PIAGGIO

WORKSHOP MANUAL

618153

MSS X9 Evolution 250

WORKSHOP MANUAL

MSS X9 Evolution 250

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

WORKSHOP MANUAL
MSS X9 Evolution 250

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

INDEX OF TOPICS

Rules

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

Safety rules

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

Maintenance rules

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

Vehicle identification

Chassis prefix: ZAPMXXXX > XXXXXX

Engine prefix: M23XM

Dimensions and mass

DIMENSIONS AND WEIGHT

Specification	Desc./Quantity
Empty weight	173 Kg
Wheelbase	1500 mm
Overall height	1450 mm
Saddle height	790 mm
Overall length	2130 mm
Overall width	910 mm

Engine

Characteristics	Version 250
Type	Single-cylinder, 4 stroke and 4 valves Piaggio QUASAR with secondary air system and catalytic converter.
Cooling system	Liquid
Number of cylinders	1
Bore	72 mm
Stroke	60 mm
Piston displacement	244,29 cm3
Compression ratio	10,5 - 11,5 : 1
Timing system	Single-head camshaft controlled by left side chain, 3-arm rockers with threaded register.
Valve clearance: intake exhaust	0,10 mm 0,15 mm
Walbro Carburettor	WVFH
Kehin Carburettor	CVK 30
Air filter	Sponge, impregnated with mixture (50% Selenia Air Filter Oil and 50% lead-free fuel).
Start-up system	electric starter
Lubrication	with twin-screw pump (inside the crankcase) controlled by chain and dual filter: net and paper filter.
Power supply	Petrol (with minimum octane level 95, lead-free) with vacuum pump and through carburettor.
Max speed	xxx Km/h
Spark plug	CHAMPION RG4HC

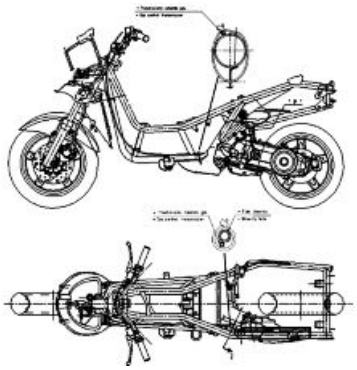
Transmission

TRANSMISSIONS

Specification	Desc./Quantity
Transmission	With automatic expandable pulley variator, V belt, automatic clutch, gear reduction unit and transmission housing with forced-circulation air cooling.

Gas control transmission fixing

Please take note that starting from the frame number ZAPM2300004502417, the gas control transmission fixing has been changed, in fact a tear-off clamp and a sheath have been introduced, in order to improve its passage



Capacities

CAPACITÀ

Specification	Desc./Quantity
Rear hub	150 cc (recommended oil: TUTELA ZC 90)
Cooling system	~ 1.2 litres (recommended fluid PARAFLU MOTORIDER).
Fuel tank (including a ~ 2.5 l reserve)	~ 14.5 l
Engine oil	approx. 1300 cc (recommended oil Selenia HI Scooter 4 Tech)

Electrical system

ELECTRIC COMPONENTS 250

Specification	Desc./Quantity
Ignition type	Electronic capacitive discharge ignition (CDI) and variable advance, with separate HV coil.
Spark plug	CHAMPION RG4HC
Battery	12V-12Ah
Generator	Three-phase alternating current
Variable spark advance	10° ± 1 at 2000 Rpm 28° ± 1 at 6500 Rpm

Frame and suspensions

CHASSIS AND SUSPENSIONS

Specification	Desc./Quantity
Rear wheel max. travel	90 mm.
Rear suspension	Engine with oscillating fork articulated to the chassis by means of a double swinging arm. Double-acting hydraulic shock absorbers, coaxial helicoidal spring with variable step, adjustable at preloading on 4 positions.
Front fork stroke	90 mm
Front suspension	Hydraulic telescopic fork with Ø 35-mm stem
Type of chassis	Welded tubular steel chassis with stamped sheet reinforcements.

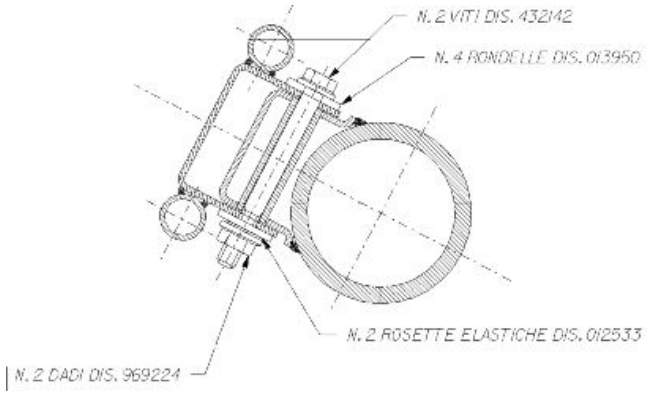
X9 Evolution 125-250-500:

Please take note that, starting from chassis serial number ZAPM2300003509521, the front small chassis fixing system has changed in order to improve its locking to the chassis. Therefore we have introduced:

• N°2 screws drawing 432142

• N°2 4x11x0 external teeth spring washers drawing 012533

• N°2 nuts drawing 968224



Brakes

BRAKES

Specification	Desc./Quantity
Front	Twin disc in stainless steel Ø 240 mm with dual-piston floating calliper Ø 25.4 mm (front right and left)
Rear	Ø 240 mm stainless steel disc with Brembo "Serie Oro" floating calliper with Ø 34 mm twin plungers
Integral braking system	Left lever acts on the left front and rear discs, through a valve that distributes the pressure; the right lever acts on the right front disc only

Wheels and tyres

WHEELS AND TYRES

Specification	Desc./Quantity
Tyre pressure (when cold)	Front: 2.1 bar Rear: 2.3 bar (2.5 bar with driver and luggage)
Tyres	Front: 120/70-14" 55P Rear: 140/60-14" 64P
Light alloy rims	Front rim: 3.50x14" Rear rim: 3.50x14"

Secondary air

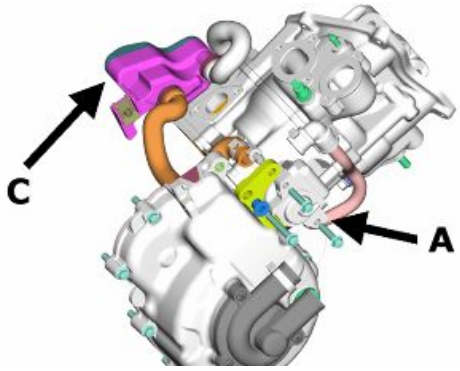
General notes:

The SAS for Quasar 250 Euro 2 engines operates in a similar manner to the SAS for 2T engines.

The differences are the following:

instead of entering through the muffler as for 2T engine, the secondary air enters directly in the discharge pipe on the head.

The 2T reed valve has a diaphragm. The unit **"A",** indicated in the figure, has a cut-off device connected to the depression intake on the inlet



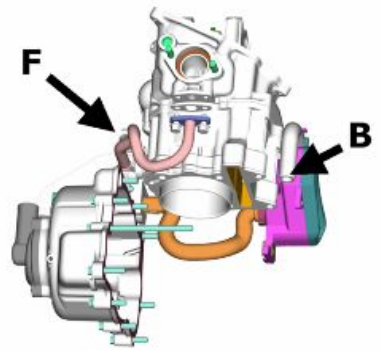
manifold that cuts the air inlet in deceleration, to avoid explosions in the muffler.

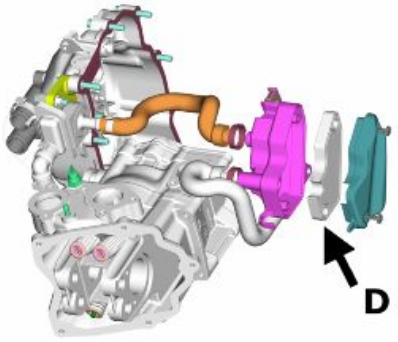
System description:

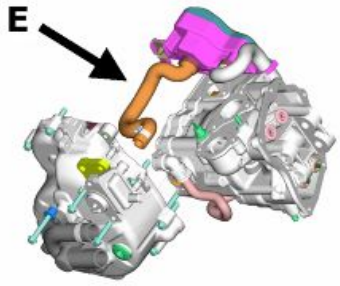
Air is sucked in through the hole **"B"** and gets through the tube into the filter housing **"C"** where the filtering element **"D"**is.

Now, the filtered air enters the diaphragm device **"A"** and then is channelled to the head.

The air passes through a flanged pipe **"E"**connected to the air head and reaches a discharge joint in order to supply oxygen to the unburned gases before the catalytic converter, thus favouring an improved reaction of the catalytic converter.







Carburettor

250cc Version

Keihin

KEHIN CARBURETTOR

Specification	Desc./Quantity
Depression carburettor	CVEK-30
Body stamping	CVEK
Stamping	303A
Tapered pin notches position from top	Fixed position
Max. air jet	70
Diffuser nozzle	Ø 2.8
Starter jet	42
Starter device resistance	~ 20 Ω
Diffuser	Ø 29

Specification	Desc./Quantity
Tapered pin stamping	NDWA
Minimum mixture set screw initial opening	± ¼
Throttle valve spring	150 ÷ 250 g
Minimum air jet	115
Minimum jet	38
Max. jet	100
Starter air jet	Ø 1.5 (body)
Starter diffuser nozzle	Ø 1.5 (body)

N.B.

THE IDENTIFICATION LETTER CAN VARY WITH EACH CARBURETTOR UPDATE

Walbro

WALBRO CARBURETTOR

Specification	Desc./Quantity
Tapered pin notches position from top	3
Tapered pin stamping	465
Minimum mixture set screw initial opening	3 ± 1/4
Throttle valve spring	120 g
Minimum air jet	50
Max. air jet	150
Minimum jet	34
Max. jet	118
Body stamping	7HO
Vacuum type	WVF-7H*
Diffuser	Ø 29 (30.3x27.0)
Starter jet	50
Starter diffuser jet	130
Starter air jet	200
Diffuser nozzle	Ø 2.7
Stamping	

N.B.

THE IDENTIFICATION LETTER CAN VARY WITH EACH CARBURETTOR UPDATE

Tightening Torques

REAR BRAKE

Product	Description	Specifications
(°) Loctite 243	Medium-strength threadlock	Apply LOCTITE 243 medium-strength threadlock

FRONT BRAKE

Name	Torque in Nm
Oil bleed screw	8÷12
Disc tightening screw (°)	5 - 6
Brake fluid pipe-calliper fitting	16 ÷ 20
Brake fluid pump-hose fitting	16 ÷ 20
Tightening screw for calliper support to the fork	45 ÷ 55

REAR SUSPENSION

Name	Torque in Nm
Upper shock absorber clamp	33 ÷ 41
Lower shock absorber clamp	33 ÷ 41
Rear wheel axle	104 ÷ 126

FRONT SUSPENSION

Name	Torque in Nm
Fork leg screw	6 ÷ 7

Name	Torque in Nm
Front wheel axle	45 ÷ 50
Fork plate screw	25 ÷ 34

CHASSIS

Name	Torque in Nm
Centre stand bolt	25 ÷ 30
Frame arm-engine arm bolt	60 ÷ 64
Swinging arm buffer nut	20 ÷ 25
Frame-swinging arm bolt	66 ÷ 80
Engine-swinging arm bolt	33 ÷ 41

STEERING

Name	Torque in Nm
Upper steering ring nut	30 ÷ 36
Steering lower ring nut	10 ÷ 13 then loosen by 90°
Handlebar fixing screw (*)	45 ÷ 50
Fixing screws for handlebar control assembly U-bolts	7 ÷ 10

ENGINE - COOLING

Product	Description	Specifications
(°) Loctite 243	Medium-strength threadlock	Apply LOCTITE 243 medium-strength threadlock

CRANKCASE AND CRANKSHAFT

Name	Torque in Nm
Internal engine crankcase bulkhead (transmission-side half shaft) screws	4 ÷ 6
Engine-crankcase coupling screws	11 ÷ 13
Starter motor screws	11 ÷ 13
Crankcase timing system cover screws (°)	3.5 ÷ 4.5

ENGINE - FLYWHEEL

Name	Torque in Nm
Pick-Up clamping screws	3 ÷ 4
Stator assembly screws (°)	3 ÷ 4
Flywheel cover fixing screws	5 - 6
Flywheel nut (250)	94 ÷ 102
Screw fixing freewheel to flywheel	13 ÷ 15

ENGINE - TRANSMISSION

Name	Torque in Nm
Rear hub cover screws	24 ÷ 27
Driven pulley shaft nut	54 ÷ 60
Transmission cover screws	11 ÷ 13
Drive pulley nut	75 ÷ 83
Clutch unit nut on driven pulley	55 ÷ 60
Belt support roller screw	11 ÷ 13

ENGINE - CYLINDER HEAD

Name	Torque in Nm
Manifold-silencer retaining bolt	15 ÷ 20
Nut fixing muffler to cylinder head	16 ÷ 18
Camshaft retention plate screw	4 ÷ 6
Timing chain tensioner central screw	5 - 6
Timing chain tensioner support screw	11 ÷ 13
Starter ground support screw	11 ÷ 15
Timing chain tensioner slider screw	10 ÷ 14
Inlet manifold screws	11 ÷ 13
Tappet set screw lock nut	6 ÷ 8
Starter ground screw	7 ÷ 8.5
Head fixing side screws	11 ÷ 12

Name	Torque in Nm
Nuts fixing head to cylinder (*)	27 ÷ 29
Tappet cover screws	6 ÷ 7
Spark plug	12 ÷ 14

LUBRICATION

Name	Torque in Nm
Hub oil drainage plug	15 ÷ 17
Oil filter on crankcase fitting	27 ÷ 33
Engine oil drainage plug/mesh filter	24 ÷ 30
Oil filter	4 ÷ 6
Oil pump cover screws	0.7 ÷ 0.9
Screws fixing oil pump to crankcase	5 - 6
Oil pump control crown screw	10 ÷ 14
Oil pump cover plate screws	4 ÷ 6
Oil sump screws	10 ÷ 14
Minimum oil pressure sensor	12 ÷ 14

N.B.

Before fitting the nuts, lubricate them with engine oil

N.B.

Use new nuts

NOTE DI ASSISTENZA TECNICA

For correct tightening, the expansion tank cap locking torque has been standardised to **2.5 Nm**

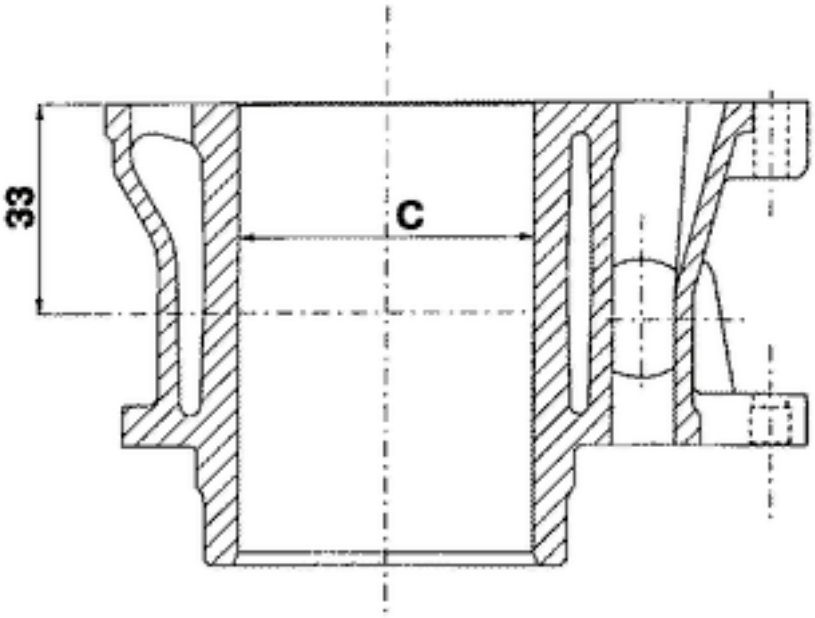
Overhaul data

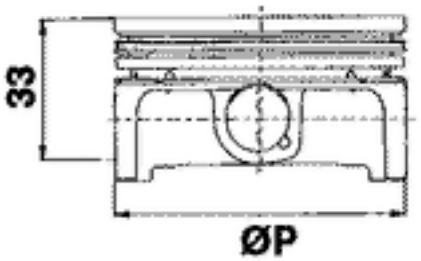
Assembly clearances

Cylinder - piston assy.

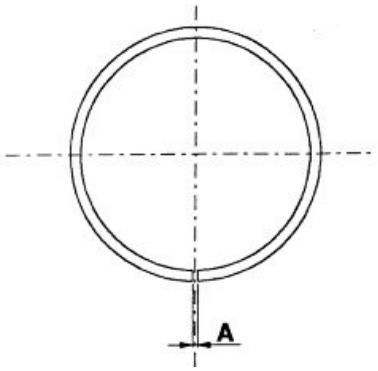
COUPLING CATEGORIES ENGINE 250

Name	Initials	Cylinder	Piston	Play on fitting
Cylinder / piston	A	71.990 ÷ 71.997	71.953 ÷ 71.960	0.030 - 0.044
Cylinder / piston	B	71.997 ÷ 72.004	71.960 ÷ 71.967	0.030 - 0.044
Cylinder / piston	C	72.004 ÷ 72.011	71.967 ÷ 71.974	0.030 - 0.044
Cylinder / piston	D	72.011 ÷ 72.018	71.974 ÷ 71.981	0.030 - 0.044





Piston rings



SEALING RINGS

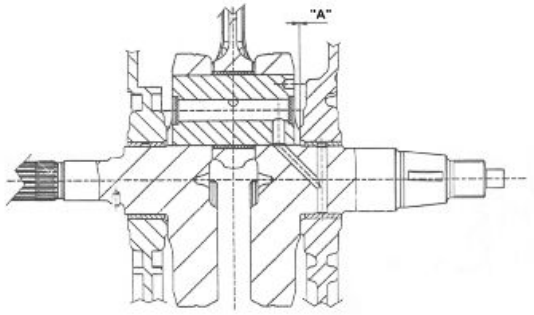
Name	Description	Dimensions	Initials	Quantity
Compression ring		72 x 1.5	A	0.15 ÷ 0.30
Oil scraper ring		72 x 1	A	0.20 ÷ 0.40
Oil scraper ring		72 x 2.5	A	0.20 ÷ 0.40

Crankcase - crankshaft - connecting rod

Characteristic

Driving shaft / crankcase axial clearance

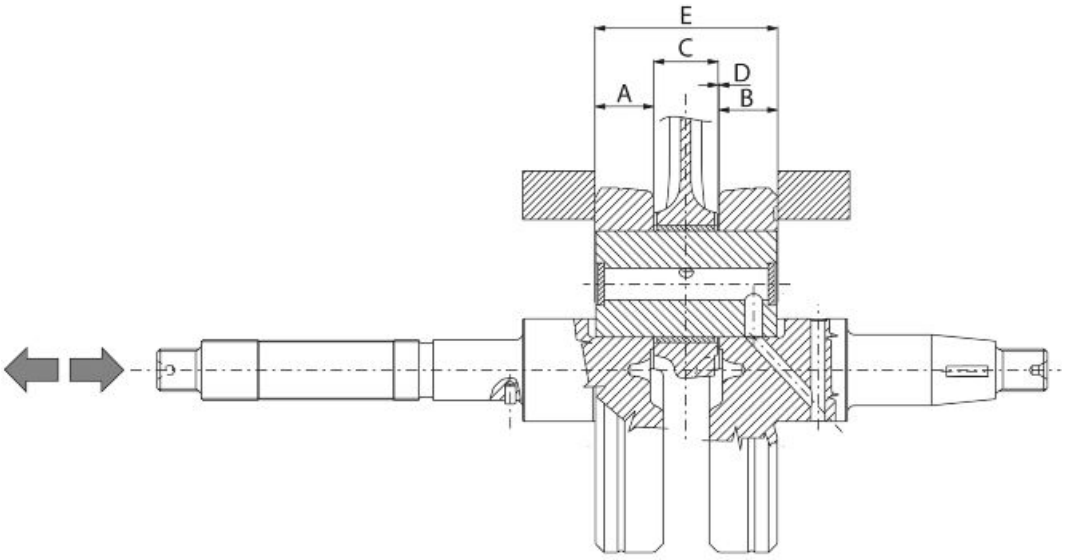
A= 0,15 ÷ 0,43 (when cold)



CRANKSHAFT

Titolo	Durata/Valore	Testo Breve (< 4000 car.)	Indirizzo Immagine
Crankshaft		Crankshaft to crankcase axial clearance	

Crankshaft to crankcase axial clearance



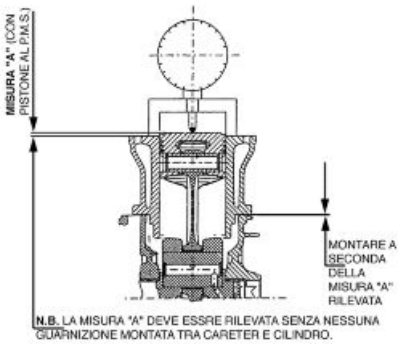
CRANKSHAFT/ CRANKCASE AXIAL CLEARANCE

Name	Description	Dimensions	Initials	Quantity
Half-shaft, transmission side		16.6 +0-0.05	A	D = 0.20 - 0.50
Flywheel-side half-shaft		16.6 +0-0.05	B	D = 0.20 - 0.50
Connecting rod		18 -0.10 -0.15	C	D = 0.20 - 0.50
Spacer tool		51.4 +0.05	E	D = 0.20 - 0.50

Slot packing system

N.B.

MEASUREMENT "A" TO BE TAKEN IS A VALUE OF PISTON RE-ENTRY, IT INDICATES BY HOW MUCH THE PLANE FORMED BY THE PISTON CROWN FALLS BELOW THE PLANE FORMED BY THE TOP OF THE CYLINDER. THE FURTHER THE PISTON FALLS INSIDE THE CYLINDER, THE LESS THE BASE GASKET IS TO BE APPLIED (TO RECOVER THE COMPRESSION RATIO) AND VICE VERSA.



ENGINE 250 SHIMMING

Name	Measure A	Thickness
shimming	3.70 - 3.60	0.4 ± 0.05
shimming	3.60 - 3.40	0.6 ± 0.05
shimming	3.40 - 3.30	0.8 ± 0.05

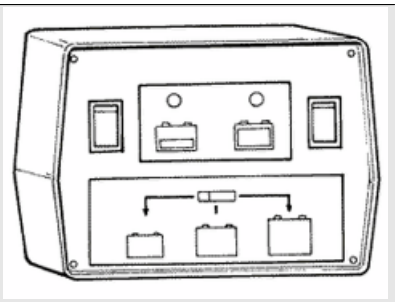
Products

PRODUCTS

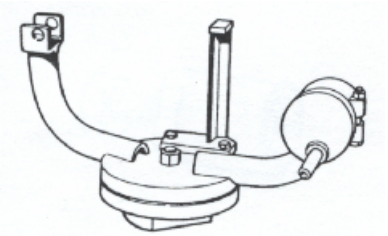
Product	Description	Specifications
AGIP GREASE PV2	Grease for steering bearings and spindle seats	Soap-based lithium and zinc oxide grease containing NLGI 2; ISO-L-XBCIB2 of the swinging arm
MONTBLANC MOLYBDENUM GREASE	Grease for driven pulley shaft adjusting ring and movable driven pulley housing	Grease with Molybdenum disulphide
AGIP FILTER OIL	Oil for air filter sponge	Mineral oil with specific additives for increased adhesiveness
AGIP GREASE MU3	Grease for odometer transmission gear case	Soap-based lithium grease with NLGI 3; ISO-L-XBCHA3, DIN K3K-20
AGIP CITY HI TEC 4T	Engine oil	SAE 5W-40 Synthetic oil that exceed the requirements of API SL, ACEA A3, JASO MA specifications
AGIP GP 330	Calcium complex soap-based grease with NLGI 2; ISO-L-XBCIB2	Grease (brake control levers, throttle grip)
AGIP CITY HI TEC 4T	Four-stroke engine oil	Lubricating oil for flexible shafts (throttle control)
AGIP ROTRA 80W-90	Rear hub oil	SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications
AGIP PERMANENT SPEZIAL	coolant	Monoethylene glycol-based antifreeze fluid, CUNA NC 956-16

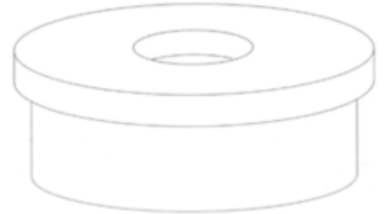
INDEX OF TOPICS

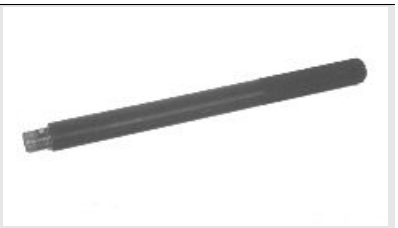
ATTREZZATURA SPECIFICA

Stores code	Description	
020151Y	Air heater	
020331Y	Digital multimeter	
020333Y	Single battery charger	
020334Y	Multiple battery charger	
001467Y014	Pliers to extract ø 15-mm bearings	

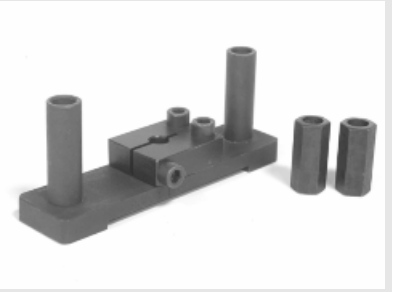
Stores code	Description	
020412Y	15 mm guide	
020335Y	Magnetic support for dial gauge	
020565Y	Flywheel lock calliper spanner	
020439Y	17 mm guide	
020359Y	42x47-mm adaptor	

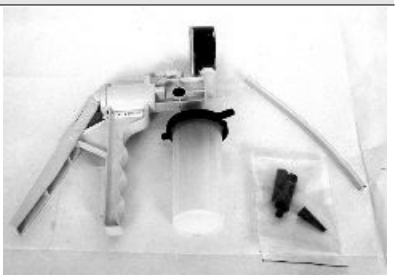
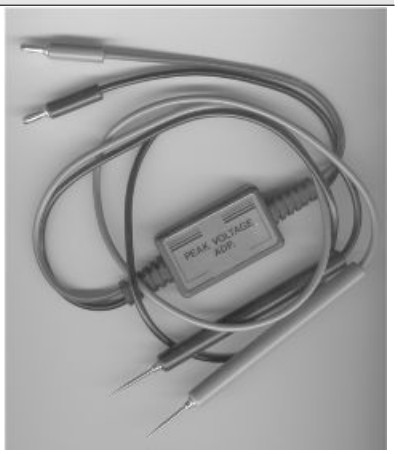
Stores code	Description	
020363Y	20 mm guide	
020459Y	Punch for fitting bearing on steering tube	
020458Y	Puller for lower bearing on steering tube	
005095Y	Engine support	
008564Y	Flywheel extractor	
020434Y	Oil pressure control fitting	

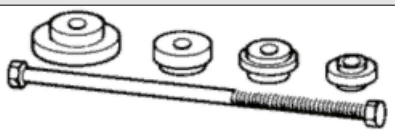
Stores code	Description	
020382Y011	adapter for valve removal tool	
020424Y	Driven pulley roller casing fitting punch	
020431Y	Valve oil seal extractor	
020193Y	Oil pressure gauge	
020306Y	Punch for assembling valve seal rings	
020360Y	Adaptor 52 x 55 mm	

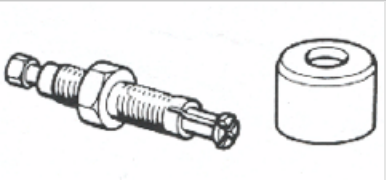
Stores code	Description	
020364Y	25-mm guide	
020375Y	Adaptor 28 x 30 mm	
020376Y	Adaptor handle	
020444Y	Tool for fitting/ removing the driven pulley clutch	
020330Y	Stroboscopic light to check timing	
001467Y035	Belle for OD 47-mm bearings	

Stores code	Description	
020368Y	driving pulley lock wrench	
020319Y	Immobilizer check tester	
020287Y	Clamp to assemble piston on cylinder	
020263Y	Sheath for driven pulley fitting	
020262Y	Crankcase splitting strip	
020430Y	Pin lock fitting tool	

Stores code	Description	
020428Y	Piston position check support	
020426Y	Piston fitting fork	
020425Y	Punch for flywheel-side oil seal	
020423Y	driven pulley lock wrench	
020414Y	28-mm guide	
020393Y	Piston fitting band	

Stores code	Description	
020382Y	Valve cotters equipped with part 012 removal tool	
020455Y	10-mm guide	
020442Y	Pulley lock wrench	
020329Y	MityVac vacuum-operated pump	
020357Y	Adaptor 32 x 35 mm	
020409Y	Multimeter adaptor - Peak voltage detection	

Stores code	Description	
020456Y	Ø 24 mm adaptor	
020332Y	Digital rev counter	
020074Y	Support base for checking crankshaft alignment	
020055Y	Wrench for steering tube ring nut	
002465Y	Pliers for circlips	
001330Y	Tool for fitting steering seats	

Stores code	Description	
020454Y	Tool for fitting piston pin stops (200 - 250)	
020622Y	Transmission-side oil guard punch	
020444Y011	adapter ring	
020444Y009	46x55 Wrench	
001467Y	Extractor for bearings for holes	
001467Y013	Pliers to extract ø 15-mm bearings	

Stores code	Description	
020444Y010	adapter ring	
020628Y	Water pump service kit	

INDEX OF TOPICS

Maintenance chart

Safety tightenings: refer to the chapter "Predelivery Operations"

AT 1000 KM OR 4 MONTHS

Action
Engine oil - replacement
Hub oil - change
Engine oil - change
Idle speed (*) - adjustment
Throttle lever - adjustment
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid level - check
Safety locks - check
Electrical system and battery - check
Tyre pressure and wear - check
Vehicle and brake test - road test

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

AT 6000 KM OR 12 MONTHS

Action
engine oil- change(125)
Hub oil level - check
Spark plug/ electrode gap - check
Air filter - clean
oil filter - change(125)
valve clearance 125 - check
Sliding blocks / variable speed rollers - check
Driving belt - checking
Coolant level - check
Brake pads - check condition and wear
Brake fluid level - check
Electrical system and battery - check
Tyre pressure and wear - check
Vehicle and brake test - road test

AT 12000 KM OR 24 MONTHS AND AT 60000 KM

Action
Engine oil - replacement
Hub oil level - check
Spark plug / electrode gap - check / replacement
Air filter - clean
Engine oil - change
Idle speed (*) - adjustment
Sliding block / variable speed rollers - change
Throttle lever - adjustment
Coolant level - check
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid level - check
Transmission elements - lubrication
Safety locks - check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Tyre pressure and wear - check
Vehicle and brake test - road test
Transmission Belt (125 cc) - Replacement
Transmission Belt - Check (250)

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

AT 18000 KM AND AT 54000 KM

Action
engine oil- change(125)
Hub oil level - check
Spark plug/ electrode gap - check
Air filter - clean
oil filter - change(125)
valve clearance 125 - check
250 cc Valve Play - Check
Sliding blocks / variable speed rollers - check
Coolant level - check
Radiator - external cleaning/ check
Brake pads - check condition and wear
Brake fluid level - check
Electrical system and battery - check
Tyre pressure and wear - check
Vehicle and brake test - road test
Secondary air filter (250) - Cleaning
Transmission Belt - Replacement (250)
Transmission Belt (125 cc) - Replacement

AT 24000 KM AND AT 48000 KM

Action
Engine oil - replacement
Hub oil - change
Spark plug / electrode gap - check / replacement
Air filter - clean
Engine oil - change
Idle speed (*) - adjustment
Sliding block / variable speed rollers - change
Throttle lever - adjustment
Coolant level - check
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid level - check
Transmission elements - lubrication
Safety locks - check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Tyre pressure and wear - check
Vehicle and brake test - road test
Transmission Belt - Check (250)
Transmission Belt (125 cc) - Replacement

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

AT 30000 KM, AT 42000 KM AND AT 66000 KM

Action
Hub oil level - check
Spark plug/ electrode gap - check
Air filter - clean
Variable speed rollers - check or replacement
Driving belt - checking
Coolant level - check
Brake pads - check condition and wear
Brake fluid level - check
Electrical system and battery - check
Tyre pressure and wear - check
Vehicle and brake test - road test
engine oil- change(125)
oil filter - change(125)

AT 36000 KM

Action
Engine oil - replacement
Hub oil level - check
Spark plug / electrode gap - check / replacement
Air filter - clean
Engine oil - change
valve clearance 125 - check
250 cc Valve Play - Check
Idle speed (*) - adjustment
Sliding block / variable speed rollers - change
Throttle lever - adjustment
Driving belt - replacement
Coolant level - check
Radiator - external cleaning/ check
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid hoses - replacement
Brake fluid level - check
Transmission elements - lubrication
Safety locks - check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Tyre pressure and wear - check
Secondary air filter (250) - Cleaning
Vehicle and brake test - road test

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

AT 72000 KM

Action
Engine oil - replacement
Hub oil - change
Spark plug / electrode gap - check / replacement
Air filter - clean
Engine oil - change
valve clearance 125 - check
250 cc Valve Play - Check
Idle speed (*) - adjustment
Sliding block / variable speed rollers - change
Throttle lever - adjustment
Driving belt - replacement
Coolant level - check
Radiator - external cleaning/ check
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid hoses - replacement
Brake fluid level - check
Transmission elements - lubrication
Safety locks - check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Tyre pressure and wear - check
Secondary air filter (250) - Cleaning
Vehicle and brake test - road test

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

EVERY 2 YEARS

Action
Coolant - change
Brake fluid - change

Action
Secondary air filter (external/internal) - cleaning (125)

EVERY 3,000 KM

10'

Action
Engine oil - level check/ top-up

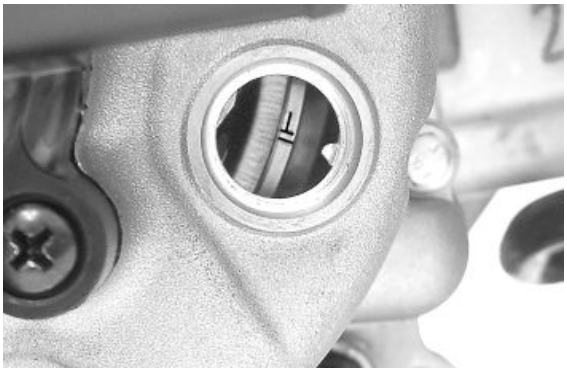
Carburettor

- Disassemble the carburettor in its parts, wash all of them with solvent, dry all body grooves with compressed air to ensure adequate cleaning.
- Check carefully that the parts are in good condition.
- The throttle valve should move freely in the chamber. Replace it in case of excessive clearance due to wear.
- If there are wear marks in the chamber causing inadequate tightness or a free valve slide (even if it is new), replace the carburettor.
- It is advisable to replace the gaskets at every refit

WARNING

PETROL IS HIGHLY EXPLOSIVE ALWAYS REPLACE THE GASKETS TO AVOID PETROL LEAKS

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).
- Remove the slit plastic cap on the flywheel cover.
- Adjust the lamp flash dephasing corrector to make the reference on the flywheel cover collimate with the level on the water pump drive. Read the

advance degrees indicated by the stroboscopic lamp.
- Check that the advance degrees match the revolution speed as indicated in the tables.
- In case of abnormal values, check the Pick-Up and the control unit supplies (positive-negative); replace the control unit, if required.
- A new control unit prevents the engine from rotating at over 2,000 rpm.
- The programmed control unit allows the engine revolution within the prescribed limits.

Specific tooling

020330Y Stroboscopic light to check timing

Characteristic

250 spark advance check

10° ± 1° at 2000 Rpm

32° ± 1° at 6000 Rpm

Spark advance variation

Characteristic

Operation threshold

First threshold : 9600±50

Second threshold : 9800±50

Reactivation threshold

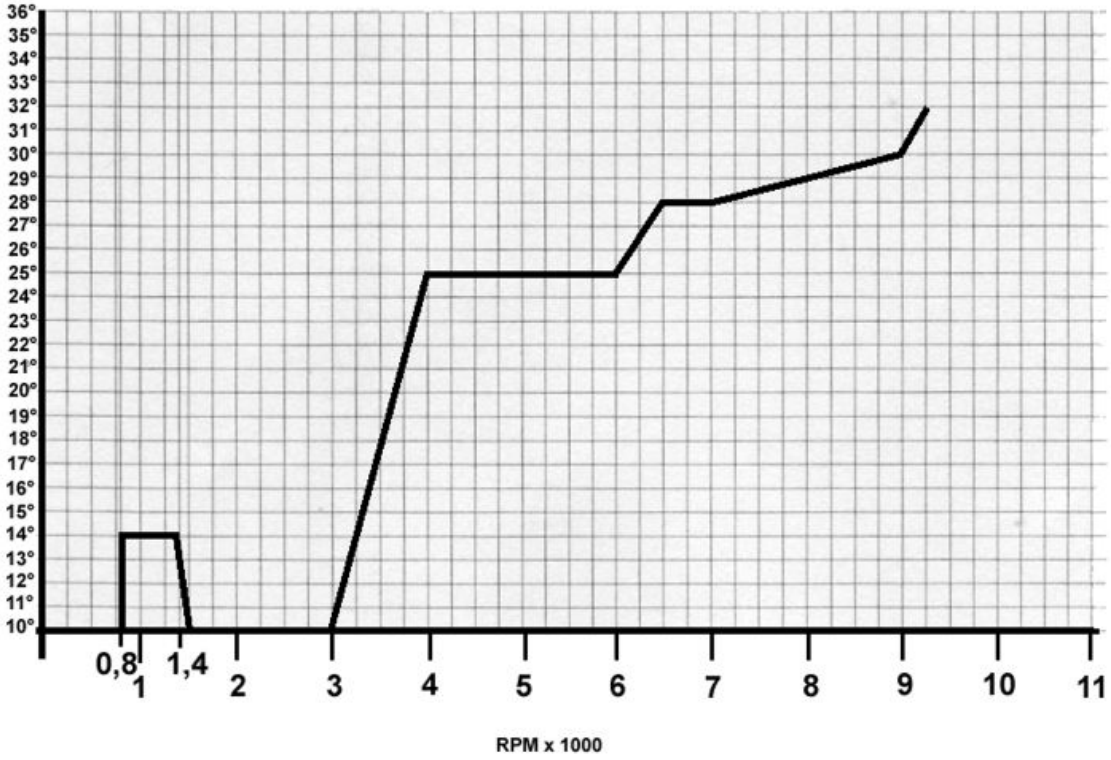
First threshold : 9500±50

Second threshold : 9700±50

Spark elimination

First threshold : 1 spark on 7

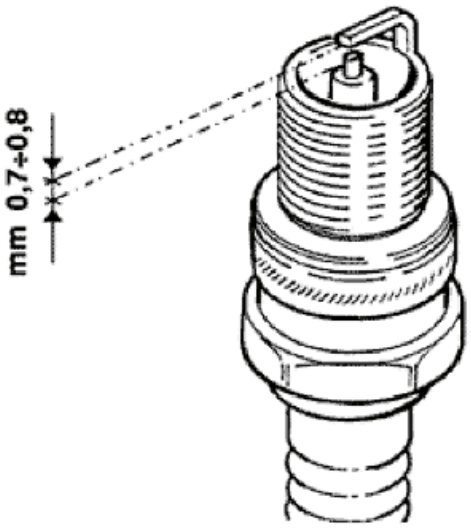
Second threshold : 2 sparks on 3



Spark plug

To inspect the spark plug the engine must be cold; proceed as follows:

- Remove the saddle after loosening the knob located into the rear trunk.
- Remove the spark plug cap.
- Using the supplied spanner (provided with retain rubber cap), remove the spark plug.
- Disconnect the spark plug lug and remove it.
- Inspect it carefully; if the insulator is damaged or chipped, replace it.
- Measure the distance between the electrodes using a thickness gauge, if required, adjust it by carefully bending the external electrode.
- Make sure that the sealing washer is in good working order.



- Install the spark plug, tighten by hand and then lock it by the special wrench at the prescribed torque.

CAUTION

THE SPARK PLUG MUST BE REMOVED WHEN THE MOTOR IS COLD. THE SPARK PLUG MUST BE REPLACED EVERY 12,000 KM. THE USE OF NON CONFORMING IGNITION CONTROL UNITS OR SPARK PLUGS OTHER THAN THOSE PRESCRIBED CAN SERIOUSLY DAMAGE THE ENGINE.

Characteristic

Spark plug: electrode distance

0.7 mm ÷ 0.8 mm

Electric characteristic

Recommended spark plug:

CHAMPION RG4HC

Locking torques (N*m)

Spark plug **12 ÷ 14**

Hub oil

Check

Level check:

- Move the vehicle to a flat ground and rest it on the stand.
- Unscrew the oil bar, dry it with a clean cloth and reinsert it, screwing it in thoroughly.
- Extract the bar and check that the oil level reaches **the second notch of the bar from the bottom.**
- Screw the oil bar back on, checking that it is tightly in place.

Recommended oil: TUTELA ZC 90

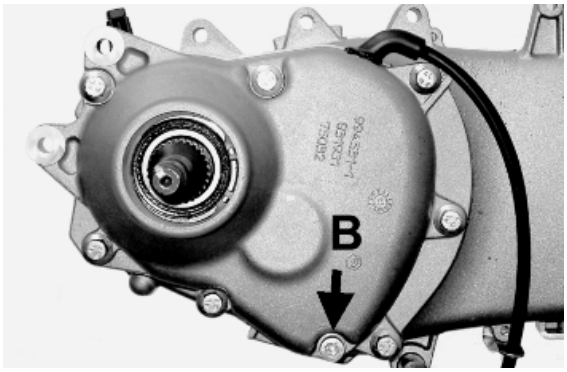
Tightening torque:

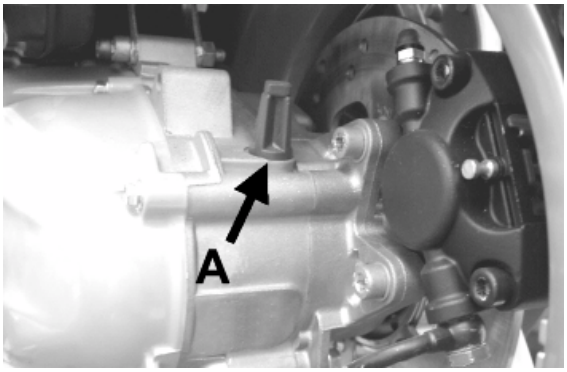
Drainage cap: 15 - 17 N·m

Replacement

Hub oil replacement

- Remove the oil loading cap «**A**».
- Remove the oil drainage cap «**B**» and let the oil drain out completely.
- Tighten the drainage cap again and fill the hub with oil (about 150 cc.).





Air filter

Remove the air cleaner cap after undoing the retainer screws, then extract the filter.

- Wash with water and neutral soap.

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

- Soak with a mixture of 50% petrol and 50% **SELENIA AIR FILTER OIL**.

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

CAUTION

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

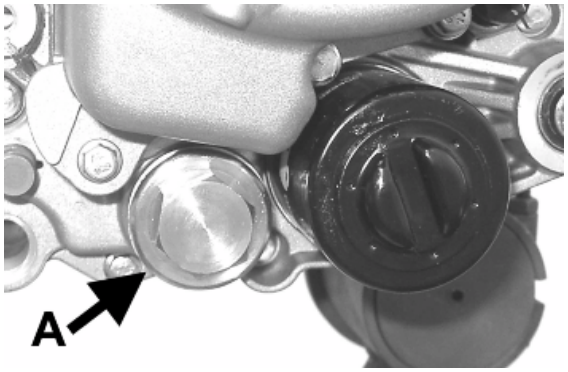
CAUTION

WHEN TRAVELLING ON DUSTY ROADS, THE AIR FILTER MUST BE CLEANED MORE OFTEN THAN SHOWN IN THE SCHEDULED MAINTENANCE CHART.

Engine oil

Replacement

- Loosen the oil loading cap/bar.
- Loosen the network filter unloading cap «**A**» on the flywheel side and let the oil drain out completely.
- Extract the oil cartridge «**B**» filter using the two protruding tabs and remove it.
- Install a new oil filter lubricating the filter sealing O-Ring with engine oil.
- Tighten the drainage cap again and fill with ~ 600 - 650 cc oil.
- Start the engine, let it run for a few minutes and then stop it.
- Wait a few minutes, then remove the cap - bar and check the level. Fill in with the prescribed oil up to reach the MAX level.



Check

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

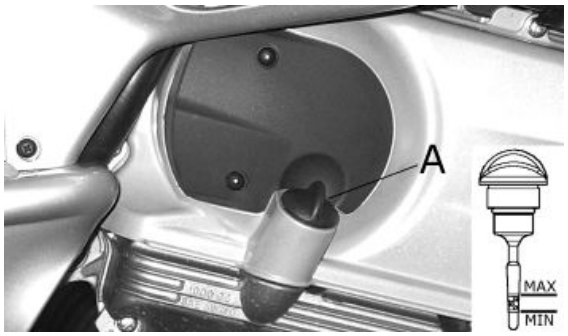
1. Place the vehicle on its centre stand and on flat ground.
2. Undo cap/dipstick "**A**", dry it off with a clean cloth and replace it, **screwing down completely**.
3. Remove the cap/dipstick again and check that the level is between the min and max. marks; top up if necessary.

The MAX level mark indicates a quantity of around 1300 cc of engine oil. If the check is carried out after the vehicle has been used, and therefore with a hot engine, the level line will be lower; in order to carry out a correct check, wait at least 10 minutes after the engine has been stopped so as to get the correct level.

Oil top up

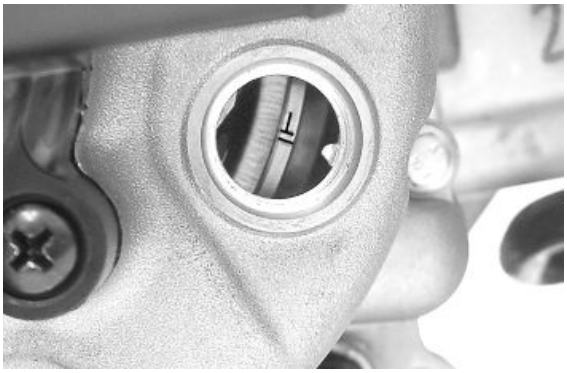
The oil should be topped up after having checked the level and in any case by adding oil **without ever exceeding the MAX. level**.

Restoration of the level from **MIN** to **MAX** requires approximately **200 cc**.



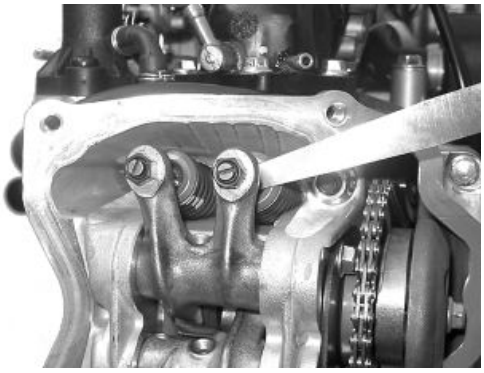
Checking the ignition timing

- Remove the plastic cap on the flywheel cover
-Turn the flywheel until the reference mark «**T**» on the rotor matches the reference mark on the flywheel cover as shown in the figure (TDC). Make sure that the 4V reference point on the camshaft control pulley is aligned with the reference point on the head as shown in the second figure. If the reference is opposite the indicator on the head, turn the crankshaft once more.
For the use of this reference mark, remove the spark plug and turn the engine in the direction that is the reverse of the normal direction using a calliper spanner applied to the camshaft command pulley casing.



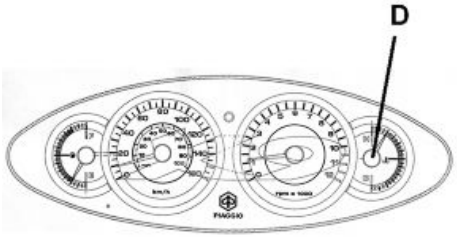
Checking the valve clearance

-To check valve clearance, centre the reference marks of the timing system
- Use a thickness gauge to check that the clearance between the valve and the register corresponds with the indicated values. When the valve clearance values, intake and drainage respectively, are different from the ones indicated below, adjust them by loosening the lock nut and operate on the register with a screwdriver as shown in the figure.
Intake: 0.10 mm (when cold)
Discharge: 0.15 mm (when cold)



Cooling system

Level check



The engine is cooled by forced liquid circulation.
The cooling circuit holds 1.8 litres of a coolant made up of 50% demineralised water and a solution of glycol-ethylene anti-freeze and corrosion inhibitors.
The packaged coolant supplied is ready-mixed and ready for use.
To ensure correct engine performance, the coolant temperature should be between 60°C min. and 105°C max. as indicated on the relevant instrument «**D**» with the coloured references on the analogue instrument panel. If the needle goes into the red , switch the engine off, allow it to cool then check the coolant level. If the fluid is within the normal limits, perform the cooling system checks.
The coolant level should be checked every 6,000 km with the engine cold, following the instruction given below.
a) Put the vehicle in an upright position on the kickstand.
b) Remove the expansion tank cap «**A**» by turning it anti-clockwise.
c) Look inside the expansion tank: the minimum and maximum levels are marked on the plastic inside the expansion tank.
d) Top up if the level of coolant is beneath the min. level mark inside the expansion tank.
The coolant level must always be between the min. and max. levels. If the coolant level is close to the min. marking, top up as required when the engine is cold. If frequent topping up is required or if the expansion tank is completely dry, the cooling system needs to be investigated.
The coolant must be replaced every 2 years.

WARNING

IN ORDER TO AVOID BURNS, DO NOT UNSCREW THE EXPANSION TANK CAP WHILE THE ENGINE IS STILL HOT.

WARNING

IN ORDER TO AVOID HARMFUL FLUID LEAKS WHILE RIDING, IT IS IMPORTANT TO MAKE SURE THAT THE LEVEL NEVER EXCEEDS THE MAXIMUM VALUE.
IN ORDER TO GUARANTEE THE PROPER FUNCTION OF THE ENGINE, IT IS NECESSARY TO KEEP THE RADIATOR GRILLE CLEAN.

Recommended products

AGIP PERMANENT SPEZIAL coolant

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

Braking system

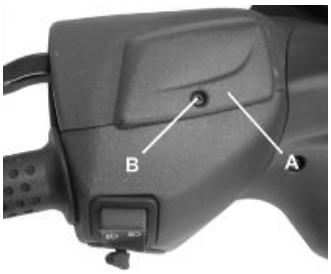
Level check

The front and rear brake fluid tanks are placed on the pumps under the handlebar covers. Proceed as follows:

1. Put the vehicle up on the central kickstand and with the handlebar centred;

2. Remove cover «**A**» by unscrewing the fixing screw «**B**»;

3. Check the fluid level using the relevant window «**C**».



CO check

Preparing the vehicle

- Remove the 2 bottom sides as explained in the Body chapter.
- Remove the 3 fastening screws of the filter box.
- Remove the filter box to access the 6 screws M6 closing the crankcase and the heat guard plate attachments.
- Remove the plate to access the flow adjustment screw on the carburettor.
- Remove the gas cap on the exhaust pipe.
- Using the original washer, install the exhaust gas collection Kit union.
- Suitably orientate the components (Figure 2).
- Close the gas outlet terminal of the tool. - Start the engine and let it warn until the electric fan starts.
- Stop the engine.
- Disconnect the vacuum feeding pipe from the SAS control valve.
- Insert a conical plug into the vacuum feeding pump.
- Connect the MITIVAC vacuum pump to the SAS control valve using a suitable pipe having the same size as the original fitted on the vehicle.
- Start the vacuum up to -0.6 -0.8 Bar so as to close the valve and cut off the SAS system.
- Remove the exhaust gas collection Kit closing cap and connect the analyser properly pre-heated.

N.B.

IN CASE OF 1000 PPM UNBURNED HYDROCARBONS (HC) >, CHECK THE IGNITION SYSTEM, THE TIMING SYSTEM, THE VALVE CLEARANCE AND THE EXHAUST VALVE TIGHTNESS.

N.B.

IN CASE OF UNSTABLE CO, CHECK THAT THE CARBURETTOR IS CLEAN AND THAT THE FUEL SUPPLY SYSTEM AND THE DEPRESSION SEALS WORK ADEQUATELY

N.B.

OTHERWISE, CHECK THE FUEL LEVEL ADJUSTMENT IN THE TANK AND THE FUEL CIRCUIT.

N.B.

ALSO CHECK THE CARBURETION ADJUSTMENT IS OBTAINED WITH THE FLOW SCREW OPEN BETWEEN 2 AND 4 TURNS.

N.B.

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

N.B.

CHECK THE CONDITIONS DISPLAYED BY THE ANALYSER AND THE ENGINE RPM AND ADJUST THE CO VALUE AT 3.8 ± 0.7 AT 1,650 ± 50 RPM.

Specific tooling

020332Y Digital rev counter

494929Y Exhaust fumes analyser

020329Y MityVac vacuum-operated pump

SAS filters inspection and cleaning

Undo the 2 fixing screws of the secondary air filter cover indicated in the figure, remove the cover and then take out the filtering element.

- Wash with water and mild soap.

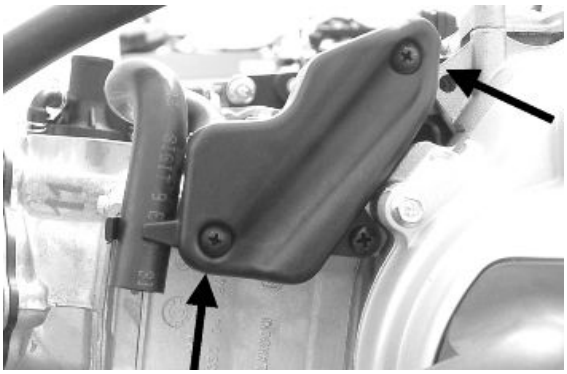
-Dry with a clean cloth and short blasts of compressed air.

Remove the flywheel cover by operating on its clamps and remove the primary filtering element.

- Wash with water and neutral soap.

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

Check that the filter housing is cleaned.



CAUTION

NEVER RUN THE ENGINE WITHOUT THE SECONDARY AIR FILTER

CAUTION

WHEN TRAVELLING ON DUSTY ROADS, THE AIR FILTER MUST BE CLEANED MORE OFTEN THAN SHOWN IN THE SCHEDULED MAINTENANCE CHART.

INDEX OF TOPICS

This section makes it possible to find what solutions to apply when troubleshooting.

For each failure, a list of the possible causes and pertaining operations is given.

Engine

Poor performance

POOR PERFORMANCE

Possible Cause	Operation
The carburettor is dirty; fuel pump or vacuum valve damaged	Remove, wash with solvent and dry with compressed air or replace
Excess of encrustations in the combustion chamber	Descale the cylinder, the piston, the head and the valves
Incorrect timing or worn timing system elements	Time the system again or replace the worn parts
Muffler obstructed	Replace
Air filter blocked or dirty.	Dismantle the sponge, wash with water and shampoo, then soak it in a mixture of 50% petrol and 50% of specific oil (Selenia Air Filter Oil), then hand dry without squeezing, allow to drip dry and then reassemble.
Automatic starter failure	Check: mechanical movement, electric connection and fuel supply, replace if required.
Oil level exceeds maximum	Check for causes and fill to reach the correct level
Lack of compression: parts, cylinder and valves worn	Replace the worn parts
Transmission belt worn	Replace
Inefficient automatic transmission	Check the rollers and the pulley movement, replace the damaged parts and lubricate the driven pulley moveable guide with Montblanc Molybdenum Grease
Clutch slipping	Check the clutch system and/or the bell and replace if necessary
Overheated valves	Remove the head and the valves, grind or replace the valves
Wrong valve adjustment	Adjust the valve clearance properly
Valve seat distorted	Replace the head assembly
Air filter dirty	Dismantle the sponge, wash with water and shampoo, then soak it in a mixture of 50% petrol and 50% of specific oil (Selenia Air Filter Oil), then hand dry without squeezing, allow to drip dry and then reassemble.
Defective floating valve	Check the proper sliding of the float and the functioning of the valve

Rear wheel spins at idle

REAR WHEEL ROTATES WITH ENGINE AT IDLE

Possible Cause	Operation
Idling rpms too high	Adjust the engine idle speed and the CO%, if necessary.
Clutch fault	Check the springs / clutch masses

Starting difficulties

DIFFICULT STARTING

Possible Cause	Operation
Altered fuel characteristics	Drain off the fuel no longer up to standard; then, refill
Rpm too low at start-up or engine and start-up system damaged	Check the starter motor, the system and the torque limiter
Incorrect valve sealing or valve adjustment	Inspect the head and/or restore the correct clearance
- Engine flooded.	Try starting-up with the throttle fully open. If the engine fails to start, remove the spark plug, dry it and before refitting, make the motor turn so as to expel the fuel excess taking care to

Possible Cause	Operation
	connect the cap to the spark plug, and this in turn to the ground. If the fuel tank is empty, refuel and start up.
Automatic starter failure	Check: mechanical movement, electric connection and fuel supply, replace if required.
Air filter blocked or dirty.	Dismantle the sponge, wash with water and shampoo, then soak it in a mixture of 50% petrol and 50% of specific oil (Selenia Air Filter Oil), then hand dry without squeezing, allow to drip dry and then reassemble.
Faulty spark plug or incorrect ignition advance	Replace the spark plug or check the ignition circuit components
The carburettor is dirty; fuel pump or vacuum valve damaged	Remove, wash with solvent and dry with compressed air or replace
Battery flat	Check the charge of the battery, if there are any sulphur marks, replace and use the new battery following the instructions shown in the chapter
Intake coupling cracked or clamps incorrectly tightened	Replace the intake coupling and check the clamps are tightened
Defective floating valve	Check the proper sliding of the float and the functioning of the valve
Carburettor nozzles clogged	Dismantle, wash with solvent and dry with compressed air

Excessive oil consumption/Exhaust smoke

EXCESSIVE OIL CONSUMPTION/SMOKEY 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 piston rings that have not been fitted properly	Replace the piston cylinder unit or just the piston rings

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 STOP FULL THROTTLE

Possible Cause	Operation
Faulty fuel supply	Check or replace the pump and the vacuum valve, check the vacuum intake and the pipe sealing
Incorrect float level	Restore the level in the tank by bending on the float the thrusting reed of the petrol inlet rod so as to have the float parallel to the tank level with the carburettor inverted.
Water in the carburettor	Empty the tank through the appropriate bleed nipple.
Maximum nozzle dirty - lean mixture	Wash the nozzle with solvent and dry with compressed air

Engine tends to cut-off at idle

ENGINE STOP IDLING

Possible Cause	Operation
Incorrect timing	Time the system and check the timing system components
Cut off device failure	Check that the following parts work properly: valve; diaphragm; spring; and that the air calibration elements are clean; check if the sponge filter is clean too
Incorrect idle adjustment	Adjust using the rpm indicator
Pressure too low at the end of compression	Check the thermal group seals and replace worn components
Faulty spark plug or incorrect ignition advance	Replace the spark plug or check the ignition circuit components
The starter remains on	Check: electric wiring, circuit not interrupted, mechanical movement and power supply; replace if necessary
Minimum nozzle dirty	Wash the nozzle with solvent and dry with compressed air

Excessive exhaust noise

EXCESSIVE EXHAUST NOISE

Possible Cause	Operation
Secondary air device cut-off valve not working	Replace the secondary air device
Depression intake pipe of the secondary air device disconnected or dented	Replace the pipe
Reed valve of the secondary air device does not close correctly and wears out the rubber coupling between the device and the head pipe	Replace the device and the coupling

High fuel consumption

HIGH FUEL CONSUMPTION

Possible Cause	Operation
Float level	Restore the level in the tank by bending on the float the thrusting reed of the petrol inlet rod so as to have the float parallel to the tank level with the carburettor inverted.
Loose nozzles	Check the maximum and minimum nozzles are adequately fixed in their fittings
Fuel pump failure	Check that there is no fuel in the low-pressure duct
Starter inefficient	Check: electric wiring, circuit continuity, mechanical sliding and power supply
Air filter blocked or dirty.	Dismantle the sponge, wash with water and shampoo, then soak it in a mixture of 50% petrol and 50% of specific oil (Selenia Air Filter Oil), then hand dry without squeezing, allow to drip dry and then reassemble.

SAS malfunctions

ANOMALIES IN THE SECONDARY AIR DEVICE

Possible Cause	Operation
Secondary air device cut-off valve not working	Replace the secondary air device
Depression intake pipe of the secondary air device disconnected or dented	Replace the pipe
Reed valve of the secondary air device does not close correctly and wears out the rubber coupling between the device and the head pipe	Replace the device and the coupling

Transmission and brakes

Clutch grabbing or performing inadequately

IRREGULAR CLUTCH PERFORMANCE OR SLIPPAGE

Possible Cause	Operation
Faulty clutch	Check that there is no grease on the masses. Check that the clutch mass contact surface with the casing is mainly in the centre with equivalent characteristics on the three masses. Check that the clutch casing is not scored or worn in an anomalous way

Insufficient braking

INSUFFICIENT BRAKING

Possible Cause	Operation
Inefficient braking system	Check the pad wear (1.5 min). Check that the brake discs are not worn, scored or warped. Check the correct level of fluid in the pumps and change brake fluid if necessary. Check there is no air in the circuits; if necessary, bleed the air. Check that the front brake calliper moves in axis with the disc.
Fluid leakage in hydraulic braking system	Failing elastic fittings, plunger or brake pump seals, replace

Brakes overheating

BRAKES OVERHEATING

Possible Cause	Operation
Rubber gaskets swollen or stuck	Replace gaskets.
Compensation holes on the pump clogged	Clean carefully and blast with compressed air
Brake disc slack or distorted	Check the brake disc screws are locked; use a dial gauge and a wheel mounted on the vehicle to measure the axial shift of the disc.
Defective piston sliding	Check calliper and replace any damaged part.

Electrical system

Battery

BATTERY

Possible Cause	Operation
Battery	This is the device in the system that requires the most frequent attention and the most thorough maintenance. If the vehicle is not used for some time (1 month or more) the battery needs to be recharged periodically. The battery runs down completely in the course of 3 months. If the battery is fitted on a motorcycle, be careful not to invert the connections, keeping in mind that the black ground wire is connected to the negative terminal while the red wire is connected to the terminal marked+.

Battery compartment plug

We inform you that a plug has been introduced starting with frame number ZAPM2300004501445 in order to prevent the possibile wear of the battery due to its rubbing against the rivets of the helmet compartment.

Turn signal lights malfunction

TURN INDICATOR NOT WORKING

Possible Cause	Operation
Electronic ignition device failure	With the key switch set to "ON" jump the contacts 1 (Blue - Black) and 5 (Red/Blue) on the control unit connector. If by operating the turn indicator control the lights are not steadily on, replace the control unit; otherwise, check the cable harness and the switch.

