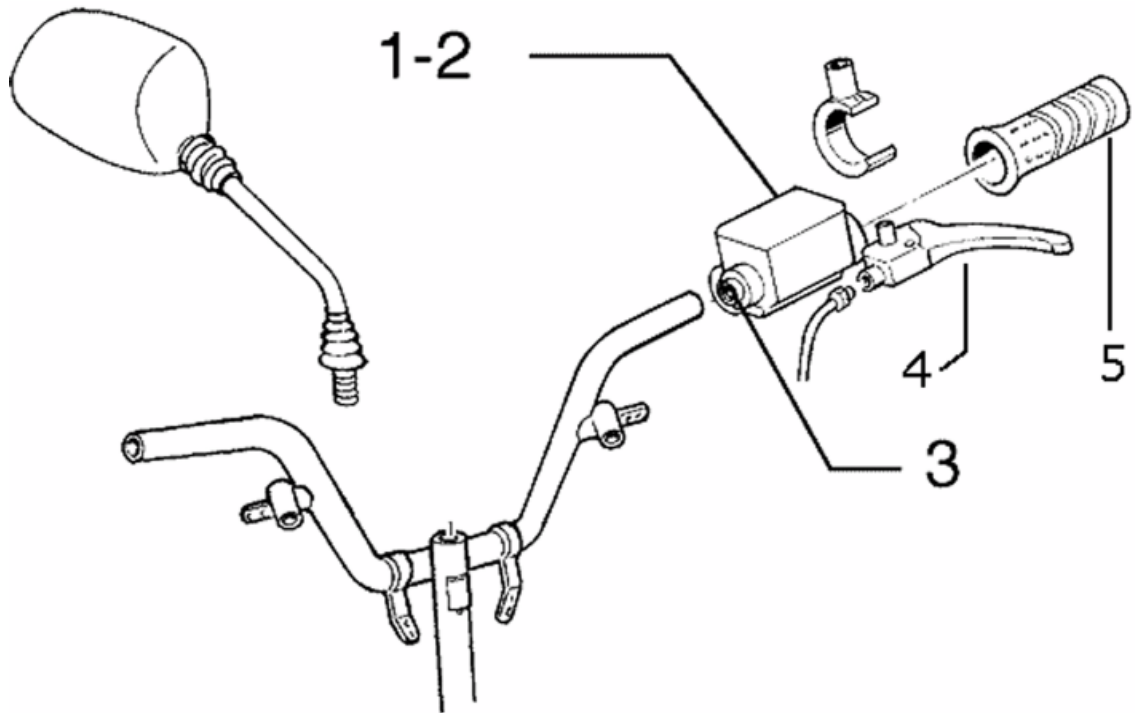
Handlebar covers



ODOMETER - HANDLEBAR COVER

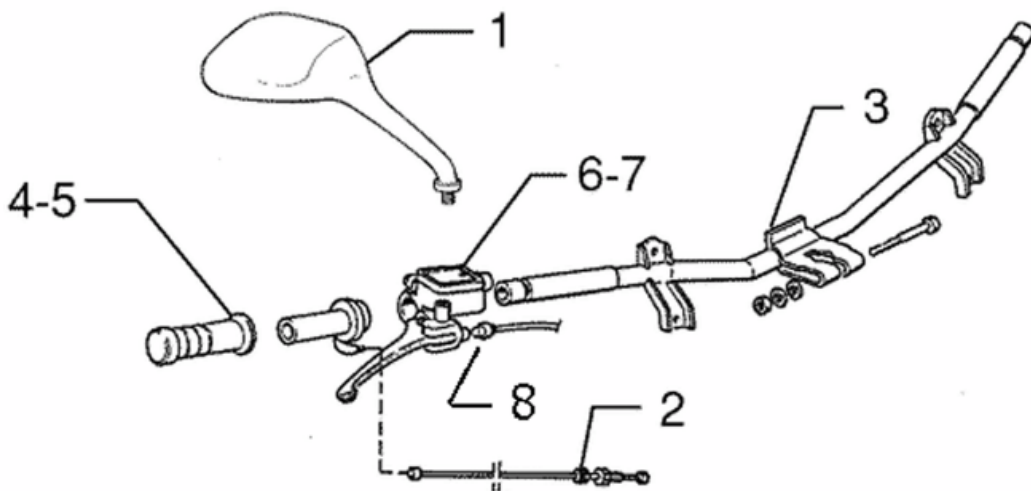
	Code	Action	Duration
1	005014	Odometer - Replacement	
2	005038	Instrument panel warning light bulbs - Replacement	
3	004018	Handlebar front section - Replacement	
4	004019	Handlebar rear section - Replacement	
5	006013	Front part of handlebar - Paintwork	

Handlebar components



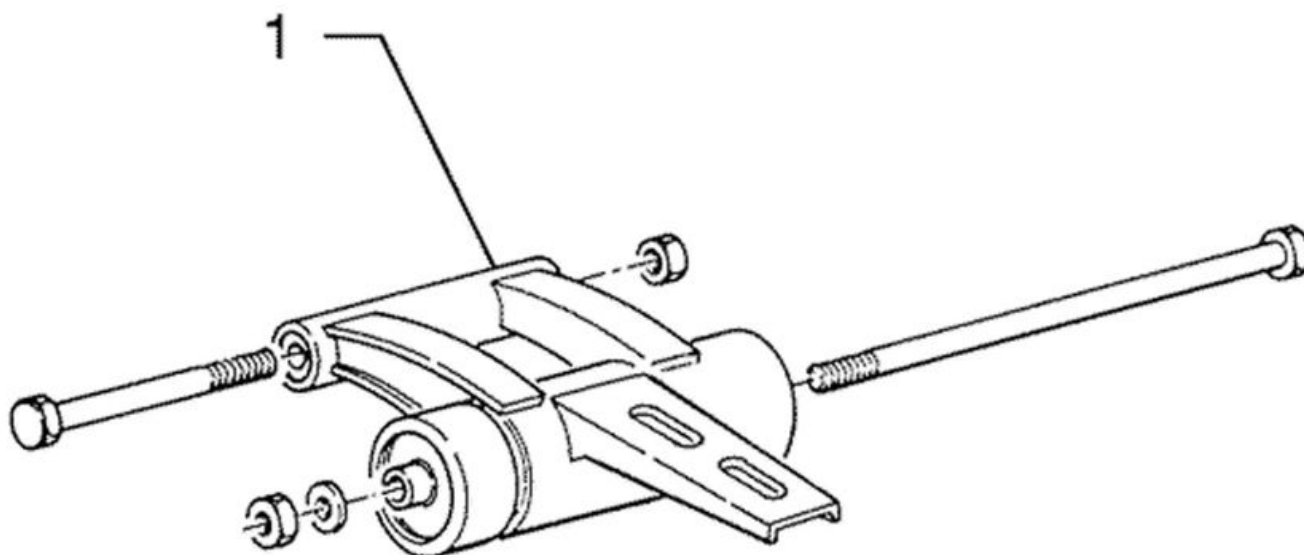
HANDLEBAR COMPONENTS

	Code	Action	Duration
1	002080	Rear brake oil bleeding system - Replacement	
2	002067	Rear brake pump - Replacement	
3	002020	Rear brake pipes - Removal and refitting	
4	002037	Brake or clutch lever - Replacement	
5	002071	Left hand grip - Replacement	



