

Vespa®

WORKSHOP MANUAL

633572



LX 150 4T USA



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WORKSHOP MANUAL

LX 150 4T USA

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

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

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

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



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



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



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



INDEX OF TOPICS

CHARACTERISTICS

CHAR

TOOLING

TOOL

MAINTENANCE

MAIN

TROUBLESHOOTING

TROUBL

ELECTRICAL SYSTEM

ELE SYS

ENGINE FROM VEHICLE

ENG VE

ENGINE

ENG

SUSPENSIONS

SUSP

BRAKING SYSTEM

BRAK SYS

CHASSIS

CHAS

PRE-DELIVERY

PRE DE

TIME

TIME

INDEX OF TOPICS

CHARACTERISTICS

CHAR

Rules

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

Safety rules

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

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

Vehicle identification

VEHICLE IDENTIFICATION

Specification	Desc./Quantity
Chassis prefix	ZAPM 428 F5
engine prefix	M442M+1001

**Dimensions and mass****DIMENSIONS AND WEIGHT**

Specification	Desc./Quantity
Curbside weight	110 ± 5 kg
Maximum height	1140 mm
Width	740 mm
Wheelbase	1280 mm
Length	1800 mm

Engine**ENGINE**

Specification	Desc./Quantity
Engine	Single cylinder 4-stroke Piaggio LEADER
Timing system	Single Over-Head Cam shaft (SOHC), 2 valves
Valve play	suction 0,10 exhaust: 0,15
Bore per stroke	62,6 x 48,6 mm
Dry weight	150,46 cm ³
Compression ratio	10.5 : 1
Carburettor	KEIHIN CVEK26
Idling	~ 1600 ÷ 1800 r.p.m.
Starter system	Electric
Max power	11,6 CV at 7750 rpm
Cooling	Forced air.

Transmission

TRANSMISSION

Specification	Desc./Quantity
Trasmission	With automatic expandable pulley variator, trapezoidal belt, automatic clutch, gear reducer and transmission compartment with forced circulation.

Capacities

CAPACITY

Specification	Desc./Quantity
Engine oil	~ 1000 cc
Rear oil hub	~ 100 cc
Fuel tank capacity	~ 8.5 litres (including 2 l reserve)

Electrical system

ELECTRICAL SYSTEM

Specification	Desc./Quantity
Starter system	Electric
Spark	Champion RG6YC- NGK CR7EB

Frame and suspensions

CHASSIS AND SUSPENSION

Specification	Desc./Quantity
Frame	Structural frame in pressed sheet steel
Steering and suspensions	Steering column tube pivoted on front wheel hub; helical spring suspension and hydraulic double-effect shock absorbers; rear with hydraulic double-effect shock absorber and adjustable coaxial spring in the preloading on 4 positions.

Brakes

BRAKES

Specification	Desc./Quantity
Front brake	Ø 200 mm disc (hydraulically controlled via a lever on RHS of handlebars) with fixed calliper.

Specification	Desc./Quantity
Rear brake	Ø110 mm drum

Wheels and tyres

WHEELS AND TYRES

Specification	Desc./Quantity
Front wheel rim	Die-cast aluminium alloy 2.50x11"
Front tyre	Tubeless 110/70-11"
Rear wheel rim	Die-cast aluminium alloy 3.00x10"
Rear tyre	Tubeless 120/70-10"
Tyre pressure (front wheel)	1,6 bar
Tyre pressure rear wheel	2 bar
Tyre pressure (rear wheel driver and passenger)	2,3 bar

Secondary air

To reduce the amount of polluting emissions, this vehicle is equipped with a catalytic converter.

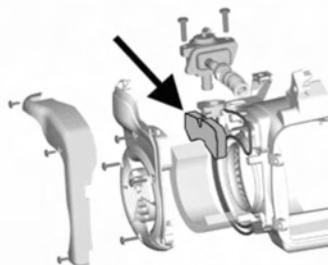
In order to facilitate the catalysis process, extra oxygen is supplied via a Secondary Air System (SAS).

Such system allows to add oxygen to the unburnt gases before the catalytic converter, thus improving the efficiency of the catalyser and hence the reaction process.

Air is added through an intake duct on the cylinder head, after being deperated by black filter.

The system is equipped with a shut-off valve which engages during deceleration, so to avoid undesired noise.

To ensure the SAS is always working correctly, it is necessary to have it checked by an **Authorised Piaggio Service** Station every 12,000 Km (see the Maintenance Operations section), so that the filters may be thoroughly cleaned.



The operation consists of cleaning the filtering elements with water and neutral detergent and then drying them with a clean cloth and light jets of compressed air.



SHOULD YOU REQUIRE ANY ASSISTANCE, CONTACT YOUR NEAREST AUTHORISED PIAGGIO DEALER.

Carburettor

150cc Version

Kehin

CALIBRATION CARBURETOR

Specification	Desc./Quantity
Type	CVEK 26
Throttle valve diameter	Ø 26,5
Choke diameter	Ø 26,4
Adjustment marking	265A
Maximum thrust	82
Maximum air thrust (on body)	85
Tapered pin stamping	NELA
Gas valve spring	130 ÷ 180 gr.
Minimum jet	35
Minimum air thrust (on body)	150
Initial minimum mixture screw opening	1 ¾
Starter jet	42
Starter air thrust (on body)	Ø 1,5
Starter pin stroke	10 mm (a 24°)
Choke resistor	20 Ohm (a 24°)

Tightening Torques

LUBRICATION

Name	Torque in Nm
Hub oil drainage cap	15 ÷ 17
Oil filter	4 ÷ 6
Oil pump cover screws	5 ÷ 6
Oil pump screw tightening torque	5 ÷ 6 Nm
Pump drive pulley screw	10 ÷ 14
Chain cover screws	4 ÷ 6
Oil pan screws	10 ÷ 14
Minimum oil pressure sensor	12 ÷ 14
Blow-by recovery duct fastening screws:	3 - 4

CYLINDER HEAD

Name	Torque in Nm
Ignition spark plug	12 ÷ 14
Head cover screw	11 ÷ 13
Head to cylinder set nuts (*)	28 ÷ 30
Head set screws (external)	11 ÷ 13
Start up mass screws	7 ÷ 8,5
Magneto housing screw	1 ÷ 2
Magneto side air duct screw	3 ÷ 4
De-compressor balance weight fixing	7 ÷ 8,5
Camshaft pulley screw:	12 ÷ 14 Nm
Timing chain tightener sliding block screws	10 ÷ 14
Start up mass bell screws	11 ÷ 15
Tightener screws	11÷13 Nm
Timing chain tensioner central screw:	5 ÷ 6 Nm
Camshaft retain plate screw	5 ÷ 6
Exhaust pipe/cylinder head fixing nut.	16 ÷ 18
Suction manifold screw on head	11 ÷ 13

TRANSMISSION

Name	Torque in Nm
Driving pulley screw	75 ÷ 83
Transmission cover screw	11 ÷ 13
Driven pulley axis (°)	54 ÷ 60
Rear hub cover screw	24 ÷ 27
Clutch assembly nut on driven pulley	45 ÷ 50

FLYWHEEL

Name	Torque in Nm
Flywheel fan screws	3 ÷ 4 N.m
Stator cover screws (°)	3 ÷ 4
Flywheel nut	52 ÷ 58
Pick-up screw	3 ÷ 4

CRANKCASE AND DRIVING SHAFT

Name	Torque in Nm
Engine crankcase inside head screws (transmission side half shaft)	4 ÷ 6
Oil filter union on crankcase	27 ÷ 33
Rear brake shaft set screw	11 ÷ 13
Engine crankcase coupling screws	11 ÷ 13
Prefilter cap	24 ÷ 30
Starter motor fixing screw:	11 ÷ 13 Nm
Muffler to crankcase set screws	24 ÷ 27
Engine oil drainage cap	24 ÷ 30

STEERING UNIT

Name	Torque in Nm
Steering upper ring nut	35 ÷ 40
Steering lower ring nut	12 ÷ 14
Handlebar fastening screw	50 ÷ 55

CHASSIS UNIT

Name	Torque in Nm
Frame - swing arm bolt	44 ÷ 52
rocker arm pin - engine	33 ÷ 41
Centre stand pin	32 ÷ 40
Bolt mounting rocker arm silent-block	33 ÷ 41

FRONT SUSPENSION

Name	Torque in Nm
Shock absorber upper nut	20 ÷ 30
Front wheel spindle nut	75 ÷ 90
Shock absorber upper bracket bolt	20 ÷ 25
Wheel rim screw	20 ÷ 25
Shock absorber lower bolts (°)	20 ÷ 27

FRONT BRAKE

Name	Torque in Nm
Pump-tube oil connection	8 ÷ 12
Tube-caliper oil connection	20 ÷ 25
Screw fixing the caliper to the support	20 ÷ 25
Brake disc screw	5 ÷ 6,5
Oil bleeder valve (on caliper)	10 ÷ 12
Handlebar to pump	7 ÷ 10

REAR SUSPENSION

Name	Torque in Nm
Rear wheel axle	104 ÷ 126
Shock absorber bottom fixing	33 ÷ 41
Shock absorber/chassis nut:	20 - 25 N.m

Overhaul data**Assembly clearances****Cylinder - piston assy.****COUPLING BETWEEN PISTON (ASSO-WERKE) AND CYLINDER**

Name	Play	Initials	Cylinder	Piston	Play on fitting
Coupling	</>	A	62,580 ÷ 62,587	62,533 ÷ 62,540	0,040 ÷ 0,054
Coupling	</>	B	62,587 ÷ 62,594	62,540 ÷ 62,547	0,040 ÷ 0,054
Coupling	</>	C	62,594 ÷ 62,601	62,547 ÷ 62,554	0,040 ÷ 0,054
Coupling	</>	D	62,601 ÷ 62,608	62,554 ÷ 62,561	0,040 ÷ 0,054
Compression segment 1st increase	</>	A1	62,780 ÷ 62,787	62,733 ÷ 62,740	0,040 ÷ 0,054
Compression segment 1st increase	</>	B1	62,787 ÷ 62,794	62,740 ÷ 62,747	0,040 ÷ 0,054
Compression segment 1st increase	</>	C1	62,794 ÷ 62,801	62,747 ÷ 62,754	0,040 ÷ 0,054

Name	Play	Initials	Cylinder	Piston	Play on fitting
Compression segment 1st increase	</>	D1	62,801 ÷ 62,808	62,754 ÷ 62,761	0,040 ÷ 0,054
Compression segment 2st increase	</>	A2	62,980 ÷ 62,987	62,933 ÷ 62,940	0,040 ÷ 0,054
Compression segment 2st increase	</>	B2	62,987 ÷ 62,994	62,940 ÷ 62,947	0,040 ÷ 0,054
Compression segment 2st increase	</>	C2	62,994 ÷ 63,001	62,947 ÷ 62,954	0,040 ÷ 0,054
Compression segment 2st increase	</>	D2	63,001 ÷ 63,008	62,954 ÷ 62,961	0,040 ÷ 0,054
Compression segment 3st increase	</>	A3	63,180 ÷ 63,187	63,133 ÷ 63,140	0,040 ÷ 0,054
Compression segment 3st increase	</>	B3	63,187 ÷ 63,194	63,140 ÷ 63,147	0,040 ÷ 0,054
Compression segment 3st increase	</>	C3	63,194 ÷ 63,201	63,147 ÷ 63,154	0,040 ÷ 0,054
Compression segment 3st increase	</>	D3	63,201 ÷ 63,208	63,154 ÷ 63,161	0,040 ÷ 0,054

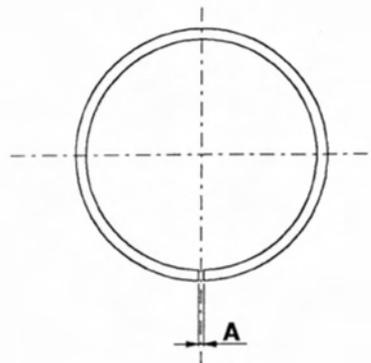
COUPLING BETWEEN PISTON (RIGHT WAY) AND CYLINDER

Name	Play	Initials	Cylinder	Piston	Play on fitting
Coupling	</>	A	62,580 ÷ 62,587	62,541 ÷ 62,548	0,032 ÷ 0,046
Coupling	</>	B	62,587 ÷ 62,594	62,548 ÷ 62,555	0,032 ÷ 0,046
Coupling	</>	C	62,594 ÷ 62,601	62,555 ÷ 62,562	0,032 ÷ 0,046
Coupling	</>	D	62,601 ÷ 62,608	62,562 ÷ 62,569	0,032 ÷ 0,046

Piston rings

PISTON RINGS

Name	Description	Dimensions	Initials	Quantity
Compression lining		62.6x1	A	0.15 ÷ 0.30
Scraper ring lining		62.6x1	A	0.20 ÷ 0.40
Scraper ring lining		62.6x2.5	A	0.20 ÷ 0.40
Compression lining 1° greater		62.8x1	A	0.15 ÷ 0.30
Scraper ring lining 1° greater		62.8x1	A	0.20 ÷ 0.40
Scraper ring lining 1° greater		62.8x2.5	A	0.20 ÷ 0.40
Compression lining 2° greater		63.0 x 1	A	0.15 ÷ 0.30
Scraper ring lining 2° greater		63.0 x 1	A	0.20 ÷ 0.40
Compression lining 2° greater		63.0 x 2.5	A	0.20 ÷ 0.40
Compression lining 3° greater		63.2 x 1	A	0.15 ÷ 0.30
Compression lining 3° greater		63.2 x 1	A	0.20 ÷ 0.40
Compression lining 3° greater		63.2 x 2.5	A	0.20 ÷ 0.40



Crankcase - crankshaft - connecting rod

AXIAL PLAY BETWEEN CRANKSHAFT AND ROD

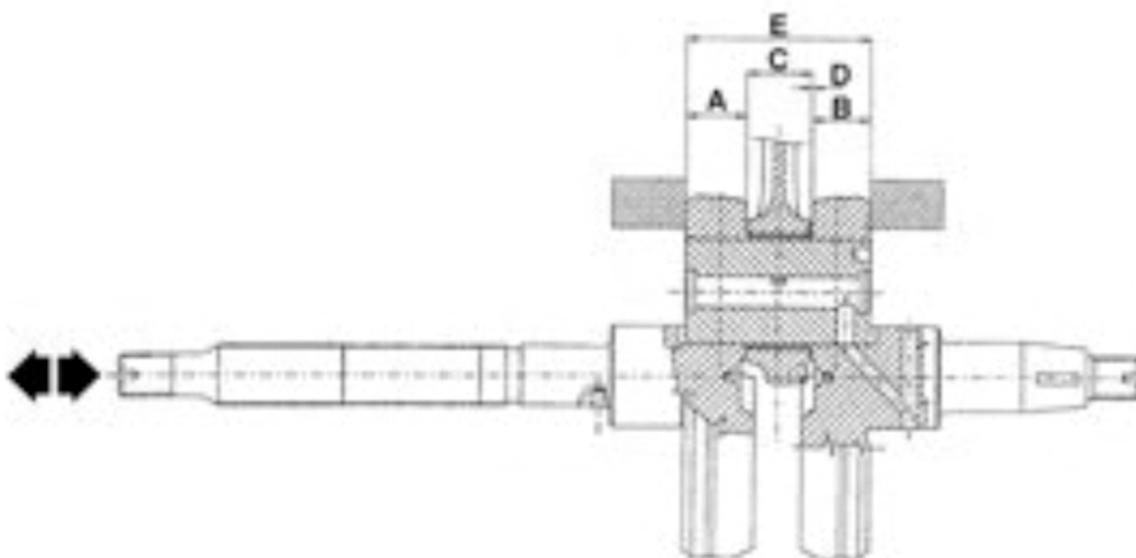
Name	Description	Dimensions	Initials	Quantity
Half shaft trans- mission side		16,6 +0 -0,05	A	D = 0,20 ÷ 0,50
Half shaft flywheel side		16,6 +0 -0,05	B	D = 0,20 ÷ 0,50
Connecting rod		18 -0,10 -0,15	C	0,20 ÷ 0,50

Name	Description	Dimensions	Initials	Quantity
Crank pin length		51,400	E	

AXIAL PLAY BETWEEN CRANKSHAFT AND BENCH SEMIBEARINGS

Name	Description	Dimensions	Initials	Quantity
Crankshaft			category 1	28,998 ÷ 29,004
Crankshaft			category 2	29,004 ÷ 29,010
Carter			Class 1	32,953 ÷ 32,959
Carter			Class 2	32,959 ÷ 32,965
Half crankshaft bearing			Type B - blue	1,973 ÷ 1,976
Half crankshaft bearing			Type C - yellow	1,976 ÷ 1,979
Half crankshaft bearing			Type E - green	1,979 ÷ 1,982
Crankshaft 1 category 1			E - E	
Crankshaft 1 category 2			C - C	
Crankshaft 2 category 1			C - C	
Crankshaft 2 category 2			B - B	

Crankshaft/crankcase axial play: 0,15 ÷ 0,40



Slot packing system

- Temporarily fit the cylinder on the piston, without the base gasket.
- Fit a comparator on the specific device
- Reset the comparator on an inspection surface with an average preload of 5 mm for example Keeping the reset position, fit the device on the cylinder and lock it with 2 nuts as shown in the figure.
- Turn the crankshaft until the upper dead centre point (inversion point of the comparator rotation).
- Calculate the difference between the two measurements: using the table below find the thickness of the cylinder base gasket to be used for reassembly. Correct identification of the thickness of the cylinder base gasket helps keep the correct compression ratio.
- Remove the specific device and cylinder.

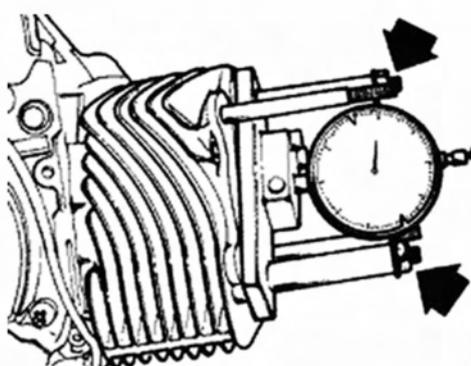
Characteristic

Compression ratio

10.5 : 1

PACKING SYSTEM

Specification	Desc./Quantity
Measured dimension	1 ÷ 1,1
Base gasket thickness	0,8 ± 0,05
Measured dimension	1,1 ÷ 1,3
Base gasket thickness	0,6 ± 0,05
Measured dimension	1,3 ÷ 1,4
Base gasket thickness	0,4 ± 0,05



Products

TABLE OF RECOMMENDED PRODUCTS

Product	Description	Specifications
TUTELA MATRYX MOTO RIDER	Oil for rear hub	Oil synthetic multidegree SAE 75W/85 API GL4

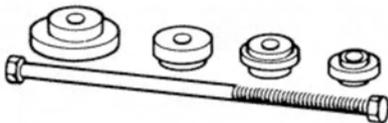
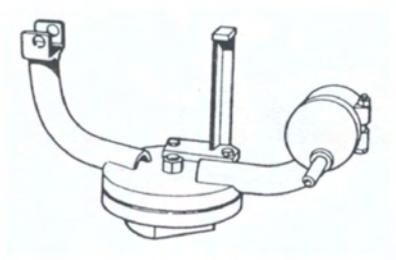
Product	Description	Specifications
SELENIA HI Scooter 4 Tech	Oil for flexible transmission lubrication (brake, acceleration control, km counter)	Oil for four stroke motors
SELENIA Air Filter Oil	Oil for air filter sponge	Mineral oil with specific additive for increasing the ISO VG 150
SELENIA HI Scooter 4 Tech	Engine oil	Synthetic oil SAE 5W/40 that passes the API SG specification.
JOTA 3 FS	Speedometer transmission	Lithium soap grease NLGI 33
TUTELA TOP 4	Brake fluid	Synthetic fluid SAE J1703, NHTSA 116 DOT 4, ISO 4925
MONTBLANC MOLYBDENUM GREASE	Grease for driven pulley shaft compensating ring and mobile driven pulley sliding seat	Molybdenum bisulphide grease
TUTELA ZETA 2	Grease for steering bearings and swing arm pin seats and driven pulley spring supporting surface (pulley side only)	Lithium soap and zinc oxide grease NLGI2
TUTELA TP1	Grease for brake control lever, gas	NLGI 1-2 calcium soap based white spray grease

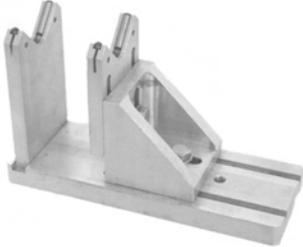
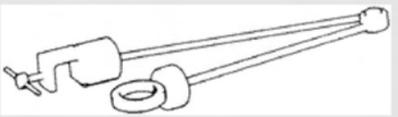
INDEX OF TOPICS

TOOLING

TOOL

TOOLS

Stores code	Description	
001330Y	Steering seat installer, to be fitted with parts: 001330Y009-For lower seat, 001330Y013-For upper seat	
001467Y009	Bell for bearings external Ø 50 mm	
001467Y013	15-mm pliers	
002465Y	Pliers for snap rings	
005095y	Engine support	
008564Y	Flywheel extractor	

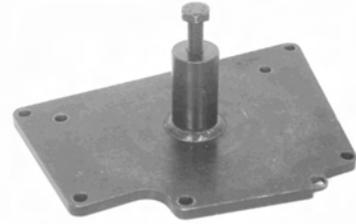
Stores code	Description	
020004Y	Drift for removing thrust rings from steering head tube	
020055Y	Steering tube ring nut spanner	
020074Y	Crankshaft aligning tool	
020150Y	Support for air heater "METABO HG 1500/2"	
020151Y	Air heater "METABO HG 1500/2"	
020193Y	Oil pressure gauge	

Stores code

Description

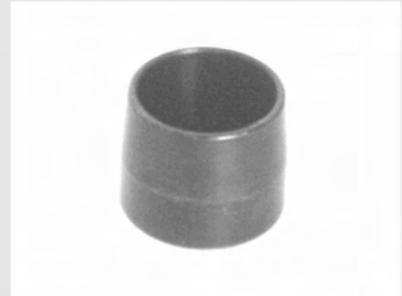
020262Y

Crankcase detachment plate



020263Y

Protective sheath



020287Y

Piston band clamps (Engine 125cc)



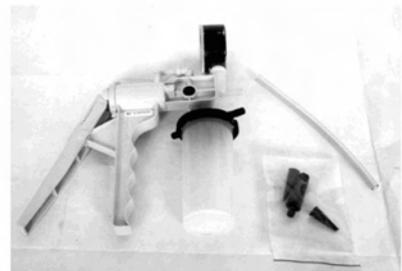
020306Y

Valve sealing ring drift



020329Y

Pump MITYVAC



Stores code

Description

020330Y

Timing light for two- and four-
stroke engines



020331Y

Digital multimeter



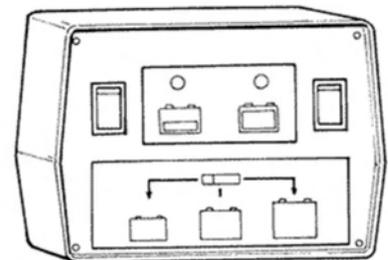
020332Y

Digital rpm counter

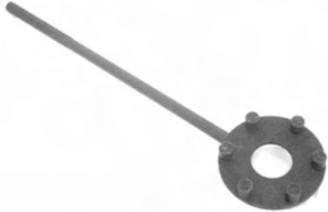


020333Y

Single battery charger



Stores code	Description	
020334Y	Multiple battery charger	
020335Y	Magnetic stand and comparator	
020357Y	32 x 35 mm adaptor	
020359Y	42 x 47 mm hub bearing fitting adaptor	
020360Y	52 x 55 mm adaptor	
020363Y	20mm guide	
020364Y	25 mm guide	

Stores code	Description	
020368Y	driving pulley stop wrench	
020375Y	Adapter 28 x 30 mm	
020376Y	Handle for punches	
020382Y011	Bushing (valve remover)	
020409Y	Multimeter adapter (Peak voltage measurement)	
020412Y	15 mm guide	

Stores code

Description

020414Y

28-mm guide - Hub bearing assembly



020423Y

driven pulley stop key



020424Y

Driven pulley roller casing drift



020425Y

Flywheel-side oil guard punch



020426Y

Piston fitting fork



Stores code	Description	
020427y	Piston Fitting Tool (motor 150)	A curved, flexible metal band used for fitting pistons.
020428Y	Piston position check support	A metal support fixture with several vertical pins and a central block, used for checking piston position.
020430Y	Pin retainers installation tool	A tool consisting of a long shaft with a handle and a pin retainer component, used for installing pin retainers.
020431Y	Valve oil seal extractor	A long, cylindrical metal tool with a tapered end, used for extracting valve oil seals.
020434Y	Oil pressure gauge connection	A long, cylindrical metal tool with a threaded end, used for connecting an oil pressure gauge.

Stores code

Description

020444Y

Driven half pulley spring compressor tool



020565Y

Compass flywheel stop spanner



020622Y

Transmission-side oil guard punch



494929

Exhaust gas analyser



INDEX OF TOPICS

MAINTENANCE

MAIN

Maintenance chart
EVERY 2 YEARS
Action

 Brake fluid - Change

EVERY 3000 KM
Action

 Engine Oil - Level Check/Top up

AT 1000 KM O 4 MONTH
Action

 Engine oil - Replacement

Hub Oil - Replacement

Oil filter (net) - cleaning

Idling speed (*) - Adjustment

Acceleration command - Adjustment

Steering - Adjust

Brake levers - Grease

Brake pads - Check condition + wear

Brake fluid level - Check

Nuts, bolts and fasteners - Check

Electrical system and battery - Check

Tires-inflation and wear - Check

Vehicle and brake test - Road test

(*) See section «Adjusting the idle speed»

AT 6000 KM OR 12 MONTH, 18000 KM, 54000 KM

150'

Action

 Engine oil - Replacement

Hub oil level - Check

Spark plug/electrode gap - Check

Air Filter - Cleaning

Oil filter - Replacement

Oil filter (net) - cleaning

Valve play 125 - recording

Variator rollers and shoes - inspection

Action

Transmission Belt - Check

Brake pads - Check condition + wear

Brake fluid level - Check

Electrical system and battery - Check

Centre stand - grease

Tires-inflation and wear - Check

Vehicle and brake test - Road test

AT 12000 KM OR 24 MONTHS AND AT 60000 KM

160'

Action

Engine oil - Replacement

Hub oil level - Check

Air Filter - Cleaning

Oil filter - Replacement

Oil filter (net) - cleaning

Spark plug - Replace

Idling speed (*) - Adjustment

Acceleration command - Adjustment

Variator rollers and shoes - replacement

Transmission Belt - Replacemen

Speedometer cable - Grease

Steering - Adjust

Brake levers - Grease

Brake pads - Check condition + wear

Brake fluid level - Check

Transmissions - Lubricate

Nuts, bolts and fasteners - Check

Suspensions - Check

Electrical system and battery - Check

Headlight - Adjust

Centre stand - grease

Secondary filter air - cleaning

Tires-inflation and wear - Check

Vehicle and brake test - Road test

(*) See section «Adjusting the idle speed»

AT 24000 KM AND AT 48000 KM

205'

Action

Engine oil - Replacement

Hub Oil - Replacement

Air Filter - Cleaning

Oil filter - Replacement

Oil filter (net) - cleaning

Spark plug - Replace

Idling speed (*) - Adjustment

Acceleration command - Adjustment

Variator rollers and shoes - replacement

Transmission Belt - Replacemen

Ventilation system cylinder - cleaning

Speedometer cable - Grease

Steering - Adjust

Brake levers - Grease

Brake pads - Check condition + wear

Brake fluid level - Check

Transmissions - Lubricate

Nuts, bolts and fasteners - Check

Suspensions - Check

Electrical system and battery - Check

Headlight - Adjust

Tires-inflation and wear - Check

Secondary filter air - cleaning

Centre stand - grease

Vehicle and brake test - Road test

(*) See section «Adjusting the idle speed»

AT 30000 KM, AT 42000 KM AND AT 66000 KM

125'

Action

Engine oil - Replacement

Hub oil level - Check

Action

Spark plug/electrode gap - Check

Air Filter - Cleaning

Oil filter - Replacement

Oil filter (net) - cleaning

Variator rollers and shoes - Check

Transmission Belt - Check

Brake pads - Check condition + wear

Brake fluid level - Check

Electrical system and battery - Check

Centre stand - grease

Tires-inflation and wear - Check

Vehicle and brake test - Road test

AT 36000 KM

300'

Action

Engine oil - Replacement

Hub Oil - Replacement

Spark plug - Replace

Air Filter - Cleaning

Oil filter - Replacement

Oil filter (net) - cleaning

Valve play 125 - recording

Idling speed (*) - Adjustment

Acceleration command - Adjustment

Variator rollers and shoes - replacement

Transmission Belt - Replacemen

Speedometer cable - Grease

Steering - Adjust

Brake levers - Grease

Brake pads - Check condition + wear

Brake fluid level - Check

Braking circuit hose - Replacement

Transmissions - Lubricate

Nuts, bolts and fasteners - Check

Action

Suspensions - Check

Electrical system and battery - Check

Headlight - Adjust

Secondary filter air - cleaning

Centre stand - grease

Tires-inflation and wear - Check

Vehicle and brake test - Road test

() See section «Adjusting the idle speed»***AT 72000 KM**

300'

Action

Engine oil - Replacement

Hub Oil - Replacement

Spark plug - Replace

Air Filter - Cleaning

Oil filter - Replacement

Oil filter (net) - cleaning

Valvle play 125 - recording

Idling speed (*) - Adjustment

Acceleration command - Adjustment

Variator rollers and shoes - replacement

Transmission Belt - Replacemen

Speedometer cable - Grease

Steering - Adjust

Cylinder cooling system - Check

Brake levers - Grease

Brake pads - Check condition + wear

Brake fluid level - Check

Braking circuit hose - Replacement

Transmissions - Lubricate

Nuts, bolts and fasteners - Check

Suspensions - Check

Electrical system and battery - Check

Headlight - Adjust

Action

Secondary filter air - cleaning

Centre stand - grease

Tires-inflation and wear - Check

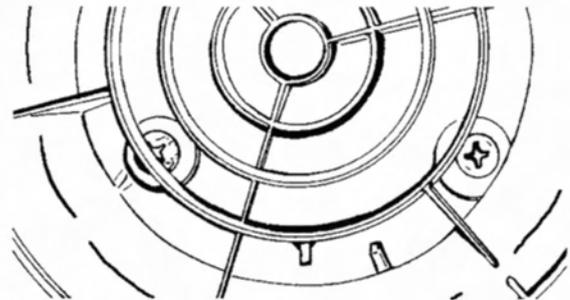
Vehicle and brake test - Road test

(*) See section «Adjusting the idle speed»

Checking the spark advance

- To check the ignition advance, use the stroboscopic lamp with induction collet connected to the spark plug power supply cable.
- Connect the induction collet according to the right polarity (the arrow on the collet must be facing the spark plug).
- Set the lamp selector to the central position (1 spark = 1 driving shaft revolution as in 2 stroke engines).
- Start the engine and check that the lamp is in good working order and that the rpm counter reads high speeds too (e.g. 8,000 rpm).
- If you detect abnormal flashes or rpm reads, increase the resistive load on the spark plug supply line (10 ÷ 15 KΩ in series with the H.V. cable).

- Acting upon the flash timing corrector on the timing light, align the reference on the flywheel cover with that on the fan, as shown in the figure. Read the degrees of advance shown by the timing light and compare them with those provided.



Characteristic

Checking the spark advance

10° ± 1° a 2000 rpm - 26° ± 1° a 6000 rpm

Spark advance variation

TIMING VARIATION

Specification	Desc./Quantity
Intervention threshold	First threshold: 9000±50 Second threshold: 9300±50
Re-establishment threshold	First threshold 8900±50 Second threshold: 9200±50

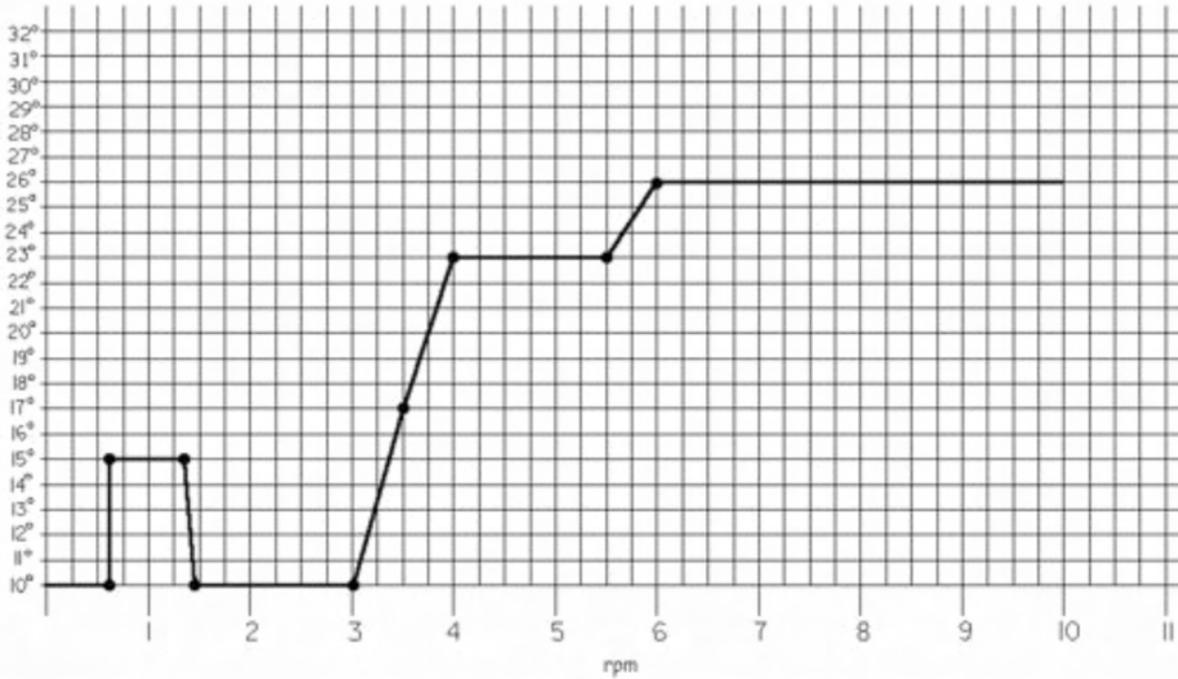
Specification

Desc./Quantity

Spark suppression

First threshold : 1 spark out of 7
 Second threshold: 2 sparks out of 3

151



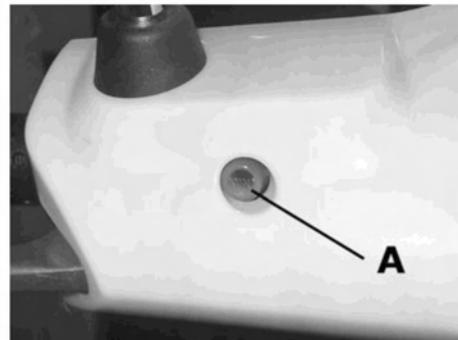
Braking system

Level check

Proceed as follows:

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

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



Top-up

Use the following procedure:

Loosen the two screws, remove the reservoir cap,

remove the gasket and top up only with the prescribed fluid without exceeding the maximum level.

CAUTION

USE ONLY DOT 4 BRAKE FLUID.

CAUTION

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

CAUTION

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

CAUTION

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

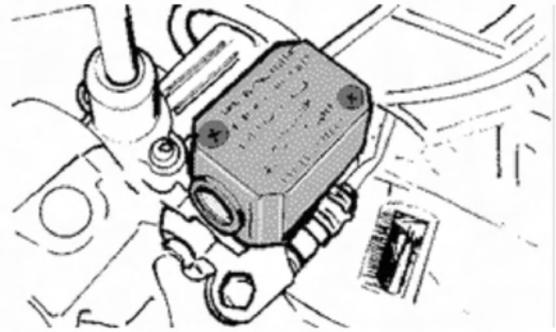
N.B.

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

Recommended products

TUTELA TOP 4 Brake fluid

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



Headlight adjustment

Proceed as follows:

1. Place the vehicle, in riding order and with the tyres inflated to the prescribed pressure, on flat ground, 10 m away from a half-lit white screen. Ensure the vehicle axis is perpendicular to the

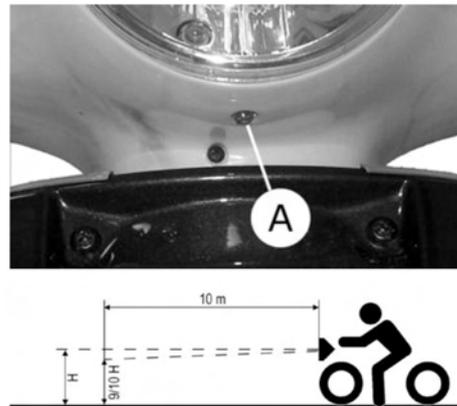
screen;

2. Turn the headlight on and check the projection of the light beam is between 7/10 and 9/10 of the distance measured from the ground to the centre of the headlight;

3. Adjust the headlight as necessary, via screw «A».

WARNING

THE PROCEDURE DESCRIBED ABOVE COMPLIES WITH THE "EURONORM" CONCERNING THE MAX. AND MIN. HEIGHT OF THE LIGHT BEAM OF A ROAD VEHICLE. PLEASE CHECK WITH THE LOCAL AUTHORITIES FOR WHAT REQUIREMENTS MUST BE FULFILLED IN EVERY SINGLE COUNTRY WHERE THE VEHICLE IS TO BE USED.



CO check

Proceed as follows:

- Remove the right side panel
- Remove the spoiler end
- Remove the magneto cover.
- Remove the band and secondary air valve as shown in the photo.
- Connect the exhaust pipe with the rubber sleeve of the secondary air system. This connection must ensure that the system is airtight to avoid incorrect readings of the CO value.

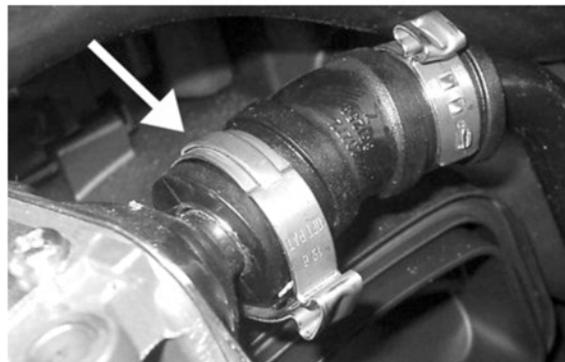
N.B.

IN CASE OF UNBURNT HYDROCARBONS (HC) > OF 1,000 P.P.M., CHECK THE IGNITION SYSTEM, THE TIMING, THE VALVE CLEARANCE AND THE DRAINAGE VALVE SEAL.

N.B.

IN CASE OF UNSTEADY CO, CHECK THE CARBURETTOR CLEANING, THE FEEDING SYSTEM EFFICIENCY AND THE VACUUM SEALS.

N.B.



IF NOT, CHECK THE FUEL LEVEL ADJUSTMENT IN THE BASIN AND CHECK THE FUEL CIRCUIT.

N.B.

ALSO CHECK THAT THE CARBURETION ADJUSTMENT IS OBTAINED WITH THE FLOW SCREW OPEN BY 2 TO 4 TURNS.

N.B.

CHECK THAT THE RESULT IS OBTAINED WITH THE GAS VALVE IN THE CLOSEST POSITION.

Specific tooling

020332Y Digital rpm counter

494929 Exhaust gas analyser

Characteristic

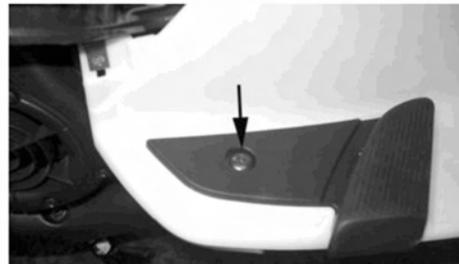
Verification

3,8±0,7 to 1650±50 rpm

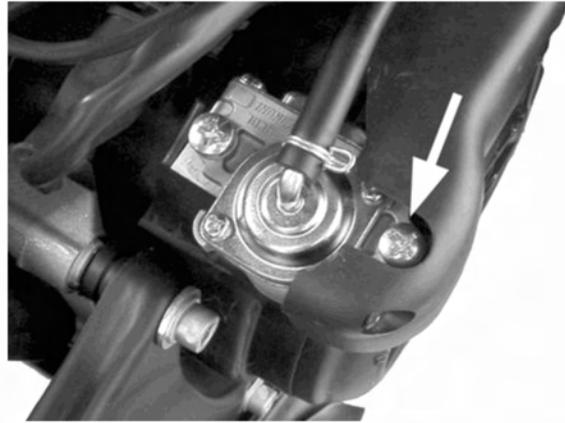
SAS filters inspection and cleaning

Proceed as follows:

- Remove the right side panel
- Remove the screw on the rear right part of the footrest indicated in the photo
- Remove the spoiler end
- Remove the 6 magneto cover screws indicated in the photo and remove the magneto cover



- Remove the screws securing the SAS to the magneto cover as shown in the photo.



- Remove the six screw flywheel cover shown in the picture and remove the flywheel cover.



- Remove the two screws shown in the picture.
- Remove the filter shown in the picture.
- Inspect the gasket.
- Ensure the SAS filter box is not cracked or deformed.
- Accurately clean the SAS filter. In the event of break-ups or abnormal deformations, proceed with the replacement.



For the reassembly, follow the above operations in the reverse order.

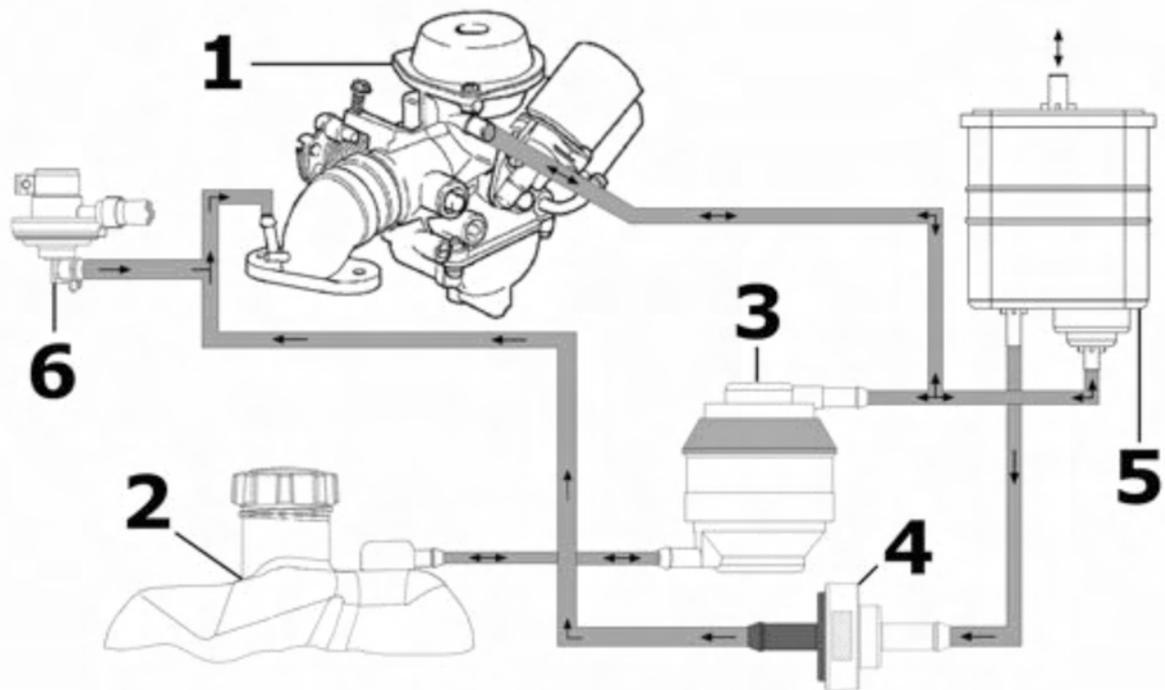
CAUTION

IF THE VEHICLE HAS RIDDEN ON DUSTY ROADS, THE AIR FILTER MUST BE CLEANED MORE FREQUENTLY THAN WHAT INDICATED IN THE SCHEDULED MAINTENANCE TABLE.

CAUTION

NEVER LET THE ENGINE RUN WITHOUT THE SECONDARY AIR FILTER.

Anti-evaporation system



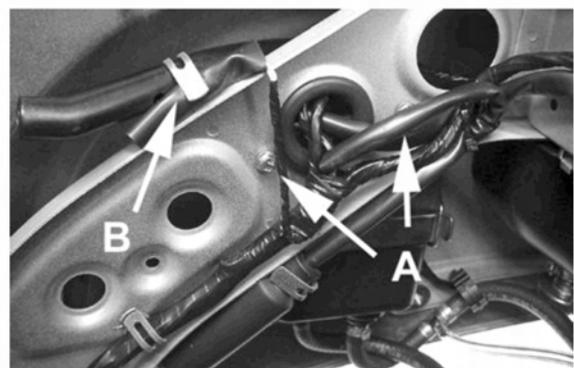
ANTI-EVAPORATION SYSTEM

Specification	Desc./Quantity
1. Carburettor	
2. Fuel tank	
3. Roll-over valve	
4. Safety valve	
5. Canister	
6. Vacuum fuel tap	

Removing system components

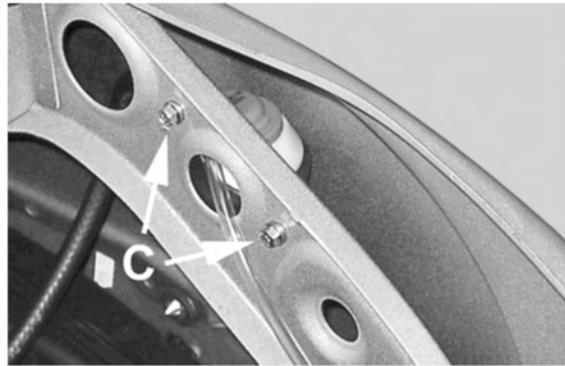
The components of the Canister system are supported by rubber belts with two metal supports anchored to the chassis under the helmet compartment: The Canister and safety valve are on the right side of the vehicle; the Roll-over valve is on the left side.

To access the components, first remove the metal supports and then unhook the rubber belts:

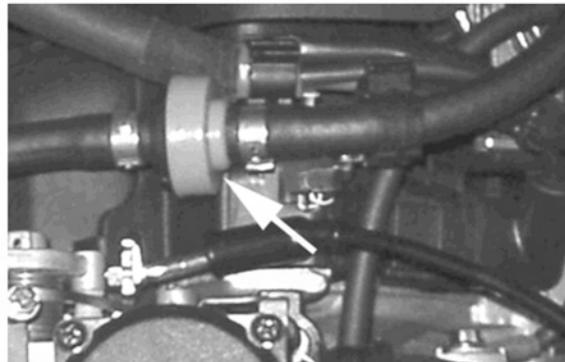


- Lift the saddle and remove the helmet compartment
- To remove the Canister use the screws A, lift the metal tab B and remove the Canister bleed hose as shown in the photo. Move the bracket with the Canister so that you can work, unhook the plastic support belt, remove the metal bands and then the related hoses.

- To remove the Roll-over valve use the two screws C shown in the photo. Move the bracket with the valve so that you can work, unhook the plastic support belt, remove the metal bands and then the related hoses.



- PTO remove the safety valve unhook the metal bands and remove the related hoses.



Refitting system components

- Replace the components inserting the piping properly and fastening them with new metal strips.
- Be careful to the direction of installation of the components. The safety valve and the Roll-over valve, if fitted in the reverse direction, affect the operation of the entire anti-evaporation



system.

Canister inspection

The Canister is fundamental for treating the hydrocarbons contained inside the volume of gas departing the fuel tank when the internal pressure rises (due to the heat induced by the radiator, engine or ambient temperature).

The volume of air is limited by the operation of ventilation valve (Roll-over).

Even though the quantity of hydrocarbons coming from the tank is fairly small, active carbon should be regenerated by a reversed flow of the ambient air sucked in by the engine, to prevent the saturation of the canister.

This carbon pollution and regeneration phenomena occur during each cycle of utilization of the vehicle.

The Canister needs to be removed to be inspected, keeping the 3 pipes connected.

- Shake the Canister and check that there is no noise.
- Using a compressed air gun, blow alternately into the 3 ducts and check that no pressure builds up into the Canister.
- Check that the air flow is always free and that no carbon residues come out of the piping.



If abnormal noise, clogging or carbon losses are noticed, replace the Canister.

Safety valve check

The Canister is cleaned by an air flow controlled by the vacuum inlet located on the intake manifold. To guarantee the correct operation of the engine, the mass air flow must not be excessively large; this is obtained by using a narrow section (0.9mm) for the inlet on the intake manifold.

The Canister tubing connections comprise the installation of a safety valve.

This is a unidirectional valve that ensures the air flow towards the manifold when the control vacuum is over 200mbar.

The engine vacuum at idle causes a weak air flow that can be easily compensated for with the idle adjustment parameters.

When the vehicle is stationary, the safety valve will be shut due to the lack of control vacuum; for this reason, any expansion of the fuel tank will not pollute the intake manifold thus preventing engine floods.

The valve should preferably be removed from the vehicle upon inspection; alternatively, it will be sufficient to access the tubing on the manifold side.

- Connect the MITYVAC pump on the engine side duct.
- Set the pump control onto "vacuum", then slowly apply vacuum to check the valve opening threshold.

If different pressures are found, replace the valve.

N.B. If the opening vacuum is too high, it causes a lack of active carbon regeneration; on the other hand, if it is too low, it increases the air flow rate to the engine, thus causing a poor fuel-oxygen mixture at idle.



Characteristic

Standard opening vacuum

200 ÷ 260 mbar

Roll-over valve check

The valve should allow the following results:

- Tank aeration when running (ambient air enters into the tank based on the volume of fuel used).
- Tank pressurization (the tank internal temperature may rise when running or while stopped. The valve should pressurize the tank so to limit the amount of fuel vapors departing towards the Canister).

Prevent the liquid fuel pollution of the Canister (if the vehicle falls, the valve should interrupt the connection to the Canister).

The valve must be removed from the vehicle

upon inspection.

A MITYVAC pump and a length of pipe are needed for the inspection; proceed as follows:

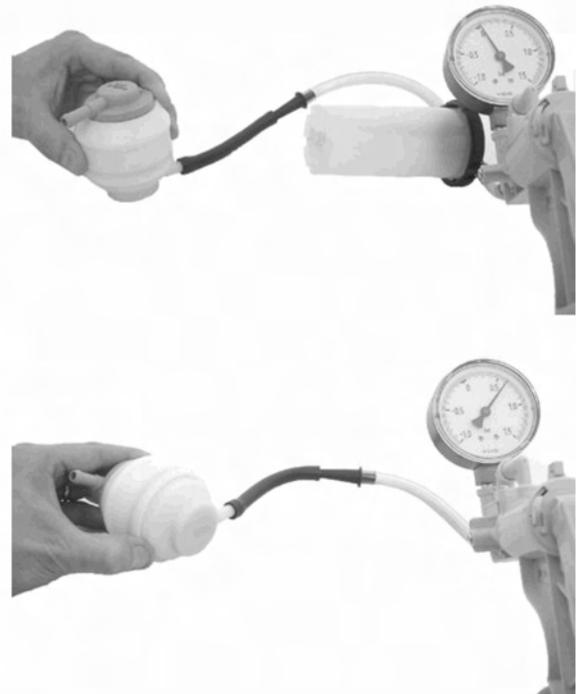
- Attach the MITYVAC pump to the lower joint to the safety valve (white).
- Set the pump control onto "vacuum" and, whilst keeping the valve aligned with its **vertical axis**, check that air may be sucked in without observing any movements on the manometer needle gauge.
- Set the pump onto "pressure" and, whilst keeping the valve aligned with its **vertical axis**, check that the valve can be pressurized to values slightly below 0.1bar (~60mbar).

N.B. The calibration pressure can be easily recognized as, when reached, the valve will start to discharge air thus emitting a weak noise.

- Align the valve with its **horizontal axis** and check that it can be pressurized to values much higher than the calibration pressure (e.g. 0.5bar without it necessarily being maintained).

Replace the valve if anomalies are found.

N.B. Any valve failure may cause the fuel tank to deform or increase of the Canister operating requirements.



INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

Engine

Poor performance

POOR PERFORMANCE

Possible Cause	Operation
Air filter clogged or dirty	Remove the sponge, wash with water and shampoo, then impregnate it in a 50% mixture of fuel and specific oil (Selenia Air Filter Oil), then press it without squeezing, let it drip and replace it
Carburettor jets or fuel cock clogged or dirty	Remove, wash in solvent and dry with compressed air
Vacuum fuel tap dirty or faulty	Check the tap's filter; if necessary drain the fuel and clean the tank. As a last resort, replace the fuel tap
Automatic choke device (on carburettor) faulty	Check the wiring and ensure the pin slides correctly; replace if necessary.
Drive belt excessively worn	Check and replace if required.
Low compression: wear of linings, cylinder and valve	Replace worn parts
Engine oil level exceeding the maximum	Check the causes and restore the correct level
Excessive scaling in the explosion chamber	Remove the scale from cylinder, piston, head and valves
Wrong timing or worn timing components	Restore the timing or replace worn parts
Clogged silencer	Replace
Inefficient automatic transmission	Check the pulley sliding and rollers, replace faulty components, lubricate the mobile driven pulley guide with grease Montblanc Molybdenum Grease
Valve seat deformed	Replace the head unit
Overheated valves	Remove the head and the valves, grind or replace the valves
Defective float valve	Check the proper sliding of the float and the valve efficiency
Cylinder worn out / piston rings worn or broken	Replace the cylinder-piston assembly or the piston rings only

Rear wheel spins at idle

REAR WHEEL TURNING WITH IDLE ENGINE

Possible Cause	Operation
Idle rpm too high	Adjust the engine idle speed and the CO, if required.
Clutch failure	Check clutch springs / masses

Starting difficulties

STARTING PROBLEMS

Possible Cause	Operation
Battery is down	Check the battery charge condition. If the battery shows signs of sulfation, replace it. Before installing the new battery, charge it for eight hours with a current corresponding to 1/10 of the capacity of the battery
Faulty spark plug or incorrect ignition advance	Replace the spark plug or check the ignition circuit components
Flooded engine	Start up keeping the gas fully open. If the engine won't start, remove the spark plug, dry it and before replacing it, start the engine to eject the excess of fuel, keeping the cap connected to the spark plug and the latter to earth. If fuel has finished, refuel and start up
Incorrect valve seal or wrong valve adjustment	Inspect the head and/or set the correct clearance
Starting rpm too low. Starter motor faulty.	Check starting motor.
Wrong fuel specifications	Drain the fuel and then refuel
Vacuum fuel tap faulty	Check fuel outflows correctly from the outlet hose when simulating a vacuum in the vacuum hose.
Automatic choke device (on carburettor) faulty	Check the wiring and ensure the pin slides correctly; replace if necessary.
Safety switches faulty	Using a tester check for continuity of resistance with the switch engaged, replace if necessary
Carburettor jets clogged or dirty	Remove, wash in solvent and dry with compressed air
Air filter clogged or dirty	Remove the sponge, wash with water and shampoo, then impregnate it in a 50% mixture of fuel and specific oil (Selenia Air Filter Oil), then press it without squeezing, let it drip and replace it

Excessive oil consumption/Exhaust smoke

EXCESSIVE OIL CONSUMPTION / SMOKE UPON EXHAUST

Possible Cause	Operation
Worn valve guides	Check and replace the head unit if required
Worn valve oil guard	Replace the valve oil guard
Oil leaks from the couplings or from the gaskets	Check and replace the gaskets or restore the coupling seal
Worn or broken piston rings, or mounted incorrectly	Replace the piston rings or the cylinder unit

Insufficient lubrication pressure

POOR LUBRICATION PRESSURE

Possible Cause	Operation
By-Pass remains open.	Check the By-Pass and replace if required. Carefully clean the By-Pass area
Oil pump with excessive clearance	Perform the dimensional checks on the oil pump components
Oil filter too dirty	Replace the cartridge filter
Oil level too low	Restore the level using the recommended oil type (Selenia HI Scooter 4 Tech)

Engine tends to cut-off at full throttle

ENGINE TENDS TO CUT OUT AT FULL THROTTLE

Possible Cause	Operation
Main jet obstructed	Remove the carburettor, clean with solvent and then dry with compressed air.
Presence of water or condensation in the carburettor float bowl	Remove the bowl, clean with solvent and then dry with compressed air.
Low fuel level in float bowl	Restore the level inside the float bowl by bending the petrol inlet thrust plate, so to have, with the carburettor upside-down, the float perfectly flushed with the mating surface of the bowl.

Engine tends to cut-off at idle

ENGINE TENDS TO CUT-OFF AT IDLE

Possible Cause	Operation
Idle adjustment is incorrect	Adjust with the rpm counter
Wrong timing	Adjust the timing and check the timing components
Starter remains pressed	Check: electric connections, circuit continuity,

Possible Cause	Operation
	mechanical sliding, and presence of power; replace, if required
Faulty spark plug or incorrect ignition advance	Replace the spark plug or check the ignition circuit components
Compression end pressure too low	Check the seals of the thermal unit and replace worn components
Idle nozzle dirty	Wash with solvent and dry with compressed air

High fuel consumption

HIGH CONSUMPTION

Possible Cause	Operation
Air filter clogged or dirty	Clean
Inefficient starter	Check: electric connections, circuit continuity, mechanical sliding, and presence of power
Slackened nozzles	Check the maximum and minimum nozzle locking into their seat
Incorrect float level	Restore the level in the basin by bending the fuel inlet pin thrusting reed on the float so as to have the float parallel to the basin plane with upturned carburettor

Transmission and brakes

Clutch grabbing or performing inadequately

SLIPPAGE OR IRREGULAR PERFORMANCE

Possible Cause	Operation
Slippage or irregular performance	Ensure there is no grease on the rollers. Check the contact surface of the clutch shoes is thicker in the middle and equally distributed on all three shoes. Check the clutch drum is not scored or abnormally worn. Never run the engine with the clutch drum not installed.

Insufficient braking

INEFFICIENT OR NOISY BRAKING

Possible Cause	Operation
Bake pads or shoes worn	Replace the pads or shoes and check the status of the brake disc or drum

Possible Cause	Operation
Front brake disc loosen or deformed	Check tightening torque of the disc fixing screws; using a dial gauge and with the wheel on the vehicle, measure the disc's axial deviation
Air bubbles in the braking hydraulic system	Carefully bleed the hydraulic system (spring action of the brake lever should not be felt)
Coolant leaking from the hydraulic brake circuit	Flexible connections, piston or brake pump gaskets faulty. Replace
Excessive play on rear brake cable	Adjust the play using the adjusting screw located on the top of the crankcase

Brakes overheating

BRAKE OVERHEATING

Possible Cause	Operation
Rubber gaskets expanded or sealed	Replace the gaskets
Pump compensation holes clogged	Clean carefully and blow with compressed air
Brake disc slackened or deformed	Check the tightening of the brake disc screws; measure the disc axial deviation using a comparator and keeping the wheel mounted on the vehicle
Defective piston sliding	Check the caliper and replace any damaged parts

Electrical system

Battery

BATTERY

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

Turn signal lights malfunction

FLASHING LIGHTS NOT WORKING

Possible Cause	Operation
Electronic ignition unit faulty	With the key-switch set onto «ON», jumper contacts 1 (Blue-Black) and 5 (Orange) located on the main control unit connector. If the turn signal lights do not stay lit when switch is operated, replace the ECU, otherwise check wiring and switch.

Steering and suspensions

Heavy steering

HARDENING STEERING

Possible Cause	Operation
Excessive steering wheel clearance	Check the tightening of the top and bottom ring nut. If the anomaly continues during the steering wheel rotation even after the adjustment, check the bearing ball rolling seats. If they are recessed or if the balls are squashed, replace.

Excessive steering play

STEERING PLAY EXCESSIVE

Possible Cause	Operation
Steering play excessive	Check the tightening of the upper and lower rings. If steering rotation is still uneven, check the bearing ball rolling races. Replace if the races appear to be embedded or if the balls are flattened

Noisy suspension

NOISY SUSPENSION

Possible Cause	Operation
Noisy suspension	If the front suspension is noisy, check the front shock absorber, and the condition of the ball bearings. Finally check the tightening torques for wheel axle nut, and calliper and disc fixing screws. Inspect the swing-arm connecting the engine to the frame and the check the rear shock absorber.

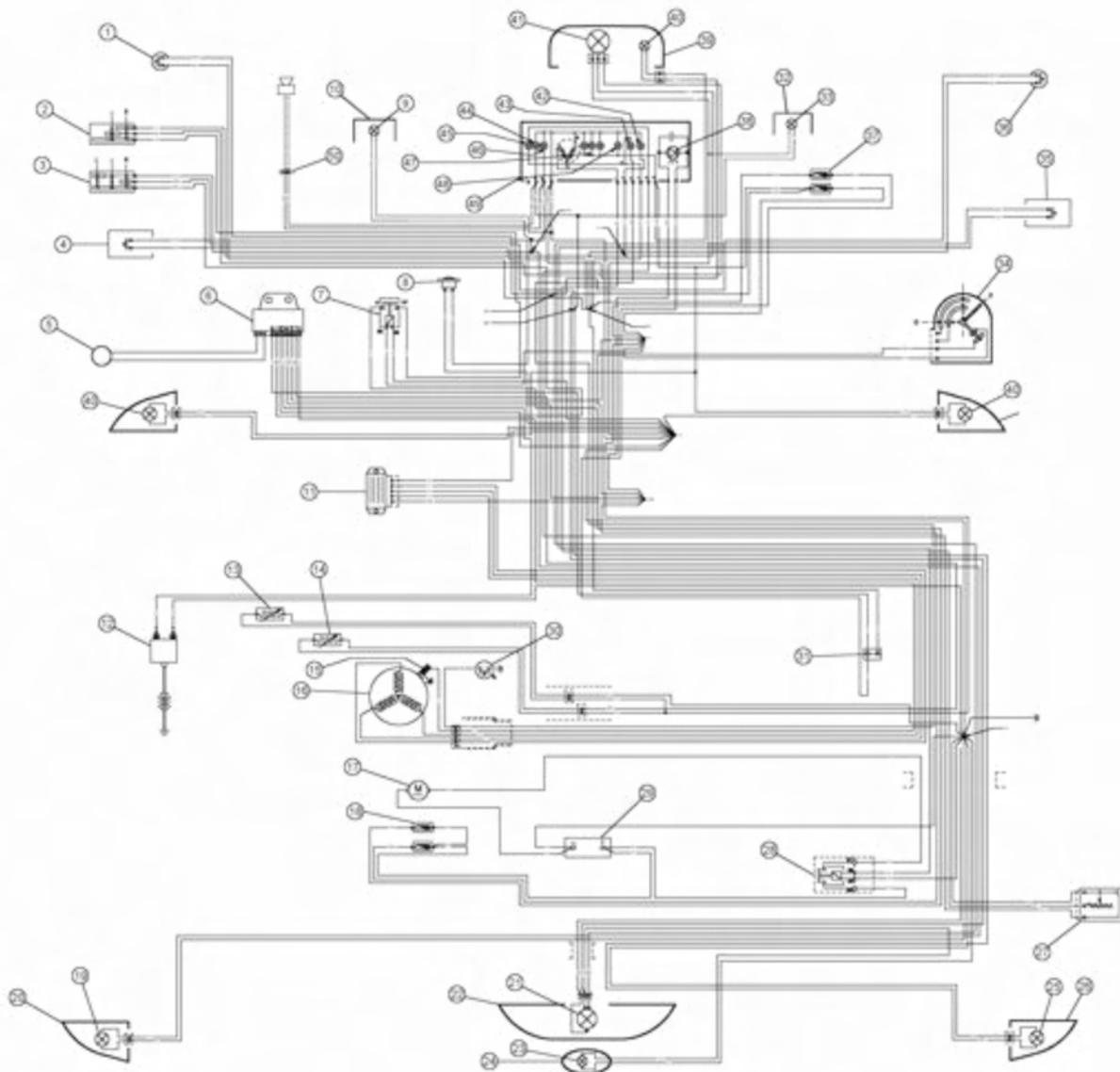
Suspension oil leakage**OIL LEAKING FROM SUSPENSION**

Possible Cause	Operation
Oil leaking from suspension	Replace the shock absorber

INDEX OF TOPICS

ELECTRICAL SYSTEM

ELE SYS



Legend

1. Rear brake stop button
2. High/low beam selector
3. Turn indicator selector
4. Horn button
5. Immobilizer aerial
6. Electronic ignition
7. Relay
8. Horn
9. Turn indicator bulb
10. Front left indicator.
11. Voltage regulator

12. HV coil
13. Heater
14. Automatic choke
15. Pick-up
16. Magneto
17. Starter motor
18. Fuse holder with 2 15A fuses
19. 2 turn indicator bulbs
20. Rear left indicator
21. Rear parking and brake light bulb
22. Complete taillight
23. License plate light bulb
24. License plate light cover
25. 2 turn indicator bulbs
26. Rear right indicator with bulb
27. Fuel warning light transmitter
28. Starter motor contactor
29. Battery 12V-9°
30. Engine oil pressure sensor
31. Immobilizer diagnostic instrument output
32. Front right indicator
33. Turn indicator bulb
34. Key switch
35. Start button
36. Front brake stop button
37. Fuse holder with 2 7.5 A fuses
38. Anti-theft and diagnostics LED
39. Complete headlight
40. Rear parking light bulb
41. Bulb for high/dipped beam light 12V - 355W / 60W
42. High beam indicator lamp
43. Engine oil pressure lamp
44. Right indicator lamp
45. Fuel warning lamp
46. Left indicator lamp

- 47. Instrument lighting light bulb
- 48. Lights indicator lamp
- 49. Odometer with lamps and level indicator instrument
- 50. Space for acoustic lamp

Wire colour coding

R = Red

B = White

BI = Blue

N = Black

V= Green

Rs = Pink

Mr = Brown

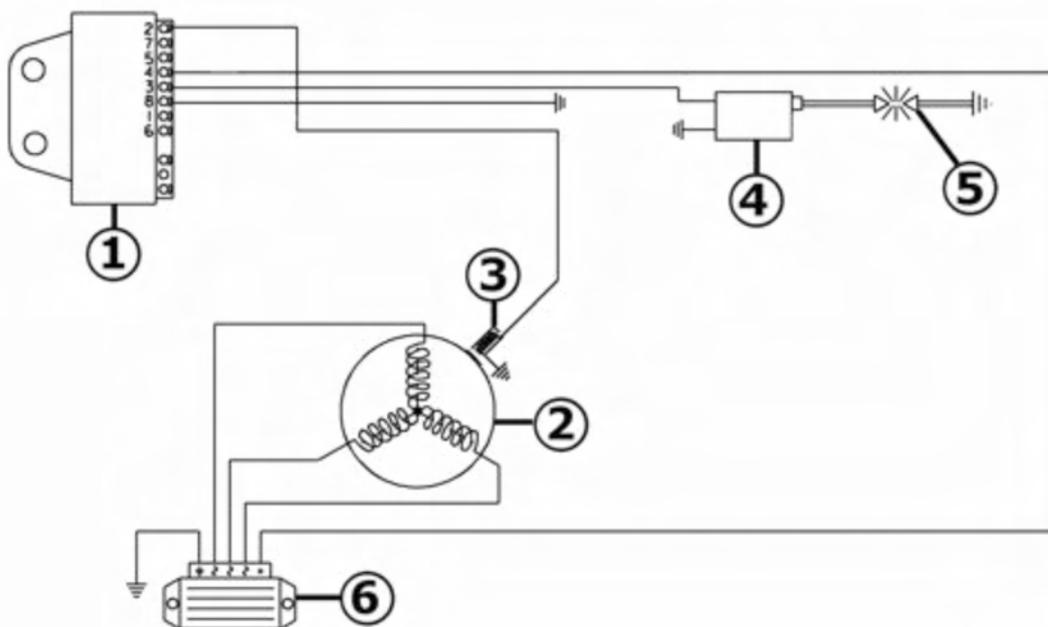
Gr = Grey

Az = Light blue

G = Yellow

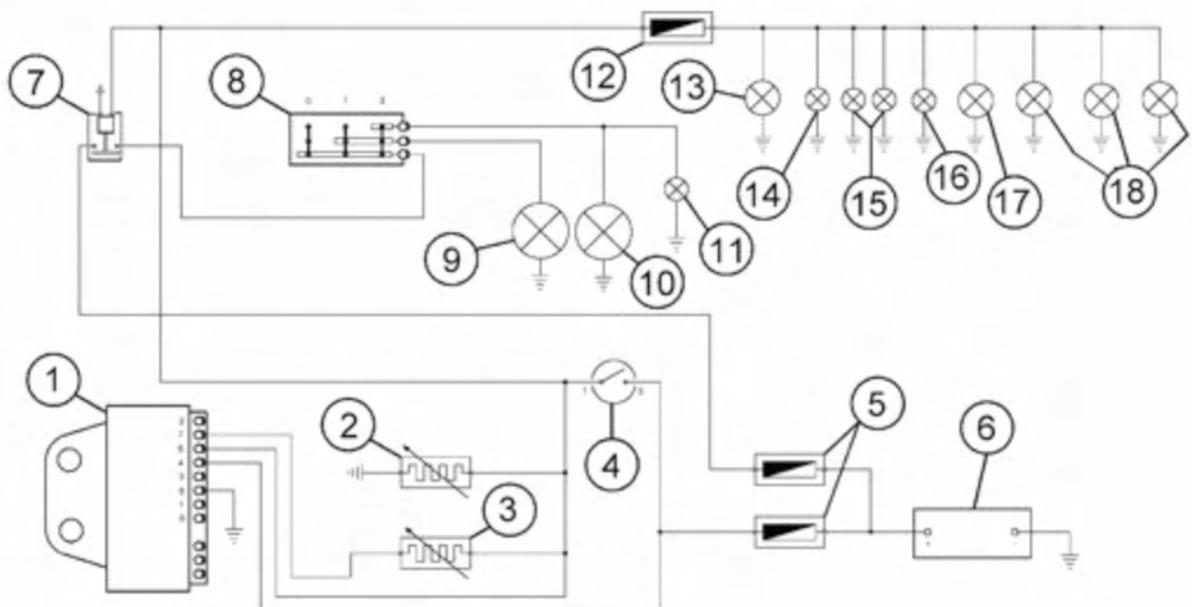
Vi = Purple

A = Orange

Conceptual diagrams**Ignition****IGNITION**

	Specification	Desc./Quantity
1	Controller	
2	Magneto flywheel	
3	Pick - up	
4	H.V. coil	
5	Spark plug	
6	Voltage regulator	

Headlights and automatic starter section

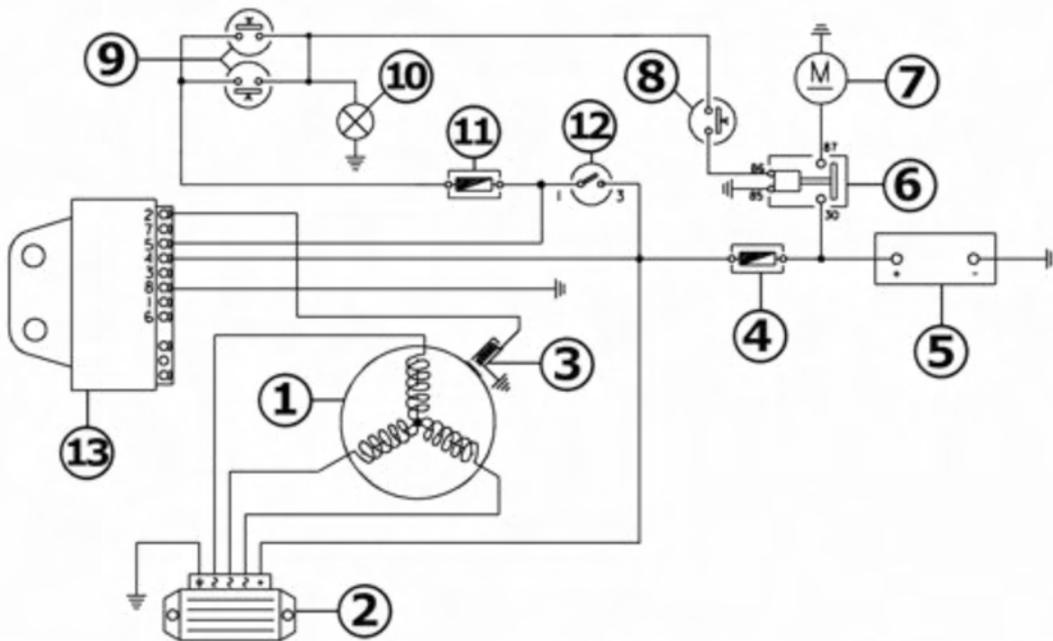


HEADLIGHTS AND AUTOMATIC STARTER SECTION

	Specification	Desc./Quantity
1	Controller	
2	Carburettor heater	
3	Automatic starter	
4	Key-switch	
5	no. 2 main fuses	15A
6	Battery	12V-9Ah
7	Headlamp relay	
8	Light switch	
9	Low-beam light bulb	12V - 55W
10	High-beam light bulb	12V-55W

	Specification	Desc./Quantity
11	High beam indicator lamp	12V - 1.2W
12	Fuse	
13	License plate bulb	12V - 5W
14	Lights indicator lamp	12V - 1.2W
15	No 2 bulbs for instrument panel lighting	12V - 1.2W
16	No 1 bulb for instrument panel lighting	12V - 2W
17	Taillight bulb	12V - 5W
18	N° 3 Lamps of front position	12V - 5W

Battery recharge and starting

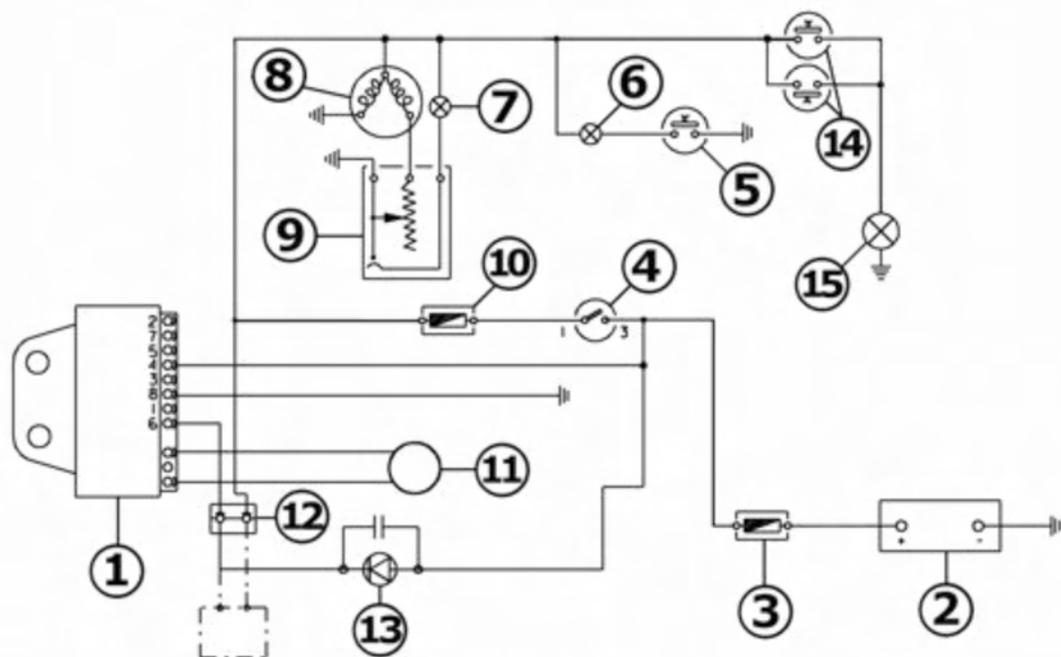


BATTERY CHARGER AND STARTING

	Specification	Desc./Quantity
1	Magneto flywheel	
2	Voltage regulator	
3	Pick - up	
4	Main fusible	15A
5	Battery	12V-9Ah
6	Starter relay	
7	Starter motor	
8	Start up button	

	Specification	Desc./Quantity
9	Front and rear brake light button	
10	Brake light filament	12V-21W
11	Fuses	7,5 A
12	Key-switch	
13	Controller	

Level indicators and enable signals section

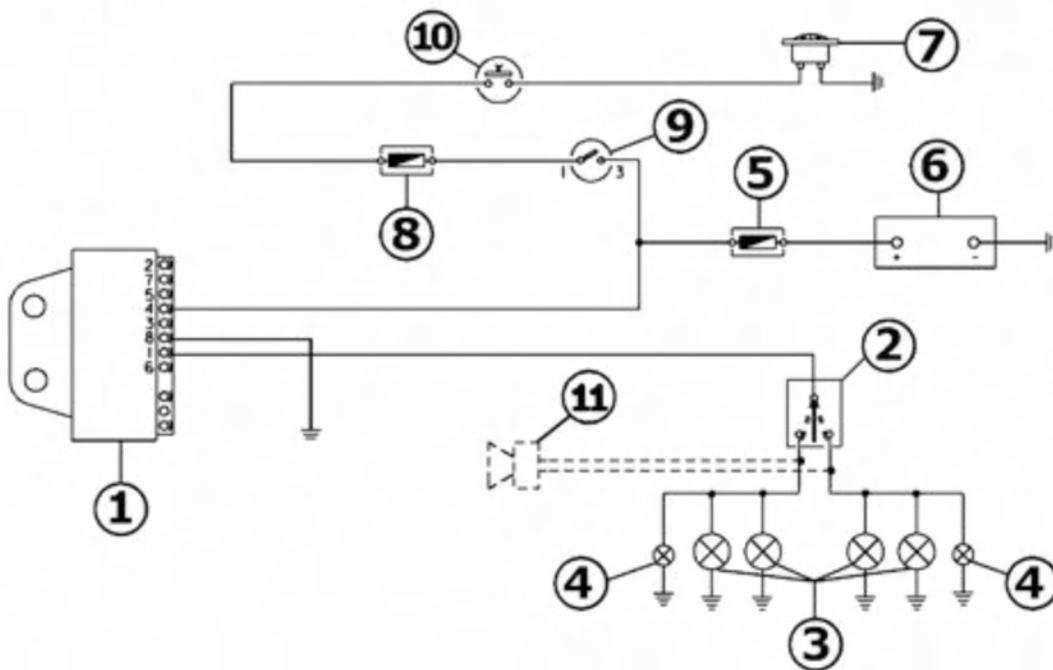


CONSENSSES AND LEVEL INDICATORS

	Specification	Desc./Quantity
1	Controller	
2	Battery	12V-9Ah
3	Main fusible	15A
4	Key-switch	
5	Engine oil pressure sensor	
6	Engine oil pressure lamp	12V - 2W
7	Reserve fuel light	12V-1,2W
8	Fuel level gauge	
9	Fuel level sender	
10	Fuses	7,5 A
11	Immobilizer aerial	

	Specification	Desc./Quantity
12	Low engine oil pressure sensor	
13	Immobiliser LED	
14	Front and rear brake light button	
15	Filament for rear brake light	12V - 21W

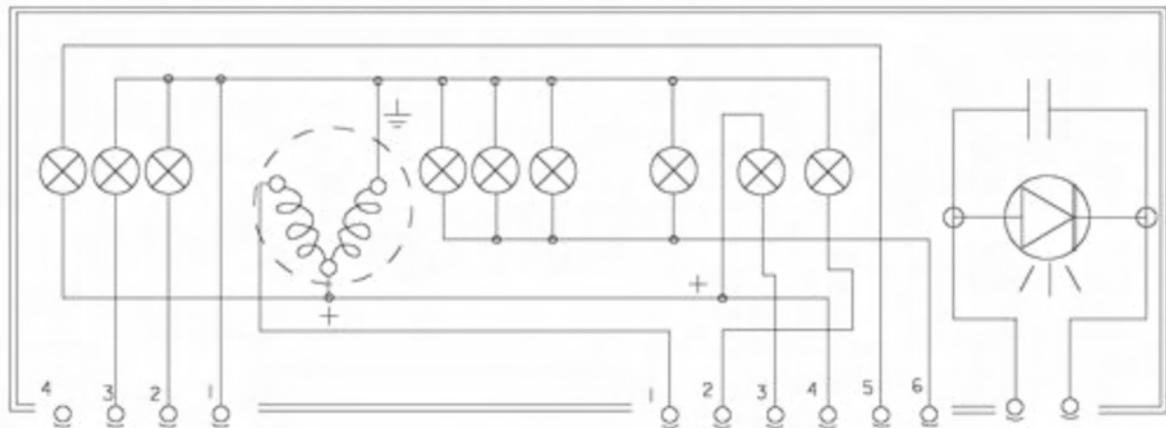
Turn signal lights



TURN INDICATORS AND HORN

	Specification	Desc./Quantity
1	Controller	
2	Indicators switch	
3	4 Turn indicator bulbs	12V-10W
4	Turn signal warning light bulbs	12V - 2W
5	Main fusible	15A
6	Battery	12V-9Ah
7	Horn	
8	Fuses	7,5 A
9	Key-switch	
10	Horn button	
11	Space for turn indicator acoustic lamp	

Instruments and warning lights control board



CONNECTOR 4 PIN

	Specification	Desc./Quantity
1	Earth	
2	Turn signal warning	
3	RHS turn signal warning light	
4	Not used	

CONNECTOR 5 PIN

	Specification	Desc./Quantity
1	Fuel level gauge	
2	High-beam warning light	12V - 1,2W
3	Engine oil pressure lamp	12V - 2W
4	+ Under-key	
5	Low-fuel warning light	
6	Dashboard illumination and headlamp warning light	

CONNECTOR 2 PIN

	Specification	Desc./Quantity
1	Anti-theft and diagnostics LED	
2	Anti-theft and diagnostics LED	

Checks and inspections

Immobiliser

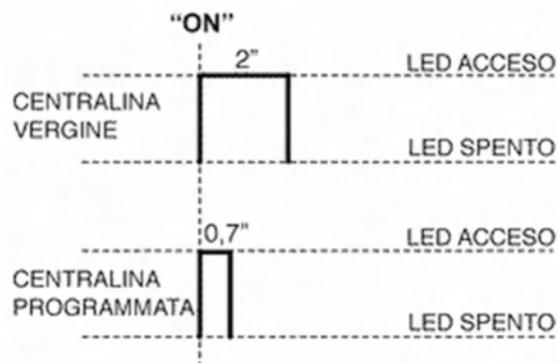
The electronic ignition system is powered by dir-

ect current and an anti-theft immobiliser device is incorporated into the ecu. The ignition system consists of:

- ECU
- immobilizer antenna
- master and slave keys with in-built transponder
- h.t. coil
- diagnostic LED

The diagnostic LED also offers a deterring function. This function is activated whenever the key-switch is turned onto «OFF», in order to avoid comprising the battery CHARGE; it remains active for 48 hours.

When the keyswitch is turned onto «ON» the deterring function is deactivated and is followed by a single flash to confirm the «ON» position. the duration of the flash depends on the program installed on the ECU (see figure).

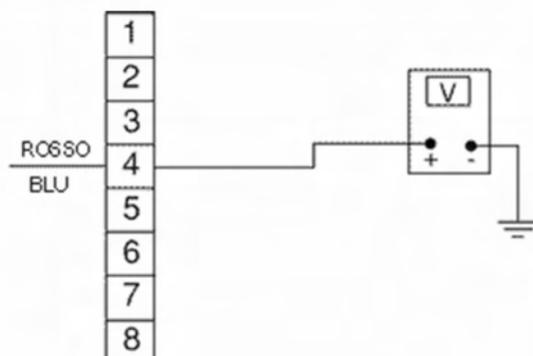


In the event that the LED remains off with the key-switch set onto «ON», it is then necessary to carry out the following procedures:

- check potential difference at battery
- ensure 15A fuse is in working conditions.

Attach the immobiliser tester to the diagnostic port (see ET4 125 manual) located behind the front LHS fuse holder flap.

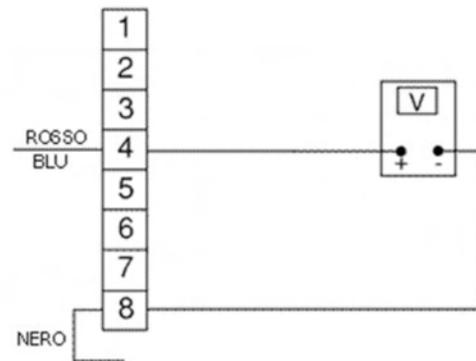
If the serial LED stays off, proceed by inspecting the electronic control unit as indicated below:



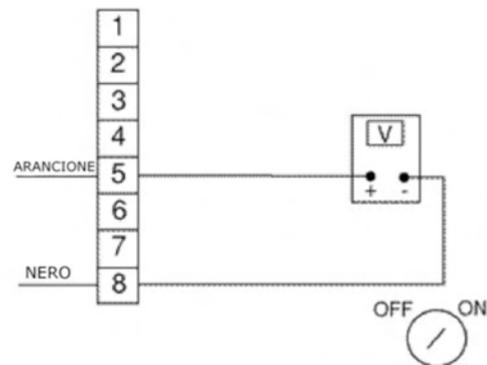
Detach the connector from the ECU and check the following:

- Presence of battery potential difference between terminal 4 (Red/Blue) and earth
- Presence of battery potential difference between

terminals 4 (Red/Blue) and 8 (black), as shown in the figure.



- Presence of battery potential difference between terminals 5 and 8 with the key-switch onto «ON». If no anomalies are found, replace the electronic control unit.



Virgin circuit

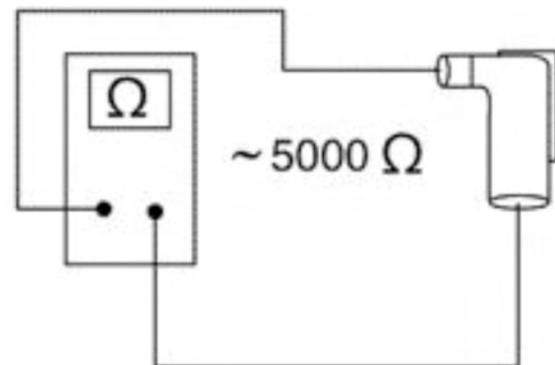
When the ignition circuit is not coded, the engine is limited to 2,000 rpm and an evident lack of power may be noted when accelerating.

To encode the system it is necessary to use the MASTER (brown) and SLAVE (blue) keys as indicated below:

- Insert the MASTER key, turn the key-switch onto "ON" and leave it in this position for 2 seconds (limit values: 1 - 3 seconds).
- Alternately insert all available blue keys leaving each key onto "ON" for 2 seconds.
- Finally reinsert the MASTER key and turn the key-switch onto "ON" for 2 seconds.

The maximum allowable time available for switching from one blue key to the next is 10 seconds.

During a single encoding sequence a maximum of 7 blue keys are allowed.



It is strictly necessary to follow the exact sequence and timings.

If necessary, repeat the whole procedure from the beginning

Once the electronic control unit has been successfully encoded, this is permanently linked to the transponder located inside the MASTER key.

With this link established, it is now possible to encode new SLAVE keys, in the event of losses, replacements, etc. Every encoding sequence supersedes the previous one.

In the event that the SERVICE keys should become un-coded, the high tension circuit must be thoroughly inspected:

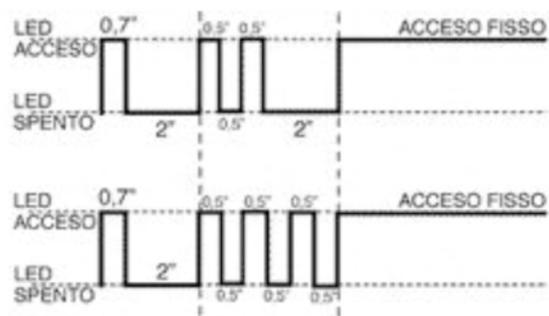
Shielded cap resistance: ~ 5000 Ω .

In any case, it is recommended the use of spark plugs as shown in the figure.

Diagnostic codes

Following the flash (0.7 seconds) which confirms that the system is now onto «ON», a sequence of coded flashes may be observed, signalling a number of possible faults.

This occurs with LED off for 2 seconds, after which diagnostic codes are transmitted with 0.5 second flashes. After the failure code signal, the LED turns on with solid light to indicate that start up is not possible; see the graph:



2 FLASH CODE

- Example electronic control unit programmed, transponder absent and/or aerial malfunctioning.

Ignition disabled - Vehicle immobilised

3 FLASH CODE

- Example electronic control unit programmed, aerial in working condition and transponder code unknown.

Ignition disabled - Vehicle immobilised

Diagnostic code - 2 flashes

When the 2-flash code is noted, proceed as follows:

-Check whether the anomaly persists using different keys (including the MASTER key). If the problem is present with any key, detach the antenna connector from the electronic control unit and check the antenna for electrical continuity using a multimeter. Replace the antenna if necessary.

If no faults are found, replace the ECU.

CAUTION

BEFORE PERFORMING THE STORING PROCEDURE ON THE NEW CONTROL UNIT, CHECK THAT NO MALFUNCTION CODE IS SIGNALLED. THIS PRECAUTION IS NEEDED TO AVOID WASTING A NEW CONTROL UNIT.

Specific tooling

020331Y Digital multimeter

Electric characteristic

Resistive value

~ 7 ÷ 9 Ohm

Diagnostic code - 3 flashes

If the 3-flash diagnostic code is displayed, check if the anomaly persists after inserting the MASTER key into the ignition switch.

- If the malfunction disappears when the MASTER key is used, proceed to code the service (blue) keys again.

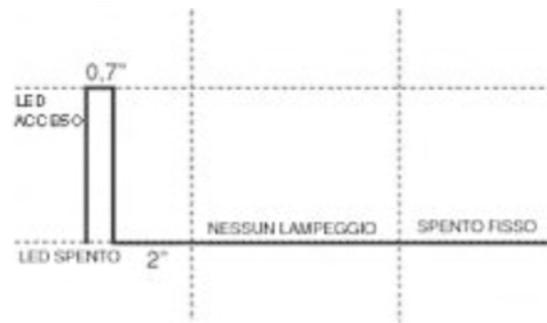
- If the anomaly persists, then the MASTER key and the control unit are not matched. In that case, replace the control unit and proceed to code the keys.

The immobilizer system is in working order when, after turning the ignition switch to «ON», one 0.7-second flash is emitted (see chart).

In that case, ignition is possible.

Example - Electronic control unit programmed, transponder present, key programmed and aerial

in working order. **Ignition enabled (normal operating conditions)**



Ignition circuit

Every operation involving the detachment of wires (i.e. ignition system and wiring checks) **must be performed when the engine is not running**: the ECU may otherwise become damaged beyond repair.

The main power supply is provided by the battery; the system is adjusted so that any battery voltage loss is immediately picked up by the starter system and is therefore almost irrelevant to the ignition system.

The Pick-Up is connected to the ECU via a single wire; the latter is therefore connected to the pick-up through the frame and the earth wire from the engine.

In order to avoid problems with the ignition system during the start-up phase, it is extremely important that the frame-engine earth connections are in good conditions.

No spark plug

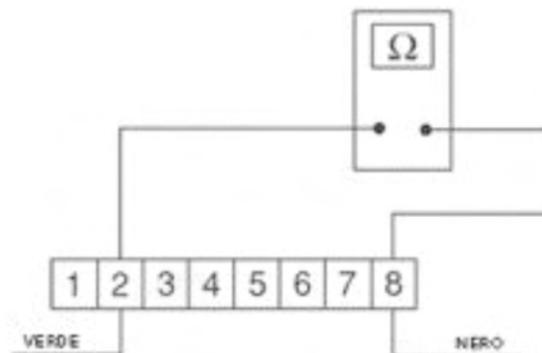
When noticing no spark plug proceed as follows:

- Pick-Up inspection.

Detach the ECU connector and check for continuity between terminals 2 (Green) and 8 (Black).

The inspection must include the pick-up and its power cable.

If an open circuit is found, repeat the inspection between the flywheel connector and earth. If unacceptable values are found, proceed by replacing the pick-up, otherwise repair the cable.



Electric characteristic

Resistance value pick-up

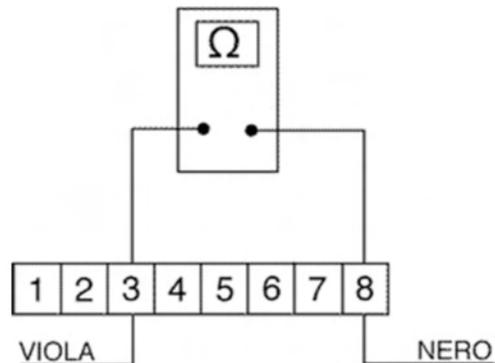
Resistance value pick-up: $105 \div 124$ ohm

- H.T. coil primary circuit inspection

Detach the connector from the ECU and check for continuity between terminals 3 (purple) and 8 (black) (see figure).

If unacceptable values are found, repeat the inspection directly from the positive and negative terminals of the H.T. coil primary circuit.

If the values are within the prescribed limit, proceed by repairing the wiring or reattaching all wirings, otherwise replace the H.T. coil.

**Electric characteristic****Resistance value H.V. coil primary check**

Resistance value H.V. coil primary check: $0,4 \pm 0,5$ ohm

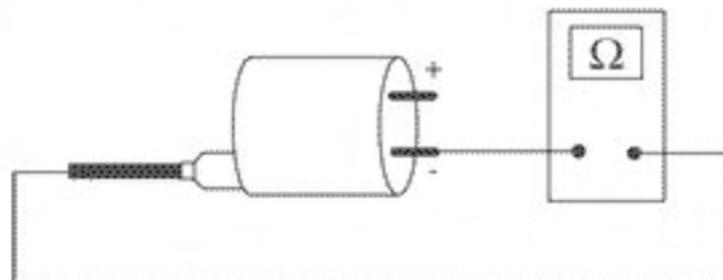
- H.T. coil secondary circuit inspection

Detach the spark plug cap from the H.T. cable and measure the resistance between the H.T. cable terminals and the negative wire of H.T. coil (see figure).

If unacceptable values are found, replace the H.T. coil. For a more thorough analysis, it is possible to proceed by checking the peak tension using the adapter for the multimeter.

Specific tooling**020409Y Multimeter adapter (Peak voltage measurement)****Electric characteristic****Resistance value H.V. coil secondary check**

Resistance value H.V. coil secondary check: $\sim 3000 \pm 300$ ohm

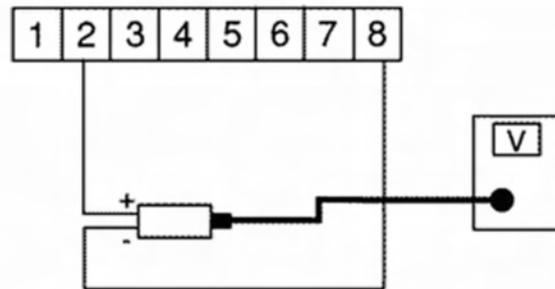
**- Pick-Up**

Detach the ECU connector and connect the posit-

ive terminal to connector no. 2 and the negative terminal to connector no. 8 (see figure).

Crank the engine using the starter motor and check the tension produced by the pick-up.

If unacceptable values are found, replace the Pick-Up.



N.B.

THE MULTIMETER MUST BE SET TO MEASURE DIRECT VOLTAGE.

Electric characteristic

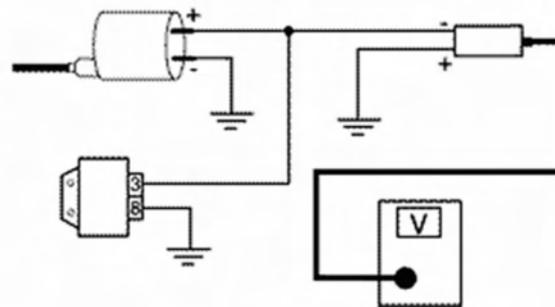
Voltage value pick-up

Voltage value pick-up: > 2 Volt

- H.T. coil

With ECU and H.T. coil connected to the circuit, measure the coil primary circuit tension during the start-up test, using the peak tension adapter and earthing the positive terminal and connecting the positive terminal to the coil.

If unacceptable values are found, replace the ECU.



CAUTION

THE NEGATIVE TERMINAL OF THE PRIMARY COIL CIRCUIT IS BLACK.

Electric characteristic

Voltage value H.V. coil

Voltage value H.V. coil: > 100 Volt

Battery recharge circuit

The charging circuit consists of tri-phase generator and a flywheel magneto.

The generator is connected to the voltage regulator.

This is then connected to the positive pole of the battery (via the 15A fuse) and earth.

This system does not therefore feature any connection to the key-switch.

The tri-phase generator allows for remarkable recharging power and allows to reach a good compromise between output power and stability at idle.

For this reason is necessary that the idle is adjusted as prescribed.

Specific tooling

020333Y Single battery charger

020334Y Multiple battery charger

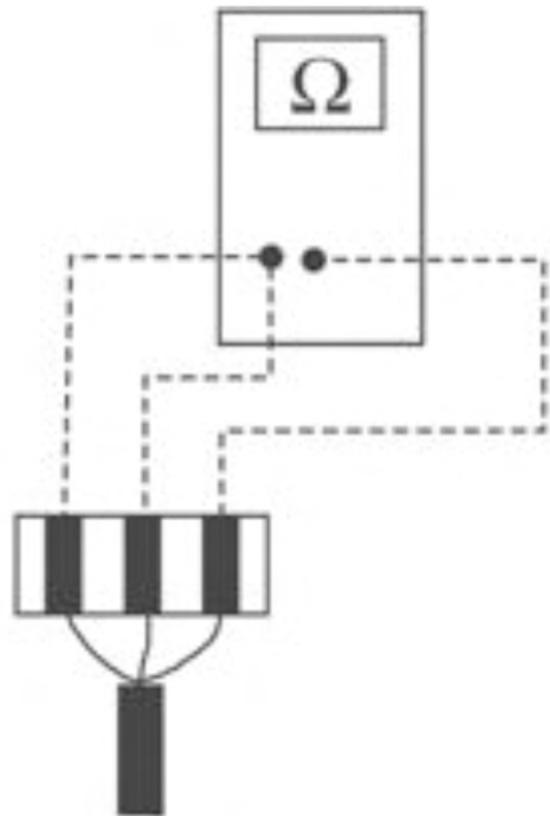
Stator check

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

Electric characteristic

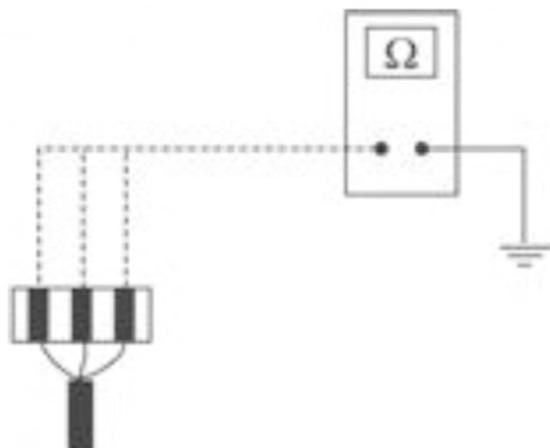
Stator check 1

Ohm value: $0,7 \div 0,9$ Ohm



Also check that each yellow wire is insulated from earth.

If non-conforming values are detected, repeat the checks directly on the stator; in case of further wrong values, replace the stator or fix the wiring.



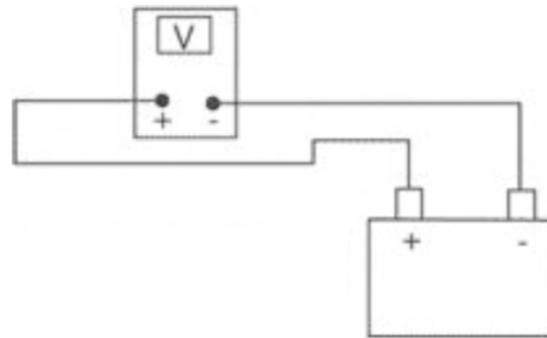
Voltage regulator check

With battery fully charged and lights off, measure the voltage at the battery poles with engine at high speed.

Voltage should not exceed 15.2 Volt.

In case of higher voltage, replace the regulator.

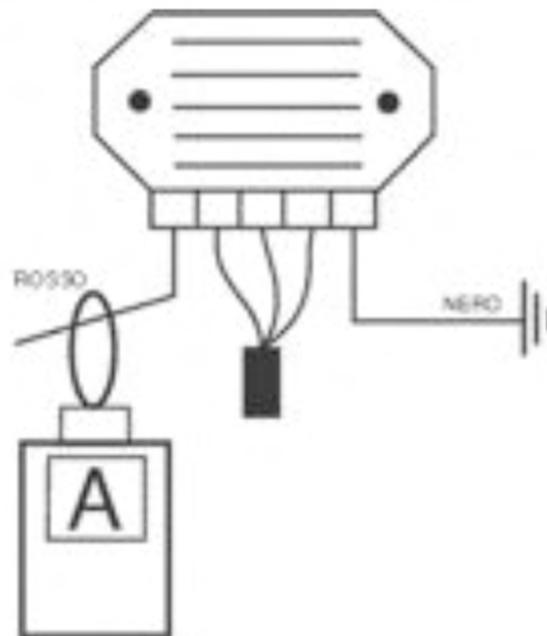
If voltage is less than 14 Volt, check the stator and its wiring.



Recharge system voltage check

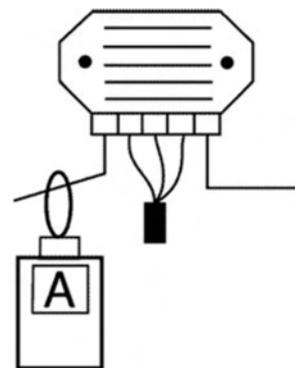
Connect the induction collet of an amperometer to the positive cable of the voltage regulator, measure the battery voltage and turn off the lights of the vehicle with engine off, then wait until voltage settles at about 12 Volt. Start the engine and measure the current delivered by the system with lights on and engine at high speed.

If the delivered current value is less than 8A, repeat the test using a new regulator and/or stator.



Choke Inspection

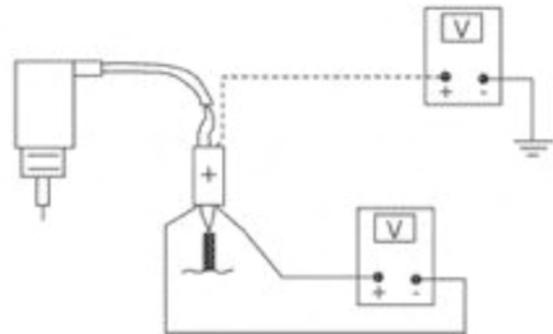
For the resistive and functional inspection of the component see the engine section. To check the power supply, leave the connector attached to the circuit and check there is battery tension between the two terminals with engine running (see figure). If no tension is measured at all, connect the negative terminal of the multimeter to earth, and the positive terminal to the orange wire from the automatic choke device; with the key-switch onto «ON» check for battery potential; if this is not



found, check wiring and key-switch.

If battery potential is found, repeat the inspection from the connector to the ECU.

After detaching the choke device, start the engine and, while at idle, check for tension connecting the positive terminal of the multimeter to terminal 5 (Orange) and the negative to terminal 7 (White/Black) (see figure).



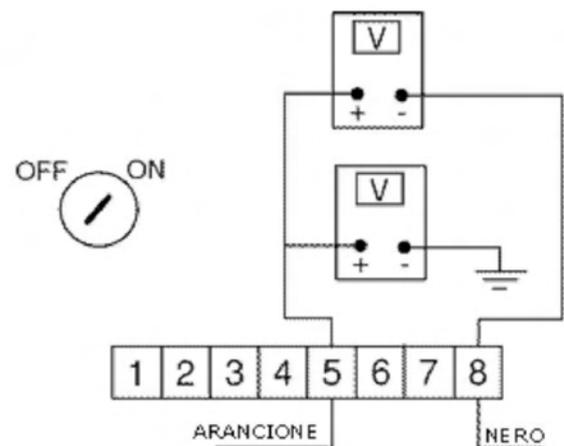
If no tension is found, replace the ECU; otherwise check the wiring between the choke device and the ECU.

Turn signals system check

- If the turn signal lights are faulty, proceed as follows:

- Detach the ECU connector and check for battery tension between terminal 5 (Orange) and earth, with the key-switch onto «ON».

- Check the same is present between terminals 5 (Orange) and 8 (Black).

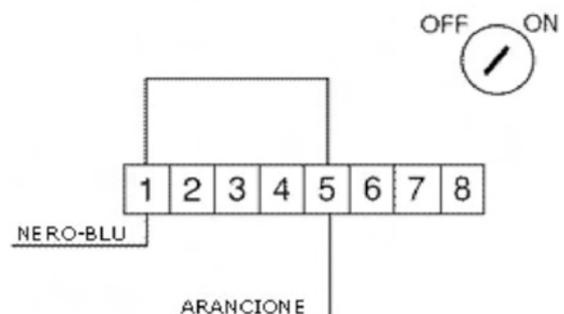


If no tension is measured, check the wiring, otherwise proceed as follows:

- Jumper terminals 1 (Black/Blue) and 5 (Orange), see figure, and alternately operate the turn signal switch towards left and right with the key-switch onto «ON» and check the bulbs go off.

If this happens, replace the ECU, as faulty.

If this does not happen, check the wiring between the ECU and the turn signal switch, hence repeat the test.



Sealed battery

If the vehicle is provided with an airtight battery, the only maintenance required is the check of its charge and recharging, if needed.

These operations should be carried out before delivering the vehicle, and on a six-month basis for storage with open circuit.

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

INSTRUCTIONS FOR THE RENEWAL RECHARGE AFTER OPEN-CIRCUIT STORAGE

1) Voltage check Before installing the battery on the vehicle, perform an open-circuit voltage check using a conventional tester.

- If voltage exceeds 12.60 V, the battery may be installed without any renewal recharge.

- If voltage is below 12.60 V, a renewal recharge is required as explained at 2).

2) Constant-voltage battery instructions

- Constant voltage charge equal to 14.40 - 14.70V

- Initial charge current equal to 0.3 - 0.5 x rated capacity

- Charge time:

Recommended 10 - 12 h

Minimum 6 h

Maximum 24 h

3) Constant-current battery instructions

- Charge current equal to 1/10 of the battery rated capacity

- Charge time: 5 h

Dry-charge battery

WARNING

BATTERY ELECTROLYTE IS POISONOUS AND CAN CAUSE SERIOUS BURNS AS IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH THE EYES, THE SKIN AND GARMENTS. IN CASE OF CONTACT WITH THE EYES OR SKIN RINSE ABUNDANTLY WITH WATER FOR ABOUT 15 MINUTES AND SEEK IMMEDIATE MEDICAL ASSISTANCE.

IF THE LIQUID IS INGESTED IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR MILK. SUBSEQUENTLY DRINK MILK OF MAGNESIA, BEATEN EGG OR VEGETABLE OIL. CALL A DOCTOR WITHOUT DELAY.

BATTERIES PRODUCE EXPLOSIVE GASES. KEEP AWAY OPEN FLAMES, SPARKS AND CIGARETTES. WHEN A BATTERY IS CHARGED IN CLOSED PLACES ENSURE ADEQUATE VENTILATION.

ALWAYS PROTECT THE EYES WHEN WORKING IN THE PROXIMITY OF BATTERIES. POSITION THE TUBE BETWEEN THE MUDGUARD AND THE FILTER.

KEEP OUT OF REACH OF CHILDREN.

Installing dry batteries:

1) - Remove the cap from the bleeder and then carefully pour sulphuric acid into each element.

Note: the acid must have a density $1,260 \text{ kg}\cdot\text{m}^{-3}$, equivalent to 30° Bé at a minimum temperature of 15°C until the upper level is reached.