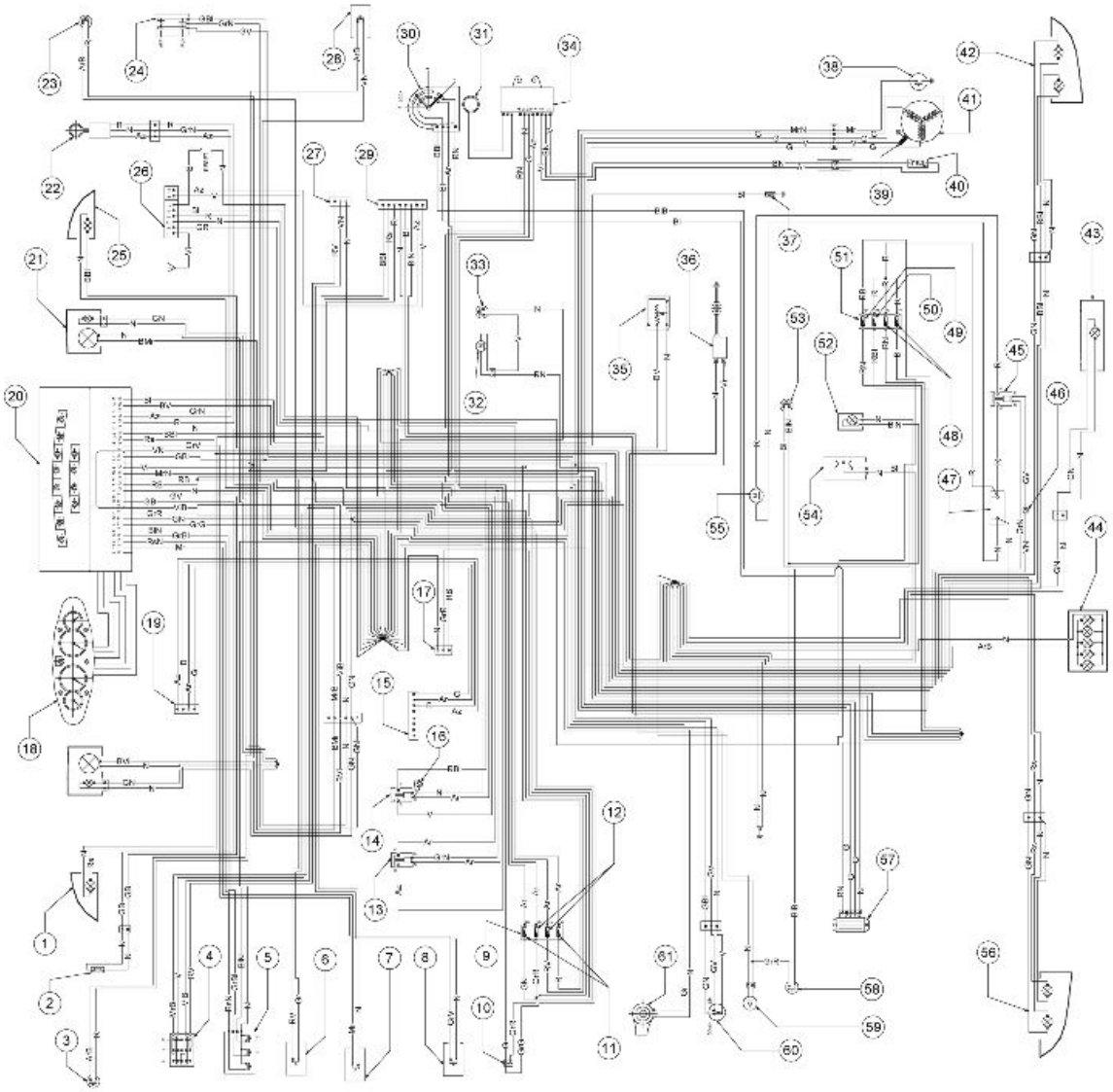
Steering and suspensions

Controls

STEERING CONTROLS AND SUSPENSIONS

Possible Cause	Operation
Torque not conforming	Check the tightening of the top and bottom ring nuts. If irregularities in turning the steering continue even after making the above adjustments, check the seats on which the ball bearings rotate: replace them if they are recessed or if the balls are flattened.
Steering hardening	Check the tightening of the top and bottom ring nuts. If irregularities continue in turning the steering even after making the above adjustments, check the seats in which the ball bearings rotate: replace them if they are recessed or if the balls are flattened.
Malfunctions in the suspension system	If the front suspension is noisy, check: the efficiency of the front shock absorbers; the condition of the ball bearings and relevant lock-nuts, the limit switch rubber buffers and the movement bushings. In conclusion, check the tightening torque of the wheel hub, the brake calliper, the shock absorber disk in the attachment to the hub and the steering tube.
Seal fault or breakage	Replace the shock absorber Check the condition of wear of the steering covers and the adjustments.

INDEX OF TOPICS



ELECTRIC SYSTEM DIAGRAM

	Specification	Desc./Quantity
1	Front left direction indicator	1 bulb 12V - 10W
2	Outside temperature sensor	
3	Combined brake stop button	
4	Light switch	
5	Indicators switch	
6	Horn button	
7	Emergency flashing button	
8	"Reset" button	
9	Front fuse holder box	
10	Output for immobilizer diagnostic instrument	
11	Fuse	7.5 A
12	Fuses	10A
13	Engine stop remote control switch	
14	Headlight remote control switch	
15	Connector fitting for PICS control unit	
16	Diode	
17	Connector fitting for PICS control unit	
18	Analogue instrument unit	
19	PICS display fitting	

	Specification	Desc./Quantity
20	Digital instrument unit	
21	Front headlight	N° 2 position bulbs 12V - 5W, N° 1 dipped beam bulb 12V- 55W, N° 1 upper beam bulb 12V - 55W
22	Wheel RPM sensor	
23	Front brake stop button	
24	Engine stop switch	
25	Front right direction indicator	N° 1 bulb 12V - 10W
26	Connector fitting for saddle opening device	
27	Fitting for accessories	
28	Anti-theft alarm fitting	
29	Start up button	
30	Key switch	
31	Immobilizer aerial	
32	Radiatore electric fan motor	
33	Thermal switch for electric fan	
34	Electronic ignition	
35	Fuel level sender	
36	HV coil	
37	Thermistor	
38	Oil pressure sensor	
39	Pick - up	
40	Automatic starter	
41	Magneto flywheel	
42	Rear right headlight	N° 1 bulb 12V - 55W for position light, N° 1 bulb 12V - 10W for flashing light
43	License plate light bulb	**Type:** ALL GLASS **Power:** 12V - 5W **Quantity:** 1
44	Stop light	N° 5 bulbs 12V-2.3W
45	Remote starter switch	
46	Diodo	
47	Battery	12V-12Ah
48	Fuse	15A
49	Fuse (Rear position light protection, number plate light, front position light)	7.5A
50	Fuse	10 A
51	Rear fuse holder box	
52	Helmet compartment lamp bulb	12V-5W
53	Helmet compartment lighting button	
54	Socket for users	12V - 180W max
55	Starter motor	
56	Rear left headlight	N° 1 bulb 12V - 55W for position light, N° 1 bulb 12V - 10W for flashing light
57	Voltage regulator	
58	Saddle opening button	
59	Saddle opening actuator	
60	Stand switch	
61	Horn	

Wiring colour chart:

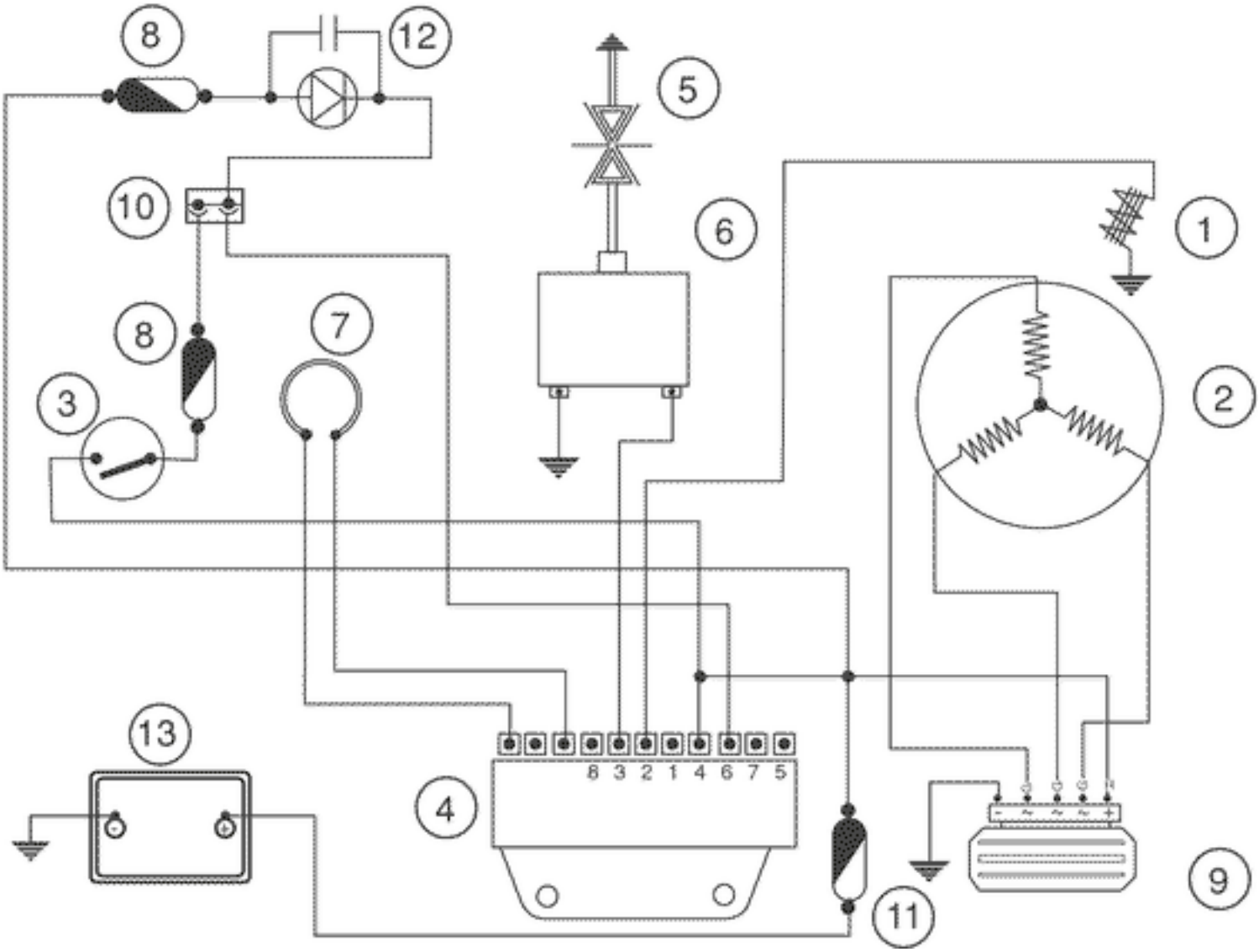
B=White - **Bl**=Blue - **G**=Yellow - **M**=Brown - N=Black - **BV**=White-Green - **GN**=Yellow-Black - **Gr**=Grey - **Rs**=Pink - **R**=Red - **Vi**=Purple - **V**=Green - **VN**=Green-Black - **BN**=White-Black - **BBl**=White-Blue - **GV**=Yellow-Green - **Ar**=Orange - **GrBl**=Grey-Blue - **GrN**=Grey-Black - **BR**=White-Red - **RN**=Red-Black - **BlN**=Blue-Black.

CAUTION

SHOULD ANY INTERVENTIONS TO THE ELECTRIC SYSTEM BE REQUIRED, MAKE SURE THAT THE LEADS TO THE ELECTRONIC IGNITION DEVICE ARE PROPERLY CONNECTED ACCORDING TO POLARITY AND TO THE LEAD COLOURS.

Conceptual diagrams

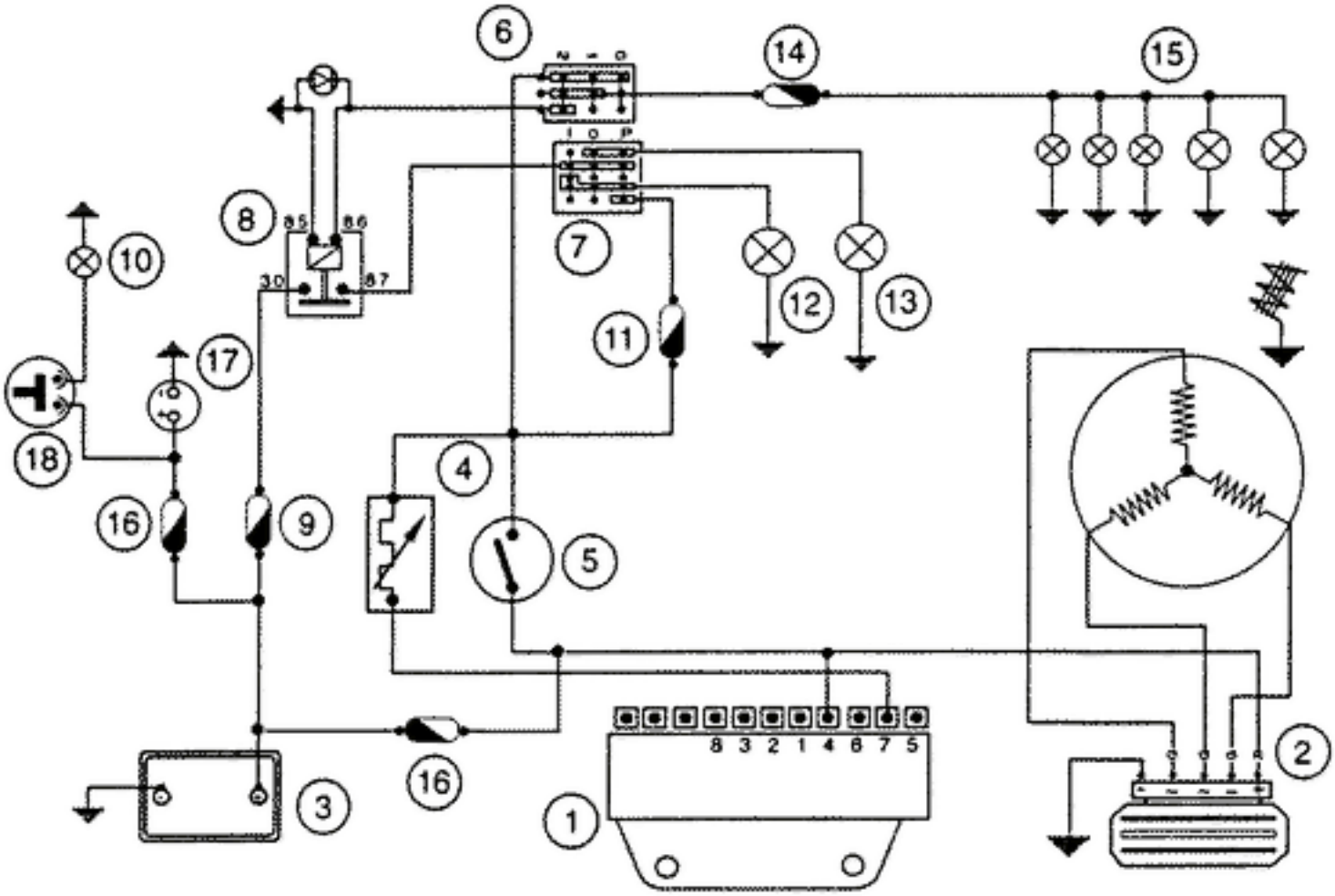
Ignition



IGNITION SECTION

	Specification	Desc./Quantity
1	Pick - up	
2	Magneto flywheel	
3	Key switch contacts	
4	Electronic controller	
5	Spark plug	
6	HV coil	
7	Immobilizer aerial	
8	Voltage regulator	
9	Voltage regulator	
10	Diagnostic tester outlet	
11	Fuse	15A
12	Immobilizer LED	
13	Battery	12V-12Ah

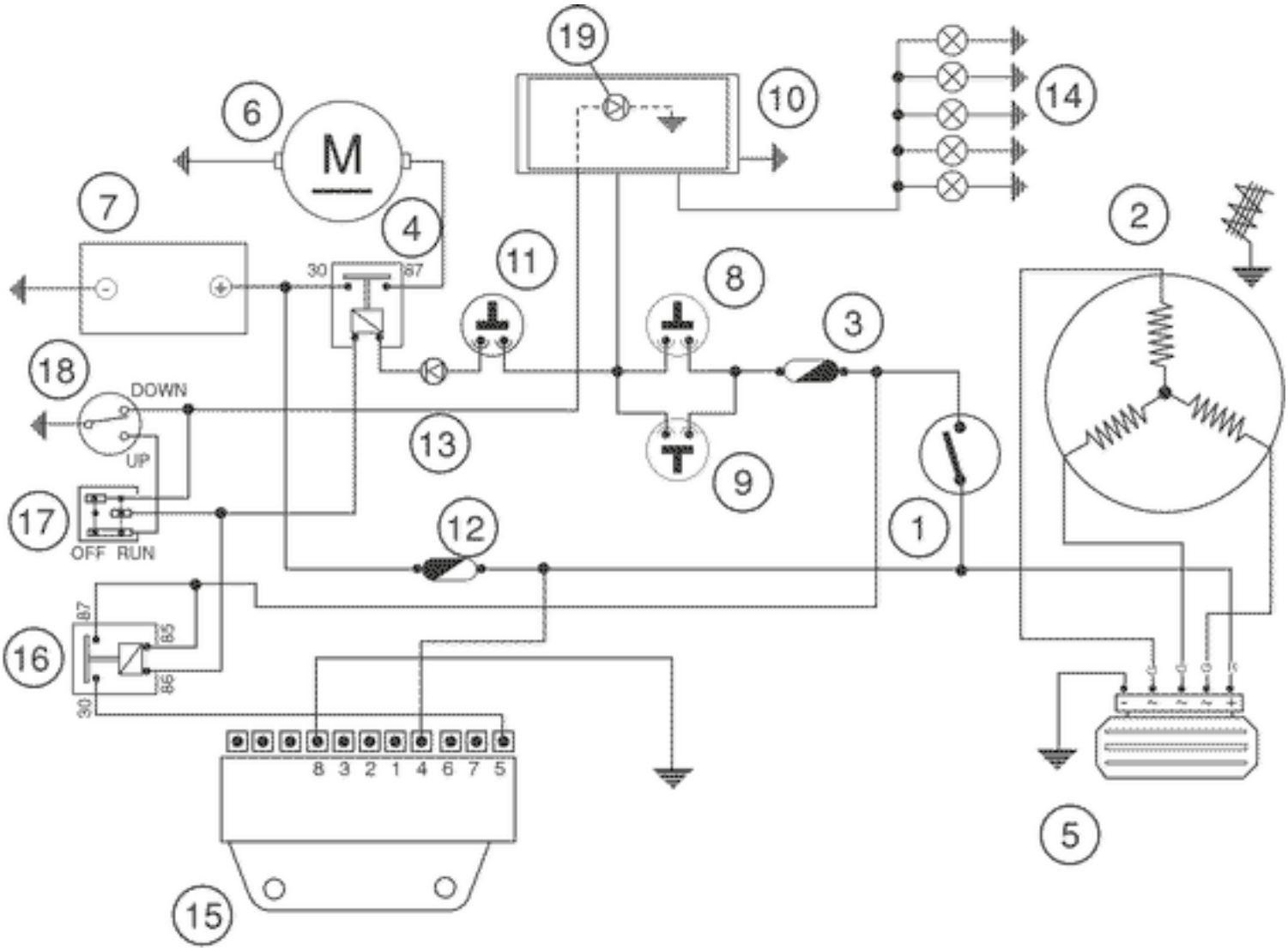
Headlights and automatic starter section



HEADLIGHTS AND AUTOMATIC STARTER SECTION

	Specification	Desc./Quantity
1	Electronic control unit	
2	Voltage regulator	
3	Battery	12V 12Ah
4	Automatic starter	
5	Key switch contacts	
6	Light switch	
7	Light switch	
8	Light remote control switch	
9	Fuse (headlight remote control protection)	10 A
10	Helmet compartment lamp bulb	12V-5W
11	Fuse (upper beam protection)	10 A
12	Bulb for upper beams	12V-55W
13	Bulb for dipped beams	12V-55W
14	Fuse (Rear position light protection, number plate light, front position light)	7.5A
15	Bulbs	N° 2 12v-3w front pos. Lights, n° 2 12v-5w rear pos. Lights, n° 1 12v-5w number plate light
16	Fuse	15A
17	Socket for users	12V - 180W max
18	Helmet compartment lighting button	

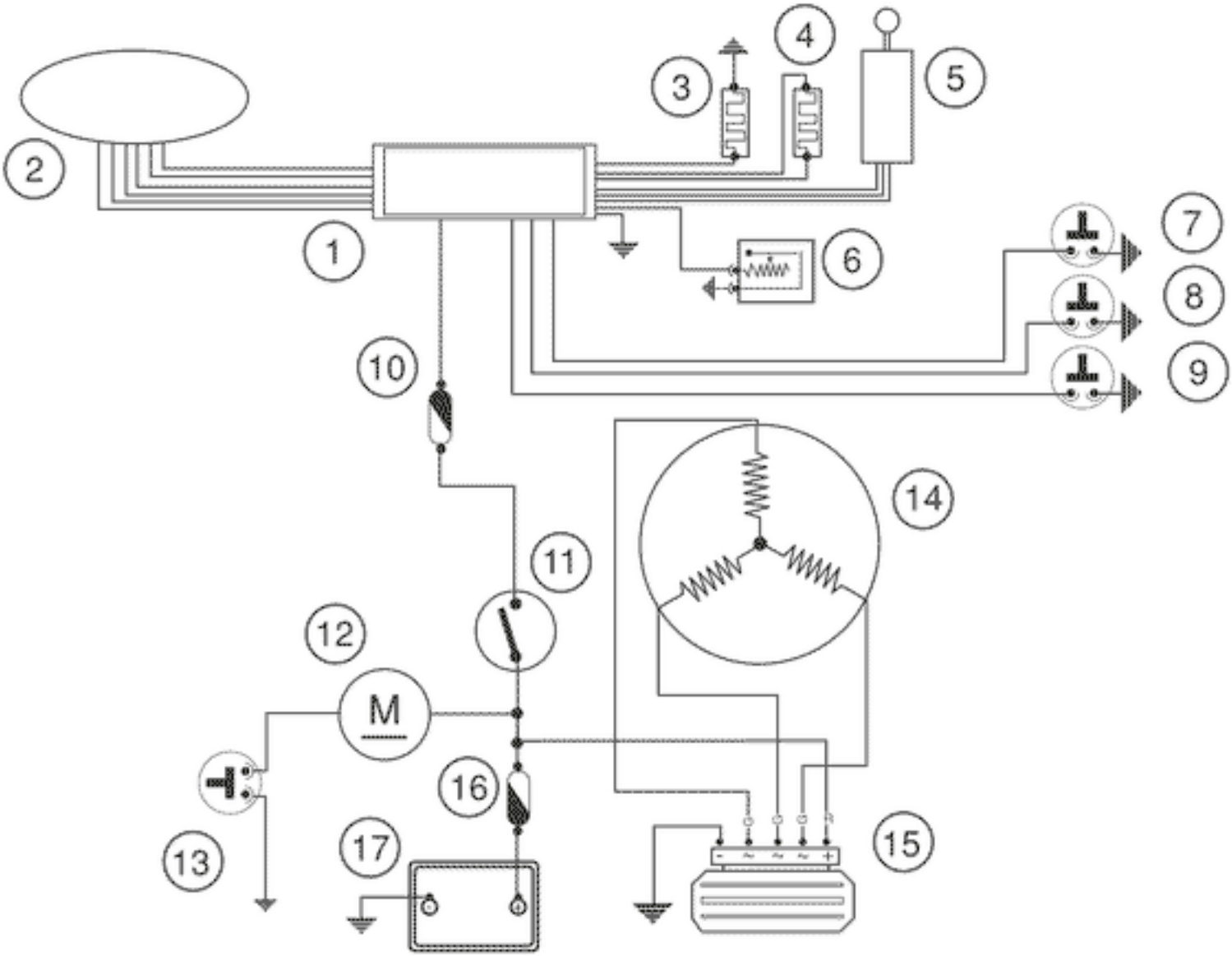
Battery recharge and starting



BATTERY RECHARGE AND START-UP

	Specification	Desc./Quantity
1	Key switch contacts	
2	Magneto flywheel	
3	Fuse	5A
4	Remote starter switch	
5	Voltage regulator	
6	Starter motor	
7	Battery	12V-12Ah
8	Start-up enable and front stop button	
9	Start-up enable and rear stop button	
10	Digital instrument	
11	Start up button	
12	Fuse	15 A
13	Diode	1 A
14	Stop light	N° 5 bulbs 12V-2.3W
15	Electronic ignition	
16	Engine stop relay	
17	Engine stop switch	
18	Stand switch	
19	Engine not enable indicator	

Level indicators and enable signals section



LEVEL INDICATORS AND ENABLE SIGNALS

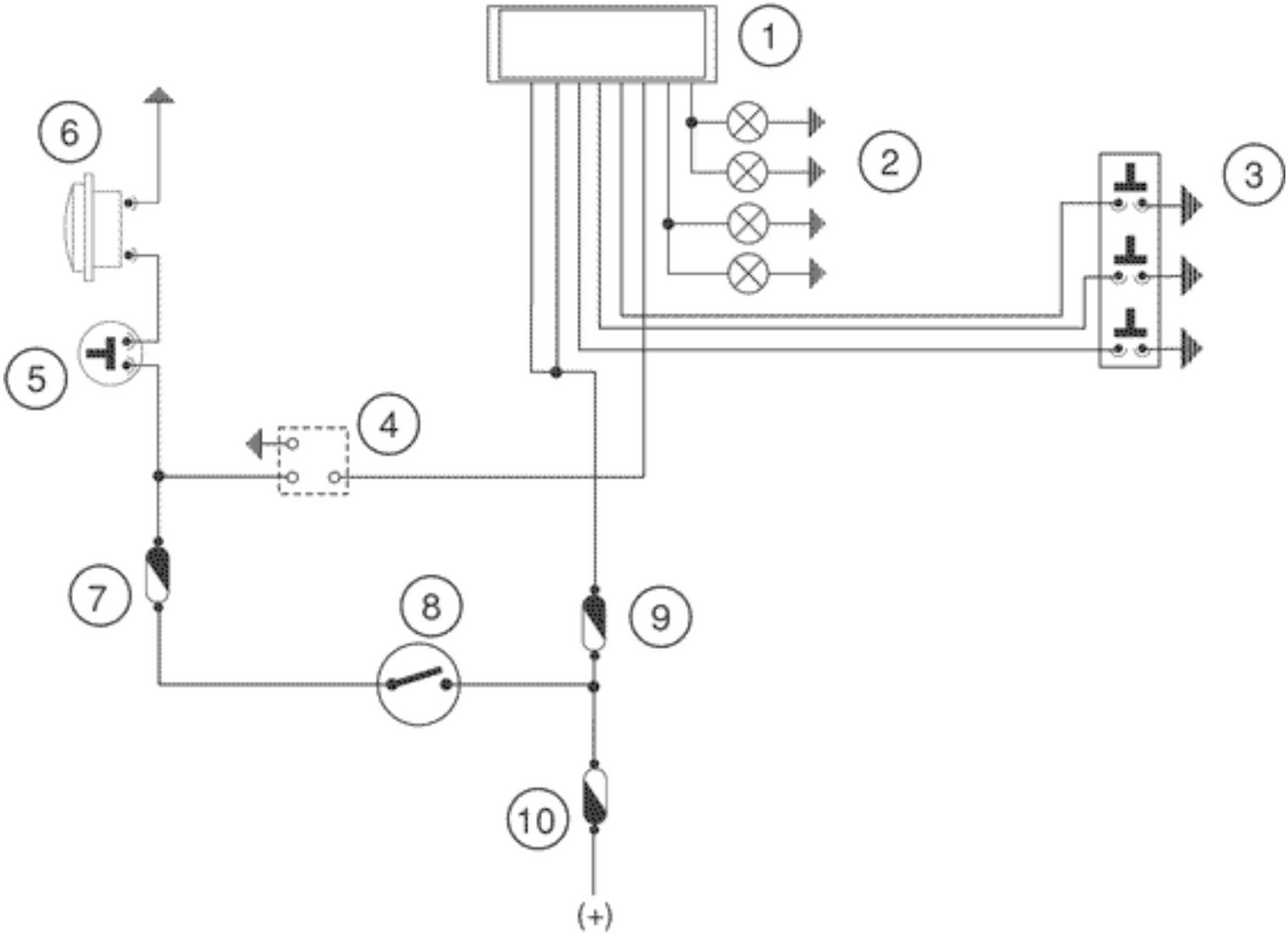
	Specification	Desc./Quantity
1	Digitsl instrument	
2	Analogue instrument unit	
3	Thermistor	
4	Outside temperature sensor	
5	Wheel RPM sensor	
6	Fuel level sender	
7	Oil pressure sensor	
8	"Reset" button	
9	Emergency button	
10	Fuse	10 A
11	Key switch contacts	
12	Radiatore electric fan motor	
13	Thermal switch for electric fan	
14	Magneto flywheel	
15	Voltage regulator	
16	Fuse	15A

	Specification	Desc./Quantity
17	Battery	12V - 12Ah

Thermal switch

We inform you that a new thermal switch has been introduced starting with frame number ZAPM2300003507739 (X9) ZAPM3620000003383 (X8) ZAPM2850000001025 (Beverly), in order to prevent possible malfunctioning of the thermal switch.

Turn signal lights



FLASHING LIGHTS, HORN AND ACCESSORY FITTINGS

	Specification	Desc./Quantity
1	Digital instrument unit	
2	Direction indicators	N° 2 + 2 bulbs 12V-10W
3	Indicators switch	
4	Fitting for accessories	
5	Horn button	
6	Horn	
7	Fuse	10 A
8	Key switch contacts	
9	Fuses	10A

	Specification	Desc./Quantity
10	Fuse	15 A

Checks and inspections

Immobiliser

The electric ignition system is fed with direct current and is protected by an antitheft immobilizer integrated to the control unit.

The ignition system consists of:

- electronic control unit
- immobilizer aerial
- master and service keys with built-in transponder
- HV coil
- diagnosis LED

-The diagnostic LED also works as a deterring blinker. This function is activated every time the key switch is turned to "OFF" and it remains active 48 hours so as not to damage the battery charging process.

When the key switch is turned to "ON", this blinking function is deactivated. A flash then confirms the system has switched to "ON".

The duration of the flash depends on the electronic control unit program (see figure).

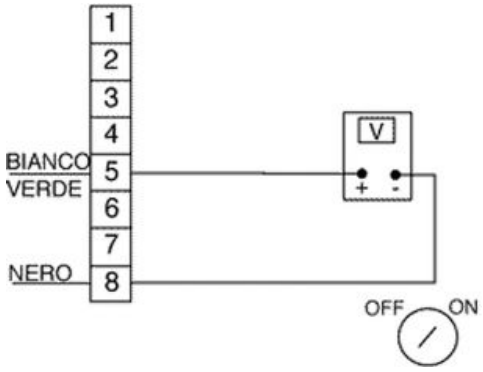
If the led turns off and remains so when switching to "ON", it is necessary to check if there is battery voltage in the electric control unit.

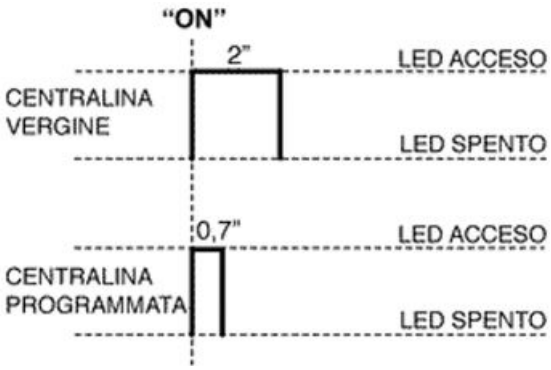
Connect the immobilizer tester to the diagnosis socket (see ET4 125 manual) located below the spark plug inspection port.

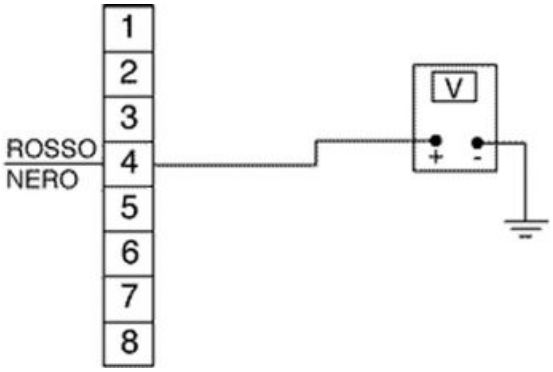
If the serial LED remains off, proceed to check the control unit supply as follows:

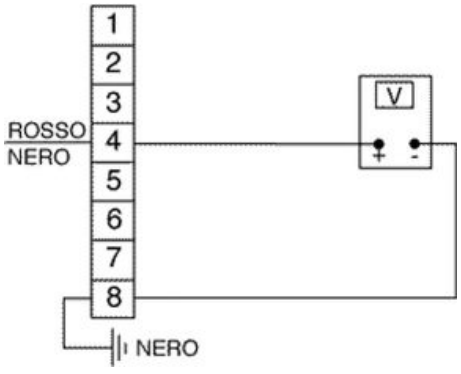
- Disconnect the control unit connector and check if:

- There is battery voltage between terminal No. 4 (Red/Black) and the ground lead.





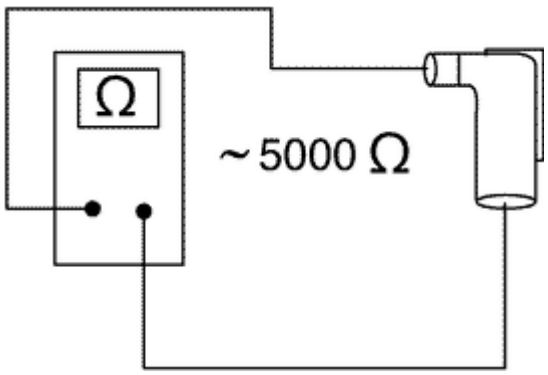




- There is battery voltage between the terminal No. 4 (Red/Black) and terminal No. 8 (Negative) as shown in the figure.
If no voltage is detected, check the wiring to the battery positive lead and see if the 15A fuse is in good conditions (see the start-up diagram)
- There is battery voltage between terminals No. 5 and No. 8 with the key switch set to "ON", the side stand retracted and the emergency switch set to "RUN".
If no faults are found, replace the control unit; otherwise check the wiring and the following components:
- Engine stop remote control;
- Emergency cut-off switch;
- Side stand contacts;
- Key switch contacts.

Virgin circuit

If the ignition system has not been programmed, the engine can be started but it will run limited to 2000 rpm. When trying to accelerate, some evident loss of power may be felt.
Program the system with the MASTER (Brown) and SERVICE (Black) keys as follows:
- Insert the MASTER key, turn it to "ON" and keep it in that position for 2 seconds (limit values: 1 ÷ 3 seconds).
- Alternately insert all the available black keys and turn each one of them to "ON" for 2 seconds.
- Insert the MASTER key again and turn it to "ON" for 2 seconds.
The maximum time to change keys is 10 seconds.
A maximum of 7 (Black) service keys can be programmed at one time.

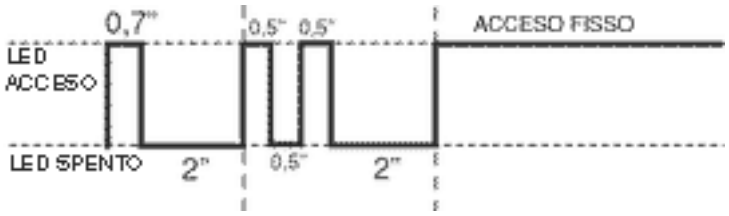


Sequence and times must be strictly observed or it will be necessary to repeat the procedure from the start.
Once the control unit has been programmed, the control unit is inseparably matched with the MASTER key transponder.
This matching allows programming further service keys in case of loss, replacement, etc. Each new time new data is programmed the previously stored one is deleted.
If a service key setting is lost, it is essential to carefully check the efficiency of the high voltage system:
Shielded cap resistance ~ 5000 Ω.
In any case it is advisable to use resistive spark plugs.

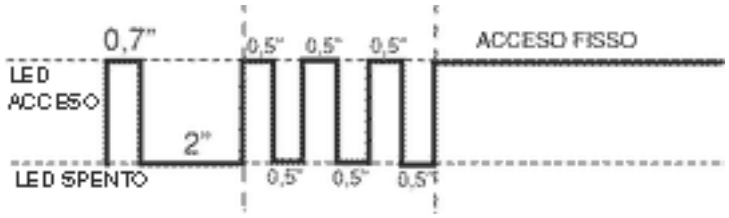
Diagnostic codes

The flash indicating the switching to "ON" can be followed by a phase of programmed failure warnings. That is, the led is off for 2 seconds, and then diagnosis codes are transmitted with 0.5-second flashes. After the failure code indication, a steadily on LED signals that ignition is disabled; see the table:

2-FLASH CODE - Example with programmed control unit, no transponder and/or malfunctioning aerial. **Ignition disabled-Vehicle immobilised**



3-FLASH CODE - Example with programmed control unit, aerial working properly and unknown transponder code. **Ignition disabled-Vehicle immobilised**



Diagnostic code - 2 flashes

Diagnosis code: 2-flashes

When the 2-flash code is detected, carry out the following checks:

- Check if the failure continues after changing key (MASTER key included). If the failure persists with any key, disconnect the aerial connector from the control unit and check the aerial continuity with the 020331Y multimeter.

If non-conforming values are measured, replace the aerial.

If no failures are found in the aerial, replace the control unit.

CAUTION

BEFORE PROGRAMMING THE NEW ELECTRONIC CONTROL UNIT CHECK THAT NO FAILURE CODE IS INDICATED. THIS IS NECESSARY TO AVOID SPOILING A NEW CONTROL UNIT

Electric characteristic

immobilizer aerial

~ 7 ÷ 9 Ohm

Diagnostic code - 3 flashes

If the 3-flash code is detected, check if the failure occurs when the MASTER key in inserted into the key switch.

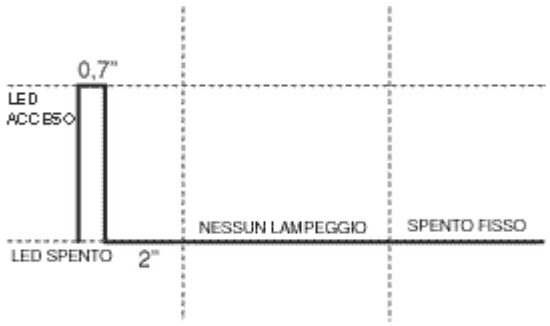
- If the failure disappears when the MASTER key is used, proceed to encode the service keys (Black).
- If the failure persists, it means that the MASTER key and the control unit are not linked; in this case, replace the control unit and then encode the keys.

The immobilizer system is efficient when, after switching over to "ON", only a 0.7-second flash is detected (see diagram).

In this case, the engine can be started.

Example with programmed control unit, transponder, programmed key and aerial working properly.

Ignition is enabled (regular conditions of use)



Ignition circuit

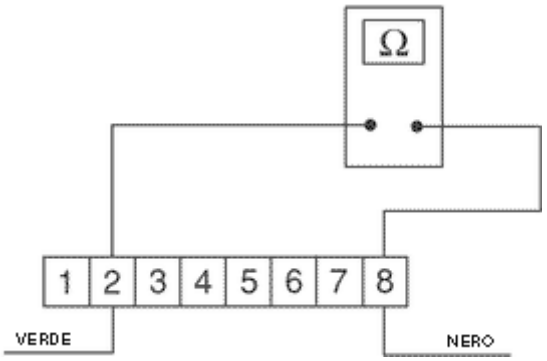
Once the immobilizer system is enabled, the HV coil and the signals from the Pick-Up will produce a spark in the spark plug.

The battery provides the basic power supply. The system is adjusted so that the start-up system immediately detects an eventual battery voltage drop, but this is practically irrelevant for the ignition system.

The Pick-Up is connected to the control unit by a single cable; then, for the ground circuit, the control unit is connected to the Pick-Up by the chassis and the engine ground lead.
To avoid disturbances in the ignition system during start-up, it is very important that the engine-chassis ground connection bonding is efficient.

No spark plug

Once the lack of power to the spark plug has been detected and the LED indicates it can be ignited, follow this procedure:
- Pick-Up check.
Disconnect the control unit connector and check that the cable between terminal No. 2 (Green) and terminal No. 8 (Black) is not interrupted. Check the Pick-Up and its power line:



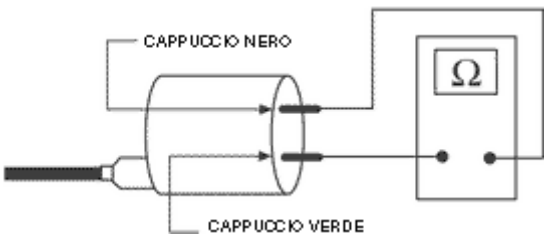
Electric characteristic

Pick-up resistance value

Pick-up resistance value: 105 ÷ 124 Ohm

If a break in the circuit is found, check again the flywheel and the engine ground connectors (see engine manual). If non-conforming values are detected, replace the Pick-Up, otherwise check the cable harness and the connections. In case conforming values are measured and the wiring and connections check is OK, try replacing the control unit (without programming) and make sure the failure has been solved by checking sparks are produced in the spark plug; only then program the control unit. If no sparks are produced with the new control unit, proceed as follows.

- HV primary coil check
Disconnect the two connectors on the HV coil and check continuity (see figure). If non-conforming values are measured, replace the HV coil. If conforming values are measured, check the cable harness taking into account that the HV coil positive wire has a branch that comes into the digital instrument panel (violet cable). Therefore, make sure this line is in perfect conditions. If failures are detected, check the HV coil secondary.



Electric characteristic

High voltage coil primary resistance value

High voltage coil primary resistance value: 0.4 ÷ 0.5 Ohm

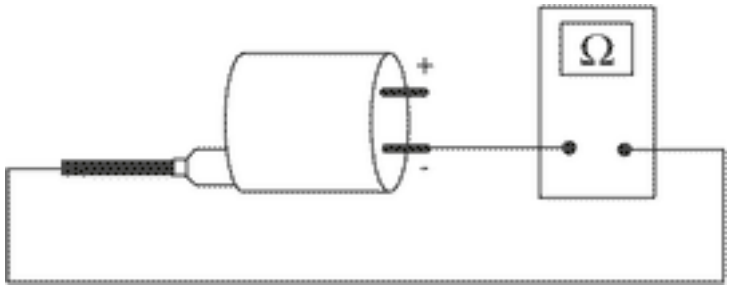
HV coil secondary check

Disconnect the spark plug cap from the HV cable and measure the resistance between the HV cable terminal and the HV coil negative terminal (see figure). If non-conforming values are measured, replace the HV coil. To carry out a more complete diagnosis, check the peak voltage with the multimeter adaptor.

Electric characteristic

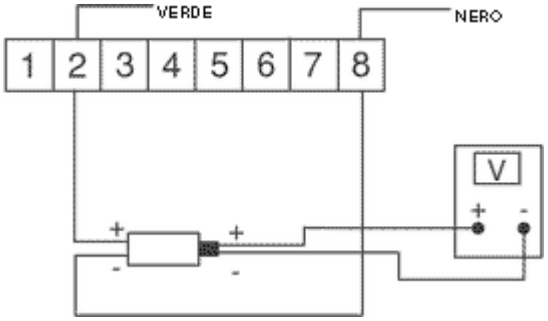
High voltage coil secondary resistance value

High voltage coil secondary resistance value: ~ 3000 ± 300 Ohm



- Pick-Up.
- Disconnect the control unit connector and connect the positive terminal to connector No. 2 and the negative terminal to connector No. 8 (see figure).

Use the start-up system to run the engine and measure the voltage produced by the Pick-Up. Replace Pick-Up if non-conforming values are measured.



Electric characteristic

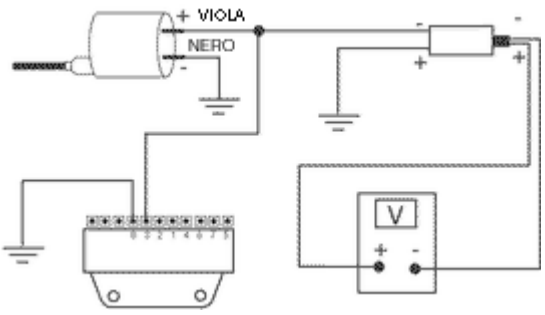
Pick-Up voltage value

Pick-Up voltage value: > 2 Volt

- HV coil

With the control unit and HV coil connected, measure the voltage of the coil primary during the start-up test with the voltage peak adaptor and connecting the positive terminal to the ground one and the negative to the coil positive connector.

If non-conforming values are measured, replace the control unit.



N.B.

THE PLASTIC CAP OF THE POSITIVE TERMINAL ON THE HV COIL PRIMARY IS BLACK AND THE NEGATIVE TERMINAL ONE IS GREEN.

Electric characteristic

High voltage coil voltage value

High voltage coil voltage value: > 100 Volt

Stator check

Disconnect the connector from the voltage regulator and check there is continuity between any yellow cable and the other two cables.

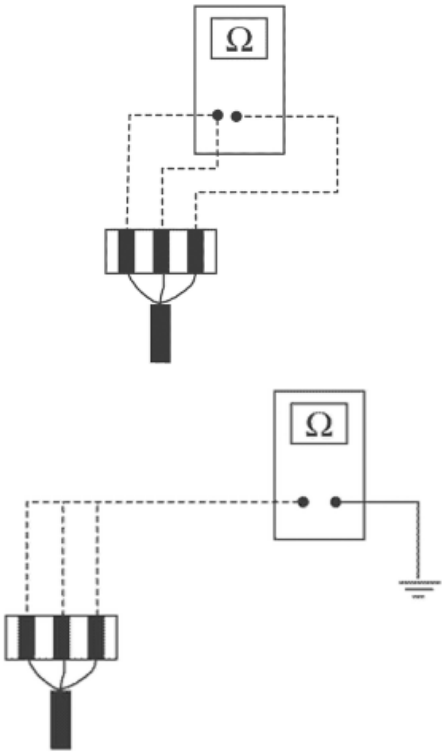
Electric characteristic

Ohm value:

0.7 ÷ 0.9 Ohm

Also check that all yellow cables are insulated from the ground connection.

If non-conforming values are detected, repeat the checks directly to the stator. In case of further repetitions of incorrect values replace the stator or repair the wiring.



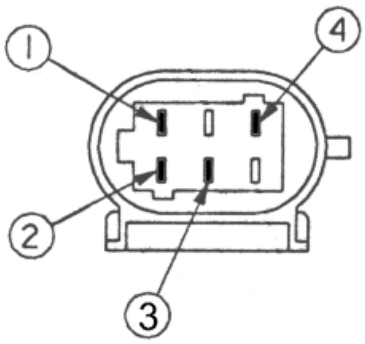
- Using a tester, check the continuity between connection 4-3, 4-1 and 3-1.
- Check the earth insulation on the three stator phases 4-earth, 3-earth and 1-earth.

Indicative resistance of each phase: 0.7 ÷ 0.9 Ω

Pick-Up Check

- Check that there is a resistance of about 105 ÷ 124 Ω at 20°C between connection 2 and earth.
- If you read values other those stated, replace the defective parts.

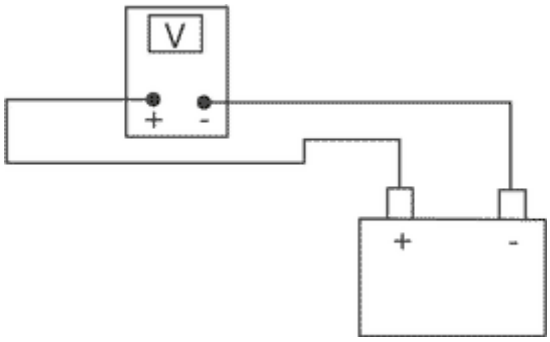
N.B.



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

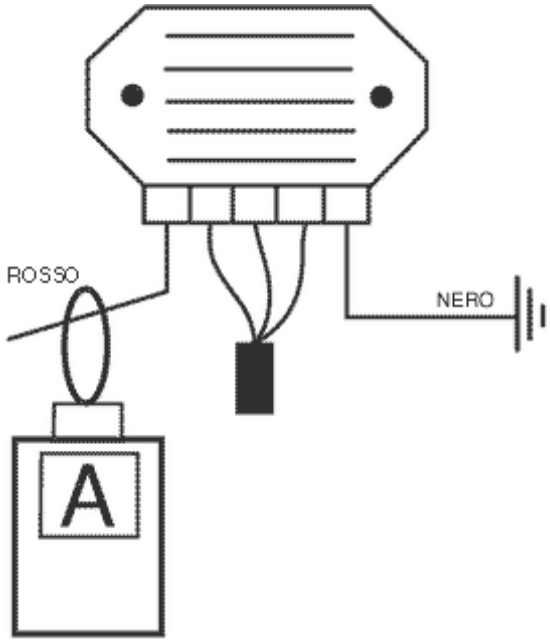
Voltage regulator check

With a perfectly charged battery and lights off, measure voltage at the battery poles with a high running engine.
The voltage should not exceed 15.2 Volt.
In case higher voltages are detected, replace the regulator.
In case of voltage values lower than 14 Volt, check the stator and the corresponding cable harness.



Recharge system voltage check

Connect an ammeter induction clamp to the voltage regulator positive terminal, measure the battery voltage and turning on the vehicles lights with engine off, wait for the voltage to set at about 12 V. Start the engine and measure the current generated by the system with lights on and a high running engine.
In case the generated current value is lower than 10A, repeat the test using a new regulator and/ stator alternatively.



The recharge system is provided with a three phase generator with permanent magneto flywheel. The generator is directly connected to the voltage regulator. In turn, the latter is directly connected to earth and to the battery positive passing through the 15A safety fuse. This system therefore requires no connection to the key switch. The three phase generator allows a considerable recharge power and at lower rpm it enables a good combination of delivered power and idle steadiness. For this reason, idle speed must be adjusted according to the prescriptions.

Choke Inspection

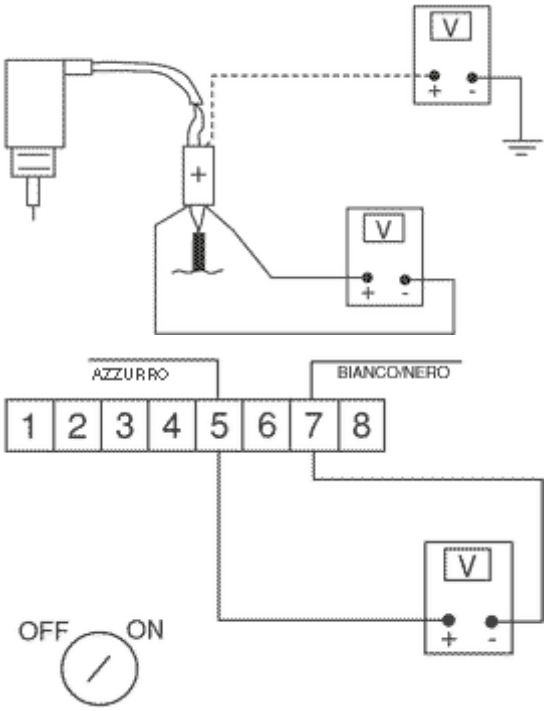
Refer to the engine section to check the resistance and operating conditions of the component. As regards voltage supply, keep the connector connected to the system and check that the two terminals receive battery voltage when the engine is on (see figure).

If voltage is detected, replace the automatic starter as it is surely failing.

If no voltage is detected, connect the multimeter negative terminal to the earth terminal and the positive terminal to the automatic starter orange cable; with the key switch set to «ON» check whether there is battery voltage; if there is no voltage, check the wiring connections to the key switch and that the 15A fuse works properly.

If there is voltage, check again the ignition control unit connector. After disconnecting the starter, start the engine and keep it at idle speed. Check if there is voltage when the multimeter positive probe is connected to the terminal No. 5 (Sky blue) and the negative one to the terminal No. 7 (Black/White) (see figure).

Replace the control unit if there is no voltage; otherwise, check the wiring connections between the starter and the control unit.



Lights list

List of lamps

Electric characteristic

Number plate lights

12V-5W

Trunk lights

12V-5W

Instrument panel lights

12V-2W x 5

Rear direction indicator lights

12V-10W x 2

Stop lights

12V-2,3W x 5

Rear position lights

12V-5W x 2

Front turn indicator bulbs

Front turn indicator bulbs 12V-10W x 2

Front position lights

12V-5W x 2

Upper beam light

12V-55W

Dipped beam light

12V-55W

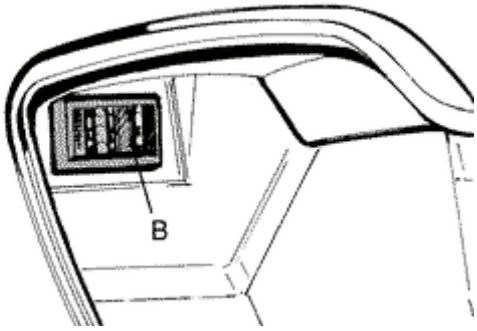
Fuses

The electric system is equipped with:

- four protective fuses «**A**» into the helmet compartment,

- four fuses «**B**» for the system circuitry safety, located inside the port in the rear left side of the shield.

The tables shows the features of the fuses on the vehicle.



CAUTION

BEFORE REPLACING A BLOWN FUSE, FIND AND SOLVE THE FAILURE THAT CAUSED IT TO BLOW. NEVER TRY TO REPLACE THE FUSE USING ANY OTHER MATERIAL (A PIECE OF ELECTRICAL WIRE, FOR EXAMPLE) OR A FUSE OF A DIFFERENT RATING THAN THAT SPECIFIED.

Electric characteristic

Light indicator on digital instrument panel, front and rear side/taillights

7.5 A

Digital instrument panel, diagnostic led indicator on analogue instrument.

10 A

Brake lights, vehicle start-up enabling signal

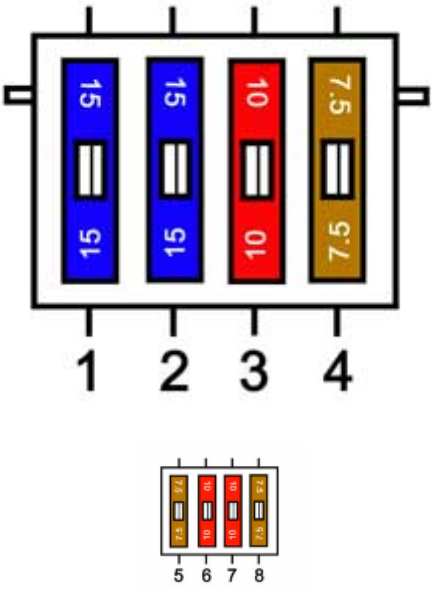
7.5 A

Horn, upper beam and indicator on "Passing" function

10 A

FUSES

	Specification	Desc./Quantity
1	Helmet compartment, 12-V socket	15 A
2	General (battery recharge, lights, radiator electric fan, electronic control unit).	15 A
3	Headlight (upper and dipped beams).	10 A
4	Digital instrument panel	7.5 A



Dashboard

Vehicle X9 is provided with an instrument panel divided into 2 sections: the analogue section is fixed into the cap while the digital section is integral to the handlebar.

The analogue section includes:

- Tachometer with dual scale (MPH/KMH) controlled by the fifth wheel;
- RPM counter controlled by the signal sent by the H.V. coil.
- Fuel level indicator controlled by a resistive sensor (into the tank)
- Cooling fluid temperature indicator controlled by a resistive sensor (on the head)

These instruments are electrical and managed by stepping motors.

The instrument panel digital section is completed by a liquid crystal display and 4 control buttons.

The display has 3 icons:

- **Oil**
- **Service**
- **Belt**

- The «**Oil**» icon flashes when 1,000 Km are reached, after that every 3,000 Km.
- The «**Service**» icon flashes when 1,000 Km or 1 year is reached. After that, it flashes every 6,000 km or 1 year.
- The «**Belt**» icon warns the user of the need of replacing the driving belt. This occurs every 12,000 Km

A: Fitting for indicator light *

B: Fitting for indicator light *

C: Fitting for indicator light *

D: Engine disabled

E: Oil pressure

F: Fuel reserve

G: Position and dipped beam lights: green coloured

H: Upper beams on

I: Left direction indicator

L: Emergency lights (four direction indicators)

M: Right direction indicator

* The DGT instrument does not include the LEDs for the indicator light fittings

The fuel reserve, direction indicators and emergency flashing functions are activated by the instrument electronics. For example, the fuel reserve indicator light only turns on when the reserve indication coming from the engine lasts at least 13.5 seconds. This prevents the intermitting turning on of the reserve light indicator.

- The intermitting function is built in the instrument electronics: this allows operating the emergency lights with switch in position «OFF» and control switch off. The control switch is only active when the instrument panel is on.

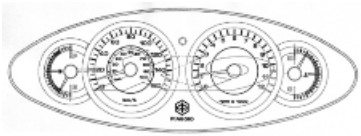
To ensure safety while riding, the «direction indicators control» function is connected to the odometer. If the indicator is left on, it automatically stops after 1 kilometre travelled.

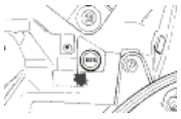
- The «engine disabled» indicator is activated by the side stand switch and by the emergency switch on the right side of the handlebar.

- The LCD display gives a 5 digit indication for the total kilometres covered by the vehicle. It can be expressed in kilometres or in miles: of course, this indication cannot be reset. **To select the indication, press "Trip" and «M» at the same time, then tirn the key switch to «ON»; keep these 2 buttons pressed for more than 3" to display «SET» on the display, then the display switches from miles to kilometres, or vice versa.**

After servicing by the authorised workshop, the icon message must be reset by the "Reset" button located in the front side of the vehicle under the fairing.

The "Reset" button allows resetting the kilometres covered and, in the case of "Service", also the year count. This count remains active even if the battery is disconnected for a short time.





To reset one of the icons, press the «Reset» button for less than a second, then on the icon before that to be reset press «Reset» for at least 3" so as to display:

- The selectionj of the desired icon through the relevant solid light.

- The flashing of this light confirms the reset.

- For example, to reset the «Service» icon, go to «Oil» and press the «Reset» button for at least 3".

To reset «Oil», repeat the above procedure going to «Belt».

This procedure must be repeated since the selection of the icon and its reset are operations to be made at the same time (it is not possible to view the desired function and reset by two different button pressures since in this way the next icon would be reset).

Data check function

Date and check function

Date should be adjusted out when delivering the vehicle to the customer. This is because the clock activation starts the year count for the "Service" function. If the clock has been previously activated, reset the "Oil", "Service" and "Belt" functions. The calendar is programmed from 2000 to 2050. For date and time adjustment act on the "Clock" and "Set" buttons.

To guarantee vehicle safety, each time the key switch is set to "ON", there is an automatic checking of all the indicators on the digital section.

The digital section provides also a functional checking of the 4 analogue instruments and of the turn indicator control. To activate this checking, press and holed the "Clock" and "Set" buttons simultaneously and then set the key switch to "ON". Within 4 seconds max, the software version is displayed, the gauges go to the end of scale and the turn indicators light up.

At the end of the operation above, the normal warning light bulbs check is carried out.

Sealed battery

If the vehicle is provided with a sealed battery, the only maintenance required is the check of its charge and recharging, if necessary.

These operations should be carried out before delivering the vehicle, and on a six-month basis while the vehicle is stored in open circuit.

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

INSTRUCTIONS FOR THE BATTERY REFRESH AFTER OPEN-CIRCUIT STORAGE

1) Voltage check

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

- If voltage exceeds 12.60 V, the battery can be installed without any renewal recharge.
- If voltage is below 12.60 V, a renewal recharge is required as explained in 2).

2) Constant voltage battery charge mode

- Constant voltage charge equal to 14.40 ÷ 14.70V
- Initial charge voltage equal to 0.3 ÷ 0.5 for Nominal capacity
- Charge time:

10 to 12 h recommended

Minimum 6 h

Maximum 24 h

3) Constant current battery charge mode

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

CAUTION

NEVER USE FUSES WITH A CAPACITY HIGHER THAN THE RECOMMENDED CAPACITY. USING A FUSE OF UNSUITABLE RATING MAY SERIOUSLY DAMAGE THE VEHICLE OR EVEN CAUSE A FIRE.
CHARGE THE BATTERY BEFORE USE TO ENSURE OPTIMUM PERFORMANCE. INADEQUATE CHARGING OF THE BATTERY WITH A LOW ELECTROLYTE LEVEL BEFORE IT IS FIRST USED SHORTENS THE LIFE OF THE BATTERY.
IF THE VEHICLE IS NOT USED FOR SOME TIME (1 MONTH OR MORE) THE BATTERY NEEDS TO BE RECHARGED PERIODICALLY. THE BATTERY RUNS DOWN COMPLETELY IN THE COURSE OF THREE MONTHS. IF IT IS NECESSARY TO REFIT THE BATTERY IN THE VEHICLE, BE CAREFUL NOT TO REVERSE THE CONNECTIONS TAKING INTO ACCOUNT THAT THE GROUND WIRE (BLACK) MARKED(-) MUST BE CONNECTED TO THE - NEGATIVE TERMINAL WHILE THE OTHER TWO RED WIRES MARKED (+) MUST BE CONNECTED TO THE TERMINAL MARKED WITH THE +POSITIVE SIGN

WARNING

WHEN THE BATTERY IS REALLY FLAT (WELL BELOW 12.6V) IT MIGHT OCCUR THAT 5 HOURS OF RECHARGING ARE NOT ENOUGH TO ACHIEVE OPTIMAL PERFORMANCE.
GIVEN THESE CONDITIONS IT IS HOWEVER ESSENTIAL NOT TO EXCEED 8 HOURS OF CONTINUOUS RECHARGING SO AS NOT TO DAMAGE THE BATTERY ITSELF.

Dry-charge battery

- Remove the battery ventilation duct closing cap and remove the caps from the single elements.
- Fill the battery with electrolyte having a density of 1.270+/-0.01 Kg/l (corresponding to 31+/-1 Bé) with minimum ambient temperature of 15 °C, up to the top level indicated on the single block.
- Slightly tilt the battery to remove any air bubbles formed during the filling.
- Place the caps on the filling holes of the single elements without tightening them and let the battery stand. During this phase, the battery undergoes a gasification phenomenon and temperature rises.

- Let it stand until ambient temperature is reached again (this phase may require up to 60 minutes).
- Slightly tilt the battery to favour the removal of any air bubbles, then restore the levels using the same electrolyte.

Within 24 hours, refill as follows:

- Connect the battery charger terminals according to the right polarity;
- Using the battery charger dwg. 020333Y and/or dwg. 020334Y, select the battery capacity;
- If the battery charger is not available, charge the battery with a constant current of 1/10 of the rated capacity (for example for a battery with rated capacity of 9Ah, the charge current must be 0.9-1.0A), for approx. 4-6 hours.
- Let the battery stand with open circuit for approx. 4-6 hours, then check the voltage using a normal tester.
- If the open circuit voltage is more or equal to **12.6V**, the battery charge is good. Slightly tilt the battery to eliminate any air bubbles formed while recharging.
- Check the electrolyte level again, restore if required up to the tol reference using distilled water, tighten the caps of the single elements and install it on the vehicle.
- If lower voltages are detected, recharge the battery for 4-6 hours more as described above.

N.B.

BATTERIES STORED FOR A LONG TIME CAN REQUIRE LONGER TIMES. BATTERY CHARGERS DWG. 020333Y AND DWG. 020334Y HAVE AN AUTOMATIC PROTECTION THAT STOPS THE RECHARGE AFTER 12 HOURS TO PREVENT OVERHEATING THE BATTERY. IN THIS CASE, THE TURNING ON OF THE GREEN LED DOES NOT INDICATE THE END OF THE CHARGE BUT THE START OF THE SAFETY SYSTEM.

N.B.

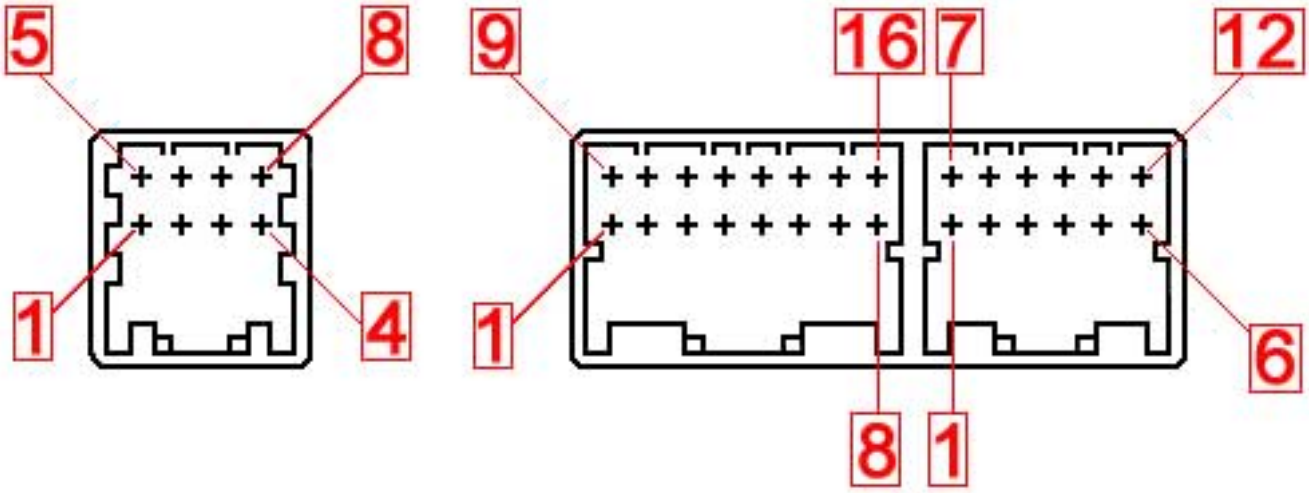
THIS IS THE LAST TIME THAT ELECTROLYTE CAN BE ADDED. FUTURE TOP UPS MUST BE MADE USING ONLY DISTILLED WATER

N.B.