HANDLEBAR COMPONENTS

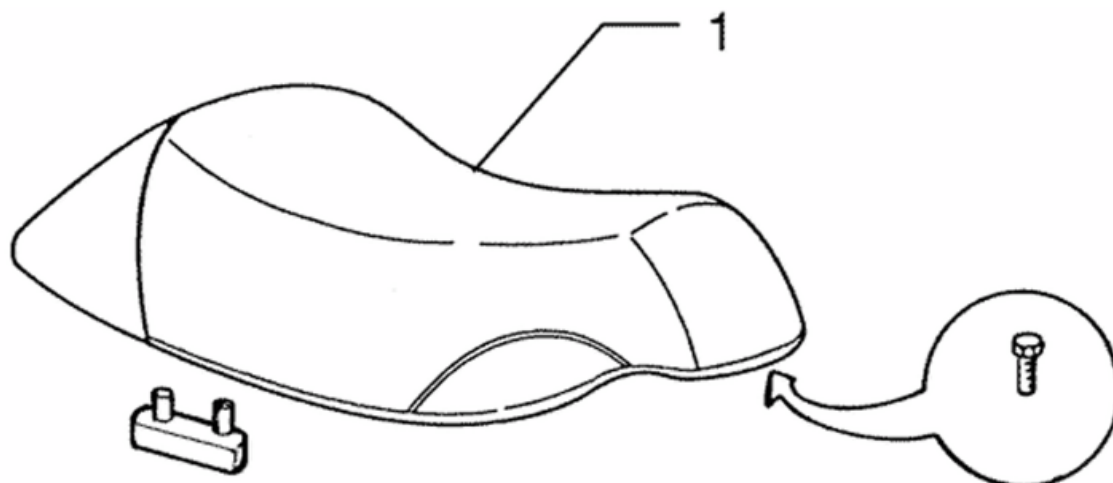
	Code	Action	Duration
1	004066	Rear-view mirror - Replacement	
2	003061	Accelerator transmission - adjust	
3	003001	Handlebar - Removal and re-fit	
4	002060	Throttle grip - Replacement	
5	002059	Right hand grip - Replacement	
6	002024	Front brake pump - Removal and Refitting	
7	002018	Front brake pump - Service	
8	005017	Stop switch - Replacement	

Swing-arm**SWINGING ARM**

	Code	Action	Duration
1	001072	Engine /frame swinging arm attachment - Replacement	

We inform you that, in order to avoid the possibility of a contact between the helmet bay and the injector fitting, swing-arm no. 560522 has been replaced by part no. 599286.

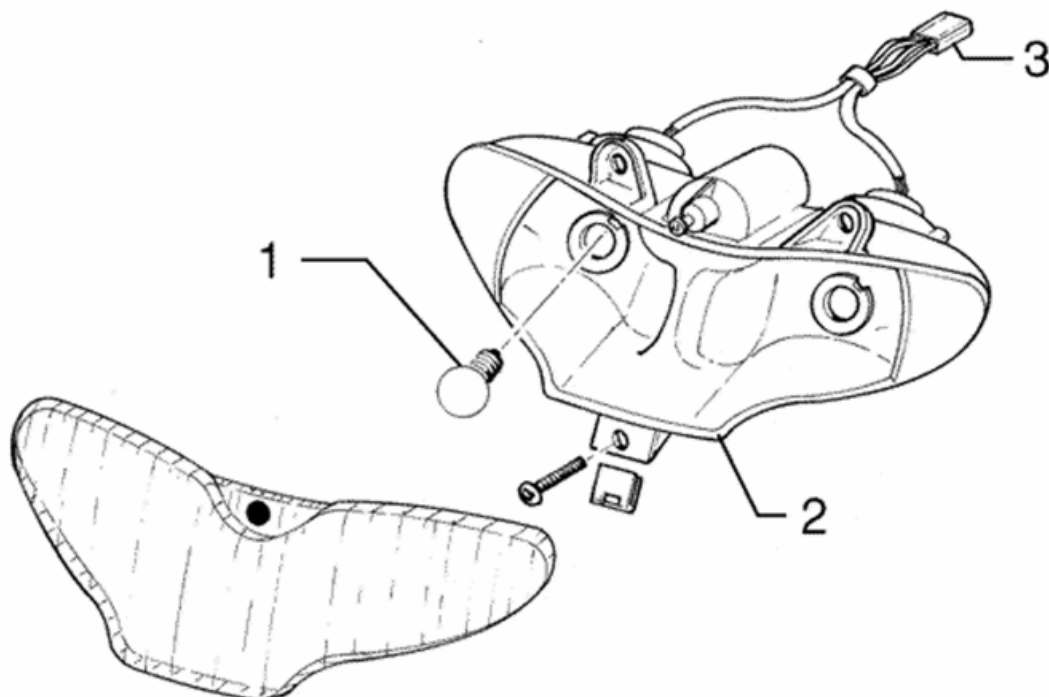
Seat



SEAT

	Code	Action	Duration
1	004003	Saddle - Replacement	

Turn signal lights



OPTICAL UNIT

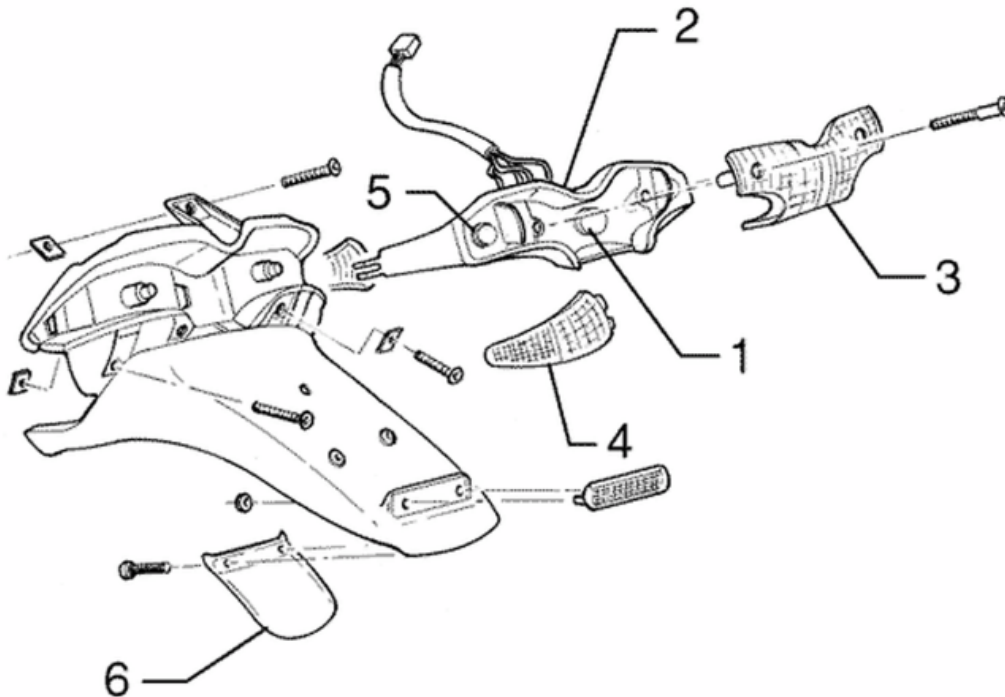
	Code	Action	Duration
1	005008	Front headlamp bulbs - Replacement	
2	005002	Front light - Replacement	