2) - Let the battery rest at least 2 hours, and then restore the level by pouring additional sulphuric acid as required.

3) - Recharge the battery within 24 hours using the recommended battery charger (single) or (multiple) at an intensity of about $1/10$ of the battery's nominal capacity and until the acid density is about $1,270 \text{ kg}\cdot\text{m}^{-3}$, corresponding to 31° Bé and such values become steady.

4) - After charging, level the acid (adding **distilled water**). Close and clean carefully.

5) - After performing the above operations, install the battery on the vehicle following the steps «described in Battery recharge» section of this manual.

1 Maintain the tube vertical

2 Check the electrolyte level

3 The floater must be free

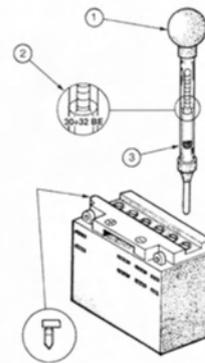
WARNING

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

Specific tooling

020333Y Single battery charger

020334Y Multiple battery charger



Battery maintenance

This is the component which requires the most diligent maintenance and frequent inspection. The main maintenance rules are:

1) Checking the electrolyte level

The electrolyte level must be checked frequently and must reach the upper mark. If the level is too low, it can be restored only by using distilled water. If water toppings are required too often, check the vehicle electrical system as this inconvenient is usually a symptom that the battery is working over-charged and is subject to quick wear.

2) Checking the battery charge level

After restoring the electrolyte level, check its density by using the density gauge. When the battery is charged, density should be equal to 30-32 Bé, corresponding to a specific weight of 12.4-12.6 kN·m⁻³ at a minimum temperature of 15° C. If density is below 20 Bé, the battery is fully discharged and it is therefore necessary to recharge it.

If the vehicle is not used for a certain period (1 month or more), the battery must be periodically re-charged.

Within a period of inactivity of approximately three months, at standard atmospheric conditions, the battery should be completely discharged. When reinstalling the battery on the vehicle, pay attention not to invert the connections, considering that the ground wire (black and marked with a (-) sign) must be connected to the negative terminal, whereas the two red wires, marked as (+), must be connected to the positive terminal.

3) Recharging the battery

Remove the battery from the vehicle detaching the negative wire first. The battery must be charged using the special battery charger (single or multiple), selecting the relevant battery type on the instrument. Connect the positive cable to the positive pole and the negative cable to the negative pole.

4) Cleaning the battery

Keep the battery always clean, especially the top; coat the terminals with Vaseline.

WARNING

BEFORE CHARGING THE BATTERY, REMOVE THE CAP FROM EACH CELL. KEEP FLAMES AND SPARKS AWAY FROM THE BATTERY WHEN CHARGING.

CAUTION

NEVER USE FUSES HAVING A CAPACITY GREATER THAN THE RECOMMENDED VALUE. THE USE OF A FUSE OF UNSUITABLE CAPACITY MAY RESULT IN SERIOUS DAMAGES TO THE WHOLE VEHICLE OR EVEN CULMINATE IN A FIRE.

CAUTION

DRINKING WATER CONTAINS MINERAL SALTS THAT CAN BE EXTREMELY HARMFUL TO THE BATTERY: ONLY USE DISTILLED WATER.

CAUTION

TO ENSURE MAXIMUM PERFORMANCE THE BATTERY MUST BE CHARGED BEFORE USING THE VEHICLE.

INSUFFICIENT BATTERY CHARGE OR LOW ELECTROLYTE LEVEL WHEN FIRST USED WILL RESULT IN PREMATURE FAILURE OF THE BATTERY.

Specific tooling

020333Y Single battery charger

020334Y Multiple battery charger

INDEX OF TOPICS

ENGINE FROM VEHICLE

ENG VE

Exhaust assy. Removal

- Remove the two nuts securing the manifold to the head



- Unscrew the two screws securing the silencer to the crankcase then remove the complete muffler paying attention to the interference between its support bracket and the cooling casing.



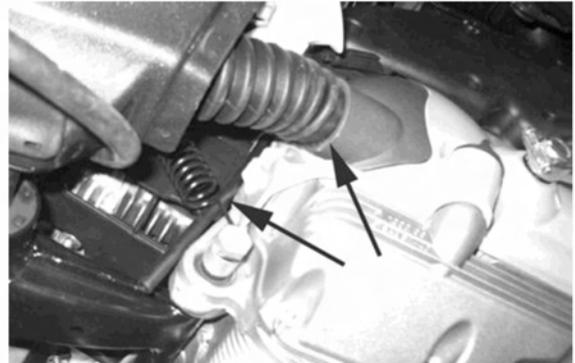
Removal of the engine from the vehicle

Removing the engine from the frame

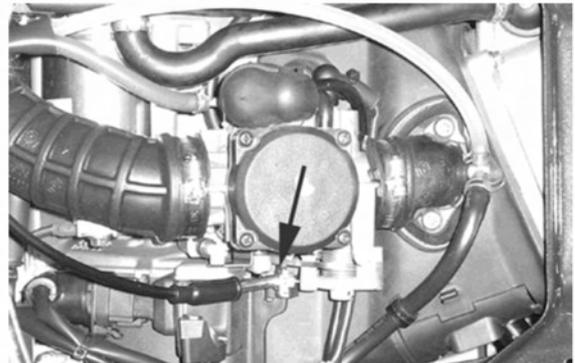
- Remove the left and right panels
- Remove the helmet compartment
- Remove the entire muffler
- Remove the 3 rear brake transmission set screws shown in the photo
- Disconnect the rear brake transmission by unscrewing the register screw



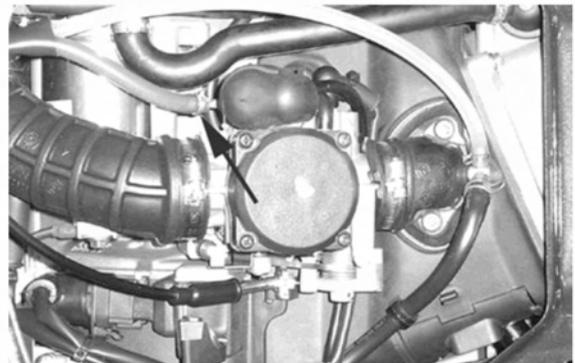
- Disconnect the belt cooling hose and the spring supporting the cocker arm indicated in the photo
- Disconnect the spark plug terminal



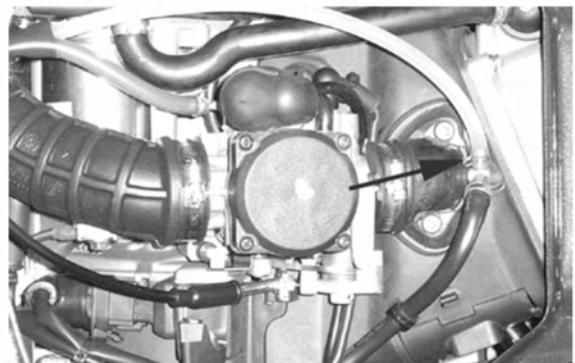
- Remove the gas control cable from the carburetor as shown in the photo



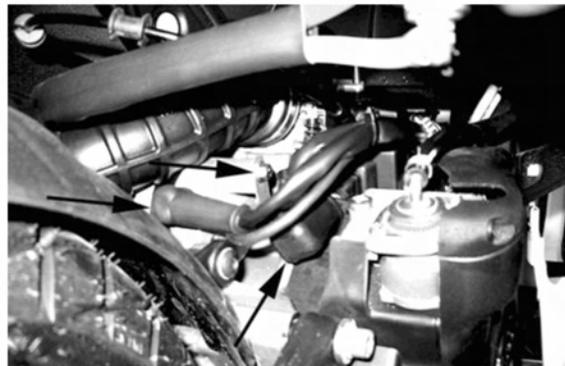
- Remove the fuel intake tube from the carburetor



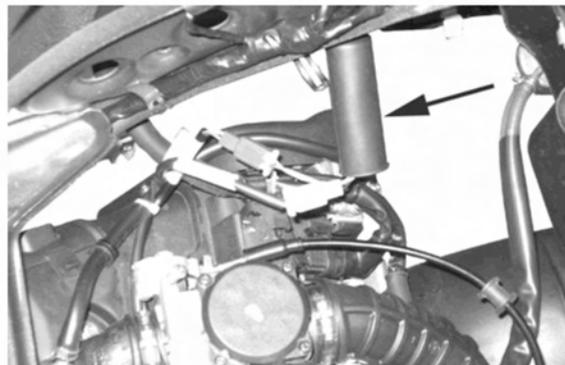
Remove the fuel tap and canister safety valve vacuum hoses from the manifold as shown in the figure



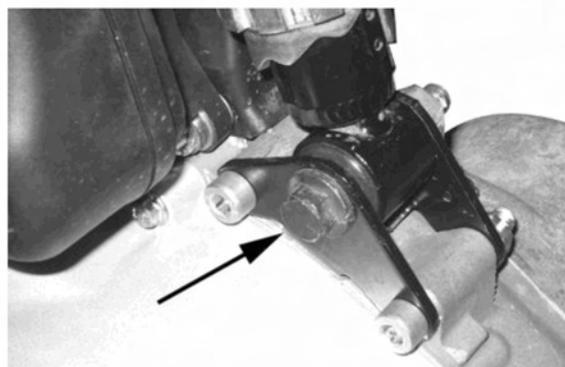
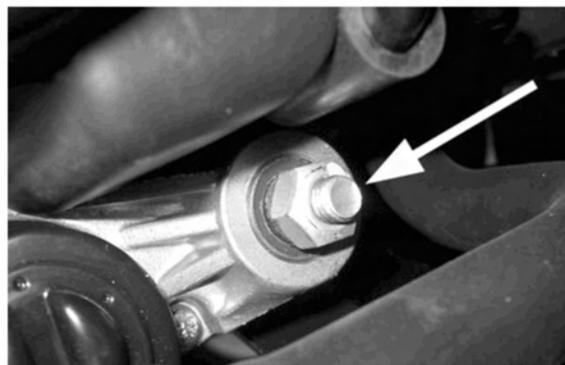
- Remove the magneto cable connector, the earth cable and started motor positive cable as shown in the figure



- Remove the protection sheathing as shown in the figure and disconnect the automatic starter and carburettor heater connections



- Unscrew the engine - rocker arm pin nut from the right side of the vehicle and remove the pin from the left side
 - Support the vehicle in an adequate manner (e.g. with the jack) then remove the lower shock absorber mounting. Now the engine is released.



INDEX OF TOPICS

ENGINE

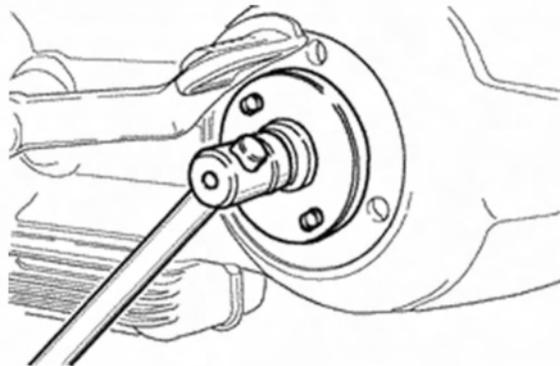
ENG

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

Automatic transmission

Transmission cover

- To remove the transmission cover it is necessary to remove the plastic cover first, by inserting a screwdriver in the slotted holes. Using the clutch drum lock wrench shown in the figure, remove the driven pulley axle locking nut and washer.



- Remove the engine oil dipstick.

- Remove the 10 fixing screws and the ground cable.

- Remove the transmission cover. If this operation is carried out directly onto the vehicle, it is necessary to remove the cooling air manifold and the air-box fasteners.

Specific tooling

020423Y driven pulley stop key

Kickstart

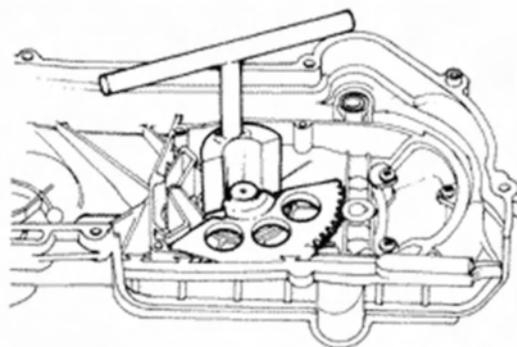
- Check for any wear on the tooth sector, the tooth sector shaft, the bushing in the cover, pinion shaft, its seat in the crankcase and the spring.

- Replace the damaged parts.

- Grease the spring with recommended grease.

- Reassemble the tooth sector loading the spring with the specific tool.

- Reassemble the washer, circlip ring and kickstart lever.



Specific tooling

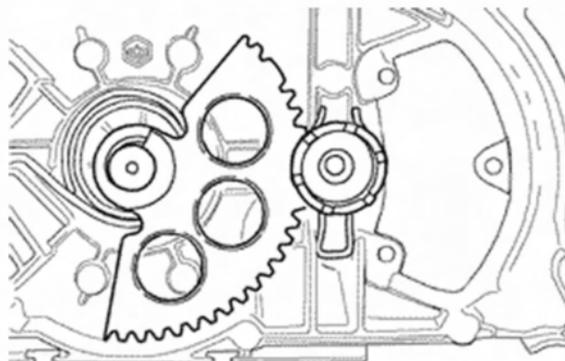
020432Y Starting spring assembly tool

Recommended products

JOTA 3 FS Speedometer transmission

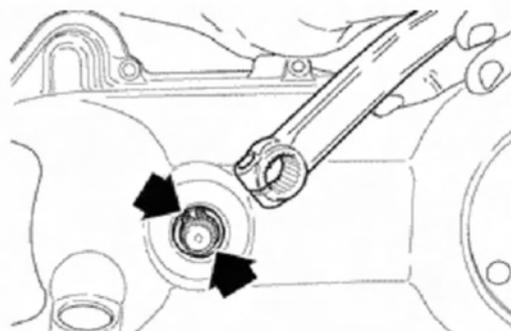
Lithium soap grease NLGI 33

- Using the start lever load the spring and put the pinion in its seat.
- Reassemble the suction opening with the 3 screws and Kickstart cover with the 4 screws. -
- Tighten the screws to the prescribed torque.



Remove the starter pinion by pressing the start lever.

- Unscrew the kickstart screw and remove the lever.
- Remove the circlip and the washer indicated in the figure.
- Remove the tooth sector.

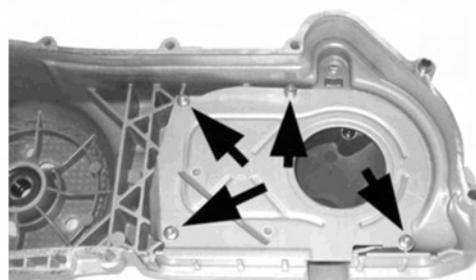


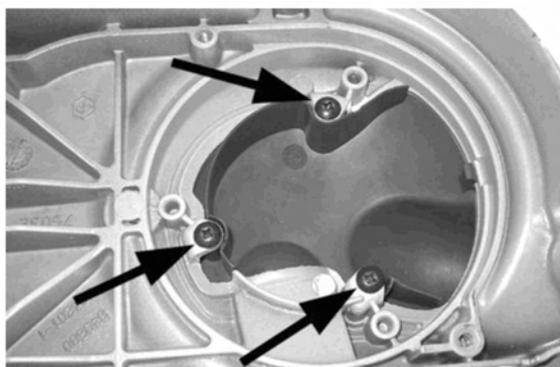
WARNING

THE SECTOR KEEPS THE SPRING LOADED, BE CAREFUL TO PREVENT ACCIDENTS

Air duct

- Loosen the Torx screws fixing the air duct panel.
- Remove the 3 screws, hence remove the conveyor and the filter.





Removing the driven pulley shaft bearing

- Remove the circlip from the inside of the cover.
- Use the Bearing Extractor with the appropriate adapter to remove the bearing from the crankcase.

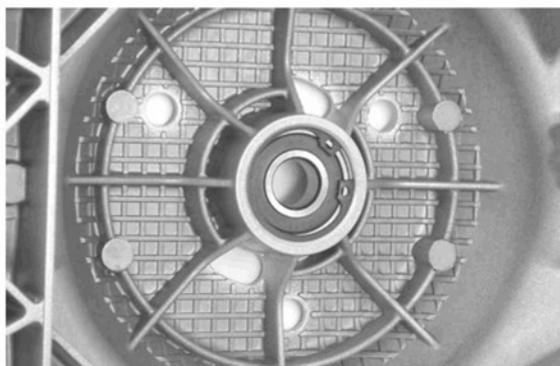
CAUTION

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

Specific tooling

020376Y Handle for punches

020375Y Adapter 28 x 30 mm

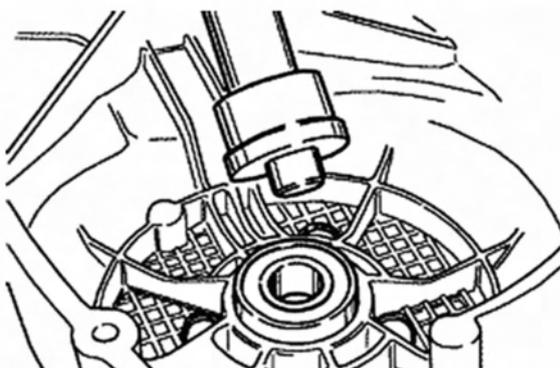


Refitting the driven pulley shaft bearing

- Heat up the internal side of the crankcase using a heat gun.
- Insert the bearing in its housing and refit the split ring.

N.B.

ALWAYS REPLACE THE BEARING WITH A NEW ONE UPON REASSEMBLY.



Specific tooling

020151Y Air heater "METABO HG 1500/2"

020376Y Handle for punches

020357Y 32 x 35 mm adaptor

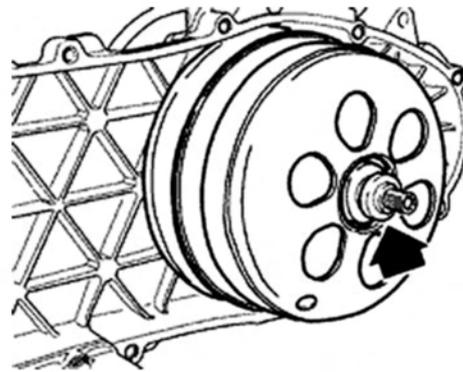
020412Y 15 mm guide

Removing the driven pulley

Remove the spacer, the clutch bell and the entire driven pulley assembly.

N.B.

THE ASSEMBLY MAY ALSO BE REMOVED WITH THE DRIVING PULLEY ON.



Inspecting the clutch drum

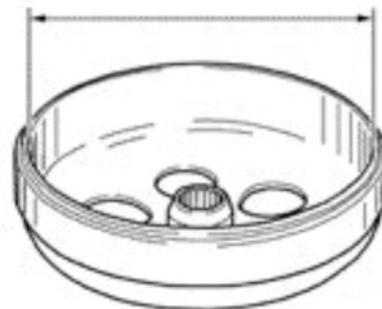
- Check that the clutch bell is not worn or damaged.
- Measure the clutch bell inside diameter.

Characteristic**Max value clutch bell**

Max value: \varnothing 134.5 mm

Standard value clutch bell

Standard value: \varnothing 134.2 mm



Checking the bell working surface eccentricity

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

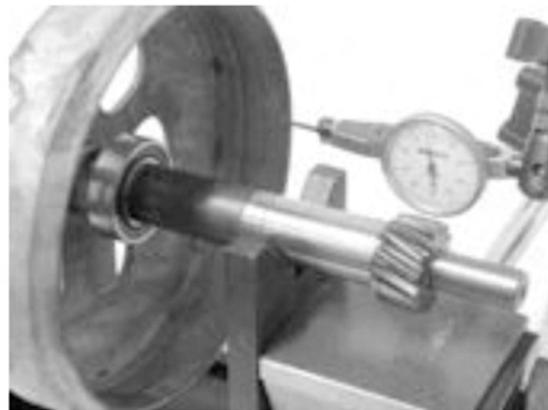


- Using a feeler pin comparator and the magnetic base, measure the bell eccentricity.
- Repeat the measure in 3 positions (Central, internal, external).
- In case of anomalies, replace the bell.

Specific tooling

020074Y Crankshaft aligning tool

020335Y Magnetic stand and comparator

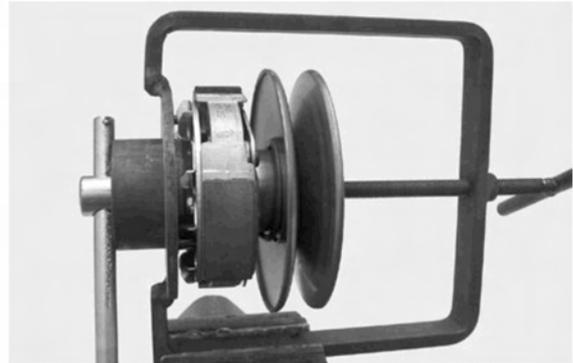


Removing the clutch

Install medium-side pins onto the driven pulley retaining tool by positioning them in position «C».



- Insert the driven pulley assembly in the special tool so that the pins engage into the clutch shoes support holes, hence force the resting screw to its position.
- Using the special spanner, on the 46mm side, remove the central clutch lock-nut.



- Dismantle the driven pulley components (clutch with fan and return spring with its plastic holder)

CAUTION

THE TOOL MUST BE FIXED IN A VICE AND THE CENTRAL SCREW MUST NOT BE TIGHTEN EXCESSIVELY, AS THIS MAY DAMAGE THE PULLEY OR THE SPECIAL TOOL.

Specific tooling

020444Y Driven half pulley spring compressor tool

020444Y009 wrench 46 x 55

Inspecting the clutch

- Check the thickness of the clutch mass friction material.
- The masses must exhibit no traces of lubricants; in that case, check the driven pulley unit seals.

N.B.

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

CAUTION

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

Characteristic

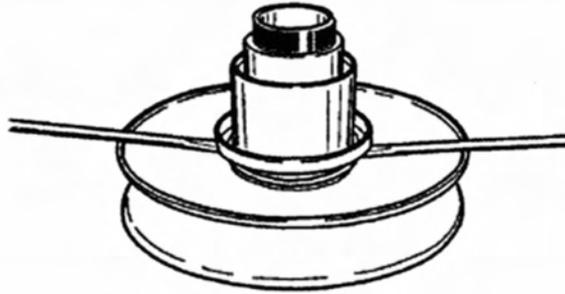
Check . Minimum thickness

1 mm



Pin retaining collar

- Remove the collar with the aid of two screw-drivers.
- Remove the three guide pins and the movable half pulley.



Removing the driven half-pulley bearing

- Remove the retaining ring using two screw-drivers and a flat blade.
- Using a hammer and a puncher, remove the ball bearing as shown in the figure.
- Remove the roller bearing using the extractor.

N.B.

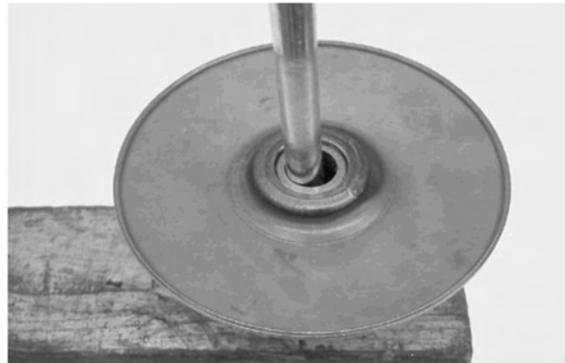
IN ORDER TO AVOID DAMAGING THE THREADED BUSHING ON THE DRIVEN PULLEY, REST THE PULLEY ONTO A WOODEN SURFACE.

Specific tooling

020375Y Adapter 28 x 30 mm

020376Y Handle for punches

020439Y 17 mm guide



Inspecting the driven fixed half-pulley

- Measure the external diameter of the pulley's central bush.

Characteristic

Minimum admissible diameter

Ø 40.96 mm

Standard diameter

Ø 40.965 mm

**Inspecting the driven sliding half-pulley**

- Remove the two internal circlips and the two o-rings.
- Measure the internal diameter of the pulley's central sleeve.

**Characteristic****Minimum admissible diameter**

Ø 41.08 mm

Standard diameter

Ø 41.035 mm

Refitting the driven half-pulley bearing

- Fit the new roller cage using the special puncher; insert the bearing with the markings facing outwards and push it as far as it will go.

N.B.

IN ORDER TO AVOID DAMAGING THE THREADED BUSHING ON THE DRIVEN PULLEY, REST THE PULLEY ONTO A WOODEN SURFACE.

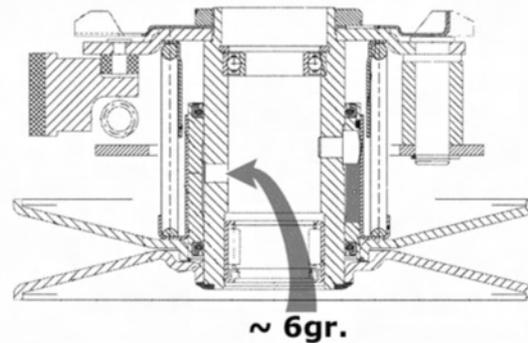
**Specific tooling****020424Y Driven pulley roller casing drift**

- When fitting a new ball bearing push it in as far as it will go using the special puncher provided, hence fit the split ring.

Specific tooling**020375Y Adapter 28 x 30 mm****020376Y Handle for punches****020439Y 17 mm guide**

Refitting the driven pulley

- Ensure the contact surfaces of the 2 half-pulleys are not worn, scored or greasy.
- Insert new oil seals and O-rings on the moving half-pulley.
- Fit the half-pulley onto the bushing using the protective sheath.
- Before refitting, check the pins and collar are not worn
- Using a curved-spout grease dispenser, lubricate the driven pulley assembly with approximately 7 g of TUTELA MRM2 grease. Apply the grease to one of the holes in the bushing until it comes out through the hole on the opposite side. This operation is necessary to avoid the presence of grease beyond the O-rings.

**Specific tooling****020263Y Protective sheath****Recommended products****TUTELA MRM 2 Grease for the phonic wheel turning ring**

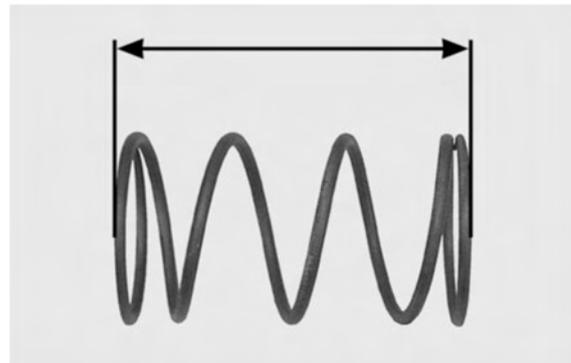
Molybdenum disulphide grease and lithium soap

Inspecting the clutch spring

- Measure the length of the spring, while it is relaxed.

Characteristic
Standard length

106 mm



Refitting the clutch

- Measure the thickness of the friction material on the clutch weights.
- The clutch weights should bear no traces of lubricants. If they do, check the driven pulley assembly.

N.B.

DURING THE RUNNING-IN PERIOD, THE CLUTCH WEIGHTS MUST HAVE A CENTRAL CONTACT SURFACE AND MUST NOT DIFFER FROM ONE ANOTHER, OTHERWISE THE CLUTCH MAY GRAP.

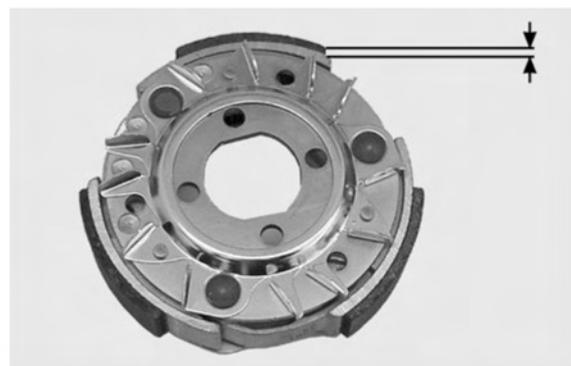
CAUTION

DO NOT USE ANY TOOLS TO OPEN THE WEIGHTS AS THIS MAY CHANGE THE LOAD OF THE RETURN SPRINGS.

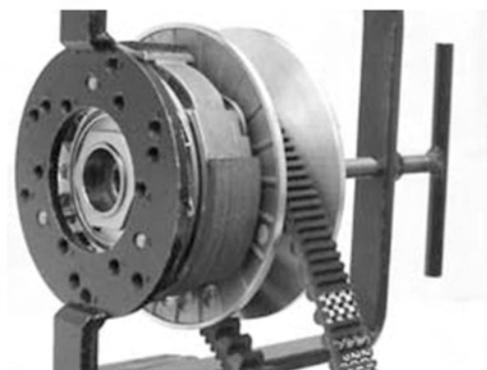
Characteristic

Minimum allowable thickness:

1 mm



- Support the driven pulley spring compressor specific tool with the control screw in vertical axis.
- Arrange the tool with the medium length pins screwed in position «C» on the inside.
- Introduce the adapter ring n° 11 with the chamfering facing upwards.
- Insert the clutch on the adapter ring.
- Lubricate the end of the spring that abuts



against the servo-system closing collar.

- Insert the spring with relevant plastic support in contact with the clutch.
- Insert the driving belt into the pulley unit according to their direction of rotation.
- Insert the pulley unit with the belt into the tool.
- Slightly pre-load the spring.
- Make sure that the clutch is perfectly inserted into the adapter ring before proceeding to tighten the clutch nut.
- Place the tool into the vice with the control screw in horizontal axis.
- Fully pre-load the spring.
- Apply the clutch fixing nut and tighten it at the prescribed torque using the specific wrench 46x55.
- Loosen the tool clamp and insert the belt according to its direction of rotation.
- Lock the driven pulley again using the specific tool.
- Pre-load the clutch contrast spring by turning and pulling at the same time and place the belt in the minimum rolling diameter position.
- Remove the driven pulley /belt assembly from the tool.

N.B.

DURING THE SPRING PRE-LOADING STEP, BE CAREFUL NOT TO DAMAGE THE SPRING PLASTIC ABUTMENT AND THE BUSHING THREADING.

N.B.

FOR DESIGN REASONS, THE NUT IS SLIGHTLY ASYMMETRIC; THE SURFACE SHOULD BE MOUNTED IN CONTACT WITH THE CLUTCH.

Specific tooling

020444Y Driven half pulley spring compressor tool



020444Y011 Adapter ring

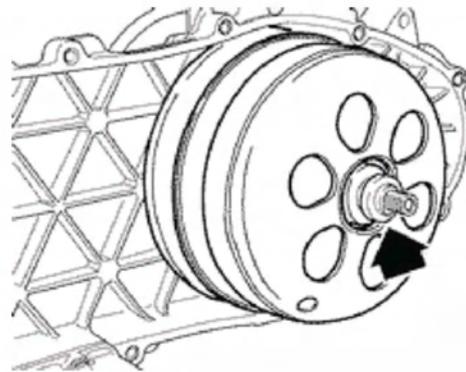
020444Y009 wrench 46 x 55

Locking torques (N*m)

Nut locking clutch assembly on pulley 55 ÷ 60
Nm

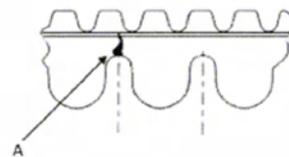
Refitting the driven pulley

- Re-fit the clutch drum and the spacer.

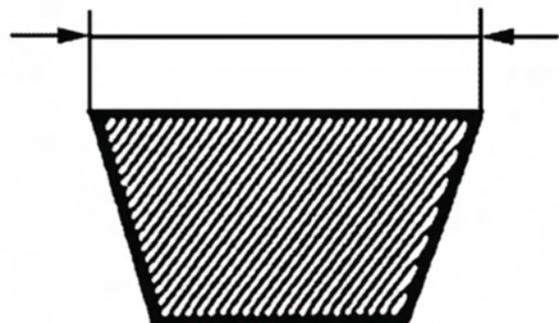


Drive-belt

During the wear check to be performed according to the scheduled maintenance in the 6,000 Km inspection, in the 18,000 Km inspection, etc., it is advisable to check that the tooth groove bottom is free from deformations and cracks (see figure). In case of cracks, the belt must be replaced. «**A**»: The tooth groove bottom must be free from deformations and cracks; if not, replace the belt.



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

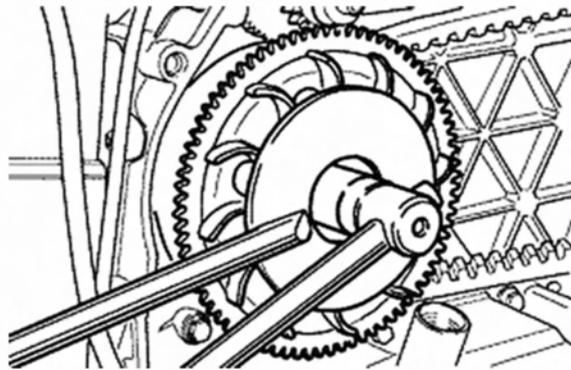


BELT DIMENSIONS

Specification	Desc./Quantity
Minimum width	21.5 mm
Standard width	22.5 ± 0.2 mm

Removing the driving pulley

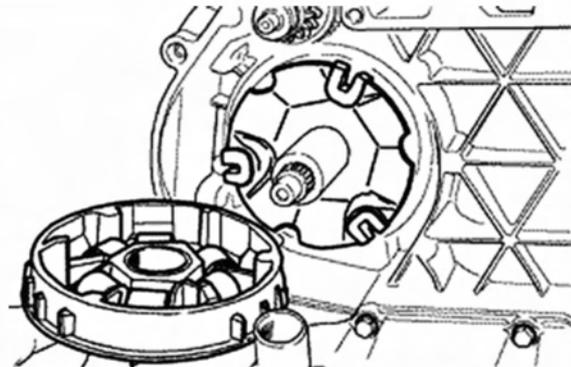
- Loosen the drive pulley retaining nut, whilst holding the drive pulley fast with the appropriate special tool shown in the diagram.
- Remove the drive pulley nut, the dished washer, the starter motor ratchet plate and the two washers.
- Remove the fixed half-pulley and the steel washer.



Specific tooling

020368Y driving pulley stop wrench

- Remove the belt and extract the mobile half-pulley with the relevant bushing, being careful to the exit of the rollers freely mounted onto it.
- Remove the roller contrast plate with the relevant guide sliding blocks.



Inspecting the rollers case

- Ensure the internal bearing is not abnormally worn and measure the internal diameter.

N.B.

DO NOT CLEAN OR LUBRICATE THE BRONZE BUSH.

ROLLER CAGE BEARING

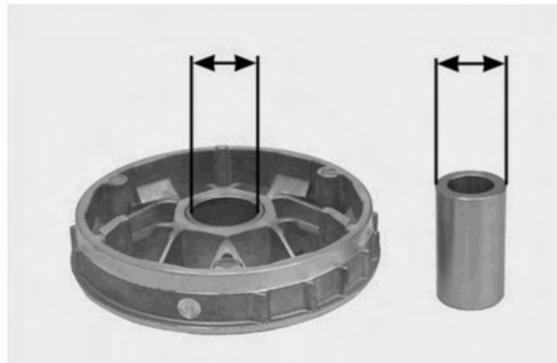
Specification	Desc./Quantity
Maximum allowable diameter	Ø 26,121 mm
Standard diameter	Ø 26+0 +0,021mm

PULLEY SLIDING BUSHING

Specification	Desc./Quantity
Minimum admissible diameter	Ø 25,950 mm
Standard diameter	Ø 26-0,020 -0,041mm

VARIATOR ROLLER

Specification	Desc./Quantity
Minimum admissible diameter	Ø 18.5 mm
Standard diameter	Ø 26±0,1 mm

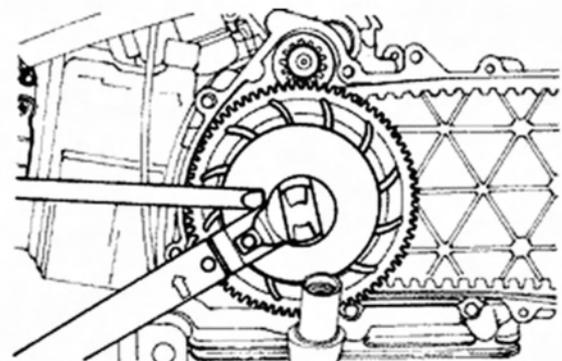


- Check the guide shoes for the variator back-plate are not worn.
- Check there is no wear on the roller ramps, inside the roller housing, and the pulley surfaces in contact with the drive belt, front and back.



Refitting the driving pulley

- Re-fit the fat innermost spacer, the fixed pulley-half, the outer spacer, the starter motor ratchet plate, the washer and the nut. Apply recommended product and tighten the nut to the specified tightening torque.
- Hold the drive pulley fast with the Compass Spanner, whilst tightening the nut on the end of the crankshaft.



N.B.

REPLACE THE NUT WITH A NEW ONE EVERY

TIME THE PARTS ARE REASSEMBLED**Specific tooling****020368Y driving pulley stop wrench****Recommended products****Loctite 243 Thread-Brake**

Medium Loctite Thread-Brake 243

Locking torques (N*m)**Tightening torque 75 ÷ 83**

Refitting the transmission cover

- Check the presence of the 2 centring dowels and the correct installation of the sealing gasket for the oil sump on the transmission cover.
- Replace the cover tightening the 10 screws at the prescribed torque.
- Replace the oil loading cap/bar.
- Replace the steel washer and the driven pulley nut.
- Tighten the nut at the prescribed torque using the lock wrench and the dynamometric wrench tools.
- Replace the plastic cover.

**Specific tooling****020423Y driven pulley stop key****Locking torques (N*m)****Cover screws 11 ÷ 13 Driven pulley axis (°) 54 ÷ 60**

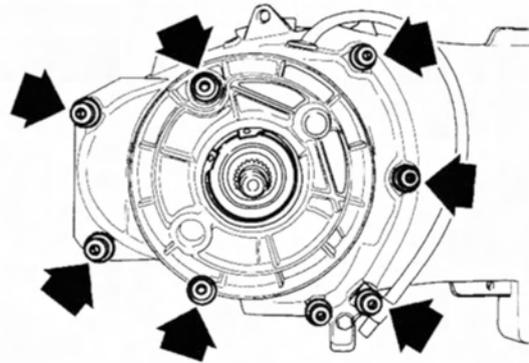
End gear

Removing the hub cover

- Drain the rear hub oil through the draining hole
-

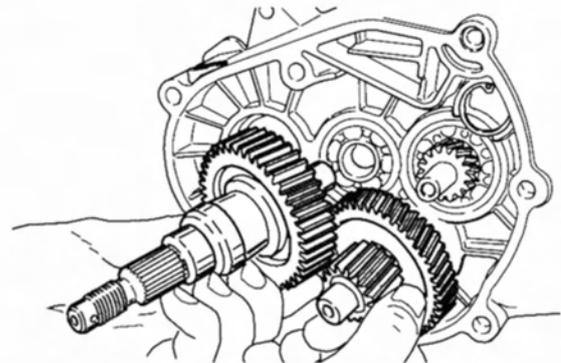
located in the lower part of the hub cover.

- Refit the brake shoes and their springs.
- Remove the 7 fixing screws shown in the figure.
- Remove the rubber cap and the rear brake shoe drive lever by loosening the fixing screw to reach the rear fastener.
- Remove the hub cover and all gaskets.



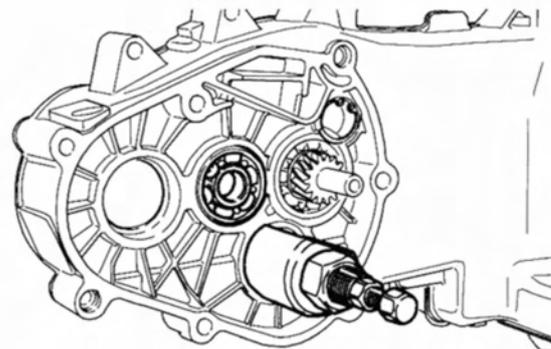
Removing the wheel axle

Remove the wheel axle and the intermediate gear from the hub casing.



Removing the hub bearings

- Inspect the bearings and replace any demonstrating abnormal wear, play or noisiness, following the steps below.
- Use the bearing extractor, available as a special tool, to remove the three gearbox bearings; two in the crankcase and one in the gearbox cover.



Specific tooling

001467Y009 Bell for bearings external Ø 50 mm

001467Y013 15-mm pliers

Removing the wheel axle bearings

- Take out the circlip on the outside of the gear-

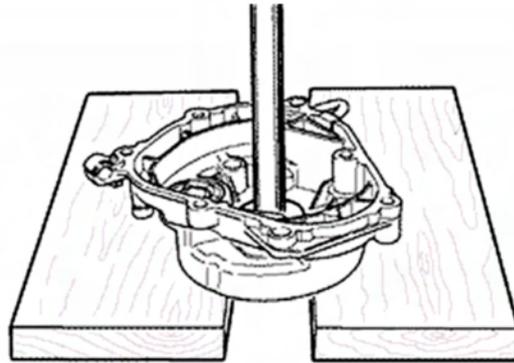
box cover.

- Remove the bearing using the appropriate special tool, taking care to provide a suitable means of support for the gearbox cover, as shown in the diagram.

Specific tooling

020376Y Handle for punches

020364Y 25 mm guide

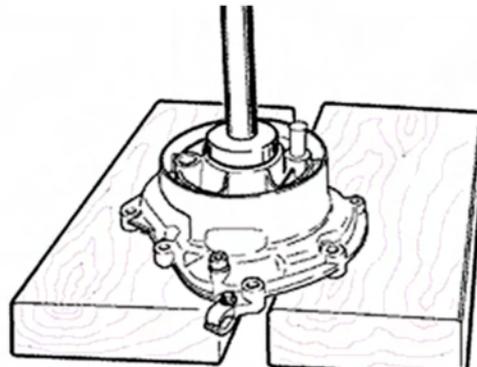


Means of the tools remove to the detent oil like in the figure.

Specific tooling

020376Y Handle for punches

020359Y 42 x 47 mm hub bearing fitting adaptor



Removing the driven pulley shaft bearing

- In order to remove the driven pulley shaft, together with its bearing and oil seal, first remove the transmission cover and the clutch assembly as previously described.

- Extract the driven pulley shaft from its bearing.
- Remove the oil seal, working from the inside of the bearing.
- Remove the circlip, as shown in the diagram.

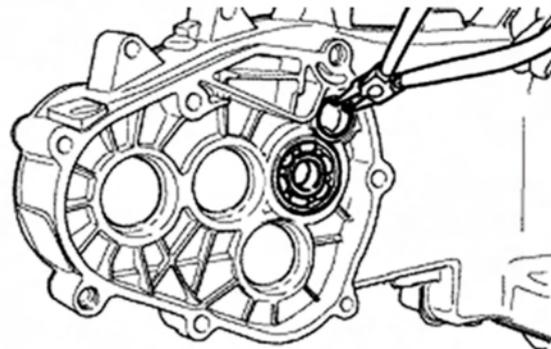
Remove the driven pulley shaft bearing using the appropriate special tool.

Specific tooling

020376Y Handle for punches

020375Y Adapter 28 x 30 mm

020363Y 20mm guide



See also

[Removing the driven pulley](#)

Inspecting the hub shaft

- Check that the three shafts exhibit no wear or deformation on the toothed surfaces, at the bearing connections and at the oil guards.
- In case of anomalies, replace the damaged components.



Inspecting the hub cover

- Check that there are no signs of blemishes or deformation on the mating surfaces.
- Check there is adequate free-play in the bearings and the brake actuating Pin.
- If any of the above anomalies are observed, replace the gearbox cover with a new one.

Refitting the driven pulley shaft bearing

- Heat the bearing housing with a heat gun

Specific tooling

020150Y Support for air heater "METABO HG 1500/2"

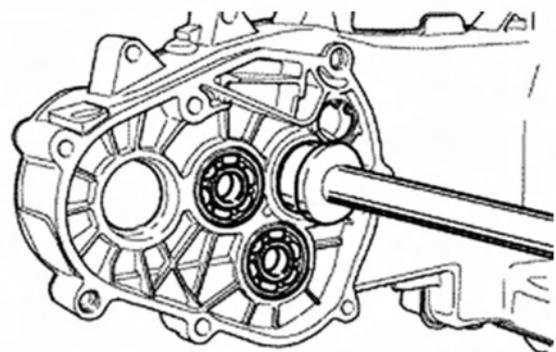
020151Y Air heater "METABO HG 1500/2"

- Fit the driven pulley shaft bearing, with the bearings visible from the inside of the gearbox cover, using the appropriate special tool.

Specific tooling

020376Y Handle for punches

- Re-fit the circlip with the opening facing away from the bearing and fit a new oil seal flush with the crankcase surface.



Refitting the wheel axle bearing

- Heat the bearing housing with the heat gun.

Specific tooling

020151Y Air heater "METABO HG 1500/2"

020150Y Support for air heater "METABO HG 1500/2"

- Fit the wheel axle bearing into the gearbox cover using the appropriate special tool.

Specific tooling

020364Y 25 mm guide

020360Y 52 x 55 mm adaptor

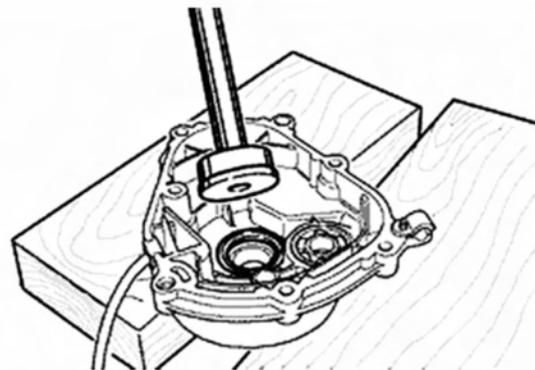
020376Y Handle for punches

- Fit the circlip.
- Fit the oil seal using the appropriate special tool, with the sealing lip towards the inside of the gearbox cover.

Specific tooling

020376Y Handle for punches

020360Y 52 x 55 mm adaptor



Refitting the hub cover bearings

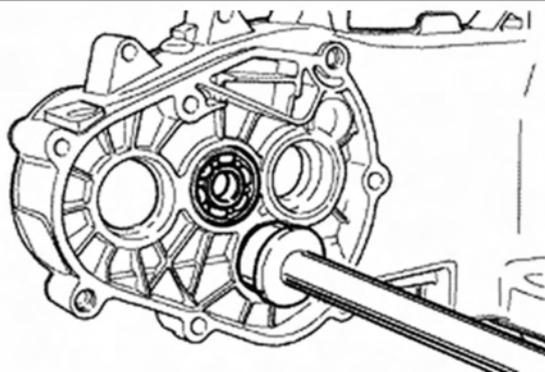
- Heat the bearing housings with a heat gun, available as a special tool.

Specific tooling

020150Y Support for air heater "METABO HG 1500/2"

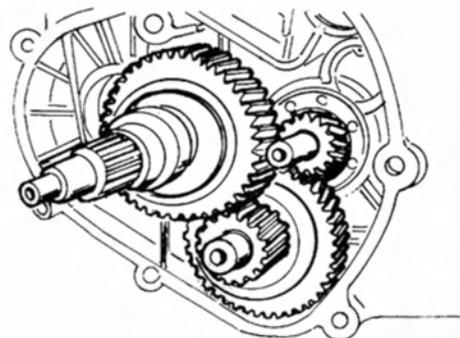
020151Y Air heater "METABO HG 1500/2"

- Fit the three 15 mm bearings using the appropriate special tool.



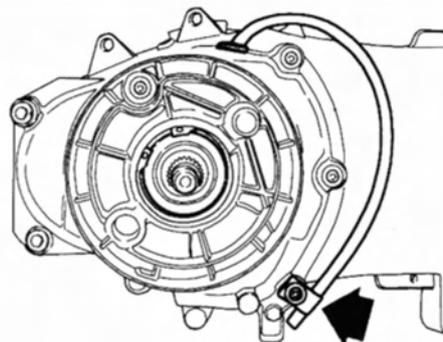
Refitting the hub bearings

- Insert the cover on the crankcase minding the insertion of the pulley shaft gearing onto the intermediate gear.



Refitting the hub cover

- Fit a new seal together with the centring grub screws.
- Fit the cover making sure to check the correct positioning of the bleed hose.
- Tighten the 7 screws to the prescribed torque, positioning the hose support plate in the position indicated in the figure.



Locking torques (N*m)

Tightening torque 24 ÷ 27

Flywheel cover

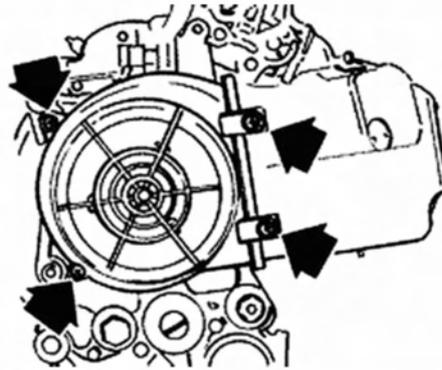
Cooling hood

- Remove the four screw fasteners shown in the

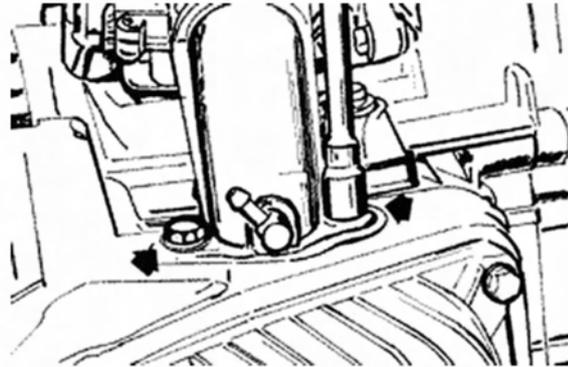
diagram and remove the fan cover.

CAUTION

DURING THE REMOVAL PULL THE CONNECTOR OUT OF THE HOUSING IN THE COVER.



- Loosen the clamp and remove the carburettor from the manifold.
- Remove the manifold assembly after loosening the two fastenings shown in the figure.
- Remove the two self-tapping screws, left and right, and the side screw fixing the hoods to the crankcase base.
- Remove the two hoods.
- Remove the gasket ensuring the seal of the hoods on the cylinder head.



N.B.

IF THE FLYWHEEL COVER HAS NOT YET BEEN REMOVED, IT IS ALSO NECESSARY TO REMOVE THE TWO KNOB SCREWS ON THE COVER.

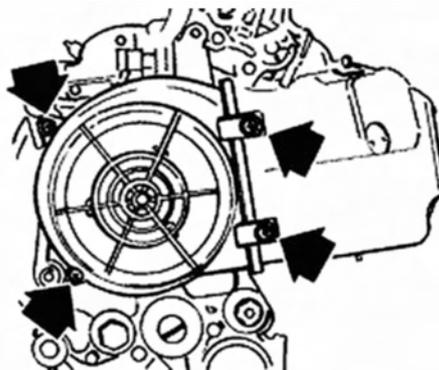
If loss of power is noticed at full throttle, on vehicles equipped with these engines, it is suggested to ream the vacuum port hole located on the intake manifold so to bring its diameter from 0.4 to 1.5 mm. It must be stressed that this operation must be carried out with the manifold detached from the vehicle and then carefully cleaning all components.

Cooling fan

- Re-fit the parts in the reverse order to which they were removed.
- Make sure both spacers are in place, behind the cylinder cooling hood, on the two screw fasteners, with the longer spacer at the top.

CAUTION

TAKE CARE TO CORRECTLY POSITION THE FLY-WHEEL CONNECTOR.

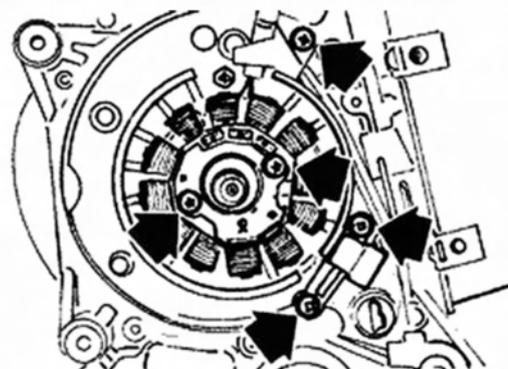


- Remove the three fastenings shown in the figure.



Removing the stator

- Remove the oil minimum pressure switch electric terminal.
- Remove the 2 Pick-Up screws and the screw of the wiring fixing bracket, along with the 2 stator fixing screws shown in the figure.
- Remove the stator and its wires.



Refitting the stator

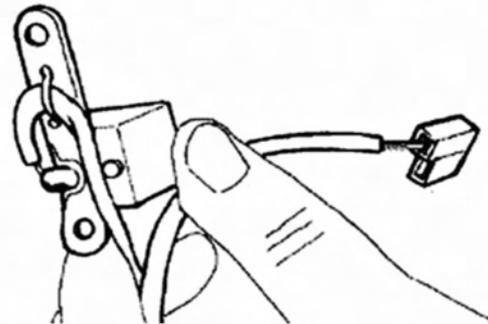
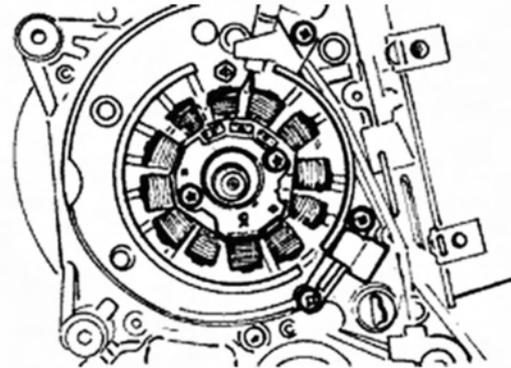
- Re-fit the stator and the flywheel components in the reverse order to which they were removed, tightening the screw fasteners to the specified tightening torque.
- Make sure the cable is in the position shown in the diagram.

N.B.