WITH BATTERY CHARGER DWG. 020334Y YOU CAN CHECK THE BATTERY CHARGE LEVEL BY THE FUNCTION CHECK. THE VALUE SHOWN ON THE DISPLAY MUST BE HIGHER THAN THAT INDICATED IN THE TABLE; IF NOT, RECHARGE AS DESCRIBED ABOVE.

Connectors

Dashboard



12-WAY INSTRUMENT CONNECTOR

	Specification	Desc./Quantity
1	BATTERY POSITIVE LEAD (+30)	BATTERY POSITIVE LEAD (+30)
2	SPEEDOMETER SENSOR POWER SUPPLY	SPEEDOMETER SENSOR POWER SUPPLY
3	SPEEDOMETER SENSOR BACK TO GROUND	SPEEDOMETER SENSOR BACK TO GROUND
4	REVOLUTION SENSOR INPUT	REVOLUTION SENSOR INPUT
5	BATTERY POSITIVE LEAD (+30)	BATTERY POSITIVE LEAD (+30)
6	ANTITHEFT DEVICE LED	ANTITHEFT DEVICE LED
7	KEY POSITIVE TERMINAL (+15)	KEY POSITIVE TERMINAL (+15)
8	SPEEDOMETER SENSOR INPUT	SPEEDOMETER SENSOR INPUT
9	GROUND	GROUND
10	AIR TEMPERATURE SENSOR BACK TO GROUND	AIR TEMPERATURE SENSOR BACK TO GROUND
11	EMERGENCY LIGHT BUTTON (HAZARD) INPUT	EMERGENCY LIGHT BUTTON (HAZARD) INPUT
12	LIGHTS ON INPUT	LIGHTS ON INPUT

8-WAY INSTRUMENT CONNECTOR

	Specification	Desc./Quantity
1	GROUND ANALOGUE CHART	GROUND ANALOGUE CHART
2	BATTERY POSITIVE LEAD (+30) FOR ANALOGUE CARD	BATTERY POSITIVE LEAD (+30) FOR ANALOGUE CHART
3	ANALOGUE CARD SERIAL CLOCK OUTPUT	ANALOGUE CARD SERIAL CLOCK OUTPUT
4	ANTITHEFT DEVICE LED OUTPUT	ANTITHEFT DEVICE LED OUTPUT
5	ANALOGUE CARD SERIAL DATE OUTPUT	ANALOGUE CARD SERIAL DATE OUTPUT
6	LIGHTS ON OUTPUT	LIGHTS ON OUTPUT
7	(Not connected)	
8	(Not connected)	

16-WAY INSTRUMENT CONNECTOR

	Specification	Desc./Quantity
1	GENERAL USE WARNING LIGHT INPUT	GENERAL USE WARNING LIGHT INPUT
2	ABS WARNING LIGHT INPUT (NOT CONNECTED)	ABS WARNING LIGHT INPUT (NOT CONNECTED)
3	STOP LIGHT NOT WORKING OUTPUT	STOP LIGHT NOT WORKING OUTPUT
4	RIGHT TURN INDICATOR OUTPUT	RIGHT TURN INDICATOR OUTPUT
5	RIGHT TURN INDICATOR BUTTON INPUT	RIGHT TURN INDICATOR BUTTON INPUT
6	LEFT TURN INDICATOR BUTTON INPUT	LEFT TURN INDICATOR BUTTON INPUT
7	HIGH-BEAM WARNING LIGHT INPUT	HIGH-BEAM WARNING LIGHT INPUT
8	AIR TEMPERATURE SENSOR INPUT	AIR TEMPERATURE SENSOR INPUT
9	ENGINE UNABLE TO START WARNING LIGHT INPUT	ENGINE UNABLE TO START WARNING LIGHT INPUT
10	OIL PRESSURE WARNING LIGHT INPUT	OIL PRESSURE WARNING LIGHT INPUT
11	STOP LIGHT NOT WORKING WARNING LIGHT IN-PUT	STOP LIGHT NOT WORKING WARNING LIGHT IN-PUT
12	LEFT TURN INDICATOR OUTPUT	LEFT TURN INDICATOR OUTPUT

	Specification	Desc./Quantity
13	TURN INDICATOR OFF SWITCH INPUT	TURN INDICATOR OFF SWITCH INPUT
14	RESET SERVICE MANAGEMENT BUTTON INPUT	RESET SERVICE MANAGEMENT BUTTON INPUT
15	WATER TEMPERATURE SENSOR INPUT	WATER TEMPERATURE SENSOR INPUT
16	FUEL LEVEL SENSOR INPUT	FUEL LEVEL SENSOR INPUT

INDEX OF TOPICS

Removal of the engine from the vehicle

- Remove the saddle and the side covers,
- Drain engine oil and coolant,
- Disconnect the battery,
- Remove the muffler assembly,
- Remove the rear wheel,
- Remove the throttle grip transmission,
- Disconnect the electrical devices,
- Disconnect the hoses (petrol-oil-vacuum-operated cock control).

WARNING

Wear safety goggles when using hitting tools.

WARNING

BE VERY CAREFUL WHEN HANDLING FUEL.

CAUTION

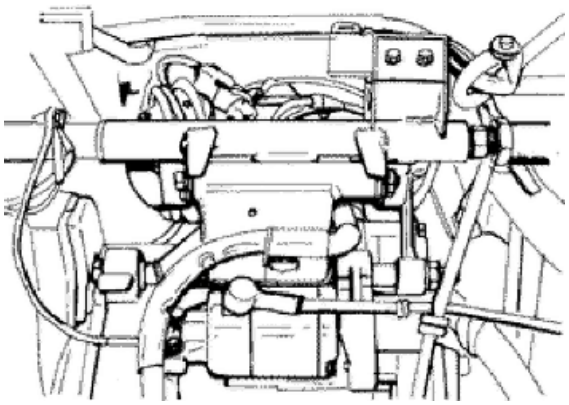
WHEN INSTALLING THE BATTERY, ATTACH THE POSITIVE LEAD FIRST AND THEN THE NEGATIVE LEAD.

Silencer fixing

Please take note that, starting from chassis serial number ZAPM2300004503144, the three M8 x 50 silencer bracket fixing screws have been replaced by three M8 x 60 flanged head screws in order to strengthen this fixing.

- Remove the nut shown in the figure, then take out the pin.

- Remove the nut shown in the figure, then take out the pin. The engine is now free.



- Carry out the removal operations but in reverse order, observing the prescribed tightening torques.

Locking torques (N*m)

Lower shock absorber clamp 33 ÷ 41 Engine-swinging arm bolt 33 ÷ 41

INDEX OF TOPICS

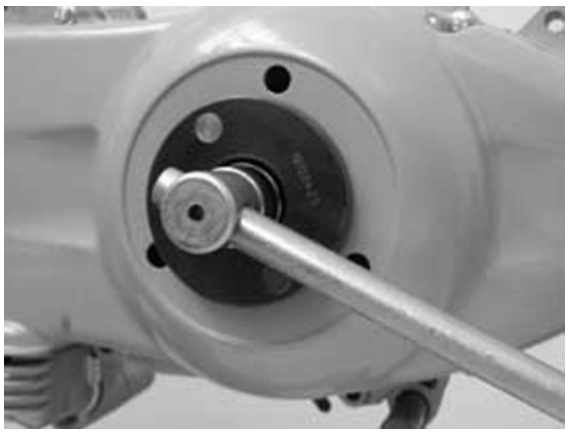
Automatic transmission

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 bell lock wrench shown in the figure, remove the driven pulley shaft locking nut and washer.

Specific tooling

020423Y driven pulley lock wrench

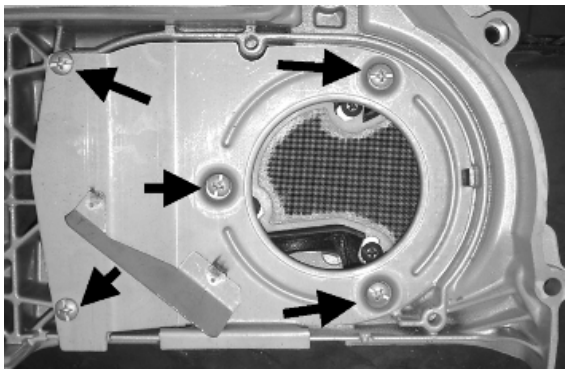


- Remove the cap/dipstick from the engine oil filling hole.
- Remove the ten screws.
- Remove the transmission cover.

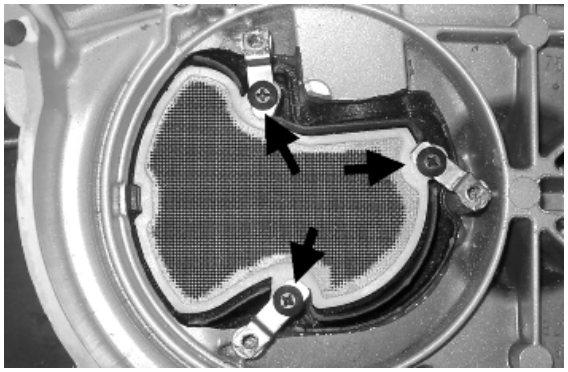
If this operation is carried out directly on the vehicle, remove the cooling air supply coupling of the transmission housing.

Air duct

- Remove the five screws on two different levels as well as the small casing.



- To remove the intake throat on the transmission cover, just remove the 3 fixing screws indicated in the figure.



Removing the driven pulley shaft bearing

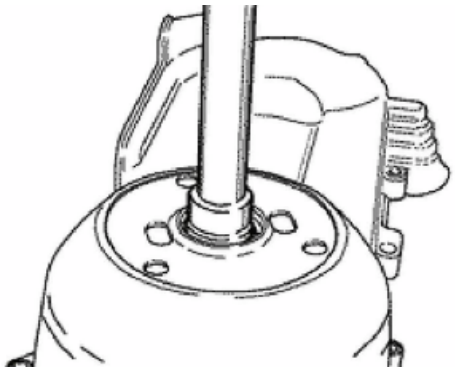
- Remove the clip from the inside of the cover.
- Remove the bearing from the crankcase by means of:

Specific tooling

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm

020412Y 15 mm guide



Refitting the driven pulley shaft bearing

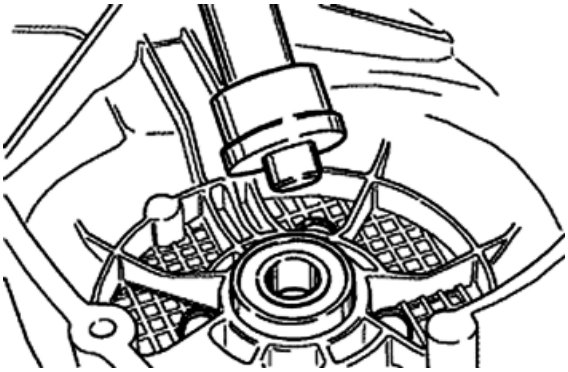
- Slightly heat the crankcase from the inside so as not to damage the painted surface.
- Insert the bearing in its seat.
- Refit the seeger ring.

CAUTION

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

N.B.

ALWAYS REPLACE THE BEARING WITH A NEW ONE UPON REFITTING.



Specific tooling

020376Y Adaptor handle

020357Y Adaptor 32 x 35 mm

020412Y 15 mm guide

Baffle roller

Plastic roller

- Check that the roller does not show signs of wear and that it turns freely.
- Remove the special clamping screws as indicated in the photograph

- Check the outside diameter of the roller does not have defects that could jeopardise belt functioning
- For refitting, place the roller with the belt containment edge on the engine crankcase side
- Tighten the wrench to the prescribed torque.

Locking torques (N*m)

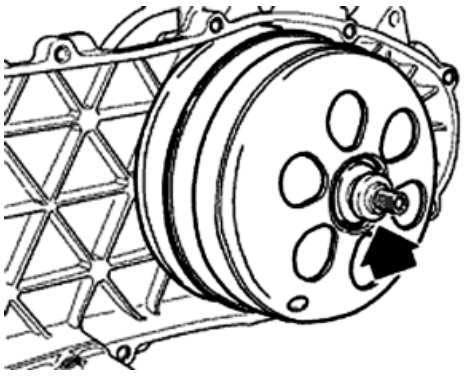
Anti-flapping roller **12 - 16**

Removing the driven pulley

- Remove the spacer, the clutch bell and the whole driven pulley unit.

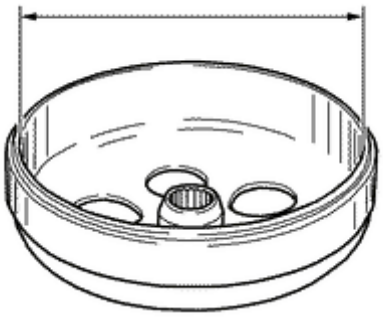
N.B.

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



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

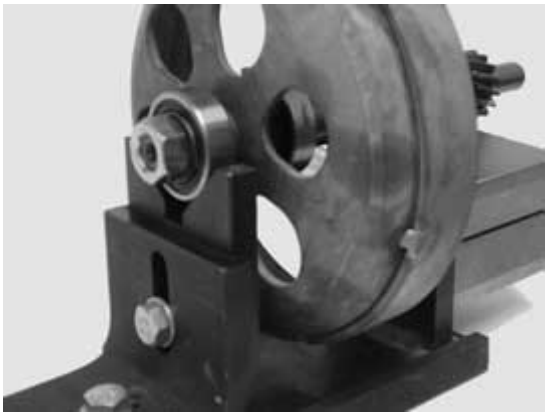
Max. value: Ø 134.5 mm

Clutch bell standard value

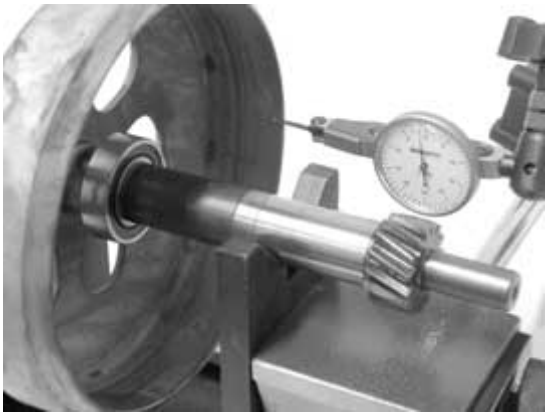
Standard value: Ø 134 - 134.2 mm

Checking the bell working surface eccentricity

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



- Using a feeler pin gauge and the magnetic base, measure the bell eccentricity.
- Repeat the measurement in 3 positions (Central, internal, external).
- If faults are found, replace the bell.



Specific tooling

020074Y Support base for checking crankshaft alignment

020335Y Magnetic support for dial gauge

Characteristic

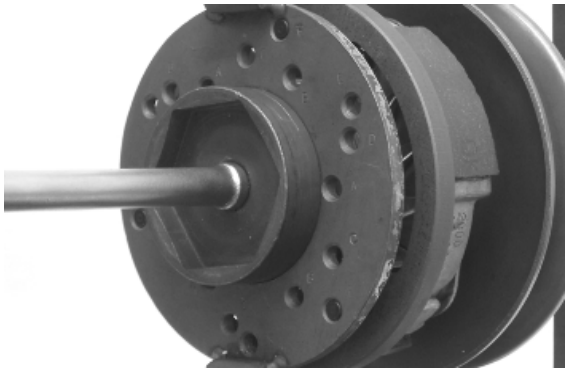
clutch bell inspection: Limit eccentricity.

Admissible limit eccentricity: 0.15 mm

Removing the clutch

Fit the driven pulley spring compressor specific tool with medium length pins screwed in position **«C»** on the tool internal side.

- Introduce the adapter ring No. 11 with the chamfering facing the inside of the tool.
- Fit the driven pulley unit on the tool with the insertion of the 3 pins in the ventilation holes in the mass holder support.
- Make sure that the clutch is perfectly inserted into the adapter ring before proceeding to loosen/tighten the clutch nut.
- Use the special 46x55 wrench component No. 9 to remove the nut fixing the clutch in place.
- Dismantle the driven pulley components (Clutch and spring with its plastic holder)



CAUTION

THE TOOL MUST BE FIRMLY FIXED IN THE CLAMP AND THE CENTRAL SCREW MUST BE BROUGHT INTO CONTACT WITH THE TOOL. EXCESSIVE TORQUE CAN CAUSE THE SPECIFIC TOOL TO BUCKLE.

Specific tooling

020444Y011 adapter ring

020444Y009 46x55 Wrench

020444Y Tool for fitting/ removing the driven pulley clutch

Inspecting the clutch

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

N.B.

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

CAUTION

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

Characteristic

Check minimum thickness

1 mm

Pin retaining collar

- Simultaneously turn and pull the collar manually to remove it.

N.B.

USE TWO SCREWDRIVERS IF YOU HAVE DIFFICULTY.

N.B.

BE CAREFUL NOT TO PUSH THE SCREW DRIVERS IN TOO FAR TO AVOID DAMAGE THAT COULD ENDANGER THE O-RING SEAL.

- Remove the four torque server pins and pull the pulley halves apart.

Removing the driven half-pulley bearing

- Check there are no signs of wear and/or noisiness; - Replace with a new one if there are.
- Remove the retaining ring using two flat blade screwdrivers.
- Support the pulley bushing adequately from the threaded side using a wooden surface.
- Using a hammer and pin, knock the ball bearing out as shown in the figure.

- Support the pulley properly using the bell as shown in the figure.

Specific tooling

001467Y035 Belle for OD 47-mm bearings

- Remove the roller bearing using the modular punch.

Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020363Y 20 mm guide

Inspecting the driven fixed half-pulley

Version 250

- Measure the outside diameter of the pulley bushing.
- Check the contact surface with the belt to make sure there are no flaws.
- Check the riveted joints are functional.
- Check the evenness of the belt contact surface.

Characteristic

Half-pulley minimum diameter

Minimum admissible diameter Ø 40.96 mm

Half-pulley standard diameter

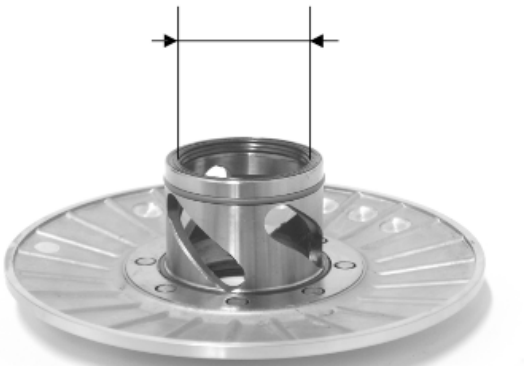
Standard diameter: Ø 40.985 mm

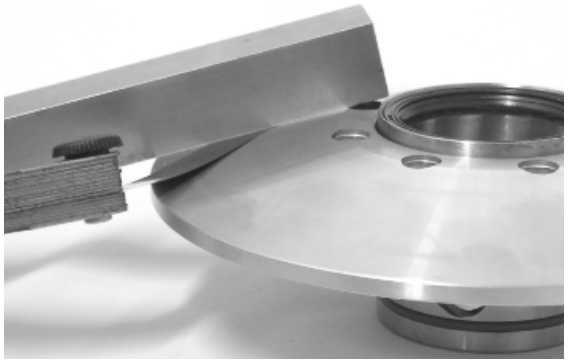
Wear limit

0.3 mm

Inspecting the driven sliding half-pulley

- Remove the two internal grommets and the two O-rings.
- Measure the movable half-pulley bushing inside diameter.
- Check the contact surface with the belt to make sure there are no flaws.
- Check the riveted joints are functional.
- Check the evenness of the belt faying surface.





MOVABLE DRIVEN HALF-PULLEY DIMENSIONS

Specification	Desc./Quantity
Wear limit	0.3 mm
standard diameter	Diameter 41.000 - 41.035 mm
maximum allowable diameter	Ø 41.08 mm

- Remove the belt and slide the movable half-pulley with the relevant bush, taking care of the falling free assembled rollers.
- Remove the return rollers plate with the relative guide pads.

Refitting the driven half-pulley bearing

- Support the pulley bushing adequately from the threaded side using a wooden surface.
- Fit a new roller sleeve as in the figure.
- For the fitting of the new ball bearing, follow the example in the figure using a modular punch.

Fit the snap ring

WARNING

N.B.

FIT THE BALL BEARING WITH THE VISIBLE SHIELD

Specific tooling

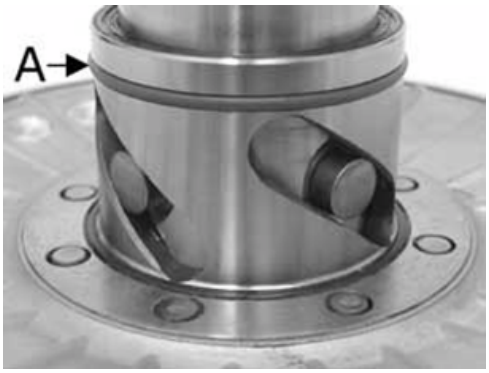
020376Y Adaptor handle

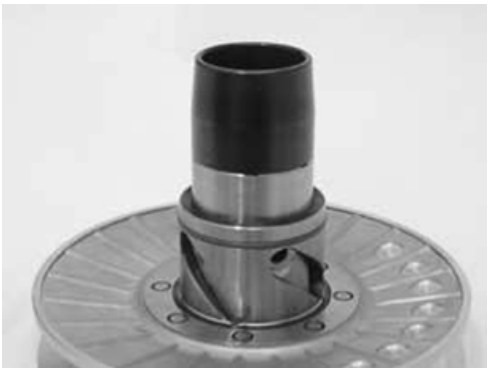
020375Y Adaptor 28 x 30 mm

020424Y Driven pulley roller casing fitting punch

Refitting the driven pulley

- Insert the new oil guards and O-rings on the movable half-pulley.
- Lightly grease the O-rings «**A**» shown in the figure.
- Fit the half-pulley over the bushing using the specific tool.
- Check that the pins are not worn and proceed to refitting them in their slots.
- Refit the torque server closure collar.
- Using a curved-spout grease gun, lubricate the driven pulley unit with approximately 6 gr. of grease. Apply the grease through 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.





N.B.

THE TORQUE SERVER CAN BE GREASED WHETHER WITH BEARINGS FITTED OR WHEN THEY ARE BEING REPLACED; UNDERTAKING THE OPERATION WHEN THE BEARINGS ARE BEING SERVICED MIGHT BE EASIER.

Specific tooling

020263Y Sheath for driven pulley fitting

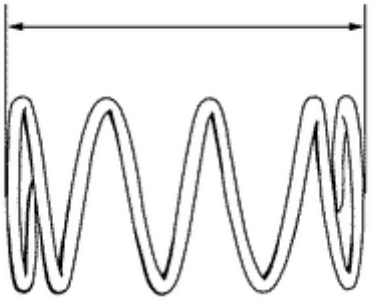
Recommended products

AGIP GREASE SM 2 Grease for the tone wheel revolving ring

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

Inspecting the clutch spring

- Measure the free length of the mobile driven half-pulley spring.



Characteristic

Standard length (200 - 250)

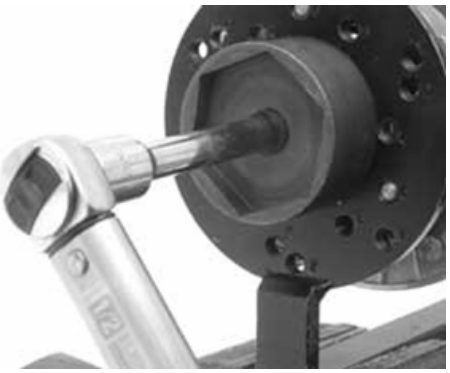
123 mm

Limit after use (200 - 250)

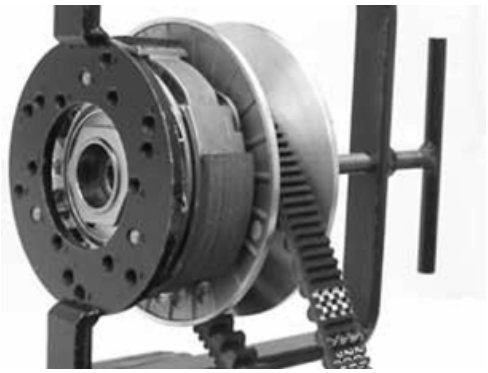
118 mm

Refitting the clutch

- Support the driven pulley spring compressor appropriate 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 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 its plastic holder 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 preload the spring.
- Make sure that the clutch is perfectly inserted into the adapter ring before proceeding to tighten the clutch nut.
- Place the tool in the clamp with the control screw on the horizontal axis.
- Fully preload the spring.



- Apply the clutch fixing nut and tighten it to the prescribed torque using the special 46x55 wrench.
- Loosen the tool clamp and insert the belt according to its direction of rotation.
- Lock the driven pulley again using the specific tool.
- Preload the clutch return spring with a traction/ rotation combined action and place the belt in the smaller diameter rolling position.
- Remove the driven pulley /belt unit from the tool.



N.B.

DURING THE SPRING PRELOADING PHASE, BE CAREFUL NOT TO DAMAGE THE PLASTIC SPRING STOP AND THE BUSHING THREADING.

N.B.

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

Specific tooling

020444Y Tool for fitting/ removing the driven pulley clutch

020444Y011 adapter ring

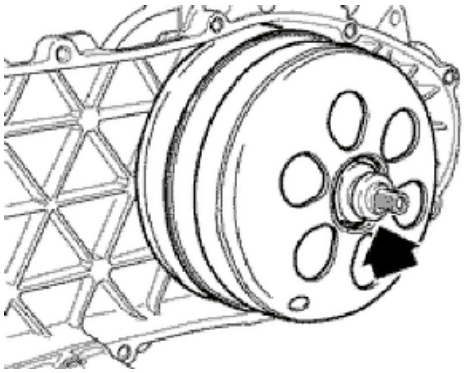
020444Y009 46x55 Wrench

Locking torques (N*m)

Nut locking clutch unit on pulley **55 ÷ 60 Nm**

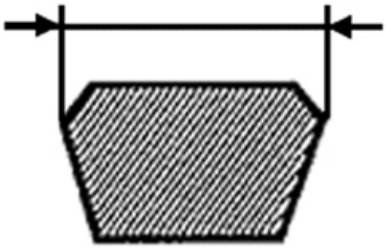
Refitting the driven pulley

- Reassemble the clutch bell and spacer.



Drive-belt

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



Characteristic

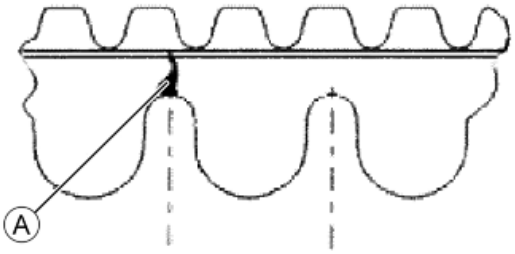
250 4T Transmission belt/minimum width

19.5 mm

250 4T Transmission belt/standard width

21.3 ± 0.2 mm

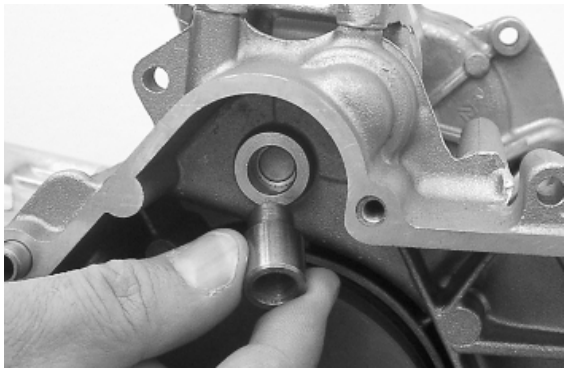
During the wear checks foreseen in the scheduled maintenance services at 6,000 km; 18,000 km; etc., check that the rim bottom of the toothing does not show signs of incisions or cracking (see figure): The rim bottom of the tooth must not have incisions or cracking; if it does, change the belt.



Removing the driving pulley

- Turn the crankshaft until the ropes of the pulley are on a horizontal axis

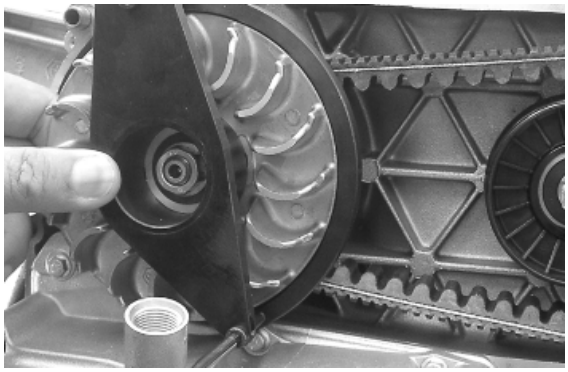
- Insert the adaptor sleeve of the appropriate tool in the hole shown in the photograph



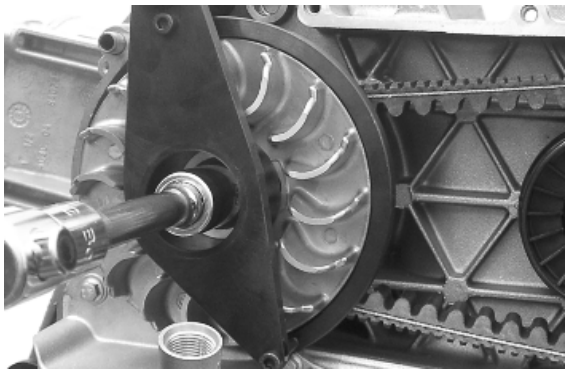
- Insert the tool in the hollows and apply the retention ring
- Bring in the ring's clamping screws while keeping the tool to support the pulley

Specific tooling

020626Y Driving pulley lock wrench

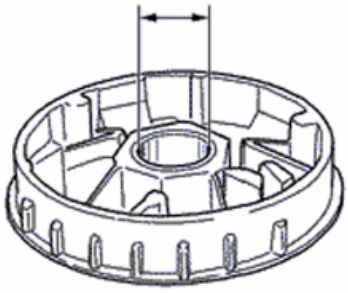


- Remove the fixing nut and the washer
- Remove the stationary drive pulley half.



Inspecting the rollers case

- Check that the internal bushing shown in the figure is not abnormally worn and measure inner diameter.
- Measure outer diameter B of the pulley sliding bushing shown in the figure.
- Check that the rollers are not damaged or worn.
- Check the guide shoes for the variator back-plate are not worn.
- Check the wear of the roller housings and of the belt contact surfaces on both pulley halves.
- Check that stationary driving pulley does not show signs of abnormal wear on the grooved edge and on the surface in contact with the belt.
- Check that the O-ring is not pushed out of shape.



CAUTION

DO NOT LUBRICATE OR CLEAN SINTERED BUSHINGS

Characteristic

Movable driving half-pulley bushing: Standard Diameter

26.000 - 26.021 mm

Movable driving half-pulley bushing: Maximum allowable diameter

Ø 26.12 mm

Sliding bushing: Standard Diameter

Ø 25.959 ÷ 25.98 mm

Sliding bushing: Minimum admissible diameter

Ø 25.95 mm

Roller: Standard Diameter

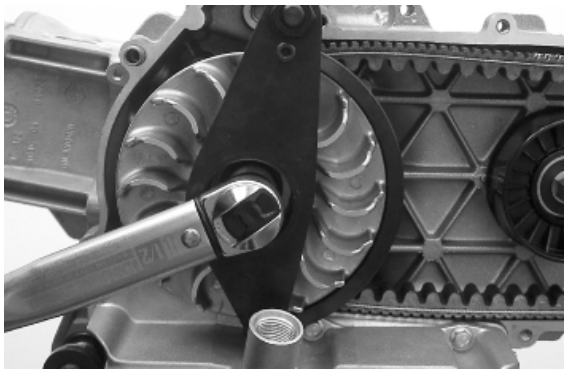
Diameter 20.5 - 20.7 mm

Roller: Minimum diameter permitted

Ø 20 mm

Refitting the driving pulley

- Fit the steel shim in contact with the bushing and the stationary drive pulley.
- Install the appropriate tool as described in the removal phase.
-Tighten the nut with washer to the prescribed torque.



Specific tooling

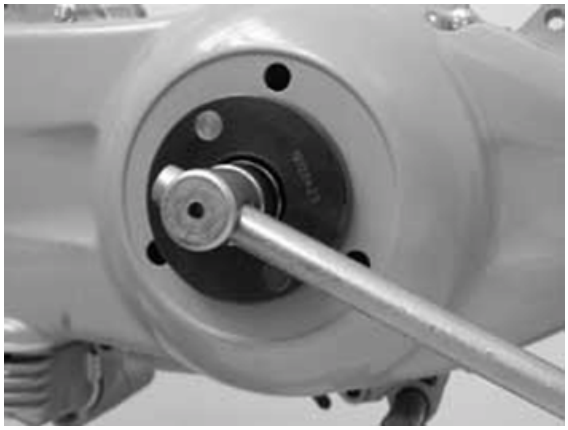
020626Y Driving pulley lock wrench

Locking torques (N*m)

Drive pulley nut 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 specified torque.
- Refit the oil loading cap/bar.
- refit the steel washer and the driven pulley nut.
- Tighten the nut to the prescribed torque using the lock wrench and the torque wrench tools.
- Replace the plastic cover.



Specific tooling

020423Y driven pulley lock wrench

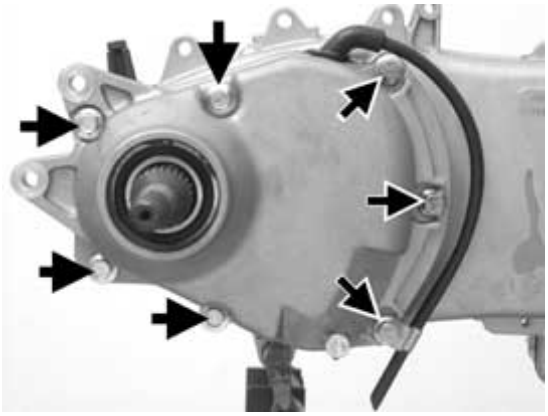
Locking torques (N*m)

Transmission cover screws 11 ÷ 13 Driven pulley shaft nut 54 ÷ 60

End gear

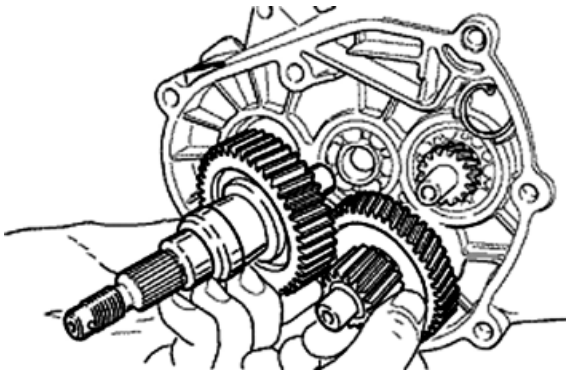
Removing the hub cover

- Empty the rear hub through the oil drainage plug.
- Remove the 7 flanged screws indicated in the figure.
- Remove the hub cover and its gasket.



Removing the wheel axle

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

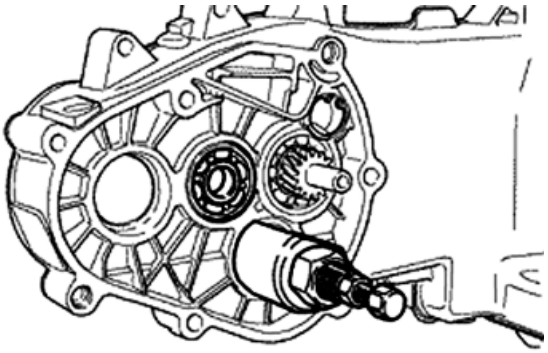


Removing the hub bearings

- Check the state of the bearings being examined (wear, clearance and noisiness). If faults are detected, do the following.
- Use the specific bearing extractor to remove the three 15 mm bearings (2 in the crankcase and 1 in the hub cover).

Specific tooling

001467Y013 Pliers to extract ø 15-mm bearings



Removing the wheel axle bearings

- Take out the clip on the outside of the gearbox cover.
- Support the hub cover and expel the bearing.

By means of the appropriate tools, remove the oil guard as in the figure.

Specific tooling

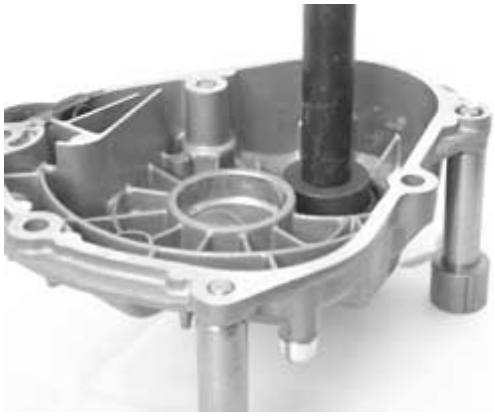
020376Y Adaptor handle

020477Y Adaptor 37 mm

020483Y 30 mm guide

020359Y 42x47-mm adaptor

020489Y Hub cover support stud bolt set



Removing the driven pulley shaft bearing

- As you need to remove the driven pulley shaft, its bearing and oil guard, remove the transmission cover as described above.
- Extract the driven pulley shaft from its bearing.
- Remove the oil guard using a screwdriver, working from inside the bearing and being careful not to damage the housing, make it come out of the belt transmission side.
- Remove the seeger ring shown in the figure

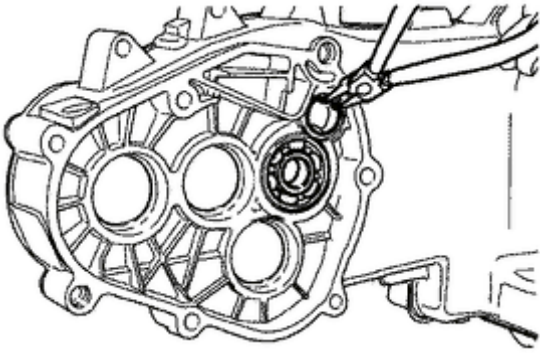
Remove the driven pulley shaft bearing using the modular punch.

Specific tooling

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm

020363Y 20 mm guide



Inspecting the hub shaft

- Check the three shafts for wear or distortion of the toothed surfaces, the bearing housings, and the oil seal housings.
- In case of anomalies, replace the damaged components.

Inspecting the hub cover

- Check that the fitting surface is not dented or distorted.
- Check the bearing bearings.
- In case of anomalies, replace the damaged components.

Refitting the wheel axle bearing

- Support the hub cover on a wooden surface.
- Heat the crankcase cover with the specific heat gun.
- Fit the wheel shaft bearing with a modular punch as shown in the figure.
- Fit the seeger ring.
- Fit the oil guard with seal lip towards the inside of the hub and place it flush with the internal surface by means of the appropriate tool used from the 52 mm side**.**

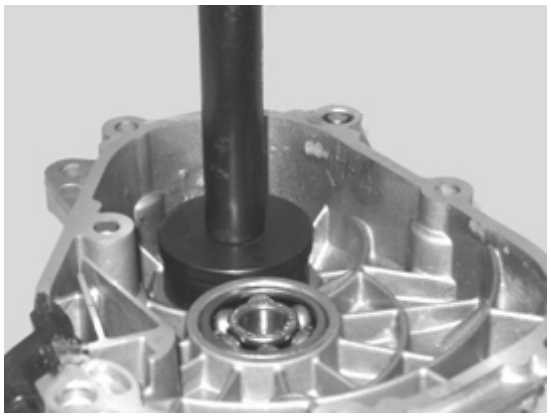
The 52 mm side of the adapter must be turned towards the bearing.

Specific tooling

020376Y Adaptor handle

020360Y Adaptor 52 x 55 mm

020483Y 30 mm guide



Refitting the hub cover bearings

- To fit the hub housing bearings, the engine crankcase and the cover must be heated with the special heat gun.
- The three 15 mm bearings must be fitted using the appropriate tools.

The 42 mm side of the adapter must be turned towards the bearing.

- Refit the driven pulley shaft bearing with a modular punch as shown in the figure.
- Refit the Seeger ring with the opening facing the bearing and the new oil guard flush with the crankcase on the pulley side.

N.B.

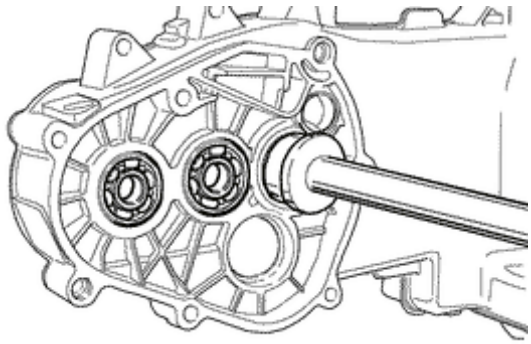
TO FIT THE BEARING ON THE COVER, SUPPORT THE COVER WITH THE STUD BOLT SET.

N.B.

IF THE BEARING HAS AN ASYMMETRICAL BALL RETAINER, PLACE IT SO THAT THE BALLS ARE VISIBLE FROM THE HUB INNER SIDE.

N.B.

WHEN FITTING THE BEARINGS ON THE ENGINE CRANKCASE, SUPPORT THE CRANKCASE PREFERABLY ON A SURFACE TO ALLOW THE BEARINGS TO BE DRIVEN VERTICALLY.



Specific tooling

020150Y Air heater support

020151Y Air heater

020412Y 15 mm guide

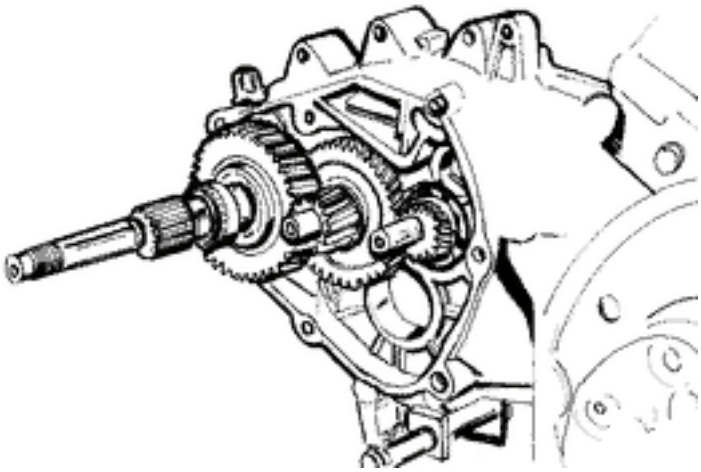
020376Y Adaptor handle

020359Y 42x47-mm adaptor

020363Y 20 mm guide

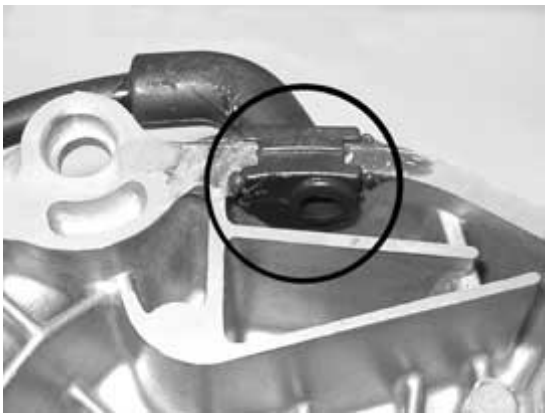
Refitting the hub bearings

- Install the three shafts in the engine crankcase as shown in the figure.



Refitting the ub cover

- Fit a new gasket together with the centring dowels.
- Seal the gasket of the breather pipe using black silicone sealant.
- Fit the gearbox cover, making sure the breather pipe is in the correct position.
- Place the 3 shortest screws, identifiable by their different colour, as shown in the figure.
- Fasten the breather pipe support bracket with the lower short screw.
- Assemble the remaining 4 screws and tighten the 7 screws to the prescribed torque.



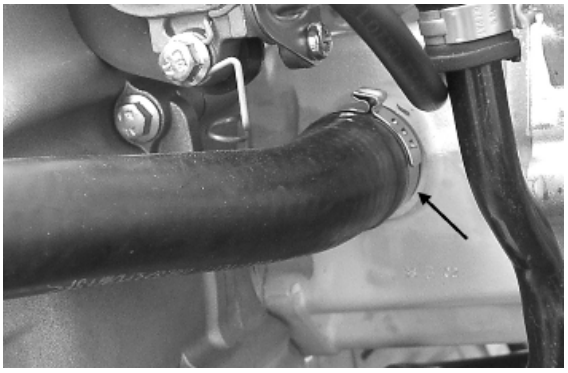
Locking torques (N*m)

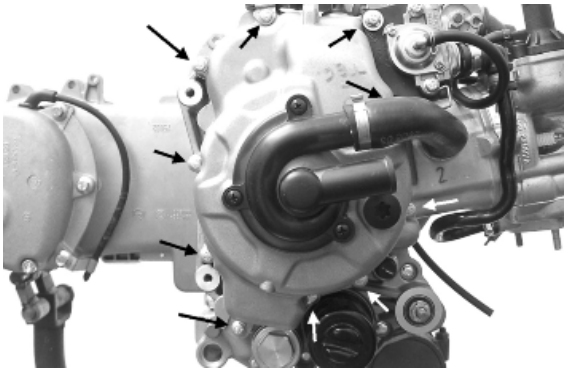
Rear hub cover screws **24 ÷ 27**

Flywheel cover

Removing the hub cover

- Remove the clip fixing the hose to the cylinder.
- Remove the 10 fixings
- Remove the flywheel cover.





Removing the stator

- Remove the two pickup screws and the screw holding the wiring support and the three stator clamping screws shown in the figure.
- Remove the stator and its wiring.

Refitting the stator

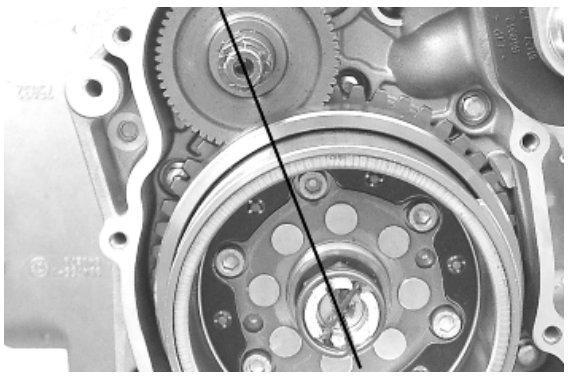
- Refit the stator and flywheel carrying out the removal procedure in reverse, tightening the retainers to the specified torque.

Locking torques (N*m)

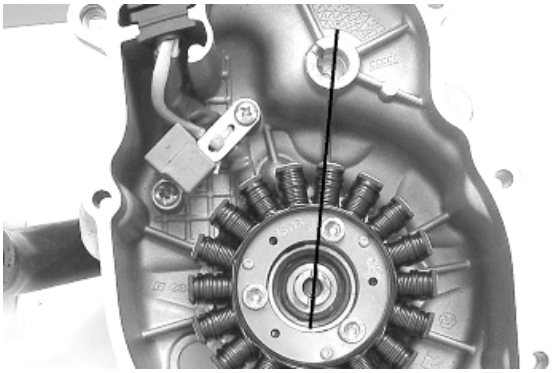
Stator assembly screws (°) **3 ÷ 4**

Refitting the flywheel cover

- Position the spline clip on the crankshaft and orient the end as shown in the figure.



- Orient the water pump shaft with reference to the transmission gear seat as shown in the photo.



- Refit the cover over the engine and tighten the screws to the prescribed torque.
- Carry out the steps in the reverse order from the dismantling procedure.

CAUTION

TAKE CARE TO CORRECTLY POSITION THE FLYWHEEL CONNECTOR. MAKE SURE THE CENTRING DOWELS ARE PRESENT.

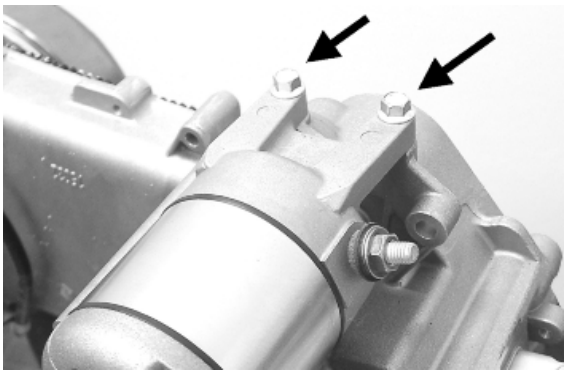
Locking torques (N*m)

Flywheel cover screws 11 - 13

Flywheel and starting

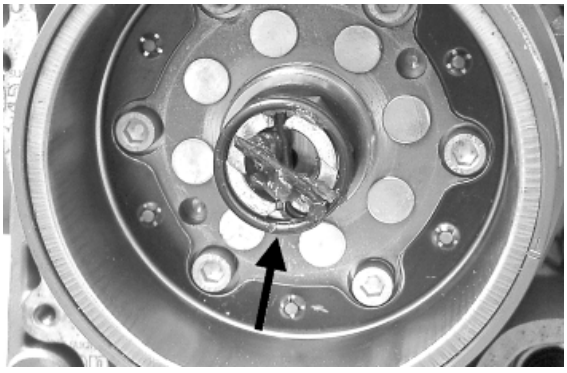
Removing the starter motor

- Remove the two screws indicated in the figure.
- Take the starter motor out of its seat



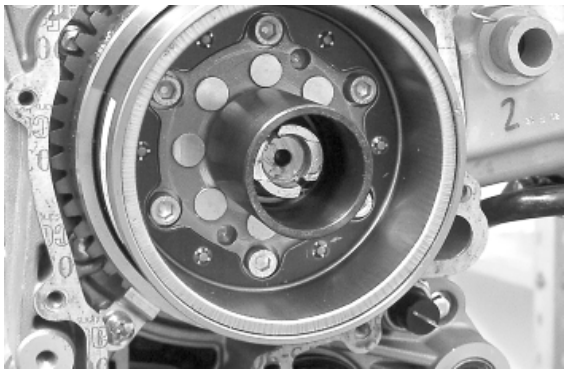
Removing the flywheel magneto

- Remove the water pump shaft and crankshaft spline clip



- Line up the two holes in the flywheel as shown in the photo

- Screw in the guide bushing that is part of the special flywheel stop tool on the flywheel as shown in the photo.



- Insert the special flywheel stop tool on the flywheel as shown in the photo

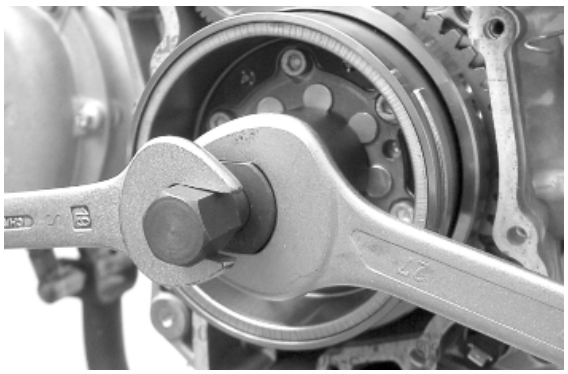
Specific tooling

020627Y Flywheel lock wrench

- Remove the flywheel nut with its washer
- Do up the flywheel nut by three or four threads so that the flywheel does not fall accidentally on extraction
- Screw the extractor onto the flywheel and extract it as shown in the photograph

Specific tooling

020467Y Flywheel extractor



Refitting the free wheel

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

- Apply the recommended product to the end of the screws.

Recommended products

Loctite 243 Medium strength threadlock

Loctite 243 medium-strength threadlock

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

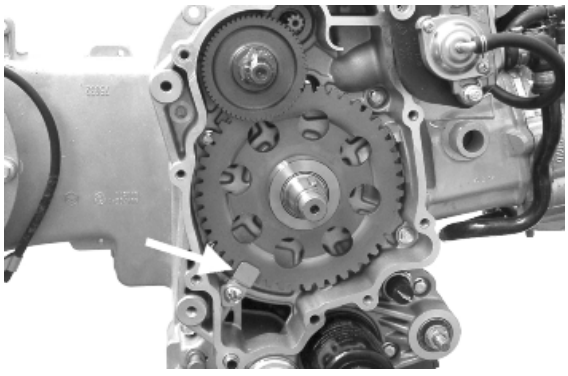
Locking torques (N*m)

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

- Oil the free wheel "rollers".

Refitting the flywheel magneto

- Remove the freewheel retaining plate indicated in the photograph
- Remove the transmission gear and the freewheel



- Insert the free wheel on the flywheel as shown in the photo
- Then refit the flywheel with free wheel and transmission gear

- Using the special flywheel stop tool, tighten up the flywheel fixing nut to the prescribed torque
-Refit the retention plate

Specific tooling

020627Y Flywheel lock wrench

Locking torques (N*m)

Flywheel nut 94 ÷ 102

Refitting the starter motor

- Fit a new O-ring on the starter motor and lubricate it.
- Fit the starter on the crankcase, locking the two screws to the prescribed torque.

Locking torques (N*m)

Starter motor screws 11 ÷ 13

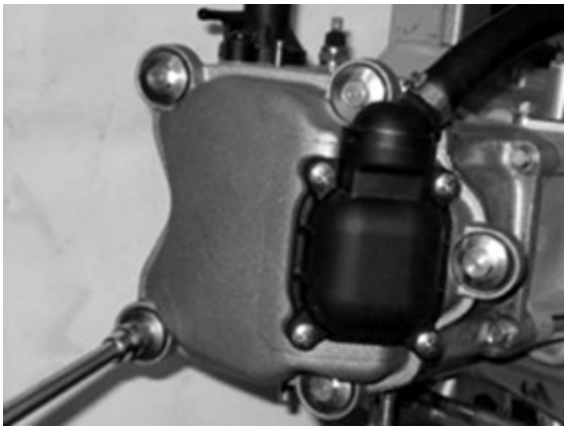
Cylinder assy. and timing system

Removing the intake manifold

- Loosen the 3 crews and remove the intake manifold.

Removing the rocker-arms cover

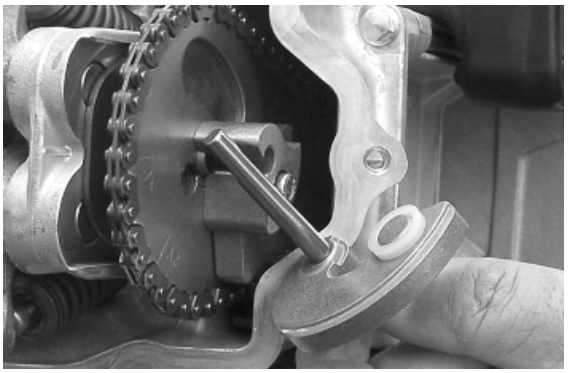
- Remove the 5 screws indicated in the figure



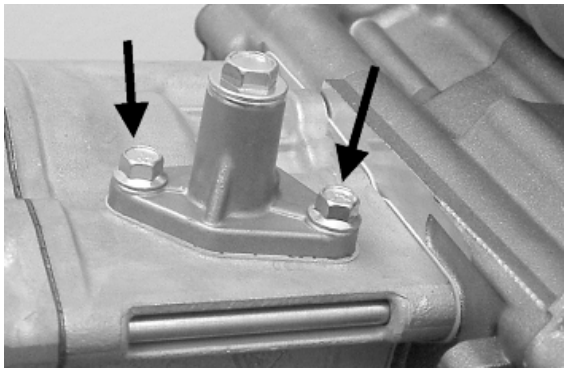
Removing the timing system drive

- Remove the parts listed below first: transmission cover, drive pulley with belt, oil sump with spring and by-pass piston, oil pump pulley cover, O-ring on the crankshaft and the sprocket wheel separation washer.
- Remove the tappet cover.
- Remove the central screw fastener and the automatic valve-lifter retaining cover, as shown in the figure.

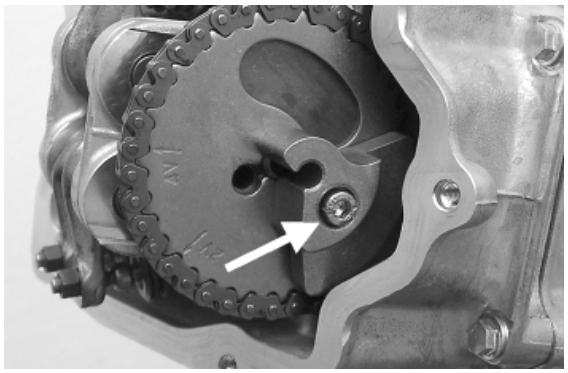
- Remove the return spring of the automatic valve lifter unit and the automatic valve lifter unit and its end of stroke washer.



- Loosen the central screw on the tensioner first.
- Remove the two fixings shown in the figure.
- Remove the tensioner with its gasket.



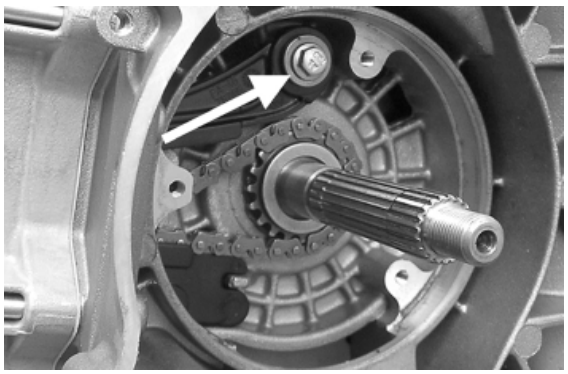
- Remove the internal hex screw and the counter-weight shown in the figure.



- Remove the camshaft control pulley with its washer.

- Remove the command sprocket wheel and the timing chain.
- Remove the screws indicated in the figure, the spacer bar and the tensioner slider.

The chain tensioning pad must be removed from the transmission side. As regards the lower chain guide pad, it may only be removed after the head has been removed.

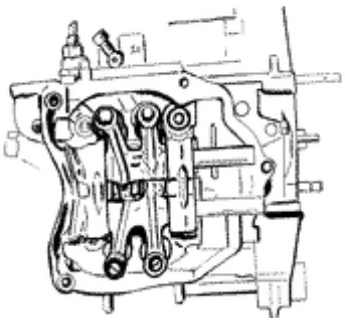


N.B.

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

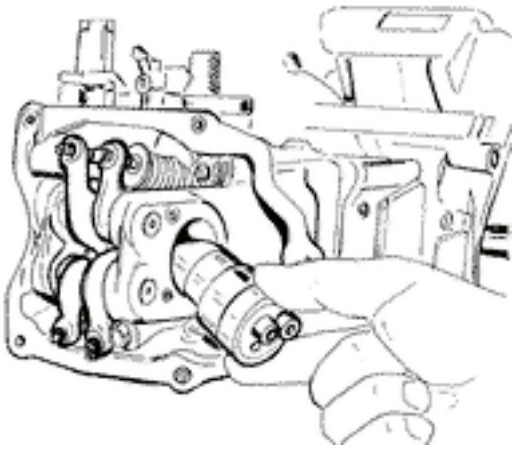
Removing the cam shaft

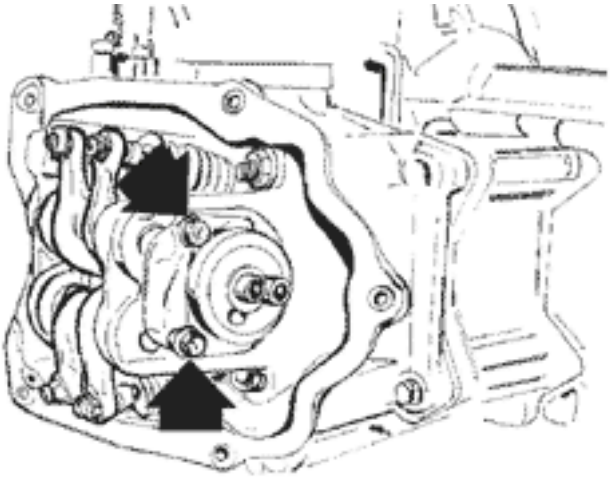
- Remove the two screws and the cam shaft retainer shown in the diagram.
- Remove the cam shaft.
- Remove the pins and the rocker arms from the flywheel side holes.



N.B.

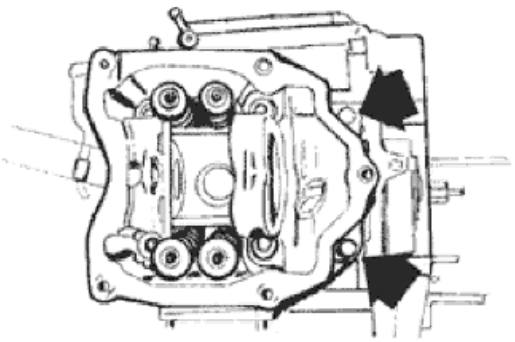
IN CASE OF NEED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, PINS, ROCKING LEVERS AND FIXING BRACKET. THE HEAD CAN ALSO BE REMOVED WITHOUT REMOVING THE CHAIN AND THE DRIVING SHAFT CHAIN TIGHTENER.





Removing the cylinder head

- Remove the spark plug.
- Remove the 2 side fixings shown in the figure.
- Loosen the 4 head-cylinder fastening nuts in two or three stages and in criss-cross fashion.
- Remove the head, the two centring dowels and the gasket.



N.B.

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

Removing the valves

- Using the appropriate tool fitted with an adaptor, remove the cotters, caps, springs and valves.
- Remove the oil guards with the appropriate tool.
- Remove the lower spring supports.

CAUTION

REPLACE THE VALVES IN SUCH A WAY AS TO RECOGNISE THEIR ORIGINAL POSITION ON THE HEAD.

Specific tooling

020382Y011 adapter for valve removal tool

020382Y Valve cotters equipped with part 012 removal tool

020306Y Punch for assembling valve seal rings

Removing the cylinder - piston assy.

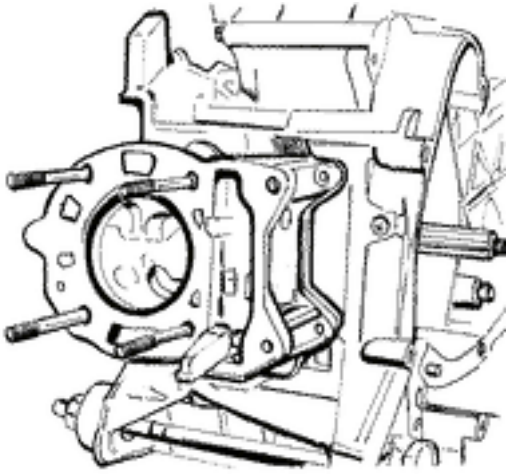
- Remove the chain guide pad.
- Pull out the cylinder.
- Remove the cylinder base gasket.
- Remove the two stop rings, the wrist pin and the piston.
- Remove the piston seals.

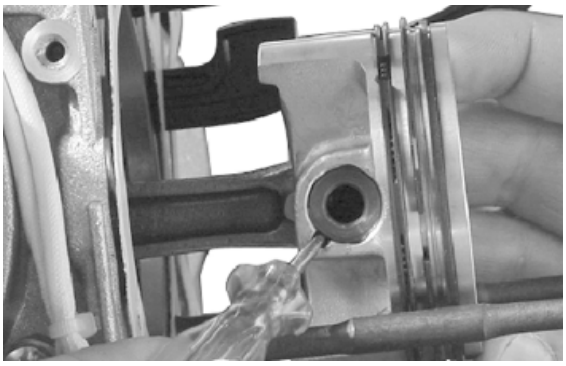
CAUTION

TO AVOID DAMAGING THE PISTON, SUPPORT IT WHILE REMOVING THE CYLINDER.

N.B.