	Code	Action	Duration
3	005044	Front lights cable unit- Replacement	



FRONT TURN INDICATORS

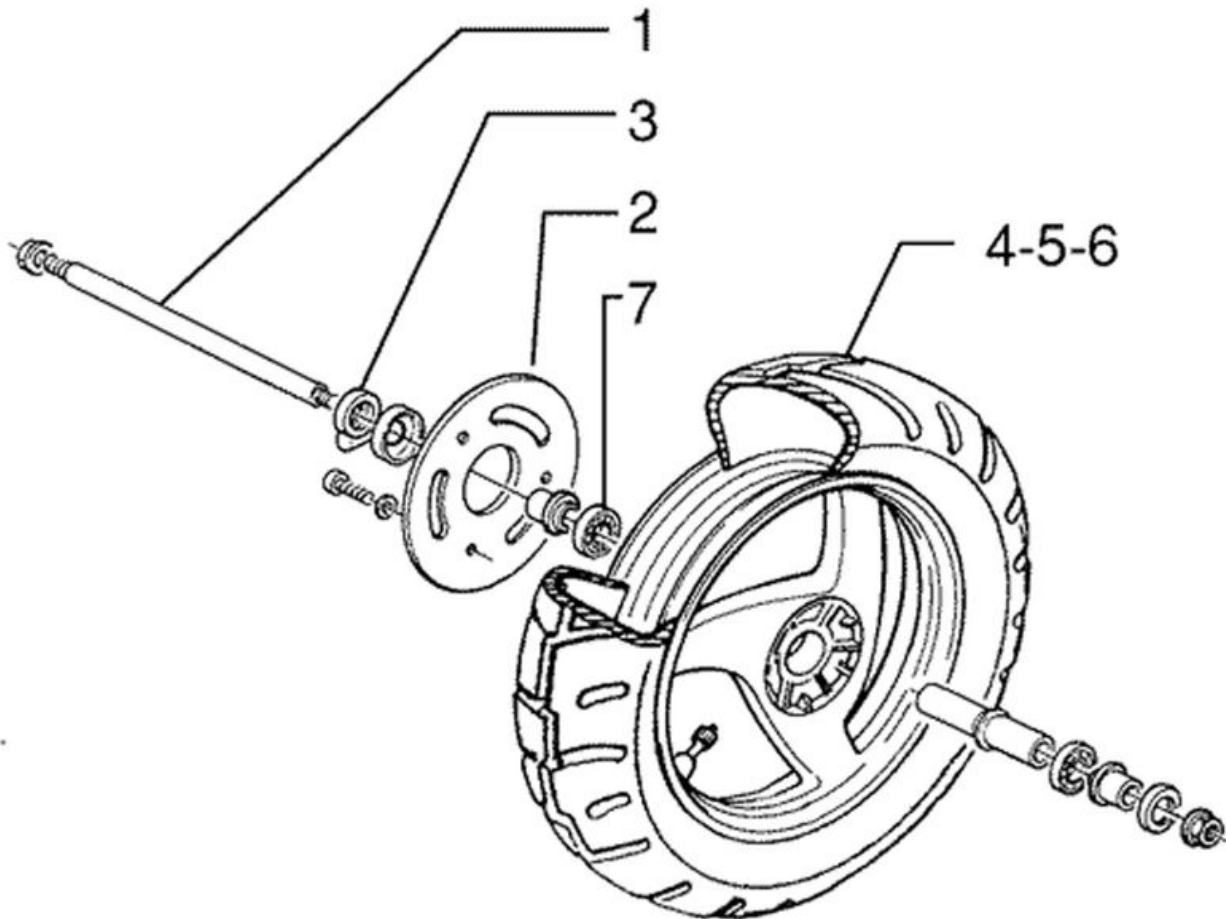
	Code	Action	Duration
1	005012	Front direction indicators - Replacement	
2	005067	Front turn indicator bulb - Replacement	



BACK HEADLIGHT

	Code	Action	Duration
1	005066	Rear light bulbs - Replacement	
2	005005	Tail light - Replacement	
3	005028	Rear light assembly glass - Replacement	
4	005022	Rear turn indicators-Replacement	
5	005068	Rear turn indicator bulb- Replacement	
6	005048	Licence plate holder - Replacement	

Front wheel



FRONT WHEEL

	Code	Action	Duration
1	003038	Front wheel axle- Removal and refit	
2	002041	Brake disc - Replacement	
3	002011	Odometer drive- Replacement	

	Code	Action	Duration
4	004123	Front wheel - Replacement	
5	003047	Front tyre - Replacement	
6	003037	Front wheel rim - Removal and refit	
7	003040	Front wheel bearings - Replacement	

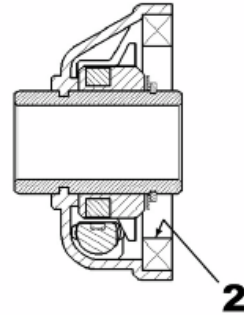
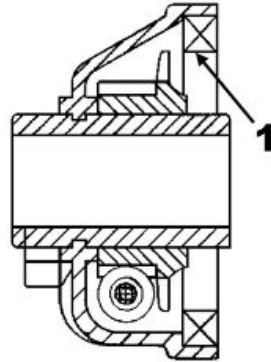
Grease tone wheel or drive

Please take note that the code has been introduced:

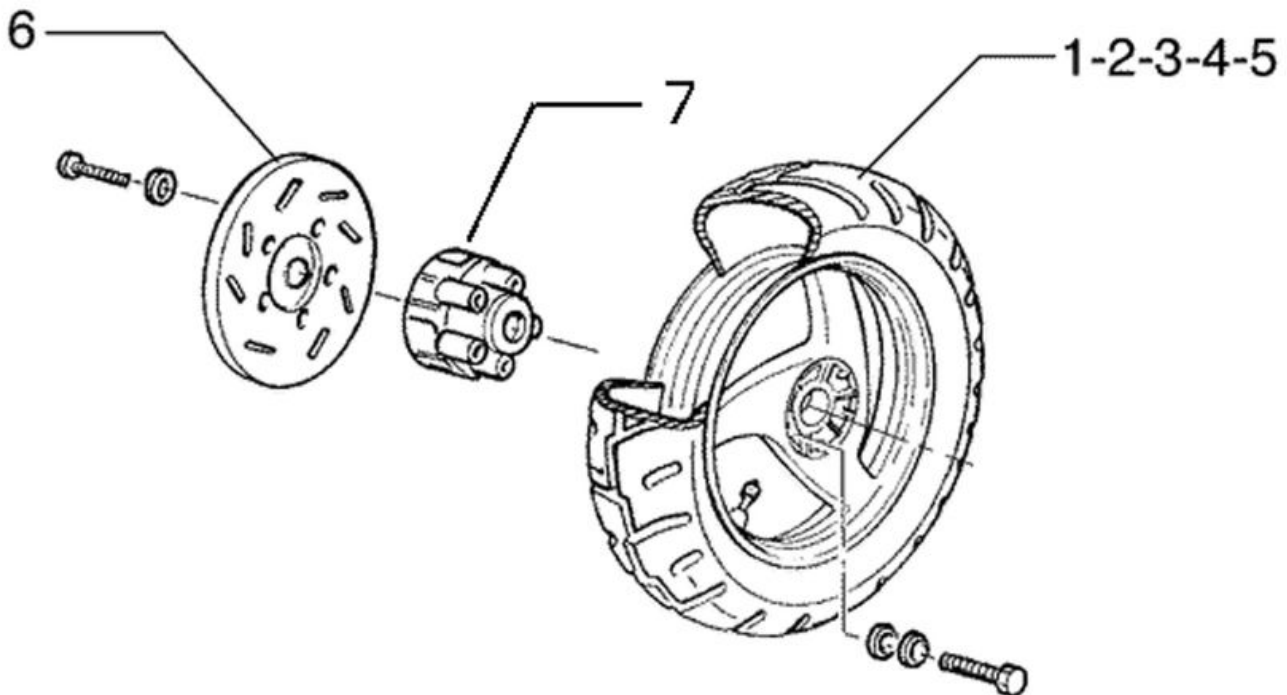
900001 - Tone wheel / drive greasing - 15'.