THE PICK-UP CABLE MUST BE PLACED BETWEEN THE TOP SCREW AND THE REFERENCE DOWEL AS SHOWN IN THE FIGURE.

Locking torques (N*m)

Stator screw 3÷ 4



Flywheel and starting

Removing the flywheel magneto

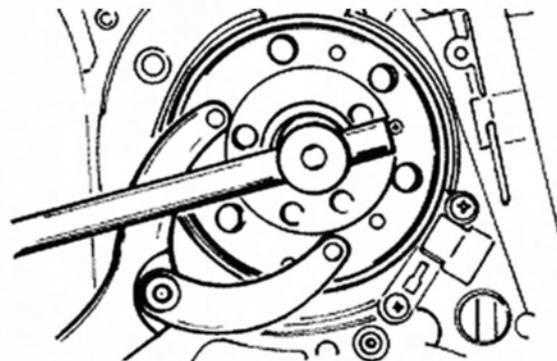
- Undo the flywheel nut, using the Compass Spanner to hold the flywheel fast.

CAUTION

USING A COMPASS SPANNER OTHER THAN THE ONE PROVIDED CAN DAMAGE THE STATOR COILS.

Specific tooling

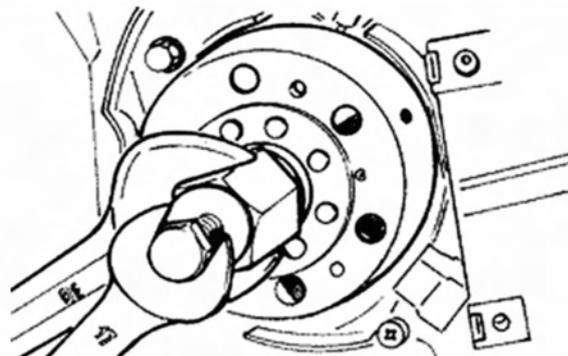
020565Y Compass flywheel stop spanner



- Remove the flywheel using the extractor available as a special tool.

Specific tooling

008564Y Flywheel extractor



Inspecting the flywheel components

- Check the integrity of the internal plastic parts of the flywheel and the Pick-Up control plate.

Refitting the flywheel magneto

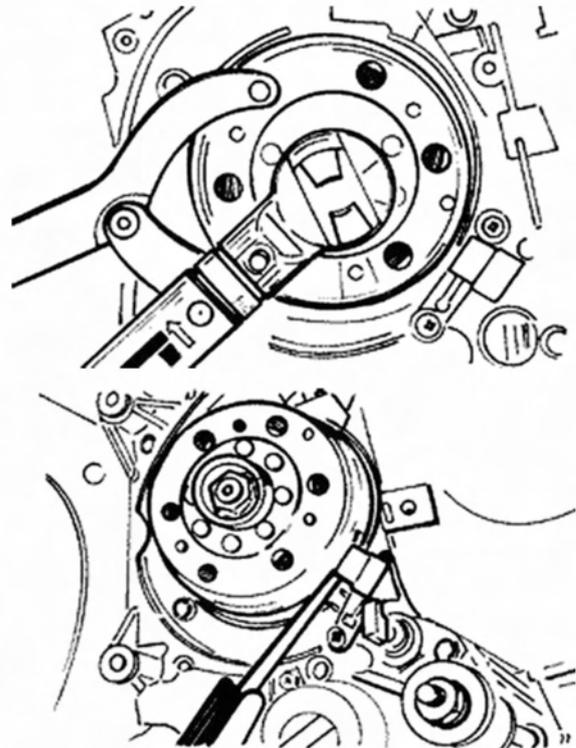
- Place the flywheel on the crankshaft, taking care to locate the Woodruff key correctly.
- Tighten the flywheel nut to the specified tightening torque.
- Check the gap between the Pick-Up and the flywheel is within the range 0.34 - 0.76 mm.

The Pick-Up must be replaced if the gap between the Pick-Up and the flywheel is outside the specified limits, as the Pick-Up support does not allow for adjustment of this gap.

A gap outside these limits means the support has been deformed.

N.B.

A VARIATION IN THE GAP DISTANCE CHANGES THE MINIMUM DELIVERY SPEED OF THE IGNITION SYSTEM.



Locking torques (N*m)

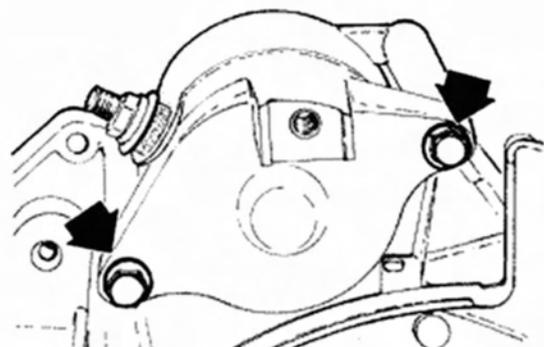
Flywheel nut 52 ÷ 58

Refitting the starter motor

- Fit a new O-ring on the starter motor and lubricate it.
- Install the starter motor on the crankcase and tighten the two screws with the prescribed torque.

N.B.

FIT THE REMAINING PARTS AS DESCRIBED IN THE CHAPTERS CYLINDER, CYLINDER HEAD, VALVE GEAR, LUBRICATION, FLYWHEEL AND TRANSMISSION.

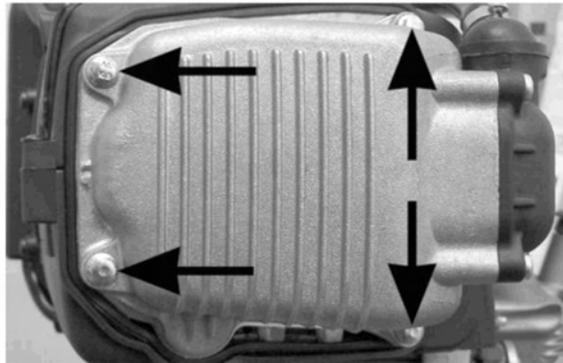


Locking torques (N*m)**Starter motor screws 11 ÷ 13**

Cylinder assy. and timing system

Removing the timing system drive

- Remove the following components: transmission cover, driving pulley with drive belt, oil pump pulley cover, and the pinion dividing washer.
- Remove the tappets cover.
- Remove the central screw fastener and the automatic valve-lifter retaining cover, as shown in the figure.
- Remove the automatic valve-lifter cam, together with its end-stop ring.
- Loosen the central screw on the chain tensioner.
- Remove the two screw fasteners shown in the figure.
- Remove the Allen screw, shown in the figure, and the counterweight.
- Remove the timing chain sprocket and associated washer from the camshaft.
- Remove the timing chain drive sprocket from the camshaft.
- Remove the screw fastener indicated by the arrow in the figure, the spacer and the chain guide. The chain tensioning pad must be removed from the transmission side. The chain guide can only be removed following the removal of the cylinder head.

**N.B.**

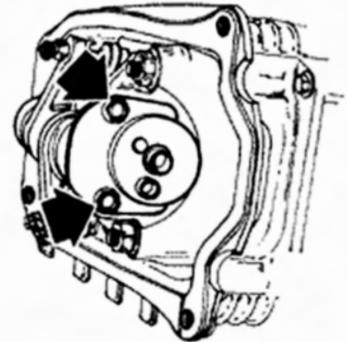
IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.

See also

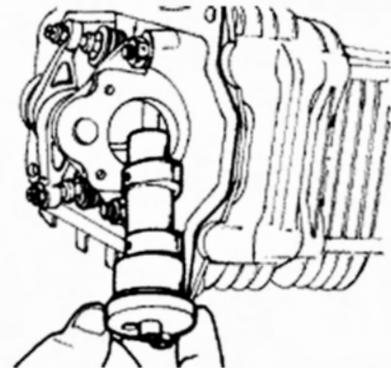
[Transmission cover](#)
[Removing the driving pulley](#)
[Removal](#)

Removing the cam shaft

- Remove the two screw fasteners and the cam shaft retainer shown in the diagram.



- Remove the cam shaft.

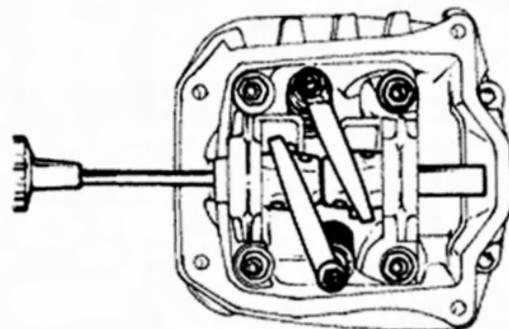


- Remove the rocker pin by pushing it through from the flywheel side.

- Remove the rockers, together with their spring washers.

N.B.

MARK THE INSTALLING POSITION OF EACH ROCKER ARM SO AS TO AVOID FITTING THE INTAKE ROCKER ARM IN PLACE OF THE EXHAUST ROCKER ARM OR VICE VERSA.

**Removing the cylinder head**

- Remove the spark plug.

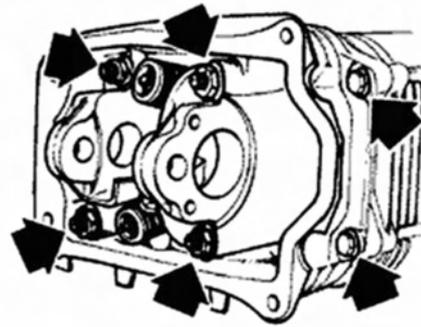
- Remove the 2 side attachments shown in the

figure.

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

N.B.

IN CASE OF NEED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, PINS, ROCKERS AND FIXING BRACKET. THE HEAD CAN ALSO BE REMOVED WITHOUT REMOVING THE CHAIN AND THE DRIVING SHAFT CHAIN TIGHTENER.



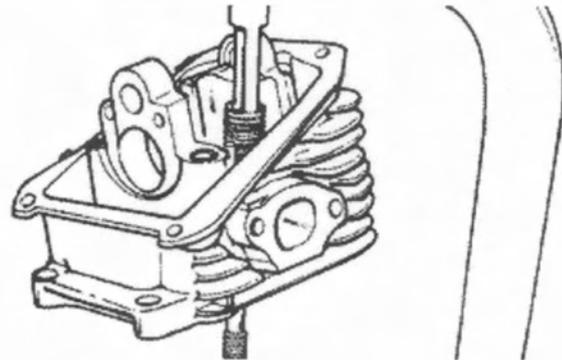
Removing the valves

- Using the special tool, fitted the part shown in the figure, remove the half-cones, plates and springs from both valves.

Specific tooling

020382Y Tool for removing valve cotters equipped with part 012

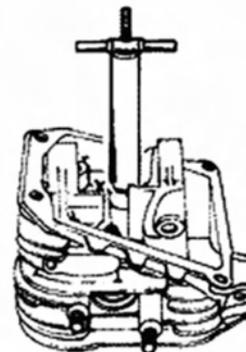
020382Y011 Bushing (valve remover)



- Remove the oil seals with the specific tool.
- Remove the lower spring supports.

Specific tooling

020431Y Valve oil seal extractor



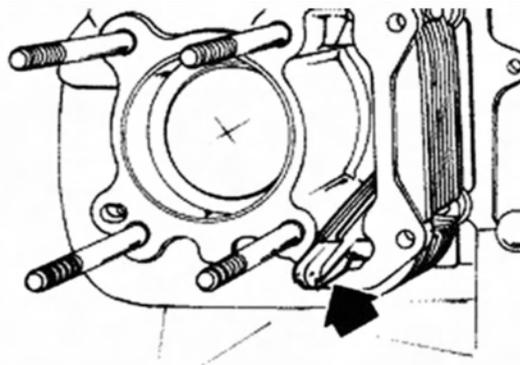
Removing the cylinder - piston assy.

- Remove the chain guide.
- Remove the cylinder base gasket.

CAUTION

TO AVOID DAMAGING THE PISTON, SUPPORT IT

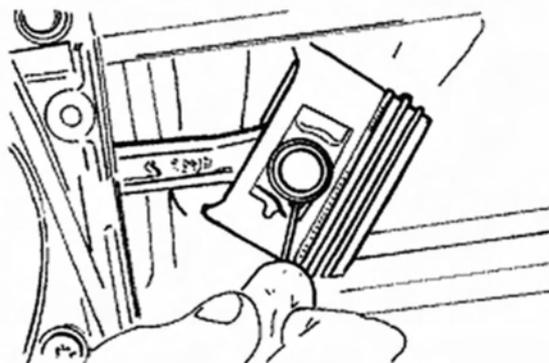
WHILE REMOVING THE CYLINDER.



- Remove the two circlips, the piston pin and the piston.
- Remove the three piston rings.

N.B.

TAKE CARE NOT TO DAMAGE THE PISTON RINGS WHILE REMOVING THEM.

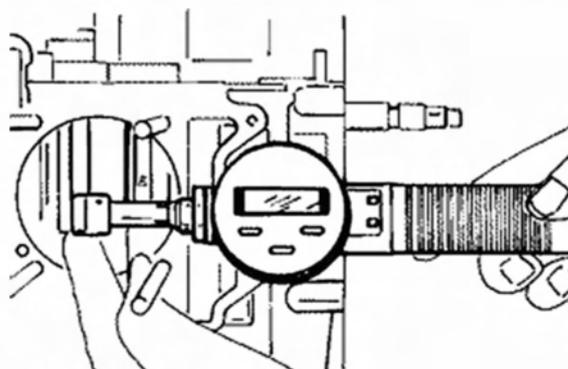


Inspecting the small end

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

N.B.

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



Characteristic

Checking the connecting rod small end: Maximum diameter

15.030 mm

Checking the connecting rod small end: Standard diameter

15.015 ÷ 15.025mm

Inspecting the wrist pin

- Measure the outside diameter of the gudgeon pin.

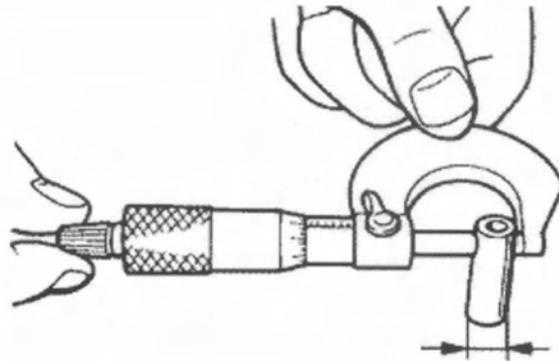
Characteristic

Standard diameter

14,996 ± 0,015 mm

Minimum admissible diameter

14,994 mm



- Calculate the clearance between the gudgeon pin and piston.

N.B.

THE HOUSINGS OF THE PIN HAVE TWO LUBRICATION CHANNELS. FOR THIS REASON MEASUREMENT OF THE DIAMETER MUST BE CARRIED OUT ACCORDING TO THE AXIS OF THE PISTON.



Characteristic

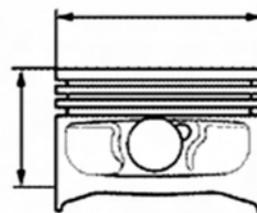
Piston wrist pin hole - standard diameter

∅ 15+0,001 +0,006

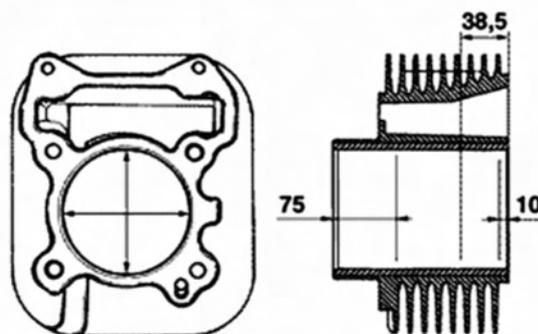
- Measure the outside diameter of the piston, perpendicular to the gudgeon pin axis.
- Take this measurement 36.5 mm from the crown of the piston, as shown in the diagram.

N.B.

THE HOUSINGS OF THE PIN HAVE TWO LUBRICATION CHANNELS. FOR THIS REASON MEASUREMENT OF THE DIAMETER MUST BE CARRIED OUT ACCORDING TO THE AXIS OF THE PISTON.



- Using a bore meter, measure the cylinder inside diameter at three different heights in the directions shown in the figure.
- Check that the mating surface with the cylinder head is not worn or distorted.
- Pistons and cylinders are classified according to diameter. Mating is obtained by matching class



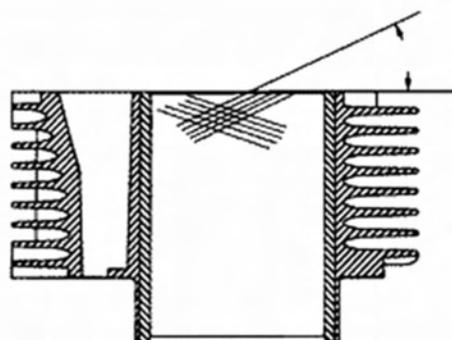
letters (A-A, B-B, C-C, D-D).

Characteristic

Maximum allowable runout:

0,05 mm

- Cylinder re-bores should be carried out respecting the original machining angle on the bored surface of the cylinder.
- The surface roughness of the bored surface of the cylinder should be 0.9 microns.
- This is imperative to ensure proper bedding-in of the piston rings, and hence reduced oil consumption and optimum performance.
- 1st , 2nd and 3rd over-size pistons are available as spare parts, for re-bored cylinders, corresponding to 0.2 mm, 0.4 mm and 0.6 mm over-sizes, respectively. There are 4 categories for matching oversize pistons and cylinders (A-A, B-B, C-C, D-D).



Inspecting the piston

- Clean the piston ring grooves thoroughly.
- Measure the clearance between the piston rings and the grooves using feeler gauges, as shown in the diagram.
- If the clearances exceed the limits specified in the table below, the piston should be replaced by a new one.

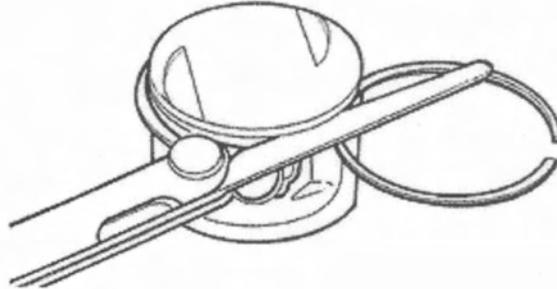
NORMAL CLEARANCE

Name	Description	Dimensions	Initials	Quantity
1st ring		0,025 ÷ 0,070		
2nd ring		0,015 ÷ 0,060		
oil scraper ring		0,015 ÷ 0,060		

WEAR LIMIT: MAX. CLEARANCE

Name	Description	Dimensions	Initials	Quantity
1st ring		0,080 mm		

Name	Description	Dimensions	Initials	Quantity
2nd ring		0,070 mm		
oil scraper ring		0,070 mm		



Removing the piston

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



Specific tooling

020430Y Pin retainers installation tool

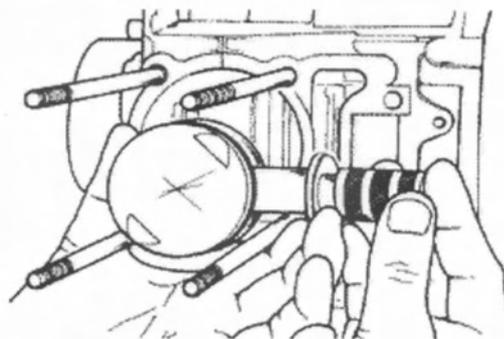
- With the gap in the position shown on the tool, fit the circlip into the tool by means of the drift.
- Fit the piston pin circlip using the tommy.

N.B.

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

CAUTION

USING A HAMMER TO FIT THE CIRCLIPS CAN DAMAGE THE CIRCLIP SEATS.



Refitting the piston rings

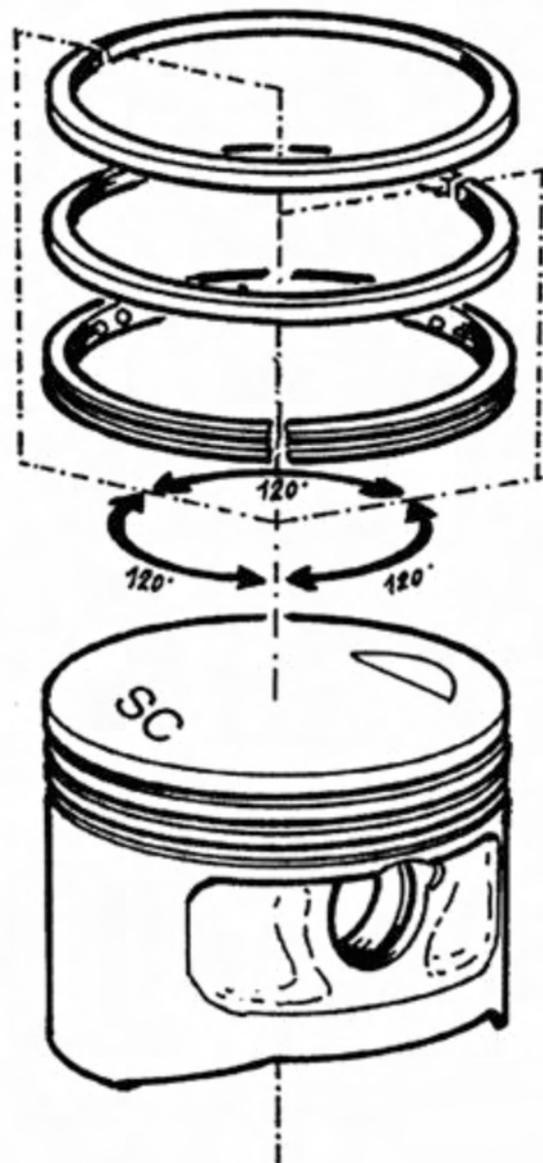
- Place the oil scraper spring on the piston.
- Re-fit the oil scraper ring with the join of spring ends on the opposite side from the ring gap and the word 'TOP' towards the crown of the piston.

The tapered side of the oil scraper ring should always be facing the crown of the piston.

- Re-fit the middle piston ring with the identification letter facing the crown of the piston. The tapered side of the middle piston ring should always be facing away from the crown of the piston.
- The top piston ring with the word 'TOP' or the reference mark facing the crown of the piston.
- Offset the piston ring gaps on the three rings by 120° to each other.
- Lubricate the components with engine oil.

N.B.

IN ORDER TO IMPROVE BEDDING IN OF THE RINGS, THE SURFACES ON THE TOP TO PISTON RINGS ARE ANGLED TO GIVE A CONICAL SECTION OF CONTACT.

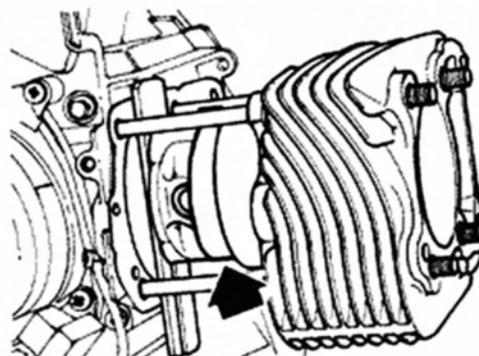


Refitting the cylinder

- Fit the base gasket of the chosen thickness, previously determined.
- Using the fork support, available as a special tool and the piston ring retaining band, re-fit the cylinder as show in the diagram.

N.B.

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



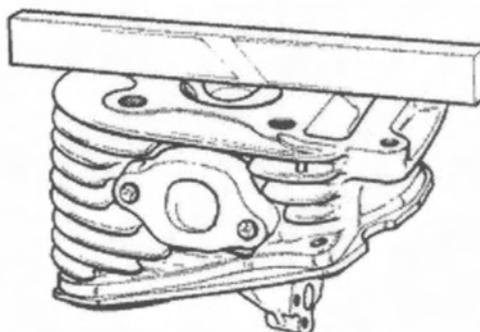
Specific tooling

020426Y Piston fitting fork

020427y Piston Fitting Tool (motor 150)

Inspecting the cylinder head

- Using a trued bar, check that the cylinder head surface is not worn or distorted.
- Ensure that the camshaft and rocker arm pivot bearings show no signs of wear.
- Check that the cylinder head cover surface, the intake manifold and the exhaust manifold are not worn.



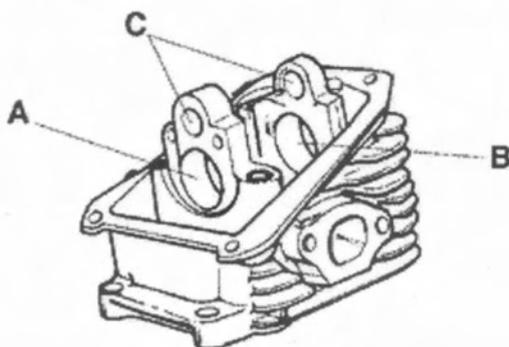
Characteristic

Maximum allowable runout: Inspecting the cylinder head

0,05 mm

STANDARD DIAMETER

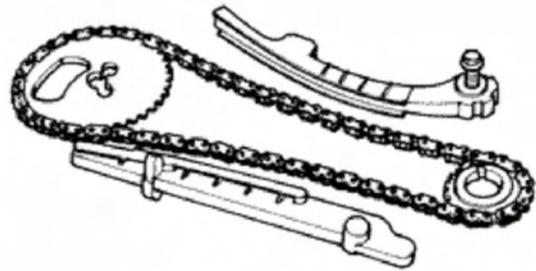
Specification	Desc./Quantity
Standard diameter	A Ø 32,5 ÷ 32,525
Normal diameter	B Ø 20 ÷ 20,021
Standard diameter	C Ø 12 ÷ 12,018



Inspecting the timing system components

- Check that the guide shoe and the tensioner shoe are not worn out.

- Ensure that the camshaft drive pulley, the chain assembly and the pinion are not worn.
- Replace any worn components. If the chain, pinion or pulley are worn, replace the whole assembly.



- Remove the central screw and the tensioner spring. Check that the one-way mechanism is not worn.
- Check the condition of the tensioner spring.
- If any worn components are found, replace the whole assembly.

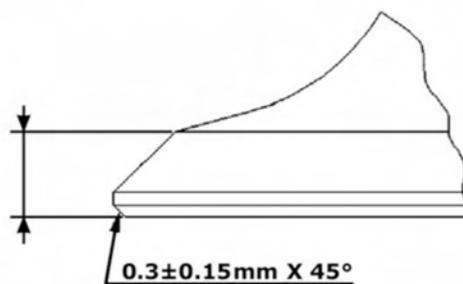


Inspecting the valve sealings

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

VALVE SEALING SURFACE

Specification	Desc./Quantity
Intake valve - sealing width	2,4 ÷ 2,8 mm
Exhaust valve - sealing width	2,2 ÷ 2,6 mm



Inspecting the valve housings

- Remove any carbon formation from the valve guides.
- Measure the inside diameter of each valve guide.

- Take the measurement at three different heights in the rocker arm push direction.

Characteristic

Intake guide: Standard diameter

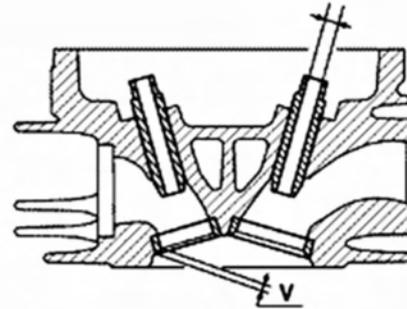
5,012 mm

Intake guide: Wear limit

5,012 mm

- If the width of the impression on the valve seat or the diameter of the valve guide exceed the pre-scribed limits, replace the cylinder head.

Measure the width of the impression on valve seat "V",



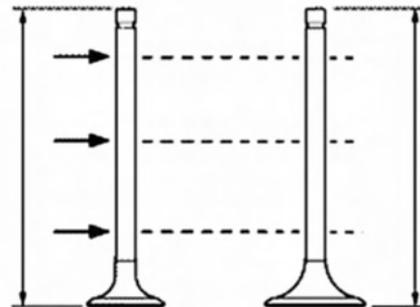
Characteristic

The wear limit being

Max. 1,6 mm.

Inspecting the valves

- Measure the diameter of the valve stems in the three positions indicated in the diagram.
- Calculate the clearance between valve stem and valve guide.



Characteristic

Minimum admissible diameter - Inlet:

4.96 mm

Minimum admissible diameter - Exhaust:

4.95 mm

Standard clearance - Inlet:

0.013 ÷ 0.040 mm

Standard clearance - Exhaust:

0,025 ÷ 0,052 mm

Maximum admissible clearance - Inlet:

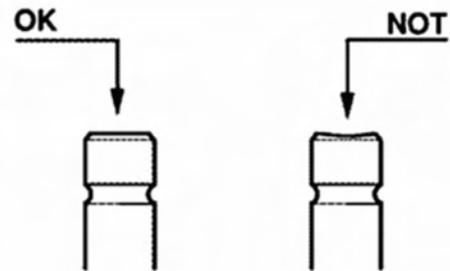
0.062 mm

Maximum admissible clearance - Exhaust:

0.072 mm

- Check the wear on the surfaces on the ends of the valve stems, in contact with the tappets, is not excessive.

- If any of the sealing surfaces on the valves does not conform to the specified wear limits, or is damaged, or curved, replace the valve with a new one.



Characteristic

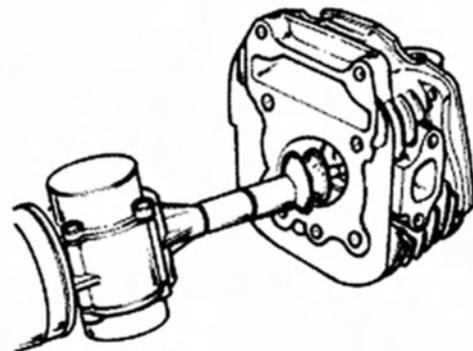
Standard length of the valves - Inlet:

80.6 mm

Standard length of the valves - Exhaust:

79.6 mm

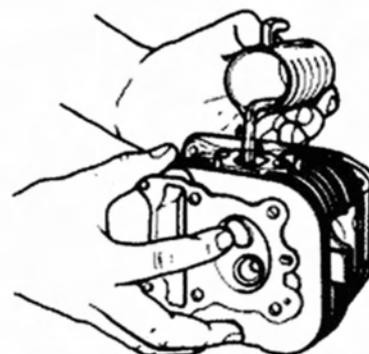
- If no anomalies are found during the above checks, the same valves can be reused. For best sealing results, it is advisable to grind the valves. Grind the valves gently with a fine-grained lapping compound. During the grinding, keep the cylinder head in a horizontal position. This will prevent the lapping compound residues from penetrating between the valve stem and the guide.



CAUTION

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

- Insert the valves into the cylinder head.
 - Alternately test the intake and exhaust valves.
 - The test is carried out by filling the manifold with petrol and checking that no petrol oozes through the valves when these are pressed with one finger.



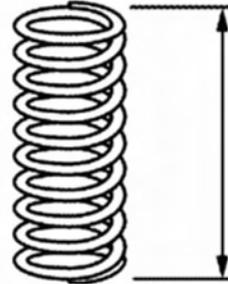
Inspecting the springs and half-cones

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

Characteristic

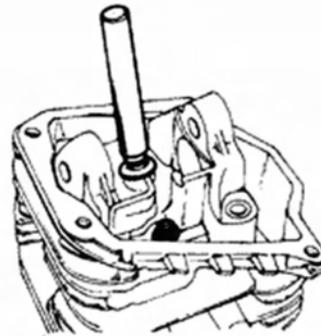
Valve springs length

33,9 ÷ 34,4 mm



Refitting the valves

- Lubricate the valve guides with engine oil.
- Place the valve spring seats on the cylinder head.
- Using the appropriate drift, available as a special tool, fit the two valve seals.



Specific tooling

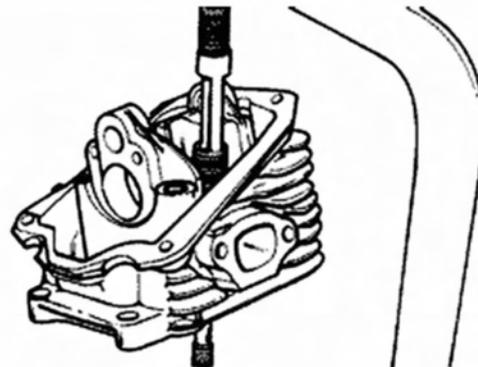
020306Y Valve sealing ring drift

- Re-fit the valves, the springs and the spring retaining caps. Using the appropriate special tool with adapter compress the spring and insert the split cones in their seats. .

Specific tooling

020382Y Tool for removing valve cotters equipped with part 012

020382Y011 Bushing (valve remover)



Inspecting the cam shaft

- Inspect the cam shaft for signs of abnormal wear on the cams.

Characteristic**Standard diameter - Bearing surface A**

Ø: 32,5mm -0,025 -0,050 mm

Standard diameter - Bearing surface B

20 -0,020 -0,041 mm

Minimum admissible diameter - Bearing surface A

Ø: 32.440 mm

Minimum admissible diameter - Bearing surface B

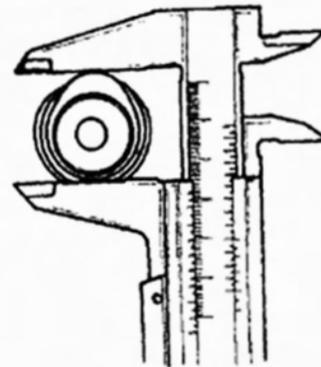
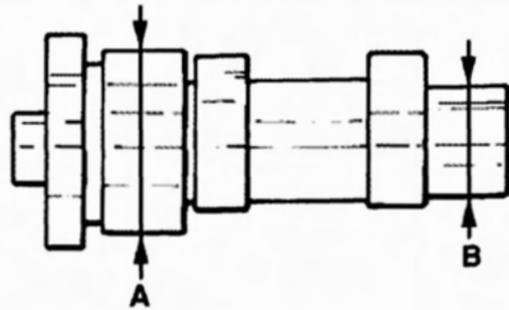
Ø: 19.950 mm

Intake cam height

27,512 mm

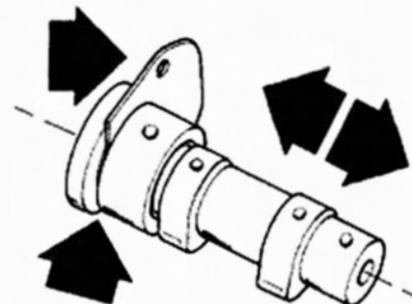
Exhaust cam height

27,212 mm



- Check there is no wear on the cam shaft retaining plate and its associated groove on the cam shaft.

- If any of the above dimensions are outside the specified limits, or there are signs of excessive wear, replace the defective components with new ones.

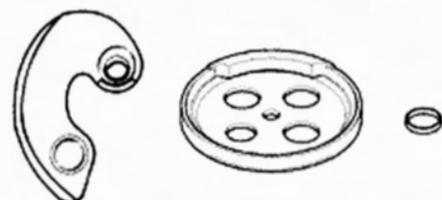
**Characteristic****Maximum admissible axial clearance:**

0.42 mm

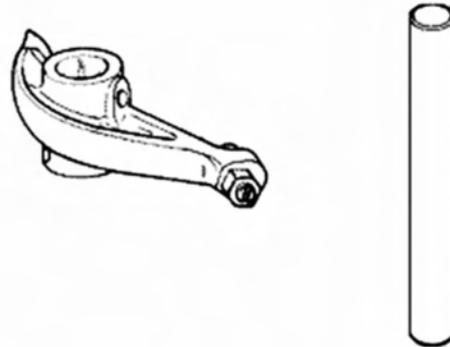
- Check there are no signs of wear on the automatic valve-lifter cam, or the end-stop ring, or the rubber buffer on the automatic valve-lifter retaining cover.

- Check the automatic valve-lifter return spring is not deformed by over-stretching.

- Replace any defective or worn components.



- Check the rocker pin for excessive wear or scoring.
- Check there are no signs of wear on the cam followers or the tappets.
- Measure the internal diameter of both rockers.
- Check there are no signs of wear on the spring washers that take up the axial play between the rockers. Replace any defective components with new ones.



Characteristic

Minimum admissible diameter:

Ø 11.970 mm

Maximum admissible diameter:

Ø 12.030 mm

Refitting the head and timing system components

- Re-fit the timing chain guide.
- Insert the dowel the cylinder head to the cylinder, fit the cylinder head gasket and the cylinder head.
- Fit the cylinder head nut fasteners and tighten them in a crosswise sequence, in two or three stages, to the specified tightening torque.

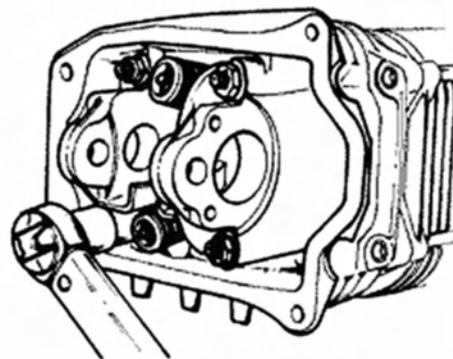
Locking torques (N*m)

Tightening torque 28 - 30

- Fit the two screw fasteners on the outside of the timing chain side of the cylinder head and tighten them to the specified tightening torque.

N.B.

BEFORE INSTALLING THE HEAD, MAKE SURE THAT THE LUBRICATION CHANNEL IS CLEAN USING A COMPRESSED AIR JET.



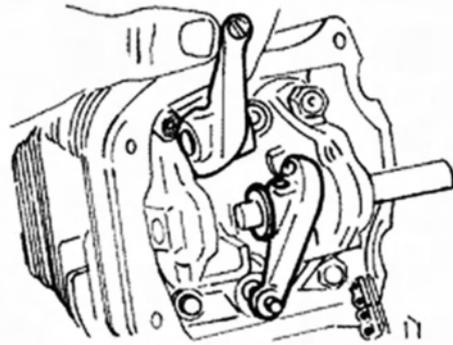
Locking torques (N*m)

Tightening torque 11 - 13

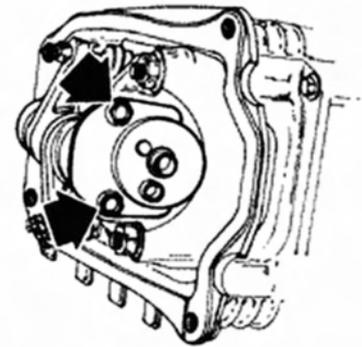
- Re-fit the lower timing chain sprocket on the

crankshaft, with the chamfer innermost.

- Loop the timing chain around the sprocket on the crankshaft.
- Re-fit the chain tensioner guide to the cylinder head.
- Fit the spacer and the screw fastener.
- Fit the rocker pin, the exhaust rocker, the spring washer and the inlet washer.
- Lubricate the rockers via the holes on top.
- Lubricate the cam surfaces and insert the cam shaft in the support, making sure the cams correspond to the rockers.



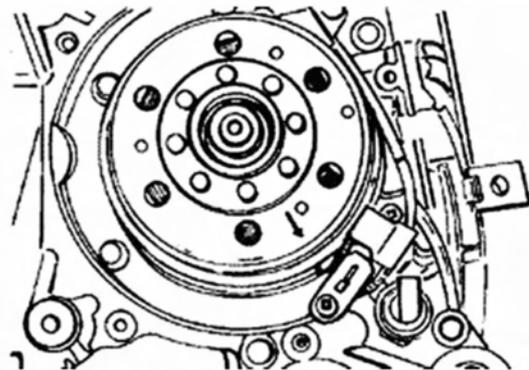
- Re-fit the cam shaft retaining plate and fit the two screw fasteners shown in the diagram to the specified tightening torque.



Locking torques (N*m)

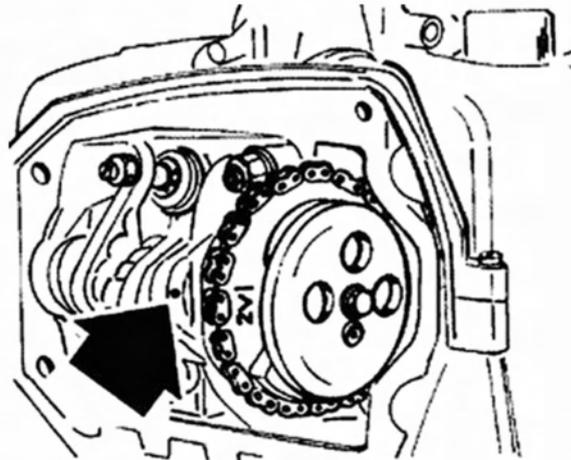
Tightening torque 4 - 6

- Re-fit the spacer on the cam shaft.
- Rotate the engine so that the piston is at TDC, using the reference marks on the flywheel and the crankcase.
- Holding the engine in this position, loop the chain over the cam shaft timing chain sprocket, making sure the reference mark **2V** on the sprocket corresponds to the reference mark machined on the cylinder head.
- Fit the pulley on the cam shaft.
- Re-fit the counterweight and tighten the screw fastener to the specified tightening torque.



Locking torques (N*m)

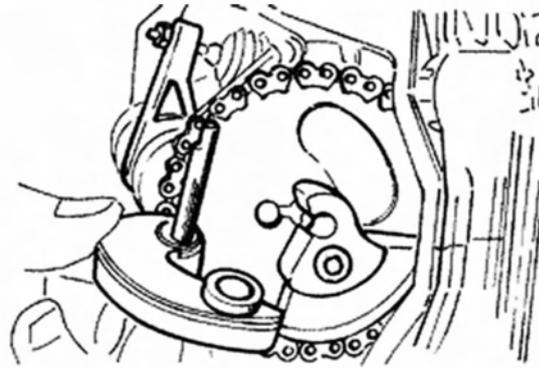
Tightening torque 7 - 8,5



- Fit the end-stop ring on the automatic valve-lifter cam and fit the automatic valve-lifter cam to the cam shaft.
- Re-fit the automatic valve-lifter return spring.
- Pre-loading it by a 180° rotation.

N.B.

LUBRICATE WITH GREASE THE TRAVEL END RING TO PREVENT ACCIDENTAL LEAKS WITH CONSEQUENT DROPPING INTO THE ENGINE.



- Re-fit the automatic valve-lifter retaining dish, using the counterweight screw fastener as a reference.
- Tighten the screw fastener to the specified tightening torque.

Locking torques (N*m)

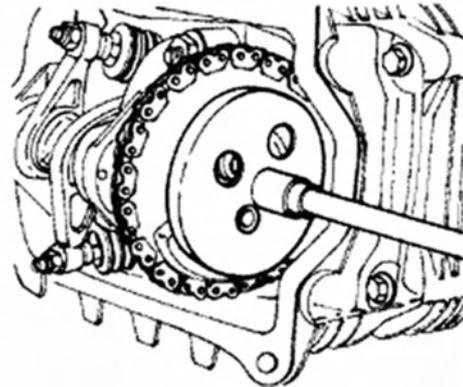
Tightening torque 12 - 14

- With the tensioning screw screwed right out.
- Fit the chain tensioner on the cylinder, using a new gasket, and tight the two screw fasteners to the specified tightening torque.

Locking torques (N*m)

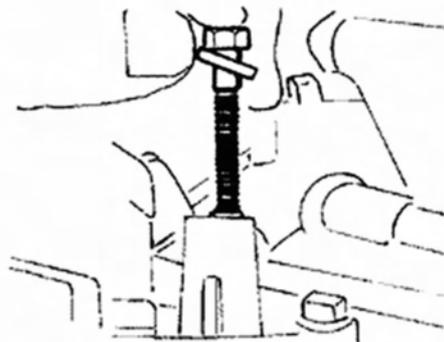
Tightening torque 11 - 13

- Insert the chain tensioning screw, together with the spring and washer, tightening it to the specified tightening torque.



Locking torques (N*m)**Tightening torque 5 - 6**

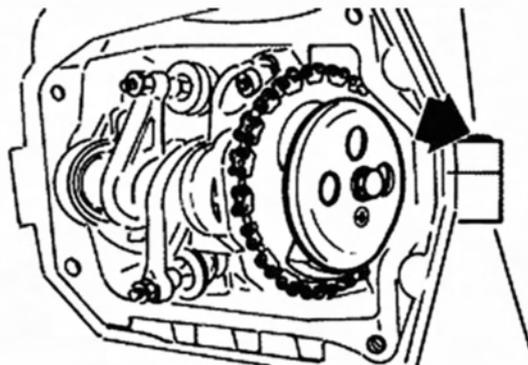
- Adjust the valve clearances according to the instructions in Chapter General Information and Maintenance.
- Re-fit the spark plug.

**Electric characteristic****Recommended spark plug:****CHAMPION RG4HC****Spark gap**

0.8 mm

Locking torques (N*m)**Tightening torque 12 - 14**

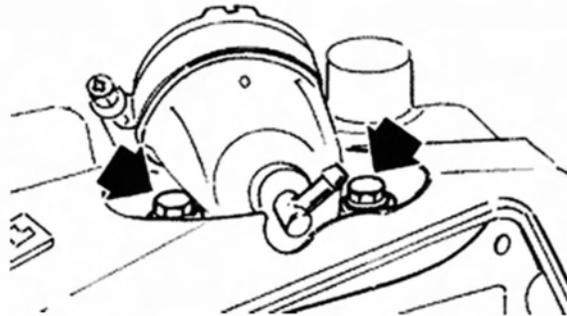
- Re-fit the rocker cover gasket. The projections on the timing chain side provide a reference for its orientation.
- Re-fit the cooling cover to crankcase screw fastener, tightening it to the specified tightening torque, and re-fit the two self-tapping screw fasteners that hold the cooling cover sides together.
- Make sure the rocker cover gasket does not come out of position.
- Whilst fitting the cover

**Locking torques (N*m)****Tightening torque 3 - 4**

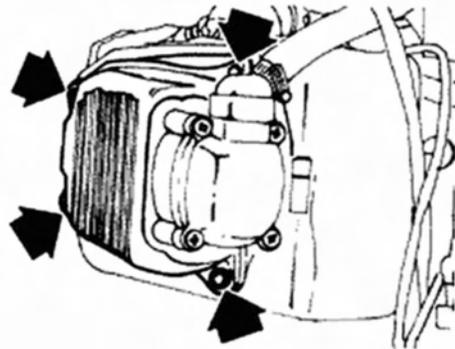
- Re-fit the inlet duct and tighten the screw fasteners to the specified tightening torque.
- Re-connect the carburettor to the inlet duct and tighten the hose clamp.

N.B.

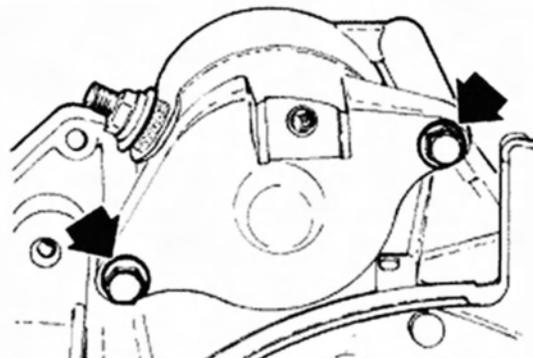
ADJUST THE ORIENTATION OF THE CARBURETTOR BY MEANS OF THE PROJECTION ON THE

MANIFOLD.**Locking torques (N*m)****Tightening torque 11 - 13**

- Re-fit the cylinder head cover, tightening the four screw fasteners to the specified tightening torque.
- Re-fit the fan and fan cover.
- Re-fit the oil pump drive, the oil pump cover, the oil blow-by valve and the sump, as described in Chapter «Lubrication».
- Re-fit the drive pulley, the drive belt and the transmission cover, as described in Chapter «Transmission».

**Locking torques (N*m)****Tightening torque 11 - 13****Crankcase - crankshaft**

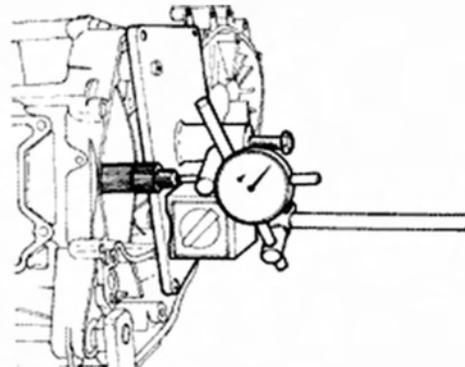
- Removing the Crankshaft:
Performing the steps described in Chapter Transmission, remove the following: transmission cover, drive pulley, driven pulley, drive belt, reduction gearbox cover, gears, bearings and oil seals.
- Performing the steps described in Chapter Lubrication, remove the following: sump, oil blow-by valve, oil pump drive cover and oil pump.
- Performing the steps described in Chapter Flywheel, remove the following: flywheel cover, fan, flywheel, stator.
- Remove the oil filter and the oil low pressure



sender.

- Performing the steps described in Chapter Cylinder Head and Timing Components, remove the cylinder head assembly and the cylinder-piston assembly.
- Remove the two screw fasteners shown in the diagram and remove the starter motor.

- Before separating the crankcase halves, it is worthwhile to measure the end-float on the crankshaft. Use a dial-gauge and support attached to the crankcase separating plate, available as a special tools.



Specific tooling

020262Y Crankcase detachment plate

020335Y Magnetic stand and comparator

Characteristic

Standard clearance

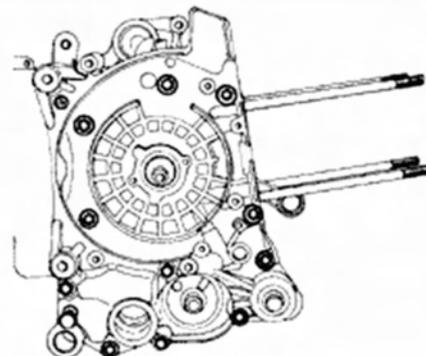
0.15 - 0.40 mm

Splitting the crankcase halves

- Remove the 11 screw fasteners securing the crankcase halves together.
- Separate the crankcase halves, taking care to leave the crankshaft supported by one of them.
- Remove the crankshaft .

CAUTION

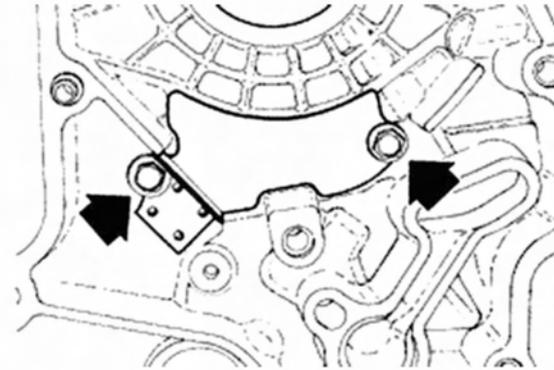
THE CRANKSHAFT MAY FALL IF THIS PRECAUTION IS NOT TAKEN.



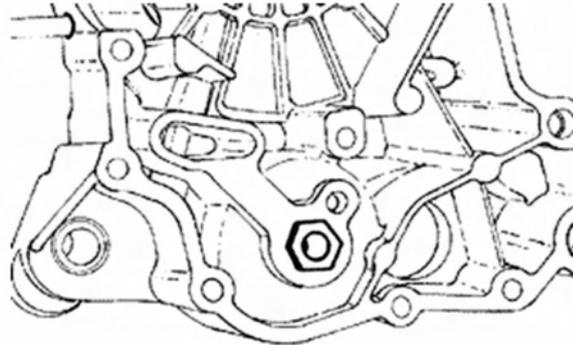
- Remove the crankcase gasket.
- Remove the two screws and the internal cover shown in the diagram.

CAUTION

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



- Remove the oil seal on the flywheel side.
- Remove the oil filter union shown in the diagram.

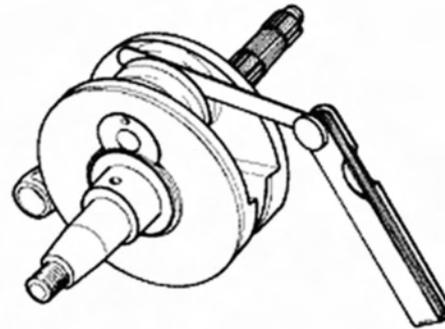


- Check the end-float, before removal.

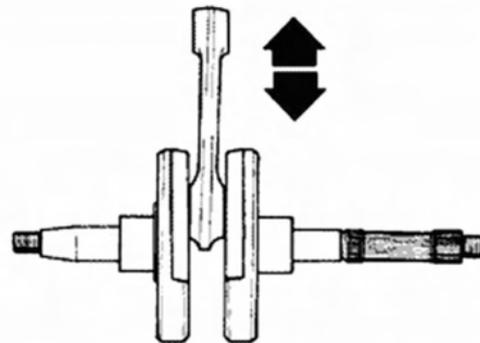
Characteristic

Standard clearance

0.20 - 0.50 mm



- Check the radial free-play on the connecting rod.
- Check the surfaces that limit the axial free-play are not scored and measure the width of the crankshaft between these surfaces, as shown in the diagram.



CAUTION

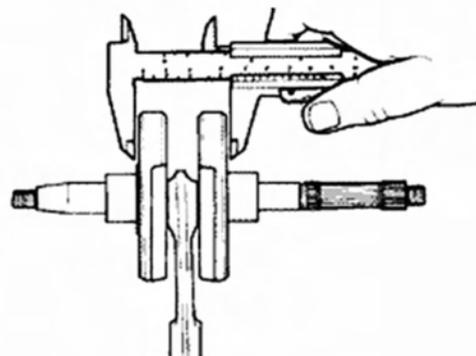
MAKE SURE THE ENDS OF THE CALIPER DO NOT GO INTO THE MACHINED CORNER ON THE CRANKSHAFT, AS THE CURVATURE IN THE CORNER MAY CAUSE INACCURATE READINGS.

Characteristic

Standard clearance

0.036 - 0.054 mm

- Provided none of the specified crankshaft tolerances are exceeded, end-float on the crankshaft found to exceed the specified limit must be due to either excessive wear or wrong machining on the crankcase.