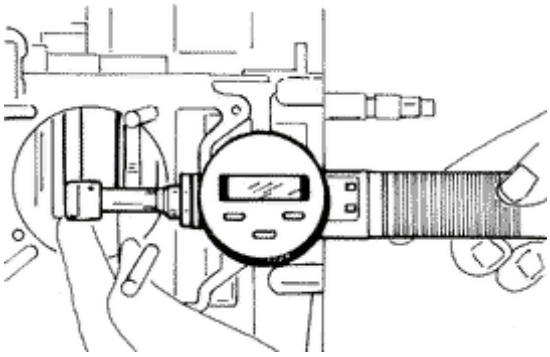
BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.





Inspecting the small end

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



N.B.

REPLACE THE CRANKSHAFT IF THE DIAMETER OF THE ROD SMALL END EXCEEDS THE STANDARD DIAMETER OR IT SHOWS SIGNS OF WEAR OR OVERHEATING.

Characteristic

Rod small end check-up: Maximum diameter

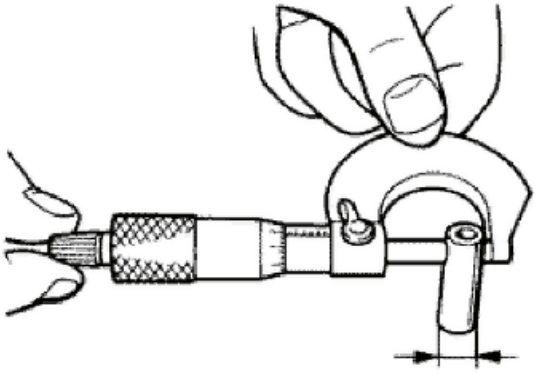
15.030 mm

Rod small end check-up: Standard diameter

15 +0.015+0.025 mm

Inspecting the wrist pin

- Measure the outside diameter of the gudgeon pin.
- Calculate the coupling clearance between pin and connecting rod end.



Characteristic

Pin diameter: Standard clearance

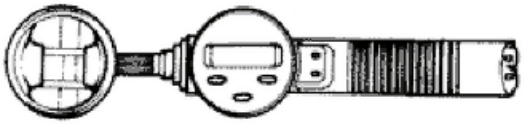
0.015 ÷ 0.029 mm

Pin diameter Standard diameter

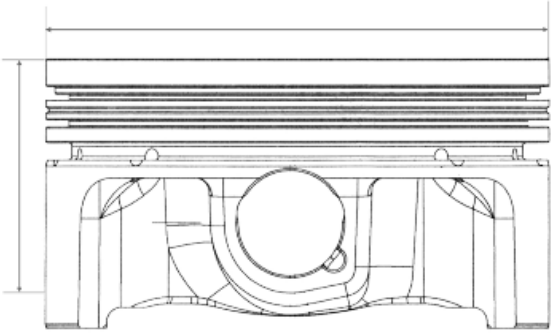
14.996 - 15.000 mm

Inspecting the piston

- Measure the diameter of the wrist pin seat on the piston.
- Calculate the piston pin coupling clearance.
- Measure the outside diameter of the piston, perpendicular to the gudgeon pin axis.
- Take the measurement at 5 mm from the base in the position shown in the figure.



- Carefully clean the seal housings.
- Measure the coupling clearance between the sealing rings and the grooves using suitable sensors, as shown in the diagram.
- If the clearance is greater than that indicated in the table, replace the piston.



N.B.

MEASURE THE CLEARANCE BY INSERTING THE BLADE OF THE FEELER THICKNESS GAUGE FROM THE SECOND SEAL SIDE.

N.B.

THE PIN HOUSINGS HAVE 2 LUBRICATION CHANNELS. FOR THIS REASON MEASUREMENT OF THE DIAMETER MUST BE CARRIED OUT ACCORDING TO THE AXIS OF THE PISTON.

Characteristic

Wrist pin seat on the piston: Standard diameter

15.001 ÷ 15.006 mm

Diameter of the wrist pin seat on the piston: Standard clearance

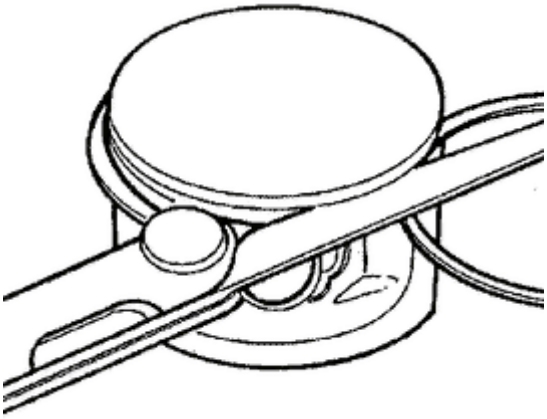
0.001 ÷ 0.010 mm

piston diameter

71.953 - 71.981 mm

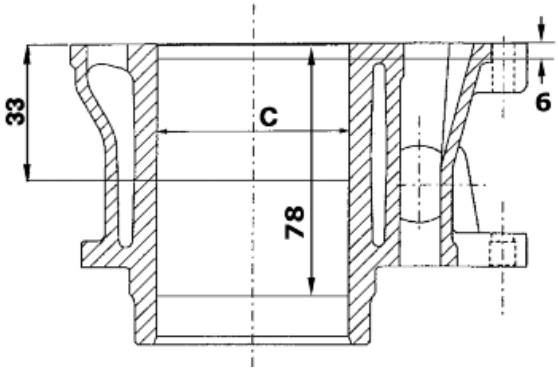
Fitting clearance

Top piston ring - standard coupling clearance 0.015 - 0.06 mm **Top piston ring - maximum clearance allowed after use** 0.07 mm **Middle piston ring - standard coupling clearance** 0.015 - 0.06 mm **Middle piston ring - maximum clearance allowed after use** 0.07 mm **oil scraper ring - standard coupling clearance** 0.015 - 0.06 mm **oil scraper ring - maximum clearance allowed after use** 0.07 mm



Inspecting the cylinder

- Using a bore gauge, measure the internal diameter of the cylinder following the directions given in the figure and at three different heights.
- Check that the plane of coupling with the head does not show wear or deformations.
- The pistons and cylinders are classified with categories depending on the diameters. The coupling is carried out matched (A-A, B-B, C-C, D-D).



Characteristic

cylinder: standard diameter

71.990 - 72.018 mm (at 33 mm)

Maximum allowable run-out:

0.05 mm

Inspecting the piston rings

Removing the piston

- Install piston and wrist pin onto the connecting rod, aligning the piston arrow the arrow facing towards the exhaust.
- Fit the wrist pin stop ring onto the appropriate tool
- With opening in the position indicated on the tool

S = left

D= right

- Place the wrist pin stop ring into position using a punch
- Fit the wrist pin stop using the plug as shown in the figure

N.B.

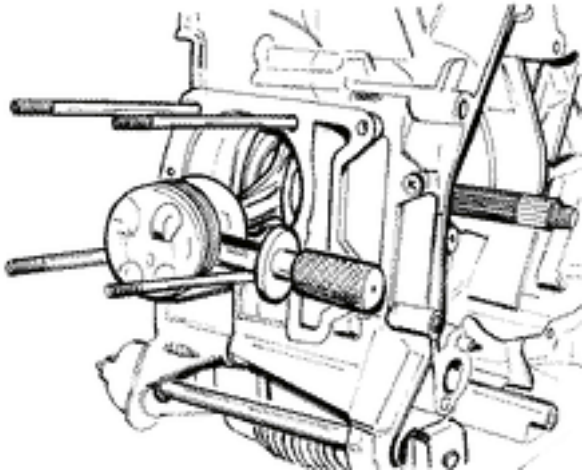
THE TOOL FOR INSTALLING THE STOP RINGS MUST BE USED MANUALLY.

CAUTION

USING A HAMMER MIGHT DAMAGE THE STOPS' HOUSING.

Specific tooling

020454Y Tool for fitting piston pin stops (200 - 250)



Choosing the gasket

- Provisionally fit the piston into the cylinder, without any base gasket.
- Assemble a dial gauge on the specific tool
- Set the dial gauge to zero placing the tool on a contrasting surface. Keeping the zero position, assemble the tool on the cylinder and lock it with 2 supplied nuts as shown in the figure.
- Rotate the crankshaft until TDC (the inverted point of the dial gauge rotation)
- Position the dial gauge on the piston as shown in the figure and measure how much the piston protrudes.
- Identify the thickness of the cylinder base gasket to be used for reassembly by the table below. Correctly identify the cylinder base gasket thickness to keep the correct compression ratio.
- Remove the special tool and the cylinder.

N.B.

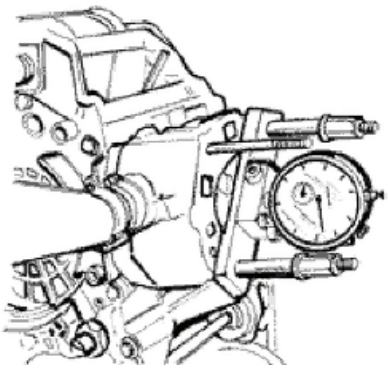
MEASUREMENT "A" TO BE TAKEN IS A VALUE OF PISTON RE-ENTRY, IT INDICATES BY HOW MUCH THE PLANE FORMED BY THE PISTON CROWN FALLS BELOW THE PLANE FORMED BY THE TOP OF THE CYLINDER. THE FURTHER THE PISTON FALLS INSIDE THE CYLINDER, THE LESS THE BASE GASKET IS TO BE APPLIED (TO RECOVER THE COMPRESSION RATIO) AND VICE VERSA.

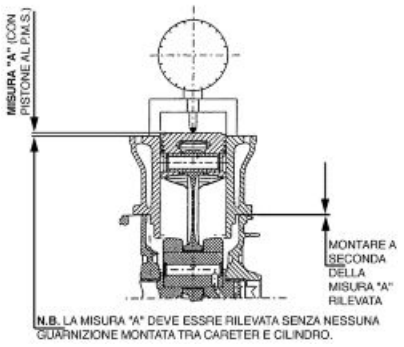
Specific tooling

020428Y Piston position check support

ENGINE 250 SHIMMING

Name	Measure A	Thickness
shimming	3.70 - 3.60	0.4 ± 0.05
shimming	3.60 - 3.40	0.6 ± 0.05
shimming	3.40 - 3.30	0.8 ± 0.05




MISURA "A" (CON PISTONE AL P.M.S.)
MONTARE A SECONDA DELLA MISURA "A" RILEVATA
N.B. LA MISURA "A" DEVE ESSRE RILEVATA SENZA NESSUNA GUARNIZIONE MONTATA TRA CARETER E CILINDRO.

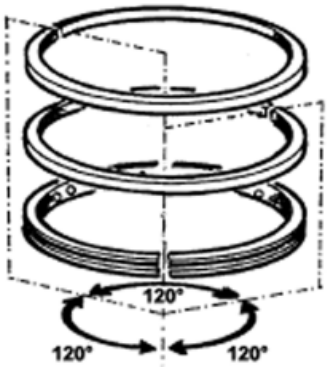
Refitting the piston rings

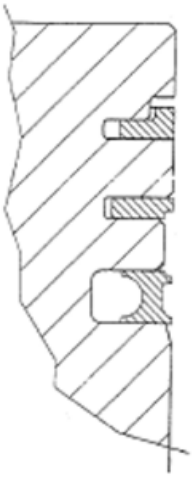
Fitting the sealing rings

- Place the oil scraper spring on the piston.
- Refit 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 chamfered side of the oil scraper ring should always be facing the piston crown.
- Fit the middle piston ring with the identification letter facing the crown of the piston. In any case, the step must be facing opposite the piston top.
- Fit 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 as shown in the figure.
- Lubricate the components with engine oil.
- The top piston ring on the 250 engine has an L cross section.

N.B.

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





Refitting the cylinder

- Insert the cylinder base gasket with the thickness determined above.
- Using the fork support and the piston ring retaining band, refit the cylinder as shown in the figure.

N.B.

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

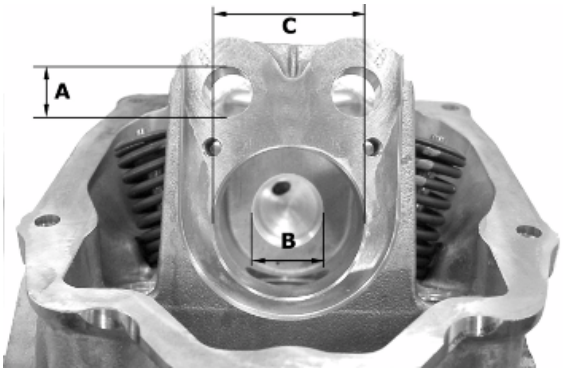
Specific tooling

020426Y Piston fitting fork

020393Y Piston fitting band

Inspecting the cylinder head

- Using a trued bar and feeler gauge check that the cylinder head surface is not worn or distorted.
Maximum allowable run-out: 0.05 mm
- Check that the camshaft and the rocker pin capacities exhibit no wear.
- Check that the cylinder head cover surface, the intake manifold and the exhaust manifold are not worn.



Characteristic

bearing «A»

Ø 12.000 - 12.018 mm

bearing «B»

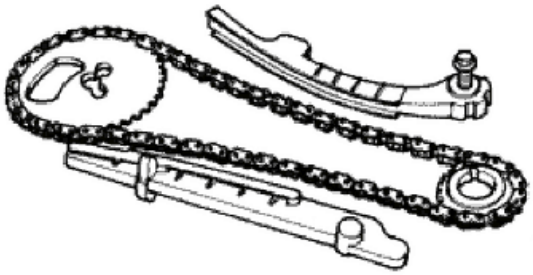
Ø 20.000 ÷ 20.021 mm

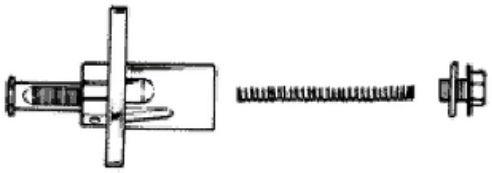
bearing «C»

Ø 37.000 - 37.025 mm

Inspecting the timing system components

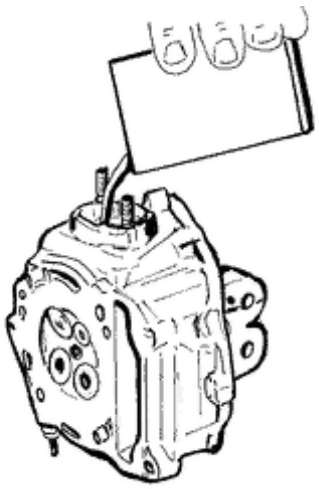
- Check that the guide shoe and the tensioner shoe are not worn out.
- Ensure that the camshaft control pulley chain assembly and the sprocket wheel are not worn.
- If you encounter wear, replace the parts or, if the chain, sprocket wheel and pulley are worn replace the whole assembly.
- Remove the centre screw with the washer and the tensioner spring. Check that the one-way mechanism is not worn.
- Check the condition of the tensioner spring.
- If examples of wear are found, replace the whole assembly.



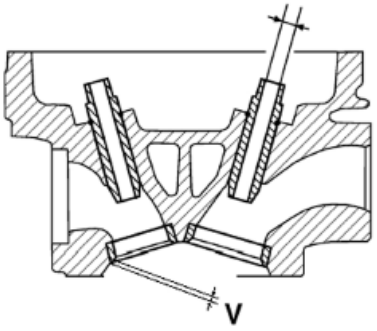


Inspecting the valve sealings

- Insert the valves into the cylinder head.
- Alternatively check the intake and exhaust valves.
- The test is carried out by filling the manifold with petrol and checking that the head does not ooze through the valves when these are just pressed with the fingers.



Inspecting the valve housings



- Check the width of the imprint on the valve seat«**V**» wear limit max. 1.6 mm.
- 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.
- If the width of the impression on the valve seat or the diameter of the valve guide exceed the specified limits, replace the cylinder head.

Characteristic

Valve seat wear Intake guide

limit accepted: 5.022

Valve seat wear Intake guide

Standard diameter: 5.000 ÷ 5.012 mm

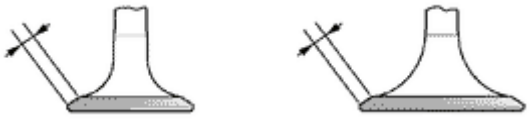
Valve seat wear Exhaust guide

Accepted limit 5.022

Valve seat wear Exhaust guide

Standard diameter: 5.000 ÷ 5.012 mm

Inspecting the valves



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

Sealing surface width: After use: Intake and exhaust: 1.6 mm

- If any of the sealing surfaces on the valves is wider than the specified limit or is damaged in one or more points, or curved, replace the valve with a new one.

CAUTION

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

Characteristic

Valve wear check Standard: Intake and exhaust:

0.99 - 1.27 mm

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

- Calculate the clearance between valve and valve guide.
- Check that there are no signs of wear on the surface of contact with the articulated register terminal.
- If the checks above give no failures, you can use the same valves. 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 with the valve axes in a horizontal position. This will prevent the lapping compound residues from penetrating between the valve stem and the guide (see figure).

CAUTION

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

N.B.

DO NOT CHANGE THE POSITIONS THE VALVES ARE FITTED IN

Characteristic

Valve check standard length

Outlet: 94.4 mm

Valve check standard length

Inlet: 94.6 mm

Valve check Maximum admissible clearance

Outlet: 0.072 mm

Valve check Maximum admissible clearance

Inlet: 0.062 mm

Valve check standard clearance

Outlet: 0.025 ÷ 0.052 mm

Valve check standard clearance

Inlet: 0.013 ÷ 0.040 mm

Valve check Minimum admissible diameter

Outlet: 4.95 mm

Valve check Minimum admissible diameter

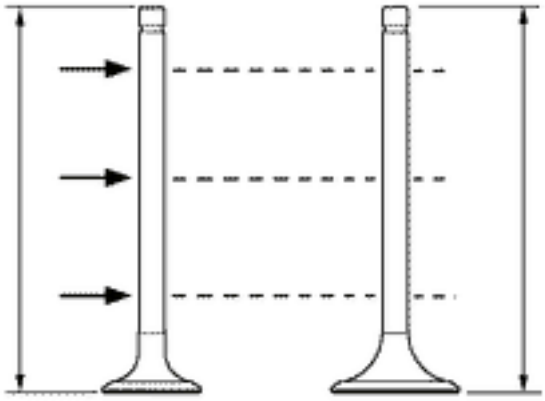
Inlet: 4.96 mm

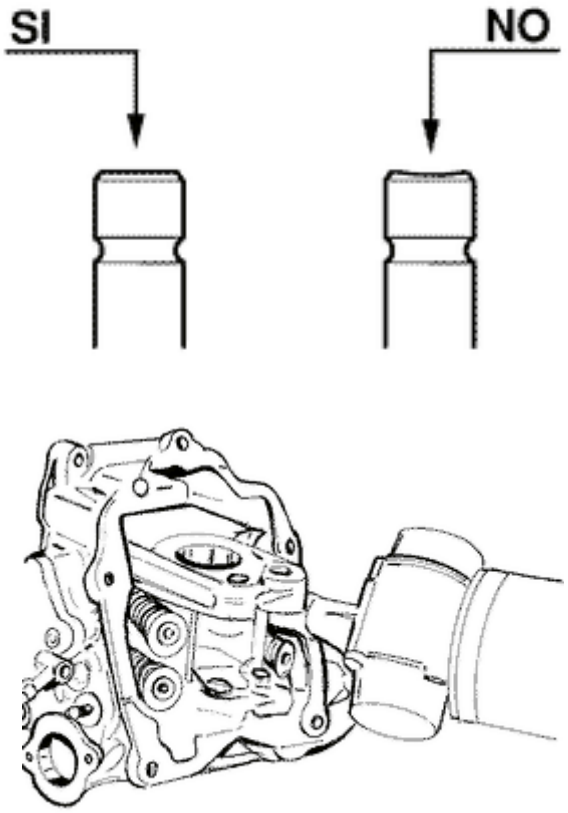
Valve check Standard diameter:

Inlet: 4.972 ÷ 4.987 mm

Valve check Standard diameter:

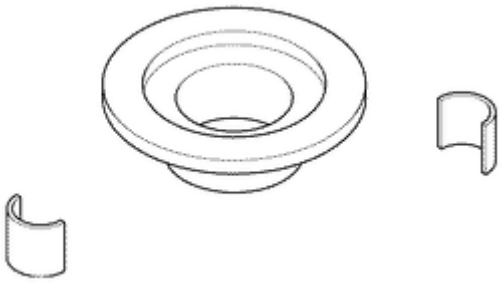
Outlet: 4.96 ÷ 4.975 mm





Inspecting the springs and half-cones

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



Refitting the valves

- Lubricate the valve guides with engine oil.
- Place the valve spring supports on the head.
- Using the special punch, fit the four valve seals.
- Fit the valves, the springs and the caps. Using the appropriate tool with adapter, compress the springs and insert the cotters in their seats.

N.B.

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

Specific tooling

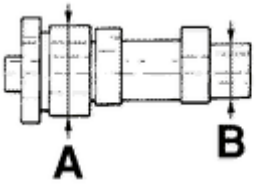
020306Y Punch for assembling valve seal rings

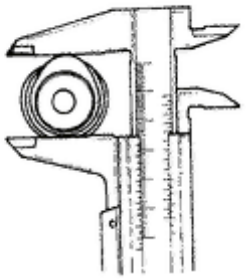
020382Y Valve cotters equipped with part 012 removal tool

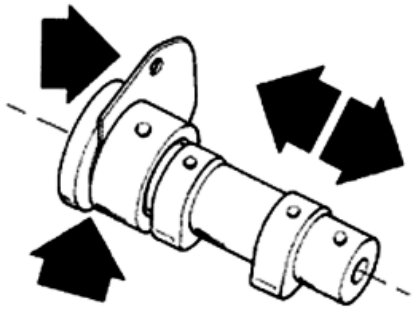
020382Y011 adapter for valve removal tool

Inspecting the cam shaft

- Inspect the cam shaft for signs of abnormal wear on the cams.
- Check the cam height.
- 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.
- Check there are no signs of wear on the automatic valve-lifter cam, or the end-of stroke roller, or the rubber buffer on the automatic valve-lifter retaining cover.
- Check that the valve lifting spring has not yielded.
- Replace any defective or worn components.
- Check the rocker pins do not show signs of wear or scoring.







- Measure the internal diameter of each rocker arm.

Check there are no signs of wear on the pad from contact with the cam and on the jointed adjustment plate.

Characteristic

Internal rocker arm diameter: Standard diameter

Diameter 12.000 - 12.011 mm

Rocking lever pin diameter: Standard diameter

Diameter 11.977 - 11.985 mm

Cam shaft check: Maximum admissible axial clearance

0.42 mm

Cam shaft check: Standard axial clearance:

0.11 - 0.41 mm

Cam shaft check: Standard height

Outlet: 29.209 mm

Cam shaft check: Standard height

Inlet: 30.285 mm

Cam shaft check: Minimum admissible diameter

Bearing B diameter: 19.950 mm

Cam shaft check: Minimum admissible diameter

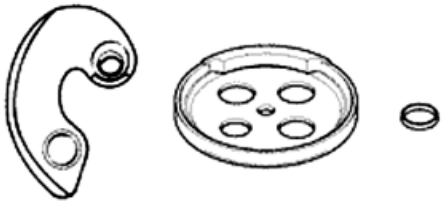
Bearing A Ø: 36.94 mm

Cam shaft check: Standard diameter

Bearing B diameter: 19.959 ÷ 19.98 mm

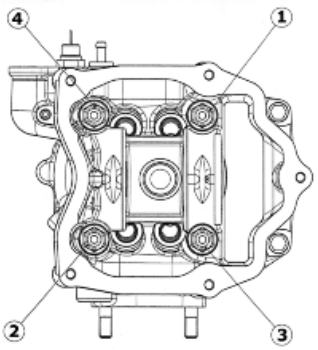
Cam shaft check: Standard diameter

Bearing A Ø: 36.95 ÷ 36.975 mm



Refitting the head and timing system components

- Fit the timing chain guide pad.
- Insert the centring dowel between the cylinder head to the cylinder, fit the cylinder head gasket and the cylinder head.
- Lubricate the stud bolt threading.
- Tighten up the nuts to an initial pre-torque of 7±1 N·m
- Tighten up the nuts to a second pre-torque of 10 ±1 N·m
- Rotate by an angle of 270°
- To carry out the operations described above, follow the tightening sequence in the figure.
- Fit the two screws on the outside of the timing chain side and tighten them to the specified torque.

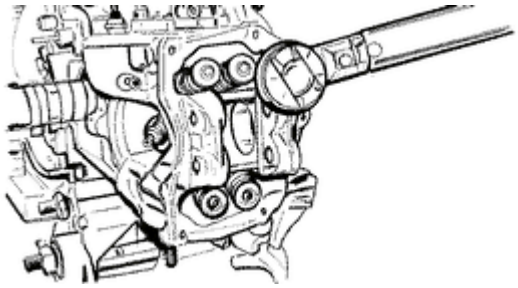


N.B.

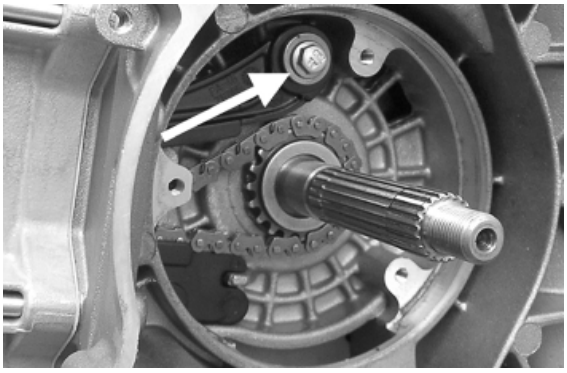
BEFORE INSTALLING THE HEAD, MAKE SURE THAT THE LUBRICATION CHANNEL IS CLEAN USING A COMPRESSED AIR JET.

Locking torques (N*m)

Timing chain tensioner support screw **11 ÷ 13**



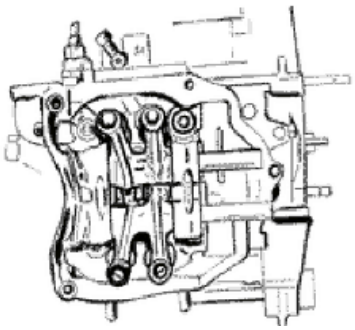
- Refit the lower timing chain sprocket wheel on the crankshaft, with the chamfer facing the insertion side.
- Loop the timing chain around the sprocket on the crankshaft.
- Fit the chain tensioner slider from the cylinder head side.
- Fit the spacer and the screw fastener.
- Tighten the screws to the prescribed torque.
- Fit the pins and rocker arms.
- Lubricate the two rocking levers through the holes at the top.

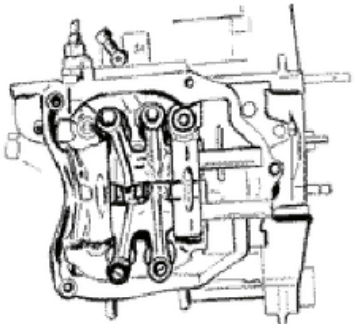


- Lubricate the 2 bearings and insert the cam shaft in the cylinder head with the cams corresponding to the rockers.
- Insert the retention plate and tighten the two screws shown in the figure to the prescribed torque.
- Refit the spacer on the cam shaft.
- Rotate the engine so that the piston is at top dead centre, using the reference marks on the flywheel and the crankcase.
- Holding this position insert the chain on the camshaft control pulley.
- Insert the pulley on the cam shaft while keeping the reference **4V** in correspondence with the reference mark on the head.
- Fit the counterweight and tighten the fixing screw to the prescribed torque.
-Fit the end-stop ring on the automatic valve-lifter cam and fit the automatic valve-lifter cam to the cam shaft.
- Fit the automatic valve-lifter return spring.
- During this operation the spring must be loaded by approximately 180°.
- Fit the automatic valve-lifter retaining dish, using the counterweight screw fastener as a reference.
- Tighten the clamping screw to the prescribed torque.
- Set the tensioner cursor in the rest position.
- Fit the chain tensioner on the cylinder, using a new gasket, and tight the two screws to the prescribed torque.
- Insert the chain tensioning screw, together with the spring and washer, tightening it to the prescribed torque.
- Adjust the valve clearance.
- Fit the spark plug.

Electrode distance 0.8 mm

N.B.

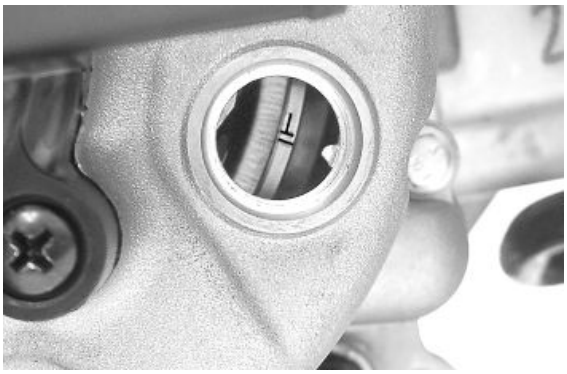


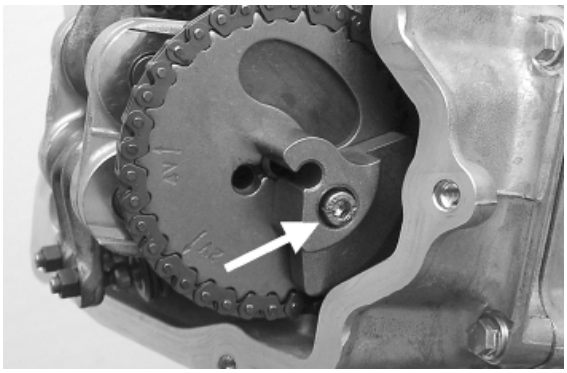


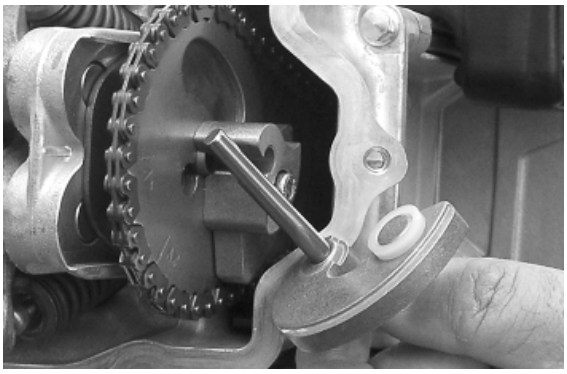
GREASE THE END STOP RING TO PREVENT IT COMING OUT AND FALLING INTO THE ENGINE.

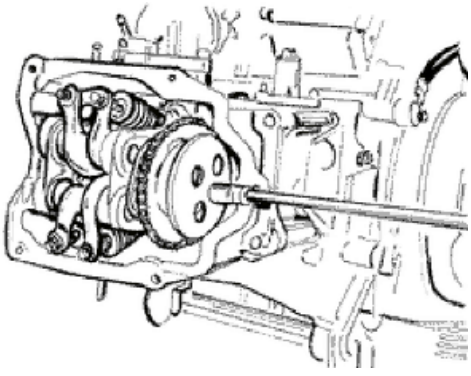
Locking torques (N*m)

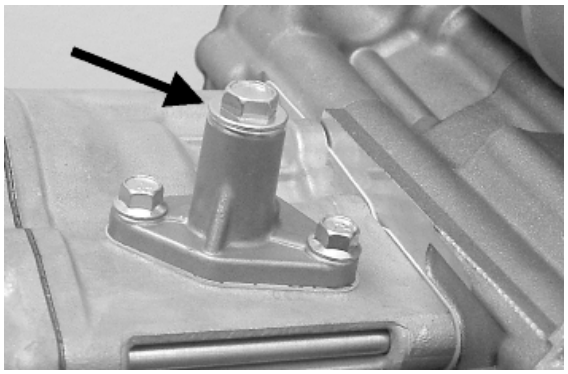
Timing chain tensioner support screw 11 ÷ 13 **Spark plug** 12 ÷ 14 **Starter ground screw** 7 ÷ 8.5 **Timing chain tensioner slider screw** 10 ÷ 14 **Starter ground support screw** 11 ÷ 15 **Timing chain tensioner central screw** 5 - 6 **Camshaft retention plate screw** 4 ÷ 6









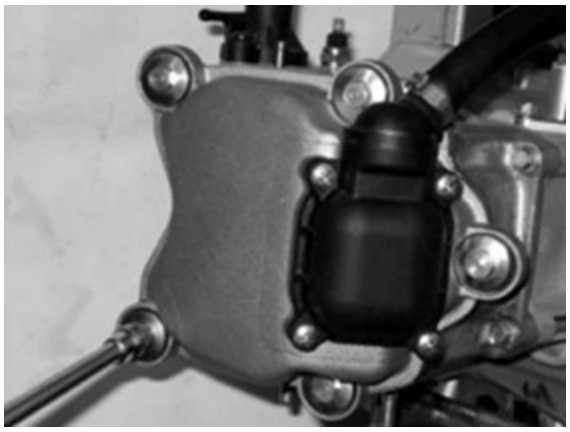


Refitting the rocker-arms cover

- Refit the cylinder head cover, tightening the 5 clamping screws to the prescribed torque.
- Make sure the gasket is positioned properly.

Locking torques (N*m)

Tappet cover screws 6 - 7 Nm



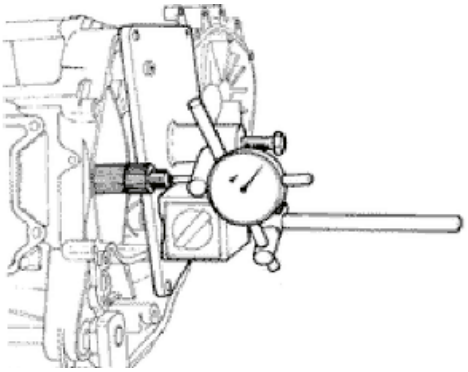
Refitting the intake manifold

Fit the intake manifold and do up the three screws.

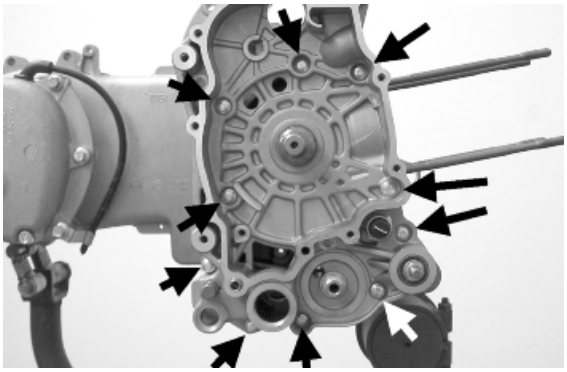
Crankcase - crankshaft

Splitting the crankcase halves

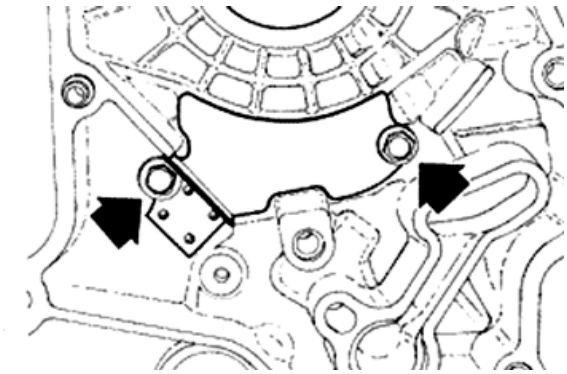
- Before opening the crankcase, it is advisable to check the axial clearance of the crankshaft. To do this, use a plate and a support with appropriate tool dial gauge.



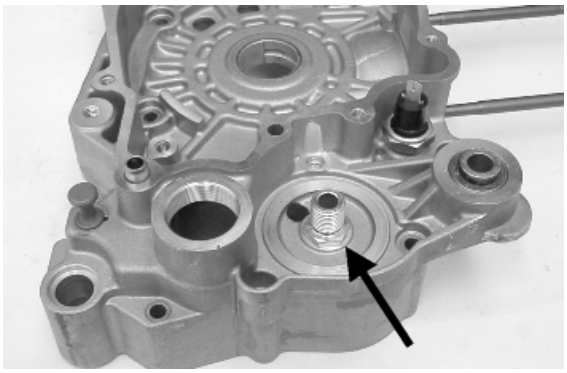
- Upper clearances are an indication of wear on the surfaces of the crankshaft casing support.
- Remove the 10 crankshaft coupling screws.
- Separate the crankcase while keeping the crankshaft in one of the two halves of the crankcase.
- Remove the crankshaft.
- Remove the half crankcase coupling gasket.
- Remove the two screws and the internal cover shown in the diagram.



- Remove the oil guard on the flywheel side.
- Remove the oil filter fitting shown in the diagram.
- Check the axial clearance on the connecting rod.
- Check the radial clearance 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.



- If the axial clearance between crankshaft and crankcase is exceeding and the crankshaft does not have any defect, the problem must be due to either excessive wear or wrong machining on the crankcase.
- Check the diameters of both the bearings of the crankshaft in accordance with the axes and surfaces shown in the figure. The half-shafts are classified in two categories Cat. 1 and Cat. 2 as shown the chart below.



CAUTION

THE CRANKSHAFT CAN BE REUSED WHEN THE WIDTH IS WITHIN THE STANDARD VALUES AND THE SURFACES SHOW NO SIGNS OF SCORING.

CAUTION

WHILE OPENING THE CRANKCASES AND REMOVING THE DRIVING SHAFT, CHECK THAT THE THREADED SHAFT ENDS DO NOT INTERFERE WITH THE MAIN BUSH-

INGS. FAILURE TO OBSERVE THIS PRECAUTION CAN DAMAGE THE MAIN BUSHINGS.

CAUTION

KEEP THE CRANKSHAFT IN ONE OF THE TWO HALVES OF THE CRANKCASE WHEN SEPARATING IT. IF YOU FAIL TO DO THIS, THE CRANKSHAFT MIGHT ACCIDENTALLY FALL.

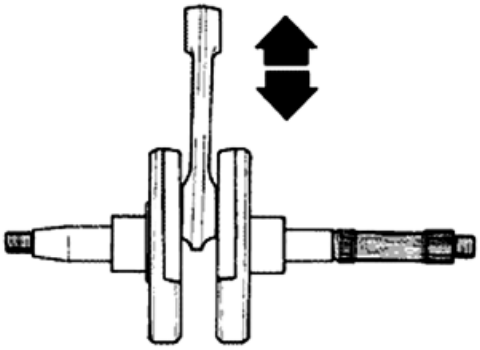
N.B.

WHEN MEASURING THE WIDTH OF THE CRANKSHAFT, MAKE SURE THAT THE MEASUREMENTS ARE NOT MODIFIED BY THE RADIUSES OF FITTINGS WITH THE CRANKSHAFT BEARINGS.

Specific tooling

020262Y Crankcase splitting strip

020335Y Magnetic support for dial gauge



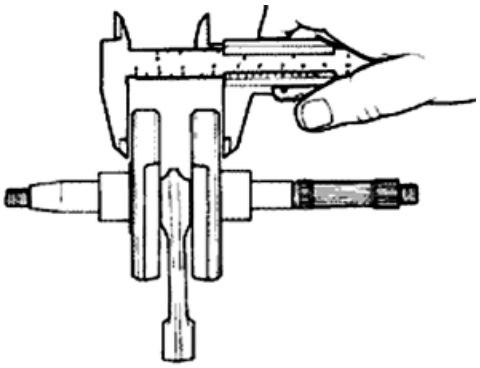
Characteristic

Axial crankshaft/crankcase clearance: Standard clearance

0.15 - 0.40 mm (when cold)

Axial connecting rod - crankshaft clearance Standard clearance

0.20 ÷ 0.50 mm



Radial connecting rod - crankshaft clearance Standard clearance

0.036 ÷ 0.054 mm

Width of crankshaft with integral washers: standard measurements

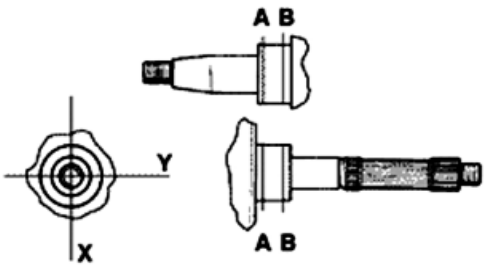
55.67 ÷ 55.85 mm

Crankshaft bearings: Standard diameter: Cat. 1

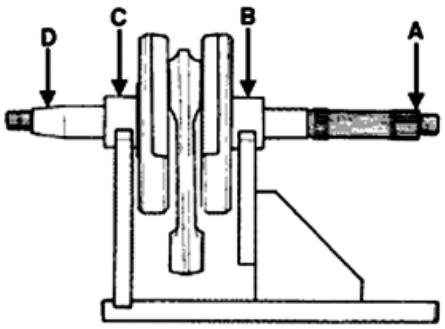
28.994 ÷ 29.000

Crankshaft bearings: Standard diameter: Cat. 2

29.000 ÷ 29.006



Inspecting the crankshaft alignment



To install the drive shaft on the support and to measure the misalignment in the 4 points indicated in figure.

- Check that the driving shaft cone, the tab seat, the oil seal capacity, the toothed gear and the threaded tangs are in good working order.
- In case of failures, replace the crankshaft.

The connecting rod head bushings cannot be replaced. For the same reason, the connecting rod may not be replaced and, when cleaning the crankshaft, be very careful that no impurities get in through the shaft's lubrication holes.

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

- Make sure that the 2 caps on the crankpin are properly fitted.
- A wrong installation of a cap can seriously affect the bushing lubrication pressure.

N.B.

THE MAIN BEARINGS ARE NOT GRINDABLE

Specific tooling

020074Y Support base for checking crankshaft alignment

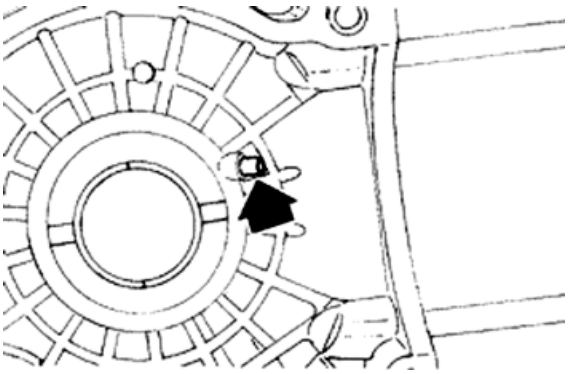
Characteristic

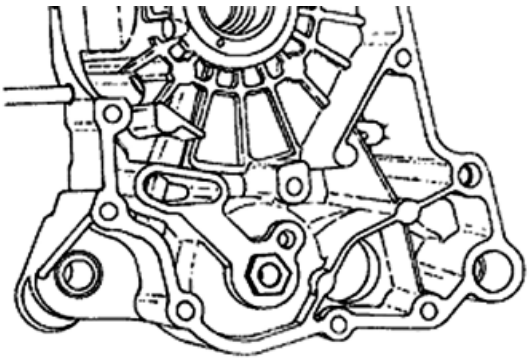
Off-line maximum admitted

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 all surfaces and oil ducts.
- On the transmission-side crankcase half, take particular care when handling the oil pump compartment and the oil ducts, the by-pass duct, the main bushings and the cooling jet on the transmission side (see diagram).
- Take particular care, also, that there are no signs wear in the oil by-pass valve housing (see Chapter Lubrication), as this could prevent a good seal in the valve, which regulates the oil pressure.
- On the flywheel side crankcase half, take particular care cleaning the oil ducts for the main bushings, the oil duct for the jet that lubricates the cylinder head and the oil drainage duct at the flywheel side oil seal.
- Inspect the coupling surfaces on the crankcase halves for scratches or deformation, taking particular care with the cylinder/crankcase surfaces and the crankcase halves surfaces.
- Defects in the crankcase coupling gasket between the crankcase halves or the mating surfaces shown in the diagram, could cause a drop in the oil pressure lubricating the main bearings and connection rod.
- Check the main bearing seats that limit axial clearance 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 clearance and dimensions.

N.B.

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

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 MAIN BUSHING AND CONNECTING ROD LUBRICATION PRESSURE.

Inspecting the crankshaft plain bearings

- T

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

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

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

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

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

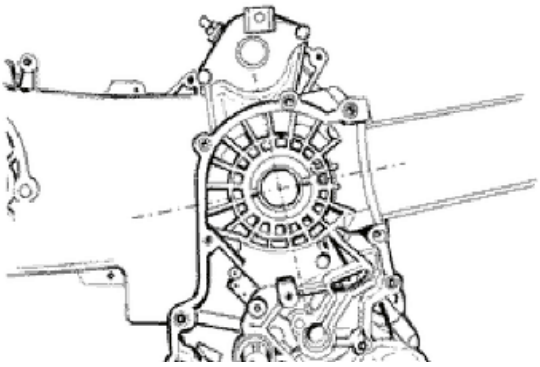
- Check the inside diameter of the main bushings in the three directions indicated in the diagram.

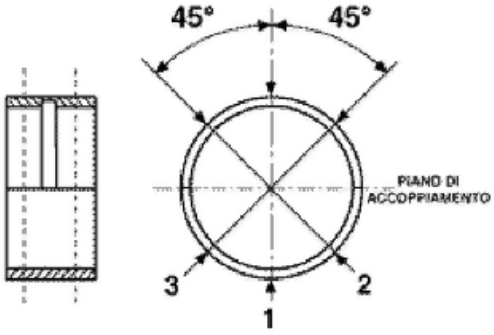
- Repeat the measurements for the other bushing half. see diagram.

- There are three crankcase versions: with RED main bushings, with BLUE main bushings and with YELLOW main bushings.

- There is only one type of main bushing housing hole in the crankcase

The standard bushing diameter after driving is variable on the basis of a coupling selection.





- The bushing housings in the crankcase are available in two categories, Cat. 1 and Cat. 2, as are the crankshafts.
- The main bushings are available in three thickness categories, identified by colour markings, as shown in the table below.

TYPE	IDENTIFICATION
A	RED
B	BLUE
C	YELLOW

	Type "A" - RED	Type "B" - BLUE	Type "C" - YELLOW
Crankshaft half-bearing	1.970 ÷ 1.973	1.9703 ÷ 1.976	1.976 ÷ 1.979

Bushing category	Crankcase halves category	Internal bushing diameter after fitting	Possible fitting
A	1	29.025 ÷ 29.040	Original
B	1	29.019 ÷ 29.034	Original and spare
	2	29.028 ÷ 29.043	
C	2	29.022 ÷ 29.037	Original

Match the shaft with two category 1 crank webs with the category 1 crankcase (or cat. 2 with cat. 2) Furthermore a spare crankcase cannot be matched with a crankshaft with mixed categories. The spare crankshaft has half-shafts of the same category.

Crankcase halves	Engine half-shaft	Bushing
Cat. 1	Cat. 1	B
Cat. 2	Cat. 2	B
Cat. 1	Cat. 2	A
Cat. 2	Cat. 1	C

N.B.

DO NOT TAKE THE MEASUREMENT ON THE TWO HALF-SHELL COUPLING SURFACE SINCE THE ENDS ARE RELIEVED TO ALLOW BENDING DURING THE DRIVING OPERATION.

N.B.

CRANKCASES FOR REPLACEMENTS ARE SELECTED WITH CRANKCASE HALVES OF THE SAME CATEGORY AND ARE FITTED WITH CATEGORY B BUSHINGS (BLUE)

Characteristic

Standard driving depth

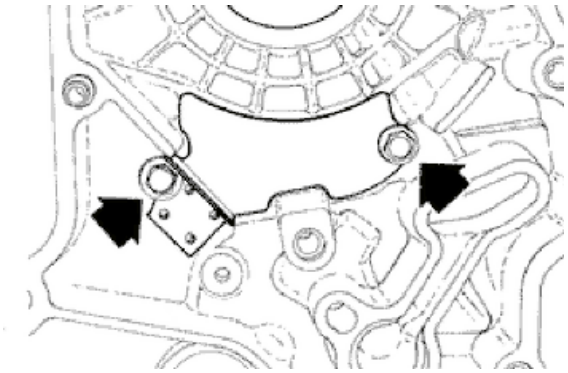
1.35 ÷ 1.6

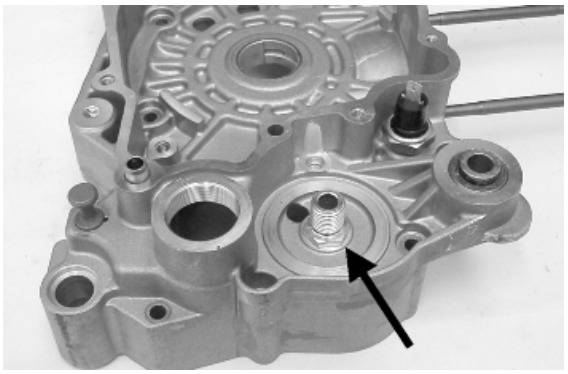
Diameter of crankcase without bushing

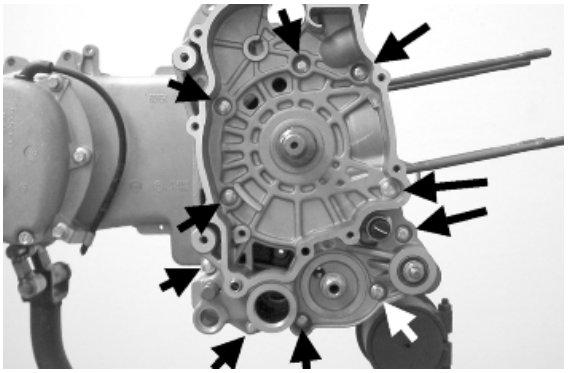
32.953 ÷ 32.963

Refitting the crankcase halves

- Fit the internal bulkhead by locking the two screws to the prescribed torque.
- Fit the oil filter fitting and tighten it to the specified torque.
- Place a new gasket on one of the crankcase halves, preferably on the transmission side, together with the locating dowels.
- Lubricate the main bushings and insert the crankshaft in the transmission side crankcase half.
- Reassemble the two crankcase halves.
- Fit the 10 screws and tighten them to the prescribed torque.
- Fit a new O-ring on the pre-filter and lubricate it.
- Insert the filter on the engine with the relative cap. Tighten to the prescribed torque.

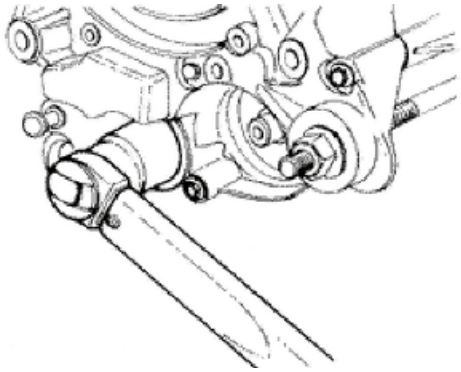






Locking torques (N*m)

Internal engine crankcase bulkhead (transmission-side half shaft) screws 4 ÷ 6 Engine-crankcase coupling screws 11 ÷ 13 Oil filter on crankcase fitting 27 ÷ 33 Engine oil drainage plug/mesh filter 24 ÷ 30

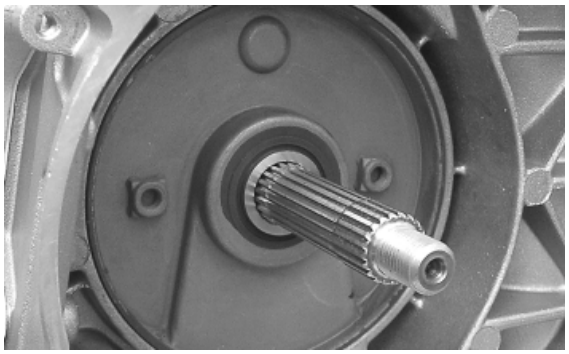


Lubrication

Crankshaft oil seals

Removal

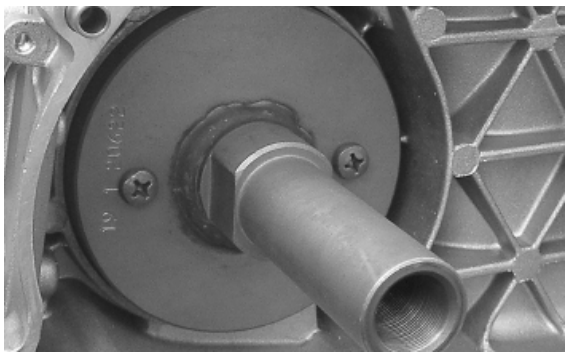
- First remove the transmission cover and the complete driving pulley



- Install the base of the appropriate tool on the oil guard using the screws provided.

Specific tooling

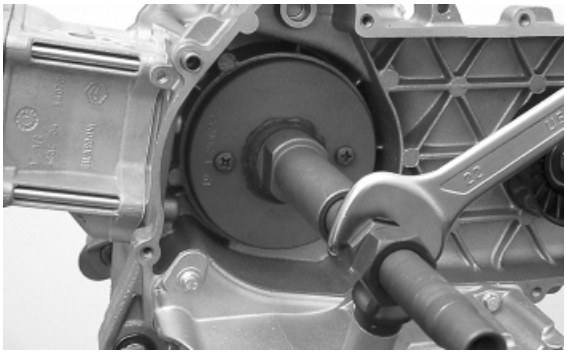
020622Y Transmission-side oil guard punch



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

Specific tooling

020622Y Transmission-side oil guard punch



Refitting

- Use a new oil seal upon refitting.
- Prepare the new oil seal, lubricating the sealing lip.
- Preassemble the oil seal with the specific tool, positioning the screws.
- Place the sheath over the crankshaft.
- Insert the tool with the oil seal on the crankshaft until it comes into contact with the crankcase.
- Orientate the oil seal by inserting the bracket which is part of the specific tool.
- Tighten the threaded bar onto the crankshaft as far as it will go.
- Use the nut to move the base of the tool until you can feel the end of the oil seal driving stroke.
- Remove all of the tool components following the inverse procedure

CAUTION

DO NOT LUBRICATE THE SURFACE FOR KEYING ONTO THE ENGINE CRANKCASE.

CAUTION

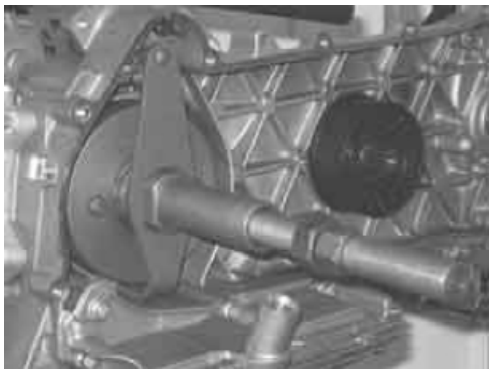
ORIENT THE OIL GUARD BY POSITIONING THE CHAIN HOUSING CHANNEL FACING DOWNWARDS. WHEN THE POSITION IS REACHED, DO NOT RETRACT THE OIL GUARD. FAILURE TO COMPLY WITH THIS RULE CAN CAUSE A WRONG POSITIONING OF THE OIL GUARD SHEATH.

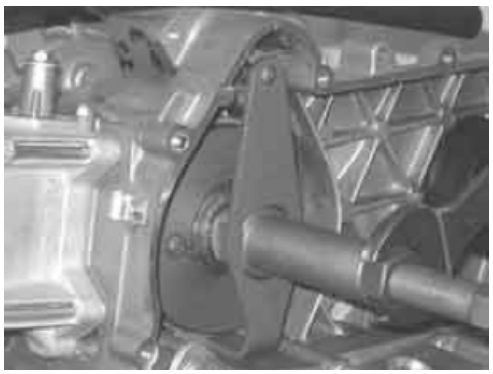
CAUTION

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

Specific tooling

020622Y Transmission-side oil guard punch

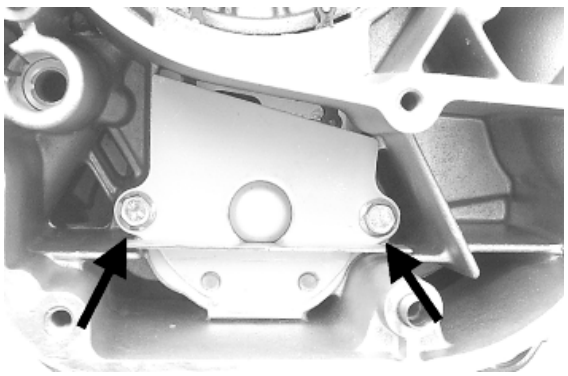




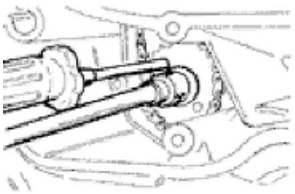
Oil pump

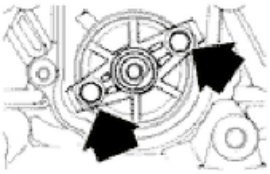
Removal

- Undo the two clamping screws in the figure and remove the cover over the pump control crown.



- Block the rotation of the oil pump control pulley with a screwdriver inserted through one of its two holes.
- Remove the central screw with Belleville washer, as shown in the diagram.
- Remove the chain with the crown.
- Remove the control sprocket with relative O-ring.
- Remove the oil pump by undoing the two screws in the figure.
- Remove the oil pump seal.





N.B.

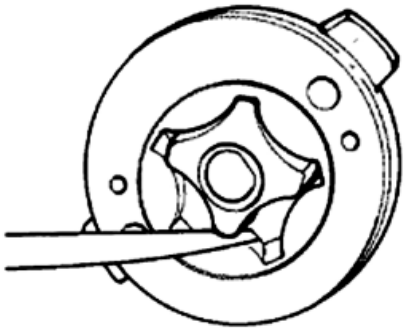
IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.

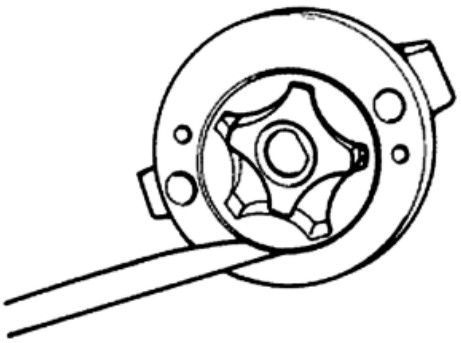
Inspection

- Remove the two screws and the oil pump cover.
- Remove the clip retaining the innermost rotor.
- Remove and wash the rotors thoroughly with petrol and compressed air.
- Reassemble the rotors in the pump body, keeping the two reference marks visible Replace the snap ring.
- Check the clearance between the rotors in the position shown in the diagram using a thickness gauge.

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

- Check the axial clearance of the rotors using a trued bar as shown in the figure.





Characteristic

Axial rotor clearance

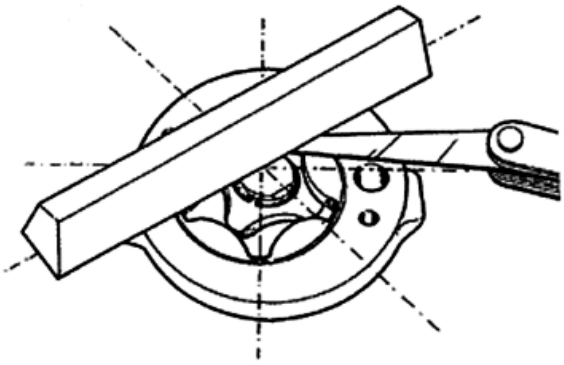
Limit values admitted: 0.09 mm

Distance between the outer rotor and the pump body

Admissible limit clearance: 0.20 mm

Distance between the rotors

Admissible limit clearance: 0.12 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.
- If you detect non-conforming measurements or scoring, replace the faulty parts or the unit.
- Fit the pump cover in the position that permits the crankcase fixing screws to be aligned.
- Make sure the gasket is positioned properly and refit the pump on the engine crankcase. The pump can only be fitted in one position. - Tighten the screws to the prescribed torque.
- Fit the sprocket wheel with a new O-ring.
- Fit the chain.
- Fit the central screw and the belleville washer. Tighten to the prescribed torque.
- Fit the oil pump cover by tightening the two screws to the prescribed torque.

N.B.

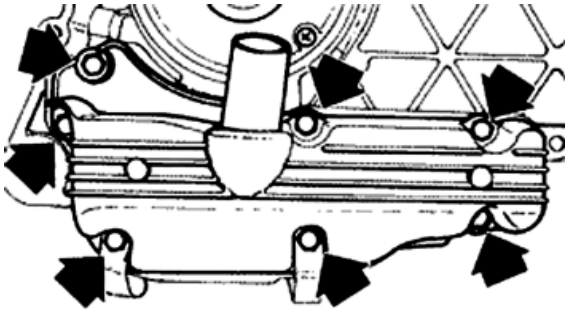
FIT THE BELLEVILLE WASHER SO THAT ITS OUTER RIM TOUCHES THE PULLEY. MAKE SURE THAT THE PUMP TURNS FREELY.

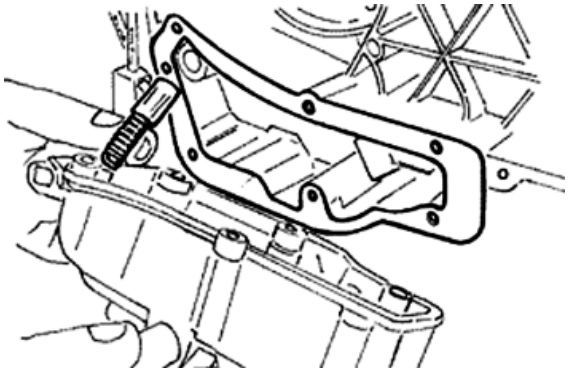
Locking torques (N*m)

Screws fixing oil pump to crankcase 5 - 6 Oil pump control crown screw 10 ÷ 14 Oil pump cover screws 0.7 ÷ 0.9

Removing the oil sump

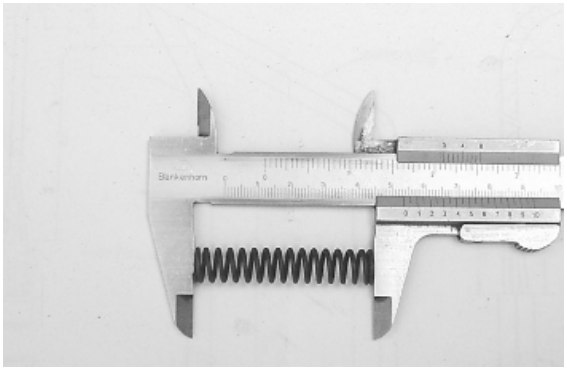
- Remove the oil filler plug, the transmission cover, the complete driving pulley assembly with belt and the sprocket wheel, as described in the "Transmission" chapter.
- Drain the oil as described previously.
- Remove the seven screws, shown in the diagram, and the two rear brake fluid pipe fixing brackets.
- Remove the screw, the by-pass piston, the gasket and centring dowels shown in the figure.





Inspecting the by-pass valve

- Check the unloaded spring length.
- Check that the small piston is not scored.
- Ensure that it slides freely on the crankcase and that it guarantees a good seal.
- If not, eliminate any impurities or replace defective parts.

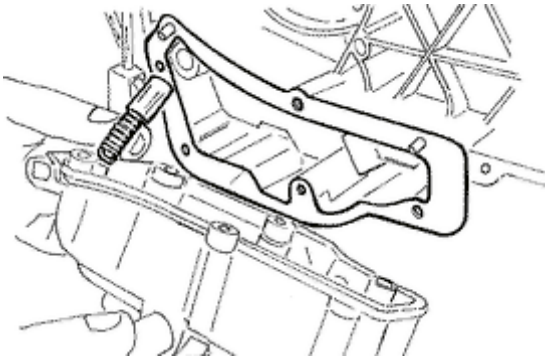


Characteristic

By-pass check up: Standard length

54.2 mm

Refitting the oil sump



- Refit the by-pass valve plunger in its housing.
- Insert the pressure-regulating spring.
- Fit a new sump seal.
- Refit the two centring dowels.
- Refit the sump, taking care to locate the spring in the appropriate recess machined into the inside of the sump.
- Refit the rear brake cable brackets and the screws in the reverse order from which they were removed.
- Tighten the screws to the prescribed torque.
- Refit the drive pulley assembly, the drive belt, the sprocket wheel and the transmission cover, as described in the "Transmissions" chapter.
- **When testing the lubrication system, refer to chapter "Crankcase and Crankshaft", regarding lubrication of the crankshaft and connecting rod**

Locking torques (N*m)

Oil sump screws **10 ÷ 14**

SAS valve

Inspecting the one-way valve

- Remove the SAS valve.
- Provisionally assemble the rubber coupling of the SAS valve outlet to ensure tightness.
- Connect the MITYVAC vacuum pump to the rubber coupling as shown in the photograph.
- Set the pump to the low-pressure position (VACUUM).
- Operate the pump slowly.
- Check that the one way valve allows the air to pass through causing a slight vibration.