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

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



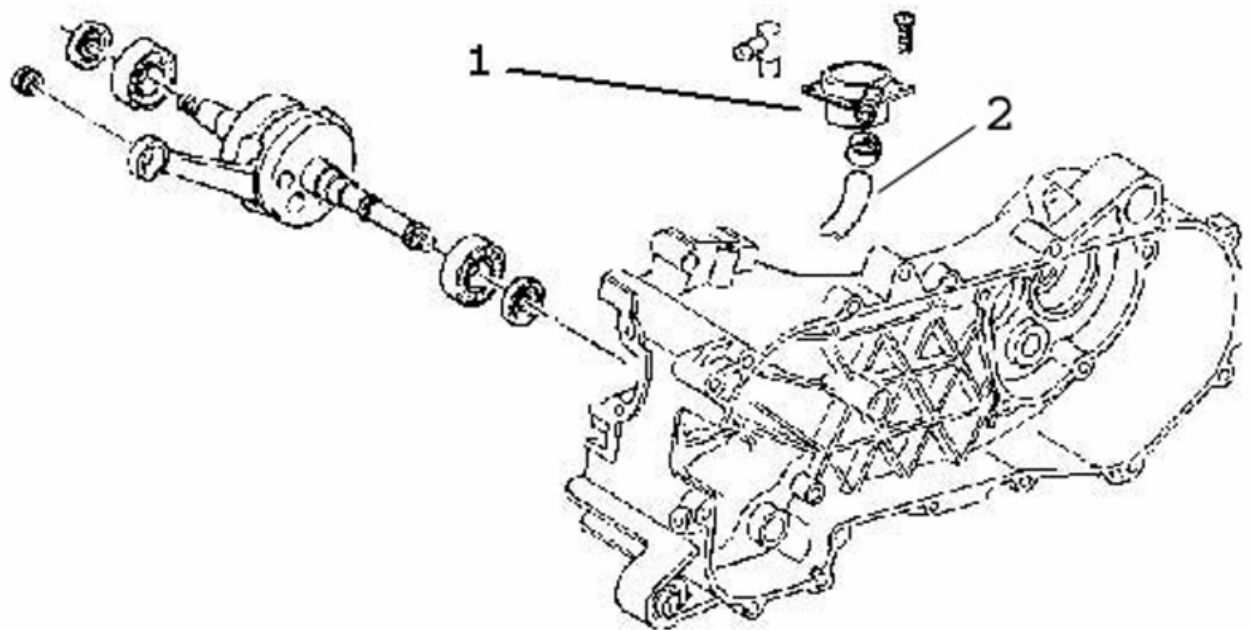
Rear wheel



REAR WHEEL

	Code	Action	Duration
1	001016	Rear wheel - Replacement	
2	004126	Rear wheel tyre - Replacement	
3	001071	Rear wheel rim - Removal and refit	
4	003063	Tyre pressure - Check	
5	006018	Wheel rim - Paintwork	
6	002070	Rear brake disc - Replacement	
7	002028	Rear wheel hub - Replacement	

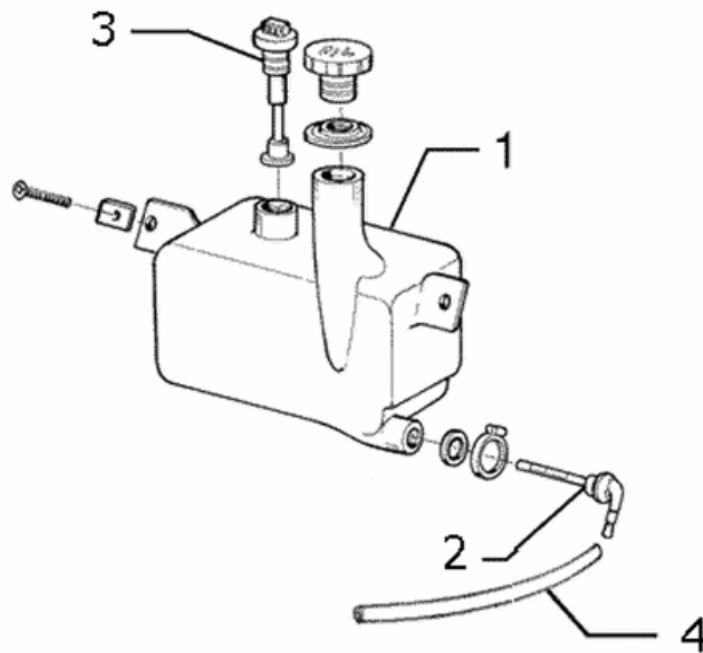
compressore aria



AIR COMPRESSOR

	Code	Action	Duration
1	001168	Air compressor - Replacement	
2	004160	Compressed air hose - Replacement	