CAUTION

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

Characteristic

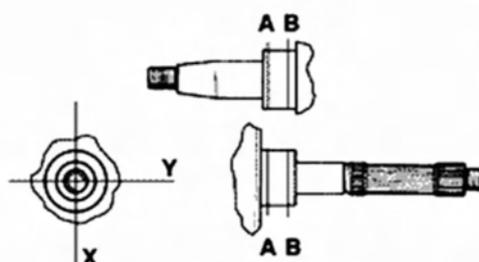
Distance between supports

55,67 ÷ 55,85 mm

- On both main bearing seats, take two perpendicular measurements of the diameters of the crankshaft at the points indicated A and B in the diagram. The crankshaft halves fall into two categories, Cat. 1 and Cat. 2, according to diameter, as shown in the table below.

STANDARD DIAMETER

Specification	Desc./Quantity
Category 1	28,998 ÷ 29,004
Category 2	28,004 ÷ 29,010



Inspecting the crankshaft alignment

To install the drive shaft on the support and to

measure the misalignment in the 4 points indicate to you in figure.

- Check that the driving shaft cone, the tab seat, the oil guard connection and the threaded tangs are in good working order.
- In case of failures, replace the driving shaft.

The connecting rod head brasses cannot be replaced.

For the same reason, when cleaning the driving shaft, be careful to prevent any impurity from entering into the shaft lubrication hole.

In order to prevent damaging the connecting rod brasses, do not attempt cleaning the lubrication duct with compressed air.

- Make sure that the 2 pads on the crank button are properly mounted.
- A wrong installation of a pad can seriously affect the brass lubrication pressure.

N.B.

BENCH ENDS ARE NOT RECTIFIABLE.

Specific tooling

020074Y Crankshaft aligning tool

Characteristic

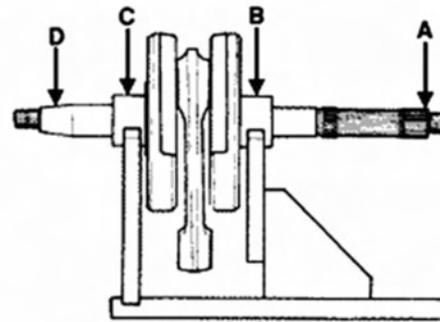
Alignment check: Max admissible displacement:

A = 0.15 mm

B = 0.01 mm

C = 0.01 mm

D = 0.10 mm

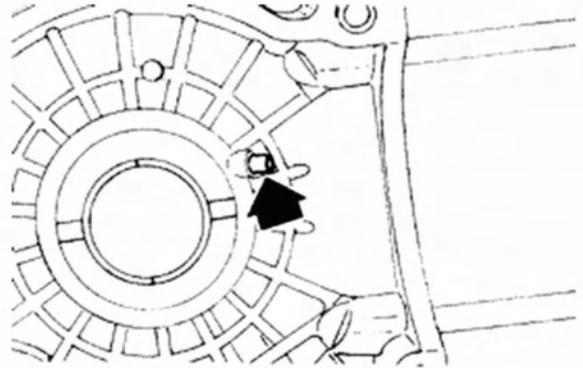


Inspecting the crankcase halves

- Before proceeding to check the crankcase halves, thoroughly clean the all surfaces and oil ducts.

- On the transmission side crankcase half, take particular care cleaning the housing and oil ducts for the following components: the oil pump, the oil blow-by valve, the main bearings and the cooling jet on the transmission side (see diagram).

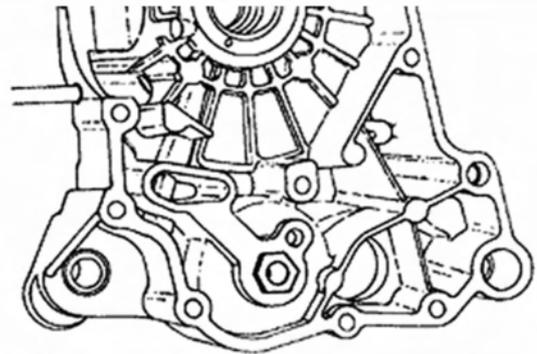
- Take particular care, also, that there are no signs wear oil blow-by valve housing (see Chapter Lubrication), as this could prevent a good seal in the valve, which regulates the oil pressure.



N.B.

THE JET IS FED THROUGH THE BENCH BRASSES. PROPER OPERATION OF THIS COMPONENT IMPROVES THE PISTON TOP COOLING. CLOGGING HAS EFFECTS THAT ARE DIFFICULT TO DETECT (PISTON TEMPERATURE INCREASE). FAILURE OR LEAK CAN CONSIDERABLY DECREASE THE BENCH BRASS AND CONNECTING ROD LUBRICATION PRESSURE.

- On the flywheel side crankcase half, take particular care cleaning the oil ducts for the main bearings, the oil duct for the jet that lubricates the cylinder head and the oil drainage duct at the flywheel side oil seal.

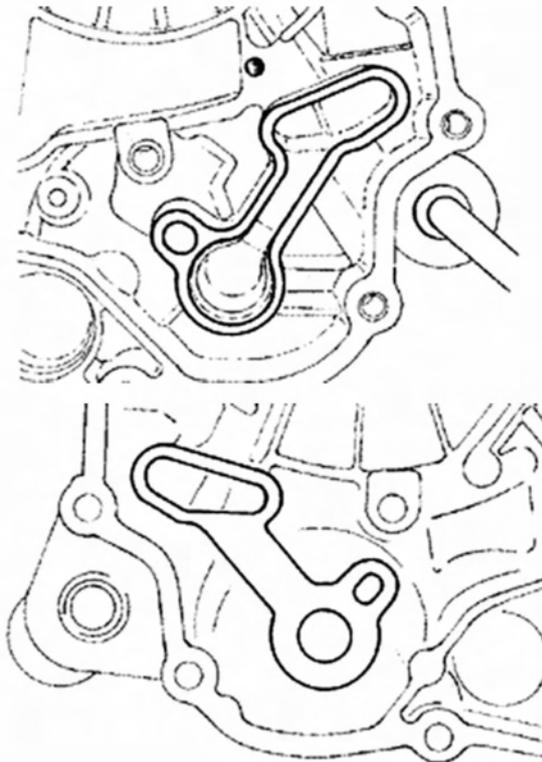


N.B.

THE HEAD LUBRICATION CHANNEL IS PROVIDED WITH A SHUTTER JET; THIS GIVES A «LOW PRESSURE» HEAD LUBRICATION; THIS CHOICE WAS MADE TO REDUCE THE OIL TEMPERATURE IN THE SUMP. THE JET CLOGGING IMPAIRS THE HEAD LUBRICATION AND THE TIMING MECHANISMS. A JET FAILURE CAUSES A DECREASE OF THE BENCH BRASS AND CONNECTING ROD LUBRICATION PRESSURE.

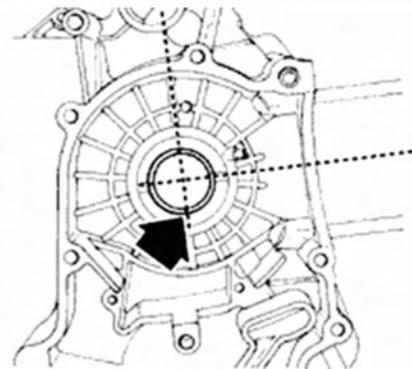
- Inspect the mating surfaces on the crankcase halves for scratches or deformation, taking particular with the surfaces that mate with the cylinder and the mating surfaces between the crankcase halves.

- Defects in the gasket between the crankcase halves, or the mating surfaces shown in the diagram, can cause a reduction in the oil pressure lubricating the main bearing and connection rod.
- Check the main bearing seats that limit axial play in the crankshaft show no signs of wear. The dimension between these seats is measured by way of the procedure described previously for measuring the crankshaft axial play and dimensions.



Inspecting the crankshaft plain bearings

- Proper lubrication of the main bearings depends on them being seated correctly in their housings, which will avoid obscuring the lubrication ducts. Not only will this ensure proper flow of oil, but also the appropriate oil pressure (4 bar), on which lubrication of the main bearings depends.
- The main bearings comprise two half-bearings, one containing holes and channels for lubrication and the other solid.
- The solid half-bearing bears the main load due to combustion and is, therefore, located at the far side from the cylinder.
- In order to avoid obstructing the passage of oil, the plane of the coupling between the two half-bearings must be absolutely perpendicular to the axis of the cylinder, as shown in the diagram.
- The depth to which the half bearings are driven,



in relation to the surface that limits axial play of the crankshaft, can also affect the alignment of the oil ducts.

N.B.

TO KEEP SUCH POSITION OF THE BRASSES ON THE CRANKCASE, DRIVING IS FORCED ON STEEL RINGS INSERTED IN THE CASTING OF BOTH HALF-CRANKCASES.

Characteristic

Standard driving depth

1.35 - 1.6

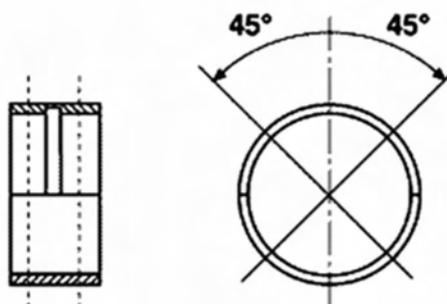
- Check the inside diameter of the main bearings in the three directions indicated in the diagram.
- Repeat these measurements on the other side of the lubrication channel in the bearing (see diagram).
- The main bearings are chosen from a selection of standard sizes that give certain inside diameters once driven into the bearing housings in the crankcase, so as to obtain a match with the crankshaft.
- The bearing housings fall are available in two categories, Cat. 1 and Cat. 2, as are the crankshafts.
- The main bearings are available in three thicknesses, identified by colour markings, as shown in the below table.

N.B.

DO NOT TAKE THE MEASURE ON THE HALF-BEARING MATCHING SURFACE SINCE THE ENDS ARE RELEASED TO ALLOW DEFORMATION UPON INSERTION.

CRANKCASE BEARINGS

Specification	Desc./Quantity
B	Blue
C	Yellow
E	Green

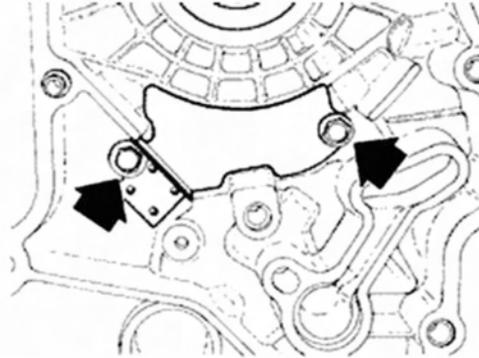


Refitting the crankcase halves

- Re-fit the internal cover shown in the diagram and tighten the two screw fasteners to the specified tightening torque.

Locking torques (N*m)

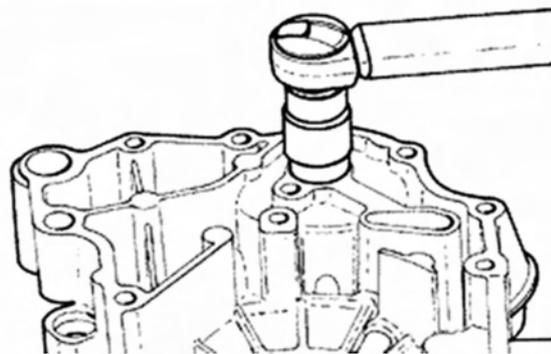
Tightening torque 4 - 6



- Re-fit the oil filter union and tighten it to the specified tightening torque.
- Place a new gasket on one of the crankcase halves, preferably on the transmission side, together with the locating dowels.

Locking torques (N*m)

Tightening torque 27 - 33



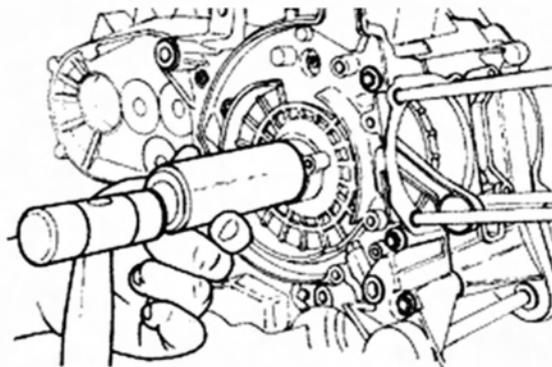
- Lubricate the main bearings and insert the crankshaft in the transmission side crankcase half.
- Re-assemble the two crankcase halves.
- Fit the 11 screw fasteners and tighten them to the specified tightening torque.

N.B.

WHILE ASSEMBLING THE CRANKCASE AND THE CRANKSHAFT, TAKE CARE NOT TO DAMAGE THE THREADED TANGS OF THE CRANKSHAFT.

Locking torques (N*m)

Tightening torque 11 - 13



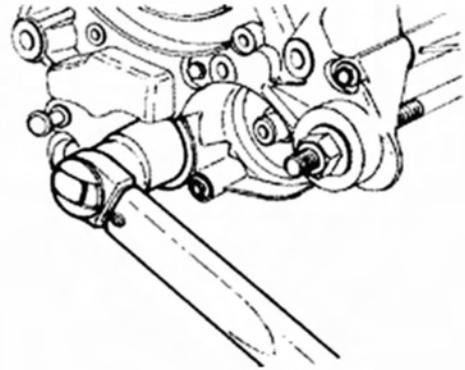
- Lubricate the flywheel side oil seal.
- Using the appropriate special tool fit the oil seal.
- Fit a new O-ring on the oil sieve and lubricate it.
- Re-fit the oil seal to the engine with the oil drain plug and tighten to the specified tightening torque.

N.B.

REMOVE ANY REMAINS OF THE OLD GASKET FROM THE CRANKCASE AND CYLINDER MATING SURFACES IN ORDER TO ENSURE PROPER SEALS

N.B.

FAILURE TO USE THE SPECIFIC TOOL MAY RESULT IN THE OIL SEAL BEING DRIVEN TO AN UNSUITABLE DEPTH, WHICH WOULD CAUSE THE OIL SEAL TO MALFUNCTION.



Specific tooling

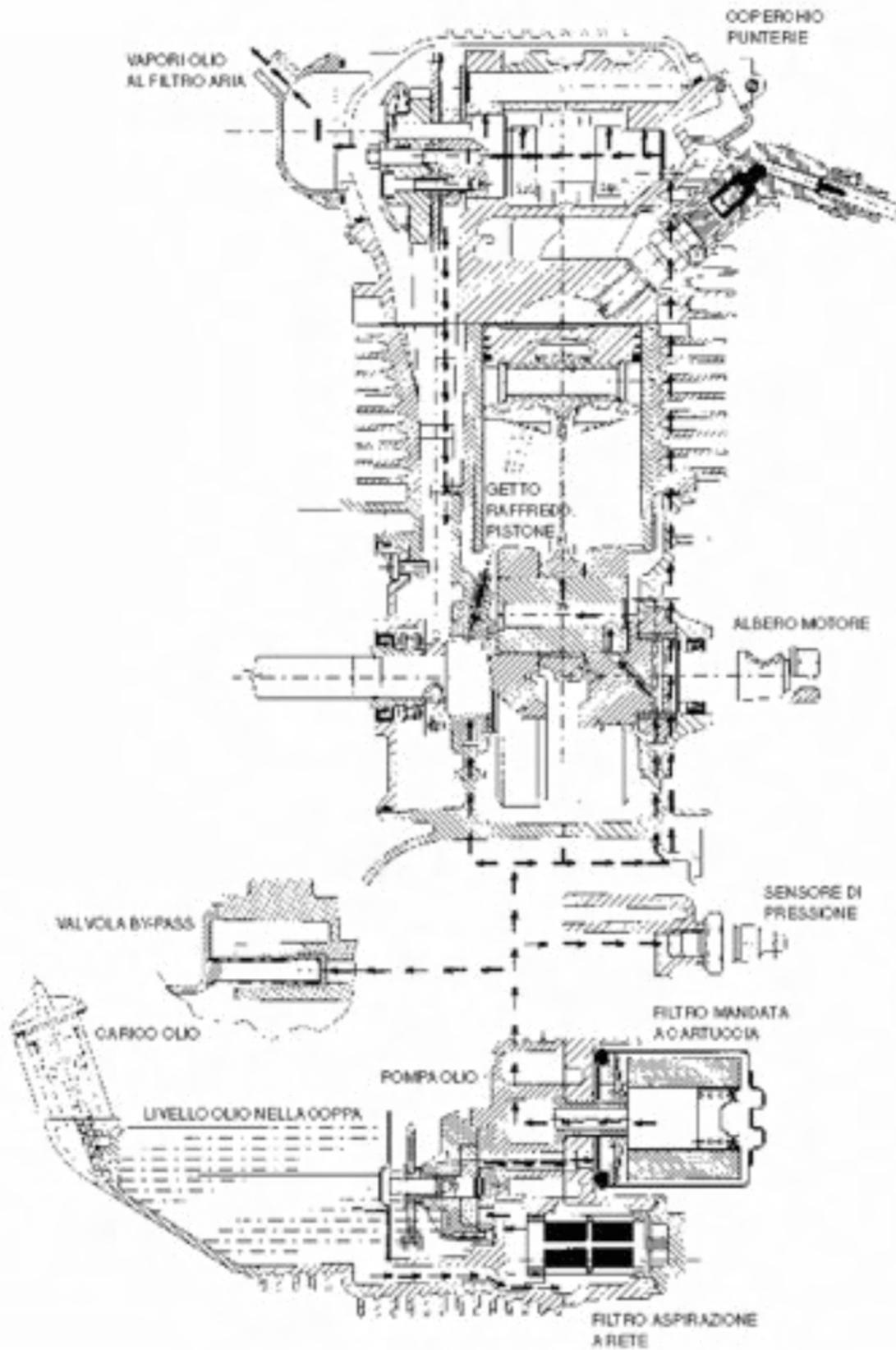
020425Y Flywheel-side oil guard punch

Locking torques (N*m)

Tightening torque 24 - 30

Lubrication

Conceptual diagrams



Oil pressure check

- Remove the fan cover, as described in the last chapter, "Flywheel", disconnect the oil low pressure warning sender wires and remove the sender itself.

- Check the oil pressure reading is between 0.5 and 1.2 atm with the engine at the slow running speed of 1650 r.p.m. and an oil temperature of around 90°C.

- Check the oil pressure reading is between 3.2 and 4.2 atm with the engine running at a speed 6000 r.p.m. and an oil temperature of around 90°C.

- Remove the compression gauge once the measurement is complete and re-fit the oil pressure sensor, tightening it to the specified tightening torque, and re-fit the fan cover.

- If the oil pressure is outside the specified limits, in the following order, check: the oil filter, the oil blow-by valve, the oil pump and the crankshaft seals.

N.B.

THE CHECK MUST BE CARRIED OUT WITH OIL AT THE CORRECT LEVEL AND WITH AN OIL FILTER IN GOOD CONDITIONS.

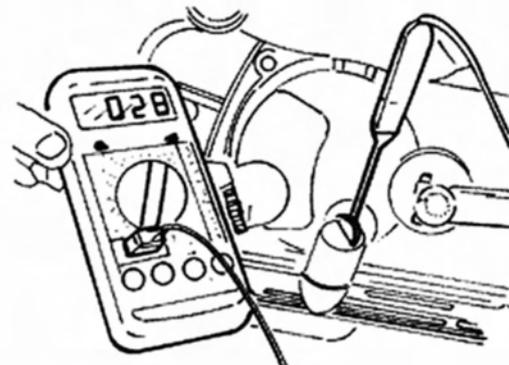
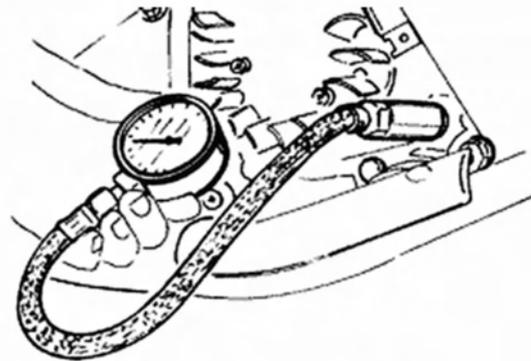
Characteristic

Minimum pressure

3.2 bar

Locking torques (N*m)

Tightening torque 12 - 14 (also applicable to compression gauge fitting)

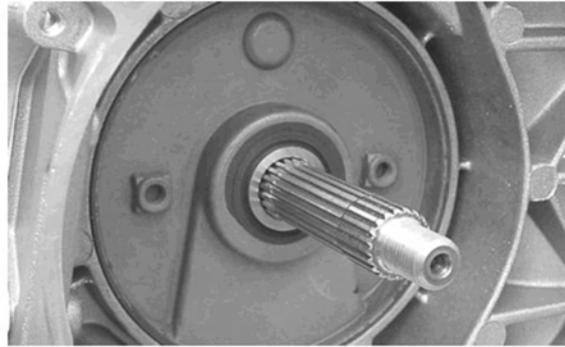


Crankshaft oil seals

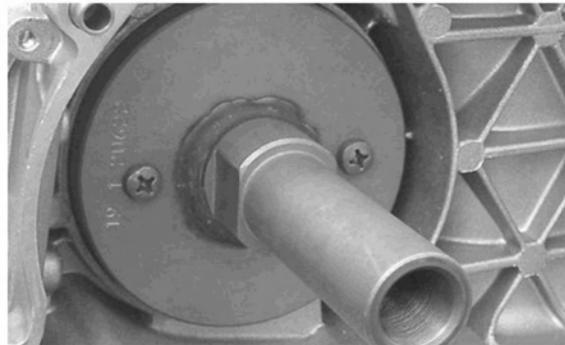
Removal

- Remove the transmission cover and complete

driving pulley beforehand



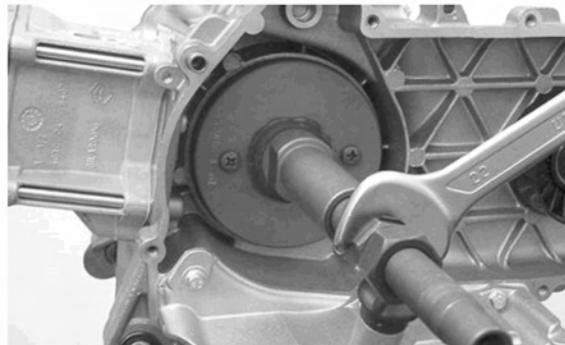
- Install the base of the special tool on the oil seal using the screws provided.



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

Specific tooling

020622Y Transmission-side oil guard punch

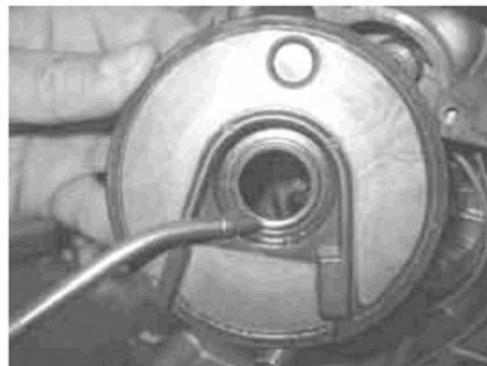


Refitting

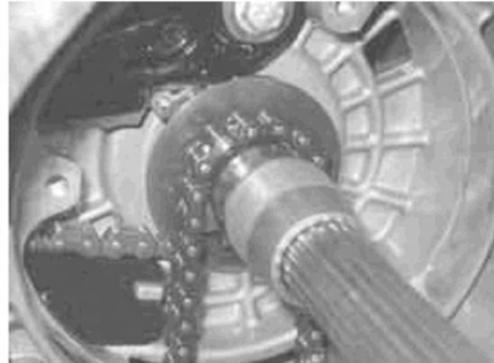
- Prepare the new oil seal lubricating the sealing surface. Note: do not lubricate the surface mating with the crankcase.

CAUTION

DO NOT LUBRICATE THE SURFACE KEYED ON THE ENGINE CRANKCASE.



- Preassemble the oil seal using the special tool.
- Insert the sheath onto the crankshaft.



- Insert the tool with the oil seal on the crankshaft until it comes into contact with the crankcase.

CAUTION

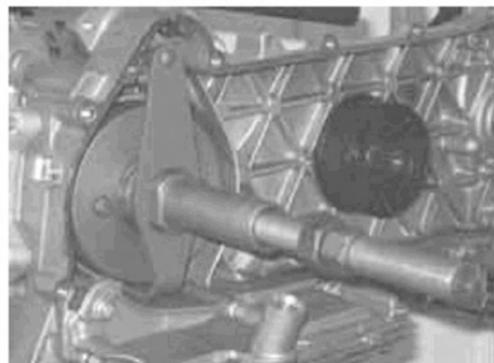
ORIENTATE THE OIL GUARD BY POSITIONING THE CHAIN HOUSING CHANNEL FACING DOWNWARDS. WHEN THE POSITION IS REACHED, DO NOT RETRACT THE OIL GUARD. FAILURE TO COMPLY WITH THIS RULE CAN CAUSE A WRONG POSITIONING OF THE OIL GUARD SHEATH.



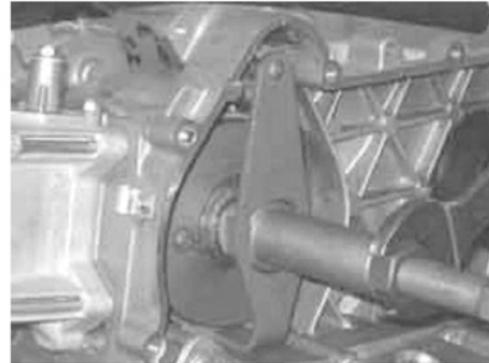
- Orientate the oil seal installing the bracket comprising the special tool.



- Tighten the threaded bar onto the crankshaft as far as it will go.



- Using the nut, act on the base of the tool as far as it will go.



- Remove all of the tool components following the inverse procedure

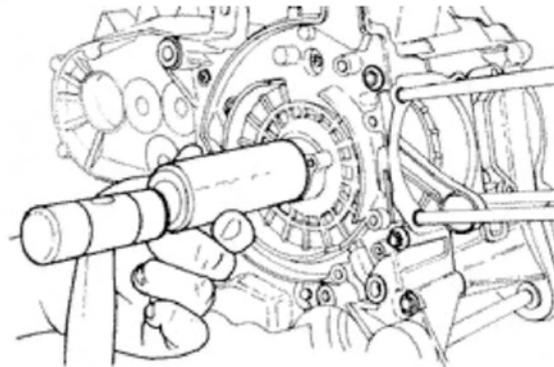
CAUTION

FAILURE TO COMPLY WITH THIS ASSEMBLY PROCEDURE CAN SERIOUSLY DAMAGE THE ENGINE DUE TO THE WRONG TENSIONING OF THE OIL PUMP CONTROL CHAIN.

Assemble a new oil guard on the magneto side using the specific tool as indicated in the photo.

N.B.

FAILURE TO USE THE SPECIFIC TOOL MAY RESULT IN THE OIL SEAL BEING DRIVEN TO AN UNSUITABLE DEPTH, WHICH WOULD CAUSE THE OIL SEAL TO MALFUNCTION.



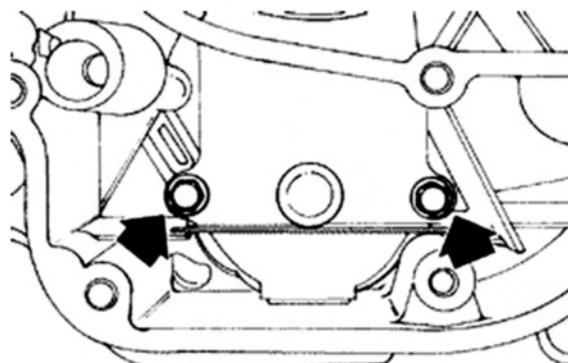
Specific tooling

020425Y Flywheel-side oil guard punch

Oil pump

Removal

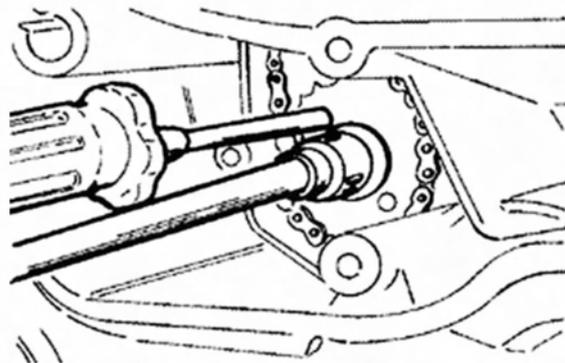
- Remove the two screw fasteners of the lower oil pump chain cover, shown in the diagram, and remove the cover itself.
- Block the rotation of the lower oil pump sprocket with a screwdriver inserted through one of its two holes.



- Remove the central screw fastener with dished

washer, as shown in the diagram.

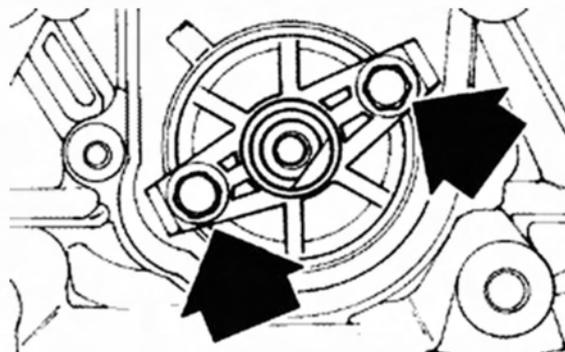
- Remove the sprocket and the chain.
- Remove the oil pump drive cog from the crankshaft.



- Undo the two oil pump screw fasteners, shown in the diagram, extract the oil pump.
- Remove the oil pump seal.

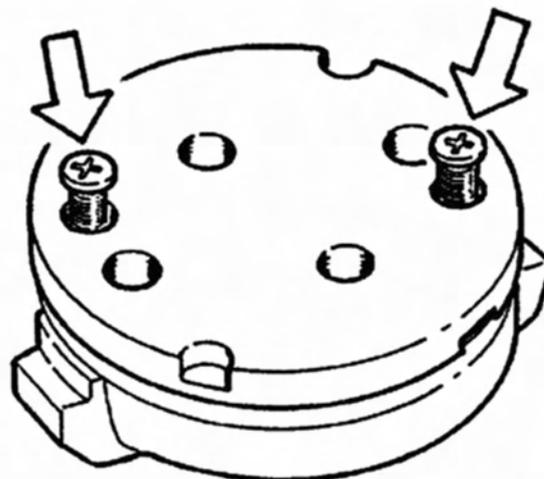
CAUTION

THE CHAIN SHOULD BE MARKED TO ENSURE THAT THE ORIGINAL DIRECTION OF ROTATION IS MAINTAINED.



Inspection

- Remove the two screw fasteners on the rear of the pump and remove its cover.
- Remove the circlip retaining the innermost impeller.
- Remove and wash the impellers thoroughly with petrol and compressed air.
- Reassemble the impellers in the pump body, keeping the two reference marks visible, and replace the circlip.

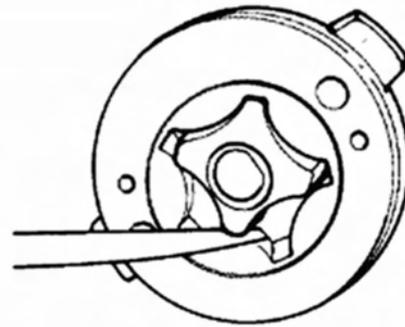


- Check the clearance between the impellers using feeler gauges, as shown in the diagram.

Characteristic

Maximum allowable clearance:

0.12 mm

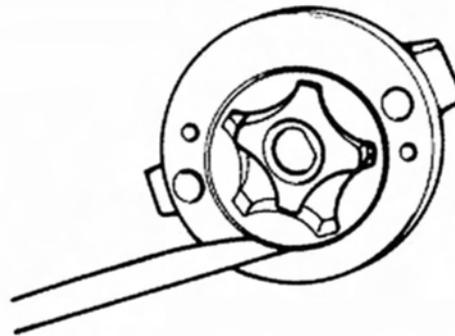


Measure the distance between the outer rotor and the pump body (see figure).

Characteristic

Maximum allowable clearance:

0.20 mm

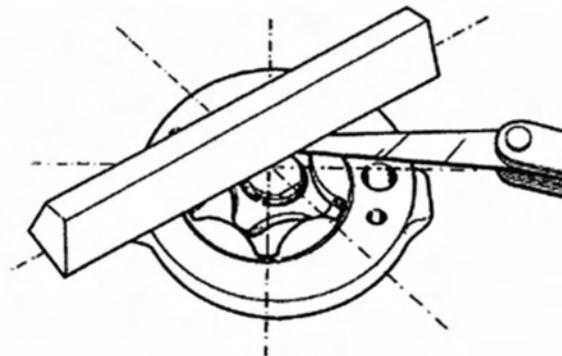


- Check the axial play in the rotors using a flat surface as a reference plane, as shown in the diagram.

Characteristic

Maximum allowable clearance:

0.09 mm



Refitting

- Check there are no signs of wear on the oil pump shaft or body.
 - Check there are no signs of scoring or wear on the oil pump cover.
 - Substitute any defective parts or the complete oil pump assembly, as appropriate.
 - Re-fit the sprocket on the pump, the central screw, tightened to the specified tightening torque, and the dished washer.
-

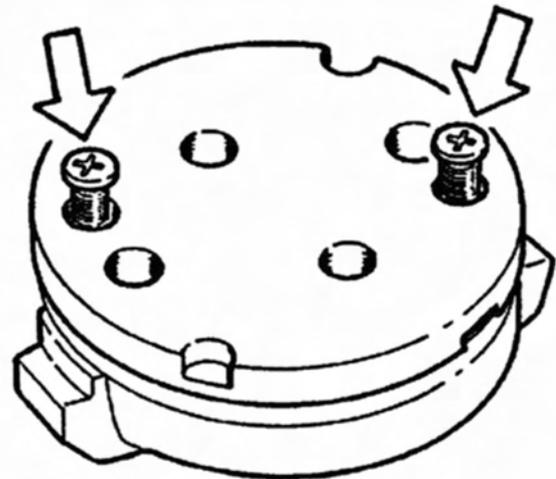
-Re-fit the lower oil pump sprocket cover, tightening the two screw fasteners to the specified torque.

N.B.

FIT THE BELLEVILLE WASHER SO THAT ITS OUTER (CURVED) RIM IS IN CONTACT WITH THE PULLEY.

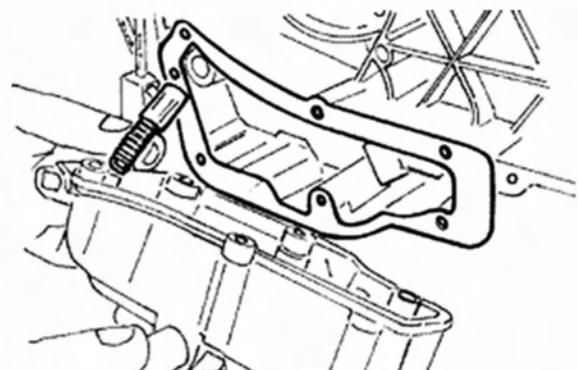
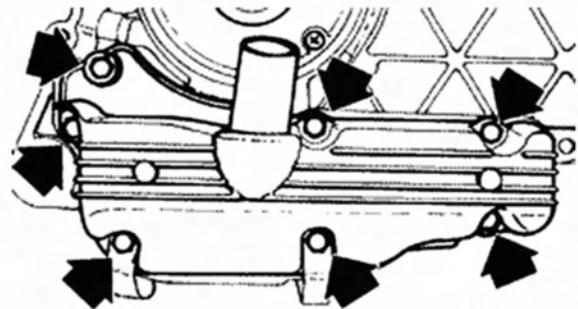
Locking torques (N*m)

Central screw tightening torque 12 - 14 N·m
Cover screw tightening torque 0.7 - 0.9 N·m



Removing the oil sump

- Remove the oil filler plug, the transmission cover, the complete drive pulley assembly, the drive belt and the bendix, as described in chapter Transmission.
- Drain the oil as described in chapter General Information and Servicing.
- Remove the seven screw fasteners, shown in the diagram, and the two rear brake cable clamps.
- Remove the spring, the blow-by valve plunger and the gasket shown in the diagram.



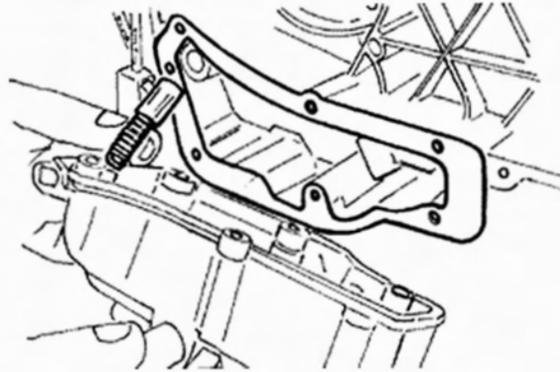
Inspecting the by-pass valve

- Check the free length of the spring.
- Check that the piston exhibits no scratches.
- Ensure that it slides freely on the crankcase and that it guarantees a good seal.
- If not, eliminate any impurities or replace defect-

ive parts.

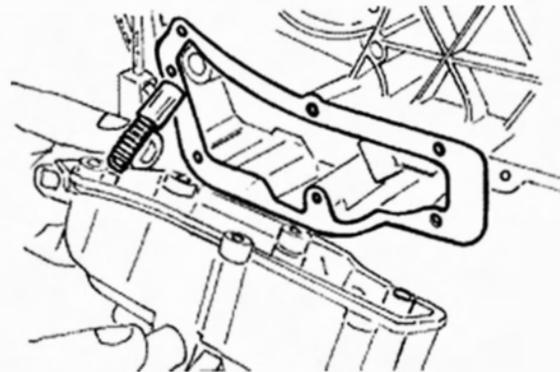
Characteristic**Check by-pass: Standard length**

54.2 mm



Refitting the oil sump

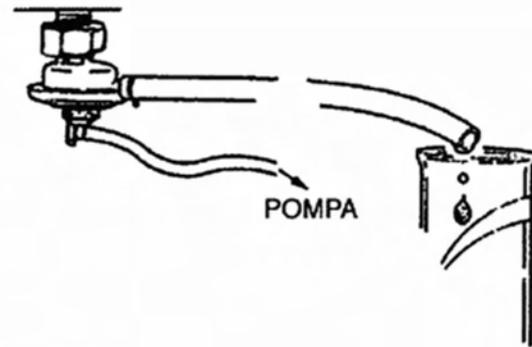
- Re-fit the blow-by valve plunger in its housing.
- Insert the pressure-regulating spring.
- Fit a new sump seal.
- Re-fit the sump, taking care to locate the spring in the appropriate recess machined into the inside of the sump.
- Re-fit the screw fasteners and the rear brake cable brackets in the reverse order to which they were removed.
- Tighten the screw fasteners to the specified tightening torque.
- Re-fit the drive pulley assembly, the drive belt, the bendix and the transmission cover, as described in chapter "Transmission".
- **When testing the lubrication system, refer to chapter "Crankcase and Crankshaft", regarding lubrication of the crankshaft and connecting rod**

**Locking torques (N*m)****Tightening torque 11 - 13**

Fuel supply

- Disconnect the fuel feed pipe and the vacuum pipe from the carburettor.

- Ensure that no fuel is leaking from the pipes.
- Close the fuel outlet.
- Using the MITYVAC pump, apply a 0.1 bar vacuum to the cock.
- Ensure that the vacuum does not change, and that no fuel is leaking.
- Reconnect the vacuum pipe to the manifold.
- Position the fuel pipe so that its outlet is on the same level as the cock.
- Make the engine turn by operating the starter motor for five seconds with the carburettor in the idle position.
- Gather the fuel in a graduated burette.



N.B.

THE MEASUREMENT MAY BE ALTERED BY AN UNSUITABLE ENGINE SPEED OR BY INCORRECT POSITIONING OF THE PIPE. IN THAT CASE, A REDUCED FUEL DELIVERY IS GENERALLY OBTAINED. THE VACUUM HOLE ON THE MANIFOLD HAS AN INTENTIONALLY REDUCED CROSS-SECTIONAL AREA IN ORDER TO IMPROVE THE VACUUM PULSES AND ENSURE CONSTANT DELIVERY OF THE COCK.

Specific tooling

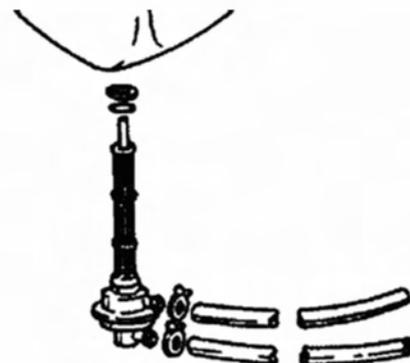
020329Y Pump MITYVAC

Characteristic

Minimum delivery

20 cc

- Drain the fuel from the tank.
- Remove the fuel delivery pipe and the vacuum pipe.
- Release the clamp and remove the cock.
- Clean the tank and the cock filter with a suitable solvent.
- Refit the cock taking care to verify the presence of the O-ring.



- Turn the cock in the same direction as before the removal and then tighten the clamp.

N.B.

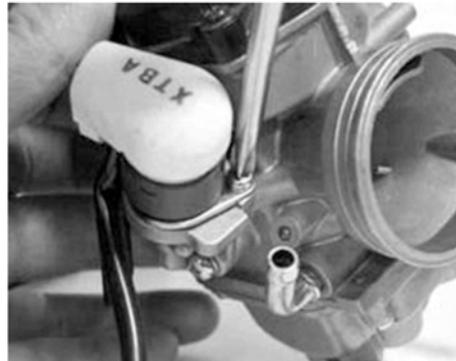
THE FILTER CAN BE SCREWED OFF THE COCK TO FACILITATE THE CLEANING.

Removing the carburettor

- To remove the carburetor from the engine, the air filter must be moved and remove the throttle, automatic starter connection, band securing the carburetor to the filter box and intake manifold, the air supply hose to the diaphragm, heater and induction coupling.



Remove the guard, the bracket and the starter by releasing the screw shown in the figure.

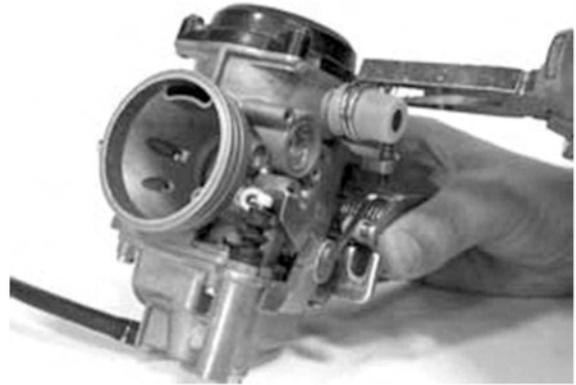


Remove the 2 screws and the starter support with the gasket.



Remove the clamp and the cap with the mem-

brane chamber aeration filter.



Remove the 4 fixing screws shown in the figure and the vacuum chamber cover.

WARNING

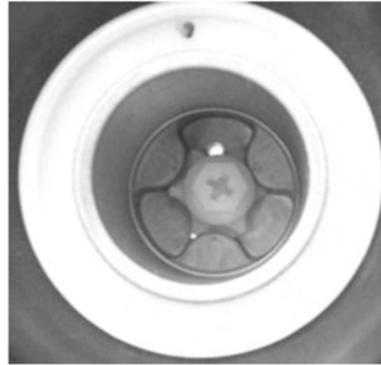
DURING THE COVER REMOVAL, BE CAREFUL TO THE SUDDEN PROJECTION OF THE SPRING.



Remove the vacuum valve with the membrane.



Loosen the coupling by 1/8 turn and remove it, remove the spring and the vacuum valve pin.



Remove the 4 screws shown in the figure.



Remove the basin with the pickup pump, control and gasket.



-
- Remove the sealing gasket.
 - Remove the pickup pump intake and delivery valves from the basin.

N.B.

BE VERY CAREFUL SINCE VALVES CONSIST OF NOZZLE, SPRING AND BALL

N.B.

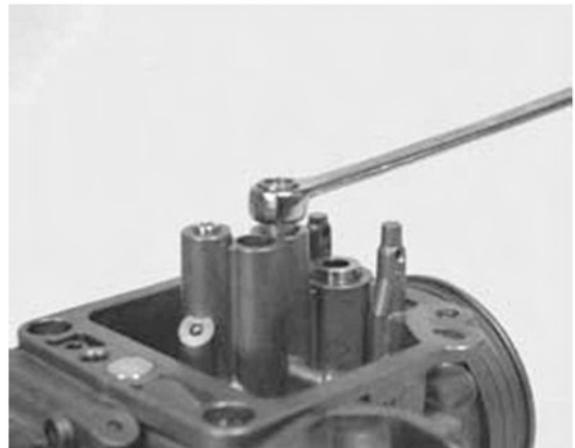
DO NOT REMOVE THE PICKUP PUMP PISTON AND

RELEVANT CONTROL.

- Suitably support the carburettor and remove the float pin by a hammer from the gas control side.
- Remove the float and the pin.
- Remove the maximum nozzle.



Remove the maximum nozzle.





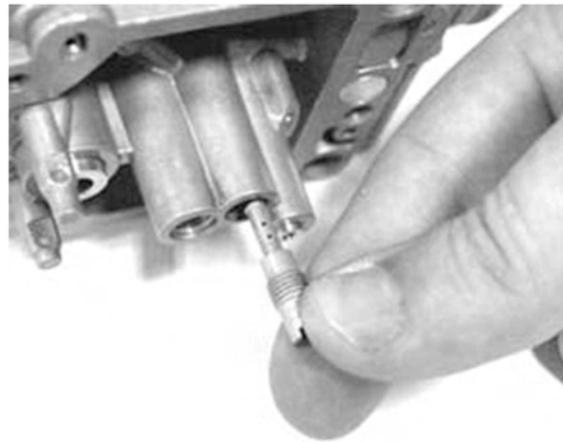
Remove the emulsifier.



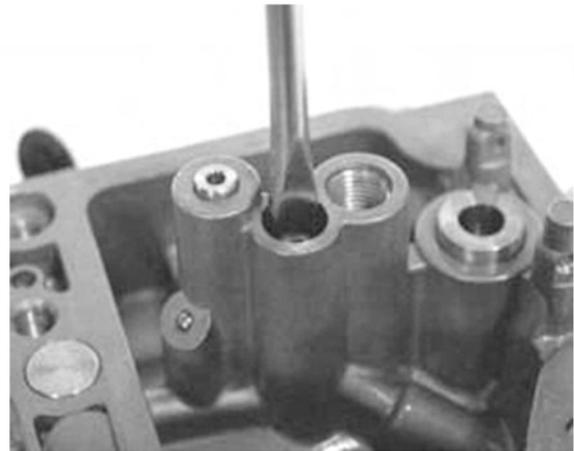
Remove the spray nozzle.

N.B.

THIS OPERATION IS REQUIRED TO PREVENT LOSING THE SPRAY NOZZLE DURING THE CARBURETTOR CLEANING OPERATIONS. IF THE SPRAY NOZZLE IS FORCED INTO ITS SEAT, DO NOT REMOVE IT TO PREVENT DAMAGING IT.



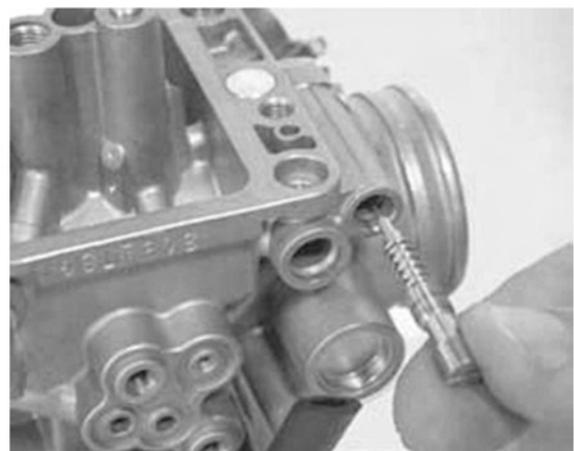
Remove the minimum nozzle.



Remove the minimum flow adjustment screw and the spring.

CAUTION

DO NOT REMOVE THE COMPONENTS FIXED INTO THE CARBURETTOR BODY, SUCH AS: FUEL FEEDING DUCT, PIN SEAT, STARTER NOZZLE, PICKUP NOZZLE AND PIT CAP, MINIMUM AND MAXIMUM AIR CALIBRATOR, THROTTLE VALVE CONTROL SHAFT. DO NOT REMOVE THE SCREWS FIXING THE THROTTLE TO THE SHAFT. THE FIXING SCREWS ARE CAULKED AFTER ASSEMBLY AND THEIR REMOVAL DAMAGES THE SHAFT.

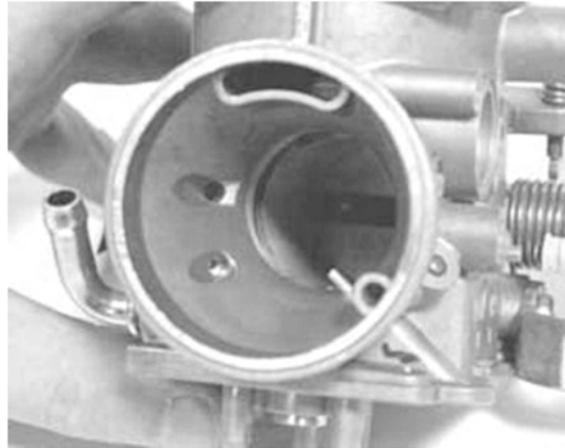


Refitting the carburettor

- Before proceeding to reassembly, carefully clean the carburettor body using fuel and compressed air.
- Be especially careful to the fuel inlet duct and the pin seat.



- For the maximum circuit, check the air calibration shown in the figure.



- For the minimum circuit, check the correct cleaning of the following points: air calibration, outlet section controlled by the flow screw, progression holes close to the throttle valve.



- For the starter circuit, carefully blow the nozzle connection duct since the nozzle support hides further internal calibrations that are not accessible.
- Carefully blow the pickup nozzle.

N.B.

ITS OUTLET SECTION IS VERY SMALL AND FACES THE THROTTLE VALVE. A WRONG ORIENTATION OF THE NOZZLE CAUSES A POOR SPRAYING.

- Check that on the carburettor body there are 5 closing balls of the processing ducts.
- Check that the matching surfaces with the basin and the membrane exhibit no dents.
- Check that the vacuum valve seat is not deformed.
- Check that the throttle valve and the shaft exhibit no abnormal wear.
- Check that the pin seat exhibits no abnormal wear.
- In case of anomalies, replace the carburettor.
- Check that the pickup pump rocker return spring is not slackened.

N.B.

TO PREVENT DAMAGES, DO NOT INSERT METAL OBJECTS INTO THE CALIBRATED SECTIONS.

- Wash and blow the minimum nozzle and then replace it.



- Wash and blow the components of the maximum, emulsifier and nozzle circuit.
- Insert the spray nozzle into the carburettor body with the shorter cylindrical part facing the emulsifier.
- Install the emulsifier making sure that the spray nozzle is properly inserted, then lock it.
- Install the maximum nozzle.



- Check that the conical pin exhibits no wear on the pin sealing surface and on the return spring.
- In case of wear, replace the pin.



- Check that the float exhibits no wear on the pin seat or on the plate in contact with the pin, or fuel infiltrations.
- In case of anomalies, replace.
- Insert the float with the pin on the fuel feeding side.

N.B.

BE CAREFUL TO THE PROPER INSERTION OF THE RETURN SPRING ON THE FLOAT PLATE.

- Remove the basin drainage screw and wash

and blow the basin, be especially careful to the cleaning of the pickup pump ducts.

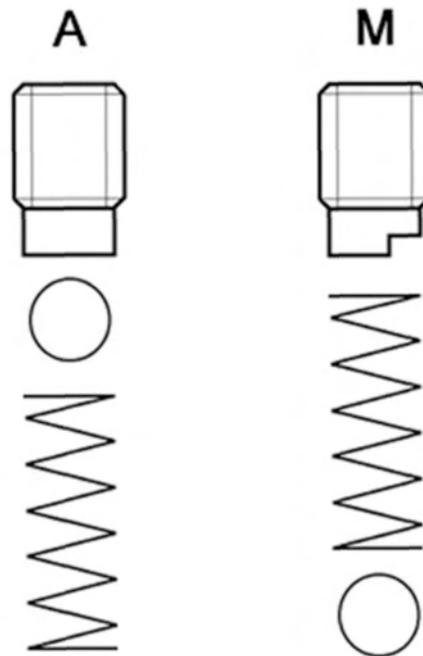
- Repeatedly actuate the pickup pump piston and blow with compressed air.
- Replace the pickup pump valves in a sequence:

INTAKE VALVE (A)

- Spring
- Sphere
- Nozzle

DELIVERY VALVE (M)

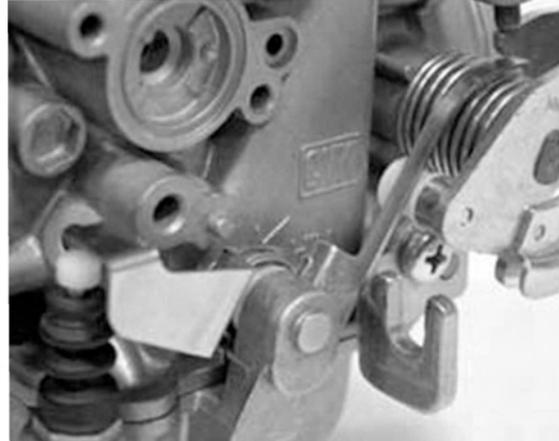
- Spring
- Nozzle
- Sphere



N.B.

THE DELIVERY VALVE NOZZLE IS PROVIDED WITH A MILLING.

- Check the screw seal by pouring a small amount of fuel into the basin.
- Install a new gasket on the basin.
- Install the basin on the carburettor body and tighten the 4 screws.
- Check that the control roller is free to rotate into its seat.



N.B.

CHECK THE PROPER INSERTION OF THE GASKET.

N.B.

AVOID ANY DEFORMATION OF THE PICKUP PUMP CONTROL ROCKER.

- Wash and blow the flow screw.
- Check that the screw is free from deformation and/or oxidation.
- Assemble the spring on the screw.

-
- Tighten the flow screw on the carburettor body.



- The final position of the screw must be defined by the exhaust gas analysis.
- Prepare the carburettor for adjustment with the screw loosened by 2 turns from the closed position.