- Switch the pump to pressure mode (PRESSURE).
- Operate the pump slowly and check if there is an increase of pressure. A small leakage is considered to be normal.

If anomalies are detected, replace the pump.

N.B.

A MALFUNCTIONING ONE-WAY VALVE CAN RESULT IN RUBBER COUPLING AND FILTER OVERHEATING

N.B.

ABSENCE OF VIBRATION INDICATES INEFFICIENT SEALING

Specific tooling

020329Y MityVac vacuum-operated pump

Inspecting the cut-off

- Remove the SAS valve.
- Connect the MITYVAC pump in low-pressure mode (VACUUM) to the CUT-OFF valve vacuum intake.
- Apply a vacuum value higher than 0.5 BAR.
- Check that this value is kept all the time.
- If a worn seal is detected, replace it.
- With a "T" bypass and flexible rubber hoses make a parallel connection between the rubber coupling and the vacuum intake of the CUT-OFF valve.
- Connect the bypass to the MITYVAC pump.
- Set the pump set to the low-pressure mode (VACUUM).
- Using a pair of long flat pliers, choke the rubber hose next to the valve.
- Operate the pump until vacuum is higher than 0.5 BAR.
- Release the hose and check how the vacuum reacts. - Under normal functioning conditions the vacuum undergoes a slight fall and then readjusts. There follows a slow and continuous loss of depression up to approximately 0.4 BAR. At this point

the valve opens and the depression is suddenly set to zero.

Lack of tightness or the fact that the valve opens at different vacuum values should be regarded as anomalies. In this case, replace it.

N.B.

LACK OF TIGHTNESS IN THE CUT-OFF VALVE RESULTS IN EXHAUST NOISE (EXPLOSIONS IN THE MUFFLER). INCORRECT CUT-OFF VALVE CALIBRATION CAN RESULT IN CATALYTIC CONVERTER MALFUNCTIONING

N.B.

A FAULTY CUT-OFF VALVE DIAPHRAGM, BESIDES JEOPARDISING THE CORRECT OPERATION OF THE CUT-OFF VALVE, ALSO DAMAGES IDLE FUNCTIONING

Specific tooling

020329Y MityVac vacuum-operated pump

Fuel supply

Removing the carburettor

Kehin

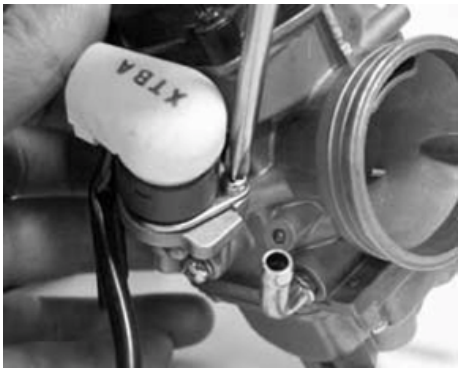
- To detach the carburettor from the engine, it is necessary to move the air filter and remove the transmission throttle control, the automatic starter connection, the clamps anchoring the carburettor to the filter housing and to the inlet manifold, the air delivery pipe to the diaphragm, and the intake fitting.

- Take out the carburettor and rotate it so as to remove the screw with the water joint and the pipes.

N.B.

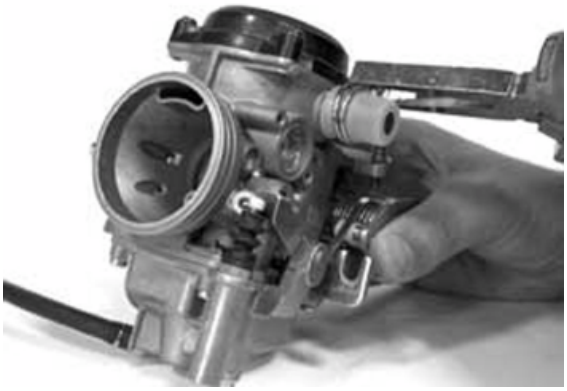
THIS LAST OPERATION IS NECESSARY SO AS NO TO EMPTY THE COOLING SYSTEM.

- Remove the protection, the bracket and the starter acting on the screw shown in the figure.



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

- Remove the clamp and cover with the airing filter of the diaphragm chamber.



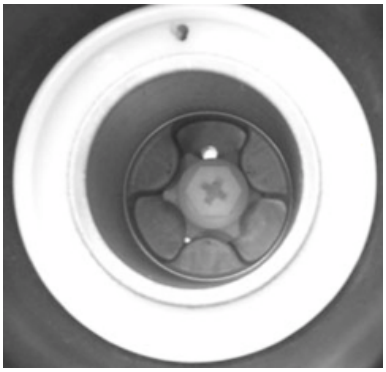
- Remove the 4 fixing screws shown in the figure and the vacuum chamber cover.

WARNING

DURING THE REMOVAL OF THE CARBURETTOR COVER TAKE SPECIAL CARE NOT TO RELEASE THE SPRING ACCIDENTALLY.

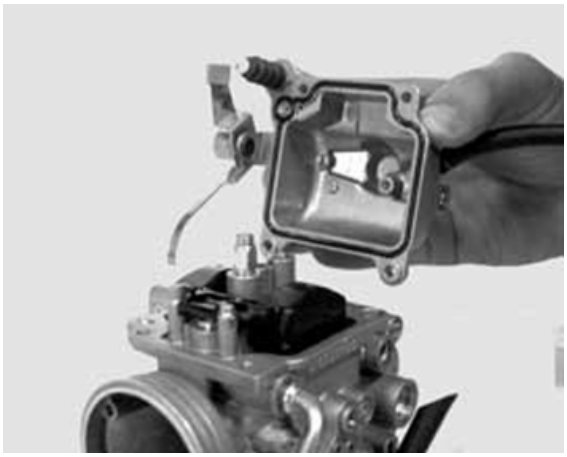
- Remove the vacuum valve together with the diaphragm.

- Unscrew the bayonet joint 1/8 of a turn and remove, take out the spring and vacuum valve needle



- Remove the 4 screws indicated in the figure.

- Remove the chamber with the accelerating pump, its control and gasket.



- Remove the oil pump seal.
- Remove the intake and outlet valves of the intake pump from the tank

N.B.

CAUTION, THE ACCELERATION PUMP VALVES ARE MADE UP OF NOZZLES, SPRING AND BALL.

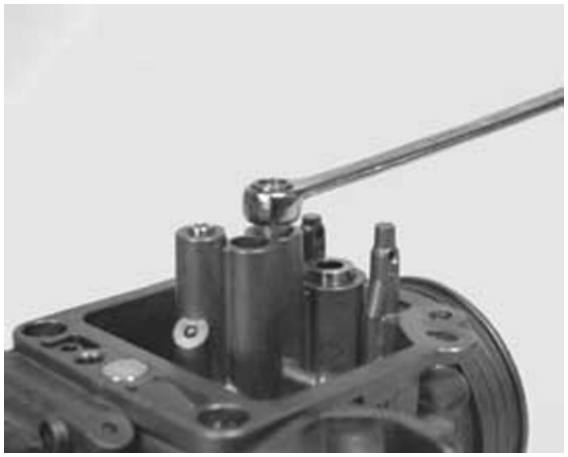
N.B.

AVOID REMOVING THE PISTON OF THE PUMP AND ITS CONTROL.

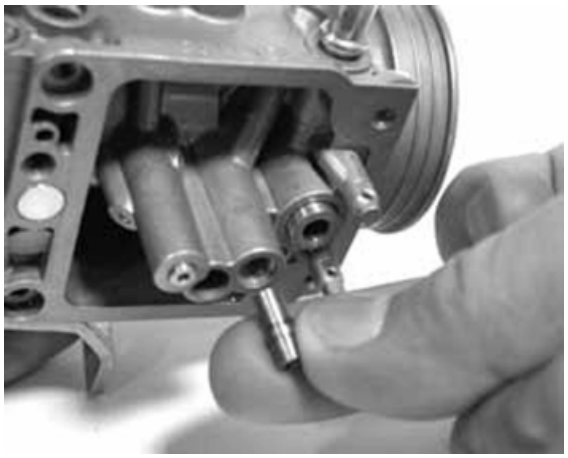
Adequately support the carburettor and using a rod and hammer remove the float pin acting from the throttle control side.

- Remove the float and the plunger.
- Remove the maximum nozzle

-Remove the maximum nozzle.



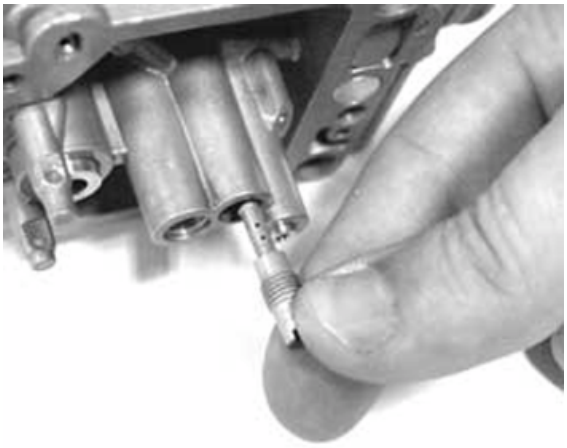
-Remove diffuser.



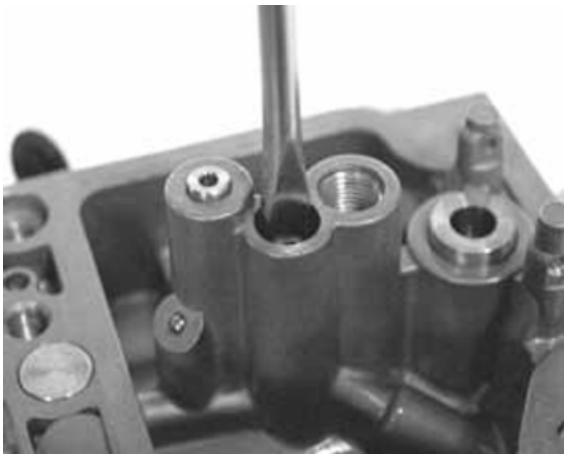
- Remove the sprayer.

N.B.

WHEN CLEANING THE CARBURETTOR BODY REMOVE THE SPRAYER TO AVOID LOSING PARTS. IF THE SPRAYER IS FORCED IN ITS HOUSING DO NOT ATTEMPT TO REMOVE IT AS THIS WILL ONLY DAMAGE IT.



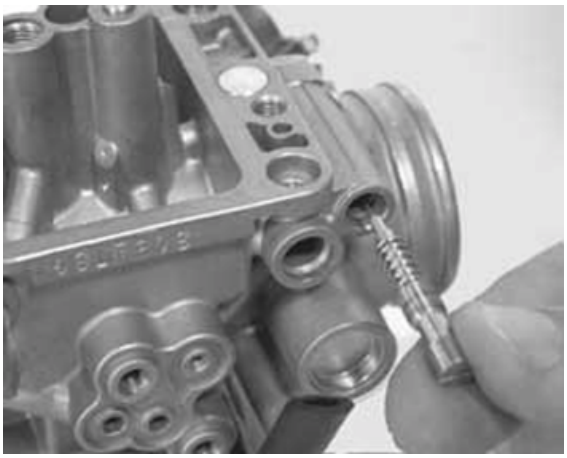
-Remove the minimum nozzle.



- Remove the minimum flow set screw and the spring.

CAUTION

DO NOT ATTEMPT REMOVING PARTS EMBEDDED IN THE CARBURETTOR BODY SUCH AS: FUEL SUPPLY PIPE, PLUNGER HOUSING, STARTER NOZZLE, PIT COVER FOR PROGRESSIONS AND INLET NOZZLE, MINIMUM AND MAXIMUM AIR GAUGE, THROTTLE VALVE CONTROL SHAFT. DO NOT REMOVE THROTTLE-SHAFT CONNECTION SCREWS. THE FIXING SCREWS ARE CAULKED AFTER ASSEMBLY AND THEIR REMOVAL DAMAGES THE SHAFT.



Walbro

To detach the carburettor from the engine, it is necessary to move the air filter and remove the transmission throttle control, the automatic starter connexion, the clamps anchoring the carburettor to the filter housing and to the inlet manifold, the air delivery pipe to the diaphragm, and the intake fitting.

- Take out the carburettor and rotate it so as to remove the screw with the water joint and the pipes

N.B.

THIS OPERATION IS NECESSARY TO AVOID LOSING SPRAYER PARTS WHEN CLEANING THE CARBURETTOR BODY. IF THE SPRAYER IS FORCED IN ITS HOUSING DO NOT ATTEMPT TO REMOVE IT AS THIS WILL ONLY DAMAGE IT.

Remove the protection, the bracket and the starter acting on the screw shown in the figure.

Remove the clamp and cover with the airing filter of the diaphragm chamber.

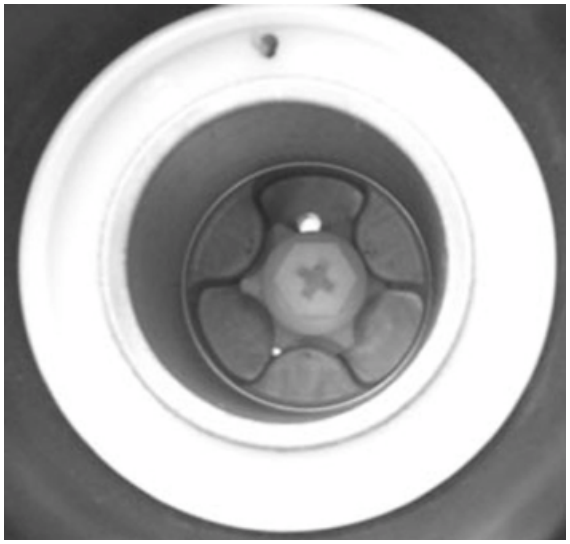
Remove the 4 fixing screws indicated in the figure and the vacuum chamber cover.

N.B.

DURING THE REMOVAL OF THE COVER TAKE SPECIAL CARE NOT TO RELEASE THE SPRING ACCIDENTALLY.

Remove the vacuum valve together with the diaphragm.

Unscrew the bayonet joint 1/8 of a turn, remove it, take out the spring and vacuum valve plunger



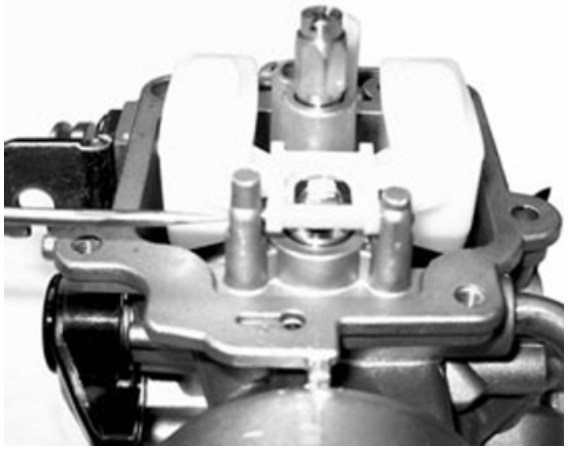
Remove the 4 screws shown in the figure.

Remove the tank with the intake pump, its control and gasket.

Remove the acceleration pump piston with the ring nut, the hood, the O-Ring and the spring from the tank as shown in the figure.

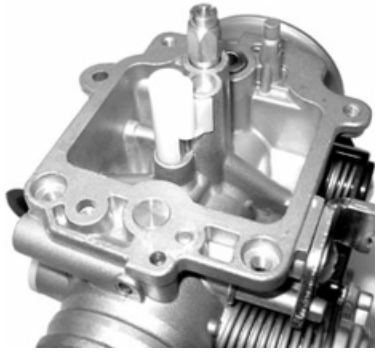
Adequately support the carburettor and using a rod and hammer remove the float pin acting from the throttle control side.
Remove the float and the plunger.

Remove the cover of the duct from the carburettor to the starter nozzle as shown in the figure.



-Remove the maximum nozzle.

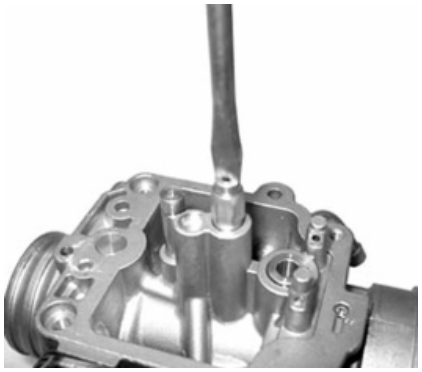
-Remove diffuser.



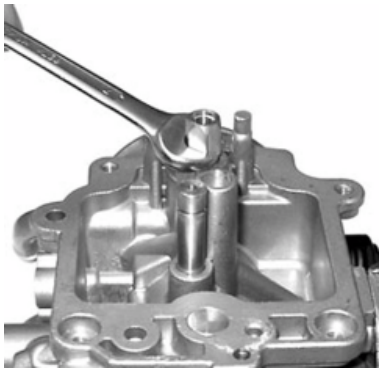
Remove the sprayer.

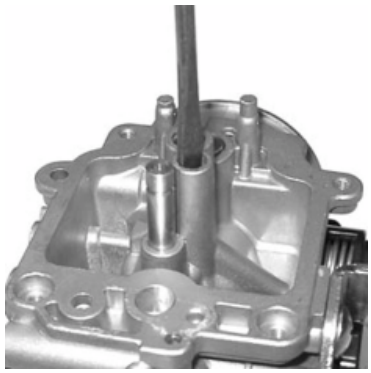
N.B.

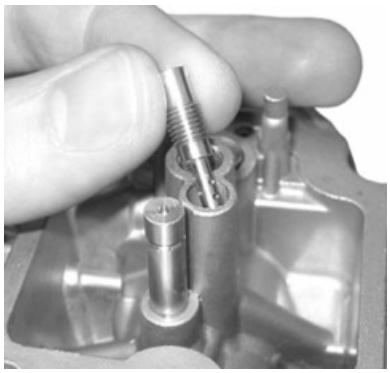
THIS OPERATION IS NECESSARY TO AVOID LOSING SPRAYER PARTS WHEN CLEANING THE CARBURETTOR BODY. IF THE SPRAYER IS FORCED IN ITS HOUSING DO NOT ATTEMPT TO REMOVE IT AS THIS WILL ONLY DAMAGE IT.



-Remove the minimum nozzle.





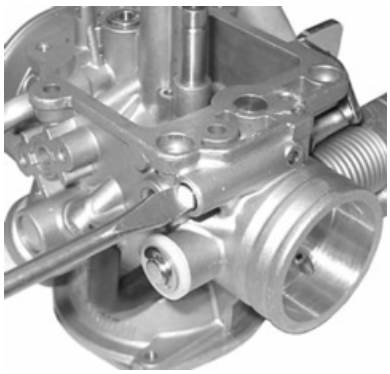


Remove the minimum flow screw with the O-ring, the washer and the spring.

-Remove the 2 fixing screws, the cover, the spring, and the cut-off device diaphragm.

CAUTION

DO NOT ATTEMPT REMOVING PARTS EMBEDDED IN THE CARBURETTOR BODY SUCH AS: FUEL SUPPLY PIPE, PLUNGER HOUSING, STARTER NOZZLE, PIT COVER FOR PROGRESSIONS AND INLET NOZZLE, MINIMUM AND MAXIMUM AIR GAUGE, THROTTLE VALVE CONTROL SHAFT. DO NOT REMOVE THROTTLE-SHAFT CONNECTION SCREWS. THE FIXING SCREWS ARE CAULKED AFTER THE ASSEMBLY AND THEIR REMOVAL DAMAGES THE SHAFT.

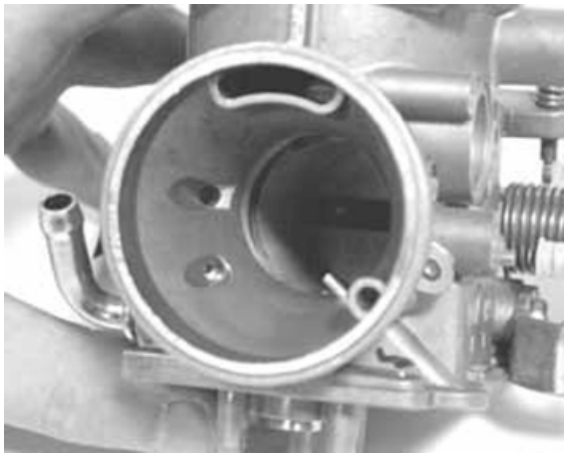


Refitting the carburettor

Kehin

- Before refitting, wash the carburettor body accurately with petrol and compressed air.
- Pay special attention to the fuel supply pipe and the plunger seat.

- For maximum circuit, check the air adjustment is correct as shown in the figure.



- For the minimum circuit, make sure the following points are properly cleaned: air gauging, outlet section controlled by flow screw, progression holes near the throttle valve.

- For the starter circuit, blow the connection pipe properly with the jet. This is necessary because the nozzle support hides other inaccessible internal calibrations.
- Blow the intake nozzle properly.

N.B.

THE ACCELERATION NOZZLE OUTLET IS EXTREMELY SMALL AND IS ORIENTED TO THE THROTTLE VALVE. NOZZLE INCORRECT ORIENTATION RESULTS IN INADEQUATE SPRAYING.

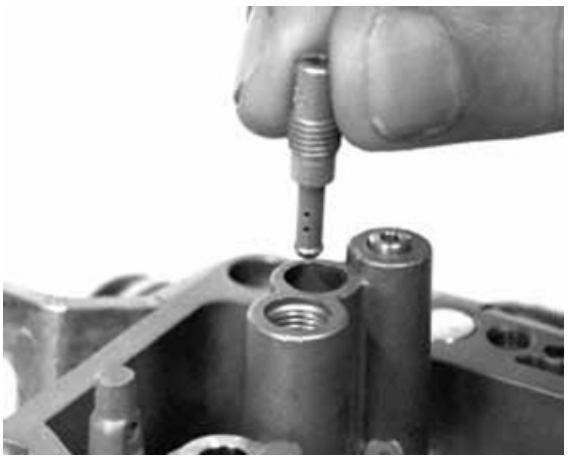
- Check that there are 5 closing ball joints for the operating pipes on the carburettor body.

- Check that the coupling surfaces, the tank and the diaphragm are not dented.
-Check that the depression valve housing pipe is not scratched.
- Check that the throttle valve and the shaft do not show abnormal wear.
- Check that the plunger seat does not show abnormal wear.
- Replace the carburettor in case of irregularities.
- Check that the return spring of the accelerating pump rocking lever is not deformed by over-stretching.

N.B.

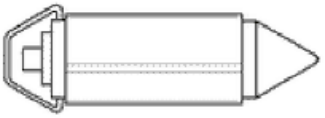
TO AVOID DAMAGES, DO NOT INTRODUCE METAL OBJECTS IN THE ADJUSTED SECTIONS.

- Wash and blow the minimum nozzle properly and reassemble it.



- Properly wash and blow the components of the sprayer maximum circuit, the diffuser and the nozzle.
- Introduce the sprayer in the carburettor body with the shortest cylindrical part directed to the diffuser.
- Assemble the diffuser making sure the sprayer is being adequately inserted and lock it.
-Assemble the maximum nozzle.

- Check that the tapered pin does not show signs of wear on the sealing surfaces of the shock absorber pin and the return clamp.
- Replace the rod if worn out.



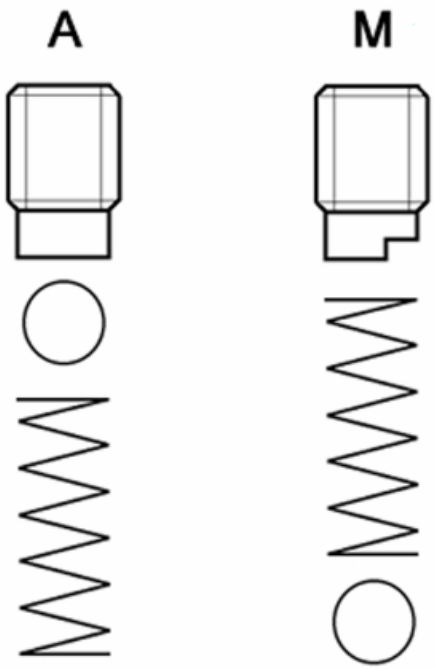
- Check that the float is not worn on the pin housing or on the contact plate with the plunger and that there are no fuel infiltration.
- Replace it in case of anomalies.

- Introduce the float with the rod on the fuel feeding tube side.

N.B.

INTRODUCE THE RETURN SPRING ON THE FLOAT PLATE ADEQUATELY

- Remove the drainage screw from the tank, wash and blow it properly and make sure the acceleration pump pipes are clean.
- Operate the acceleration pump piston repeatedly and blow with compressed air.
- Reassemble the acceleration pump valves following this order:



INTAKE VALVE (A)

- Spring
- Ball
- Nozzle

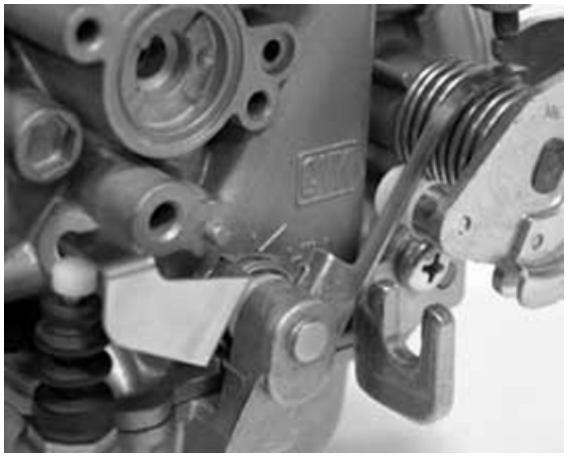
IN VALVE (M)

- Ball
- Spring
- Nozzle

N.B.

THE IN VALVE NOZZLE, CORRESPONDING TO THE ACCELERATION PUMP, IS MILLED.

-Check the screw tightness introducing a small amount of fuel in the tank.
- Assemble a new gasket on the tank.
- Assemble the tank on the carburettor body fastening the 4 screws.
- Check that the control roller is free to rotate in its own seat.



N.B.

MAKE SURE THE TANK GASKET IS CORRECTLY INTRODUCED

N.B.

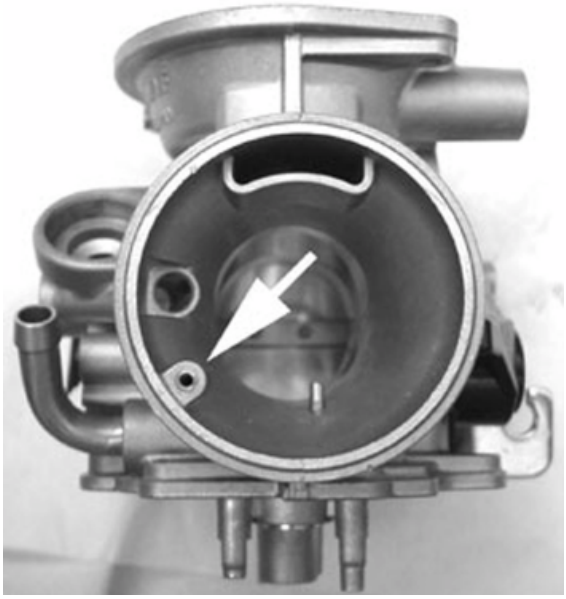
AVOID DEFORMING THE ACCELERATION PUMP CONTROL ROCKING LEVER.

- Wash and blow the flow screw properly.
- Check that screw is not deformed and/or rusty.
- Assemble the spring on the screw.
- Screw the flow screw on the carburettor body.

- The screw final position should be determined by an exhaust fume analysis.
- Adjust the carburettor by turning the screw twice from the close position.

Walbro

- Before refitting, wash the carburettor body accurately with petrol and compressed air.
- Pay special attention to the fuel supply pipe and the plunger seat.



- For maximum circuit, check the air adjustment is correct as shown in the figure.
- Carefully clean the air holes indicated in the figure.

- For the minimum circuit, make sure the following points are properly cleaned: air gauging, outlet section controlled by flow screw, progression holes near the throttle valve.

N.B.

THE MINIMUM AIR IS CONTROLLED BY TWO ADJUSTMENTS. THE CUT-OFF ONE IS INDICATED DIRECTLY IN THE CARBURETTOR BODY.

- For the starter circuit, blow the connection pipe properly with the jet.This is necessary because the nozzle support hides other inaccessible internal calibrations.
- Blow the intake nozzle properly.

N.B.

THE ACCELERATION NOZZLE OUTLET IS EXTREMELY SMALL AND IS ORIENTED TO THE THROTTLE VALVE. NOZZLE INCORRECT ORIENTATION RESULTS IN INADEQUATE SPRAYING.

- Check that there are 5 closing ball joints for the operating pipes on the carburettor body.
- Check that the coupling surfaces, the tank and the diaphragm are not dented.
-Check that the depression valve housing pipe is not scratched.
- Check that the throttle valve and the shaft do not show abnormal wear.
- Check that the plunger seat does not show abnormal wear.
- Replace the carburettor in case of irregularities.

N.B.

TO AVOID DAMAGES, DO NOT INTRODUCE METAL OBJECTS IN THE ADJUSTED SECTIONS.

- Wash and blow the minimum nozzle properly and reassemble it.
- Properly wash and blow the components of the sprayer maximum circuit, the diffuser and the nozzle.
- Introduce the sprayer in the carburettor body with the shortest cylindric part directed to the diffuser.
- Assemble the diffuser making sure the sprayer is being adequately inserted and lock it.
-Assemble the maximum nozzle.
- Check that the tapered pin does not show signs of wear on the sealing surfaces of the shock absorber pin and the return clamp.
- Replace the rod if worn out.

- Check that the float is not worn on the pin housing or on the contact plate with the plunger and that there are no fuel infiltration.
- Replace it in case of anomalies.
- Assemble the float with the plunger introducing the pin on the carburettor feeding tube side.

N.B.

INTRODUCE THE RETURN SPRING ON THE FLOAT PLATE ADEQUATELY

Level check

Kehin

- Place the carburettor inclined as shown in the figure.

- Check that the float reference is parallel to the tank coupling surface
- If different positions are detected, change the plunger control metal plate direction to obtain the position described above.

Walbro

- Make sure the float coupling surface is parallel to the tank surface with the carburettor in inverted position.
- If different positions are detected, change the plunger control metal plate direction to obtain the position described above.
- If the plate gets deformed, make sure it remains parallel to the float pin.

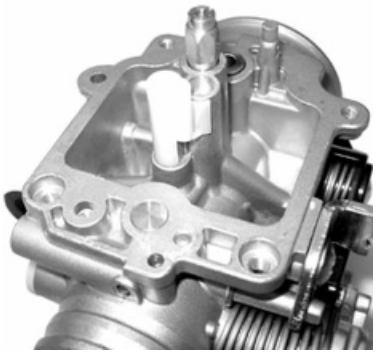
N.B.

WITH INVERTED CARBURETTOR, THE FLOAT WEIGHT SHOULD NOT EXCEED THE TAPERED PIN SPRING THRUST. OTHERWISE, CHECK THAT THE FLOAT IS NOT HEAVY DUE TO FUEL INFILTRATION. REPLACE THE FLOAT AND THE TAPERED PIN, IF NECESSARY.

- Wash and blow the carburettor duct cover properly and introduce it in the starter nozzle.

N.B.

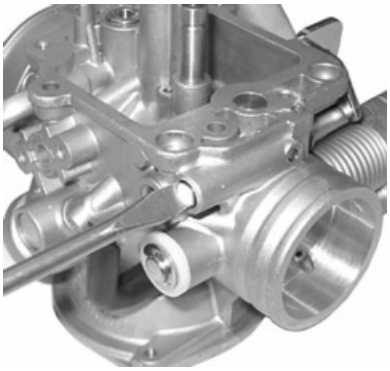
INCORRECT ASSEMBLY OF CARBURETTOR DUCT COVER ON THE STARTER NOZZLE CAUSES A NEGATIVE COLD START-UP SITUATION: THE STARTER NOZZLE TAKES UP THE OLD FUEL FROM THE BOTTOM OF THE TANK.



- Remove the drainage screw from the tank, wash and blow the tank properly and make sure the acceleration pump intake and supply valve are clean.
- Being the valves unidirectional, blow them carefully with compressed air, at the inner side of the tank for the intake valve and at the pump piston housing for the supply valve.
- Check that there are no signs of wear in the acceleration pump piston and its corresponding seat in the tank.
- In case of wear, replace the defective parts.
- Check that the acceleration pump piston contrast spring is not worn.
- Assemble a new O-Ring and a new bellows gasket. Reassemble the piston unit on the tank.
- Assemble a new O-Ring on the tank drainage screw and lock it.

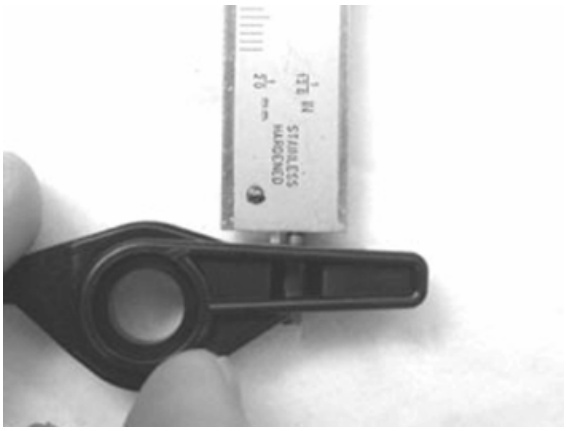
-Check the screw tightness introducing a small amount of fuel in the tank.
- Assemble a new gasket on the tank.
- Assemble the tank on the carburettor body fastening the 4 screws.

- Wash and blow the flow screw properly and assemble a new O-Ring.
- Preassemble the components on the screw as follows: spring, washer and O-ring.
- Screw the flow screw on the carburettor body.
- The screw final position should be determined by an exhaust fumes analysis.



- Prepare the carburettor for adjustment by rotating the screw 3 turns from the close position.

- Check that the rocking lever control of the accelerating pump does not show abnormal wear.
- Check that the end of stroke screw of the rocking lever protrudes 3.2 mm.



Check that the return spring of the rocking lever is not loaded.
- Preassemble the spring and rocking lever as shown in the figure.
- Assemble the rocking lever on the carburettor keeping the throttle valve open.
- Lock the fixing screw of the rocking lever.
- Make sure that the mechanism works correctly.

Inspecting the valve and needle

Kehin

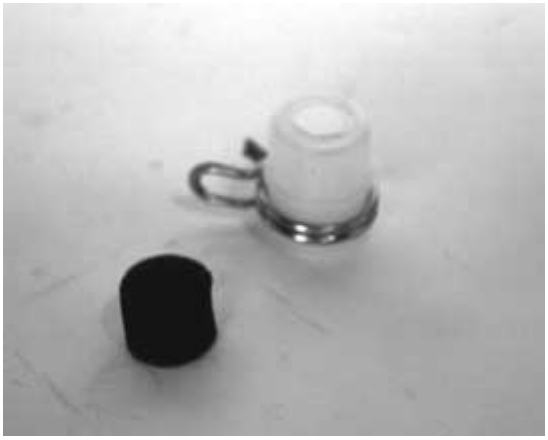
- Check that the tapered pin of the vacuum valve does not show wear.
- Check that the depression valve does not show threads on the external surfaces.
- Check that the vacuum intake hole is not clogged.
- Check that the diaphragm is not damaged or has hardened, otherwise replacement the whole valve.
- Insert the tapered pin into the vacuum valve housing.
- Reassemble the vacuum valve on the carburettor body taking care that the tapered pin is inserted into the sprayer.

N.B.

THE VALVE CAN BE INSERTED IN ONLY ONE POSSIBLE POSITION.

- Reassemble the spring with the pin lock.
- Remove the cover of the vacuum chamber being careful to correctly insert the spring in its place on the cover.
- Tighten the screws.

- Wash and blow dry the filter sponge of the ambient pressure intake.



- Reassemble the filter with its clamp.

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

Walbro

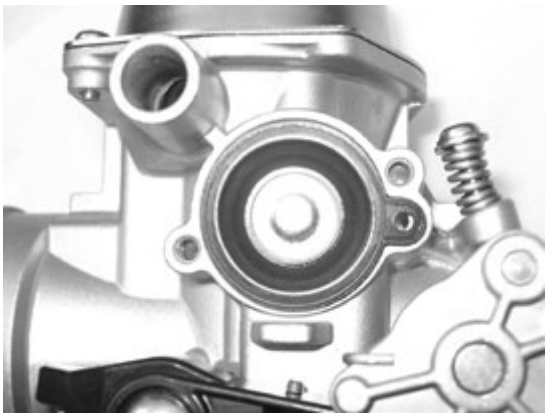
- Check that the pin does not show signs of wear and that the lock is in the 3rd of the 3 notches.
- Check that the valve does not show threads around its external diameter.
- Check that the 2 vacuum supply holes are not clogged.

N.B.

THE 2 VACUUM SUPPLY HOLES ARE OF DIFFERENT DIAMETERS.

- Check that the diaphragm is not worn or has hardened.
If it does, replace it.
- Refit the tapered pin on the vacuum valve.
- Make sure the spring is in the correct position on the plunger and inserted in its housing.
- Assemble the coupling by rotating it 1/8 of a turn.

- Reassemble the vacuum gas valve on the carburettor body being careful that the tapered pin is inserted into the sprayer.
- Time the vacuum valve rotation inserting the diaphragm tab in its place.
When the diaphragm is correctly assembled to the valve, the main vacuum supply hole is positioned axially with the diffuser, on the throttle valve side.
- Refit the spring on the valve.
- Refit the vacuum chamber cover matching the reference mark with the orientation of the diaphragm.
- Tighten the screws to the prescribed torque.
- Check the cut-off valve correct functioning. - Check that the diaphragm is not worn or has hardened. Check the free length of the spring.



Characteristic

Walbro: Standard length of cut-off spring

24 mm

- Reassemble the diaphragm and the metal pin placed on the valve.
- Reassemble the spring and the cover. The vacuum intake should be facing upwards.

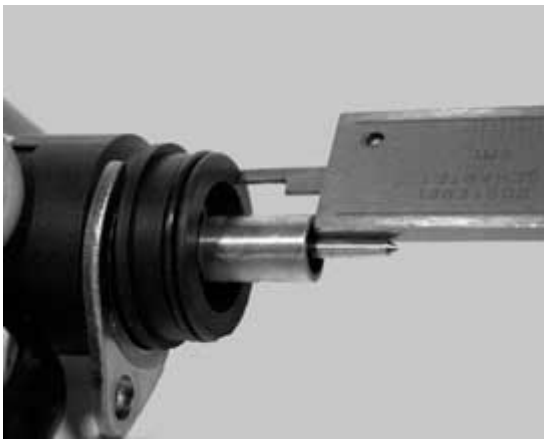
Inspecting the automatic choke device

Kehin

- Check that the automatic starter piston is not deformed or rusty.
- Check that the piston slides freely from the seat to the support.
- Check that the piston sealing gasket is not deformed.
- The starter must be more or less functional depending on the ambient temperature.
- Measure the protrusion of the piston as shown in the figure and check its corresponding value.
- Make sure that the starter is adjusted for the ambient temperature.
- The starter should disconnect progressively by means of electrical heating.
- Check the starter resistance when adjusted to the ambient temperature.

With a 12V battery power the automatic starter and check that the piston protrudes as much as possible.

- The correct warm up time depends on the ambient temperature.
- If protrusion, resistance or timing values are different from the ones prescribed, replace the starter.
- Assemble the starter to the carburettor being careful to position the O-Ring correctly, insert the plate with the machined side contacting the starter, tighten the fixing screws.
- Position the starter as shown in the figure.
- Assemble the protection casing.



N.B.

TO CARRY OUT THIS CHECK PAY SPECIAL ATTENTION NOT TO GENERATE SHORT CIRCUITS USE A CABLE SECTION WITH A TERMINAL SUITABLE TO BE CONNECTED TO THE STARTER.

Characteristic

Check the automatic starter: Kehin: Protrusion value

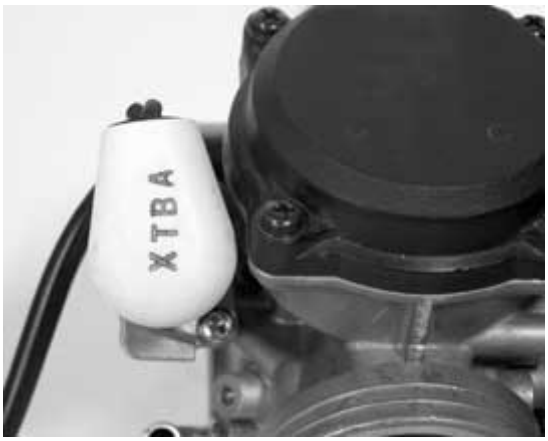
XX ÷ XX mm at approx. 20°C

Check the automatic starter: Kehin maximum protrusion

XXX ÷ XXX mm

Check the automatic starter: Keihin maximum time

5 min



Walbro

- Check that the automatic starter piston is not deformed or rusty.
- Check that the piston slides freely from the seat to the support.
- Check that the piston sealing gasket is not deformed.
- The starter must be more or less functional depending on the ambient temperature.
- Measure the protrusion of the piston as shown in the figure and check its corresponding value.
- Make sure that the starter is adjusted for the ambient temperature.
- The starter should disconnect progressively by means of electrical heating.
- Check the starter resistance when adjusted to the ambient temperature (20 - 25° C).

With a 12V battery power the automatic starter and check that the piston protrudes as much as possible.

- The correct warm up time depends on the ambient temperature.
- If protrusion, resistance or timing values are different from the ones prescribed, replace the starter.

Characteristic

Check the auto starter: Protrusion Value for Walbro

12.5 ÷ 13 mm at approx. 20°C

Check the automatic starter: Walbro maximum protrusion

18.5 ÷ 19 mm

Check the automatic starter: Walbro max. time

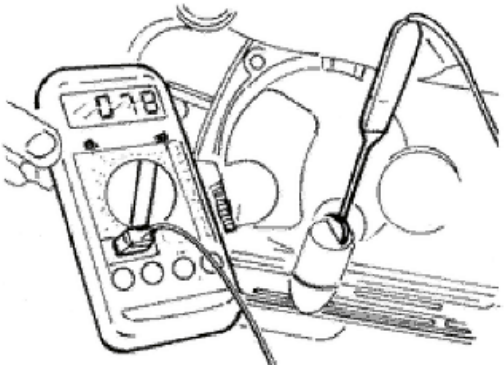
5 min

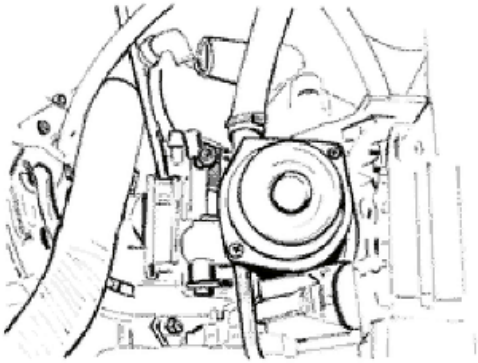
Electric characteristic

Walbro Resistance

approx. 40 Ω

Adjusting the idle





- The engine does not need frequent idle adjustments, however it is very important to make any adjustments fully respecting some standards.
- Before adjusting the carburettor make sure to respect the lubrication requirements, valve clearance, and complying timing, spark plug should be in optimum conditions, air filter clean and sealed, and the exhaust system tight.
- Warm up the engine by running it at least 5 minutes at approximately 50 kph.
- Connect the vehicle to the exhaust fumes analyser inserting the probe into a sealed extension pipe placed at the muffler exit end.
- Connect a millimetre thermometer (020331y) on the sump, using a cover with oil expressly prepared for probes.
- Start the motor and before adjusting the idle speed make sure that the oil temperature is between 70 ÷ 80°C.
- Using the rpm indicator or any other instrument (020332y), adjust the idle screw to obtain 1600 rpm ÷ 1700 rpm
- Adjust the flow screw until the carbon monoxide (CO) percentage is 3.1 ÷ 4.5%, when the screw is

loosened the CO value rises (rich mix). Tightening the screw decreases the CO (lean mix).

- If the adjustment of the flow screw causes a rpm increase readjust the revs again and if necessary, the flow screw to reach stable values.
- When the oil temperature, the numbers of revs and the percentage of carbon monoxide are respected the idle carburetion is considered correct.

From the analyser we can draw further information:

- carbon dioxide percentages (CO2), the percentage of carbon dioxide has an inverted course compared to the percentage of(CO), values over 12.5% are considered correct. Non complying values indicate lack of tightness in the exhaust system.
- Unburned hydrocarbons (HC) are measured in parts per million (PPM). The HC value decreases while the rpm increases; with the engine at idle it is normal to detect 200 ÷ 400 PPM, these emission values are deemed normal for an engine with a diagram of distribution for motorcycles. Higher values can cause loss of engine blows as the mixture is too lean (low CO), ignition failure or, incorrect timing or a clogged or unsealed exhaust valve.
- If it were difficult to ???? adjustment CO check accurately:
- That the carburettor is clean
- That the automatic starter is efficient
- Tapered pin housing efficiency
- Tank level adjustments

N.B.

THE EXTENSION TUBE IS INDISPENSABLE SO AS NOT TO SEND POLLUTED EXHAUST FUMES TO THE AMBIENT OXYGEN. IT IS INDISPENSABLE TO USE AN EXHAUST FUMES ANALYSER PREVIOUSLY HEATED AND PREPARED TO GUARANTEE THE RESET OF THE READING OF GASES AND THE CORRECT GAS CAPACITY. FAILURE TO RESPECT THESE REGULATIONS RESULTS IN INACCURATE READINGS.

N.B.

THE WASTED SPARK IGNITION SYSTEM OFFERS REMARKABLE POWER. READINGS MAY NOT BE ACCURATE IF INADEQUATE RPM INDICATORS ARE USED.

CORRECT COUPLING OF THE RPM INDICATOR WILL BE INDICATED WHEN IT CAN READ RPM OVER 6000 ÷ 8000

Characteristic

Idle adjustment: Pipe sizes

Ø 40 mm

Idle adjustment: length

500 ÷- 600 mm

INDEX OF TOPICS

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

Front

Removing the front wheel

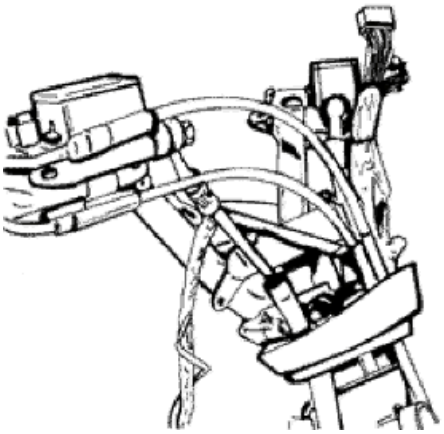
Remove the two callipers according to what is described in the "Braking system" chapter.

- Unscrew the wheel axle fixing nut;
- Loosen the fork-wheel axle retainer clamp by slightly unscrewing the two screws located on the fork
- Slide off the axle and remove the front wheel, releasing the odometer gear.

Handlebar

Removal

- Remove the digital panel support, the front and rear parts of the handlebar cover according to "Bodywork" chapter.
- Remove the handlebar wiring retaining straps and disconnect the electric connectors from the brake levers.
- Remove from the handlebar the hoses of both the front and rear brake pump and of the voltage distribution valve located on the front frame according to the "Braking system" chapter.
- Remove the flexible transmission from the front and rear brake lever and remove the throttle grip.
- Loosen the handlebar steering tube retaining clamp indicated in the figure and slide off the handlebar, removing the plastic support.



N.B.

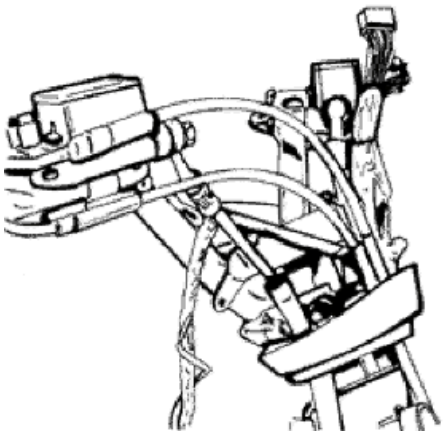
IF THE HANDLEBAR IS BEING REMOVED TO REMOVE THE STEERING, IT IS ONLY NECESSARY TO TILT THE HANDLEBAR FORWARD ONTO THE FRONT PART OF THE VEHICLE WITHOUT REMOVING THE PARTS FITTED SO AS TO AVOID DAMAGING THE SHAFTS.

Refitting

Carry out the above operations by working in the reverse order from those of the removal.

Locking torques (N*m)

Handlebar fixing screw (*) **43 ÷ 47**



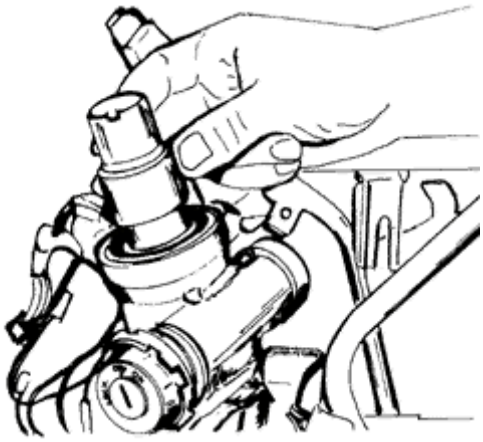
Front fork

Removal

After removing the upper seat, lean the vehicle on one side and extract the steering tube completely from the fork.

Specific tooling

020055Y Wrench for steering tube ring nut



Overhaul

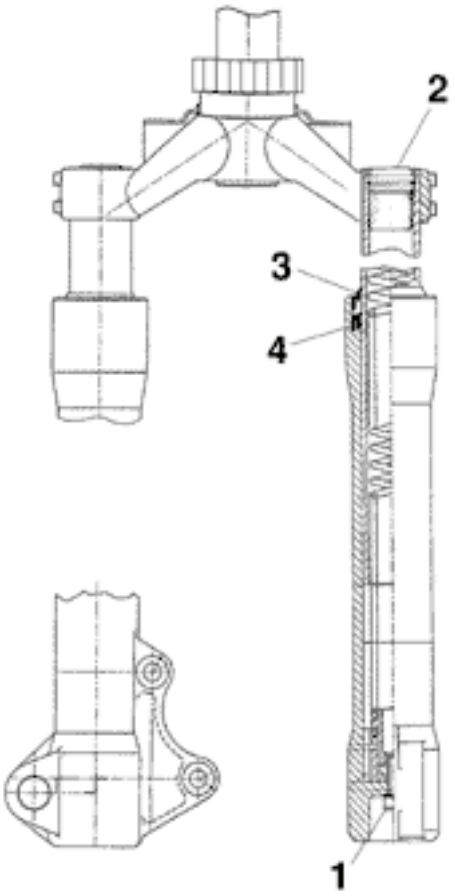
- Remove the lower screw (1);
- Drain oil from suspension;
- Slide off the stem;
- Replace the sealing rings (3-4) with new ones;
- Fit the new sealing rings only after lubricating their seats;
- Refit the stem and the lower screw (1);
- Unscrew the cap (2);
- Pour 133±2.5 cm^3 of Selenia Fork 10W oil per stem on the KAYABA fork, recognisable by the mark stamped on the sleeves inner side (wheel side)

- Pour 145 cm³ of Selenia Fork 10W oil per stem on the MVP fork, recognisable by the label with the "**S**" on the sleeve external side near the wheel axle.
- Refit all parts following the removal steps but in reverse order.

Recommended products

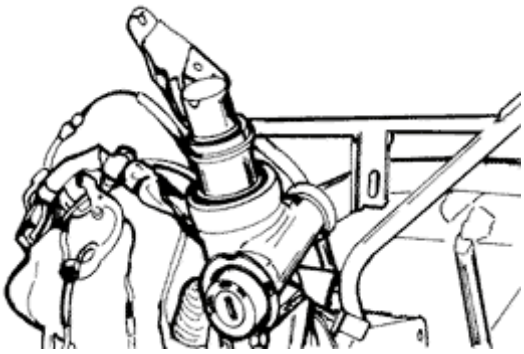
SELENIA FORK 10W Oil for front fork

SAE 10 W hydraulic oil



Refitting

- Inserire il distanziale
- Bloccare la ghiera inferiore alla coppia prescritta.
- Inserire l'anello distanziale
- Bloccare la ghiera superiore alla coppia prescritta.



Specific tooling

020055Y Wrench for steering tube ring nut

Locking torques (N*m)

Upper steering ring nut 40 ÷ 45 Steering lower ring nut 10 ÷ 12

Steering bearing

Removal

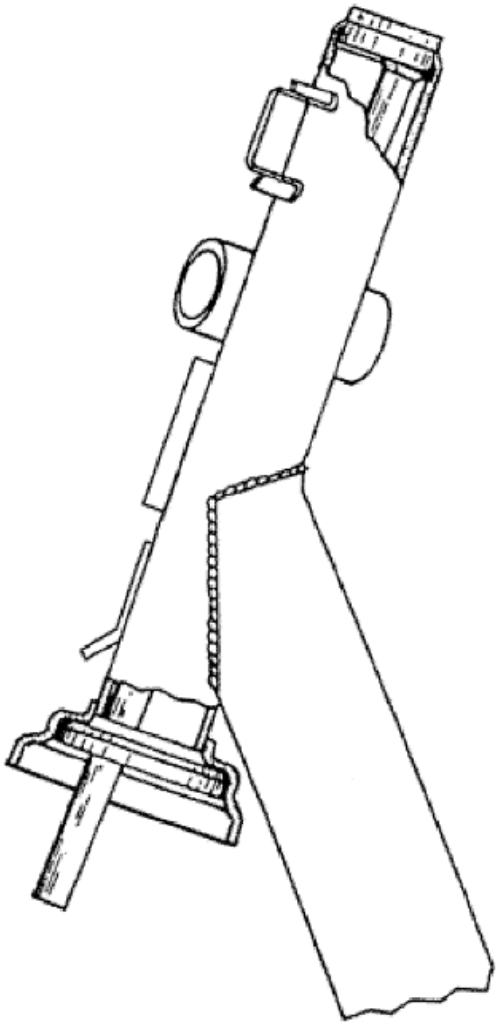
Remove upper bearing with an appropriate tool.

N.B.

USE THE APPROPRIATE TOOL AGAIN TO REMOVE THE LOWER HOUSING OF THE STEERING LOWER BEARING

Specific tooling

020004Y Punch for removing fifth wheels from headstock



Refitting

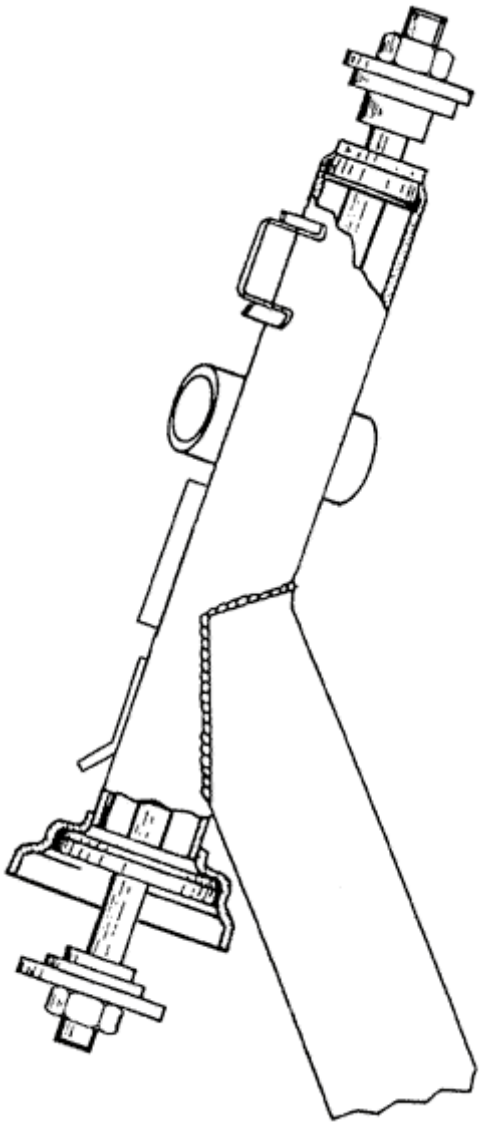
Insert the lower and upper bearing on the chassis using an appropriate tool.

N.B.

ASSEMBLE THE LOWER HOUSING ON HE STEERING TUBE WITH A TUBE SECTION OF AN ADEQUATE DIAMETER.

Specific tooling

001330Y Tool for fitting steering seats



Rear

Removing the rear wheel

Removal

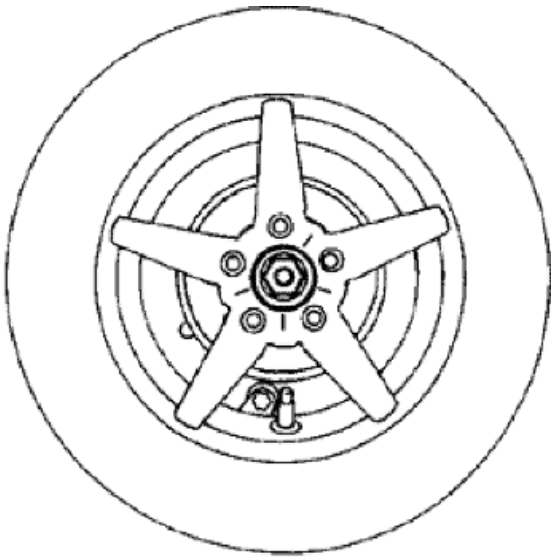
- Unscrew the four fixing screws and remove the muffler and the relevant bracket;
- Unscrew the central retaining nut.

Reassembly

Carry out the previous operations in reverse order.

Locking torques (N*m)

Rear wheel axle 104 ÷ 126 Rear wheel fixing screws 33÷37



Swing-arm

Removal

Removal

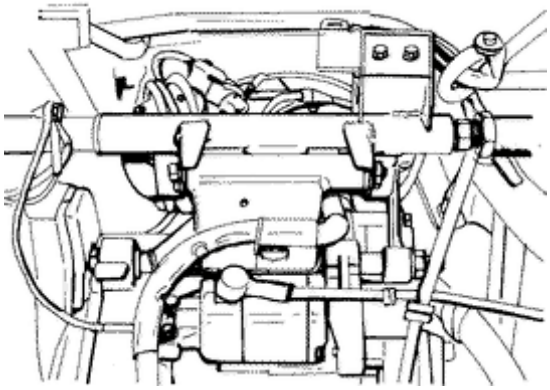
- Remove the chassis external nut on the left side.
- Loosen the two nuts shown in the figure.
- Slide off the bolt and remove the swinging arm.

Reassembly

Carry out the previous operations in reverse order.

Locking torques (N*m)

swinging arm 8 ÷ 12 Nm

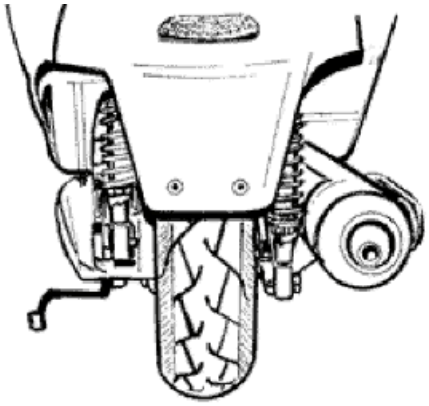


Shock absorbers

Removal

Proceed as follows:

- Undo the screw fixing the shock absorber spring unit to the engine (A) on one side and the corresponding support (B) on the other;
- remove the saddle and the helmet compartment;
- undo the two upper nuts (one on each side) fixing the shock absorber spring unit to the chassis and remove the shock absorbers.



Refitting

Carry out the previous operations but in reverse order.

Locking torques (N*m)

Lower shock absorber clamp 33 ÷ 41 Upper shock absorber clamp 33 ÷ 41

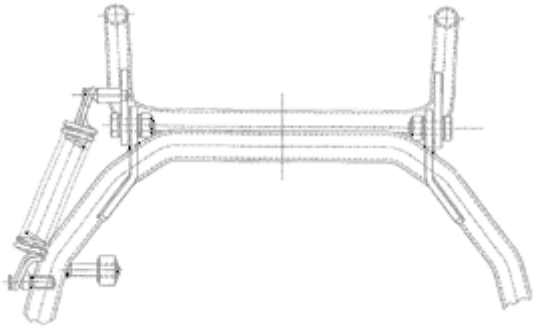
Centre-stand

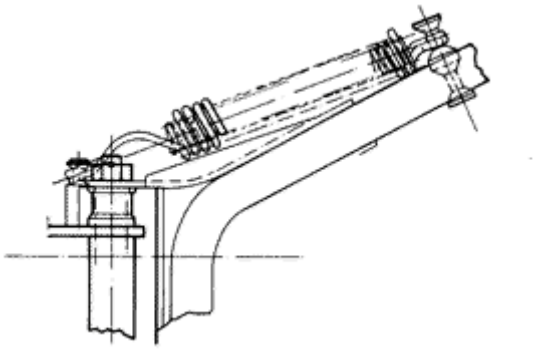
Removal

- Unhook the springs.
- Loosen the nut.
- Pull out the screw.

Reassembly

- Install the sealing rings on the support tube of the stand;
- Carry out the operations described above in reverse order, then insert the sealing rings into their seats.





CAUTION

Lubricate the following parts with grease: spring coupling pins, bushings on stand fixing bracket.

Recommended products

AGIP GREASE PV2 Grease for control levers on the engine

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

Locking torques (N*m)

stand retaining bolt **20 ÷ 25**

INDEX OF TOPICS

This section è is devoted to the description of the braking system components.

Interventions rules

General rules for maintenance operations on the hydraulic braking system.

WARNING

HYDRAULIC OIL IS CORROSIVE: ALWAYS WEAR PROTECTIVE GLOVES.
IN THE EVENT OF ACCIDENTAL CONTACT WITH THE EYES, RINSE THE CONTACT AREA WELL WITH COPIOUS AMOUNTS OF WATER.
USED HYDRAULIC OIL CAN HARM THE ENVIRONMENT. COLLECTION AND DISPOSAL SHOULD BE CARRIED OUT IN COMPLIANCE WITH CURRENT REGULATIONS.

N.B.

FOR TOPPING UP AND CHANGE, USE ONLY BRAKE FLUID DOT4 - NHTSA 116.
OBSERVE THE MAXIMUM DEGREE OF CLEANLINESS. HYDRAULIC FLUID IS EXTREMELY CORROSIVE FOR PAINTED SURFACES.
BRAKE FLUID IS HYGROSCOPIC; THAT IS, IT ABSORBS MOISTURE FROM THE SURROUNDING AIR.
IF THE MOISTURE CONTENT IN THE BRAKE FLUID EXCEEDS A CERTAIN VALUE, IT WILL RESULT IN POOR BRAKING EFFICIENCY DUE TO A LOW BOILING POINT OF THE FLUID.

N.B.

ALWAYS STORE THE FLUID IN SEALED CONTAINERS.
UNDER NORMAL DRIVING AND CLIMATIC CONDITIONS YOU SHOULD CHANGE THE FLUID EVERY TWO YEARS. IF THE BRAKES ARE USED INTENSELY AND/OR IN HARSH CONDITIONS, CHANGE THE FLUID MORE FREQUENTLY.
DURING INSTALLATION, THE PARTS TO BE REUSED MUST BE ABSOLUTELY CLEAN AND FREE FROM ANY TRACES OF OIL, FUEL AND GREASE: IT IS THEREFORE NECESSARY TO CLEAN THOROUGHLY WITH DENATURED ALCOHOL.

N.B.

RUBBER PARTS SHOULD NEVER BE LEFT IN ALCOHOL LONGER THAN 20 SECONDS. AFTER WASHING, THE PIECES MUST BE DRIED WITH A BLAST OF COMPRESSED AIR AND A CLEAN CLOTH.
THE SEAL RINGS MUST BE IMMERSED IN THE OPERATING FLUID; THE USE OF PRF1 PROTECTIVE DEVICE IS ALLOWED.