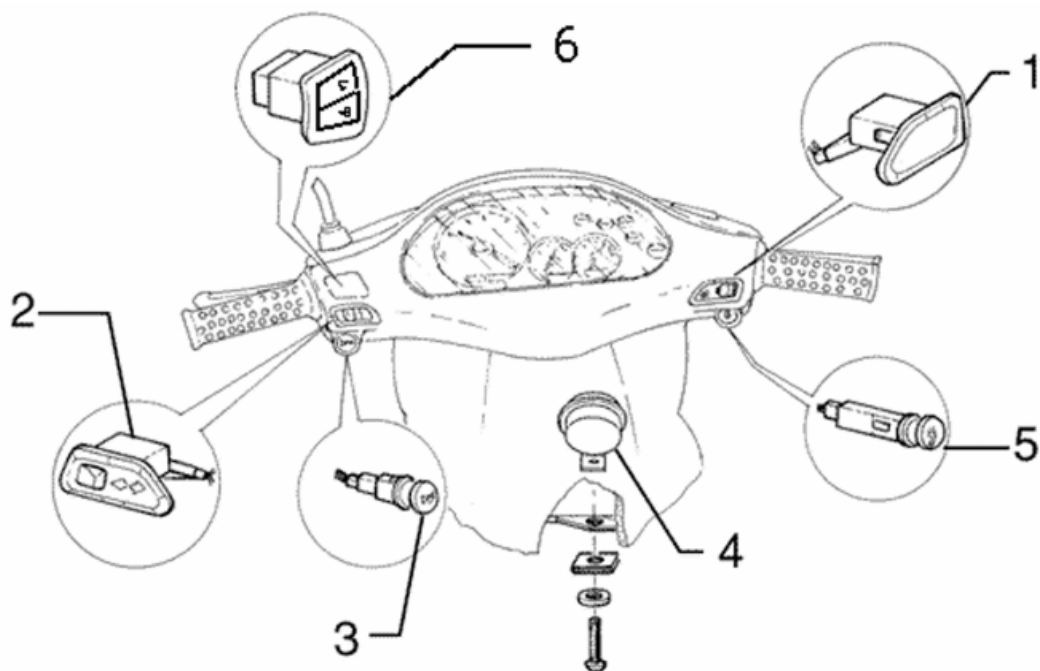
Fuel pump



SUPPLY SYSTEM

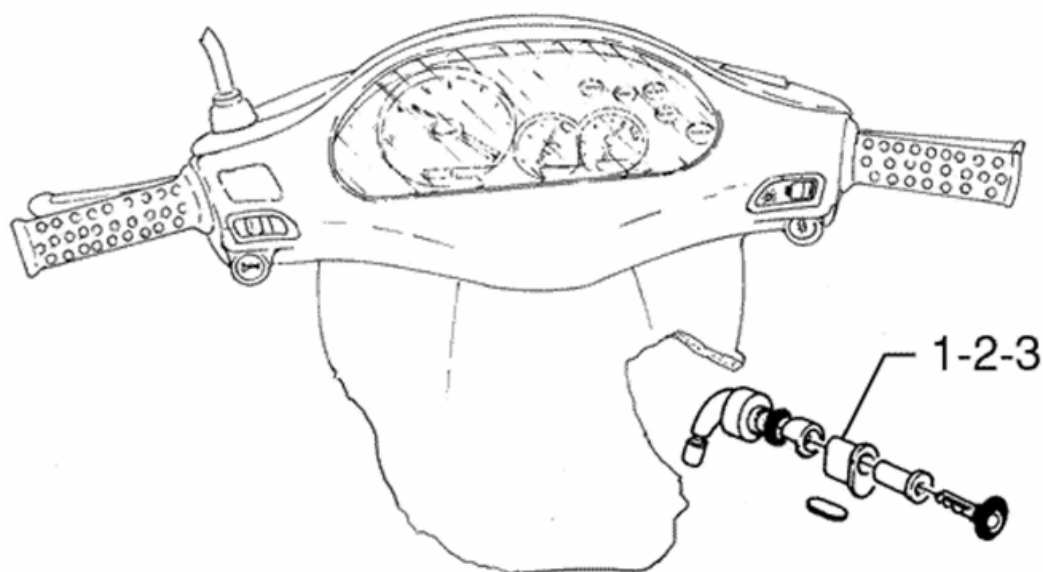
	Code	Action	Duration
1	004072	Fuel filter - Replacement	
2	004073	Fuel pump - Replacement	
3	004137	Injector pump pipe - Replacement	
4	004138	Fuel reverse pipe - Replacement	

Electric devices



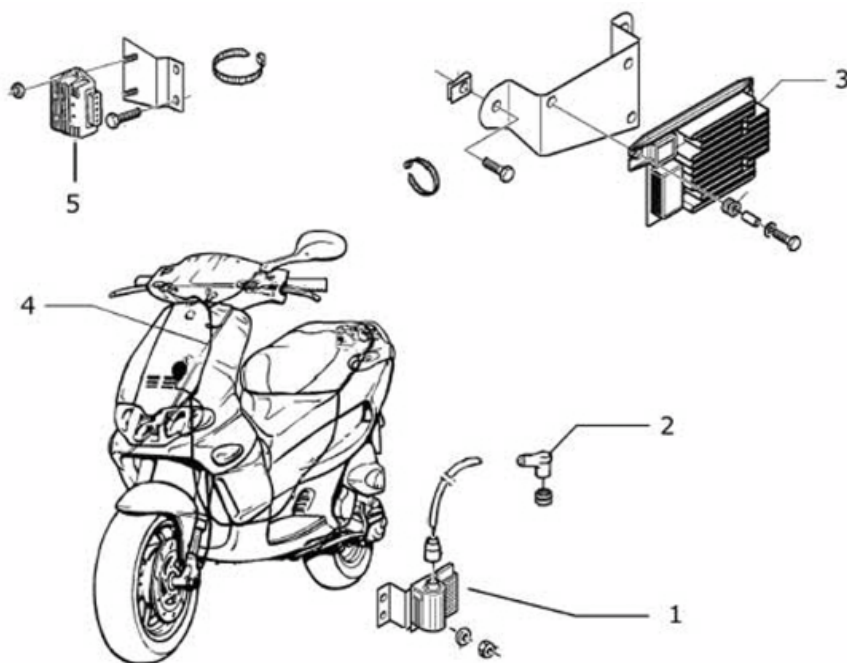
FRONT ELECTRIC DEVICES

	Code	Action	Duration
1	005113	Plug with contacts - Replacement	
2	005069	Left switch - Replacement	
3	005040	Horn button - Replacement	
4	005003	Horn - Replacement	
5	005041	Starter button - Replacement	
6	005039	Headlight switch - replace	

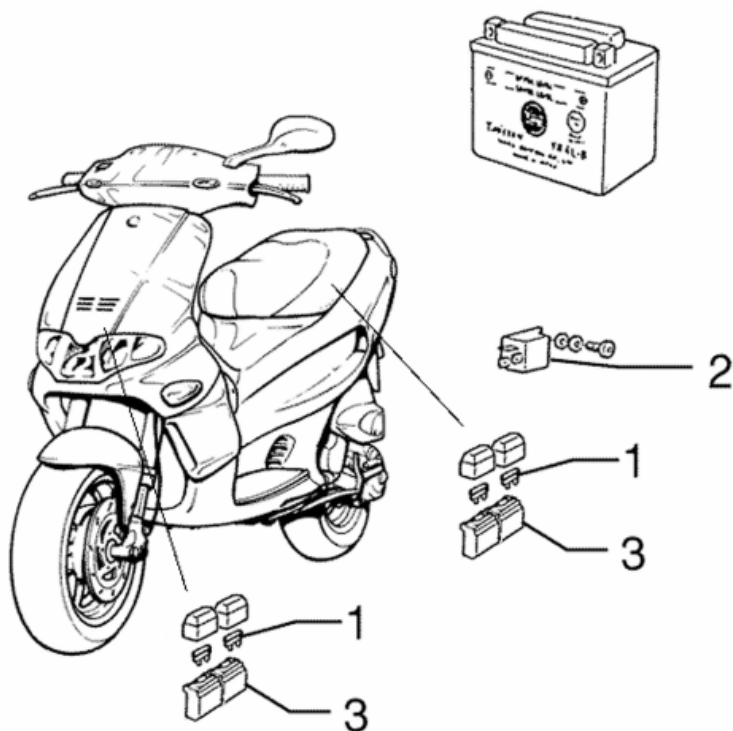


ELECTRIC DEVICES LOCKS

	Code	Action	Duration
1	004096	Lock series - Replacement	
2	005016	Key switch - Replacement	
3	004010	Anti-theft lock - Replacement	