Level check

- Place the carburettor tilted as shown in the figure.



- Check that the reference on the float is parallel to the basin matching surface.
- If the position is different, change the orientation of the metal pin control plate to obtain the position described above.

Inspecting the valve and needle

- Check that the vacuum valve conical pin is free from wear.
- Check that the vacuum valve exhibits no scratches on the outside surfaces.
- Check that the vacuum feeding hole is not clogged.
- Check that the membrane is not broken or hardened, if not so, replace the entire valve.
- Insert the conical pin into the vacuum valve



seat.

- Replace the vacuum gas valve on the carburetor body being careful to insert the pin into the spray nozzle.

N.B.

THE VALVE CAN BE INSERTED IN A SINGLE POSITION ONLY.



- Replace the spring with the pin lock.
- Replace the vacuum chamber cover checking the proper positioning of the spring into the housing on the cover.
- Tighten the screws at the prescribed torque.

Locking torques (N*m)

Vacuum chamber cover screws: XX N m



- Wash and blow the ambient pressure inlet filter sponge.



- Replace the filter and its clamp.



- Wash and blow the starter support.
- Install a new gasket on the carburettor body and tighten the 2 fixing screws.



Inspecting the automatic choke device

- Check that the automatic starter piston exhibits no scratches or oxidation.
- Check that the piston slides freely into the seat.
- Check that the piston sealing gasket exhibits no deformations.
- The starter must be more or less inserted according to the ambient temperature.
- Measure the projection of the piston as shown in the figure, and check the corresponding value.
- Ensure that the starter settles at ambient temperature.
- The starter should gradually disconnect by the electric heating.
- Check the starter resistance when settled at am-



bient temperature.

- Using a 12V battery, power the automatic starter and check that the piston reaches the maximum protrusion.
- The actual heating time depends on the ambient temperature.
- If you detect projections, resistance or times differing from those prescribed, replace the complete starter.
- Install the starter on the carburettor checking the proper positioning of the O-Ring, insert the plate with the knurling resting against the starter, tighten the fixing screw.
- Orientate the starter as in the figure.
- Install the safety casing.

N.B.

TO PERFORM THIS CHECK, BE CAREFUL NOT TO GENERATE ANY SHORT CIRCUITS. TO THIS PURPOSE, USE A CABLE WITH SUITABLE TERMINAL FOR CONNECTING TO THE STARTER.

Characteristic

Automatic starter check Kehin

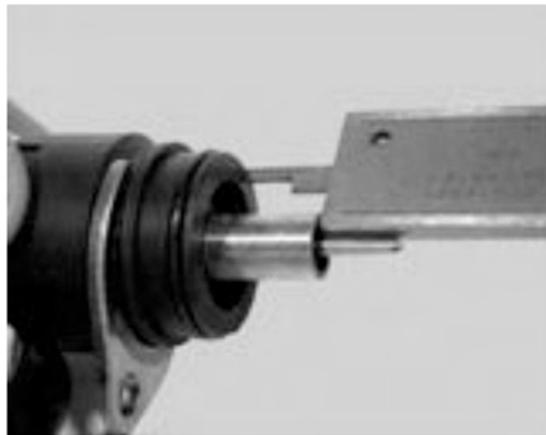
XX ÷ XX mm at about 20°C

Automatic starter check Kehin maximum projection

XXX ÷ XXX mm

Automatic starter check Kehin max time

5 min



Adjusting the idle

- The engine does not require frequent adjustment of the idle, however it is important that this adjustment be made in complete compliance with a few rules.
- Before adjusting the carburettor make sure that

the following conditions are met: good lubrication, valve play and distribution timing conform, spark plug in excellent conditions, air filter clean and sealed, exhaust system completely sealed. -

Warm up the engine for at least 5 minutes at around 50 Km/h.

- Connect the vehicle to an exhaust analyser inserting the analyser probe into a extension hose fitted airtight to the outlet of the silencer.

- Connect the thermometer of the multimeter (020331y) to the sump, using the oil cap specifically made for insertion of the probe.

- Start the engine before adjusting the idle speed, making sure the oil temperature is between 70 - 80 °C.

- Using the analyser revolution counter or a separate one (020332y), adjust the idle until obtaining a speed of 1600 - 1700 rpm.

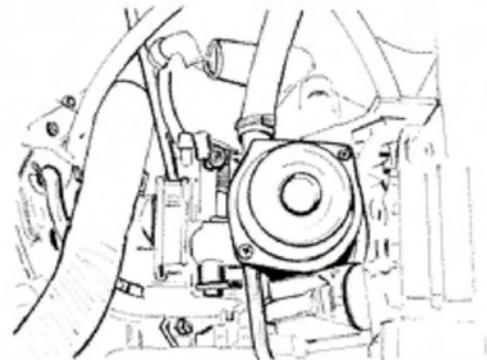
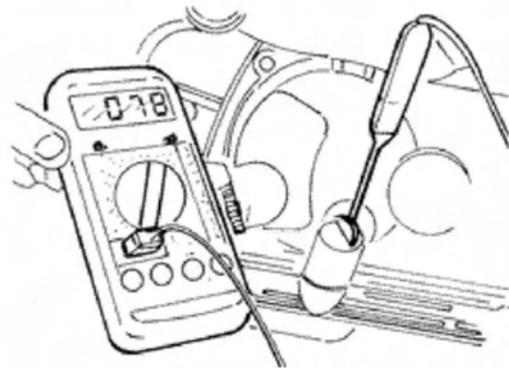
- Adjust the flow screw until obtaining a percentage of carbon monoxide (CO) of 3.1

- 4.5%, by loosening the screw the CO value increases (rich mixture) by tightening the CO value decreases (thin mixture).

- If correction of the flow screw position leads to an increase in speed, adjust the revolutions again and if necessary the flow screw until stabilised values are achieved.

- Idle carburetion is considered correct when the values of oil temperature, number of revolutions and percentage of carbon monoxide are correct. Additional information can be obtained from the analyser:

- the percentage of carbon dioxide (CO₂), the percentage of carbon dioxide has a reverse trend compared to the percentage of (CO), values



above 12.5% are considered correct. Values out of this range are considered as an indication of a non-airtight condition on the exhaust system.

- Unburnt hydrocarbons (HC) are measured in parts per million (PPM), the value of the HC decreases with increased rpm, with the engine idling it is normal to measure 200
- 400 PPM, these exhaust values are considered normal for an engine with motorcycle distribution diagram. Much higher values can be caused by engine misfiring due to a too thin mixture (low CO), ignition defects or incorrect distribution timing or a stuck or non-airtight exhaust valve.
- If the CO is difficult to adjust, carefully check:
 - Cleaning of the carburettor
 - Correct working order of the automatic starter
 - Correct working order of the tapered pin-seat
 - Bowl level

N.B.

THE EXTENSION PIPE IS REQUIRED TO AVOID WITHDRAWING EXHAUST GAS FROM THE AMBIENT OXYGEN. USE A GAS ANALYSER WARMED IN ADVANCE AND CAPABLE OF ENSURING THE RESET OF THE GAS READING AND A CORRECT GAS RATE. FAILURE TO COMPLY WITH THESE RULES MAY GIVE A WRONG READING.

N.B.

THE IGNITION SYSTEM IS OF THE SPARK TYPE AND HAS A VERY HIGH POWER. USING WRONG RPM COUNTERS MAY CAUSE DIFFICULTIES IN THE READING. THE RPM COUNTER MATCHING IS CORRECT WHEN IT CAN READ HIGH SPEEDS TOO, SUCH AS 6,000 - 8,000 RPM.

Characteristic**Engine idle: Pipe dimensions**

Ø 40 mm

Engine idle: Length

500 ÷ 600 mm

INDEX OF TOPICS

SUSPENSIONS

SUSP

Sospensioni anteriore

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

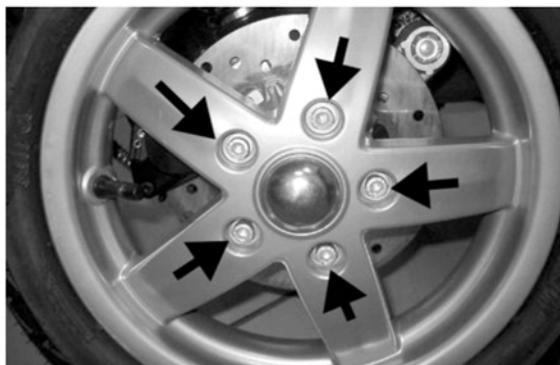
Front

Removing the front wheel

-Remove the five socket-head screws fastening the wheel to the hub.

N.B.

REMOVE THE BRAKE CALLIPER BEFORE REMOVING THE WHEEL HUB.



Front wheel hub overhaul

- Remove the ball bearing lock snap ring shown in the figure



Using the specific tool, remove the ball bearing.

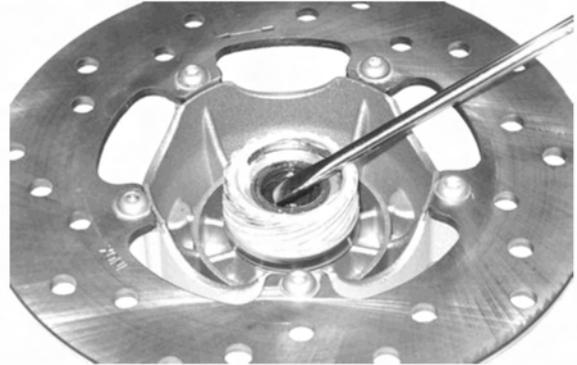
Specific tooling

001467Y014 15 mm pliers

001467Y017 Bell for bearings external Ø 39 mm



- Using a screwdriver, remove the oil guard on the roller bearing side.



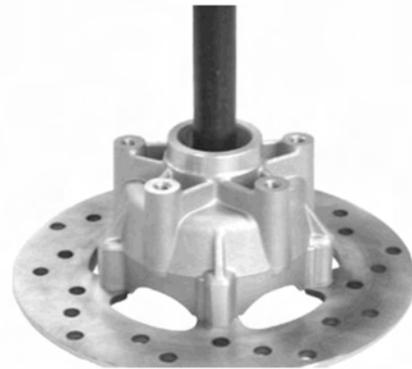
Using the specific tool, remove the roller bearing

Specific tooling

020376Y Handle for punches

020456Y Ø 24 mm adapter

020363Y 20mm guide



- Using a heat gun, heat the seat of the roller bearing
- Using the specific tool insert and push the bearing to its stop with the shielded side facing the outside
- Refit the ball bearing stop ring

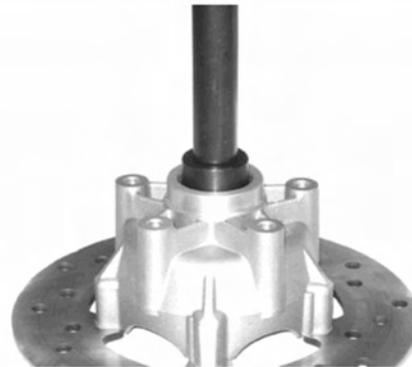
Specific tooling

020151Y Air heater "METABO HG 1500/2"

020376Y Handle for punches

020357Y 32 x 35 mm adaptor

020412Y 15 mm guide



- Using the specific tool, insert the roller case and move it to travel end
- Replace the oil guard on the roller bearing side
- Apply grease between ball and roller bearings

Specific tooling

020038y Drift**Recommended products****JOTA 3 FS Speedometer transmission**

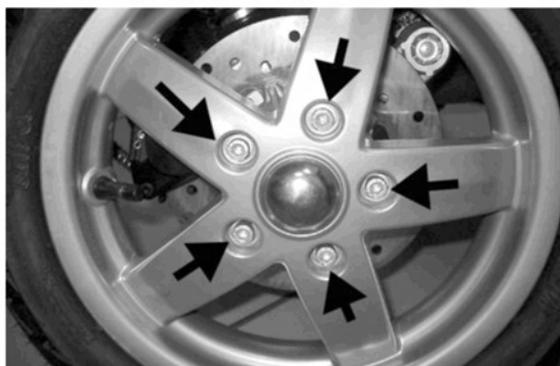
Lithium soap grease NLGI 33

**Refitting the front wheel**

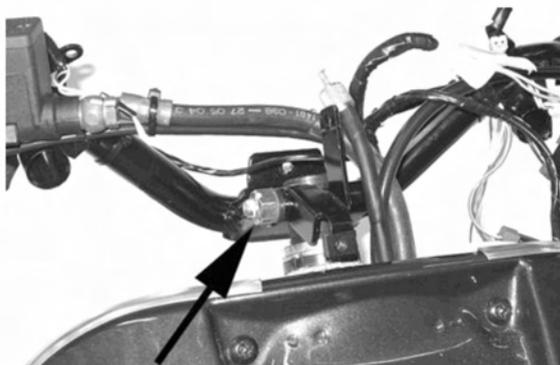
- Reassembly, tighten the five screws to the prescribed torque.

Locking torques (N*m)

Nut tightening torque 20 ÷ 25 N·m

**Handlebar****Removal**

- Before proceeding, remove the handlebar fairing.
- After detaching flexible transmission cables and disconnecting electrical terminals, loosen the clamp securing the handlebar to the steering tube
- Check all components and replace any damaged or defective parts.

**N.B.**

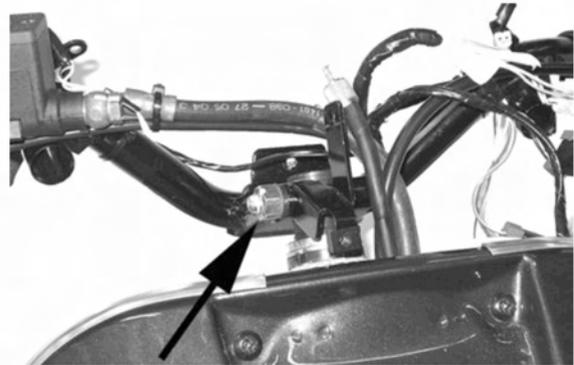
IF YOU ARE REMOVING THE HANDLEBAR ONLY SO THAT YOU CAN THEN REMOVE THE STEERING ASSEMBLY, SIMPLY ALLOW THE HANDLEBAR TO TIP OVER THE FRONT OF THE SCOOTER, TAKING CARE THAT FLEXIBLE TRANSMISSION CABLES ARE NOT DAMAGED.

Refitting

Follow the operations for removal in reverse, observing the prescribed tightening torques.

Locking torques (N*m)

Handlebar fastening screw $45 \div 50$ N·m



Steering column

Removal

After removing the top seat, tilt the vehicle on a side and extract the steering tube with fork.

Specific tooling

020055Y Steering tube ring nut spanner



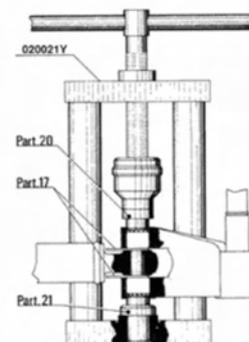
Overhaul

- Use the tool equipped with parts 3 and 4 and turn the tool handle until the washers are wedged into the trailing link.
- Remove spacers, part 17, and pack the clearance between the steering tube and the trailing link with grease. Now slide the dust seals into position.

* Supplied with the tool

N.B.

THE LOWER SEAT ON THE STEERING COLUMN TUBE MUST BE MOUNTED WITH THE HELP OF A



CROP END WITH AN APPROPRIATE DIAMETER.

Specific tooling

020021y Front suspension overhaul kit

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

Recommended products

ZETA 2 Grease for steering wheel bearings and pin seats

Lithium soap and zinc oxide grease NLG12

-Lubricate the oil seals with mineral oil and half-fill the needle bearings with grease.

-Fit the oil seal and the needle bearing on the pin, complete with retaining washer.

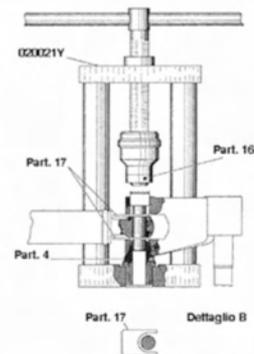
-Remove the special tool and then remove part 5 (guide) which was partially expelled in the previous assembly step. Leave part 4* mounted on the tool.

-Remove part 3 from the tool and replace it with part 16*.

-Turn the tool handle to insert the retaining washer - needle bearing - seal ring assy. until part 16 comes into contact with the trailing link.

- To fit the second retaining washer - needle bearing - seal ring assy. repeat the above operation with the tool on the opposite side to that shown in the figure, still equipped with part 16 and with part 22* instead of part 4.

* supplied with the tool



Specific tooling

020021y Front suspension overhaul kit

Recommended products

ZETA 2 Grease for steering wheel bearings

and pin seats

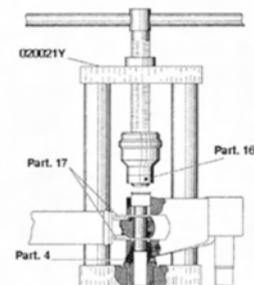
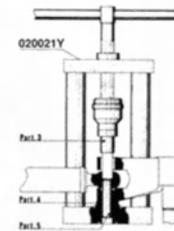
Lithium soap and zinc oxide grease NLG12

- Fit the two dust seals «C» on the trailing link as shown in detail «A».
- Connect the trailing link to the steering tube by means of guide pin 5*.
- Apply the special tool equipped with part 3* on the shaft and part 4* at the bottom.
- Smear Z2 grease on the pin and insert it into the trailing link and turn the tool handle until part 3 locates against the steering tube.
- After fitting the pin, insert the two spacers, part 17*, by tapping lightly with a mallet (see following figure).

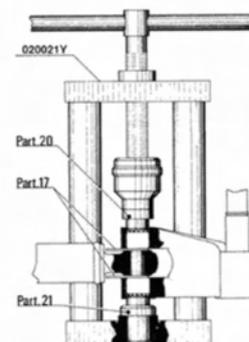
* supplied with the tool

Specific tooling**020021y Front suspension overhaul kit****Recommended products****ZETA 2 Grease for steering wheel bearings and pin seats**

Lithium soap and zinc oxide grease NLG12



- Use the special tool equipped with parts 20* and 21* as shown in the figure.
- Turn the handle to force the base of the needle bearings into contact with the end of the pin.

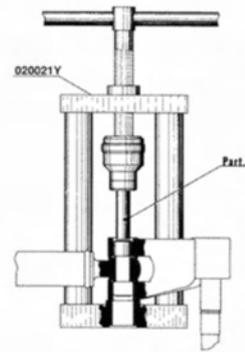


- Apply the special tool fitted with part 1* and turn

the handle until both the pin and the needle bearing opposing the force exerted by the tool are expelled at the same time.

- To remove the second needle bearing, fit the tool with part 2* working from the side opposite to the one shown in the figure.

* supplied with the tool



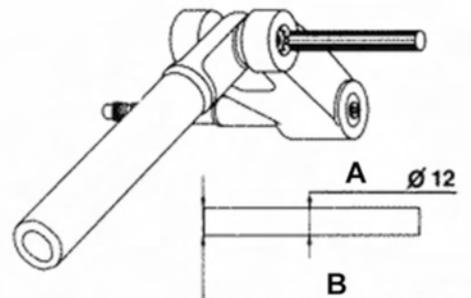
Specific tooling

020021y Front suspension overhaul kit

- Overhauling the front suspension serves to renew the parts connecting the steering tube and the trailing link. This operation is only effective if both steering tube and trailing link are in perfect condition.

- Crush the retaining washer and remove it by means of a punch.

- Repeat the operation for the second washer using the punch on the opposite side to the one shown in the figure.



A = Punch Ø12

B = Sharp edge end

Refitting

CAUTION

REASSEMBLE WITH NEW ROLLER BEARINGS, PIN, OIL SEALS AND DUST SEALS.

When assembling the steering tube apply the recommended grease on the steering fifth wheel.

Tighten lower ring nut "A" and upper ring nut "B" to the prescribed torque.

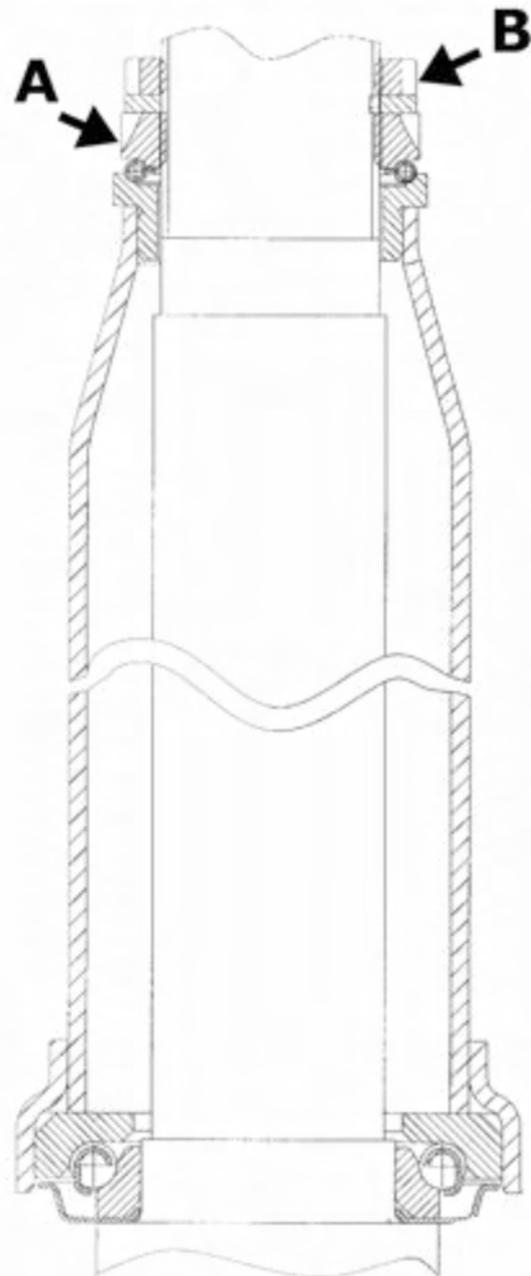
Recommended products

TUTELA ZETA 2 Grease for steering, seats of pin and swing arm

Lithium soap and zinc oxide grease NLG12

Locking torques (N*m)

Steering lower ring nut $8 \div 10$ Steering upper ring nut $35 \div 40$



Front shock absorber

Removal

- Remove the steering tube
- Remove the shock absorber bottom fixing screws
- Remove the top shock absorber attachments



Refitting

- For re-assembly, perform the operations for removal in the reverse order according to the tightening torques.

Locking torques (N*m)

Shock absorber top fixing 20 - 27 Nm Shock absorber bottom fixing 20 - 30 Nm

Shock-absorber - calliper bracket

Removal

- Remove the wheel hub with the brake disc
- Remove the front shock absorber bottom fixing screws



- Remove the bracket lock snap ring
- Extract the bracket



- Before replacing the bracket into the wheel axle,
-

place the o-ring as shown in the figure in order to have a proper positioning of the same after the installation of the bracket.

- Replace the washer and the snap ring
- Replace the screws fixing the shock absorber to the bracket and tighten at the prescribed torque

Locking torques (N*m)

Shock absorber bottom fixing $20 \div 27$ Nm



Overhaul

- The caliper - shock absorber fixing bracket is provided with two roller bearings spaced from one another as shown in the figure



- Remove the two roller bearings from the bracket using the specific tool from the shock absorber coupling side, as shown in the figure

Specific tooling

020376Y Handle for punches

020441y 26 x 28 mm adapter

020365y 22 mm guide



- Remove the oil guard on the wheel hub side using a screwdriver as shown in the figure



- Suitably support the shock absorber - brake caliper bracket
- Using the specific tool, install a new oil guard and move it to travel end

Specific tooling

020376Y Handle for punches

020360Y 52 x 55 mm adaptor



- Using the specific tool, install a new roller bearing on the shock absorber side and move it to travel end

Specific tooling

020036y Drift



- Suitably support the shock absorber - brake caliper bracket
- Using the specific tool, install a new oil guard and move it to travel end

Specific tooling

020037y Drift



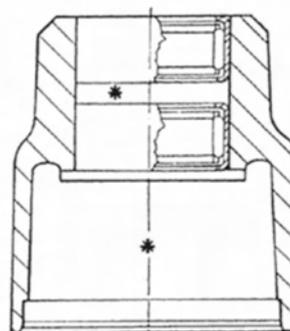
Refitting

- Using a suitable drift, drive out the two needle bearings from the side opposite to the assembly side.

CAUTION

BEFORE REFITTING, USE GREASE IN THE AREAS MARKED WITH AN ASTERISK.

Specific tooling



020036y Drift

020037y Drift

Recommended products

ZETA 2 Grease for steering wheel bearings and pin seats

Lithium soap and zinc oxide grease NLG12

Steering bearing

Removal

- Use the special tool to remove the lower race of the top bearing and the upper race of the bottom bearing from the frame.

N.B.

THE LOWER BEARING RACE CAN BE PRISED OFF BY LEVERING IT WITH A SCREWDRIVER OR SIMILAR.

Specific tooling

020004Y Drift for removing thrust rings from steering head tube

- Using the specific tool, remove the fifth wheel seat and the dust guard on the steering tube as shown in the figure. Proceed by slightly hitting with a mallet.



Specific tooling

020004Y Drift for removing thrust rings from steering head tube

- Using the specific tool, replace the dust guard and the fifth wheel seat on the steering tube to abutment.



Specific tooling

006029y Drift for fitting thrust ring seats on steering tube

Rear

Removing the rear wheel

- Straighten the split pin and remove.
- Remove the central nut as shown in the figure.

Refitting the rear wheel

- Fit the wheel and tighten the central nut to the prescribed torque.
- Fit the nut cap and insert the split pin, peening over the ends as shown in the figure.



Locking torques (N*m)

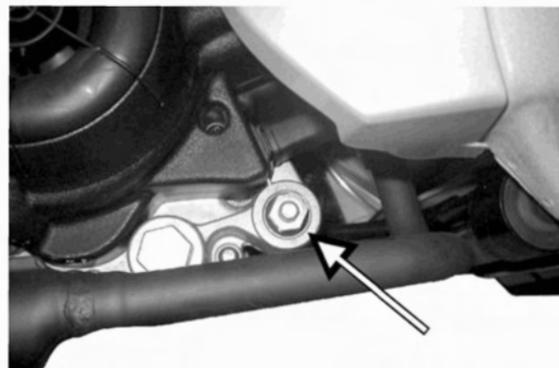
Tightening torque 137 ÷ 152 N·m

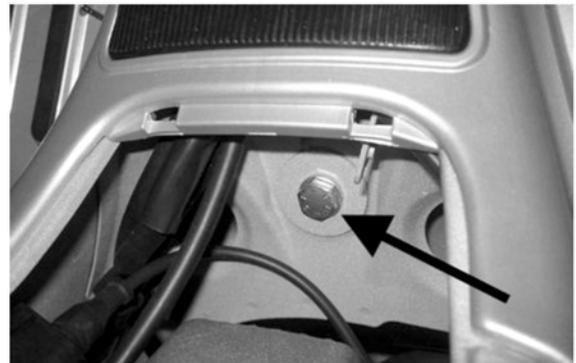
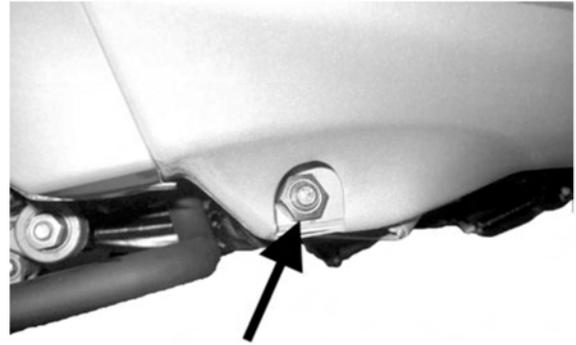
Swing-arm



Removal

To remove the swing-arm, loosen the three fixings shown in the picture.





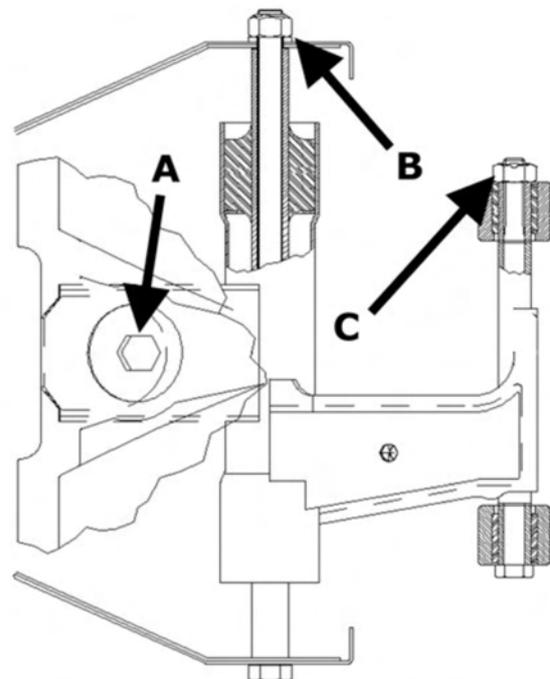
Refitting

Upon refitting, tighten to the prescribed torque

Locking torques (N*m)

Component C 33 ÷ 41 Component B 44 ÷ 52

Component A 33 ÷ 41

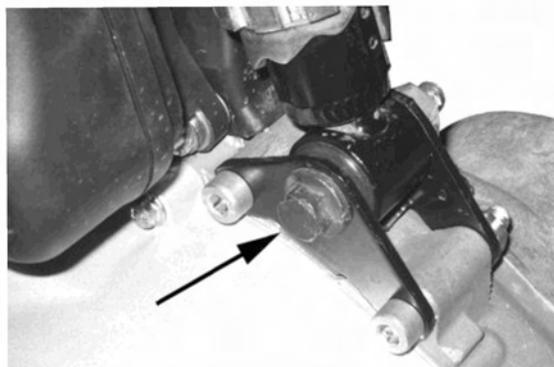
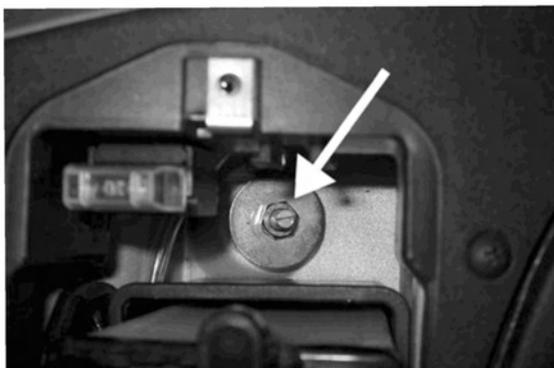


Shock absorbers

Removal

- To replace the shock absorber, it is necessary to remove the the battery access door, in order to gain access to the nut fixing the shock-absorber to the frame. Then, remove the bolt fixing the shock-absorber to the engine.

- Upon refitting, tighten the nut securing the shock-absorber to the frame, and the bolt fixing it to the engine, to the prescribed torque.



Locking torques (N*m)

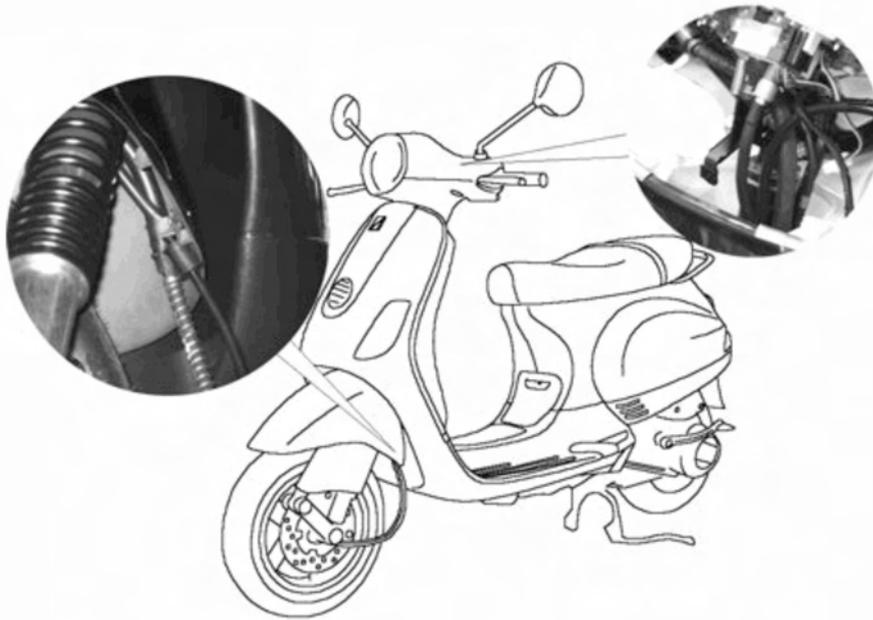
Shock absorber/engine pivot pin $33 \div 41$ N·m

Shock absorber/frame nut $20 \div 25$ N·m

INDEX OF TOPICS

BRAKING SYSTEM

BRAK SYS



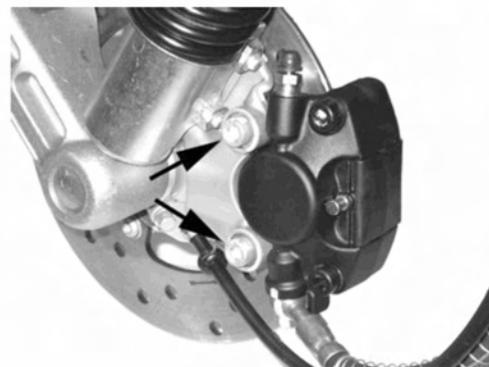
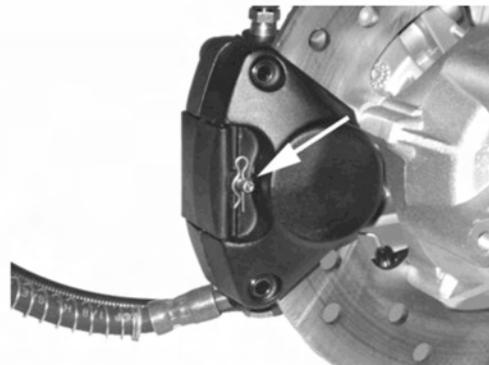
Front brake calliper

Removal

- Remove the front wheel.
- Remove the stop of the brake pad pin.
- Using a pin partially remove the brake pad pin.
- Remove the two screws attaching the brake calliper to the chassis and then remove the brake calliper with hose.
- Complete the extraction of the brake pad pin, spring and pads.

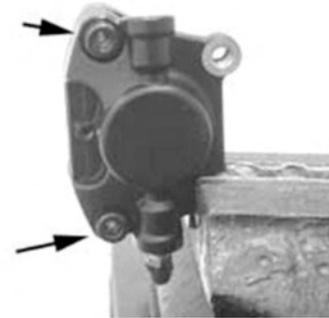
N.B.

IF THE BRAKE CALLIPERS NEED TO BE REPLACED OR OVERHAULED, BEFORE REMOVING THE SCREWS ATTACHING THE CALLIPER TO THE SUPPORT BRACKET, FIRST LOOSEN THE OIL COUPLING SET SCREW.



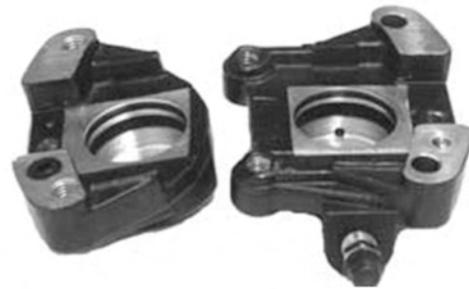
Overhaul

- Remove the front brake calliper
- Adequately support the brake calliper in a clamp
- Remove the two calliper coupling screws as indicated in the photo
- Remove the two pistons of the calliper body using small jets of compressed air through the hole for adding brake fluid
- Remove the dust seal ring and seal ring for each calliper half. - Remove the two seal rings of the calliper half



N.B.

DO NOT SCRATCH THE HALF-CALIPER SEATS WHILE REMOVING THE RINGS.



- Make sure there are no scratches on the pistons and related seats, if so replace them.
- Wash and carefully dry all the components
- Fit new seal and dust seal rings
- Refit the pistons in their seats making sure to lubricate them with brake fluid
- Rejoin the two calliper halves and lock the two screws to the prescribed torque



Locking torques (N*m)

Caliper coupling screws 22 ÷ 27 Nm



Refitting

-
- Insert the brake pads in the calliper
 - Insert the pad set pin and spring making sure to position the end of it towards the bleed screw as indicated in the photo.
 - Insert the stop of the brake pad pin.



N.B.

A WRONG POSITIONING OF THE PADS ACCORDING TO THE DIRECTION OF ROTATION CAN IMPAIR THE BRAKE PERFORMANCE AND NOISELESSNESS.



Keeping the pads in contact with the pistons insert the calliper in the brake disc.

- Secure the calliper to the fork using the two screws with plastic washer to the prescribed torque as indicated in the photo



- Secure the brake hose coupling to the calliper and tighten to the prescribed torque.
- Bleed the system and refit the front wheel

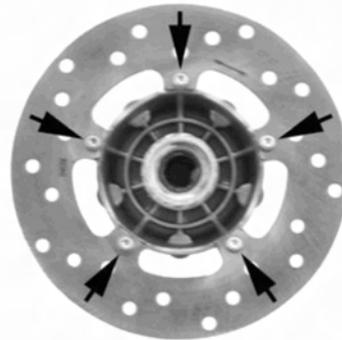
Locking torques (N*m)

Brake caliper support fixing screws 20 ÷ 25 Nm Brake pipe union: 20÷25 N•m

Front brake disc

Removal

- Remove the front wheel
- Remove the front brake calliper
- Remove the hub with the disc using the wheel axle nut
- Adequately support the hub with the disc and use the five screws shown in the photo to remove the brake disc

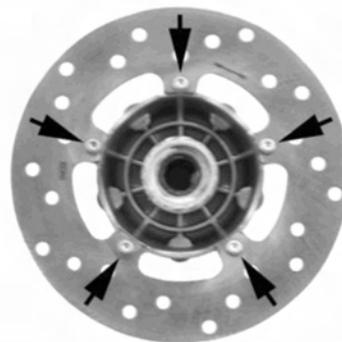


Refitting

- Carry out the operations in the reverse order from disassembly making sure to respect the rotation direction of the disc indicated by an arrow on the disc
- Lock the 5 screws to the prescribed torque

Locking torques (N*m)

Brake disc screws: 6 +0,5 -1 Nm



Disc Inspection

- Remove the front wheel
- Using a micrometer, check the disc thickness as shown in the figure.

- Repeat the measurement in at least 6 points of the disc
- Remove the front brake caliper
- To fix the specific tool, use a metal plate with threaded hole M8 and secure it to one of the two front brake caliper couplings
- Place the comparator on the disc outside edge
- Turn the wheel hub and check the disc deviation



Specific tooling

020335Y Magnetic stand and comparator

Characteristic

Standard thickness:

4 +0,2 -0,2mm

Max admissible deviation:

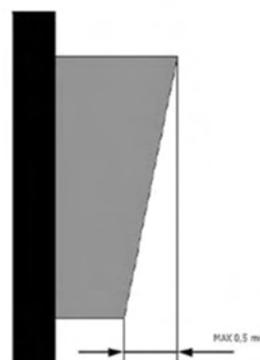
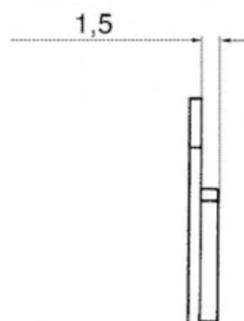
0,1 mm



Front brake pads

Removal

- Remove the front wheel
- Remove the brake calliper
- Remove the protection cover, the pin and leaf spring
- Extract the pads
- Check for any faults or deformation. If there is any replace them
- Make sure the friction material thickness is greater than 1,5mm. If not replace it
- In addition the replacement must be made if there are remaining greater thicknesses when the pad has not worn uniformly. A difference in remaining friction material thickness of 0.5 mm is allowed.



Refitting

- Insert the brake pads
- Insert the set pin making sure to position the clip with the ends of it towards the bleed screw as indicated in the photo.
- Insert the stop of the brake pad pin and then the protection cover
- Secure the front brake calliper to the bracket and lock the 2 screws to the prescribed torque.

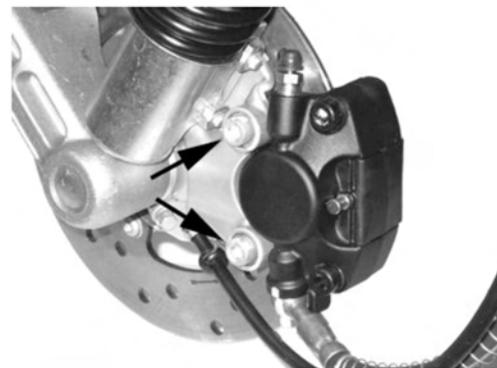


CAUTION

BEFORE USING THE BRAKE, PULL THE LEVER FOR A FEW TIMES.

Locking torques (N*m)

Rear brake caliper fastening screws 20 ÷ 25 Nm



Fill

Front

- Remove the rubber cap from the bleed screw.
- Insert a rubber tube in the bleed screw to recover the brake fluid.
- Use the right brake lever to load and pressurize the system.
- Keeping the right lever pulled loosen the bleed screw to let the air out of the system. Then tighten the bleed screw
- Release the brake lever
- Repeat the operation until only brake fluid comes out of the rubber tube.
- Remove the tube and put the rubber cap from the bleed screw back on.
- Top up the level of the brake fluid in the reservoir. If necessary bleeding can be carried out using a



specific vacuum pump

N.B.

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

N.B.

DURING BLEEDING, AVOID ANY CONTACT BETWEEN THE BRAKE FLUID AND THE BODY TO PREVENT DAMAGES. ALSO, WHILE BLEEDING THE BRAKE CALIPER AVOID ANY CONTACT BETWEEN THE FLUID AND THE BRAKE DISCS OR PADS. FAILURE TO OBSERVE THIS PRECAUTION AFFECTS THE BRAKING SYSTEM PERFORMANCE.

Specific tooling

020329Y Pump MITYVAC

Locking torques (N*m)

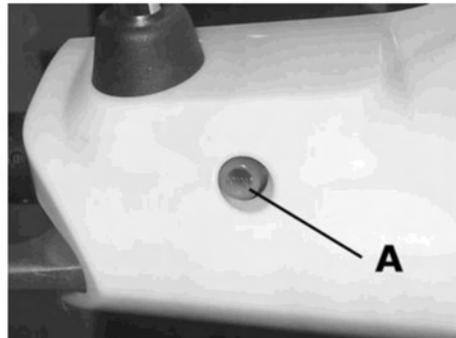
System bleed caliper union: 20 ÷ 25 Nm

Brake fluid level check

Proceed as follows:

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

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



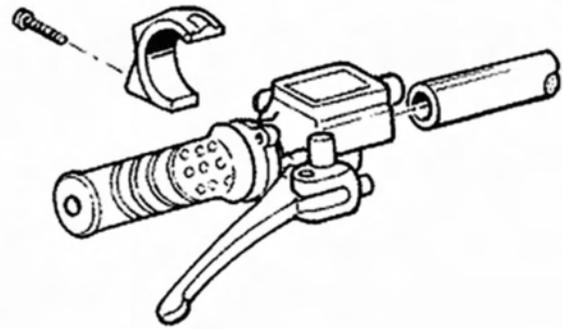
Front brake pump

- After removing the front and rear handlebar cover remove the two U clamp fixing screws (see figure).
- Disconnect the brake tube and allow the brake fluid to flow into a receptacle.

- When refitting, follow the operations in the reverse order.
- Tighten the hose to the prescribed torque and bleed the system.

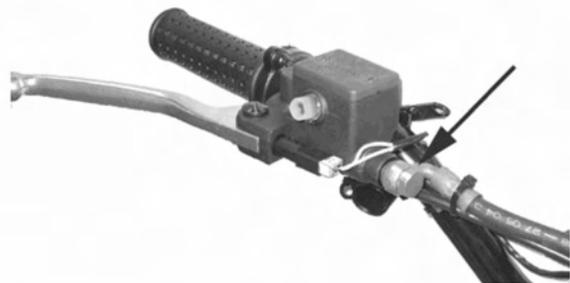
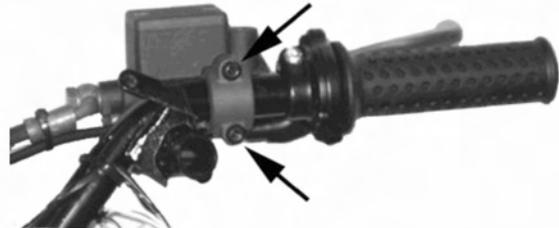
Locking torques (N*m)

Oil pump-hose joint 16÷20 N·m



Removal

- Remove the front and rear handlebar cover
- Remove the two screws securing the brake pump to the handlebars as shown in the photo
- Remove the oil hose coupling from the pump
- Remove the brake light switch connector



Overhaul

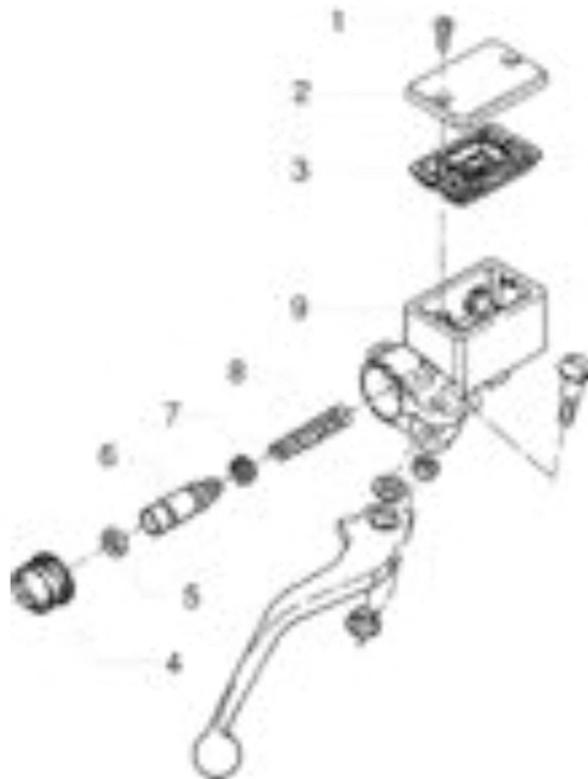
Proceed as follows:

- 1) remove the brake lever releasing the fixing screw; open the cover (2) and recover the membrane (3);
- 2) unscrew the cap (4) and extract the internal components in a sequence;
- 3) check that:
 - the pump body exhibits no internal scratches or corrosion;
 - the piston exhibits no abnormal wear or scratches;the piston return spring is in good working order.

CAUTION

ANY TIME THE PUMP IS OVERHAULED, ALL SEALING COMPONENTS MUST BE REPLACED.

1. Tank cap screw.
2. Tank cap.
3. Membrane.
4. Bellows.
5. Sealing ring.
6. Piston.
7. Gasket.
8. Spring.
9. Tank

**Refitting**

For re-assembly, perform the operations for removal in the reverse order according to the tightening torques.

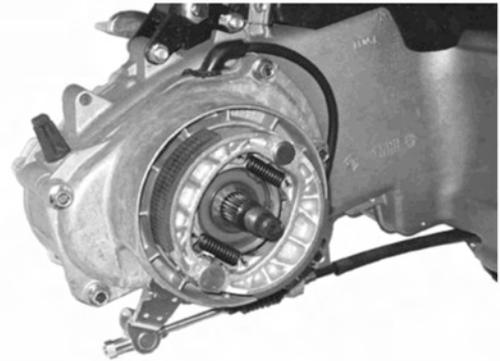
Locking torques (N*m)

Oil piping union to pump: **20÷25** Screws fixing the brake pump to the handlebar: **7 ÷ 10 Nm**

Rear drum brake

After removing the muffler and wheel proceed as follows:

- 1.Remove the shoe spring using the specific pliers.
- 2.Remove the shoes using a lever.
- 3.Fit the new shoes using a mallet and hitting lightly.
- 4.Hook the spring using the specific pliers.

**Specific tooling**

020325y Pliers for brake-shoe springs

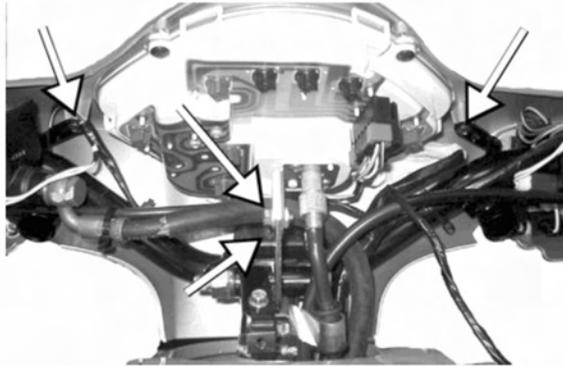
INDEX OF TOPICS

CHASSIS

CHAS

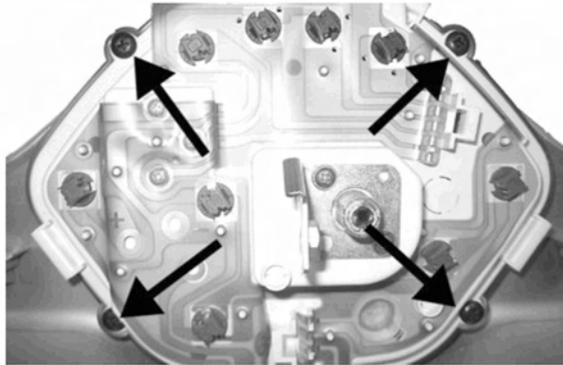
Rear handlebar cover

Remove the handlebar rear fairing after loosening the screws as shown in the figure.



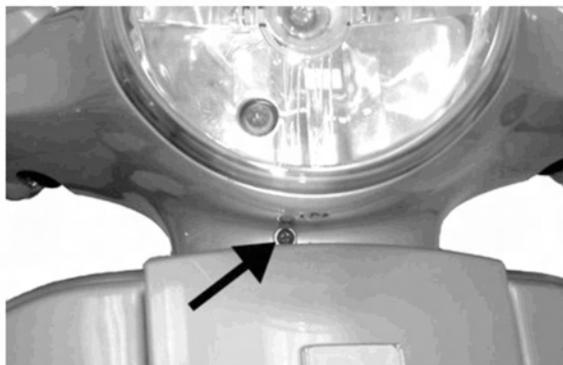
Instrument panel

To replace the instrument panel, loosen the 4 screws shown in the figure.



Front handlebar cover

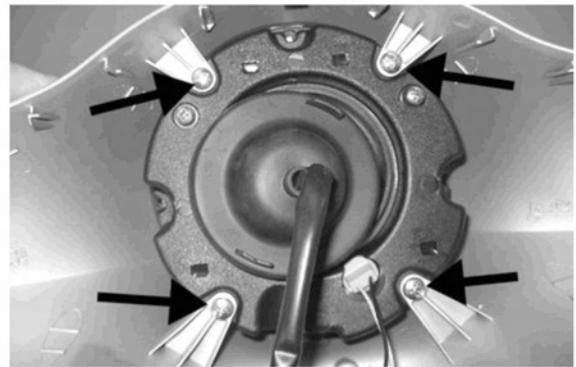
- Remove the 2 screws in the handlebar fairing and the screw under the headlight.
- Pull up to release the handlebar fairing and disconnect the headlight connections





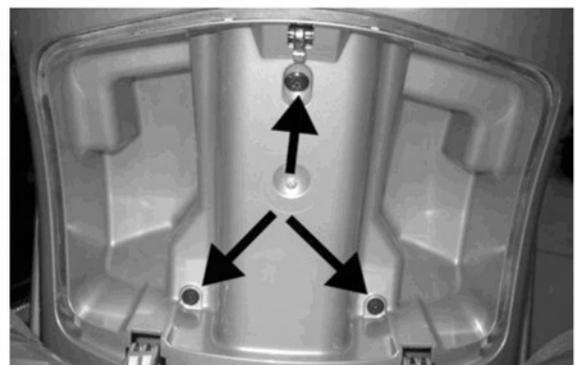
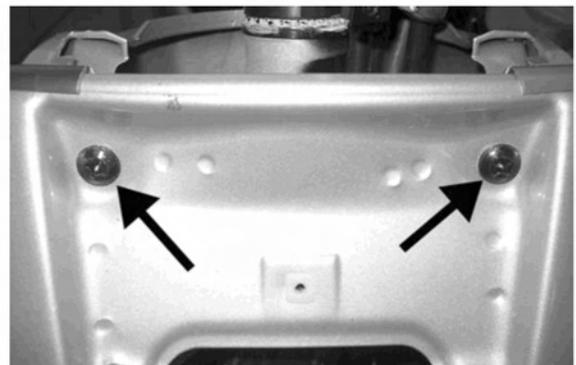
Headlight assy.

After removing the front handlebar cover, remove the 4 screws shown in the figure and remove the headlight.



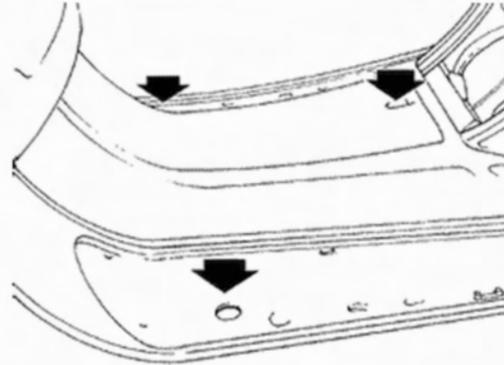
Knee-guard

- Loosen the two screws located under the front grille (see figure).
- Open the glove compartment door and remove the three screws located inside (see figure).



