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# WORKSHOP MANUAL

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633367

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**ET4 50**

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# WORKSHOP MANUAL

## ET4 50

The descriptions and illustrations given in this publication are not binding. While the basic specifications as described and illustrated in this manual remain unchanged, PIAGGIO-GILERA reserves the right, at any time and without being required to update this publication beforehand, to make any changes to components, parts or accessories, which it considers necessary to improve the product or which are required for manufacturing or construction reasons.

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# WORKSHOP MANUAL

## ET4 50

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

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

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

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



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



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



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

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CHARACTERISTICS

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## Rules

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### 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 naked 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.
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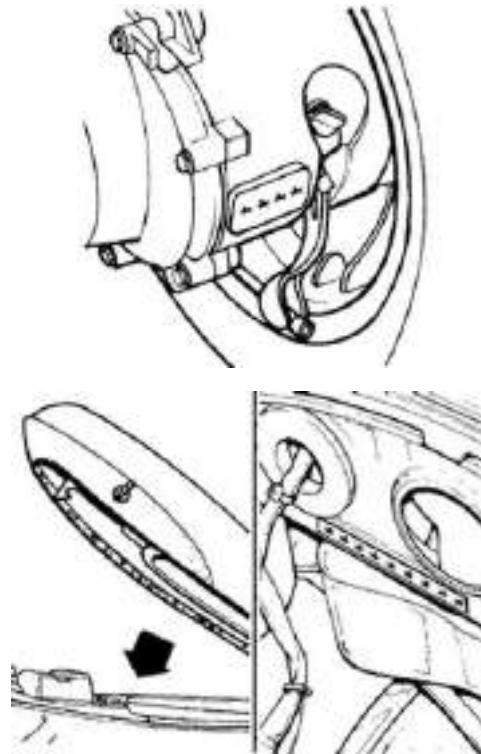
### Maintenance rules

- 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 tapered couplings, before refitting these parts.
  - 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 sizes. 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.
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### Vehicle identification

#### VEHICLE IDENTIFICATION

Specification	Desc./Quantity
Frame prefix	ZAPC2610000001001
Engine prefix	C261M



### Dimensions and mass

#### DIMENSIONS AND MASS

Specification	Desc./Quantity
Total unloaded kerb weight	105 Kg
Width	710 mm
Length	1780 mm
Wheelbase	1275 mm
Height	1090 mm





## Engine

### ENGINE

Specification	Desc./Quantity
Type	single-cylinder, four-stroke
Bore	39 mm
Stroke	41,8 mm
Cubic capacity	49.93 cm <sup>3</sup>
Compression ratio	11,5 ÷ 12 : 1
Timing system	single overhead camshaft, driven by a chain to the left side.
Vacuum carburettor	KEIHIN CVK Ø 18 mm WALBRO WP 16A
CO adjustment	3,2% ± 0,5
Engine idle	1900 ÷ 2000 rpm.
Air filter	Sponge impregnated with fuel mixture (50% SELENIA air filter oil and 50% unleaded petrol).
Starting system	electric starter/kickstarter
Lubrication	engine lubrication with lobe pump (in the crankcase) driven by a chain. Mesh prefilter and centrifugal on the crankshaft
Fuel supply	Gravity feed, with unleaded petrol (with a minimum octane rating of 95) with carburettor.
Max. power (crankshaft)	2,5 KW (3,4 CV) at 6500 rpm.
Cooling system	forced coolant circulation system
Valve clearance (cold engine)	intake 0.10 mm discharge 0.15 mm

## Transmission

### TRANSMISSION

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

## Capacities

### CAPACITIES

Specification	Desc./Quantity
Fuel tank (including ~ 2.3 l reserve)	~ 9l
Rear hub	80 cc
Engine oil	~ 850 cc

## Electrical system

### ELECTRICAL COMPONENTS

Specification	Desc./Quantity
Type of ignition	Capacitive discharge type electronic ignition, with incorporated high voltage coil
Ignition advance variable, with microprocessor (before T.D.C.)	10° at 1800-2000 rpm 26° at 5000-6000 rpm
Spark plug	Champion RG 4 PHP Champion RG 4 HC
Battery	12V-9Ah
Fuse	10A
Generator	single-phase alternating current