WARNING

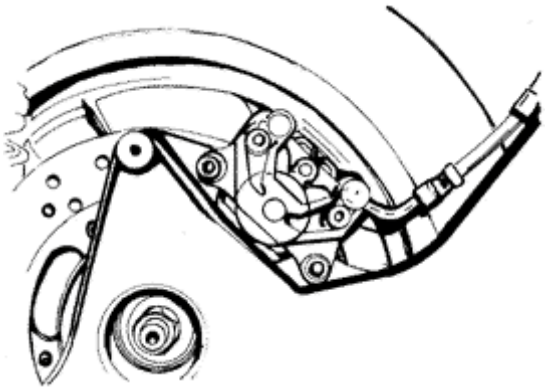
THE PRESENCE OF BRAKE FLUID ON THE DISC OR BRAKE PADS REDUCES BRAKING EFFICIENCY.
IN THIS CASE, REPLACE THE PADS AND CLEAN THE DISC WITH A HIGH-QUALITY SOLVENT.

Rear brake calliper

Removal

Proceed as follows:

- remove the muffler,
- repeat the operations above regarding front caliper removal.

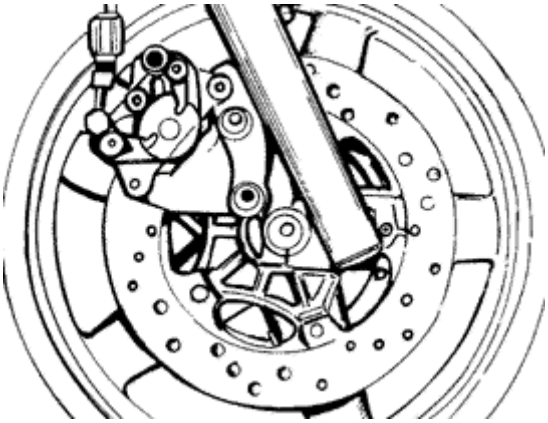


Front brake calliper

Removal

Proceed as follows:

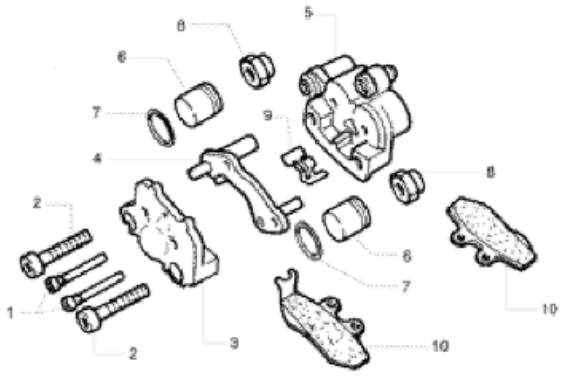
- remove the front wheel;
- unscrew the fixing screws and open the oil reservoir cover;
- Place a suitable container to collect the oil, disconnect the oil pipe from the calliper and actuate on the brake lever until no more oil comes out;
- Remove the two screws (indicated in the figure) fixing the calliper to the support and remove the calliper.
- repeat the same operations for the opposite calliper, necessary for combined braking. Besides removing the oil pipe connected to the voltage distribution valve, also remove the clamp fixing the odometer gear transmission.
- when refitting, tighten up the screws and the joint to the prescribed torque and bleed the system.



Locking torques (N*m)

Screw tightening calliper to the support **20 ÷ 25**
Brake fluid pipe-calliper fitting **16 ÷ 20**

Overhaul



Proceed as follows:

1) remove the two male hexagonal screws (1) and take out the two pads (10);

2) remove the two male hexagonal screws (2) and remove the reaction plate (3);

3) take out the fixed plate (4) from the guide;

4) remove the internal elements from the floating body (5) with the help of short blows of compressed air through the brake fluid pipe in order to facilitate the expulsion of pistons (6).

5) Check:

- that the plates and the body are whole and in good condition;
- that the cylinder and the floating body of the caliper do not show signs of scratches or erosion, otherwise replace the entire calliper;
- that the guides of the fixed plate are not scratched or eroded, otherwise replace the entire plate;
- that the brake pad check spring works properly.

Refitting

1) insert the pistons (6) and the sealing rings (7) in the body;

2) place the guide rubbers (8) and refit the fixed plate (4);

3) assemble the reaction plate (3) tightening the screws (2), insert the brake pad check spring (9) and then the pads, fixing them with the corresponding screws (1);

5) place the calliper on the disc and lock it to the strut by tightening the fixing screws;

6) fix the pipe joint on the calliper at the prescribed torque.

Functioning

This is a floating type calliper.

It takes advantage of the action and reaction principle to obtain the thrust for both pads.

The body and the reaction plate body work integrally and can move axially with respect of the fixed plate that is integral to the strut.
The pistons, forced by pressure to push the pad to the disk, cause the reaction plate to push in turn the other pad towards the disc.

The brake pad lock spring

1. Pad fixing screws
2. Reaction plate fixing screws
3. Reaction plate
4. Fixed plate
5. Floating body
6. Piston
7. Piston sealing rings
8. Guide protection rubbers
9. Brake pad check spring
10. Pads

CAUTION

ALL THE SEALS AND GASKETS MUST BE REPLACED EVERY TIME THE CALLIPER IS SERVICED.

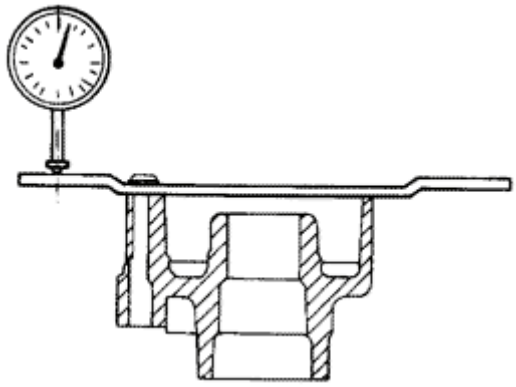
Locking torques (N*m)

Brake fluid pipe-calliper fitting 20 ÷ 25 Pad fastening pin 19.6 ÷ 24.5

Front brake disc

Removal

Remove the wheel and check that the axial deviation of the braking surface is within in the recommended values:
- If this is not the case, replace the disc and repeat the test.
If the problem persists, check and replace the wheel hub if necessary.



Front/rear disc replacement

1) disassemble the front/rear wheel;
2) loosen the two fixing screws and remove the disc.

When refitting, position the disc correctly, respecting the direction of rotation, and apply medium threadlock.

N.B.

THE SURFACE OF THE DISC WITH THE STAMPED ARROW INDICATING THE DIRECTION OF ROTATION MUST FACE THE SHOCK ABSORBER.

Recommended products

(°) Loctite 243 Medium-strength threadlock

Apply LOCTITE 243 medium-strength threadlock

Characteristic

Brake discs check: Max. axial deviat.

0.1 mm

Locking torques (N*m)

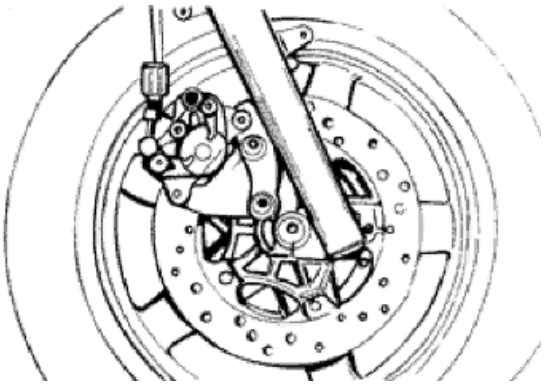
Disc tightening screw (°) **5 ÷ 6.5**

Front brake pads

Removal

Proceed as follows:

- disassemble the front wheel.
- remove the two screws indicated in the figure.
- remove the stop ring and withdraw the pin.
- slide the two pads down.
- repeat these operations for the brake calliper on the opposite side.



N.B.

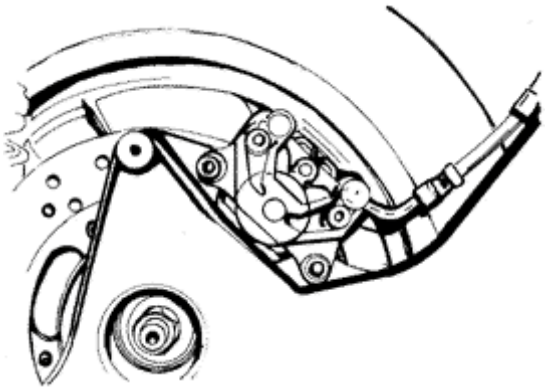
Minimise difficulty for this operation by removing the callipers from their supports without removing the oil pipe.

Rear brake pads

Removal

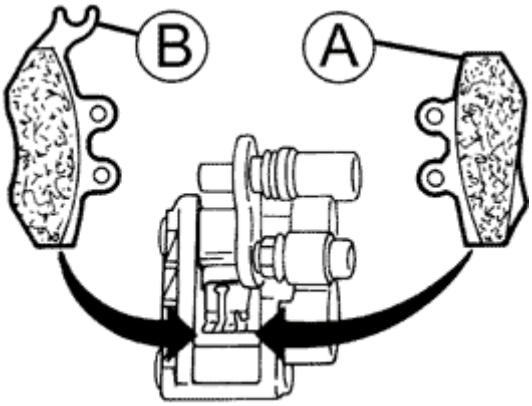
Proceed as follows:

- remove the muffler and rear wheel, following the instructions in the "Rear suspension" Chapter.
- remove the two screws indicated in the figure.
- remove the stop ring and withdraw the pin.
- slide the two pads down.
- fit the new pads and tighten the screws (1) so that they fit in the pad centring holes.



CAUTION

The brake pads are asymmetrical and cannot be interchanged
A = shock absorber side
B = wheel side



CAUTION

PADS MUST BE REPLACED IF THE FRICTION MATERIAL THICKNESS IS LESS THAN 1.5 MM.

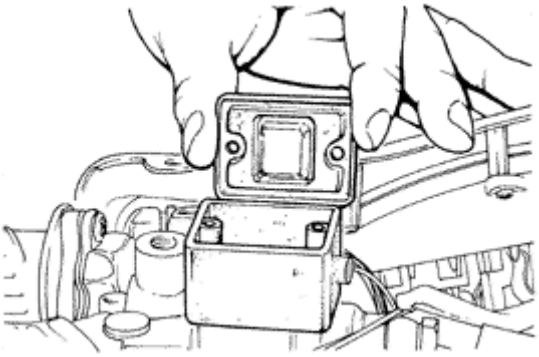
Fill

Front

- Rest the scooter on its stand on level ground.
- Refill the brake circuit reservoir to the maximum level with the recommended fluid;
- Connect the bleed fitting to the appropriate tool pipe (Mityvac manual pump);
- Actuate the tool at the bleed fitting, at the same time constantly top up the brake reservoir to prevent air being drawn into the system, until no more air escapes at the bleed fitting:

The operation is finished when only oil comes out of the bleed screws;

- Close the bleed screw and tighten to the prescribed torque.



N.B.

IF AIR CONTINUES TO COME OUT DURING THE BLEED OPERATION, EXAMINE ALL THE FITTINGS. IF SAID FITTINGS DO NOT SHOW SIGNS OF BEING FAULTY, LOOK FOR THE AIR INPUT AMONG THE VARIOUS SEALS ON THE PUMP AND CALLIPER PISTONS. WHEN CARRYING OUT THE OPERATION, BRAKE FLUID MAY LEAK FROM THE BLEED SCREW ON THE CALLIPER AND ON THE DISC. IN THIS CASE; CAREFULLY CLEAN THE CALLIPER AND DEGREASE THE BRAKE DISC.

CAUTION

The left brake pump is for the integral braking system and, besides controlling the rear brake calliper, it also controls the front left calliper. Therefore utmost care must be paid when bleeding these two callipers.

Specific tooling

020329Y MityVac vacuum-operated pump

Locking torques (N*m)

Oil bleed screw 8÷12

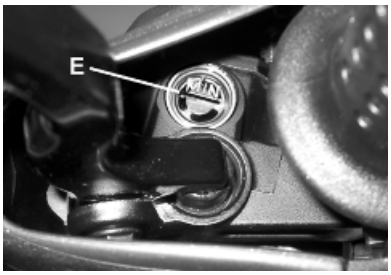
Brake fluid level check

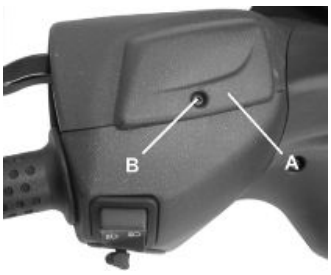
The front and rear brake fluid tanks are placed on the pumps under the handlebar covers. Proceed as follows:

1. Put the vehicle up on the central kickstand and with the handlebar centred;

2. Remove cover «**A**» by unscrewing the fixing screw «**B**»;

3. Check the fluid level using the relevant window «**C**».

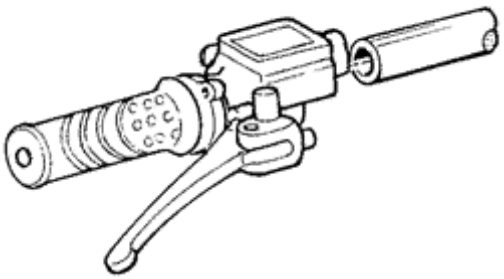




Front brake pump

Removal

1) remove the front and rear handlebar covers;
2) placing a suitable container to catch the oil, disconnect the oil pipe from the calliper and work the brake lever until no more oil comes out;
3) disconnect the oil pipe from the pump then unscrew the two u-bolt clamping screws and remove the pump.
- On refitting, tighten up the fitting to the specified torque and bleed the system.



Locking torques (N*m)

Brake fluid pipe-calliper fitting **16 ÷ 20**

Overhaul

1) Remove the brake lever by loosening the fixing screw;
open the cover (2) and take out the diaphragm (3);
2) Remove the cap and unscrew the internal parts in the specified order;
3) Check that:
- The body of the pump shows no signs of internal damage or corrosion;
- The piston shows no sign of damage or abnormal wear;
- The piston return spring is in good condition.

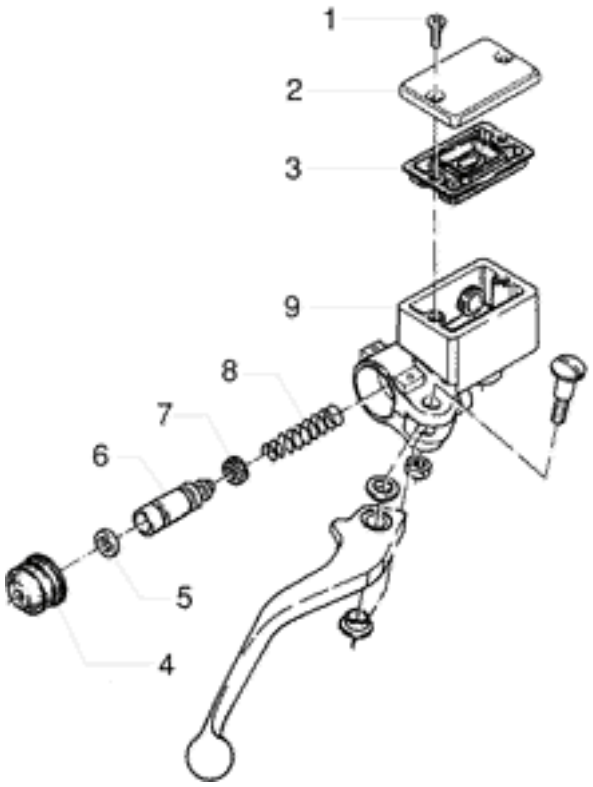
Refitting

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

1. Tank cover screw
2. Tank cover
3. Diaphragm
4. Bellows
5. Seal ring
6. Piston
7. Gasket
8. Spring
9. Tank

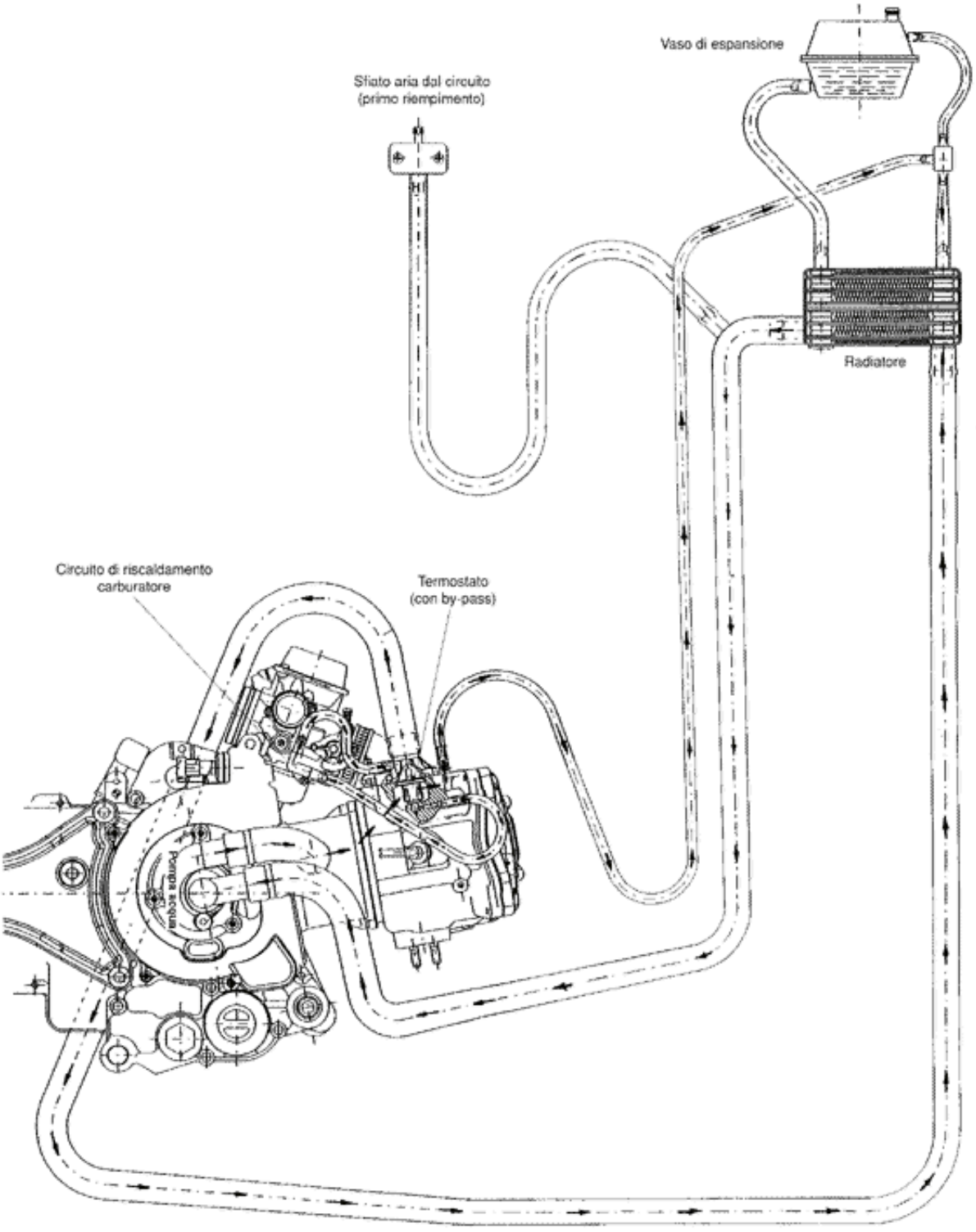
CAUTION

ALL THE SEALS AND GASKETS MUST BE REPLACED EVERY TIME THE PUMP IS SERVICED.


1
2
3
9
8
7
6
5
4

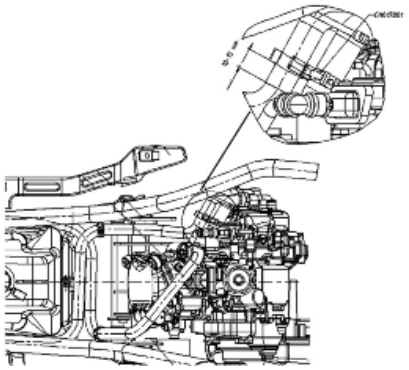
INDEX OF TOPICS

Circuit diagram



Cooling plant

We inform you that a tubes case spring has been added starting with frame number ZAPM2300004501449, in order to prevent possibile contacts between the pump/radiator tube and the secondary air tube. Place the spring at the distance indicated in the drawing.

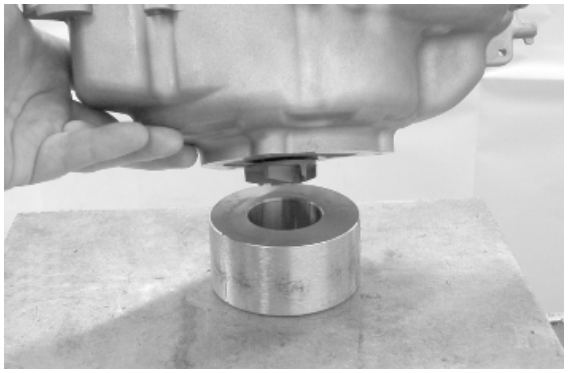


Water pump - overhaul

- Remove the complete flywheel cover
- Remove the stator
- Remove the pump cover by loosening the 3 fixing screws
- Remove the sealing gasket

The pump can be services using the special tool and a press. The special tool is designed to be used with the presses most commonly found in workshops. For those presses equipped with a 35-mm piston and protective cap with fixing screw, it is sufficient to remove the cap and install the components of the special tool in its place. The special tool can be prepared in advance depending on its use on presses equipped with piston with a threaded type of coaxial coupling tang or cylindrical with stop groove. Then prepare the threaded ring with the adapter suitable for the coupling of the press used.

- Position the flywheel cover in the hydraulic press by inserting the impeller in the ring that is part of the special tool, as shown in the photo



N.B.

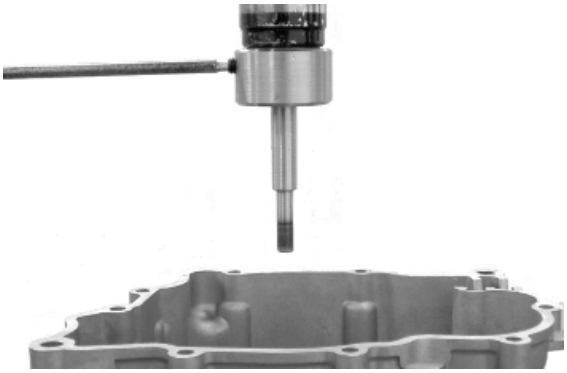
POSITION THE BASE WITH THE SURFACE PROVIDED WITH BETTER FINISH TURNED TOWARDS THE FLYWHEEL COVER. FAILURE TO COMPLY WITH THIS INSTRUCTION MAY RESULT IN DETERIORATION OF THE SURFACE INTENDED FOR THE COOLANT'S SEAL.

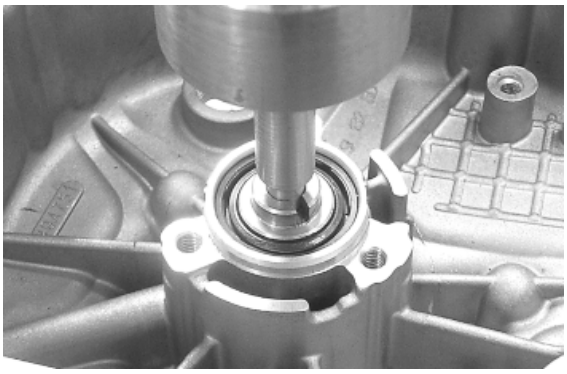
Specific tooling

020628Y Water pump service kit

Install the pin that is part of the special tool on the press piston.

Turn the flywheel cover until it permits insertion of the pin inside the joint and eject the pump shaft from the joint and bearings.





Specific tooling

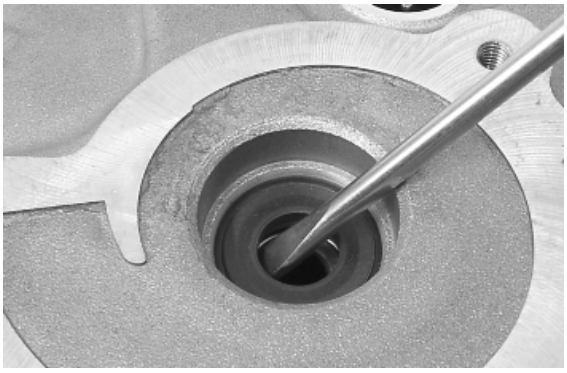
020628Y Water pump service kit

Remove the ceramic seal from the pump shaft.

Using a screwdriver, remove the ceramic ring and sealing gasket from the flywheel cover.

N.B.

IN THE EVENT YOU PLAN TO REUSE THE MECHANICAL SEAL, PAY ATTENTION DURING THE DISASSEMBLY STAGES IN ORDER TO NOT CHIP THE CERAMIC RING.

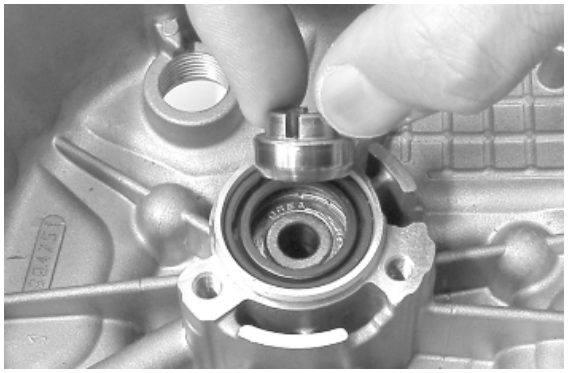


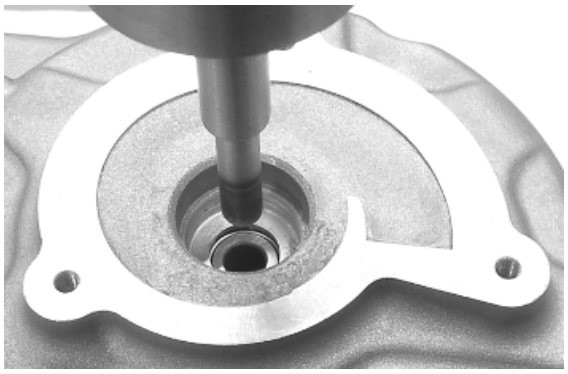
- Remove the joint from the seat inside the seal ring.
- Position the flywheel cover in the press while sustaining it using the surface to be used for coupling with the engine case.

CAUTION

CHECK THE POSITIONING OF THE CENTRING DOWELS. PROPERLY PROTECT THE COUPLING SURFACE.

Centre the cover until it permits insertion of the pin and then eject the seal ring and the two ball bearings.

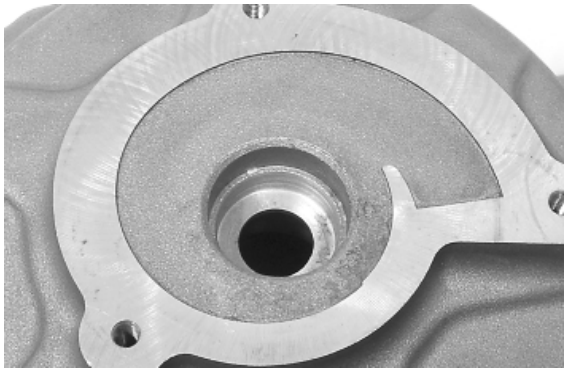


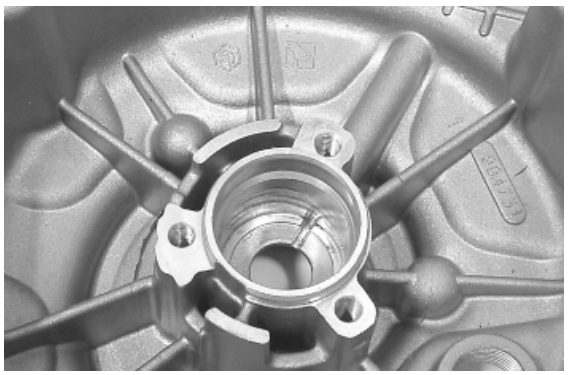


Specific tooling

020628Y Water pump service kit

Before you reassemble, wash all the components and continue with the following checks.
Flywheel cover: Check that there are no cracks or oxidation on the seat of the ceramic seal. Check the capacity loads of the bearings and of the seal ring. Check the efficiency of the drain hole.





Shaft: Check to be sure there is no oxidation.
Check that the impeller is in perfect condition.
Ceramic seal: Check that the ceramic seals are not worn, cracked or scored. Check that the two rubber seals are in perfect condition. Check the thrust spring.
Bearings: Check that they do not have irregular plays or are noisy.

Entrainment joint: Check that there is no abnormal wear on the seat for the oil seal seat and on the slots for the entrainment spring.

Heat the flywheel cover using the heat gun

N.B.

IF THE JOB IS PERFORMED WITH THE STATOR MOUNTED, HEAT FROM THE EXTERNAL SIDE OF THE COVER.

Specific tooling

020151Y Air heater

020150Y Air heater support

Properly support the cover and using the modular punch, install the two bearings all the way down at the same time.

N.B.

WORK IN AN UPRIGHT POSITION

Specific tooling

020376Y Adaptor handle

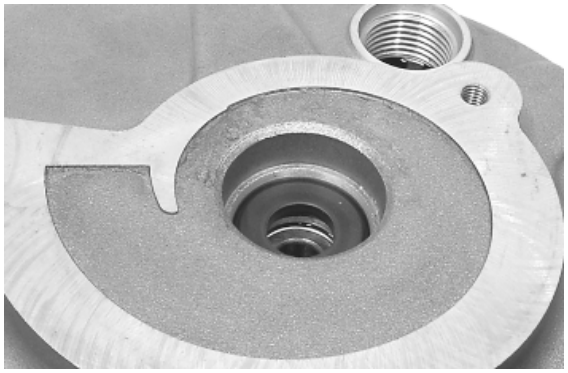
020441Y 26 x 28 mm adaptor

020629y 8 mm guide

Let the flywheel cover guard cool down and then manually mount the static part of the ceramic seal with the relative rubber seal.

N.B.

PAY ATTENTION TO MOUNTING THE CERAMIC RING CORRECTLY. THE CHAMFER ON THE INTERNAL DIAMETER MUST BE TURNED AWAY FROM THE SIDE OF THE BEARINGS.

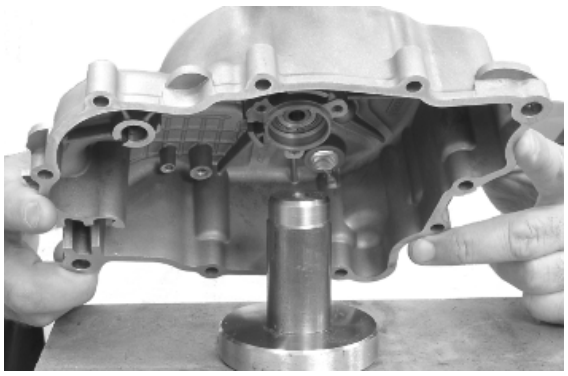


Mount the moving part of the ceramic seal on the shaft with the impeller. The rubber part must rest against the impeller.

Position the flywheel cover on the press using the support base for the bearings that is part of the special tool. Install the special punch with the impeller's template on the press piston.

Specific tooling

020628Y Water pump service kit

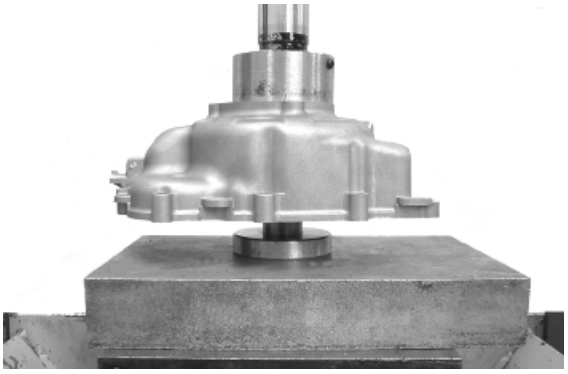


Manually insert the pump shaft in the relative bearings.

While keeping the bearings in contact with the support base, line up the shaft with the press piston and proceed with the driving. The driving depth is determined by the beat of the punch when it is in contact with the flywheel cover.

N.B.

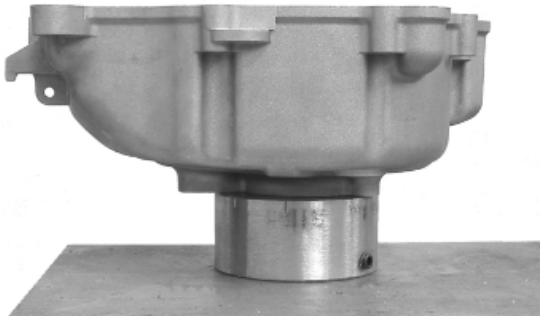
SO AS TO NOT DAMAGE THE FLYWHEEL COVER DURING THE DRIVING OPERATION, SLIGHTLY TURN IT BY HAND IN ORDER TO BETTER PERCEIVE THE MOMENT OF CONTACT WITH THE PUNCH.



Specific tooling

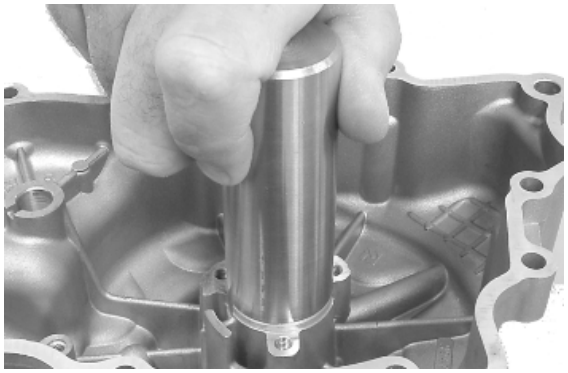
020628Y Water pump service kit

Remove the special punch from the press piston and support the flywheel cover from the impeller side with it.



Put the new oil seal on the special punch while being careful to position the seal lip starting from the side of the handle.

Install the oil seal on the flywheel cover all the way to the depth determined by the punch.



Specific tooling

020628Y Water pump service kit

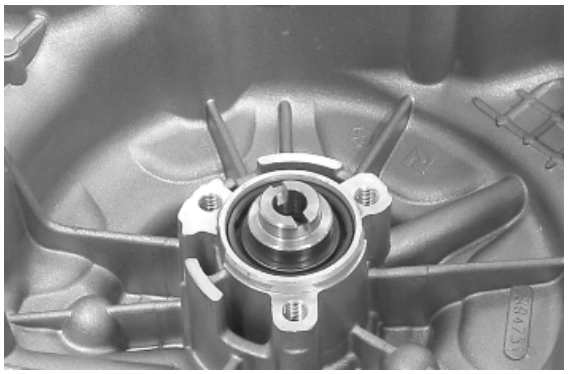
Fit the punch with the template of the entrainment joint to the press punch.

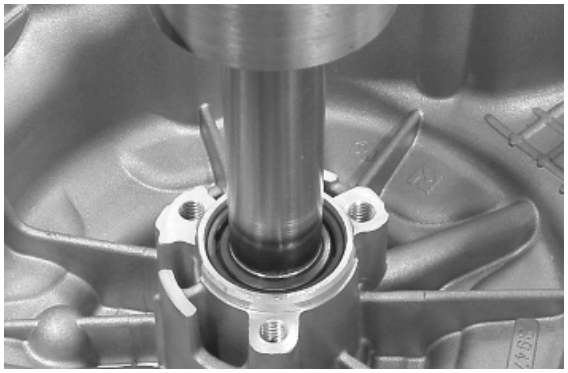
Position the entrainment joint on the shaft and using the press, drive it to the depth determined by the punch.

Specific tooling

020628Y Water pump service kit

Lubricate the oil seal with motor oil.





Water pump ceramic seal

Our Leader, Quasar, and Master liquid cooled engines are equipped with water pumps fitted with the ceramic seal in the subject. This component is intended to guarantee the leak tightness of the coolant in relation to the pump shaft. The seal achieved via two special ceramics, a static one and a spinning one, kept in contact by the thrust of a spring, coaxially mounted onto the pump shaft. The efficiency of this system is guaranteed by the accurate machining and cleaning of the components as they are fitted; in any case, ceramic seals are subjected to a running in period. During this period (1,000 ± 1,500 km), there may be small leaks through draining holes, which remain visible on the aluminium crankcase. This phenomenon is particularly visible there where the hole is more exposed (Quasar and Master). In such cases we recommend cleaning the casing in order to be able to check again for leaks after a distance of more than 1500 km. If leaks continue or in the event of real losses, the ceramic seal should be replaced. For these operations, observe the tools and instructions given in the relevant service station manuals.

Note: The ceramic seal may be overhauled according to the following couplings:

- Coupling "A": seal ring no. 485084 with ceramic seal no. 486216
- Coupling "B": seal ring no. 841329 with ceramic seal no. 841330

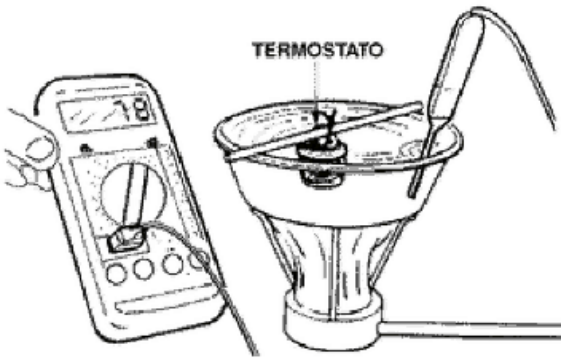
The couplings above may be selected according to their availability, as they are interchangeable.

Thermostat

Removal

- Loosen the two screws indicated in the figure and remove the thermostat cover.
- Remove the thermostat with its gasket.

Check



- Visually check that the thermostat is not damaged.
- Prepare a metal container with approx. 1 litre of water.
- Immerse the thermostat, keeping it in the centre of the container.
- Immerse the multimeter temperature probe, near the thermostat.
- Warm up the container using the heat gun.
- Check the temperature when the thermostat starts to open:
- Heat up until the thermostat is completely open
- Replace the thermostat if it does not work properly.

CAUTION

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

Specific tooling

020331Y Digital multimeter

020151Y Air heater

Characteristic

Thermostat check: opening travel

3.5 mm at 80°C

Thermostat check: Opening start temperature

69.5 ÷ 72.5°C

Refitting

- Place the thermostat with the bleeding hole at the highest point.
- Make sure that the rubber gasket is positioned properly.
- Fit the thermostat cover with the connection for the carburettor heating pipe facing the flywheel.
- Tighten the two screw to the torque indicated below.

Locking torques (N*m)

Thermostat cover screws 3 ÷ 4

INDEX OF TOPICS

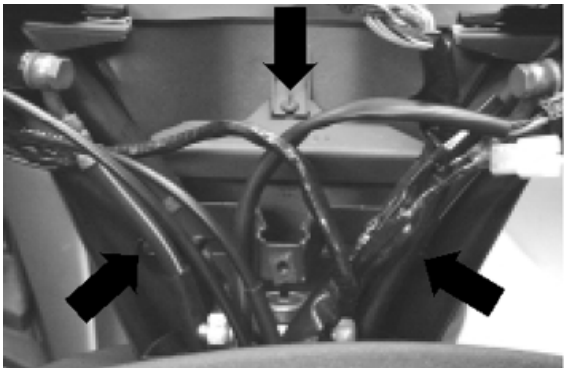
This section è is devoted to the operations that can be carried out on the vehicle's bodywork.

Seat

- Raise the saddle
- Extract the coupling pin of the gas shock absorber;
- Unscrew the 3 screws fixing the saddle plate to the centre cover and remove the saddle.

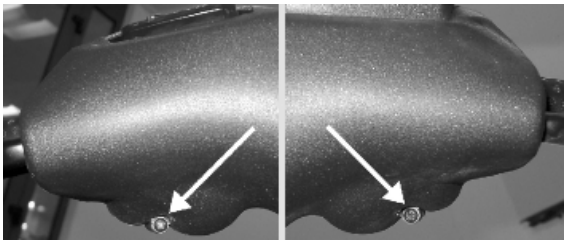
Rear handlebar cover

- Unscrew the 3 fixing screws;
- Disconnect the electric connectors;
- Remove the rear handlebar cover.



Front handlebar cover

- Remove the brake and oil pump covers on the handlebar cover;
- Unscrew the 2 lower screws of the handlebar cover (one per side).
- Remove the front handlebar cover.



Headlight assy.

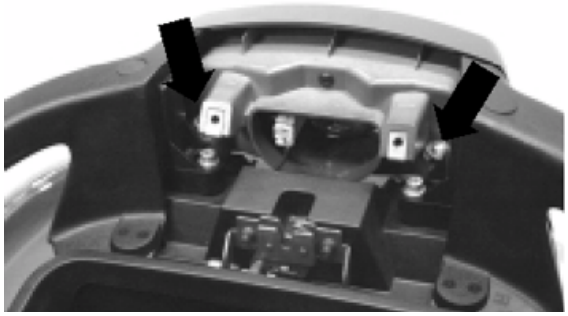
- Unscrew the 3 fixing screws;
- Disconnect the electric connectors;
- Extract the optical unit from the front.

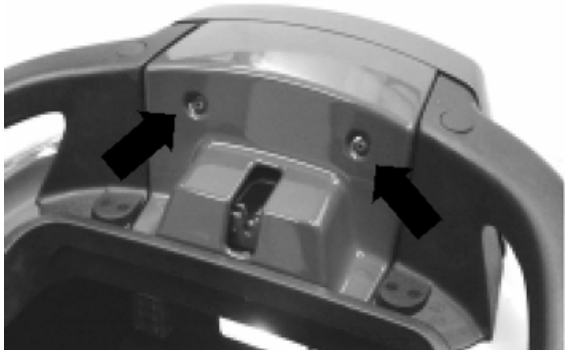
Frame central cover

- Open the tank door;
- Remove the fuel tank cap and the protective rubber
- Unscrew the 2 fixing screws located inside of it;
- Extract the centre cover in an upwards direction;
- Remove the tank door opening transmission.

Taillight assy.

Unscrew the 2 fixing screws of the cover component of the saddle coupling;
- Release it from the rear cover and remove it.
- Unscrew the 2 fixing screws indicated on the figure and remove them;
- Disconnect the stop lights connection wiring;
- Remove the stop lights support (battery cover) by extracting it upwards so as to disengage the coupling teeth from the side panels.



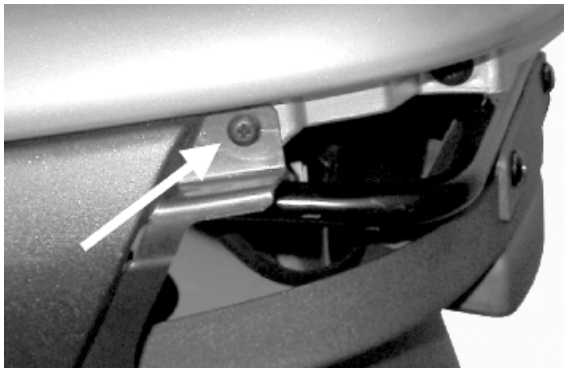


Footrest

- With the help of a small slotted screwdriver, remove the fixing caps and then the safety covers;
- Unscrew the fixing screws on the frame at the rear shield and at the tunnel cover;
- Remove the footrest board complete with the passenger boards.

Side fairings

- After having removed the panel union element, unscrew the rear screw of the lower panel;
- Unscrew the lower screw connecting to the spoiler;
- Extract the lower side panel by pulling it towards the rear;

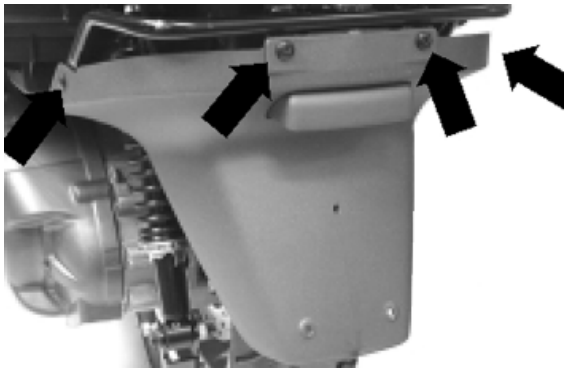


License plate holder

- Unscrew the 4 fixing screws on the rear frame;
- Disconnect the electric connector of the number plate light;
- Remove the number plate bracket support with the lamp socket.

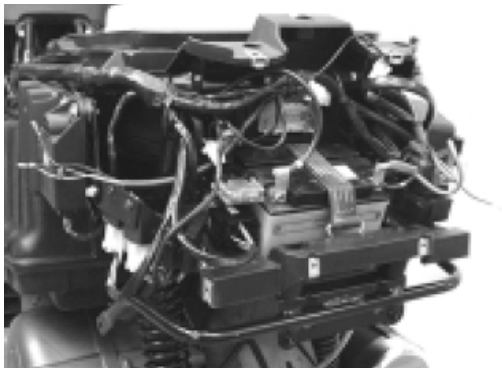
N.B.

WHEN SECURING THE NUMBER PLATE BRACKET ON THE SUPPORT, PAY ATTENTION TO INSERTING THE RIVETS WITH THE HEAD ON THE WHEEL SIDE SO AS TO PREVENT THE PROTRUDING PART OF THE RIVET FROM INTERFERING WITH THE TYRE WHEN THE VEHICLE IS IN USE.

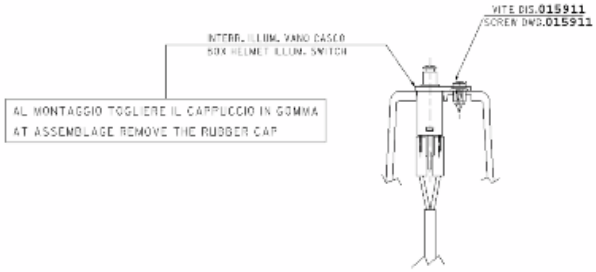


Helmet bay

- Remove all electric devices;
- Remove the 4 fuse carrier enclosures;
- Free the cables fixed to the frame with the relative support clamps;
- Remove the battery;
- Unscrew the fixing screws on the rear frame;
- Remove the rear frame by lifting it from the front and extracting it from behind.
- Remove the saddle closing coupling;
- Unscrew the remaining fixing screws on the frame;
- Extract the helmet compartment.



Please take note that, starting from chassis serial number ZAPM2300004505518, the helmet bay lighting drive switch fixing screw has been replaced. The new screw drawing 015911 differs from the previous one for a bigger lenght of 3mm

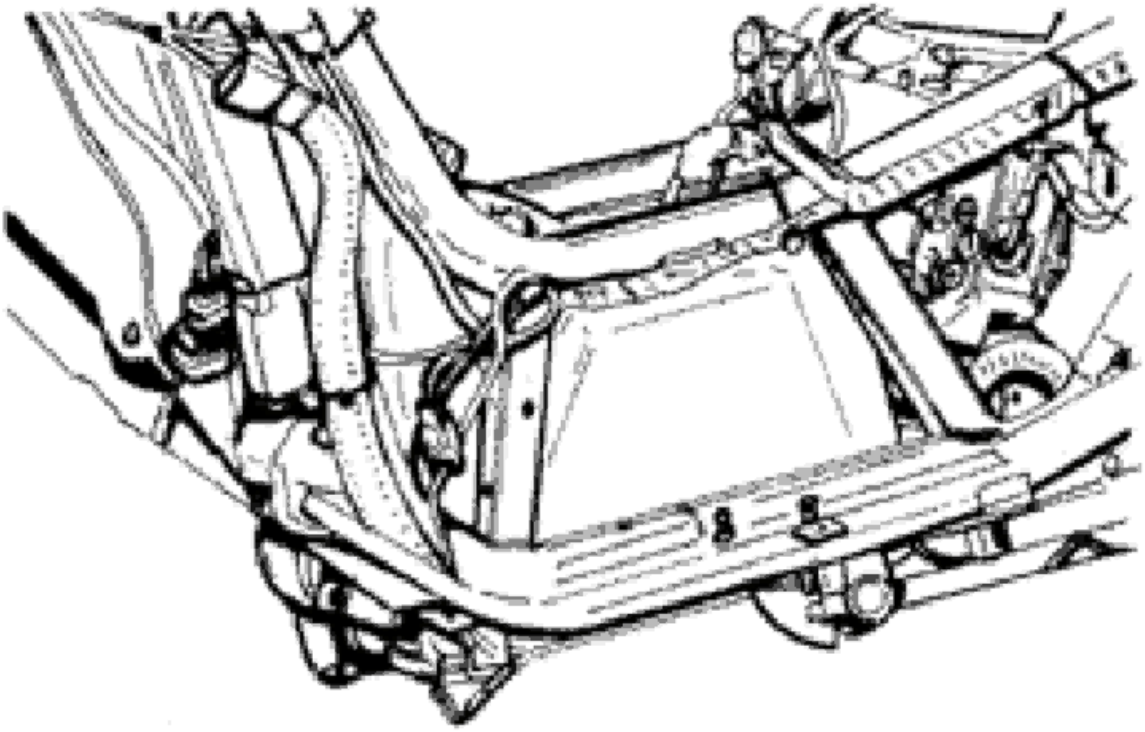


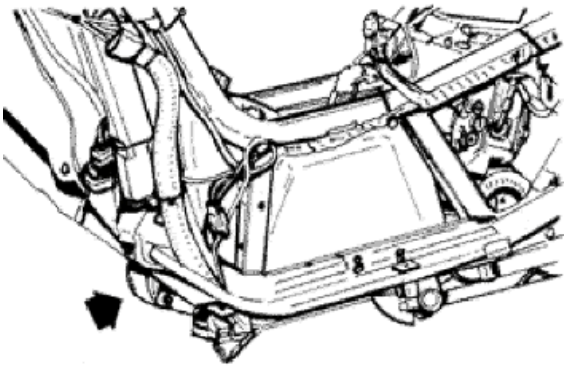
Fuel tank

- Remove both footrests, the central cover and the tunnel cover as described before;
- Separate the electrical connections of the fuel gauge and disconnect the fuel supply line and tank breather;
- Remove the horn after unscrewing its fixing screws indicated in the figure and after disconnecting the electrical connections.
- Unscrew the four fixing screws of the holding bracket indicated in the figure and remove it;
- Unscrew the two fuel tank fixing screws, located on the upper part;
- Slide off the tank downward after tilting it slightly.

N.B.

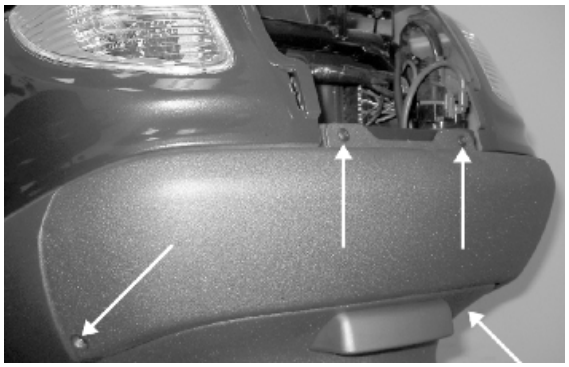
this operation should be preferably be carried out with the tank empty.





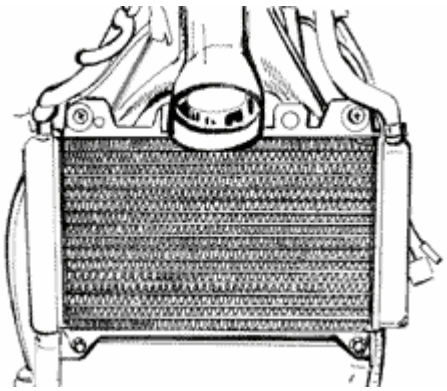
Rear central cover

- Unscrew the 4 fixing screws;
- Remove the rear centre cover.



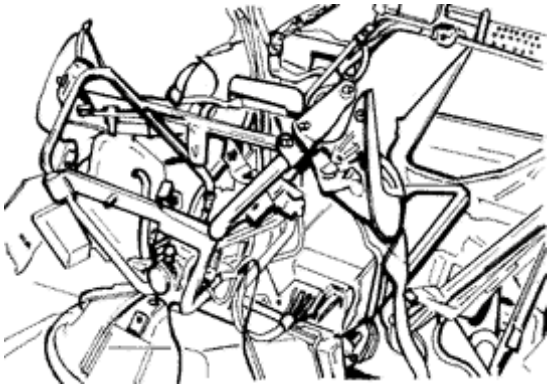
Radiator fan

- Prepare a container for the coolant.
- Remove the delivery and reverse pipes of both the expansion tank and the radiator coolant;
- Disconnect the connector from the thermostat pipe;
- Unscrew the fixing screws and release the radiator and the electrical fan.



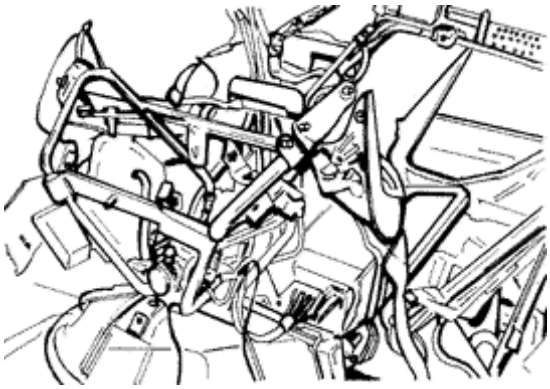
Expansion tank

- Unscrew the fixing screws from the expansion tank support and remove the support;
- Slide off the expansion tank downwards with the relative gasket after removing momentarily the cap;
- Prepare a container for the coolant.
- Close the cap again and remove the coolant delivery and reverse pipes.



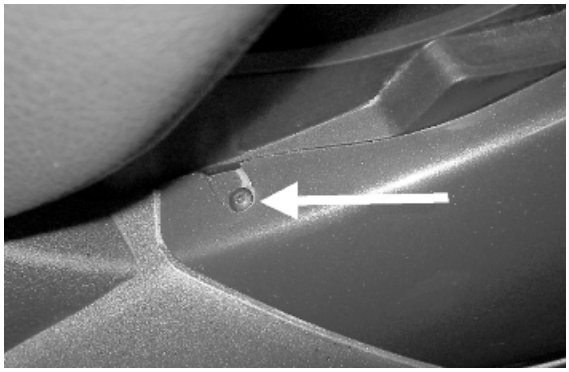
Top-case

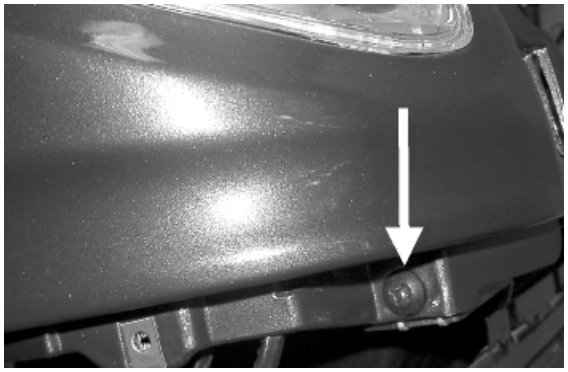
- Unscrew the fixing screws from the electrical connection indicated in the figure;
- Remove the expansion tank as described before;
- Unscrew the screw inside the case and remove it together with the saddle latch transmission.



Handles and top side fairings

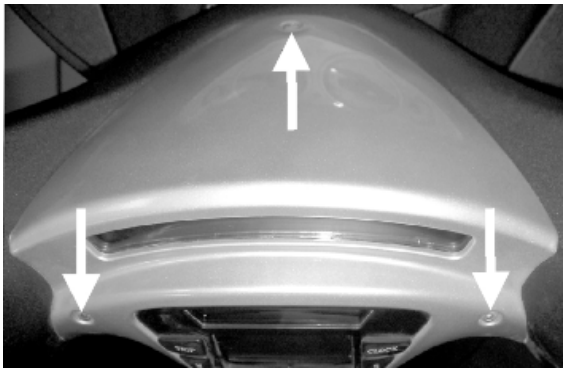
- Remove the rubber plugs covering the fixing screws;
- Unscrew the socket head screws and remove them;
- Remove the passenger handles.
- Unscrew the screw under the tail light.
- Unscrew the screw in the upper part of the side panel;
- Disconnect the optical unit wiring;
- Remove the upper side panel by extracting it towards the rear of the vehicle.





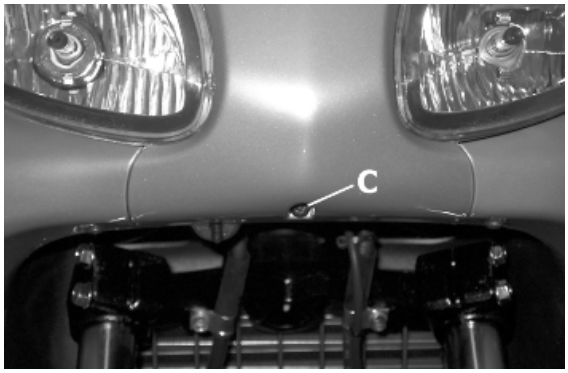
Digital panel support

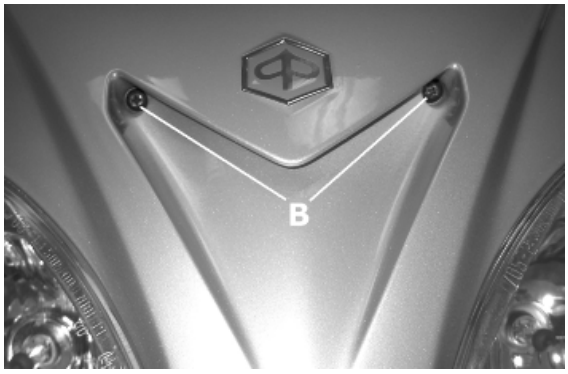
- Unscrew the 3 fixing screws;
- Disconnect the electric connectors while paying special attention to the coupling teeth;
- Remove the support with digital panel;



Front central cover

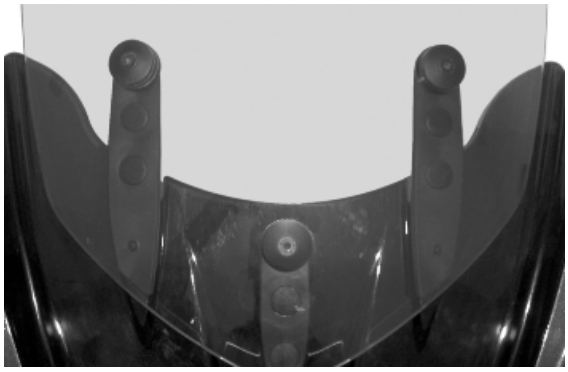
- To disassemble the front centre cover, it is necessary to first unscrew the screws «**A**» shown in the figure (2 per side) and remove them together with the right and left mirrors. You have to remove the rubber cover plugs in order to get to the screws.
- Remove the 2 centre screws «**B**»
- Remove the lower screw «**C**» found under the optical unit





Flyscreen

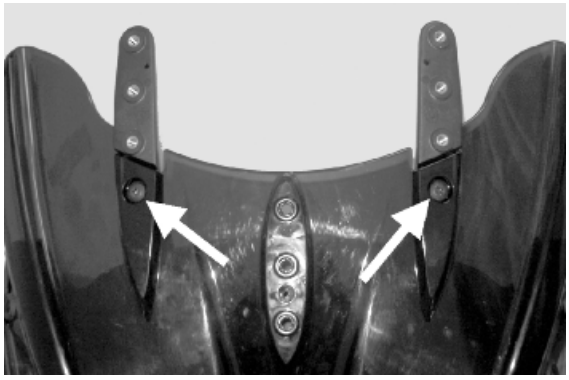
Unscrew the 3 screws retaining the upper windscreen with the relative spacers;
- Remove the upper windscreen
- Extract the 6 plastic plugs and remove the protective rubber covers of the windscreen supports together with the central adjustment flange in order to get to the 2 upper fastenings of the lower windscreen.

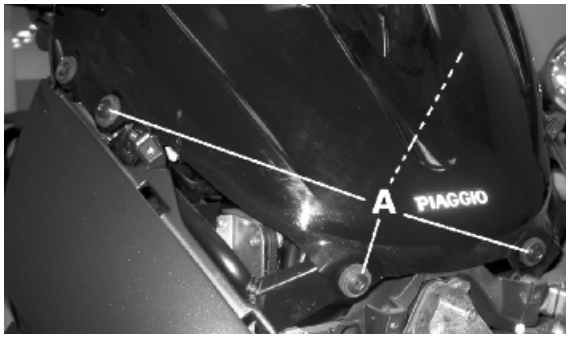


- Unscrew and remove the 2 screws shown in the figure
- Unscrew the 4 fixing screws with the washers located under the rear-view mirrors and beneath the front centre cover;
- Remove the lower fairing.

N.B.

BE SURE TO CORRECTLY INSERT THE SEALS IN THEIR SEATS WHEN REASSEMBLING.





INDEX OF TOPICS

Carry out the listed tests before delivering the vehicle.

Warning- be very careful when handling fuel.

Aesthetic inspection

Appearance check:

- Paintwork
- Fitting of plastics
- Scratches
- Dirt

Tightening torques inspection

Lock check

- Safety locks
- clamping screws

Safety locks

Rear shock absorber upper fixing
Rear shock absorber lower fixing
Front wheel axle nut
Wheel hub nut
Frame - swinging arm bolt *
Swinging arm bolt - Engine
Engine arm pin - Frame arm
Handlebar lock nut
Steering lower ring nut
Upper steering ring nut

Electrical system

Electrical system:

- Main switch
- Headlamps: high beam, low beam, position and parking lights and the respective warning lights
- Adjusting the headlights according to the regulations currently in force
- Rear light, parking light, stop light
- Front and rear stop light switches
- Turn indicators and their warning lights
- Instrument panel lights
- Instrument panel: fuel and temperature indicator
- Instrument panel warning lights

- Horn
- Starter

CAUTION

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

WARNING

BEFORE RECHARGING THE BATTERY, REMOVE THE CAPS OF EACH CELL.
KEEP THE BATTERY AWAY FROM NAKED FLAMES OR SPARKS WHILE IT IS CHARGED.
REMOVE THE BATTERY FROM THE SCOOTER, DISCONNECTING THE NEGATIVE TERMINAL FIRST.

CAUTION

WHEN INSTALLING THE BATTERY, ATTACH THE POSITIVE LEAD FIRST AND THEN THE NEGATIVE LEAD.

WARNING

BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH EYES, SKIN AND CLOTHING.
IN CASE OF CONTACT WITH EYES OR SKIN, RINSE WITH ABUNDANT WATER FOR ABOUT 15 MINUTES AND SEEK MEDICAL ATTENTION AT ONCE.
IF IT IS SWALLOWED, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.
BATTERIES PRODUCE EXPLOSIVE GAS; KEEP THEM AWAY FROM NAKED FLAMES, SPARKS AND CIGARETTES. IF THE BATTERY IS CHARGED IN A CLOSED PLACE, TAKE CARE TO ENSURE ADEQUATE VENTILATION. ALWAYS PROTECT YOUR EYES WHEN WORKING CLOSE TO BATTERIES.
KEEP OUT OF THE REACH OF CHILDREN

CAUTION

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

Levels check

Level check:

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

Road test

Test ride

- Cold start
- Instrument operations
- Response to the throttle control
- Stability on acceleration and braking
- Rear and front brake efficiency
- Rear and front suspension efficiency

- Abnormal noise

Static test

Static control after the test ride:

- Starting when warm
- Starter operation
- Minimum hold (turning the handlebar)
- Uniform turning of the steering
- Possible leaks

CAUTION

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

CAUTION

NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES OR TYRES MAY BURST.