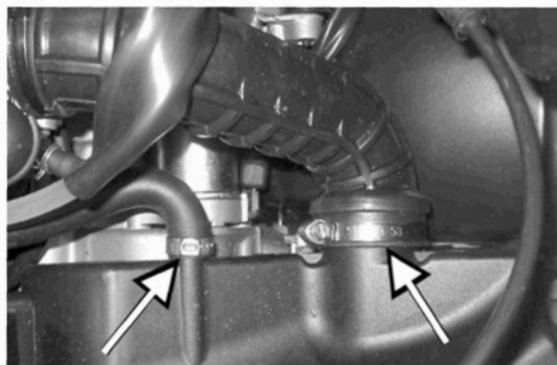
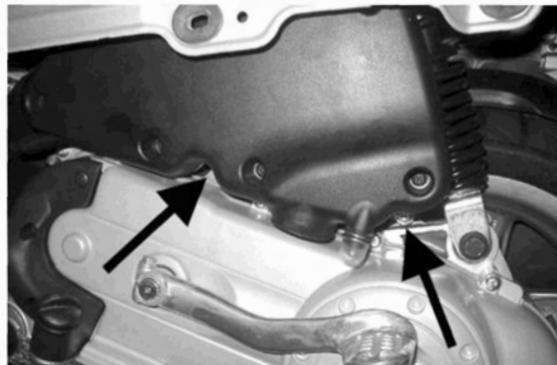
Footrest

- Loosen the three screws shown in the figure after removing the glove compartment and the side fairings.



Air filter

- Remove the helmet bay.
- After removing the side fairing, loosen the 2 screws shown in the figure and fix the air-box to the engine.
- Remove the two clamps shown in the figure.



Front mudguard

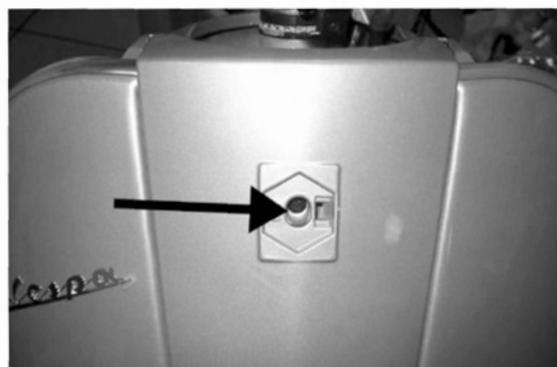
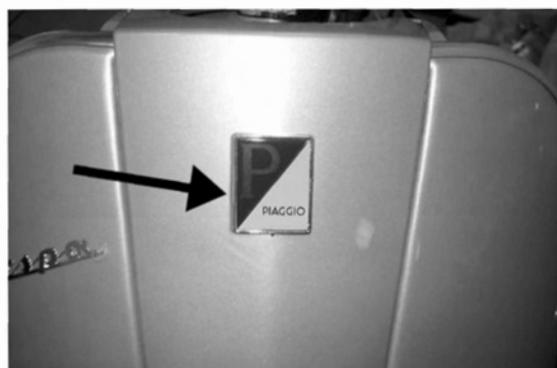
- To remove the front mudguard, remove the steering tube and release the front brake piping from the caliper
- Then, remove the three attachments fixing the mudguard to the steering tube as shown in the

figure



Front central cover

- Remove the «PIAGGIO» logo
- Release the screw shown in the figure
- Remove the radiator grill



INDEX OF TOPICS

PRE-DELIVERY

PRE DE

Aesthetic inspection

Predelivery checks:

- Paintwork
- Mating of plastics
- Scratches
- Dirt

Tightening torques inspection

Locks Inspection

- Safety locks
- Fixing screws

Safety locks:

Rear shock absorber top tightening

Rear shock absorber bottom tightening

Front wheel axle nut

Wheel hub nut

Oscillating arm pin - Chassis

Oscillating arm pin - Engine

Chassis arm-engine arm pin

Handlebar locking nut

Steering wheel lower ring nut

Steering wheel upper ring nut

Electrical system

Electrical system:

- Main switch
- Headlight: high-beam, low-beam, sidelight, and relevant warning lights
- Headlight adjustment as per statutory regulations
- Taillight, stop light
- Front and rear stop light switches

-
- Turn signals and relevant warning lights
 - Dashboard light
 - Gauges: fuel gauge
 - Dashboard warning lights
 - Horn
 - Choke

CAUTION

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

WARNING

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

CAUTION

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

WARNING

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

CAUTION

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

Levels check

Check the following levels:

- Hydraulic brake system fluid.
 - Rear hub oil
 - Engine oil
-

Road test

Road test:

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

Static test

Static inspection after test on the road:

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

CAUTION

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

CAUTION

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

Functional inspection

Functional Check:

Braking system (hydraulic)

- Lever stroke

Braking system (mechanical)

- Lever stroke

Clutch

- Proper performance check

Engine

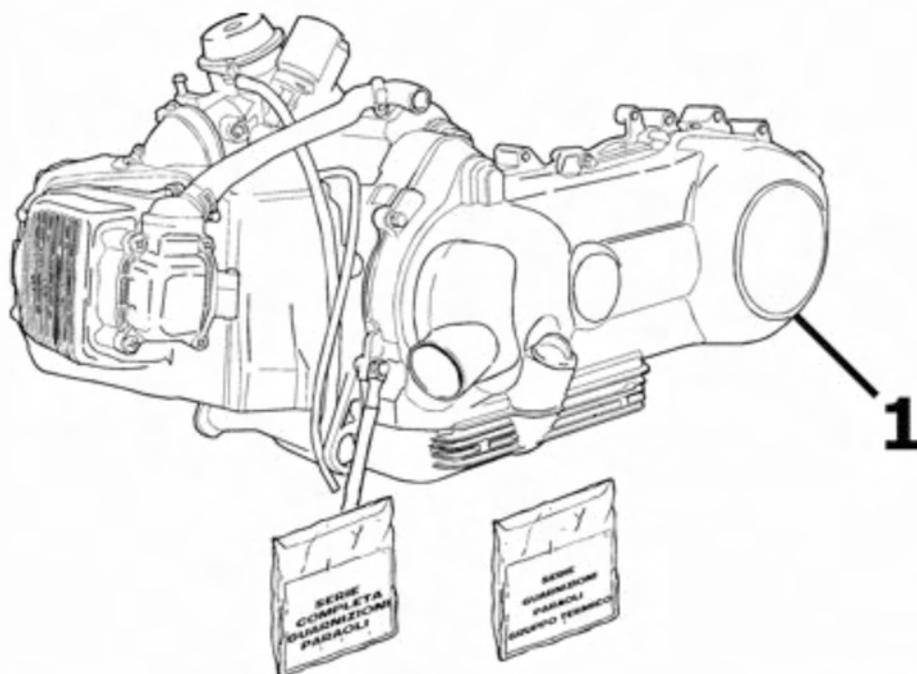
- Gas control stroke check Miscellaneous
 - Document check
 - Check of chassis no. and engine no.
-

- Ancillary tools
 - Plate assembly
 - Check of locks
 - Tyre pressure check
 - Installation of rear-view mirrors and optional fixtures
-

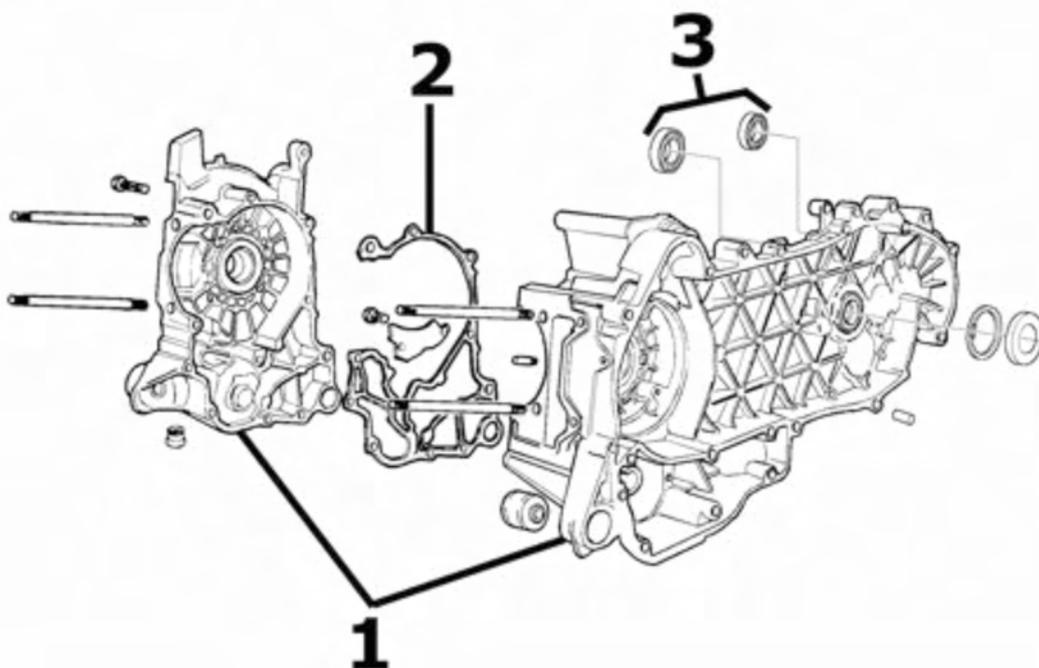
INDEX OF TOPICS

TIME

TIME

Engine
**ENGINE**

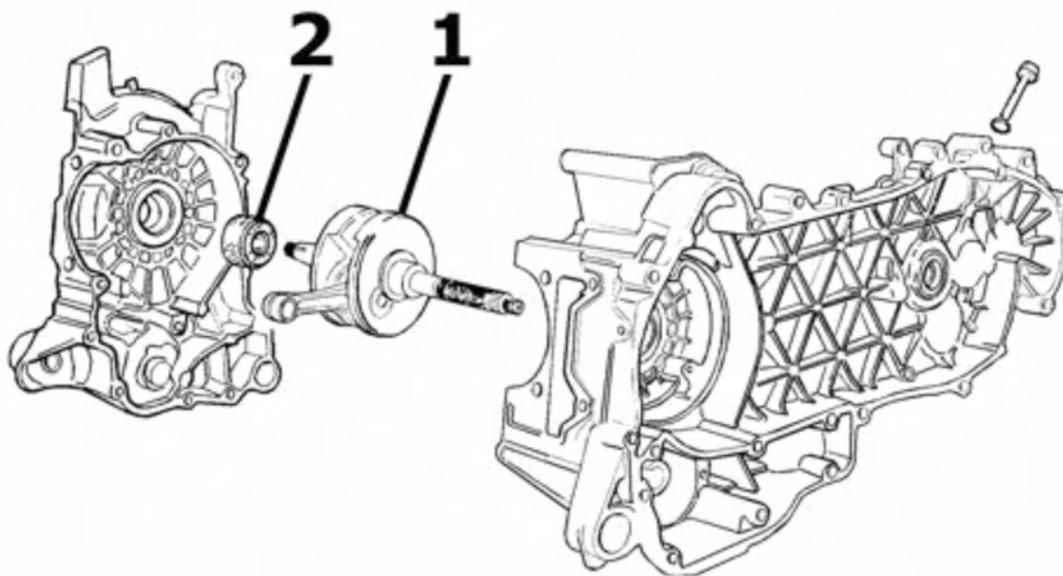
	Code	Action	Duration
1	001001	Engine to frame - Disassembly and reassembly	

Crankcase


CRANKCASE

	Code	Action	Duration
1	001133	Engine crankcase - Replacement	
2	001153	Half crankcase gasket - Replacement	
3	002031	Rear wheel hub bearings - Replacement	

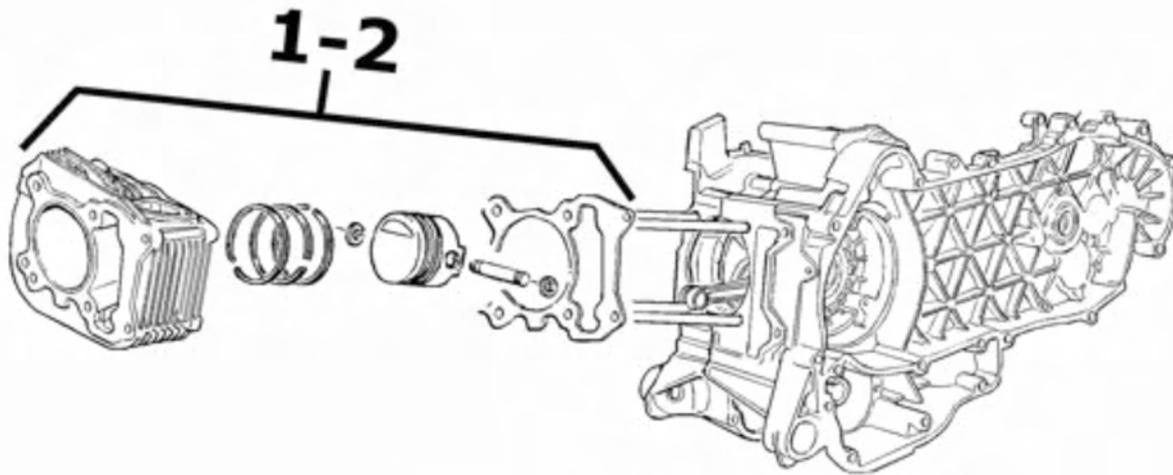
Crankshaft



DRIVING SHAFT

	Code	Action	Duration
1	001117	Driving shaft - Replacement	
2	001099	Oil seal, flywheel side - Replacement	

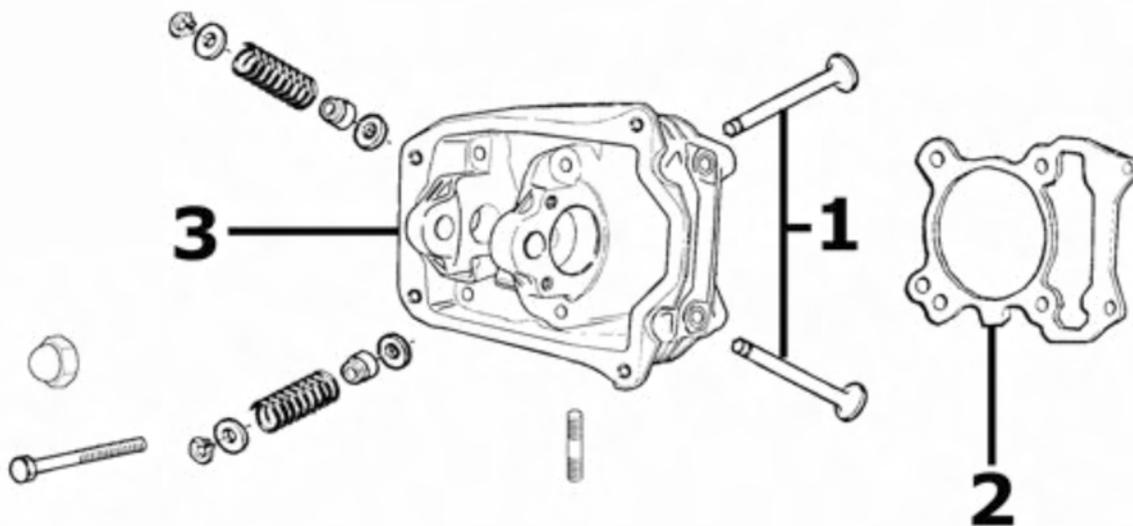
Cylinder assy.



PISTON CYLINDER

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

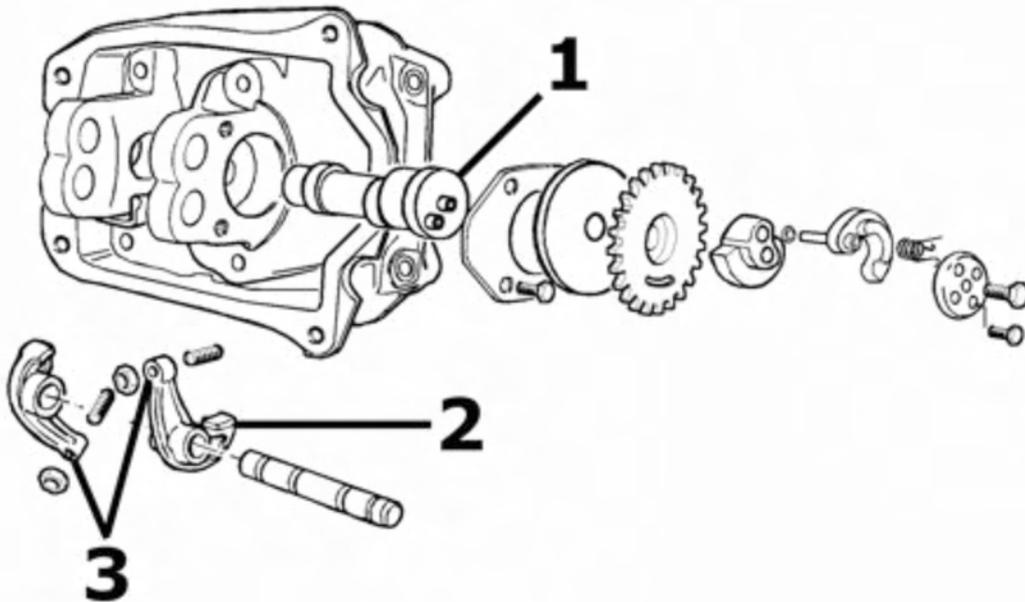
Cylinder head assy.



HEAD

	Code	Action	Duration
1	001045	Valves - Replacement	
2	001056	Head gasket - Replacement	
3	001126	Head - Replacement	

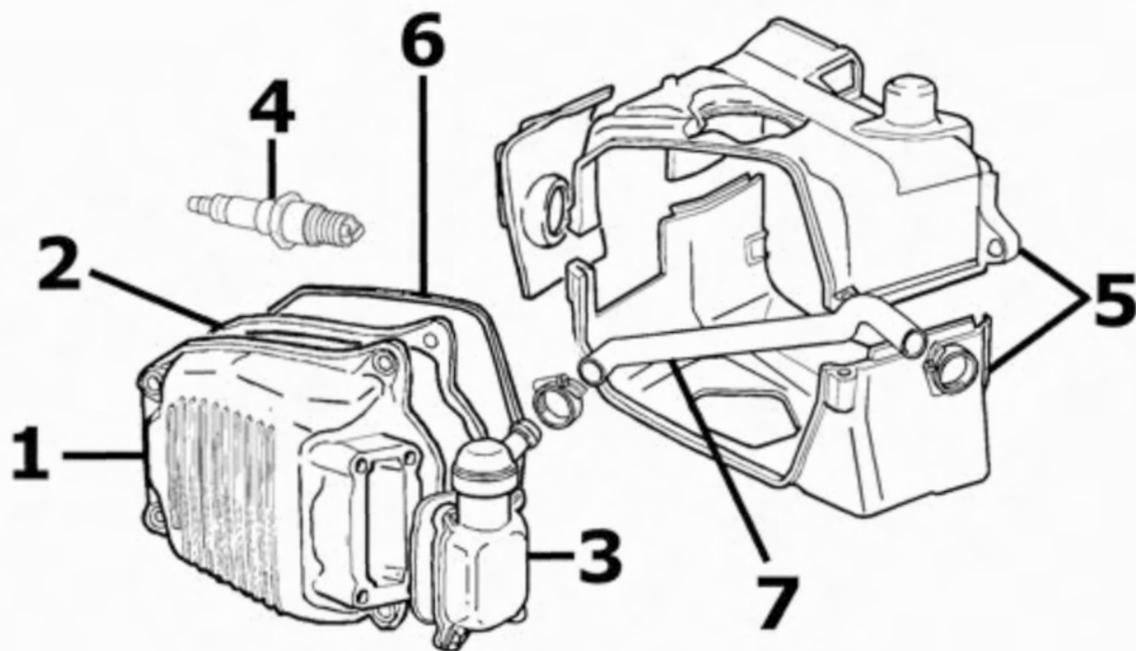
Rocker arms support assy.



ROCKER ARMS SUPPORT ASSY.

	Code	Action	Duration
1	001044	Camshaft - Replacement	
2	001148	Valve rockers - Replacement	
3	001049	Valves - Adjustment	

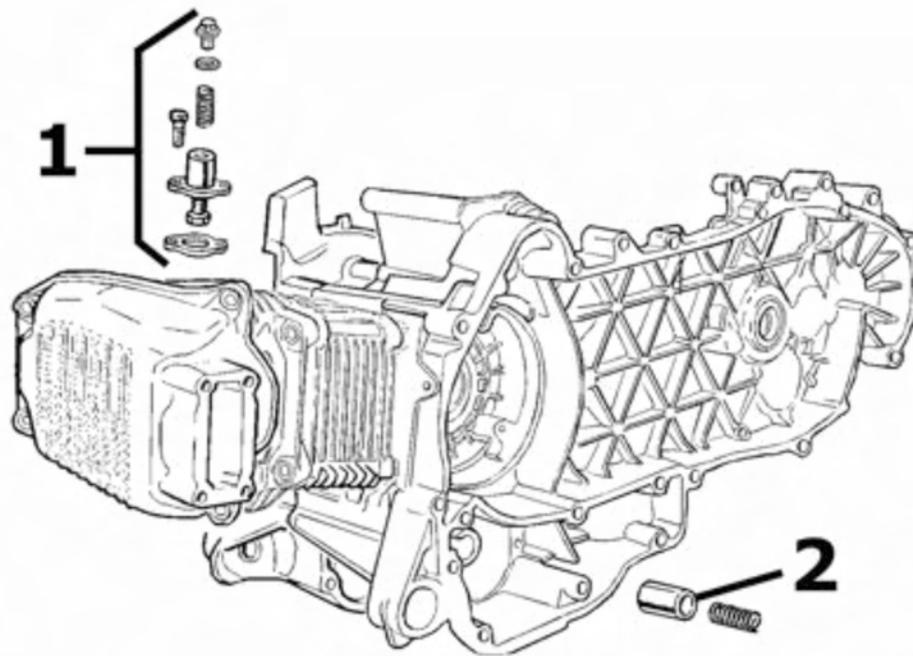
Cylinder head cover



HEAD COVER

	Code	Action	Duration
1	001089	Head cover - Replacement	
2	001088	Head cover gasket - Replacement	
3	001159	Oil vapours recovery bowl - Overhaul	
4	001093	Spark plug - Replacement	
5	001097	Cooling case - Replacement	
6	001091	Head cover oil seal ring	
7	001074	Oil vapour recovery pipe - Replacement	

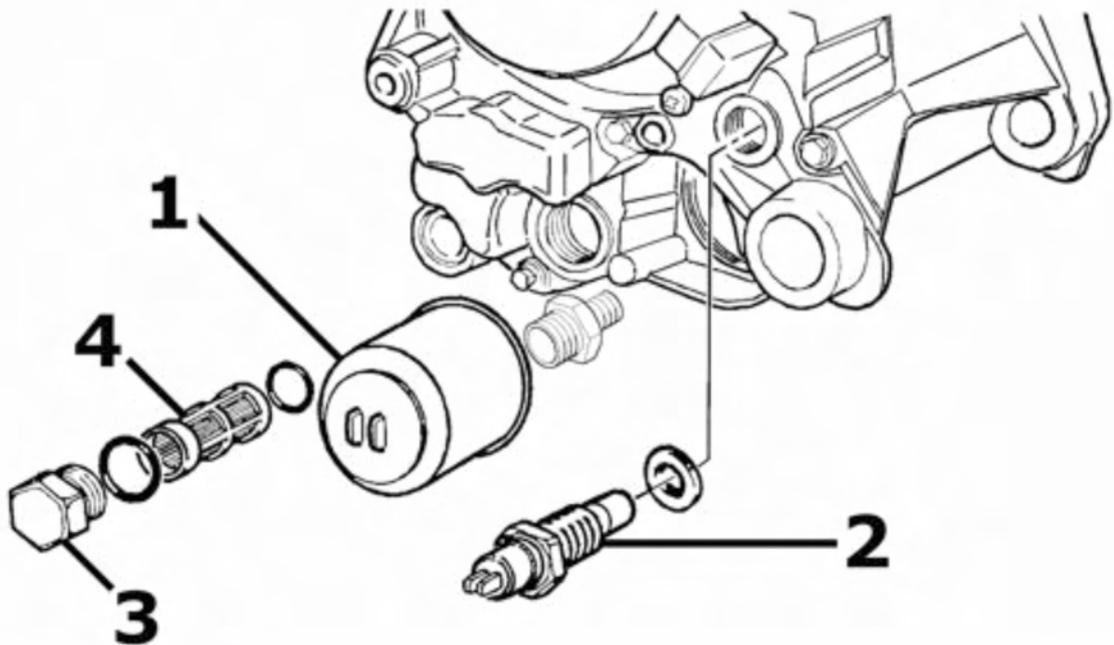
Chain tensioner



CHAIN TIGHTENER

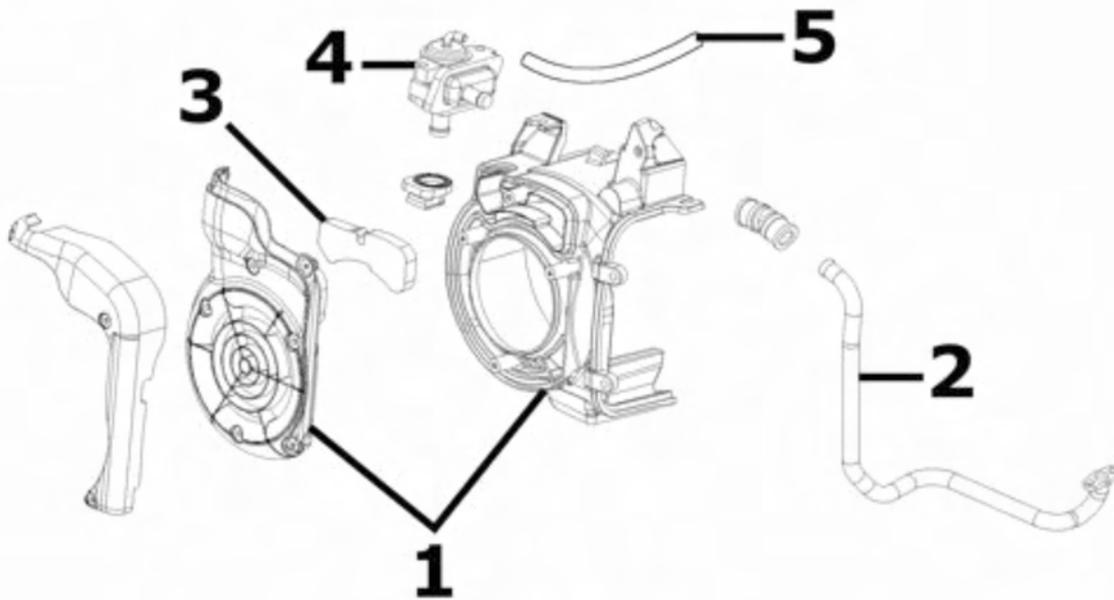
	Code	Action	Duration
1	001129	Chain tightener - Replacement	
2	001124	Lubrication by pass - Replacement	

Oil filter



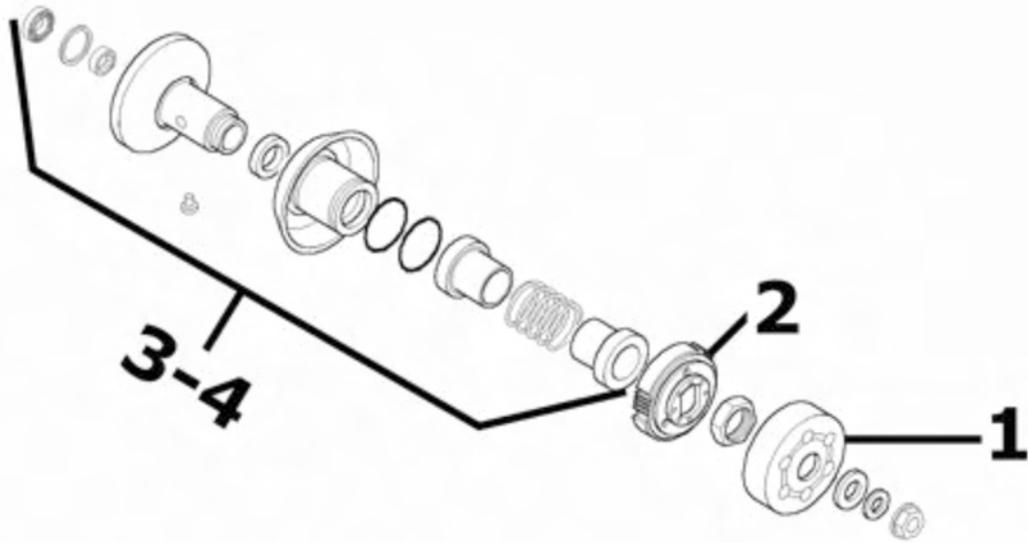
OIL FILTER

	Code	Action	Duration
1	001123	Oil filter - Replacement	
2	001160	Oil pressure sensor - Replacement	
3	003064	Engine oil - Replacement	
4	001102	Oil net-filter - Replacement / Cleaning	

Flywheel cover**FLYWHEEL COVER**

	Code	Action	Duration
1	001087	Flywheel cover - Replacement	
2	001163	Secondary air-exhaust manifold - Replacement	
3	001161	Secondary air filter- Replacement / Cleaning	
4	001174	SAS valve - Replacement	
5	001164	Secondary air-crankcase manifold - Replacement	

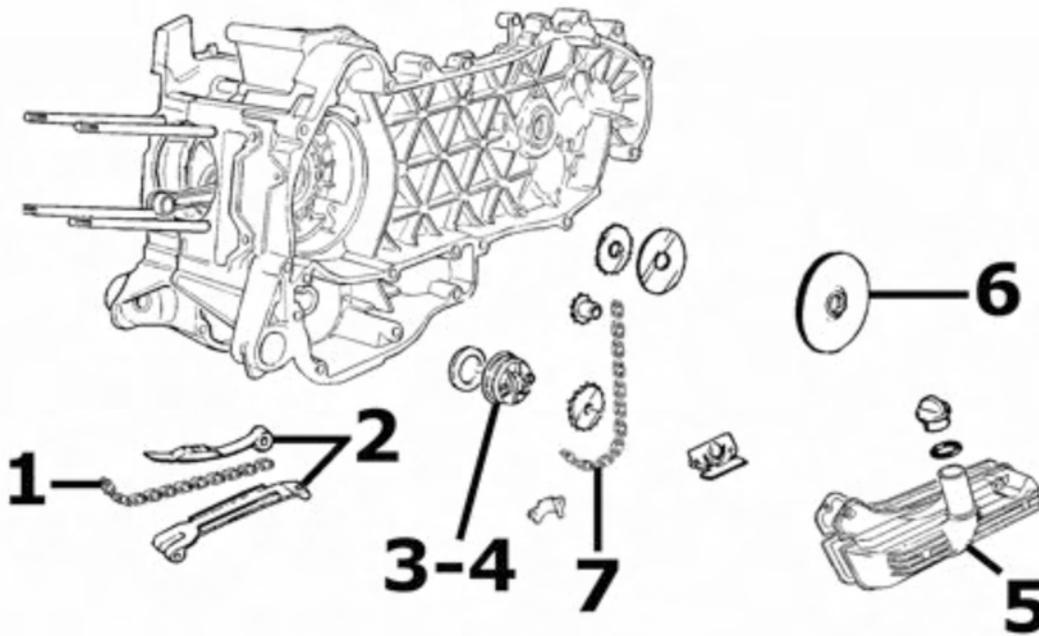
Driven pulley



DRIVEN PULLEY - CLUTCH

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

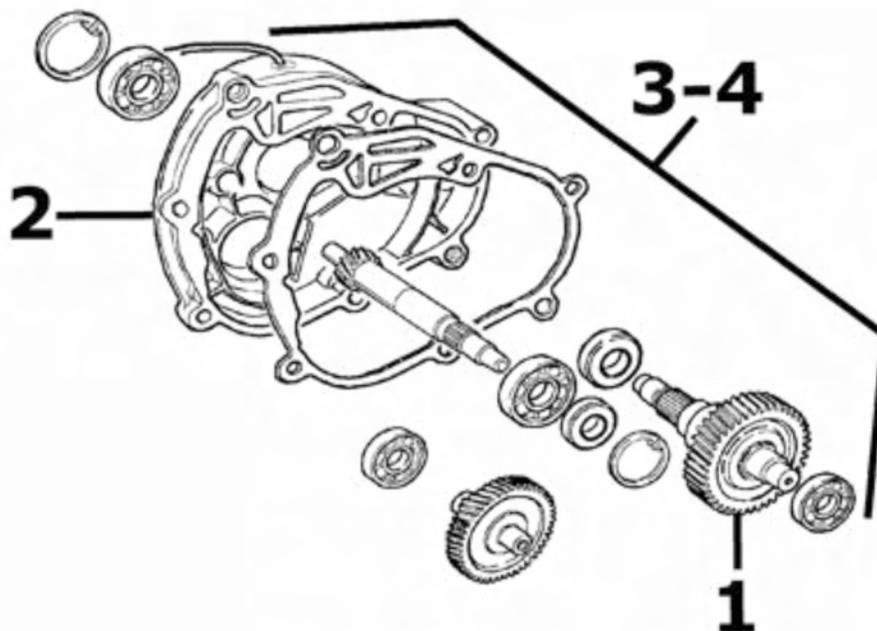
Oil pump



OIL PUMP

	Code	Action	Duration
1	001051	Belt/Timing chain - Replacement	
2	001125	Chain guide pads - Replacement	
3	001042	Oil pump - Overhaul	
4	001112	Oil pump - Replacement	
5	001130	Oil sump - Replacement	
6	001100	Oil seal clutch side - Replacement	
7	001122	Oil pump chain - Replacement	

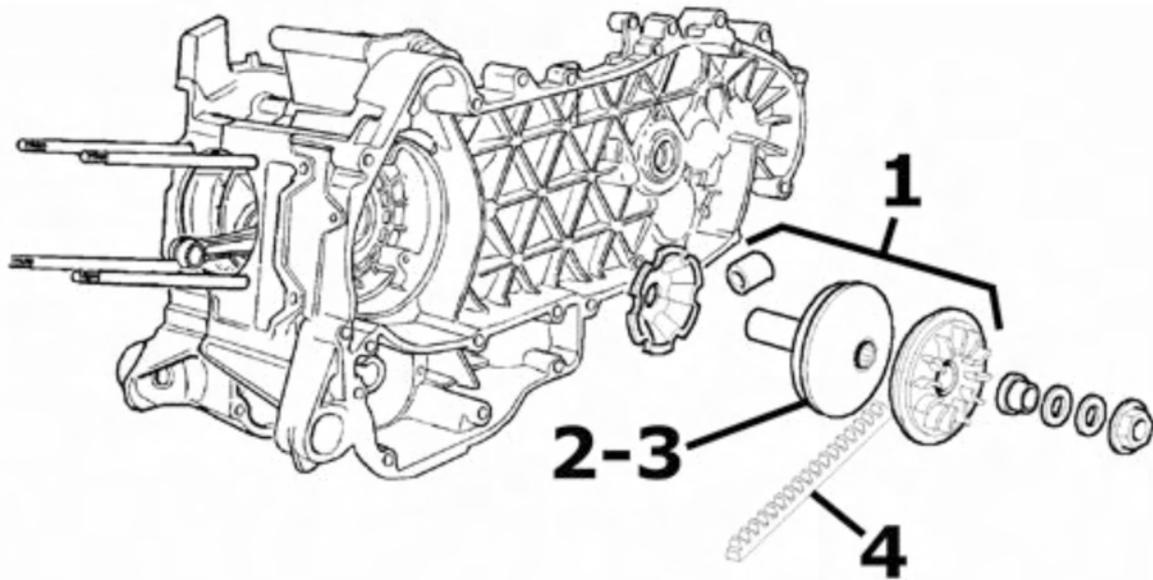
Final gear assy.



REDUCTION GEAR

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

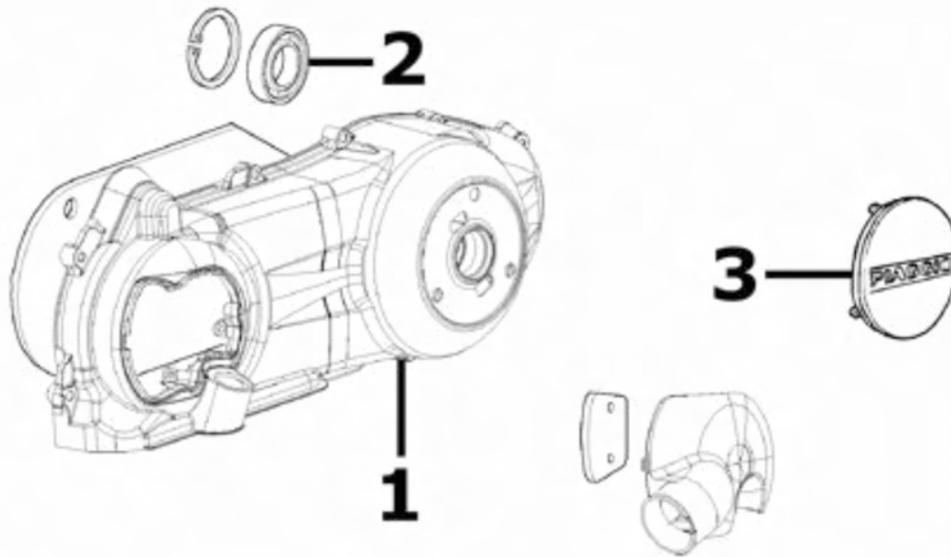
Driving pulley



DRIVING PULLEY

	Code	Action	Duration
1	001066	Driving pulley - Disassembly and reassembly	
2	001086	Driving half pulley - Replacement	
3	001177	Variator rollers / slides - Replacement	
4	001011	Driving belt - Replacement	

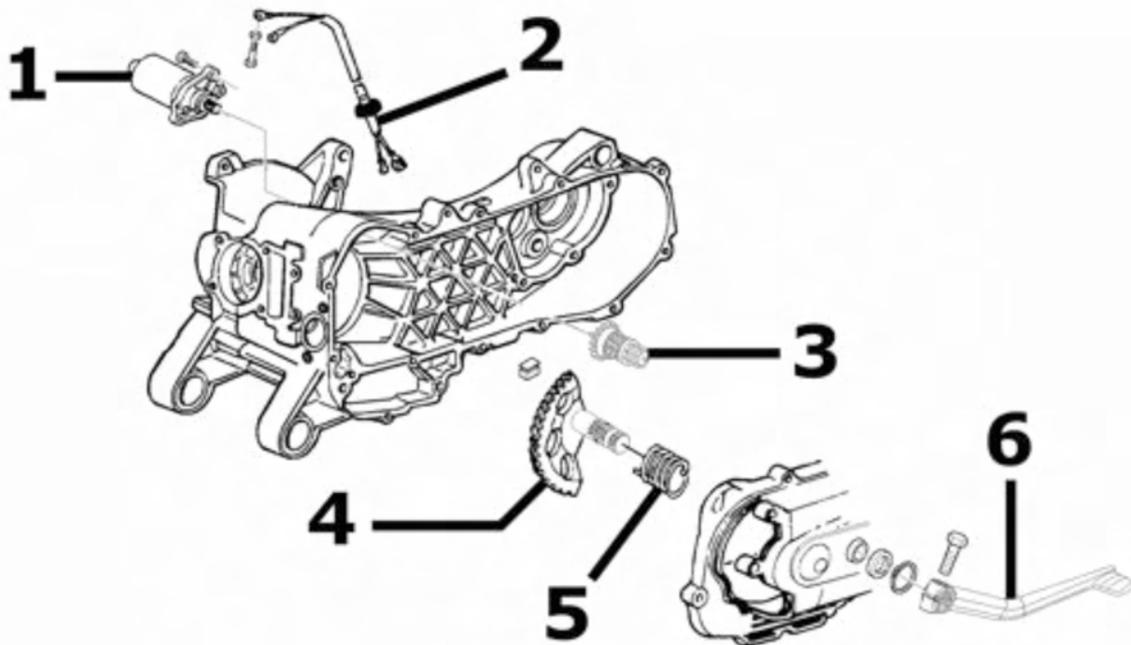
Transmission cover



TRANSMISSION COVER

	Code	Action	Duration
1	001096	Transmission casing cover - Replacement	
2	001135	Transmission cover bearing - Replacement	
3	001065	Internal transmission cover - Removal and refitting	

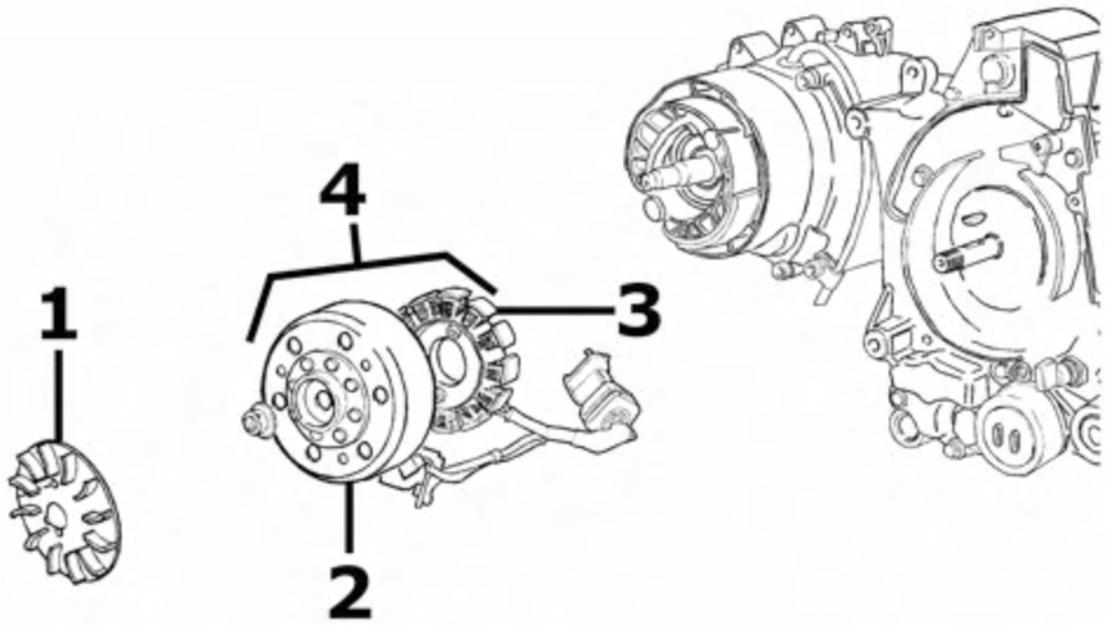
Starter motor



ELECTRIC START

	Code	Action	Duration
1	001020	Starter engine - Replacement	
2	005045	Starting motor cables - Replacement	
3	001017	Starter pinion - Replacement	
4	001021	Kick starter - Overhaul	
5	008008	Starting sector spring - Replacement	
6	001084	Starting lever - Replacement	

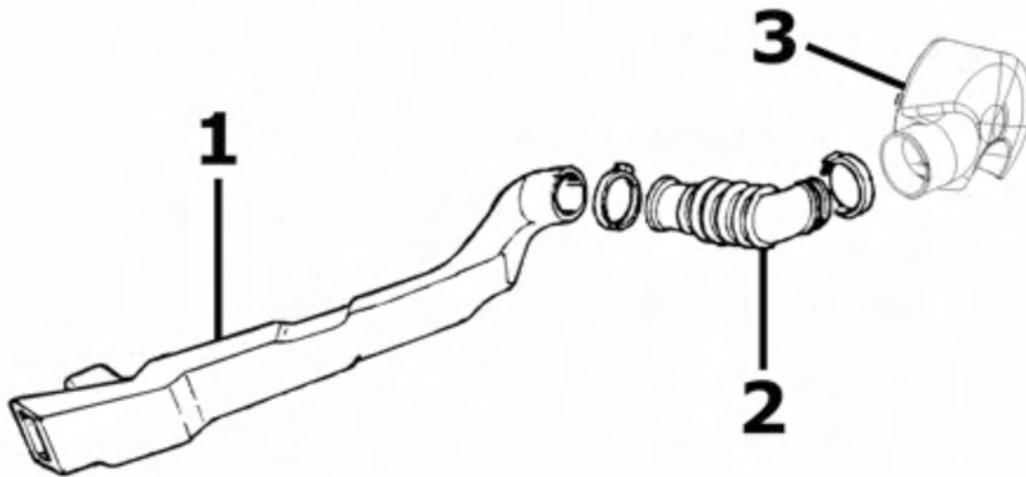
Flywheel magneto



FLYWHEEL - FAN

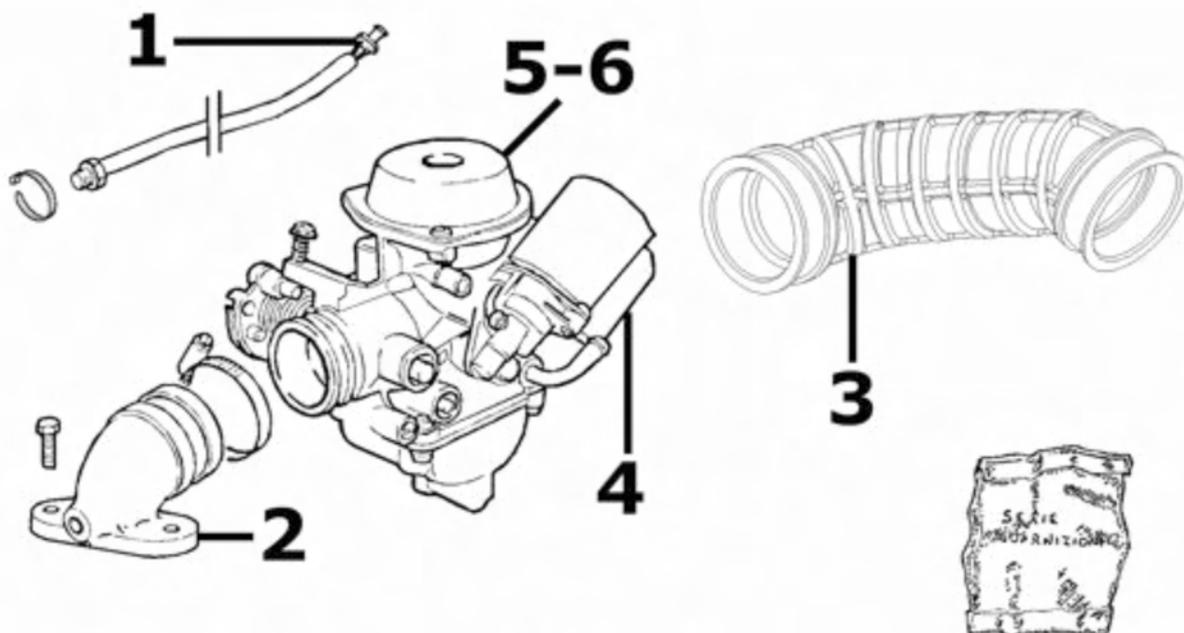
	Code	Action	Duration
1	001109	Cooling fan - Replacement	
2	001173	Rotor - Replacement	
3	001067	Stator - Disassembly and re-assembly	
4	001058	Flywheel - Replacement	

Belt cooling duct

**BELT COOLING PIPE**

	Code	Action	Duration
1	001170	Cooling air duct - Replacement	
2	001132	Transmission air intake tube - Replacement	
3	001131	Transmission air inlet - Replacement	

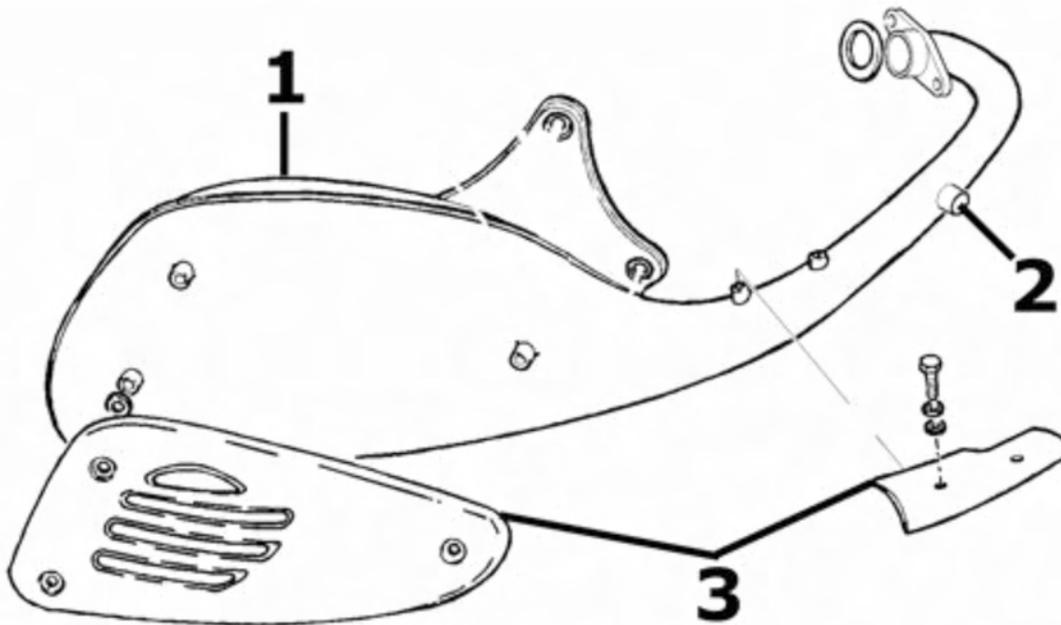
Carburettor



CARBURETTOR

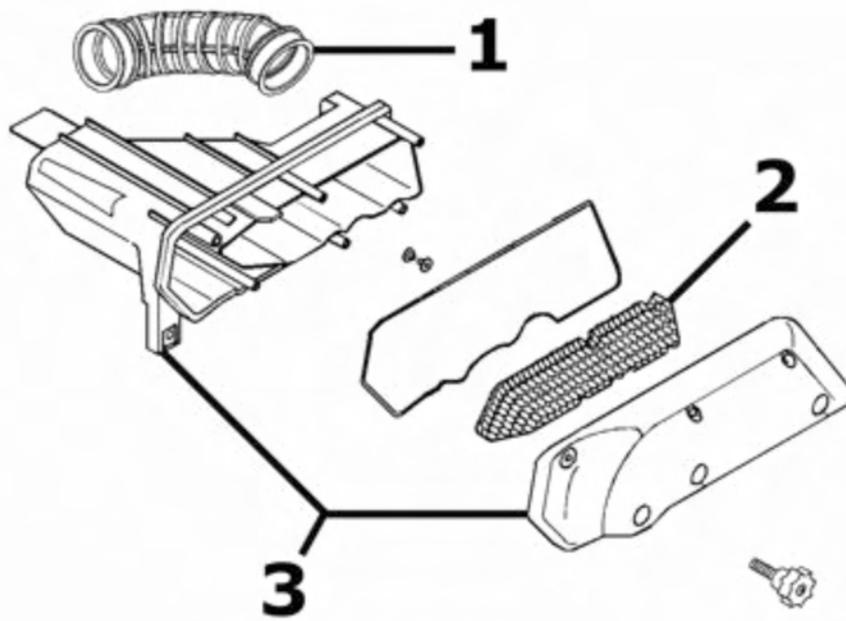
	Code	Action	Duration
1	001082	Carburettor heating resistor - Replacement	
2	001013	Intake hose - Replacement	
3	004122	Carburettor-filter bellow - Replacement	
4	001081	Automatic starter device - Replacement	
5	001008	Carburettor - Overhaul	
6	001063	Carburettor - Replacement	

Exhaust pipe

**MUFFLER**

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

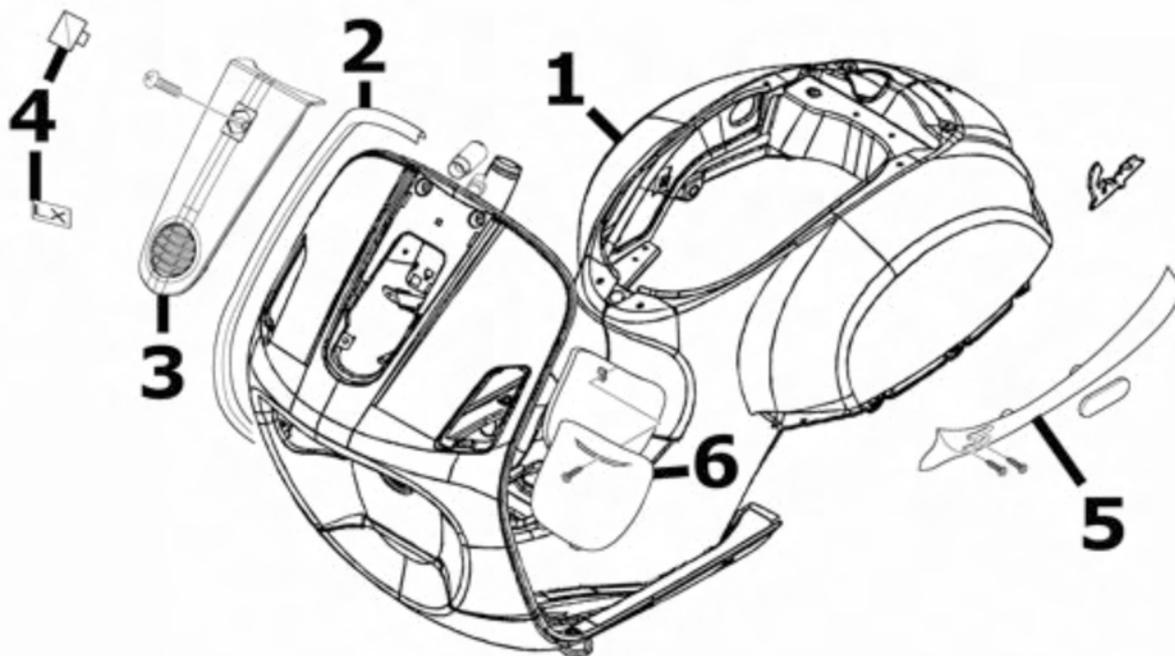
Air cleaner



AIR FILTER

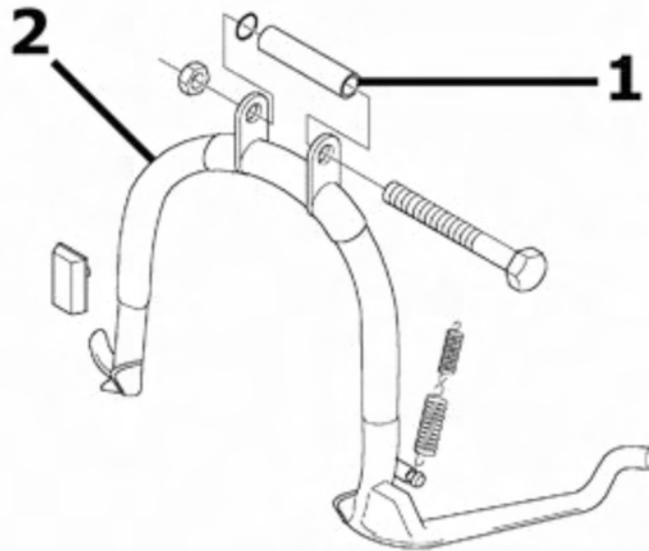
	Code	Action	Duration
1	004122	Carburettor filter manifold - Replacement	
2	001014	Air Filter - Replacement/Cleaning	
3	001015	Air filter box - Replacement	