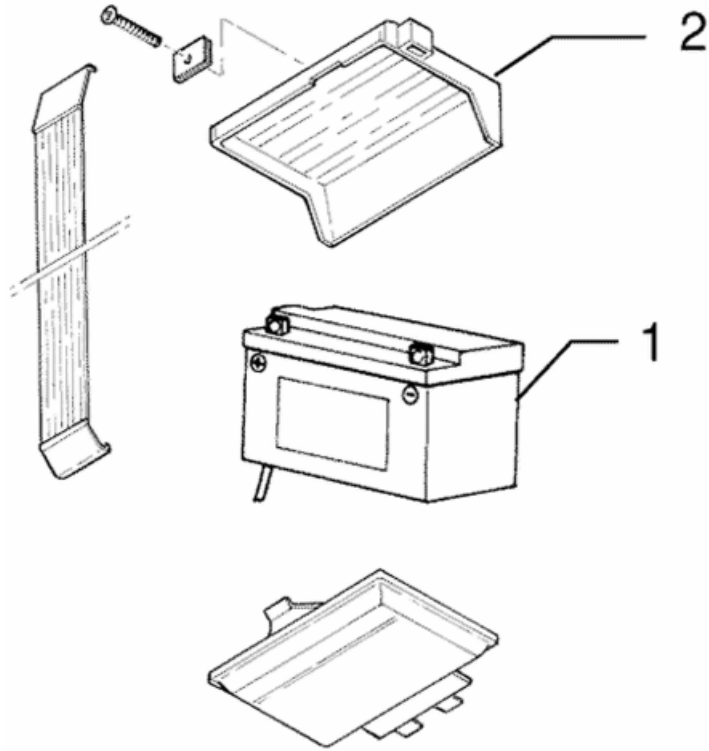
**ELECTRIC DEVICES**

	Code	Action	Duration
1	001069	HV coil - replace	
2	001094	Spark plug cap - Replacement	
3	001023	Control unit - Replacement	
4	005001	Electrical system - Removal and refitting	
5	005009	Voltage regulator - replace	



BATTERY ELECTRIC DEVICES

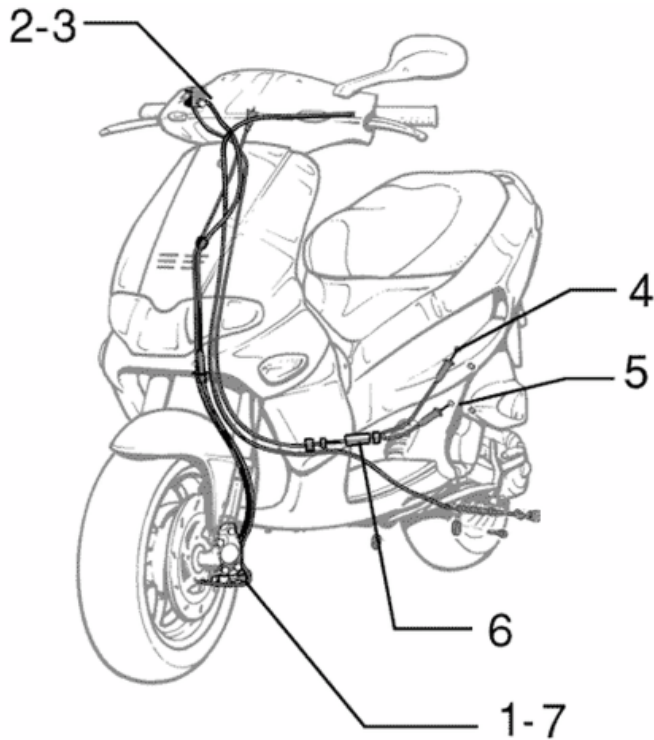
	Code	Action	Duration
1	005052	Fuse - Replacement	
2	005011	Start-up remote control switch - Replacement	
3	005025	Fuse holder - Replacement	



BATTERY

	Code	Action	Duration
1	005007	Battery - Replacement	
2	005046	Battery cover - change	

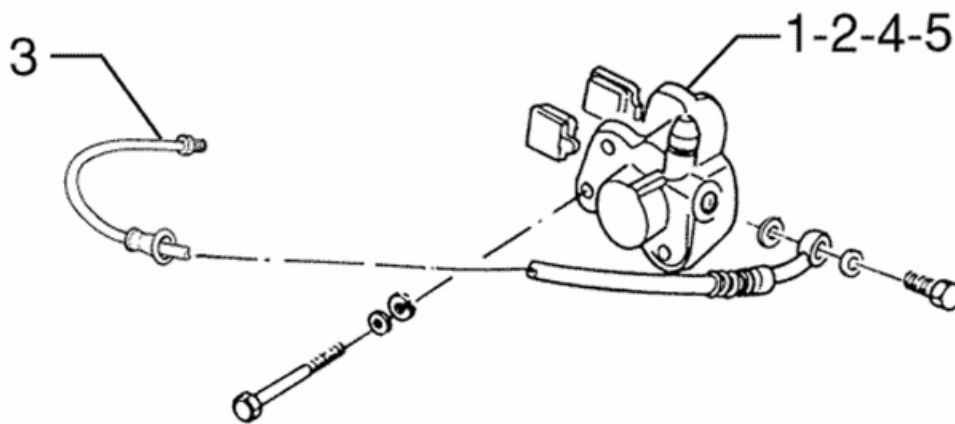
Transmissions



TRANSMISSIONS

	Code	Action	Duration
1	002051	Complete odometer transmission - Replacement	
2	002063	Complete gas command trans. - Replacement	
3	002054	Complete gas command or splitter trans. - Replacement	
4	002057	Splitter transmission - complete throttle body - Replacement	
5	002058	Splitter transm. compl. mix - Replacement	
6	002012	Splitter - Replacement	
7	002049	Odometer wire - Replacement	

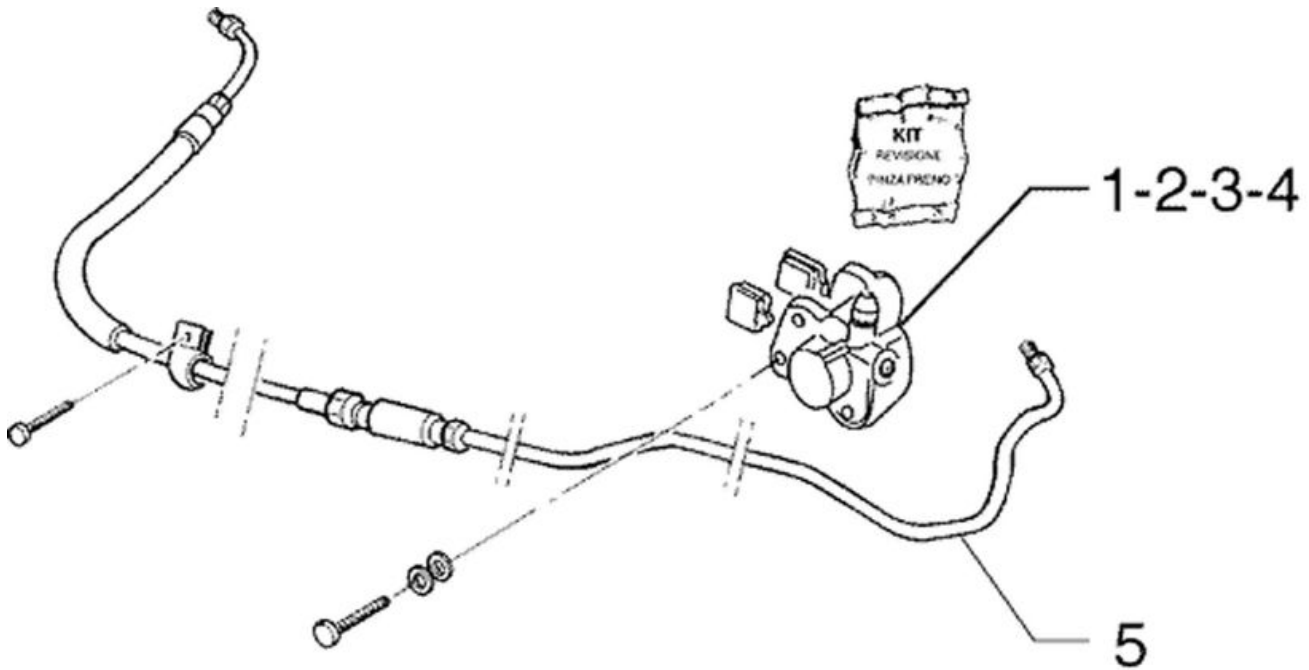
Brake callipers



FRONT BRAKE CALLIPER

	Code	Action	Duration
1	002039	Front brake calliper - Removal and refit	
2	002040	Front brake calliper - Check	
3	002021	Front brake line - Removal and refit	
4	002047	Frt. brake fluid and bleeding circuit- Replacement	