Functional inspection

Functional check up:

Braking system (hydraulic)

- Lever travel

Braking system (mechanical)

- Lever travel

Clutch

- Proper functioning check

Engine

- Throttle travel check

Others

- Check documentation
- Check the frame and engine numbers
- Tool kit
- License plate fitting
- Check locks
- Check tyre pressures
- Installation of mirrors and any accessories

INDEX OF TOPICS

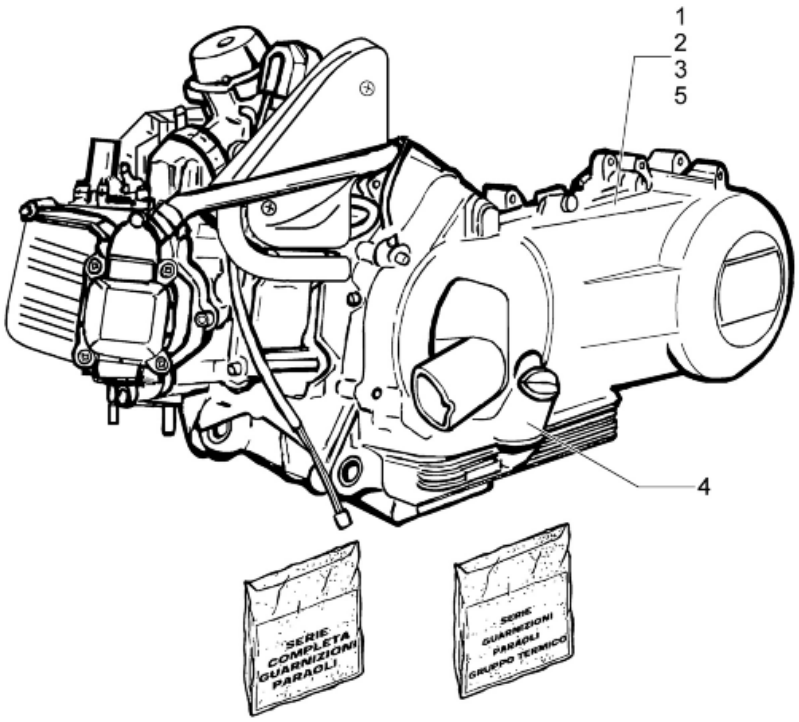
This section is devoted to the time necessary to carry out repairs.

For each operation, the description, code and time envisages are specified.

Engine

ENGINE

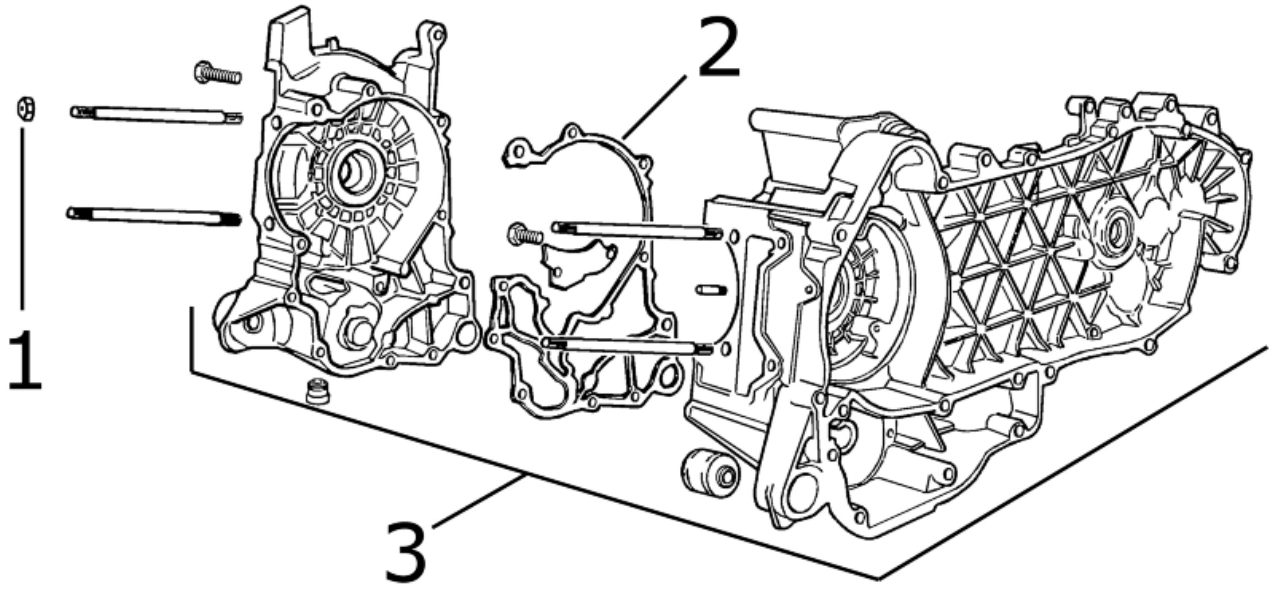
	Code	Action	Duration
1	001001	Engine from chassis - replacement	
2	001127	Engine - Complete service	
3	001136	Exhaust emissions - Adjustment	
4	003064	Engine oil - Change	
5	003057	Engine retainer - Tighten nuts	



Crankcase

CRANKCASE

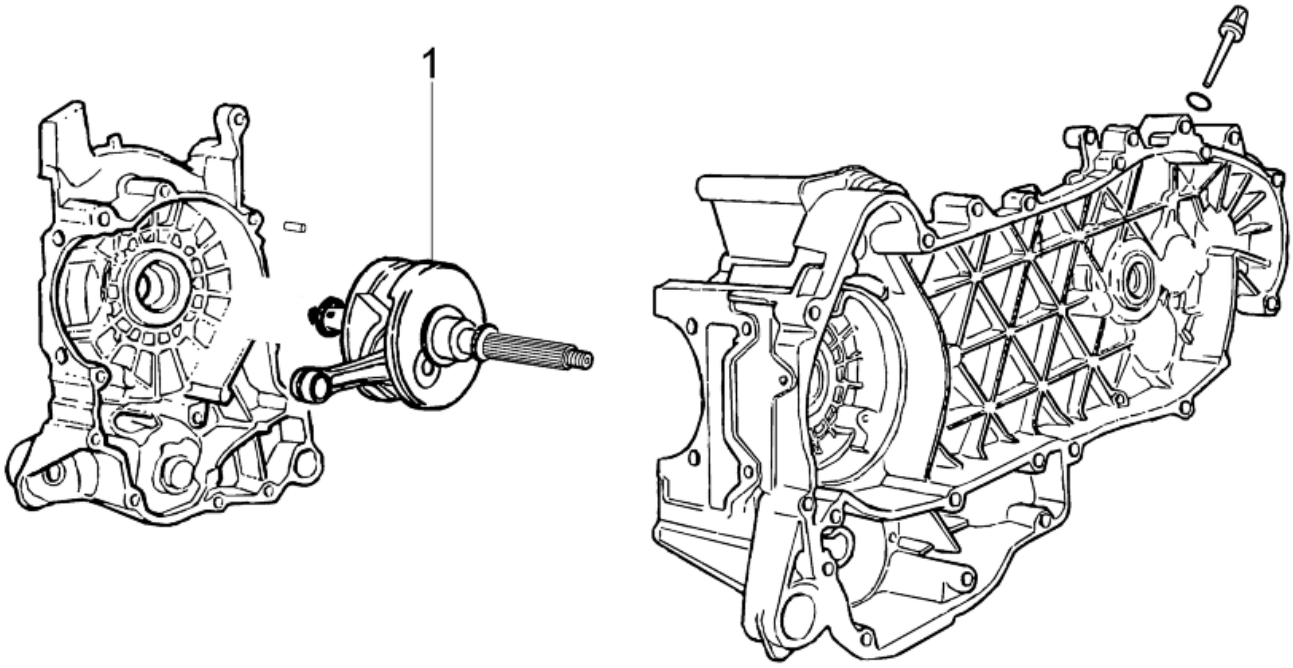
	Code	Action	Duration
1	003056	Head/Cylinder - Nut tightening	
2	001153	Crankcase halves gasket - Replacement	
3	001133	Engine crankcase - replace	



Crankshaft

CRANKSHAFT

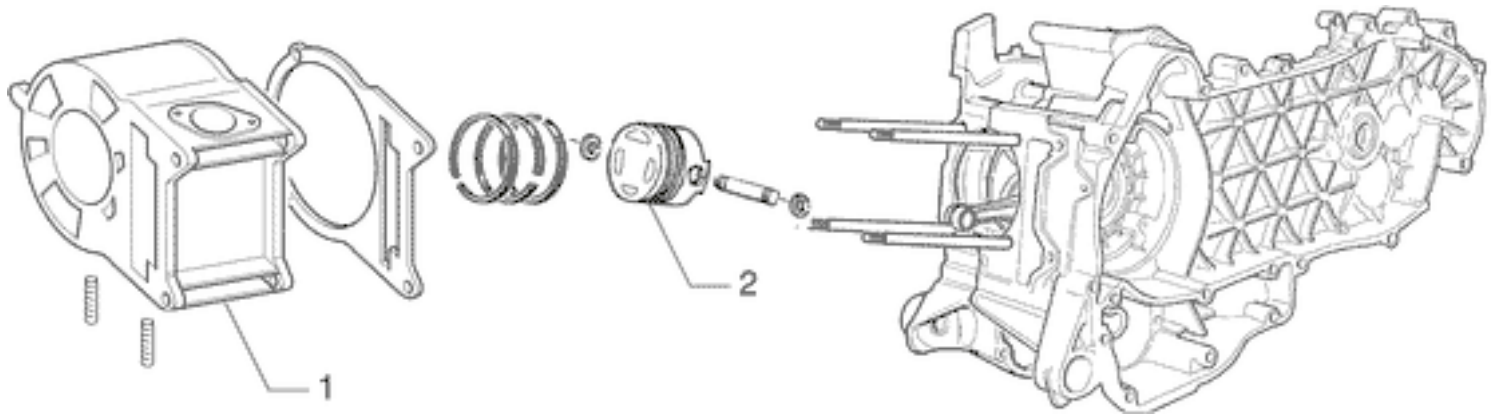
	Code	Action	Duration
1	001117	Crankshaft - Replacement	



Cylinder assy.

CYLINDER - PISTON - PIN UNIT

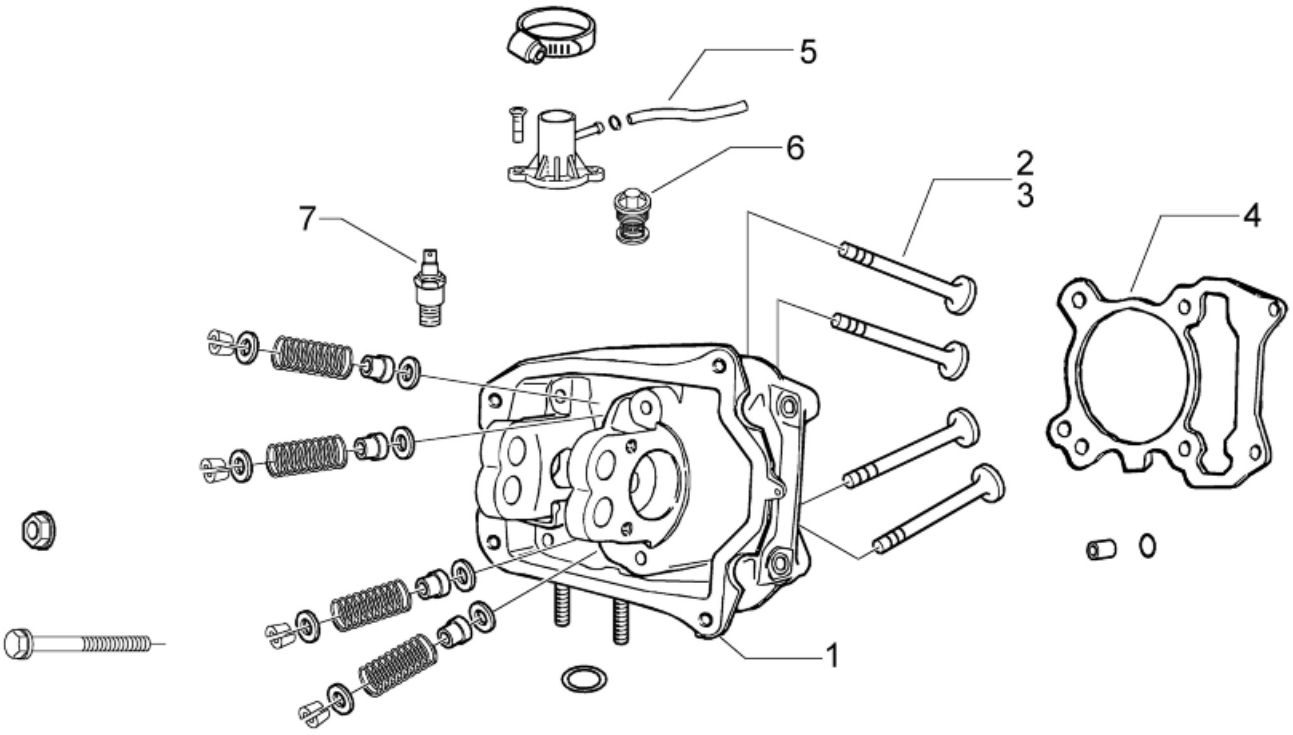
	Code	Action	Duration
1	001002	Cylinder-Piston - Replacement	
2	001154	Pin ring piston unit - Service	



Cylinder head assy.

HEAD - VALVE UNIT

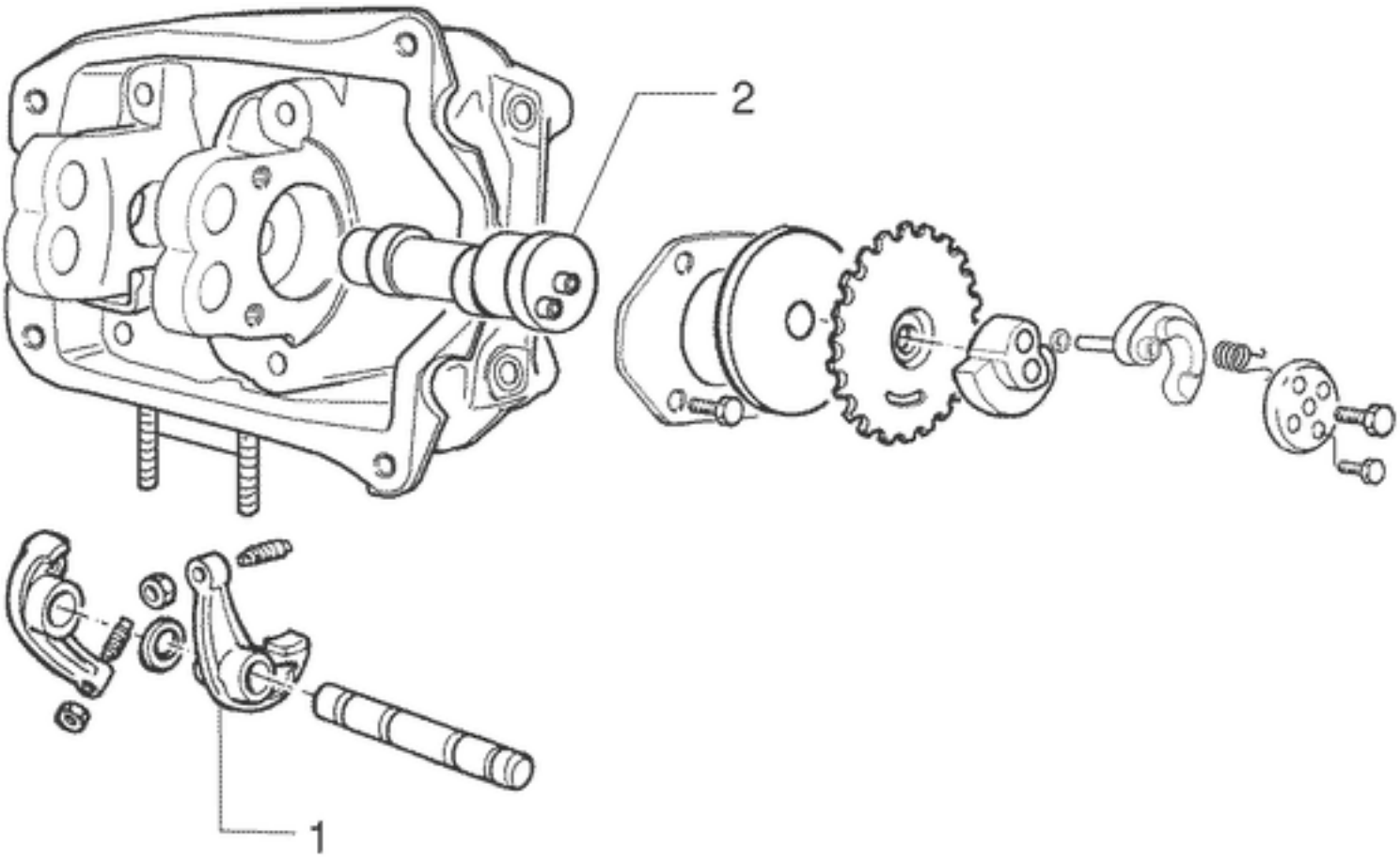
	Code	Action	Duration
1	001126	Head - Replacement	
2	001045	Valves - Replacement	
3	001049	Valves - Adjustment	
4	001056	Head gasket - change	
5	007008	Cylinder head outlet rubber coupling - Replacement	
6	001057	Thermostat - Replacement	
7	001083	Thermistor - Replacement	



Rocker arms support assy.

ROCKING LEVER SUPPORT UNIT

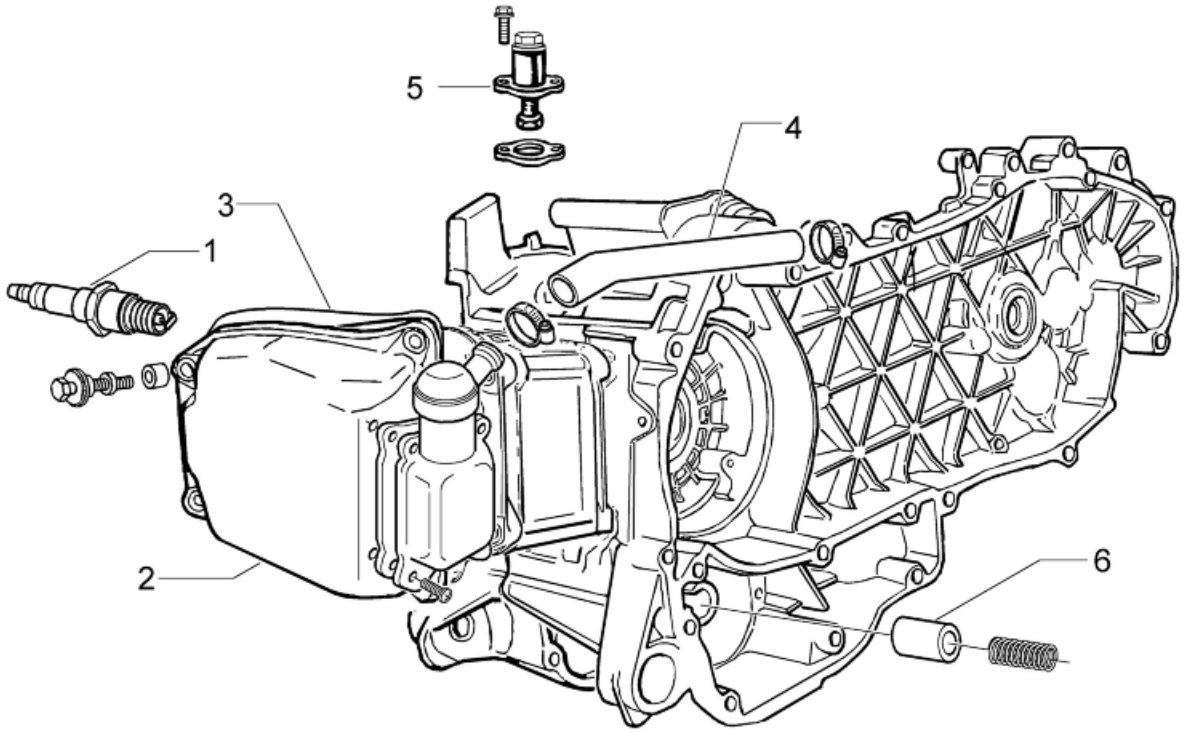
	Code	Action	Duration
1	001148	Valve rocking levers - Replacement	
2	001044	Camshaft - Replacement	



Cylinder head cover

HEAD COVER - CHAIN TENSIONER - BY-PASS LUBRICATION

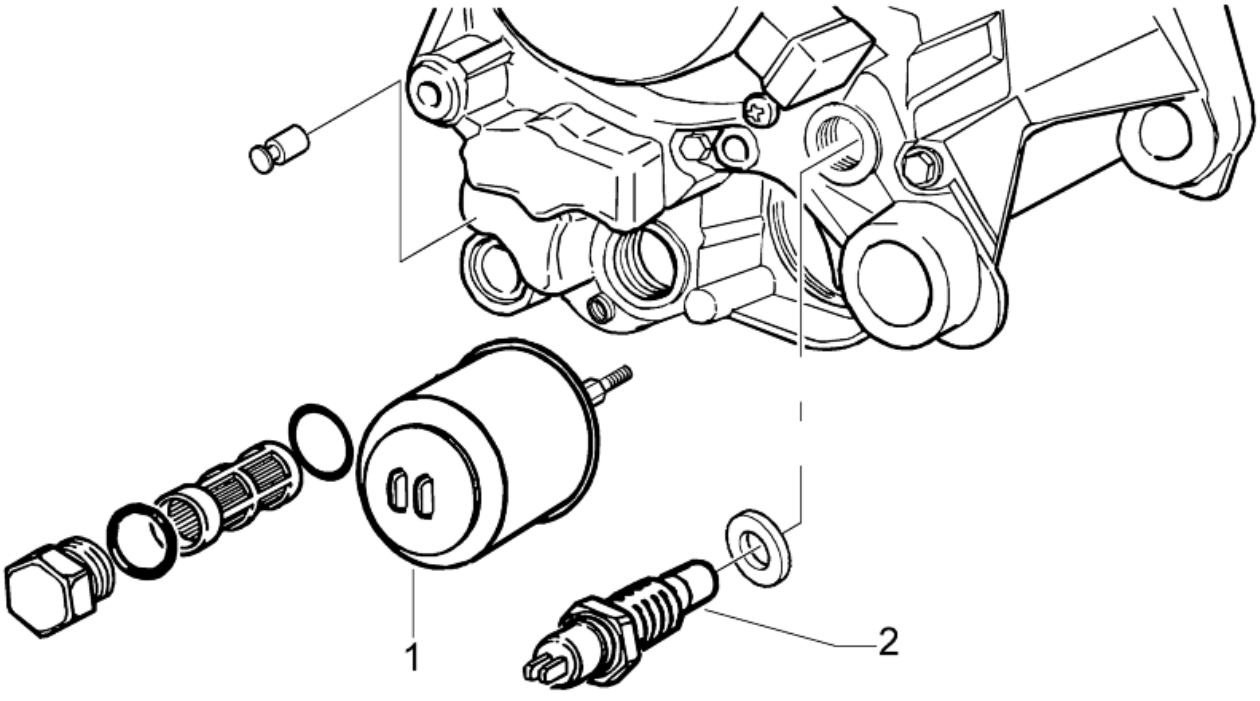
	Code	Action	Duration
1	001093	Spark plug - Replacement	
2	001089	Head cover - Replacement	
3	001088	Head cover gasket - Replacement	
4	001074	Oil vapour recovery pipe - Replacement	
5	001129	Chain tightener - Overhaul and replacement	
6	001124	By pass lubrication - Replacement	



Oil filter

OIL FILTER

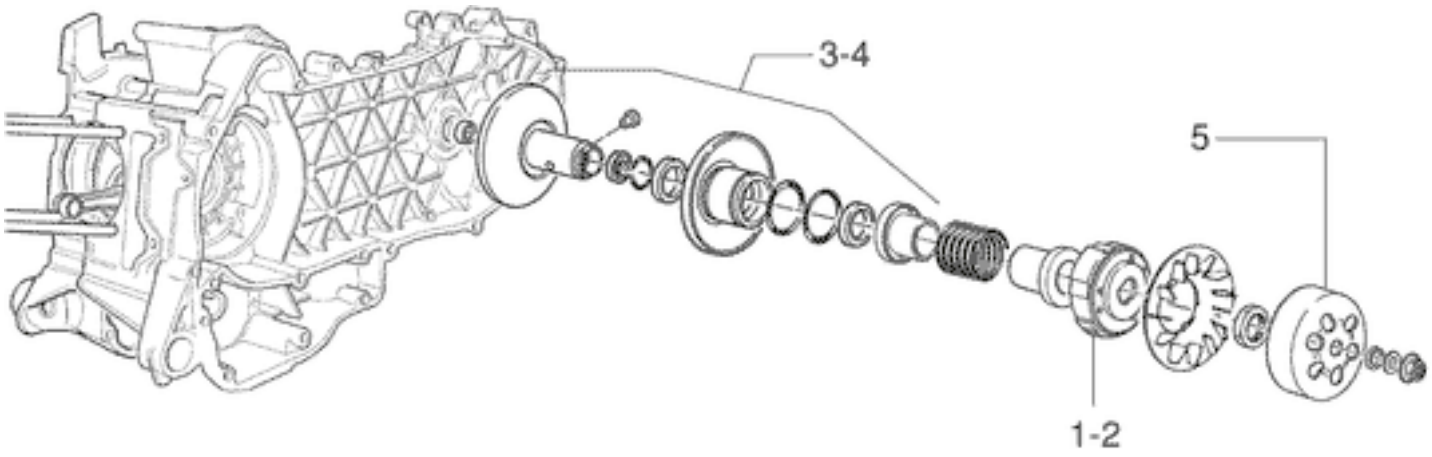
	Code	Action	Duration
1	001123	Oil filter - Replacement	
2	001160	Oil pressure sensor - Replacement	



Driven pulley

DRIVEN PULLEY

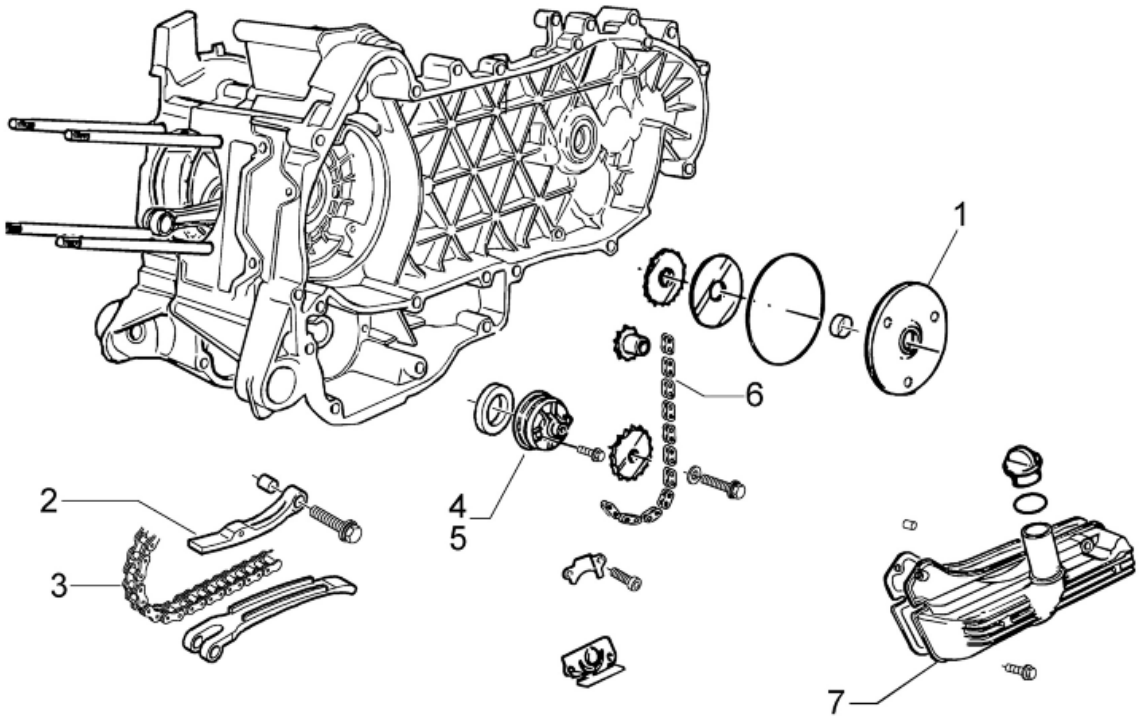
	Code	Action	Duration
1	001022	Clutch - Replacement	
2	003072	Clutch - replacement Clutch assembly - Wear check	
3	001012	Driven pulley - Service	
4	001110	Driven pulley - Replacement	
5	001155	Clutch bell housing - Replacement	



Oil pump

OIL PUMP

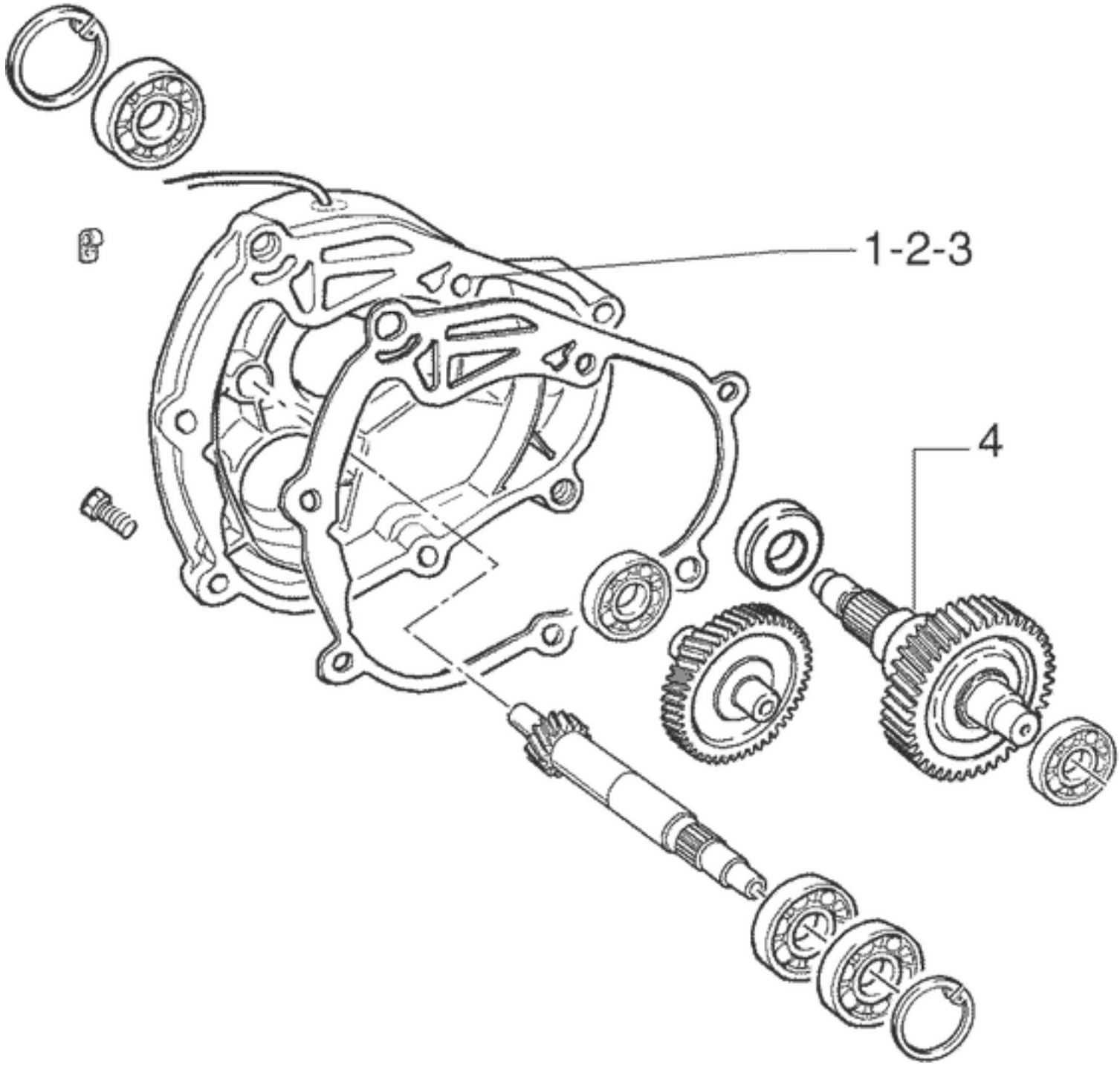
	Code	Action	Duration
1	001100	Oil seal, clutch side - Replacement	
2	001125	Chain guide pads - Replacement	
3	001051	Belt/ Timing chain - Replacement	
4	001042	Oil pump - Service	
5	001112	Oil pump - change	
6	001122	Oil pump chain - Replacement	
7	001130	Oil sump - Replacement	



Final gear assy.

FINAL REDUCTION GEAR

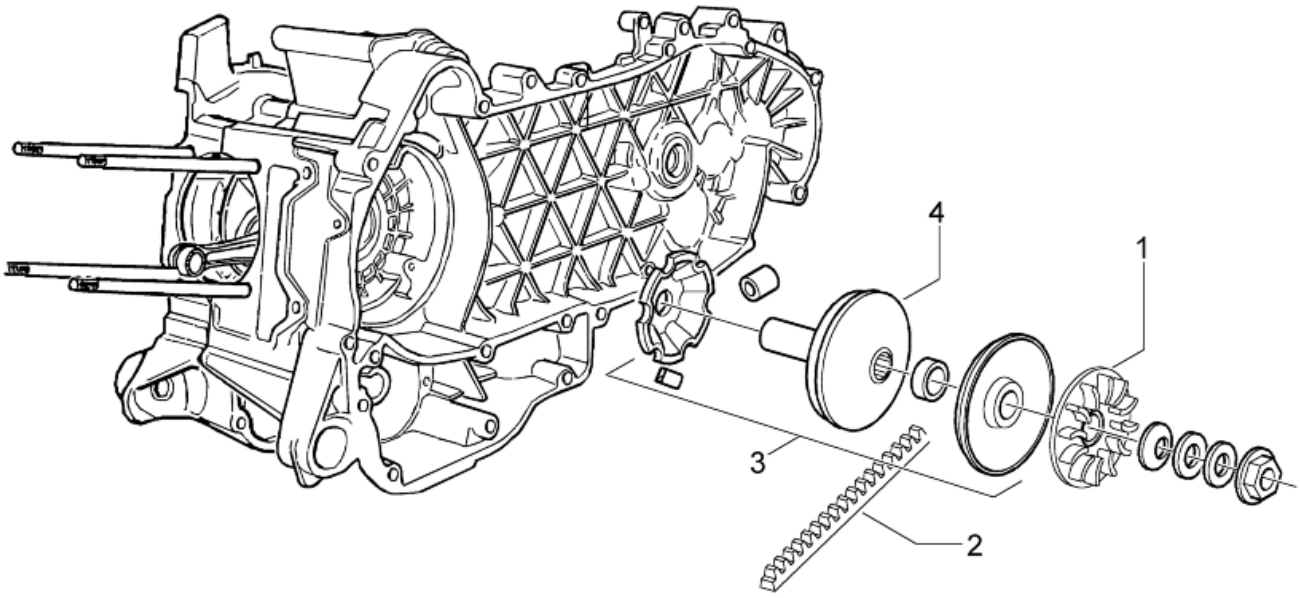
	Code	Action	Duration
1	001010	Gear reduction unit - Inspection	
2	001156	Gear reduction unit cover - Replacement	
3	003065	Gear box oil - Replacement	
4	004125	Rear wheel axle - Replacement	



Driving pulley

DRIVING PULLEY

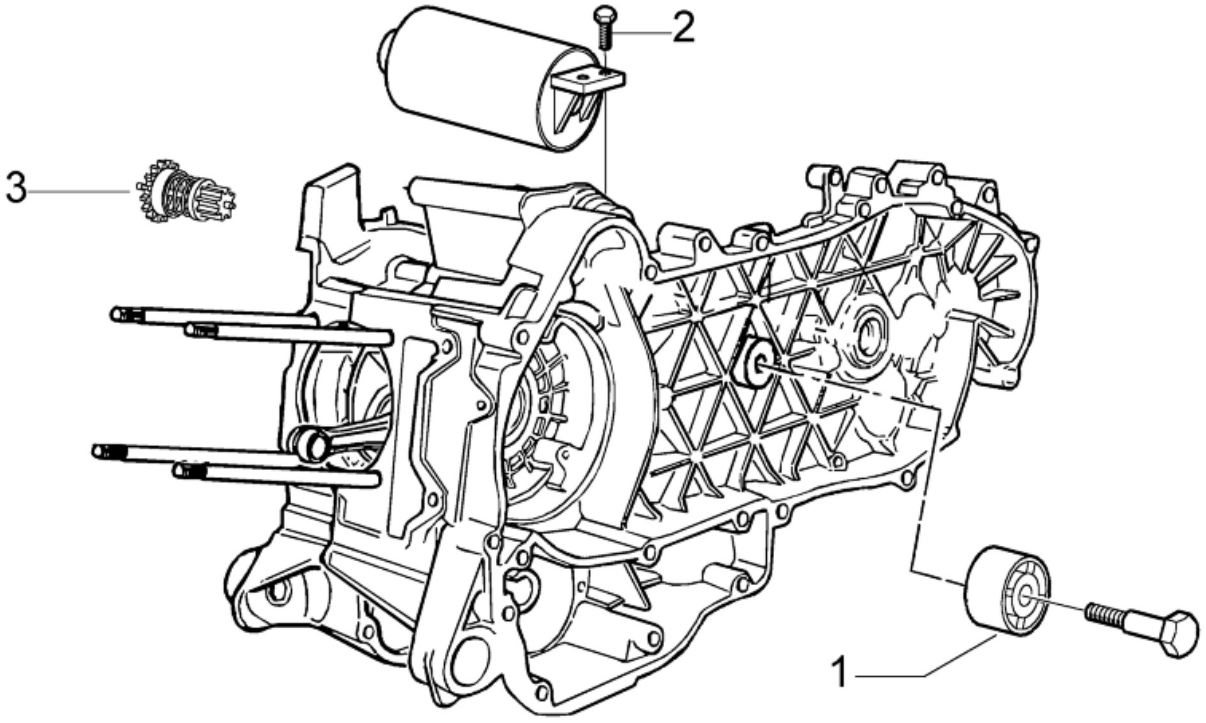
	Code	Action	Duration
1	001086	Driving half-pulley - Replacement	
2	001011	Driving belt - Replacement	
3	001006	rear-view pulley - Service	
4	001066	driving pulley - Replacement	



Starter motor

ELECTRICAL START UP

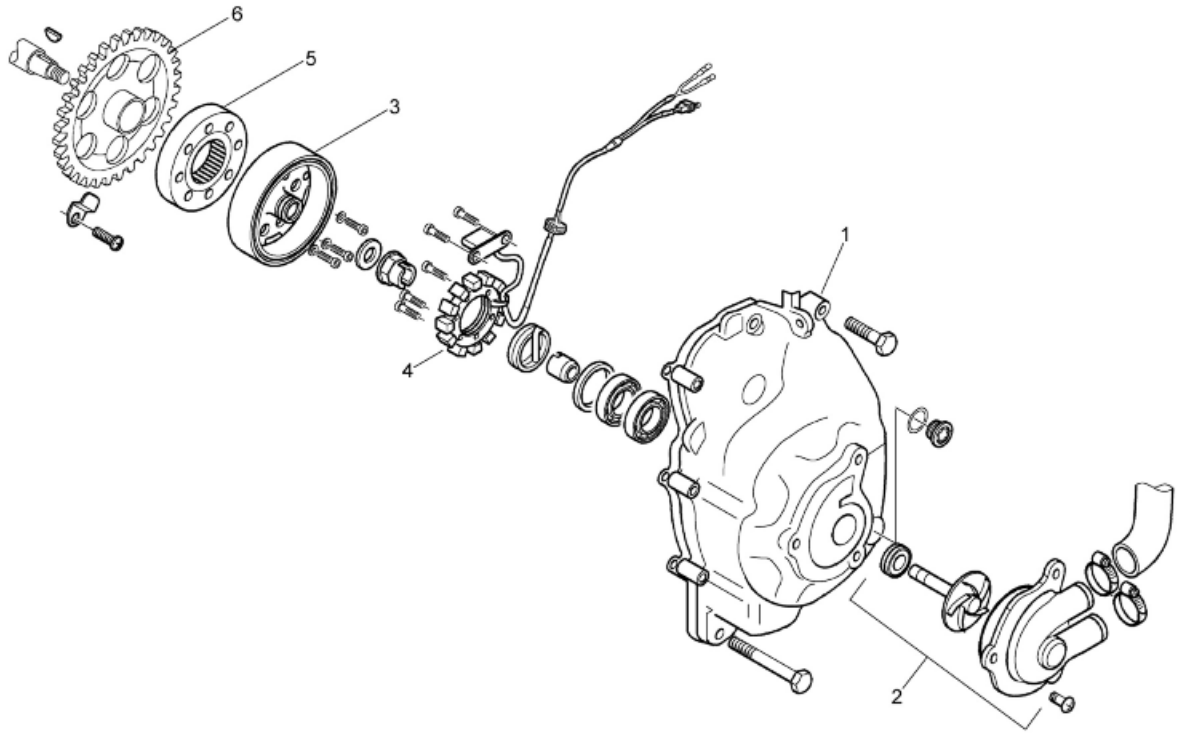
	Code	Action	Duration
1	001141	Belt anti-vibration roller - Replacement	
2	001020	Starter motor - Replacement	
3	001017	Starter sprocket wheel - Replacement	



Flywheel magneto

MAGNETO FLYWHEEL

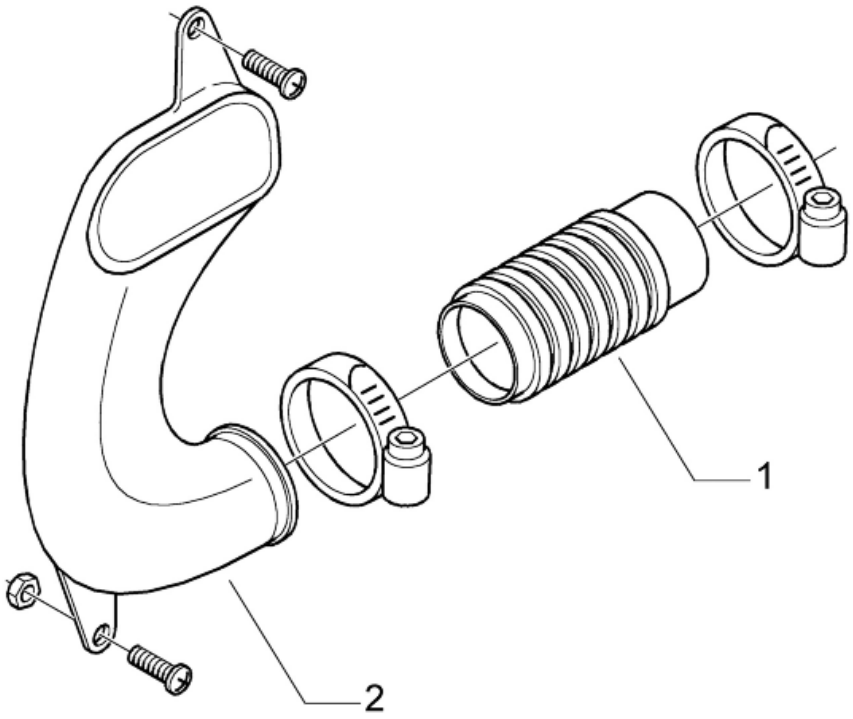
	Code	Action	Duration
1	001087	Flywheel cover - replace	
2	001113	Water pump / Pump rotor - Replacement	
3	001173	Rotor - replace	
4	001067	Stator - Replacement	
5	001104	Start-up freewheel - Replacement	
6	001151	Start-up driven gearing - Replacement	



Belt cooling duct

BELT COOLING TUBE

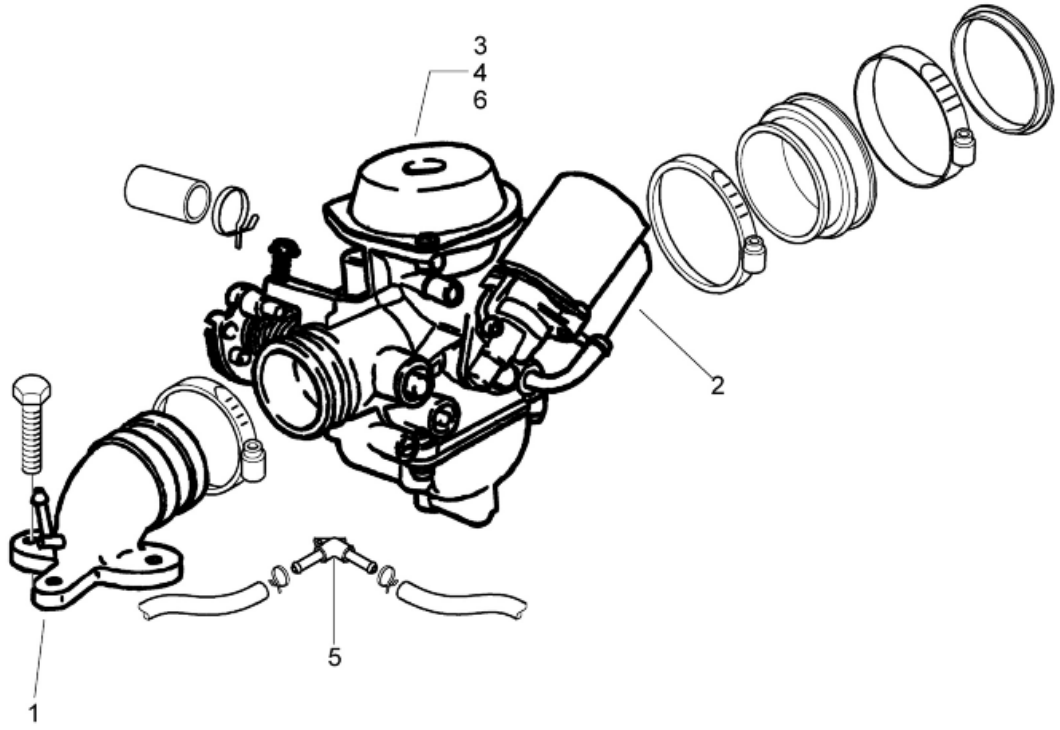
	Code	Action	Duration
1	001132	Transmission air inlet pipe - Replacement	
2	001131	Transmission air intake - Replacement	



Carburettor

CARBURETTOR

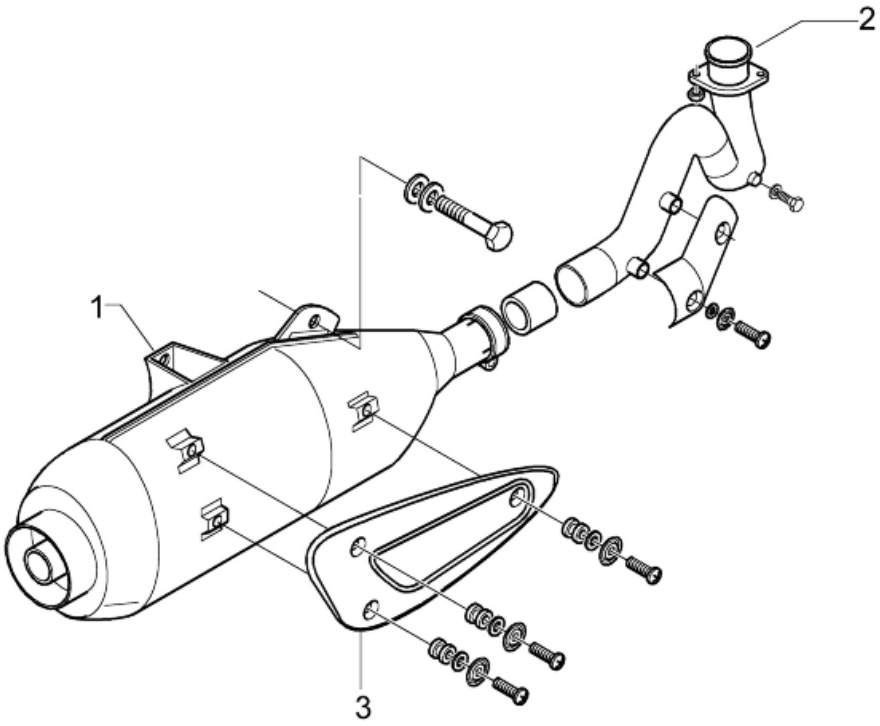
	Code	Action	Duration
1	001013	Intake manifold - change	
2	001081	Automatic choke - Replacement	
3	001008	Carburettor - Inspection	
4	001063	Carburettor - Replacement	
5	007020	Carburettor heat piping. - Replacement	
6	003058	Carburettor - Adjustment	



Exhaust pipe

SILENCER

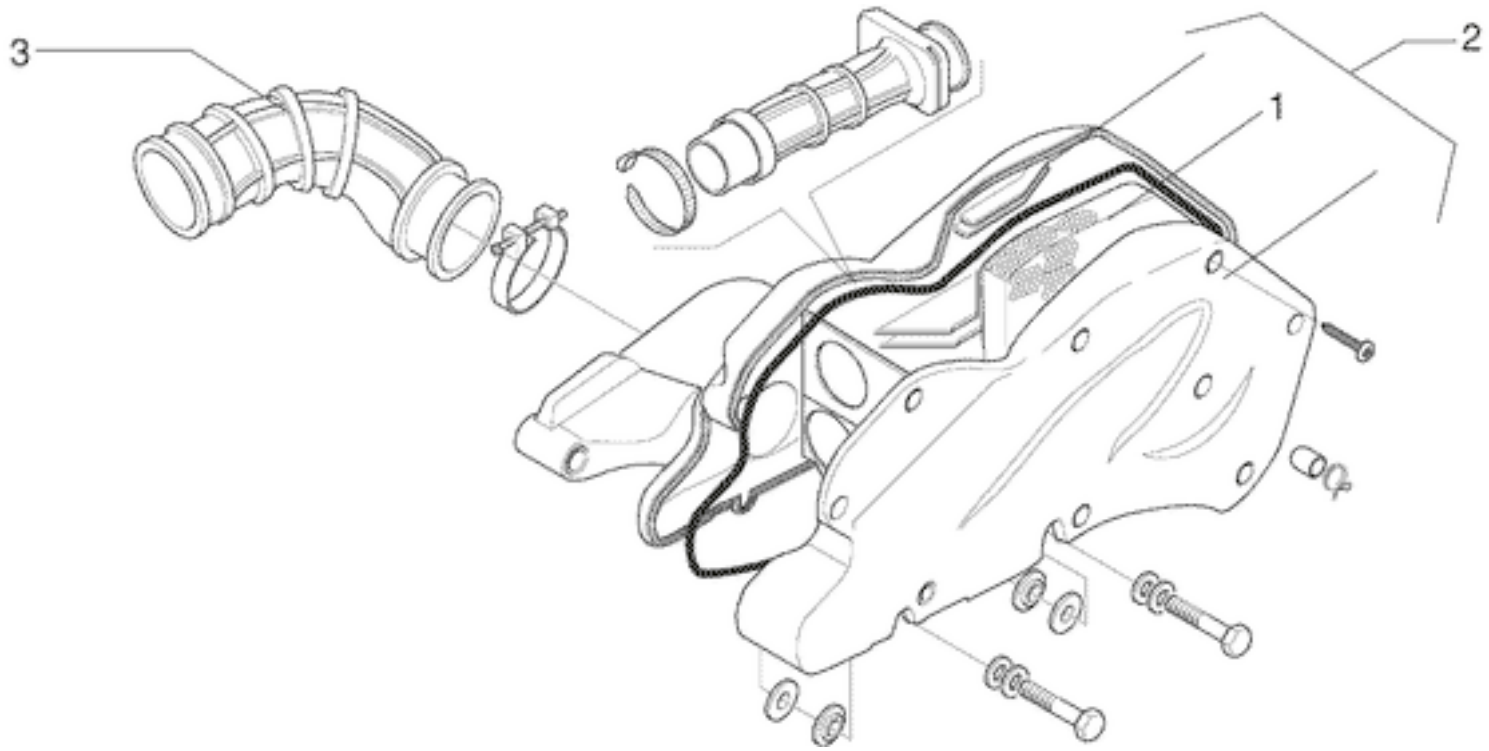
	Code	Action	Duration
1	001009	Muffler - Replacement	
2	001092	Exhaust manifold - Replacement	
3	001095	Muffler guard - Replacement	



Air cleaner

AIR CLEANER

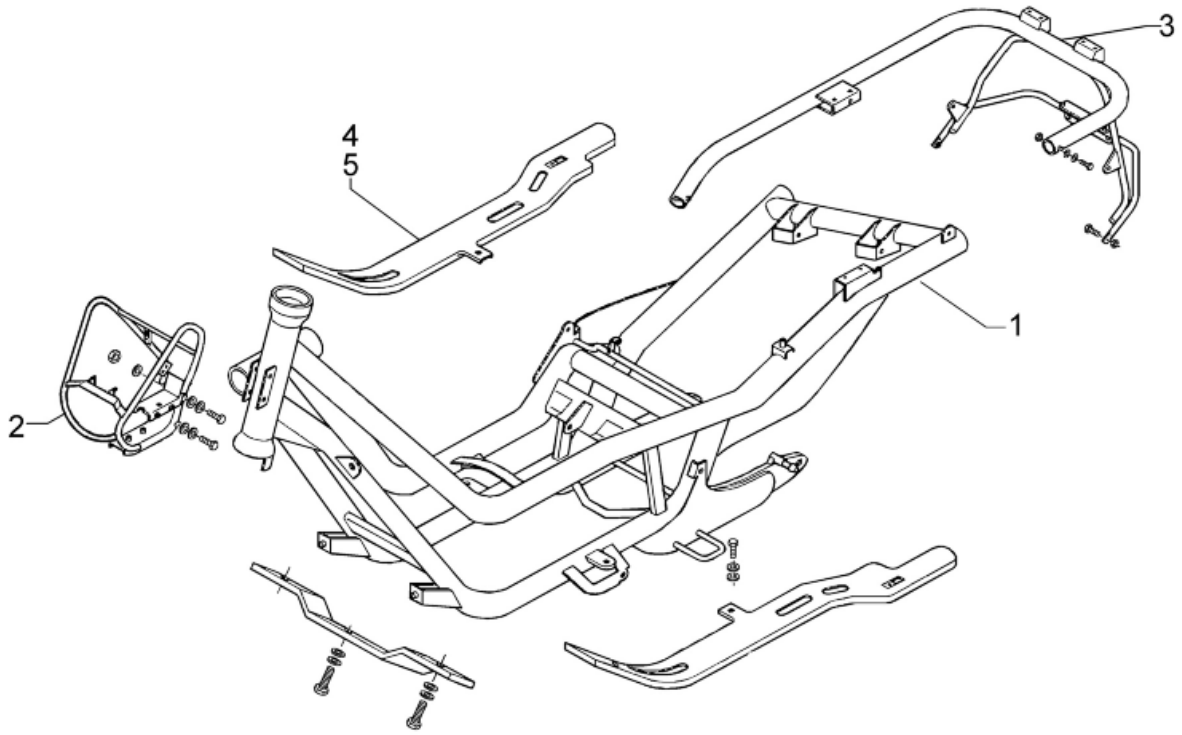
	Code	Action	Duration
1	001014	Air filter - Replacement/Cleaning	
2	001015	Air filter box - Replacement	
3	004122	Air cleaner carburettor fitting - Replacement	



Frame

CHASSIS

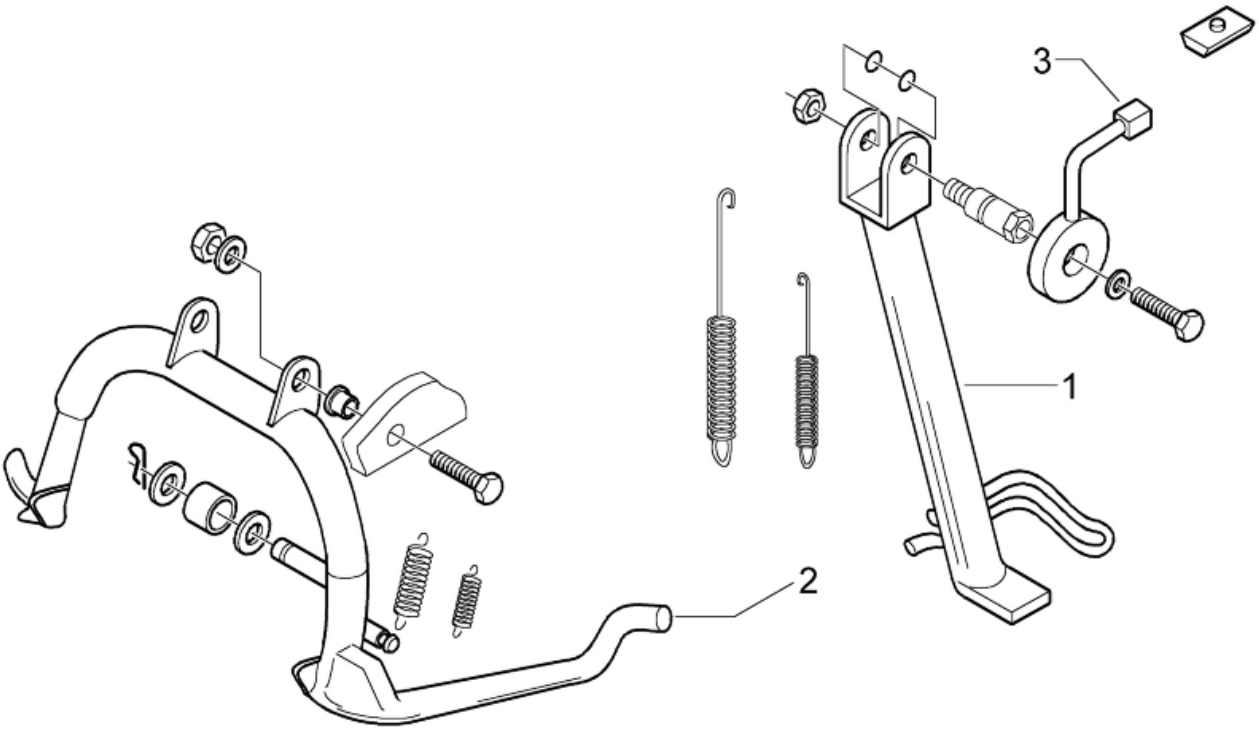
	Code	Action	Duration
1	004001	Frame - replace	
2	004146	Front frame - Replacement	
3	004116	Rear frame - Replacement	
4	004147	footboard support bracket one side - Replacement	
5	004148	footboard support bracket two sides - Replacement	



Centre-stand

SIDE / CENTRAL STAND

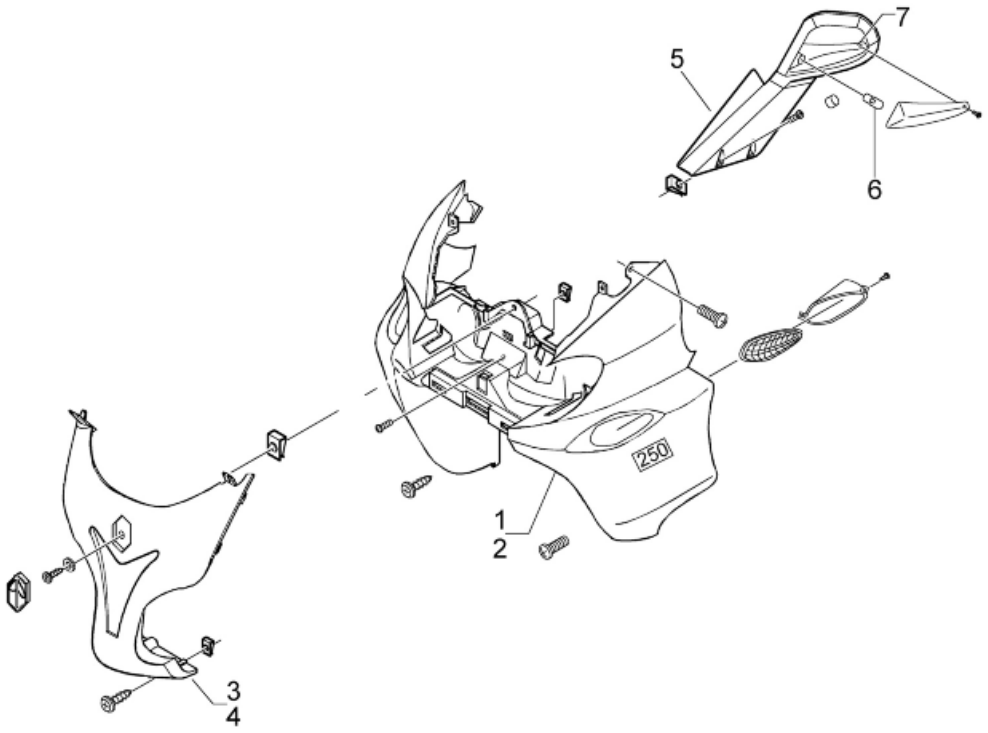
	Code	Action	Duration
1	004102	Side stand - Replacement	
2	004004	Stand - Replacement	
3	005079	Stand switch - Replacement	



Legshield spoiler

GRILL SHIELDS

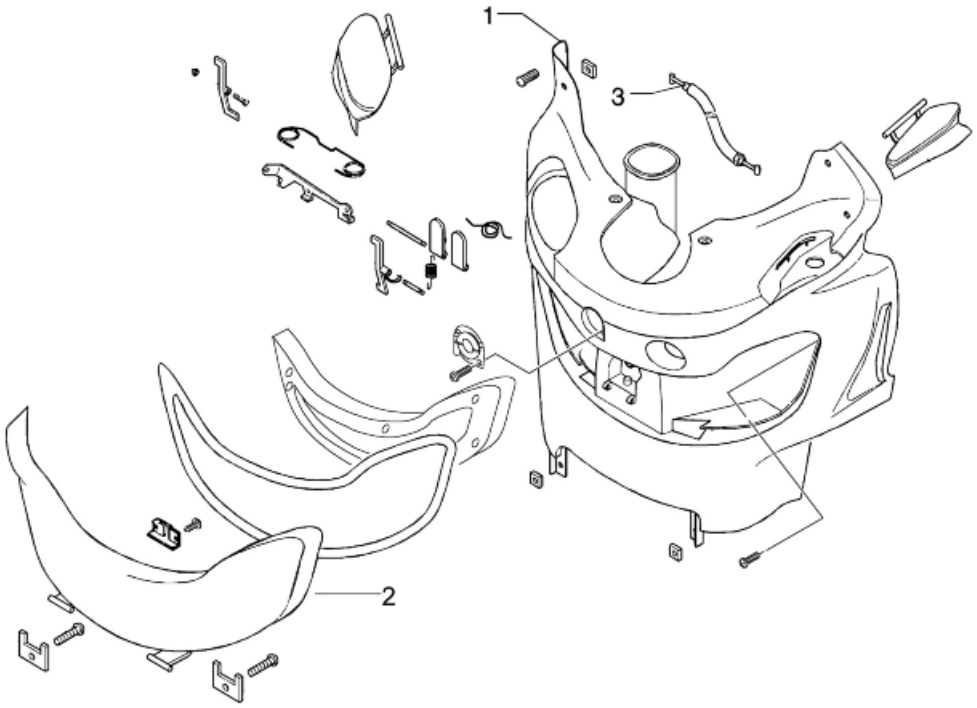
	Code	Action	Duration
1	004064	Front shield - front section - Replacement	
2	006012	Front shield - Paintwork	
3	004149	Shield central cover - Replacement	
4	006006	Headstock cover - Paintwork	
5	004066	Rear view mirrors - Replacement	
6	005067	Front direction indicator bulb - Replacement	
7	005012	Front turn indicator - Replacement	