Frame

**CHASSIS**

	Code	Action	Duration
1	004001	Chassis - Replacement	
2	004023	Front shield beading - Replacement	
3	004149	Front shield cover - Replacement	
4	004159	Plates / Stickers - Replacement	
5	004012	Posterior flanks - Substitution	
6	004059	Spark plug inspection flap - Replacement	

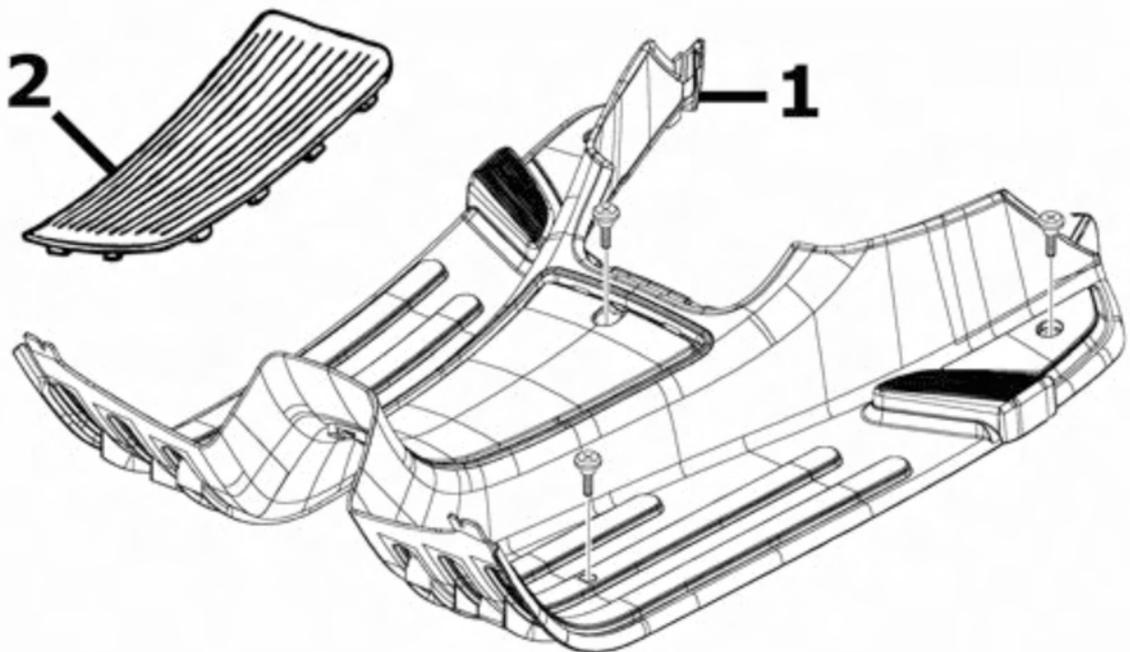
Centre-stand



STAND

	Code	Action	Duration
1	001053	Stand pin - Replacement	
2	004004	Stand - Replacement	

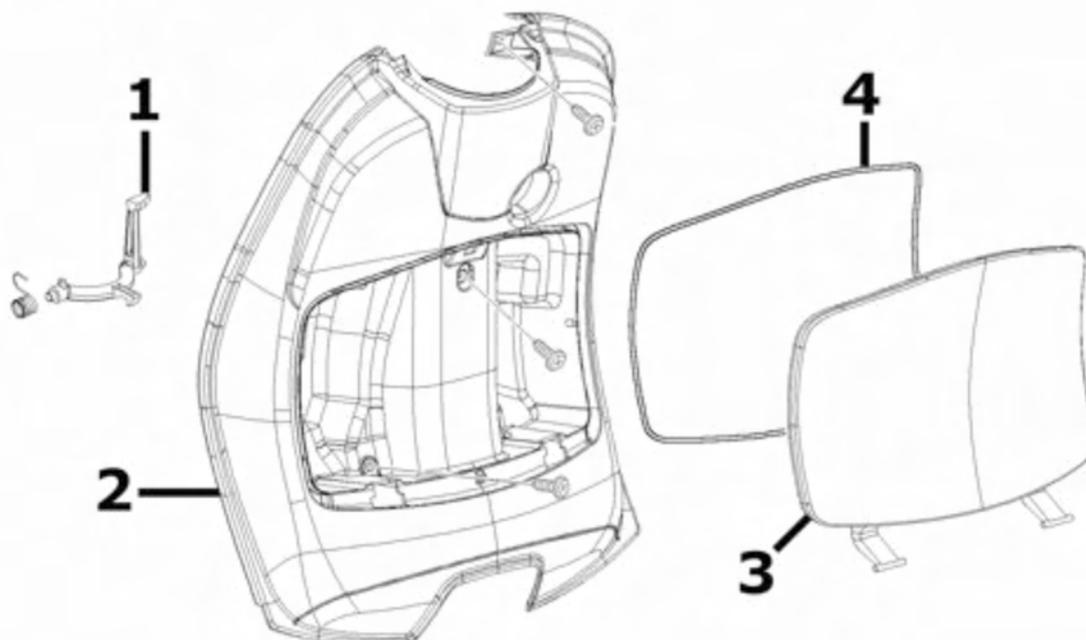
Footrests



FOOTREST

	Code	Action	Duration
1	004178	Footrest - Replacement	
2	004078	Front/rear footboard rubber. - Replacement	

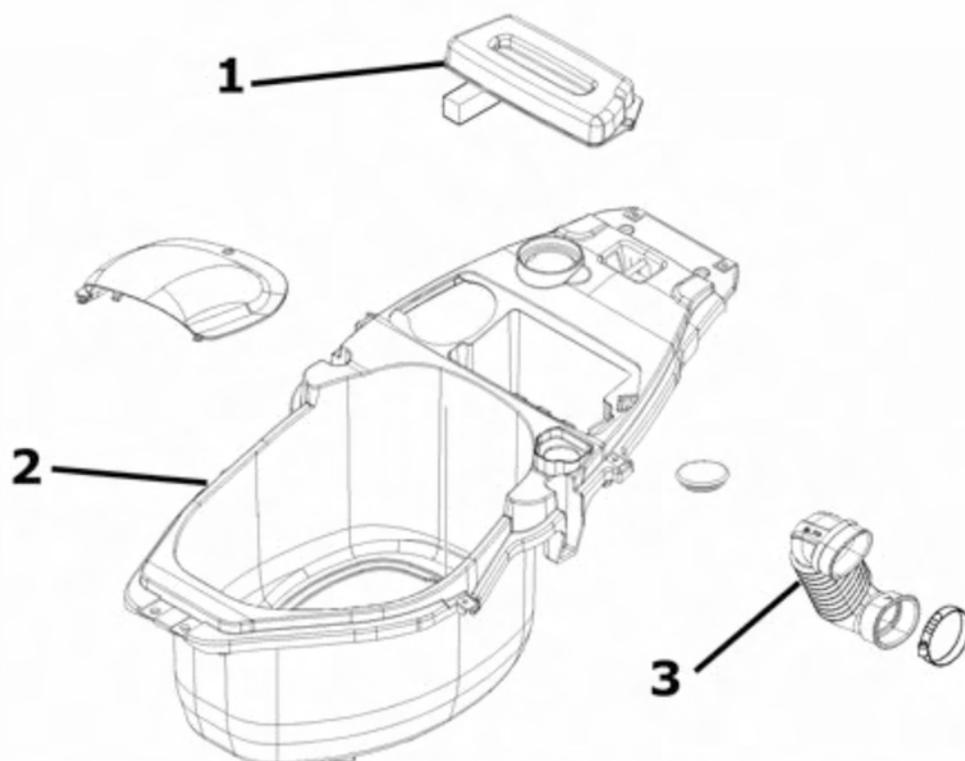
Rear cover



KNEE-GUARD

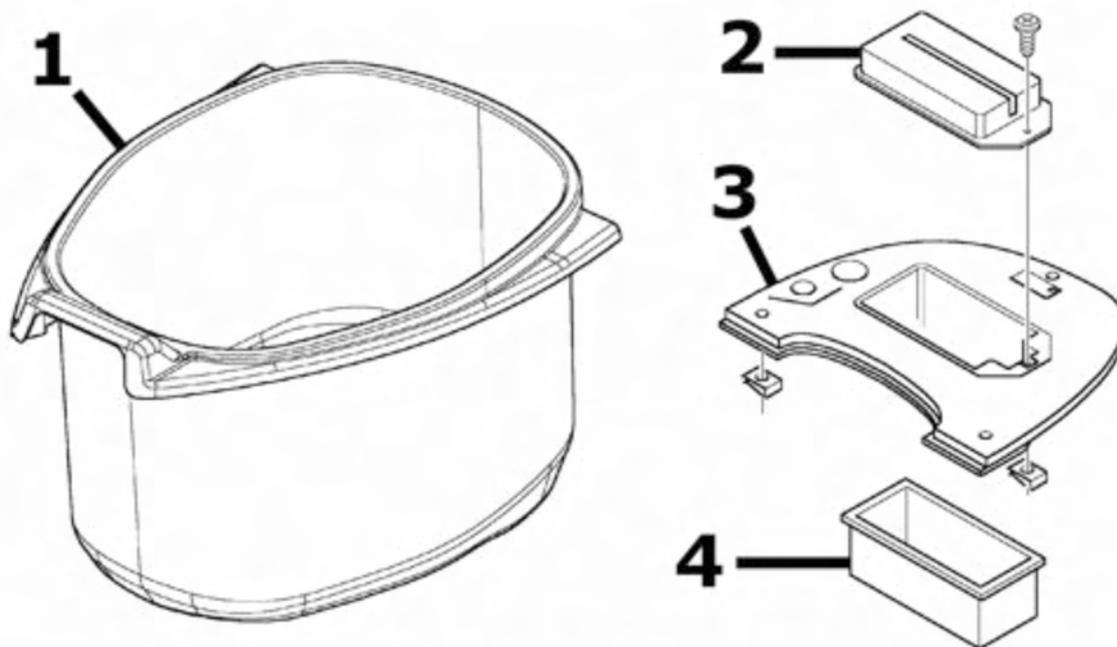
	Code	Action	Duration
1	004174	Glove-box remote opening linkage - Replacement	
2	004065	Knee-guard - Removal and refitting	
3	004081	Glove compartment door - Replacement	
4	004082	Trunk gasket - Replacement	

Underseat compartment



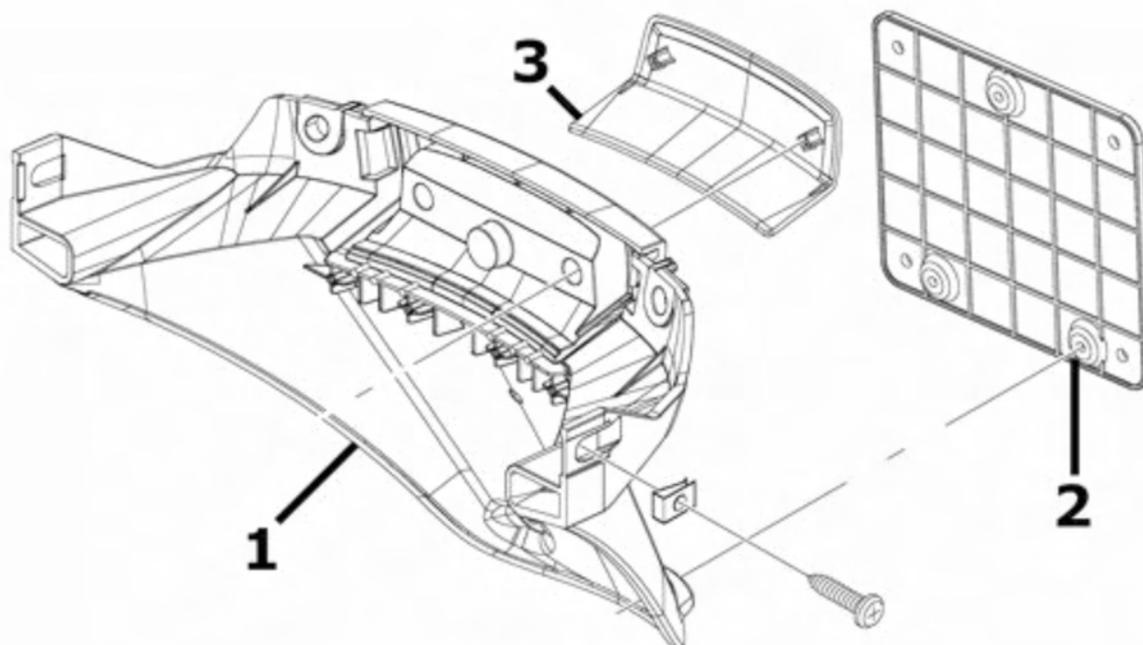
UNDERSEAT COMPARTMENT

	Code	Action	Duration
1	005046	Battery cover - Replacement	
2	004016	Helmet compartment - Disassembly and reassembly	
3	001027	Filter bellow - Replacement	

**UNDERSEAT**

	Code	Action	Duration
1	004016	Helmet compartment - Replacement	
2	005046	Battery cover - Replacement	
3	004011	Chassis central cover - Replacement	
4	004071	Battery compartment - Replacement	

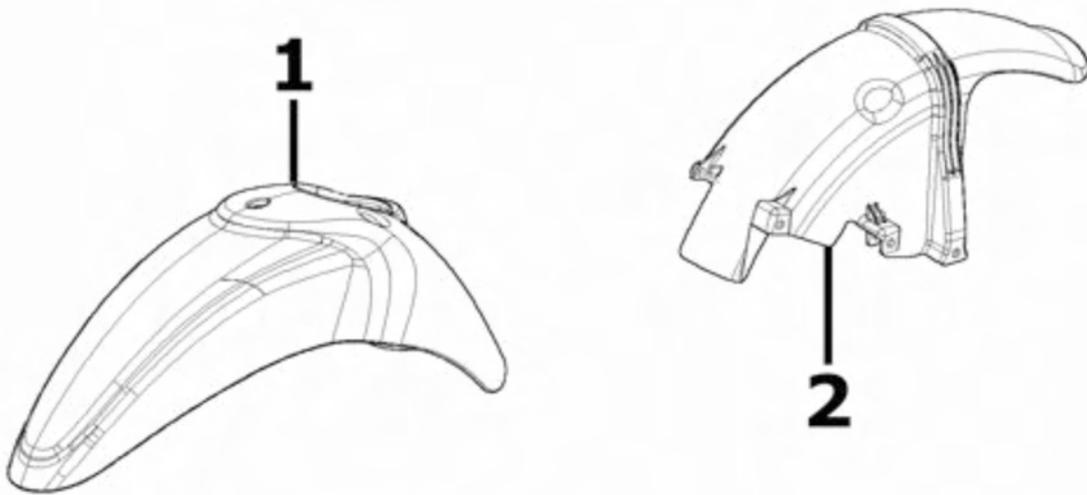
Plate holder



SUPPORT PLATE

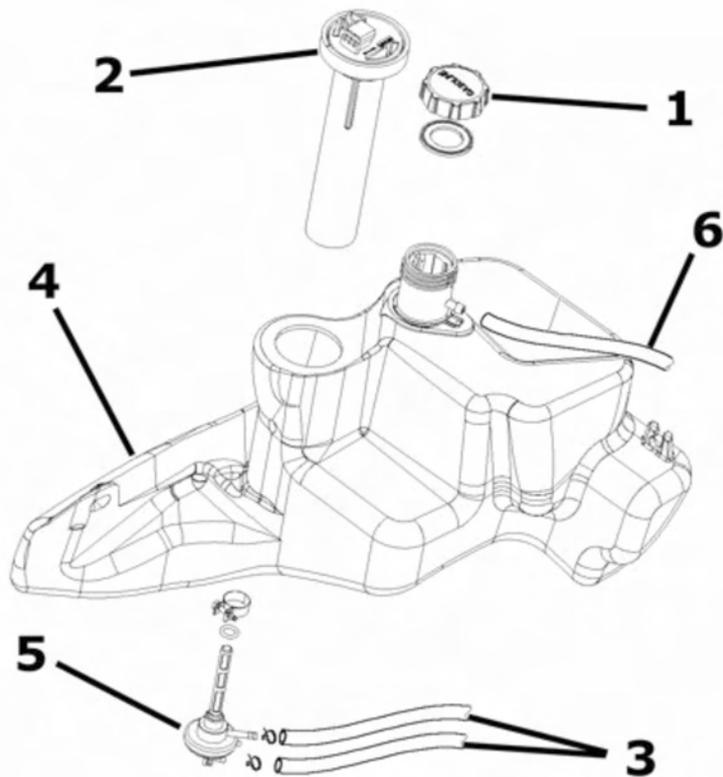
	Code	Action	Duration
1	004136	License plate holder - Replacement	
2	005048	Number plate holder - Replacement	
3	005032	Number plate light cover - Replacement	

Mudguard

**MUDGUARDS**

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

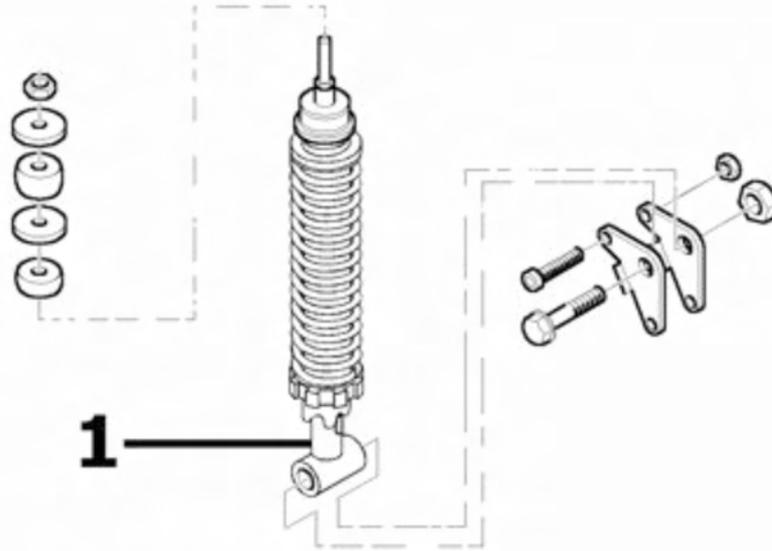
Fuel tank



FUEL TANK

	Code	Action	Duration
1	004168	Fuel filler cap - Replacement	
2	005010	Tank float - Replacement	
3	004112	Cock-carburettor pipe - Replacement	
4	004005	Fuel tank - Replacement	
5	004007	Mixture cock - Replacement	
6	004109	Fuel tank breather - Replacement	

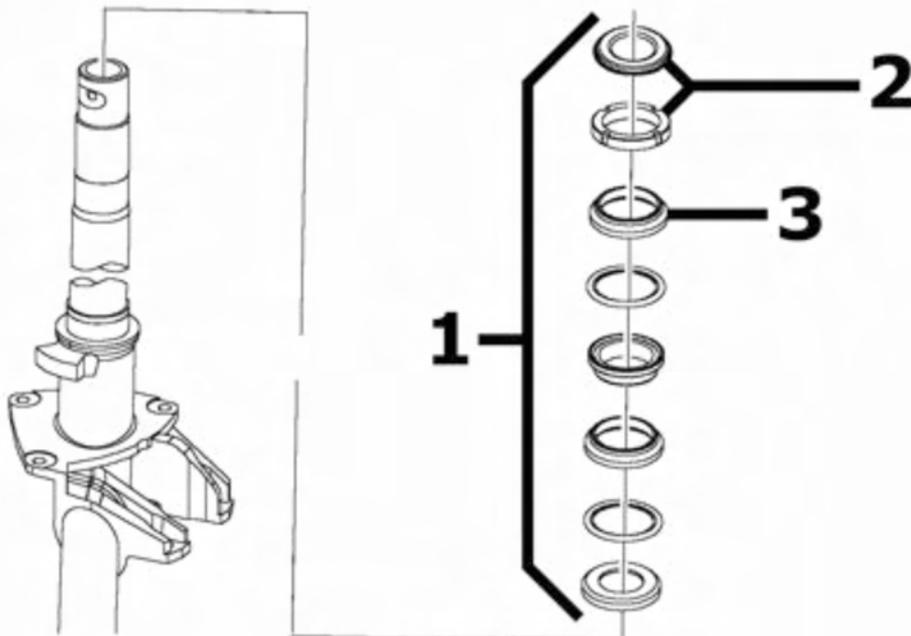
Rear shock-absorber



REAR SHOCK ABSORBER

	Code	Action	Duration
1	003007	Rear shock absorber - Disassembly and reassembly	

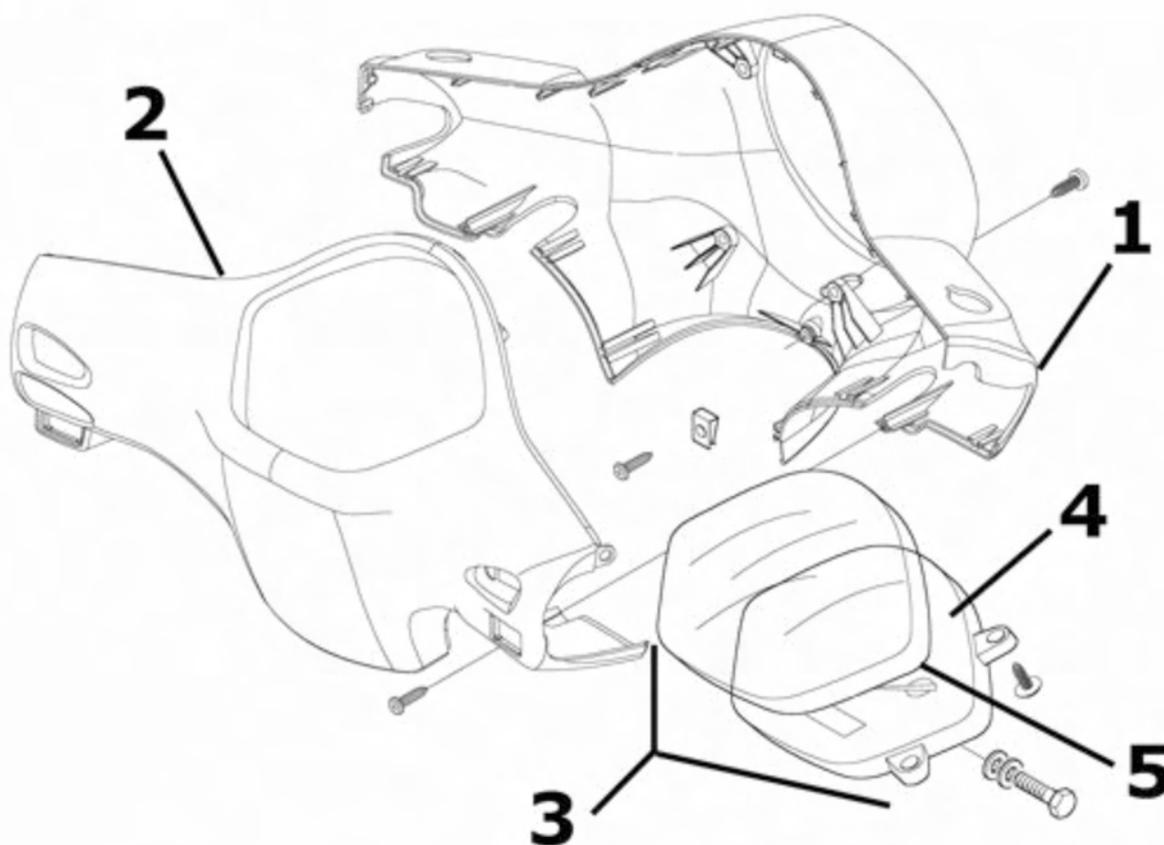
Steering column bearings



STEERING COLUMN BEARINGS

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

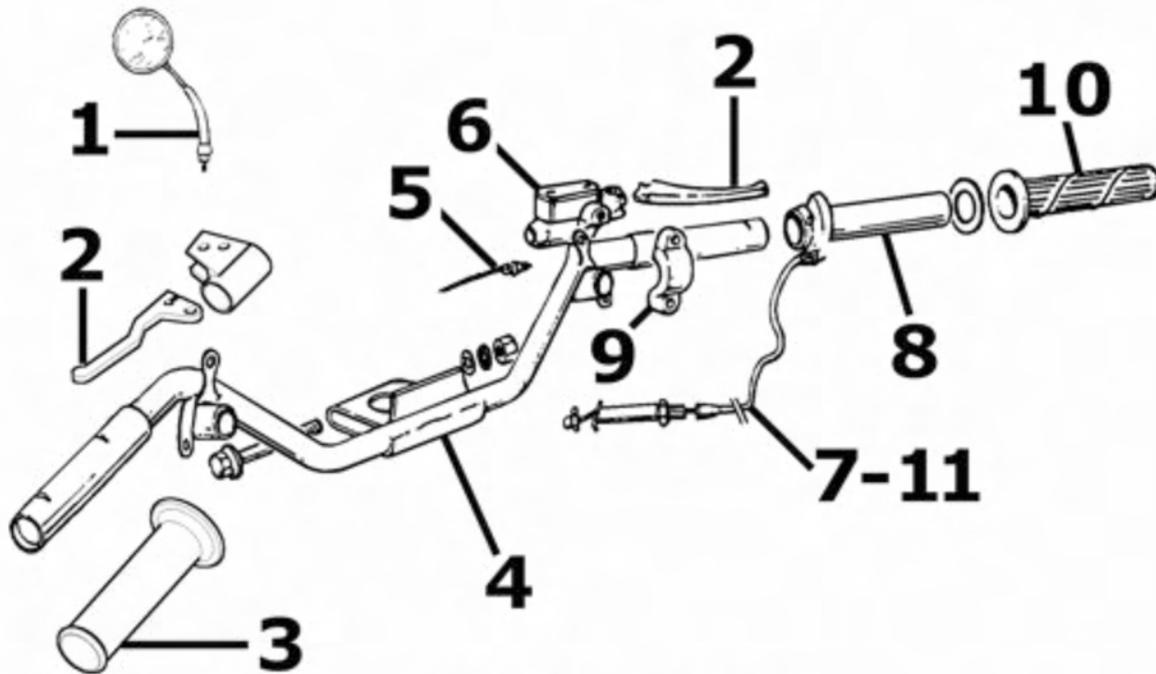
Handlebar covers



SPEEDOMETER - HANDLEBAR COVERS

	Code	Action	Duration
1	004018	Handlebar front part - Replacement	
2	004019	Handlebar rear part - Replacement	
3	005054	Speedometer - Replacement	
4	005038	Dashboard warning lights - Replacement	
5	005078	Odometer plastic cover - Replacement	

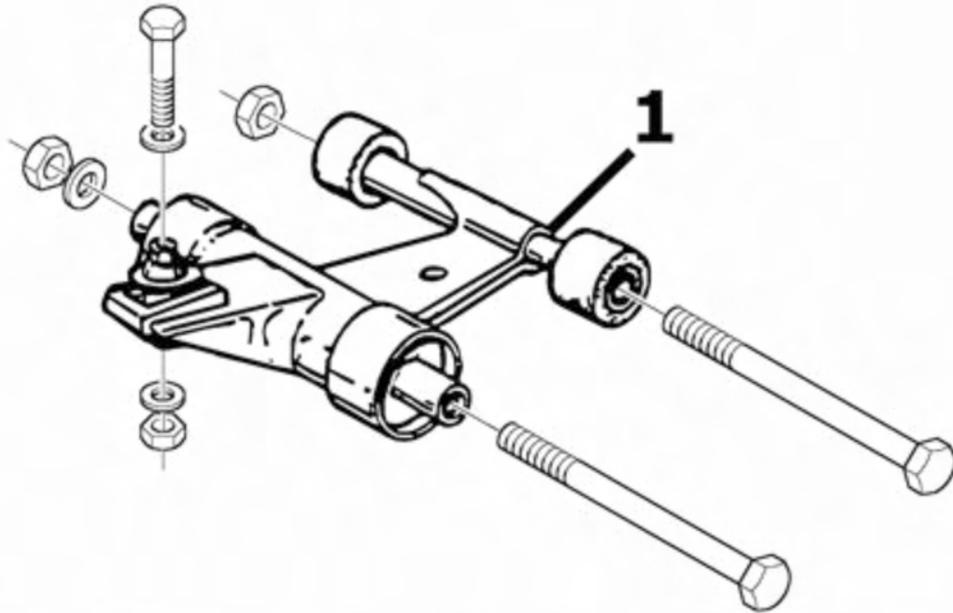
Handlebar components



HANDLEBAR COMPONENTS

	Code	Action	Duration
1	004066	Rearview mirrors - Replacement	
2	002037	Complete gas control - Replacement	
3	002071	Left knob - Replacement	
4	003001	Handlebar - Disassembly and reassembly	
5	005017	Stop light switch - Replacement	
6	002024	Brake pump - Removal and reinstallation	
7	003061	Accelerator transmission - Adjustment	
8	002060	Complete gas control - Replacement	
9	004162	Mirror U-bolt and/or brake pump fitting - Replacement	
10	002059	Right knob - Replacement	
11	002063	Gas control transmission - Replacement	

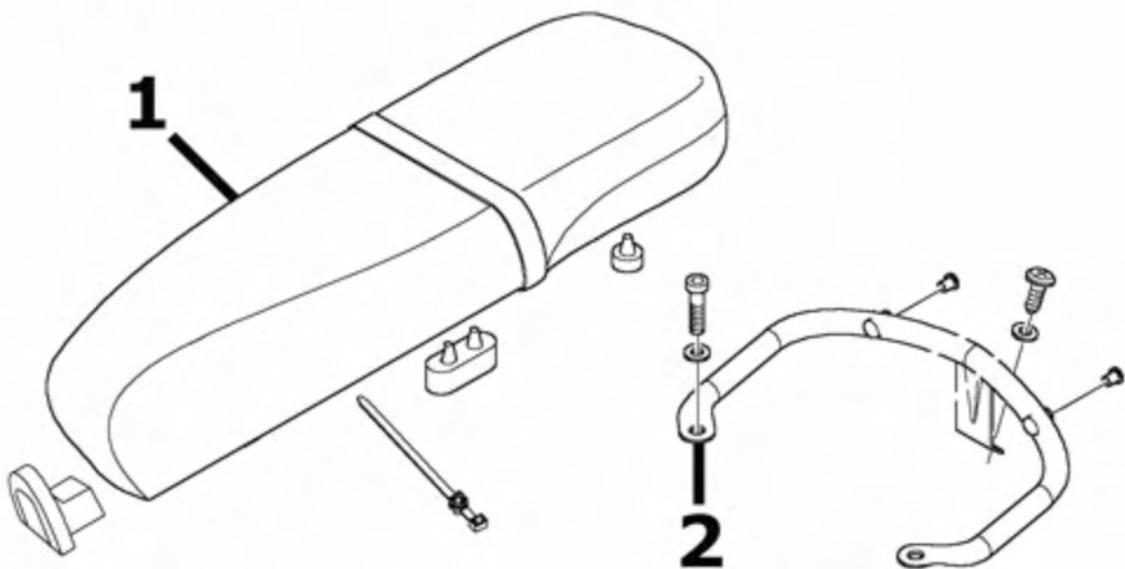
Swing-arm



SWINGING ARM

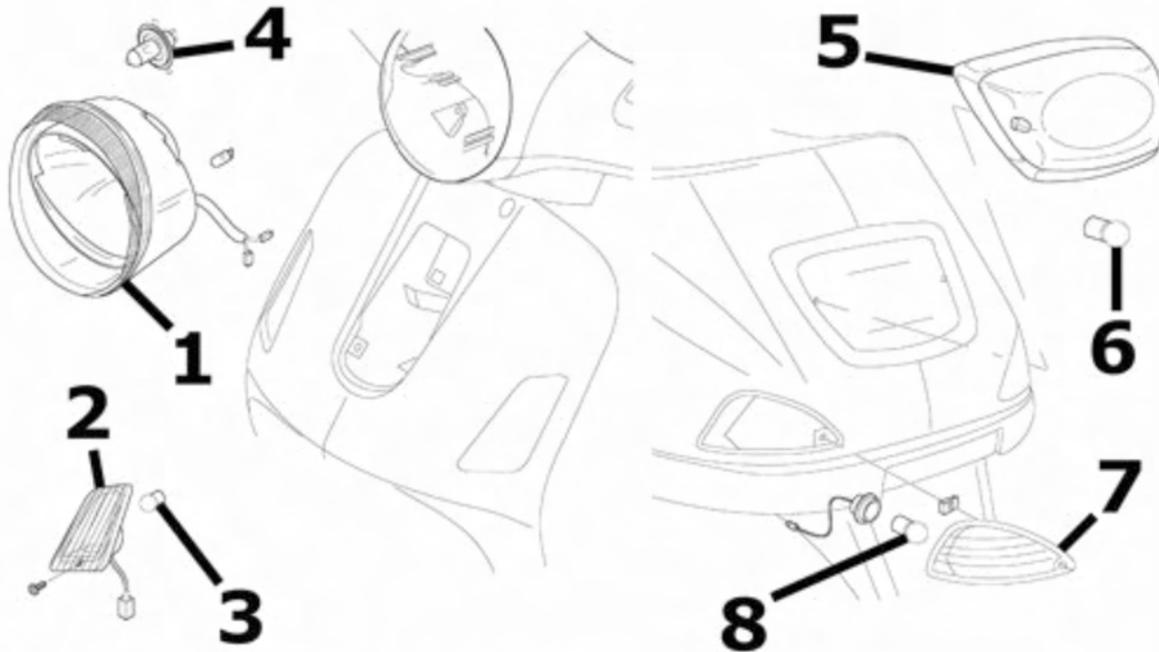
	Code	Action	Duration
1	001072	Engine-frame connection swing arm - Replacement	

Seat



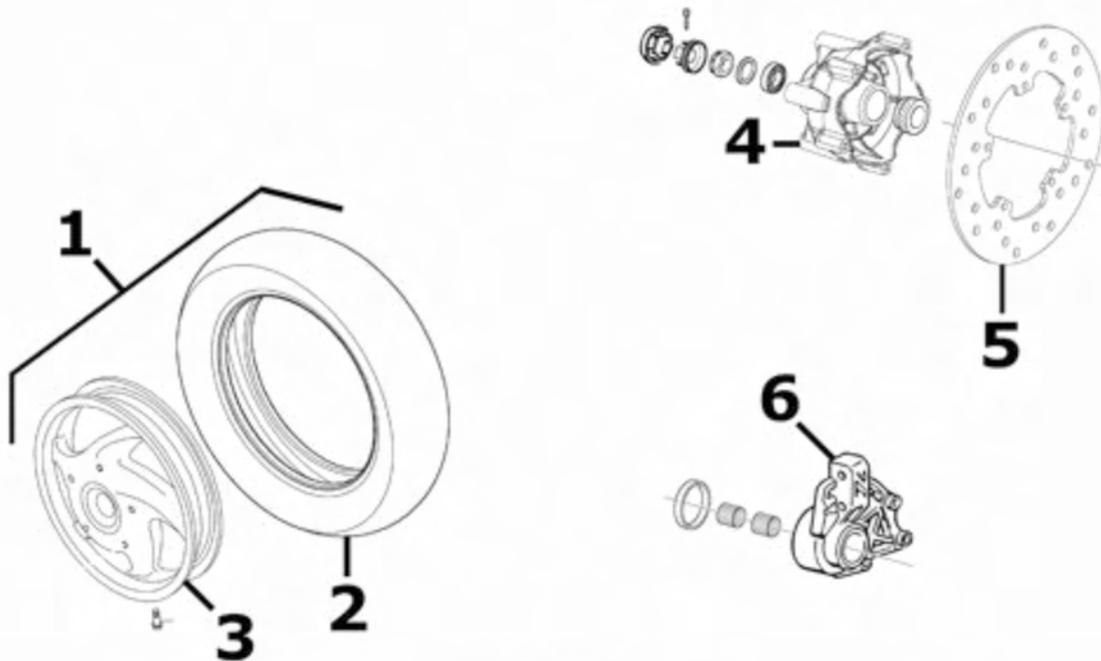
SADDLE

	Code	Action	Duration
1	004003	Saddle - Replacement	
2	004131	Rear rack mounting bracket - Replacement	

Turn signal lights**TURN SIGNAL LIGHTS**

	Code	Action	Duration
1	005002	Headlight - Replacement	
2	005012	Front turn signal light - Replacement	
3	005067	Front direction indicator bulb - Replacement	
4	005008	Front headlights - Replacement	
5	005005	Rear light - Replacement	
6	005066	Rear light bulbs - Replacement	
7	005022	Rear turn signal light - Replacement	
8	005068	Rear turn indicator bulb - Replacement	

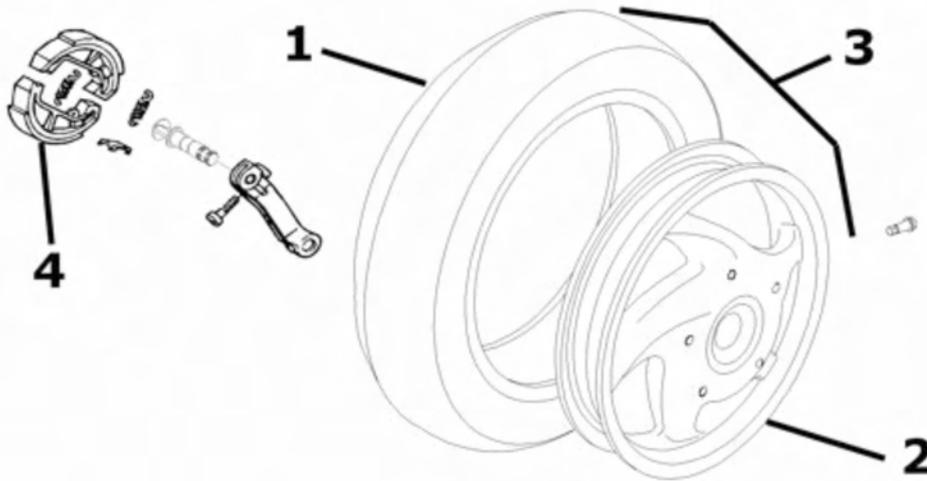
Front wheel



FRONT WHEEL

	Code	Action	Duration
1	004123	Front wheel - Replacement	
2	003047	Front tyre - Replacement	
3	003037	Front wheel rim - Replacement	
4	003033	Front wheel hub - Replacement	
5	002041	Brake disc - Replacement	
6	003034	Front wheel hub bearings - Replacement	

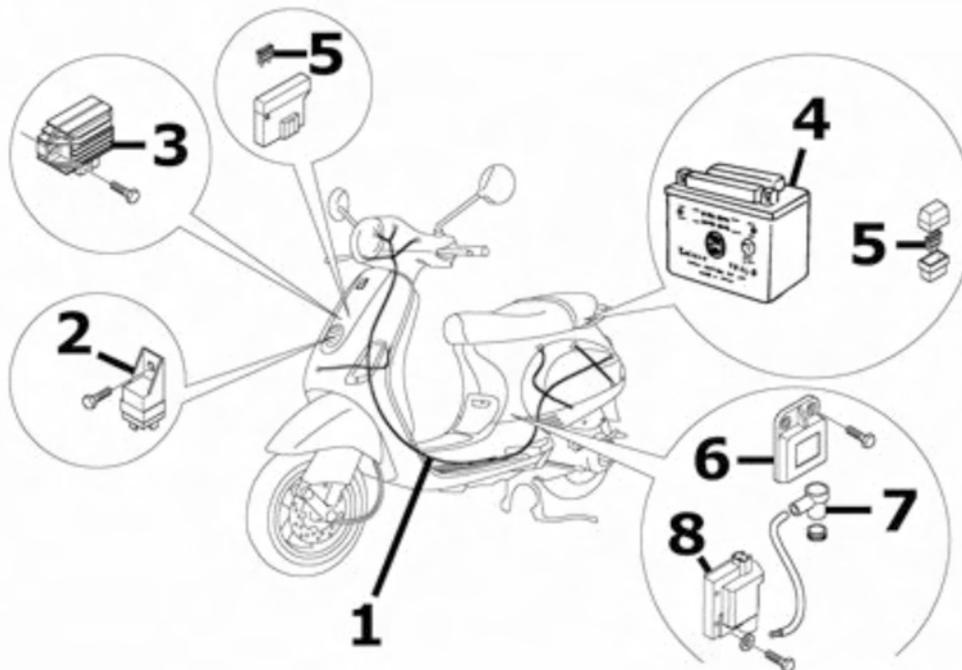
Rear wheel



REAR WHEEL

	Code	Action	Duration
1	004126	Rear tyre - Replacement	
2	001071	Rear wheel rim - Removal and refitting	
3	001016	Rear wheel - Replacement	
4	002002	Rear brake shoes/pads - Replacement	

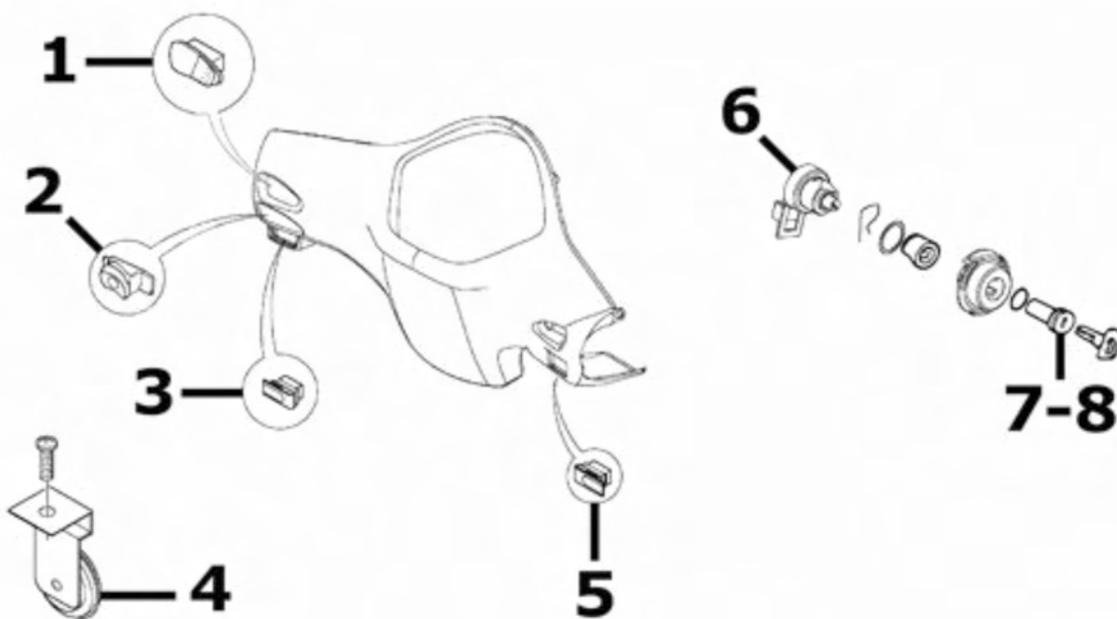
Electric devices



ELECTRIC COMPONENTS

	Code	Action	Duration
1	005001	Electric circuit - Replacement	
2	005011	Start-up remote control switch - Replacement	
3	005009	Voltage regulator - Replacement	
4	005007	Battery - Replacement	
5	005052	Fuse (1) - Replacement	
6	001023	Controller - Replacement	
7	001094	Spark plug cap - Replacement	
8	001069	H.T. coil - Replacement	

Electronic controls

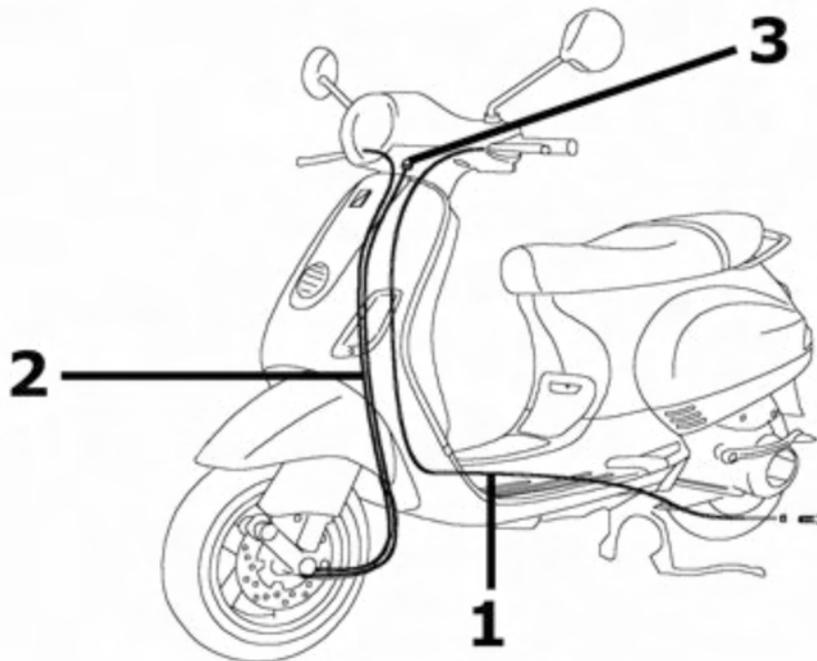


ELECTRIC CONTROLS

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

	Code	Action	Duration
7	004096	Locks series - Replacement	
8	004010	Antitheft lock - Replacement	

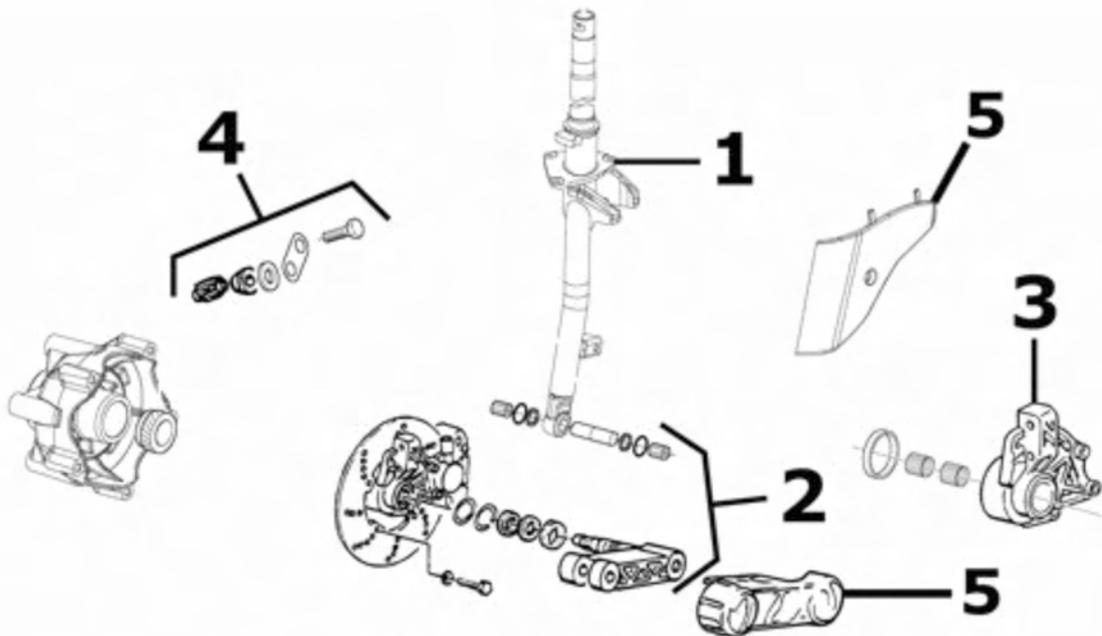
Transmissions



TRANSMISSIONS

	Code	Action	Duration
1	002053	Rear brake transmissions assembly - Replacement	
2	002051	Odometer transmissions assembly - Replacement	
3	002049	Odometer cable - Replacement	

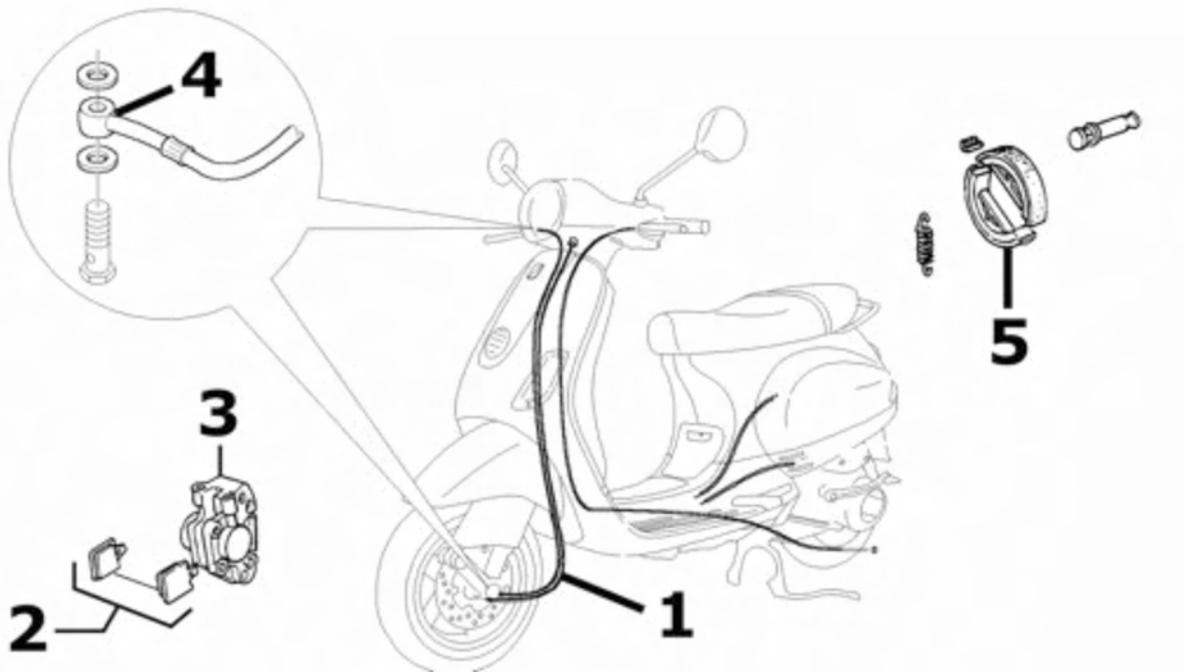
Front suspension



FRONT SUSPENSION

	Code	Action	Duration
1	003045	Steering column - Replacement	
2	003010	Front suspension - - Revision	
3	003035	Shock abs. and brake caliper support - Replacement	
4	001064	Speedometer gear - Replacement	
5	003044	Shock absorber cover - Replacement	

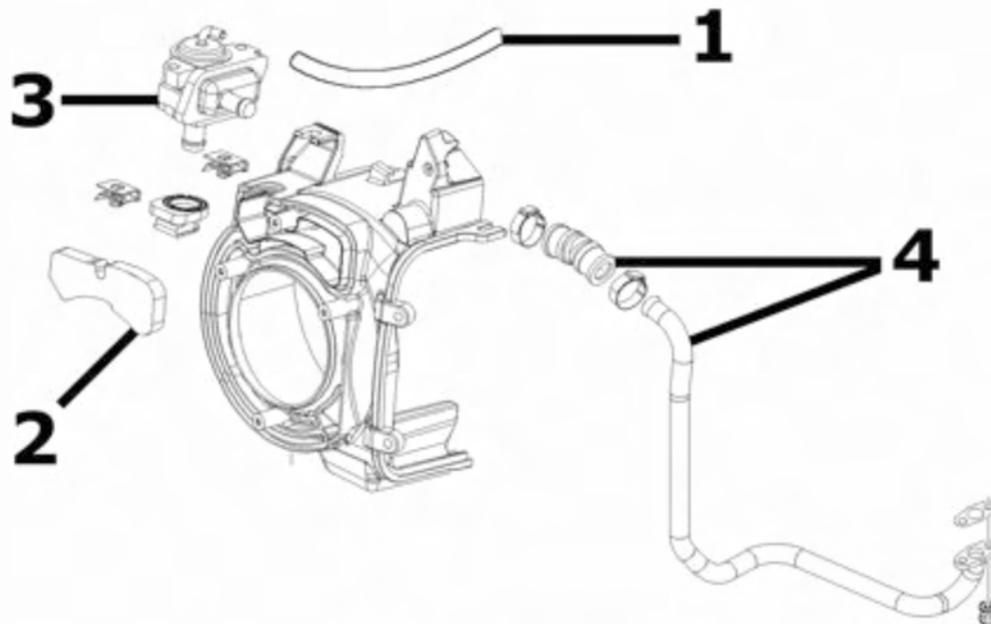
Braking system



BRAKING SYSTEM

	Code	Action	Duration
1	002021	Front brake line - Replacement	
2	002007	Front brake shoes/pads - Removal and refitting	
3	002039	Front brake calliper - Removal and refitting	
4	002047	Front brake liquid and circuit bleeding - Replacement	
5	002002	Rear brake shoe - pad - Replacement	

Secondary air box



SISTEMA ARIA SECONDARIA

	Code	Action	Duration
1	001164	Crankcase secondary air junction - Replacement	
2	001161	Secondary air filter- Replacement / Cleaning	
3	001174	SAS valve - Replacement	
4	001163	Exhaust secondary air junction - Replacement	