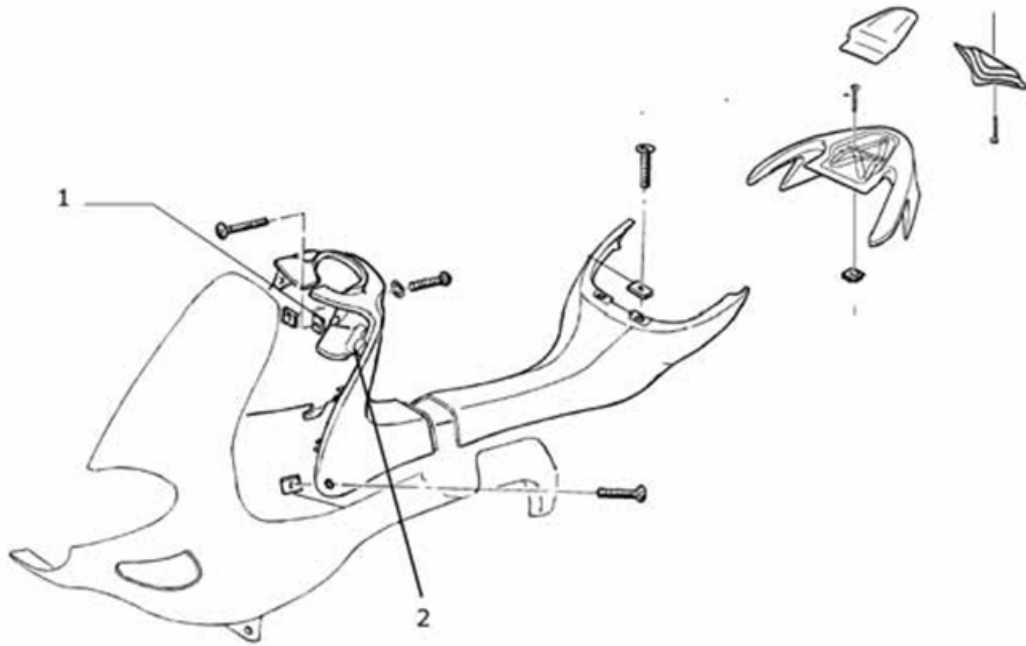
	Code	Action	Duration
5	003070	Front brake pads / Shoes - Check wear	



REAR BRAKE CALLIPER

	Code	Action	Duration
1	003071	Rear brake pads - Wear check	
2	002002	Rear brake pads - replace	
3	002068	Rear brake calliper - Check	
4	002048	Rear brake calliper - Re- placement	
5	002081	Rear brake disc piping - Re- placement	

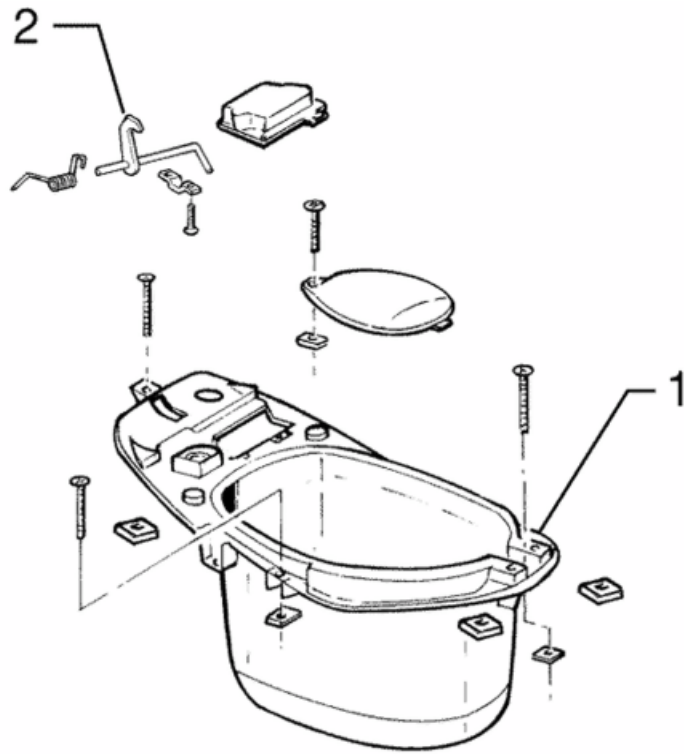
Fuel tank filler flap



GASOLINE DOOR - STEER BLOCK

	Code	Action	Duration
1	004135	Fuel tank port - Replacement	
2	002082	Fuel tank cap opening drive - Replacement	

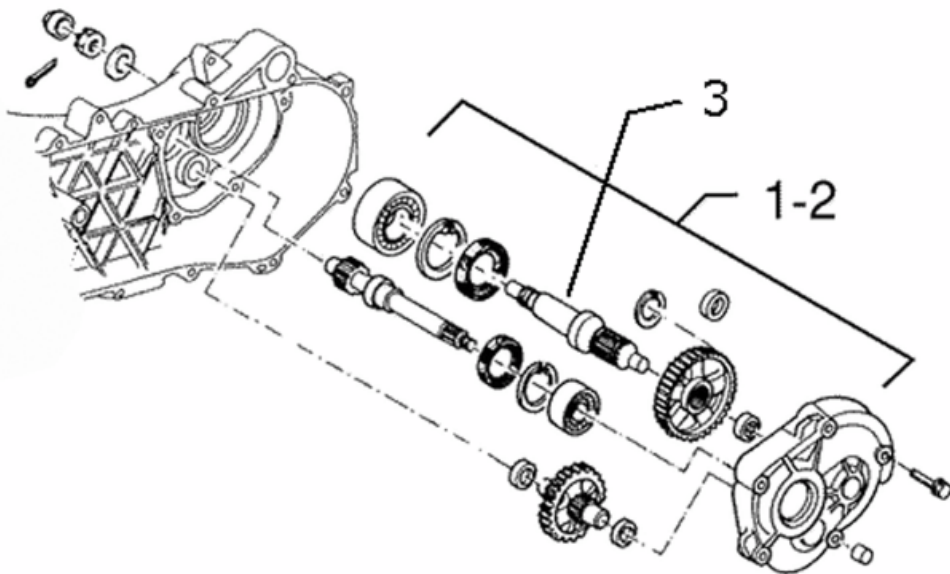
Helmet bay



HELMET HOLDER

	Code	Action	Duration
1	004016	Helmet-compartment - Removal and refit	
2	004054	Seat lock hook - Replacement	