Rear cover

REAR SHIELD

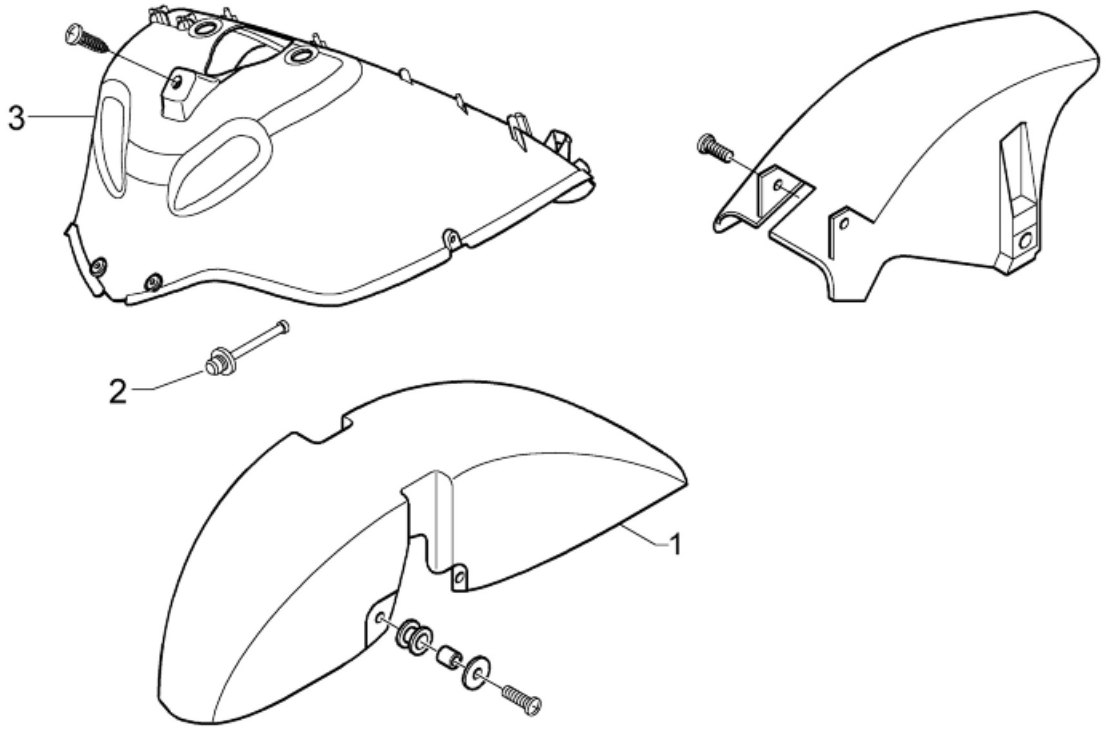
	Code	Action	Duration
1	004065	Front shield, rear part - Removal and refitting	
2	004081	Glove box door - Replacement	
3	002082	Fuel tank door opening drive - Replacement	



Mudguard

FRONT MUDGUARD

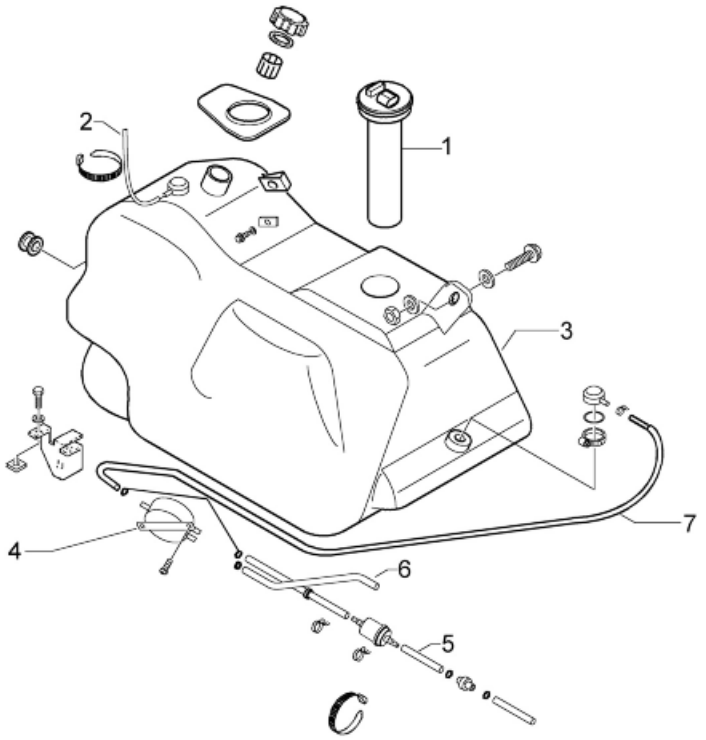
	Code	Action	Duration
1	004053	Spoiler - Replacement	
2	004002	Front mudguard - change	
3	005081	Temperature sensor - Replacement	



Fuel tank

FUEL TANK

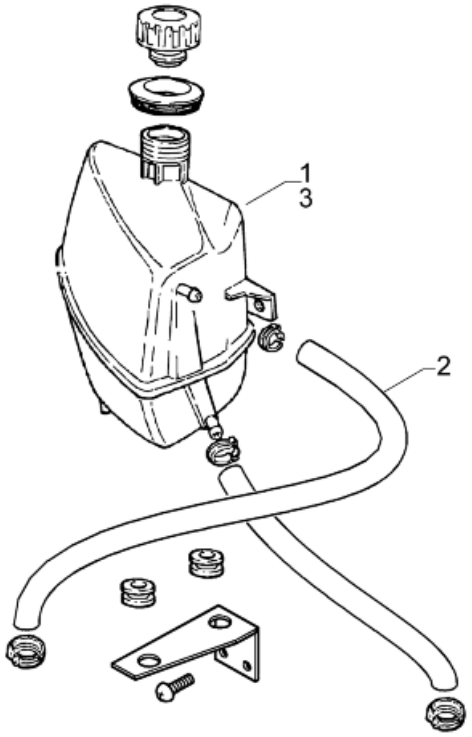
	Code	Action	Duration
1	005010	Tank float - Replacement	
2	004109	Fuel tank breather - change	
3	004005	Fuel tank - replace	
4	004073	Fuel pump - Replacement	
5	004137	Carburettor - pump hose - Replacement	
6	004086	Petrol pump depression tube - Replacement	
7	004089	Tank-pump hose - Replacement	



Expansion tank

EXPANSION TANK

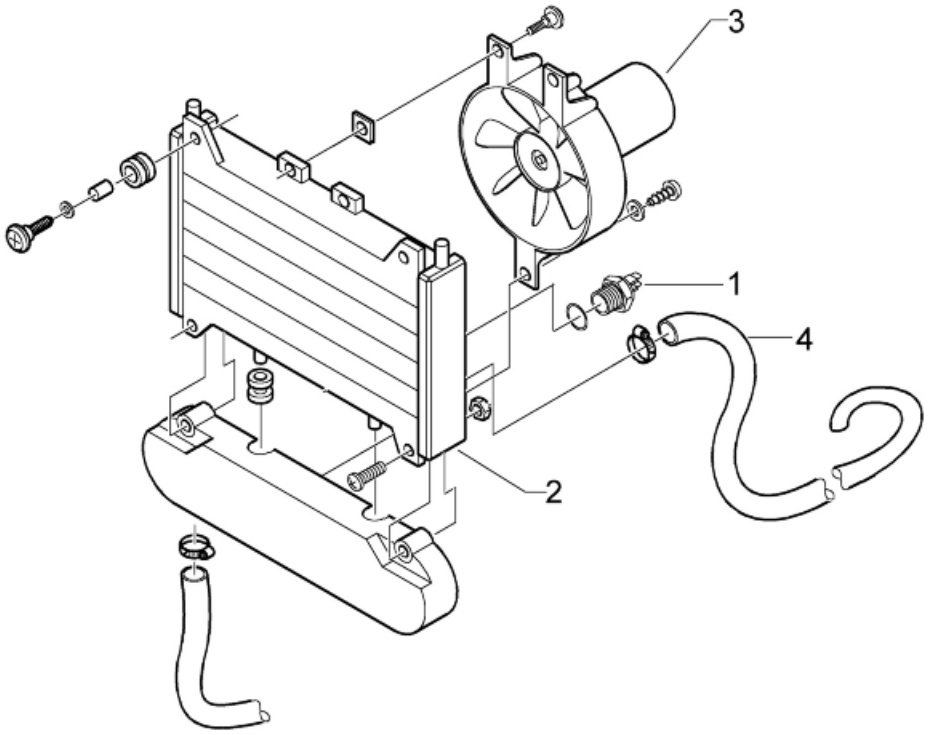
	Code	Action	Duration
1	007001	Expansion tank - Replacement	
2	007013	Expansion tank connection pipe - Replacement	
3	001052	Coolant and air bleed - Replacement	



Radiator

RADIATOR

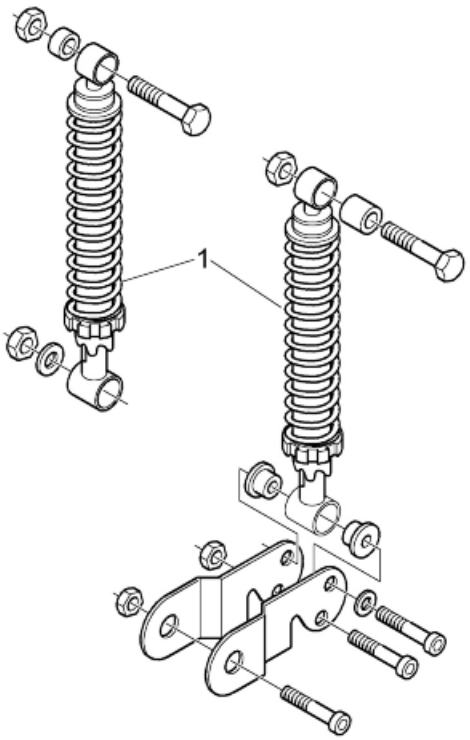
	Code	Action	Duration
1	007014	Radiator thermal switch - Replacement	
2	007002	Radiator - Replacement	
3	007016	Fan with support - replace	
4	007003	Coolant delivery and return pipe - Replacement	



Rear shock-absorber

REAR SHOCK ABSORBER

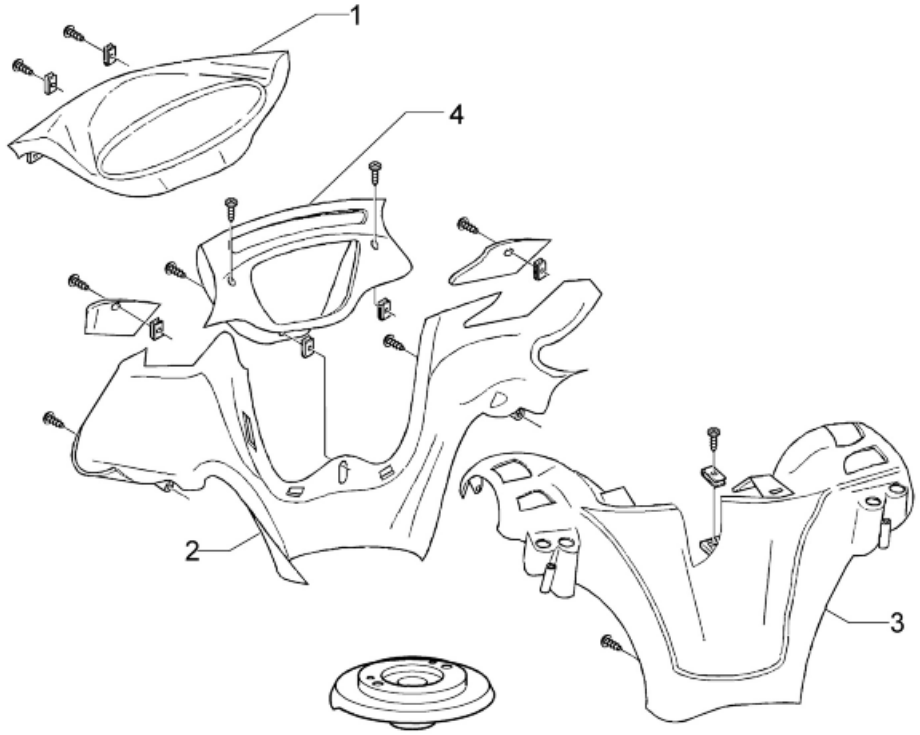
	Code	Action	Duration
1	003007	Rear shock absorber - Removal and Refitting	



Handlebar covers

HANDLEBAR COVERS

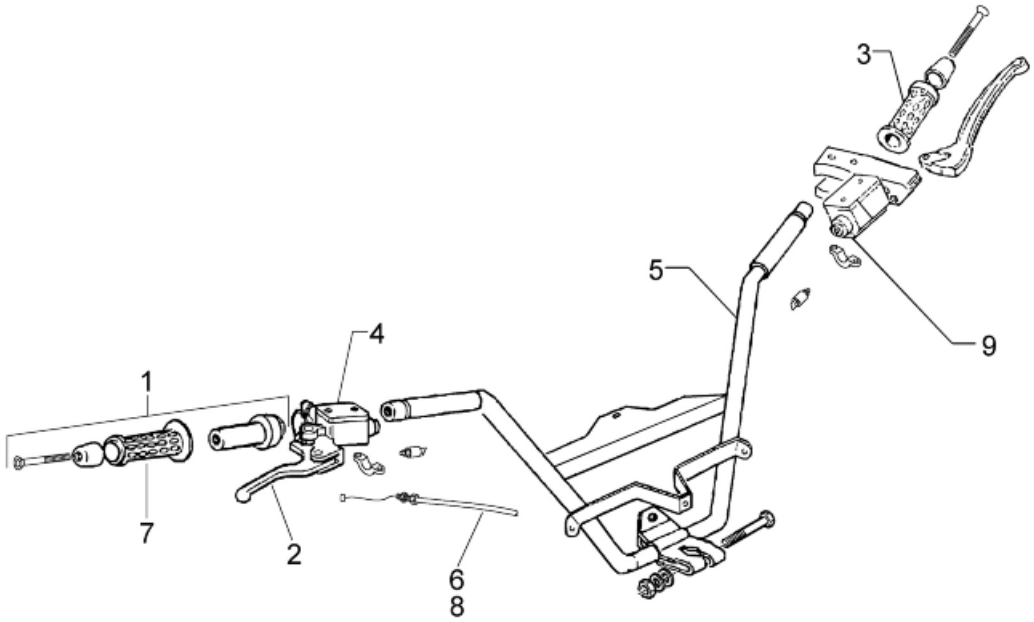
	Code	Action	Duration
1	004151	Instrument panel support - Replacement	
2	004018	Front handlebar covers - Replacement	
3	004019	Handlebar rear section - Replacement	
4	004152	Board computer cover - Replacement	



Handlebar components

HANDLEBAR COMPONENTS

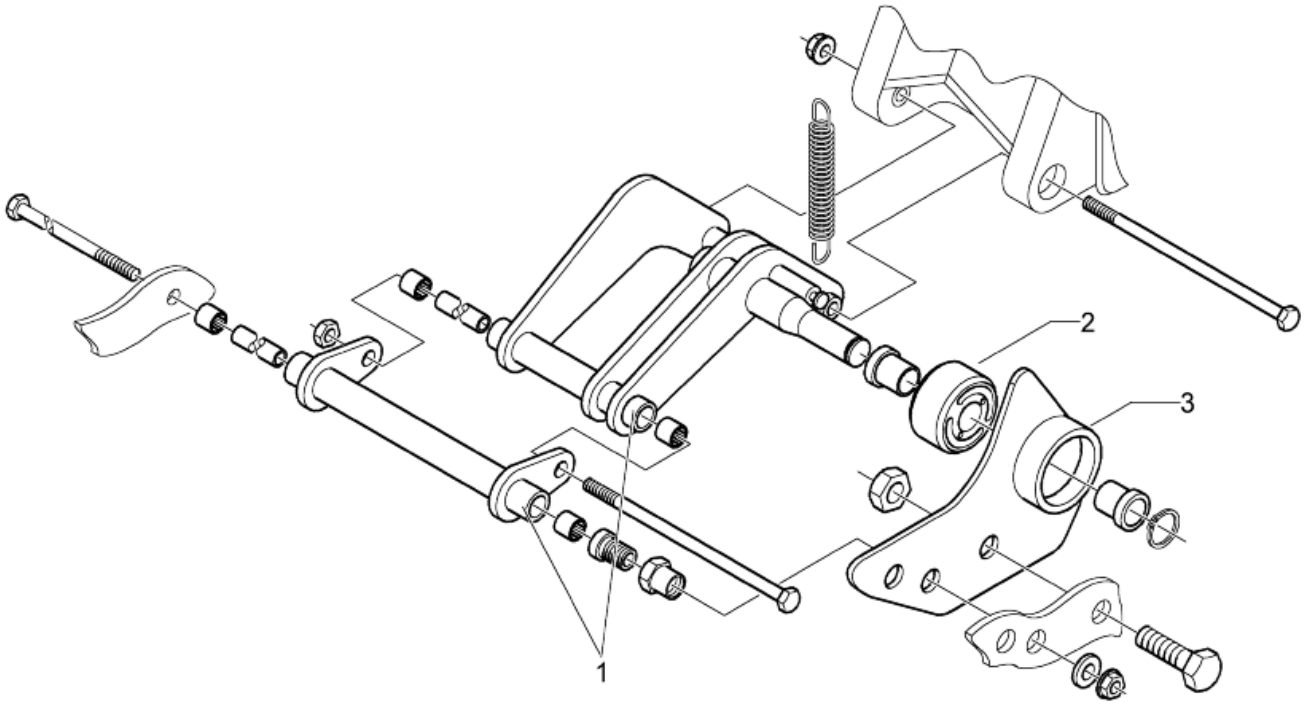
	Code	Action	Duration
1	002060	Complete gas command - Replacement	
2	002037	Brake or clutch lever - Replacement	
3	002071	Left hand grip - Replacement	
4	002024	Front brake pump - replace	
5	003001	Handlebar - Removal and refitting	
6	002063	Throttle control transmission - Replacement	
7	002059	Right hand grip - Replacement	
8	003061	Accelerator transmission - Adjustment	
9	002088	Integral brake pump - Replacement	



Swing-arm

SWING ARM

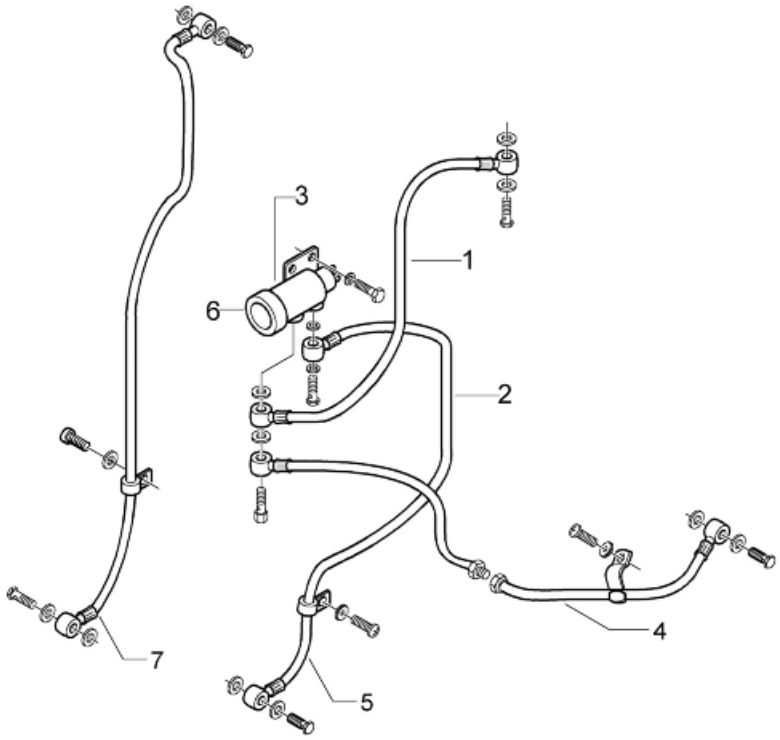
	Code	Action	Duration
1	001072	Engine / frame swinging arm fitting - Replacement	
2	004058	Silent block - Replacement	
3	003081	Swinging arm support flange - replace	



Brake hoses

BRAKE PIPING

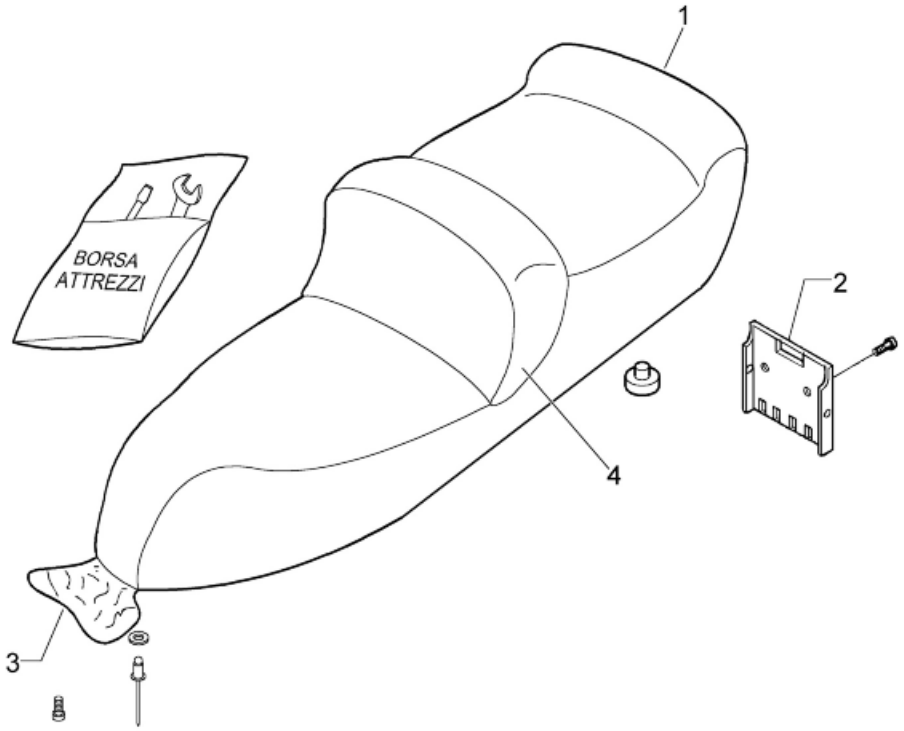
	Code	Action	Duration
1	002084	Integral break pump pipe, device - Replacement	
2	002085	Integral brake device pipe- front caliper - Replacement	
3	002089	Integral breaking device - Replacement	
4	002087	Integral brake rear rigid pipe- Replacement	
5	002086	Integral brake front rigid pipe- Replacement	
6	002090	Integral brake fluid and bleeding system - Replacement	
7	002021	Front brake piping - Replacement	



Seat

SADDLE

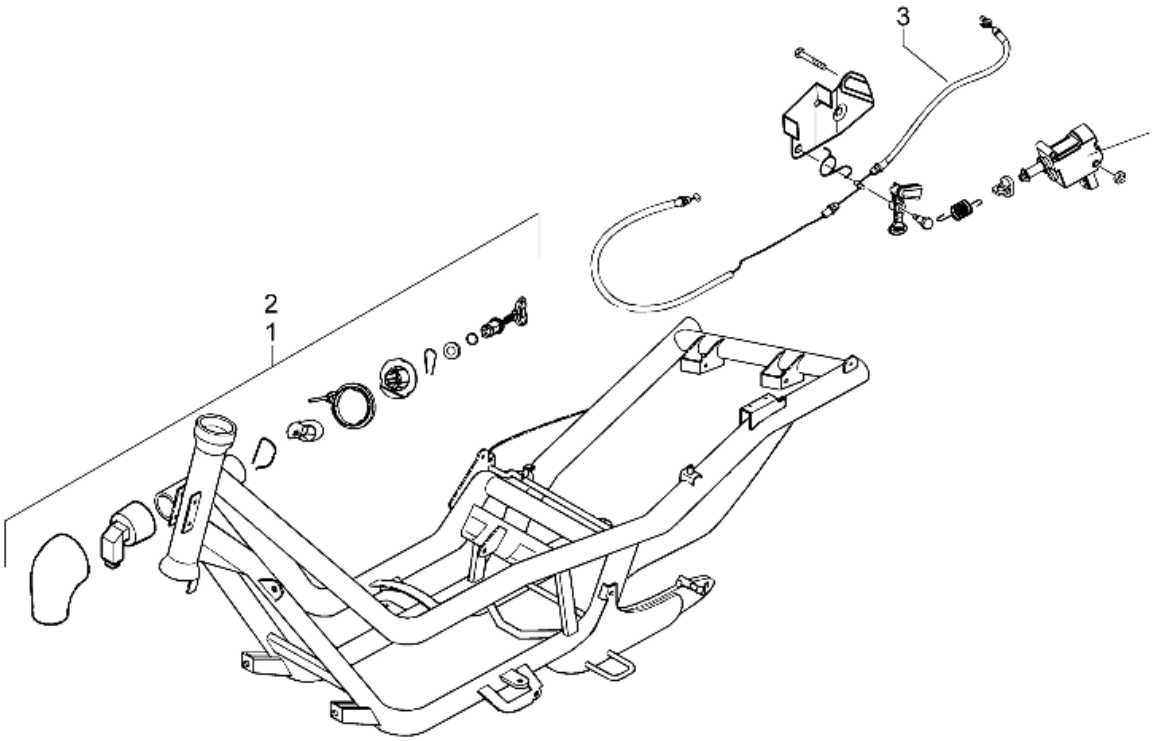
	Code	Action	Duration
1	004003	Saddle - Replacement	
2	004054	Saddle lock catch - Replacement	
3	004144	Port and/or saddle cover - Replacement	
4	004067	Rider backrest - Replacement	



Locks

LOCKS

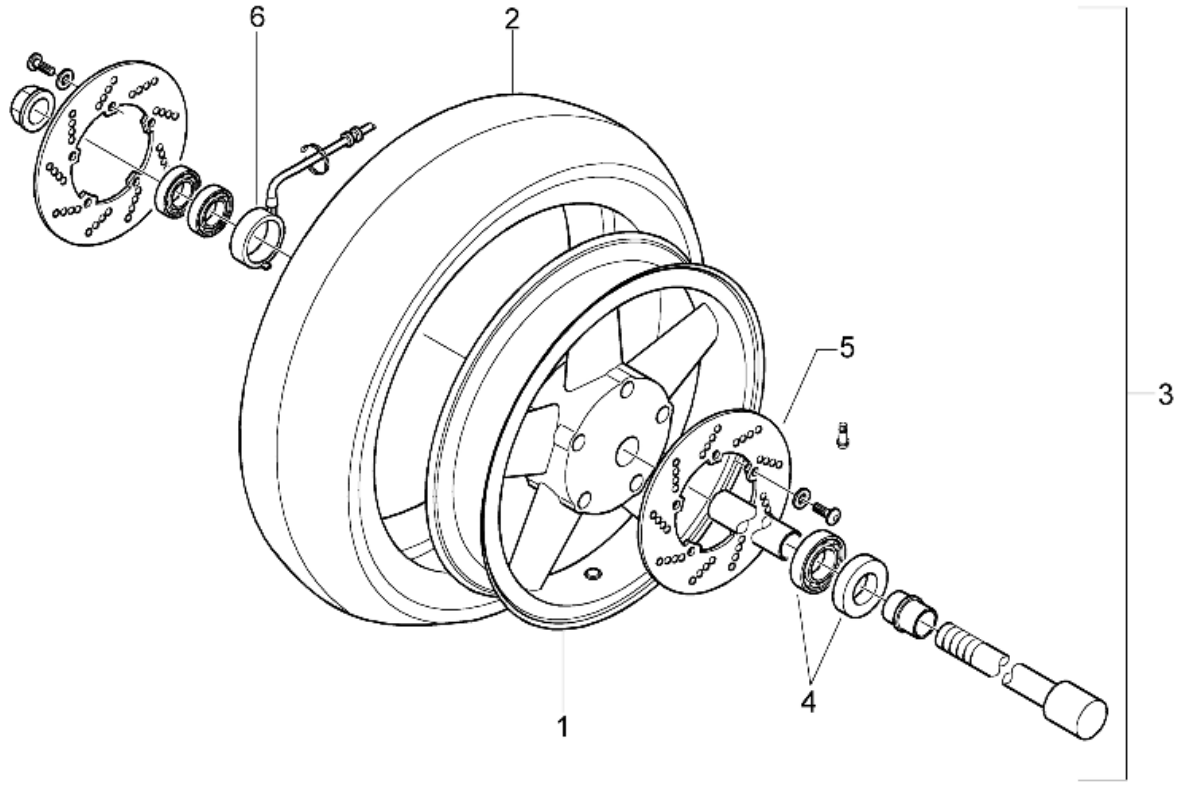
	Code	Action	Duration
1	005016	Key switch - Replacement	
2	004010	Antitheft lock - Replacement	
3	002083	Saddle opening transmission - Replacement	



Front wheel

FRONT WHEEL

	Code	Action	Duration
1	003037	Front wheel rim- Replacement	
2	003047	Front tyre - Replacement	
3	004123	Front wheel - Replacement	
4	003040	Tyre pressure - Check	
5	002041	Front brake disc - Replacement	
6	005089	Tone wheel - Replacement	



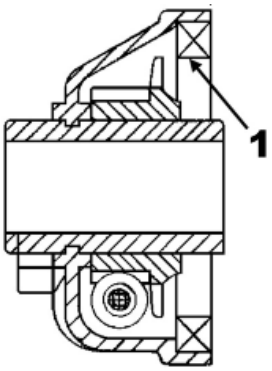
Grease tone wheel or drive

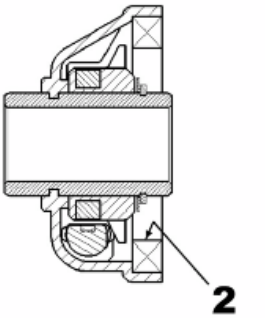
Please take note that the code has been introduced:

900001 - Tone wheel / drive greasing - 15'.

Never mistake the codes 002011 (movement sensor replacement) and 005089 (tone wheel replacement) in the event of noise of the indicated components. The grease recommended is TUTELA MRM 2 (soap-based lithium grease with Molybdenum disulphide).

In the following points we indicate with an arrow the area to be greased (1 - Drive, 2 - Tone wheel)

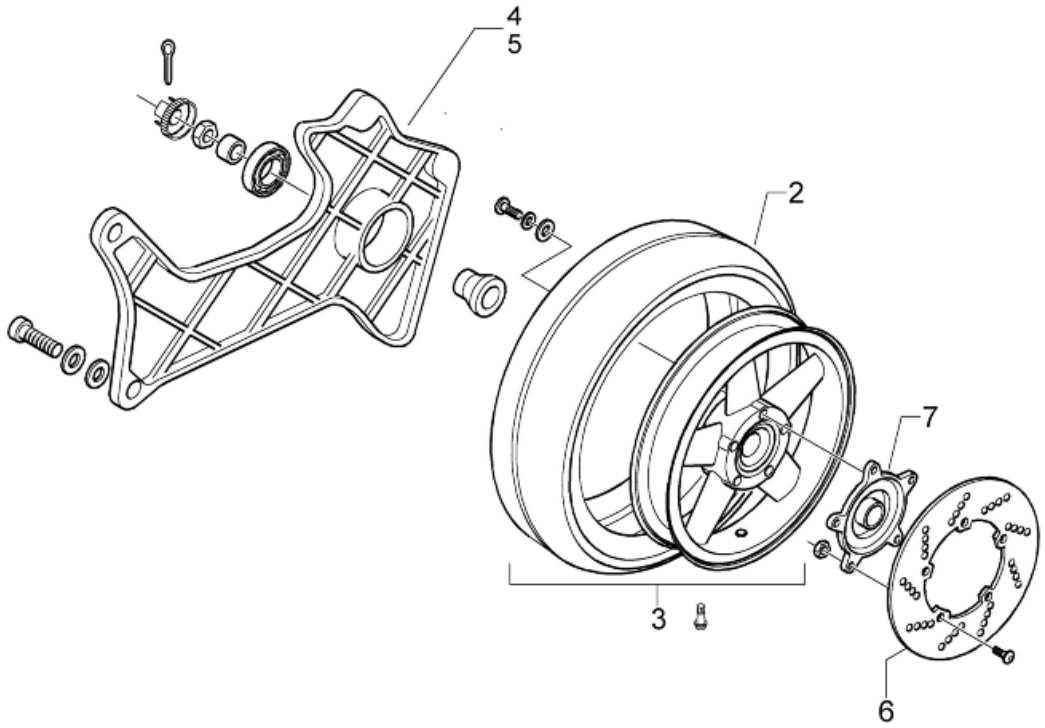




Rear wheel

REAR WHEEL

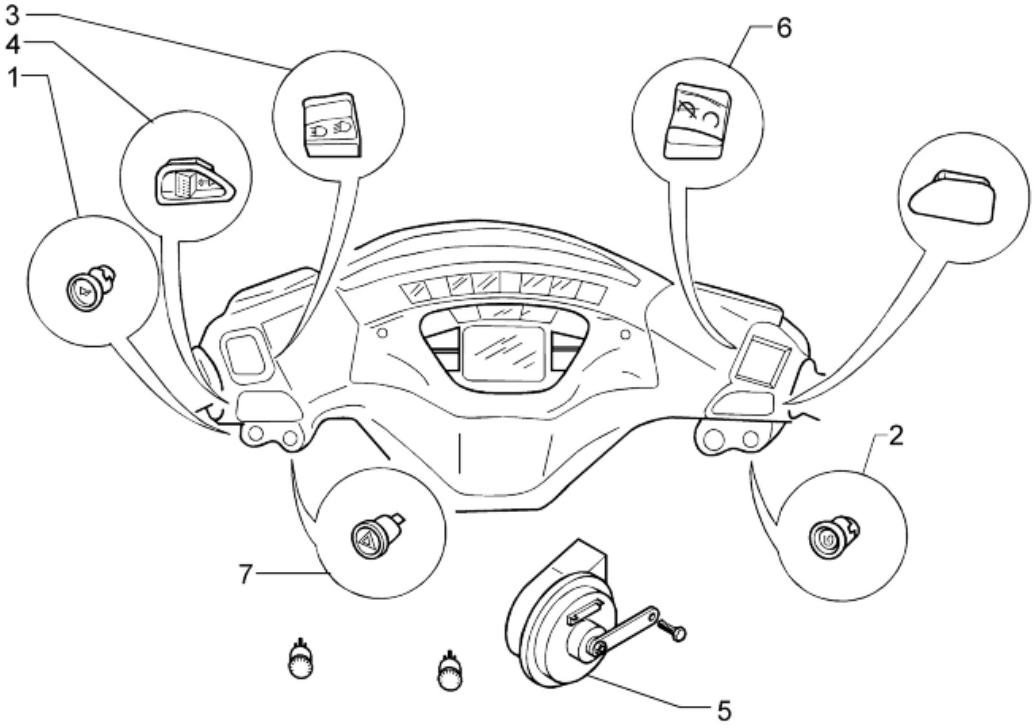
	Code	Action	Duration
1	001071	Rear wheel rim - Replacement	
2	004126	Rear wheel tyre - Replacement	
3	001016	Rear wheel - Replacement	
4	003014	Rear suspension arm - Replacement	
5	003077	muffler/rear shock absorber support arm - Service	
6	002070	Rear brake disc - Replacement	
7	002028	Rear wheel hub - Replacement	



Electric devices

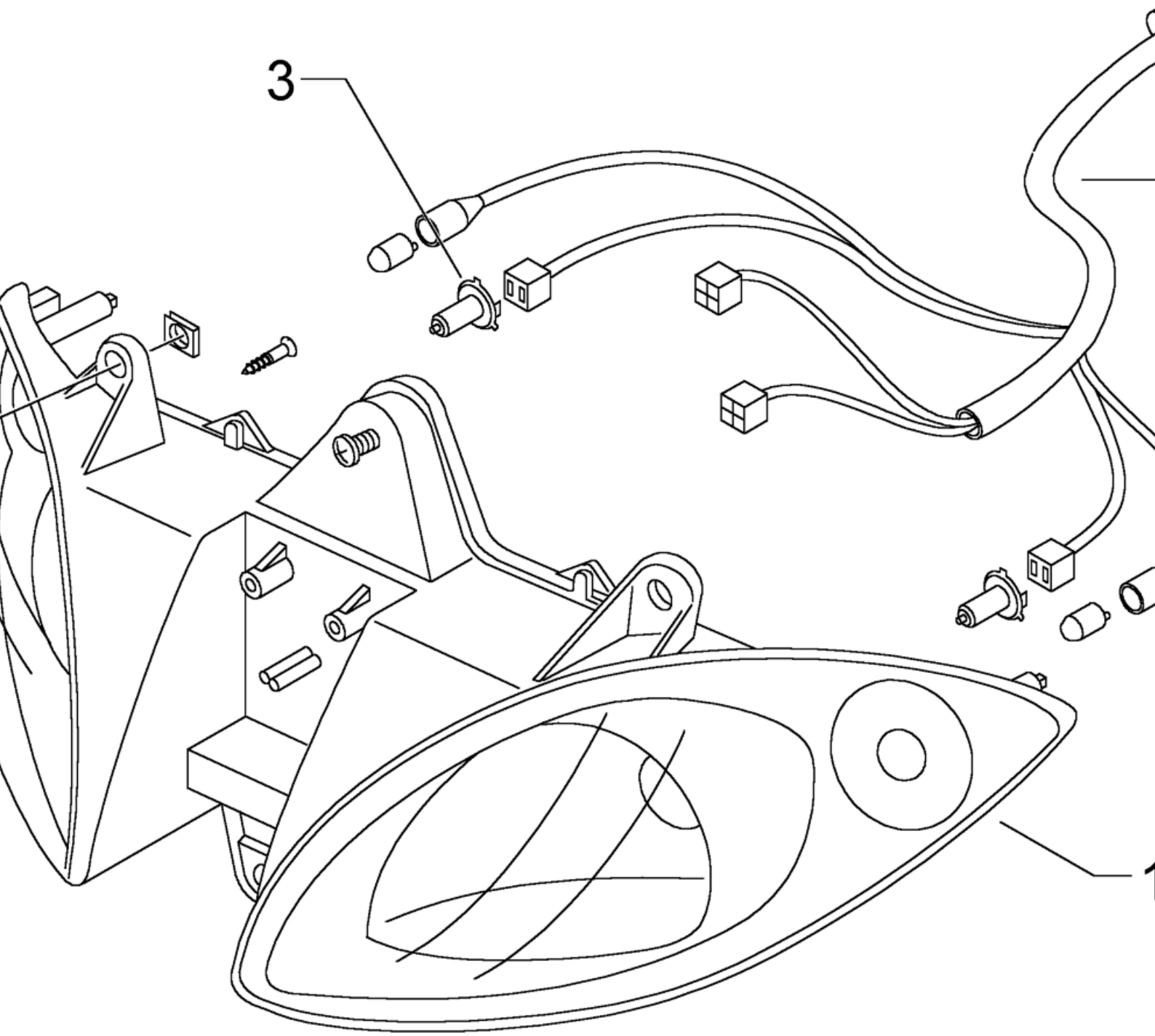
ELECTRIC DEVICES

	Code	Action	Duration
1	005040	Horn button - Replacement	
2	005041	Starter button - Replacement	
3	005039	Headlight switch - Replacement	
4	005006	Light switch or turn indicators - replace	
5	005003	Horn - Replacement	
6	005077	Emergency stop switch - Replacement	
7	005084	Emergency light switch - Replacement	



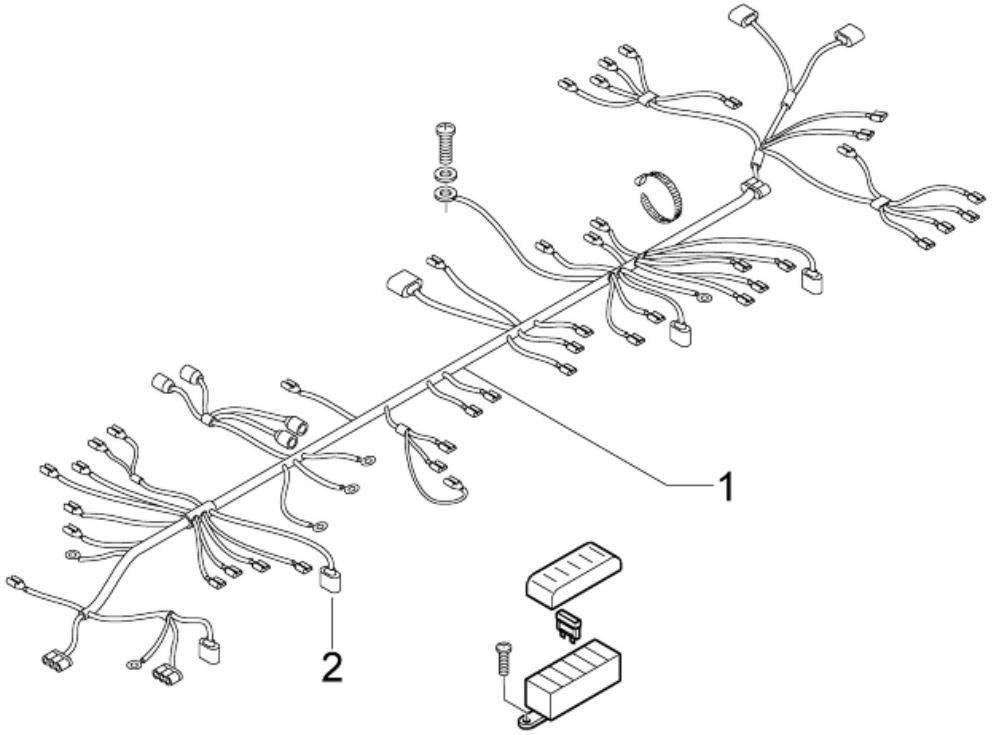
HEADLIGHT

	Code	Action	Duration
1	005002	Front headlamp - change	
2	005044	Front lights cable unit - replace	
3	005008	Front headlamp bulbs - Replacement	



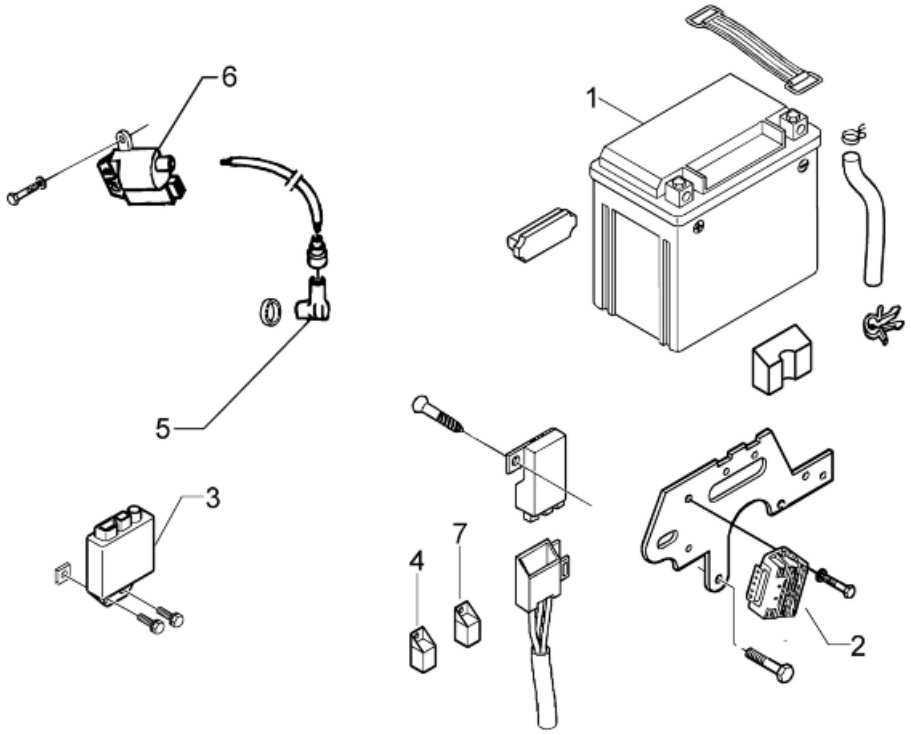
WIRING (WIRE UNIT)

	Code	Action	Duration
1	005001	Electrical system - Removal and re-fitting	
2	005025	Battery fuse box - Replacement	



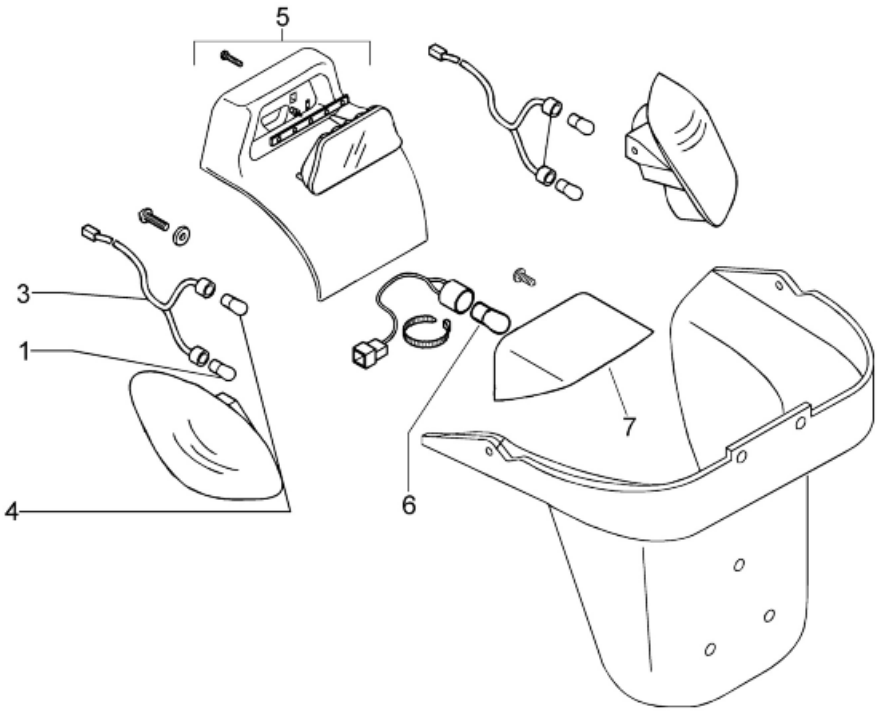
BATTERY

	Code	Action	Duration
1	005007	Battery - Replacement	
2	005009	Voltage regulator - Replacement	
3	001023	Control unit - Replacement	
4	005035	Headlight remote control - Replacement	
5	001094	Spark plug cap - Replacement	
6	001069	HV coil - Replacement	
7	005075	Stop remote control - Replacement	



ELECTRIC DEVICES

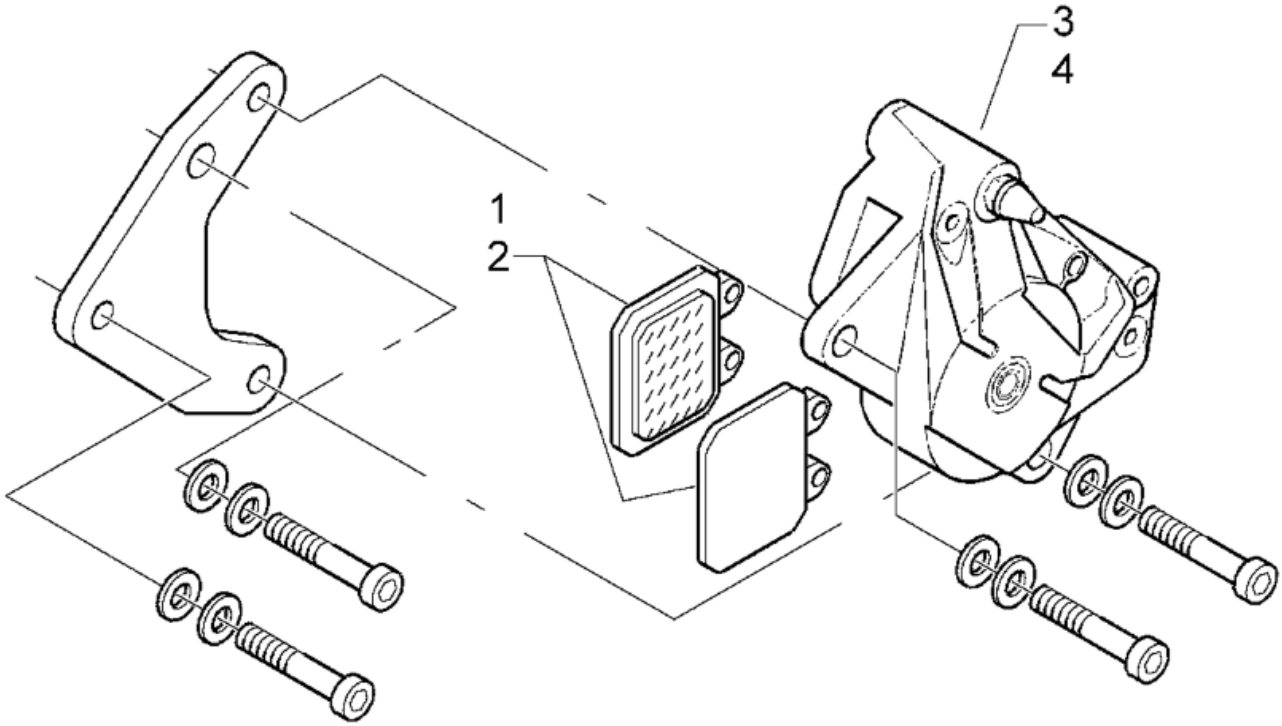
	Code	Action	Duration
1	005068	Rear turn indicator bulb - Replacement	
2	005005	Taillight - change	
3	005030	Rear telltale light and headlamp cable assembly - Replacement	
4	005066	Rear light bulbs - replace	
5	004141	Cat's eye - Replacement	
6	005031	Licence plate light bulb - Replacement	
7	005032	Transparent licence plate cover - replace	



Brake callipers

BRAKE CALIPERS

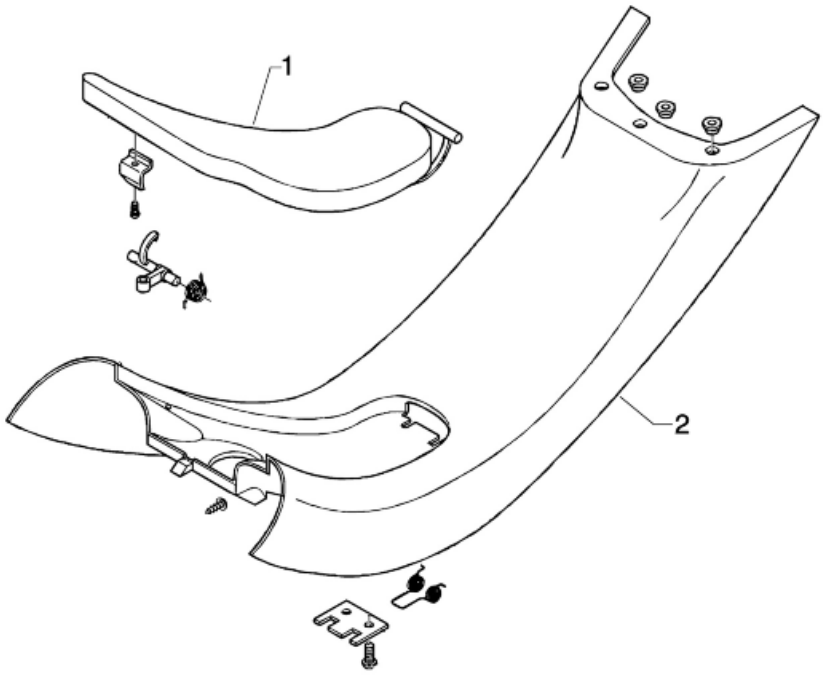
	Code	Action	Duration
1	002007	Front brake pads - replace	
2	002002	Rear brake pads - Replacement	
3	002039	Front brake calliper - Replacement	
4	002048	Rear brake caliper - Replacement	



Fuel tank filler flap

TANK PORT FOOTBOARD

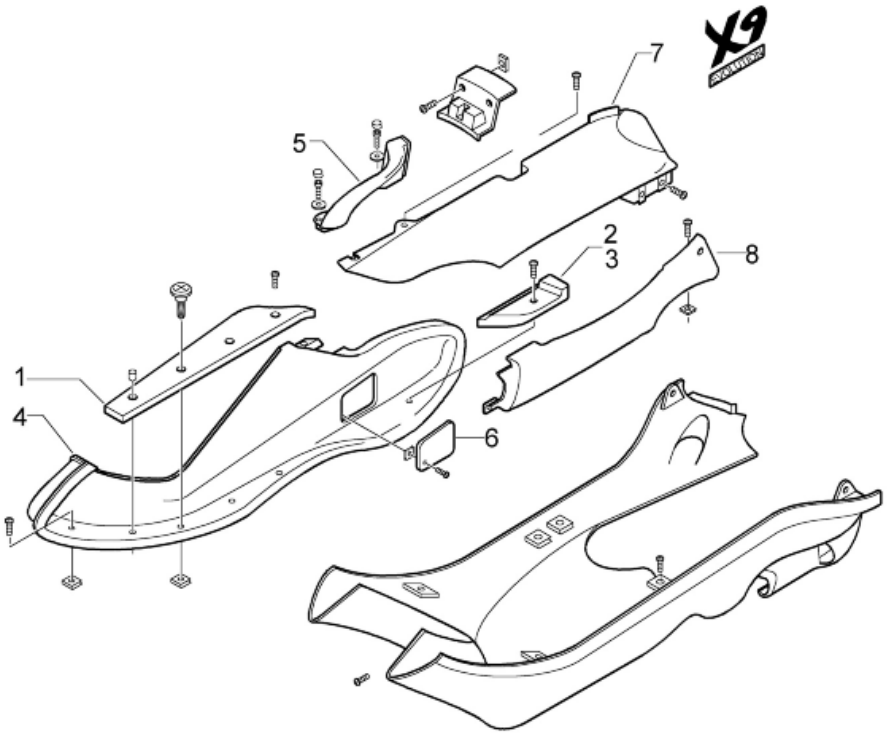
	Code	Action	Duration
1	004135	Fuel tank lid - Replacement	
2	004011	Central frame cover - replace	



Footrests

MATS

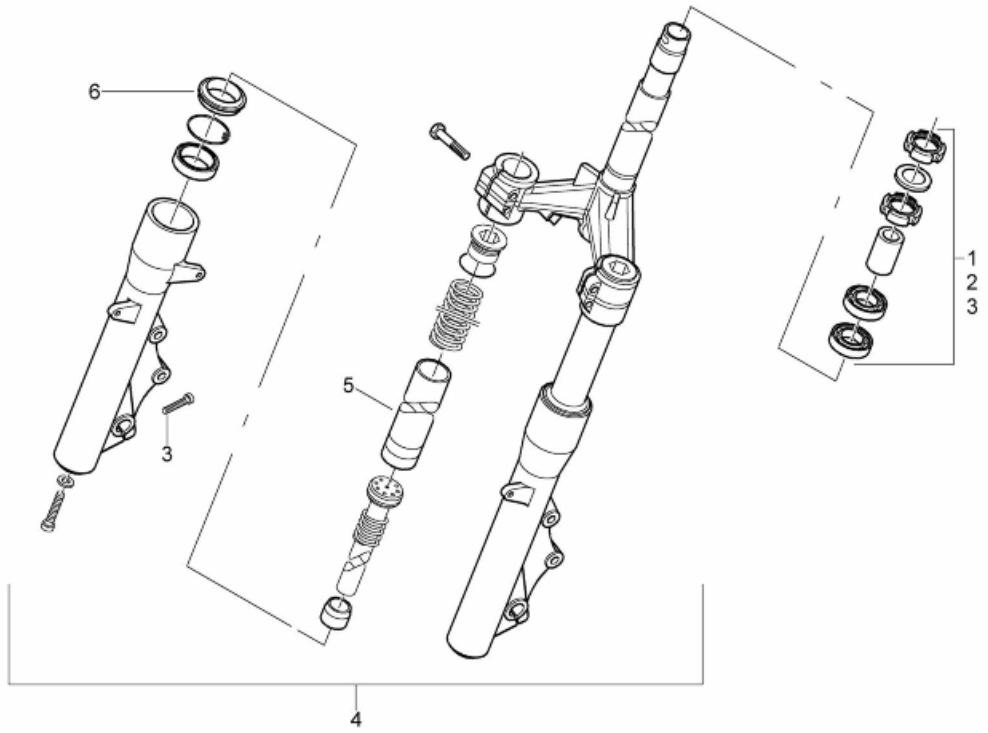
	Code	Action	Duration
1	004075	Front mat - Replacement	
2	004076	Single rear mat - Replacement	
3	004143	Footrest support - Replacement	
4	004015	Footrest - Replacement	
5	004068	One passenger grab handle - Replacement	
6	004059	Spark plug inspection flap - Replacement	
7	004012	Rear fairing - Replacement	
8	004129	Rear fairing - Replacement	



Steering column

STEERING WHEEL

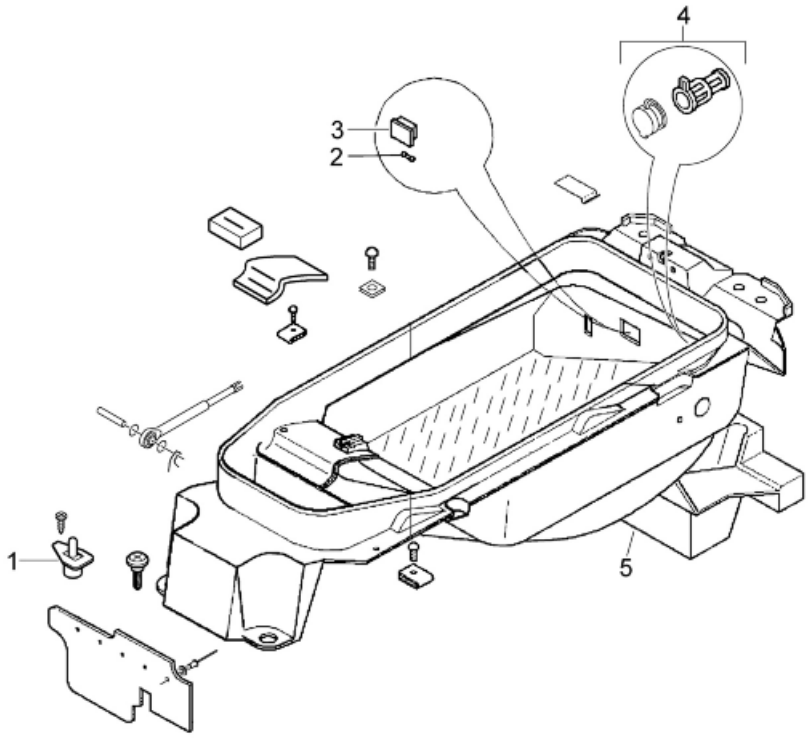
	Code	Action	Duration
1	004119	Bearing / Steering support fifth wheel - Replacement	
2	003002	Steering fifth wheel - Replacement	
3	003073	Steering clearance - Adjust	
4	003051	Fork assembly - Replacement	
5	003079	Fork stem - Replacement	
6	003048	Fork oil seal - Replacement	



Helmet bay

HELMET COMPARTMENT

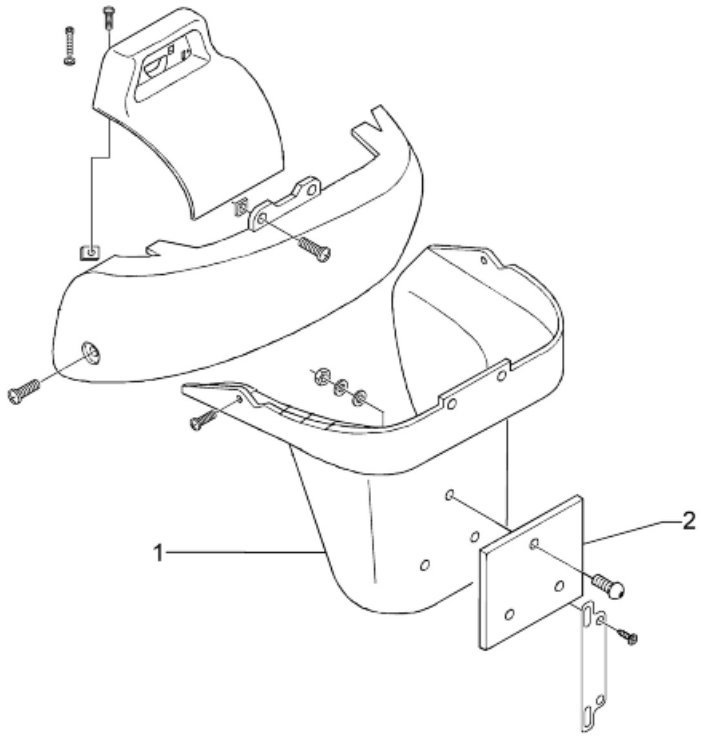
	Code	Action	Duration
1	005033	Glove-box light switch - Replacement	
2	005026	Helmet compartment light - Replacement	
3	005027	Helmet compartment bulb support - Replacement	
4	004142	electric socket - Replacement	
5	004016	Helmet compartment - Replacement	



Rear side fairings

REAR MUDGUARD

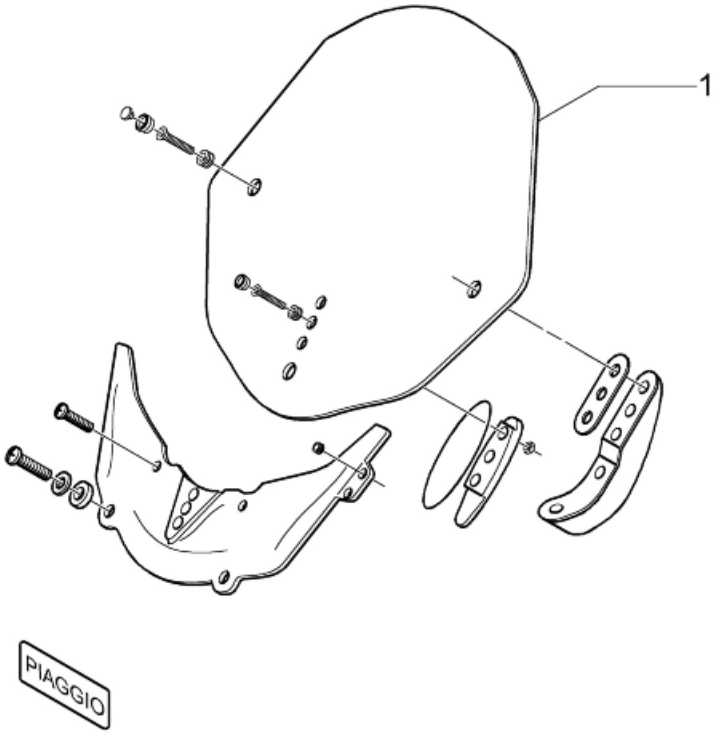
	Code	Action	Duration
1	004009	Rear mudguard - Replacement	
2	005048	Licence plate holder - Replacement	



Windscreen

WINDSCREEN

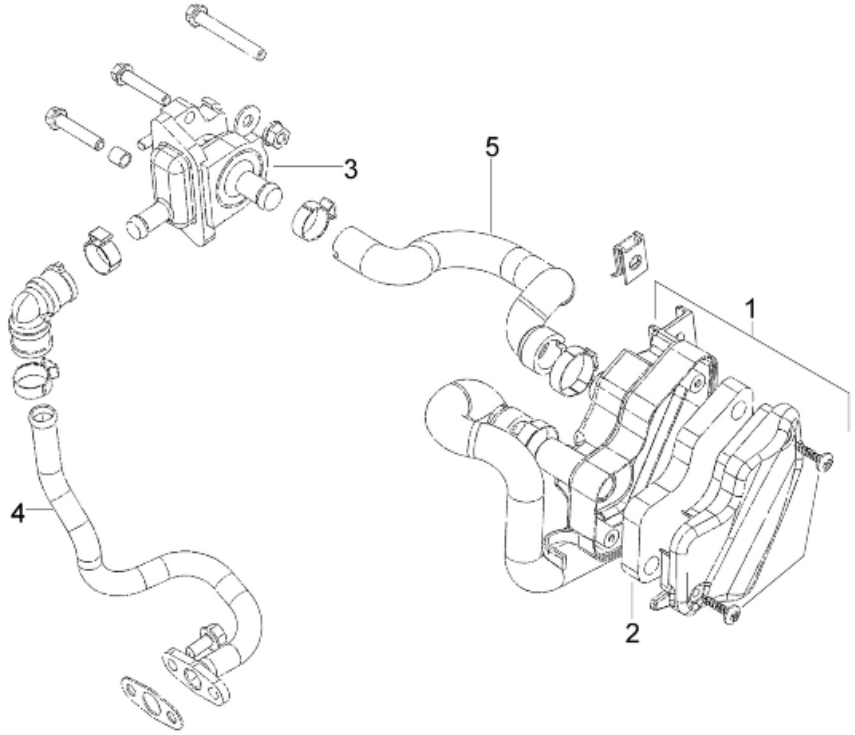
	Code	Action	Duration
1	004028	Windshield glass - Replacement	



Secondary air box

SECONDARY AIR HOUSING

	Code	Action	Duration
1	001162	Secondary air housing - Replacement	
2	001161	Secondary air filter - Replacement / Cleaning	
3	001174	SAS valve - Replacement	
4	001163	SAS valve / Head connection - Replacement	
5	001164	Crankcase secondary air connection - Replacement	


1
2
3
4
5

A

B

C

E

F

H

I

M

O

S

T