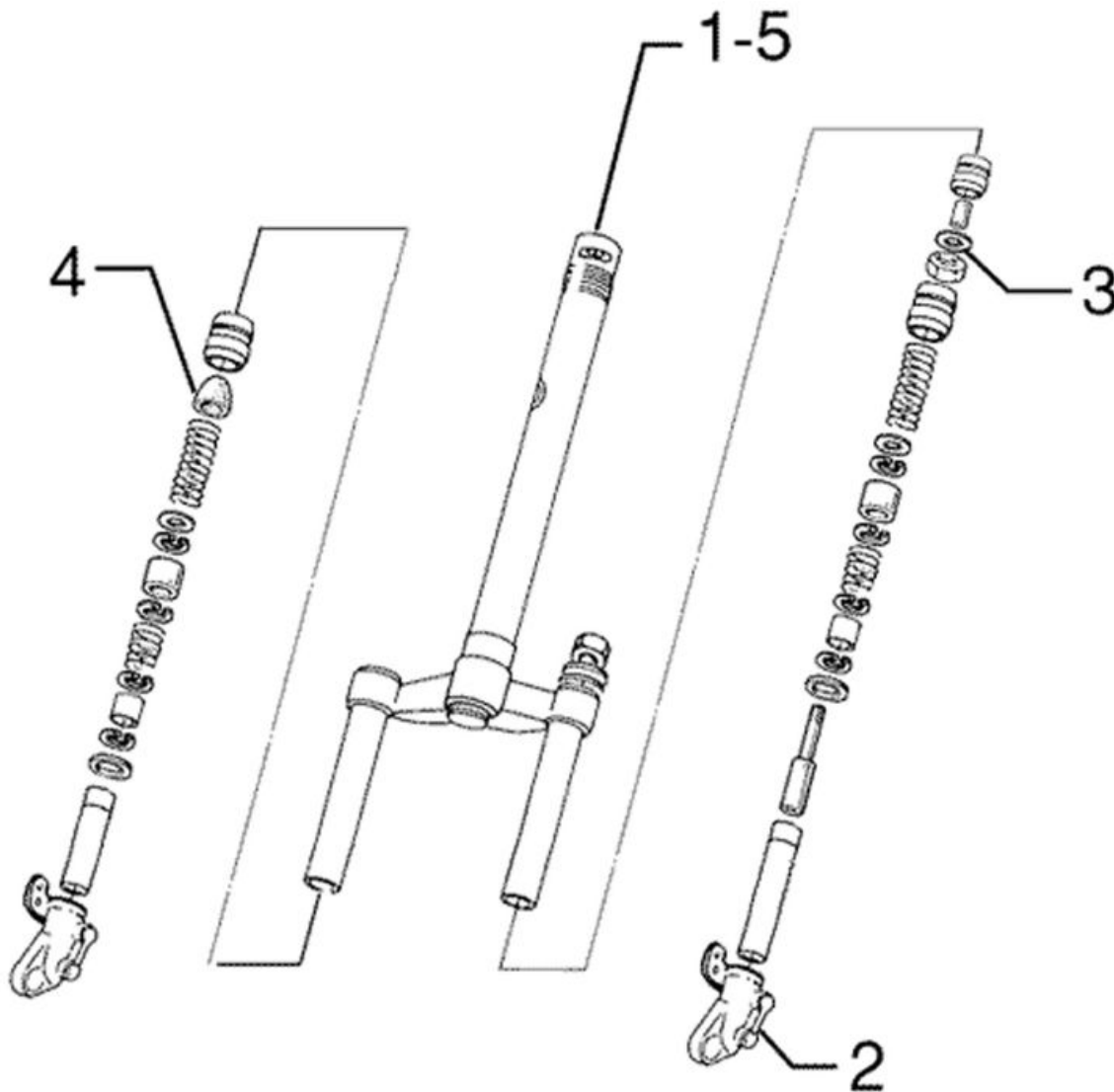
Rear wheel axle



REAR WHEEL AXLE

	Code	Action	Duration
1	001010	Reduction gear-Service	
2	003065	Gear box oil - Replacement	
3	004145	Rear wheel axle - Replacement	

Front suspension

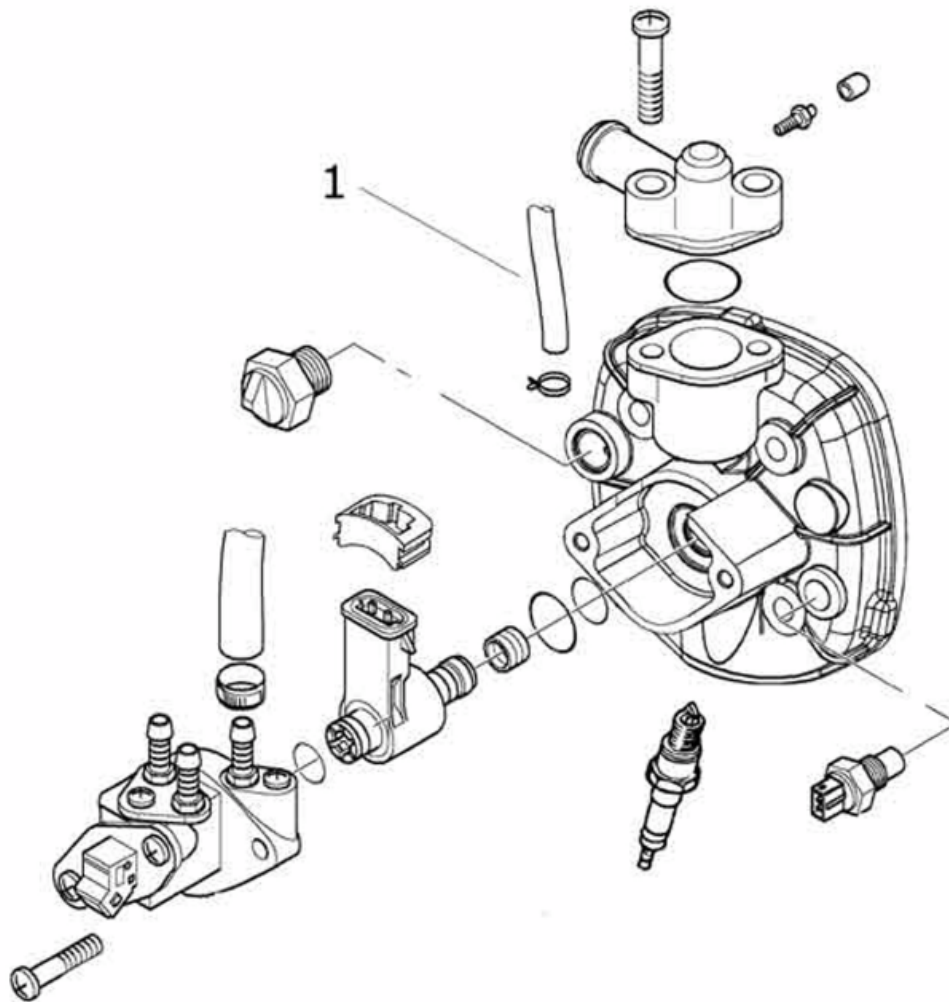


FRONT FORK

	Code	Action	Duration
1	003051	Complete fork - Replacement	
2	003041	Fork stanchion - Replacement	
3	003048	Oil seal fork - Replacement	
4	003039	Fork leg mandrels - Replacement	

	Code	Action	Duration
5	003010	Front suspension - Service	

Cooling system



COOLING SYSTEM

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