## Frame and suspensions

### FRAME AND SUSPENSIONS

Specification	Desc./Quantity
Type	Unitised body made of stamped plate
Front suspension	Single arm suspension with swinging arm articulated to the steering tube. Hydraulic double-acting shock absorber and co-axial spring
Front suspension stroke	70 mm
Trail (suspension rebounded/compressed)	71/68 mm
Rear suspension	Single hydraulic double-acting shock absorber, helicoidal co-axial spring. Chassis engine support with swinging arm.
Rear suspension bump position	80 mm

## Brakes

### BRAKES

Specification	Desc./Quantity
Front brake	Disc brake Ø 200 mm with hydraulic linkage (r.h brake lever).
Rear brake	Drum brake Ø 110 mm with mechanical linkage.

## Wheels and tyres

### WHEELS AND TYRES

Specification	Desc./Quantity
Front tyre dimension	100/80-10"
Rear tyre size	120/70-10"
Front tyre pressure:	1,3 bar
Rear tyre pressure:	1,8 ÷ 2 bar
Lightweight alloy wheels (front)	2,15" x 10"
Light alloy rims (rear rim)	3.00 x 10"

N.B.

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

## Carburettor

### 50cc Version

## Kehin

### CARBURETTOR KEHIN

Specification	Desc./Quantity
Manufacturer and Type	KEHIN CVK 18
Type	vacuum
Choke diameter	Ø 18 mm
Maximum thrust	75
Minimum jet	35
Starter jet	42
Emulsioner	Ø 2,1 mm
Tapered pin stamping	NACA
Notches from the top	the rod has no notches

Specification	Desc./Quantity
Fuel inlet hole	Ø 1,2 mm
Starter piston protrusion	11 mm at 24°C

## Tightening Torques

### STEERING ASSEMBLY

Name	Torque in Nm
Upper steering ring nut	30 ÷ 40
Lower steering ring nut	8 ÷ 10
Handlebar fastening	45 ÷ 50

### FRAME ASSEMBLY

Name	Torque in Nm
Engine-swinging arm bolt	33 ÷ 41
Floating arm-frame pin	44 ÷ 52
Shock absorber - chassis nut	20 ÷ 25
Shock absorber-engine nut	33 ÷ 41
Rear wheel nut	137 ÷ 152
Speedometer gear plate fixing screw	4 ÷ 6

### FRONT SUSPENSION

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

(°)Tighten these two bolts after tightening the shock absorber central upper nut.

**N.B.**

**FOR INFORMATION ON SAFETY TIGHTENINGS, REFER TO CHAPTER «PRE-CONSIGNMENT CHECKS».**

### FRONT BRAKE

Name	Torque in Nm
Brake fluid pump-hose fitting	8 ÷ 12
Brake fluid pipe-calliper fitting	20 ÷ 25
Screw tightening calliper to the support	20 ÷ 25
Brake disc screw	5 ÷ 6,5
Oil bleed valve (on the calliper)	10 ÷ 12
Handlebar pump	7 ÷ 10

### ENGINE ASSEMBLY

Name	Torque in Nm
Spark plug:	10 ÷ 15 Nm
Head cover screws	8 ÷ 10
Head-cylinder stud bolt nuts	6 ÷ 7 + 90° + 90° *
Screws fixing head and cylinder to crankcase	8 ÷ 10
Chain tensioner pad screw	5 ÷ 7 Nm
Timing chain tensioner central screw	5 - 6
Camshaft pulley screw	12 ÷ 14
Rocking lever axle and camshaft bearing screw	3 ÷ 4 Nm
Rocker-arm adjusting nuts:	7 ÷ 9 Nm
Engine oil pre-filter cover:	25 ÷ 28 Nm
Engine oil drainage cap	25 ÷ 28
Flywheel nut	40 to 44 N.m
Stator screws	3 ÷ 4
Pick-up screws	3 ÷ 4
Oil pump bulkhead screw	4 ÷ 5
Timing chain/oil pump compartment cover screws	4 ÷ 5

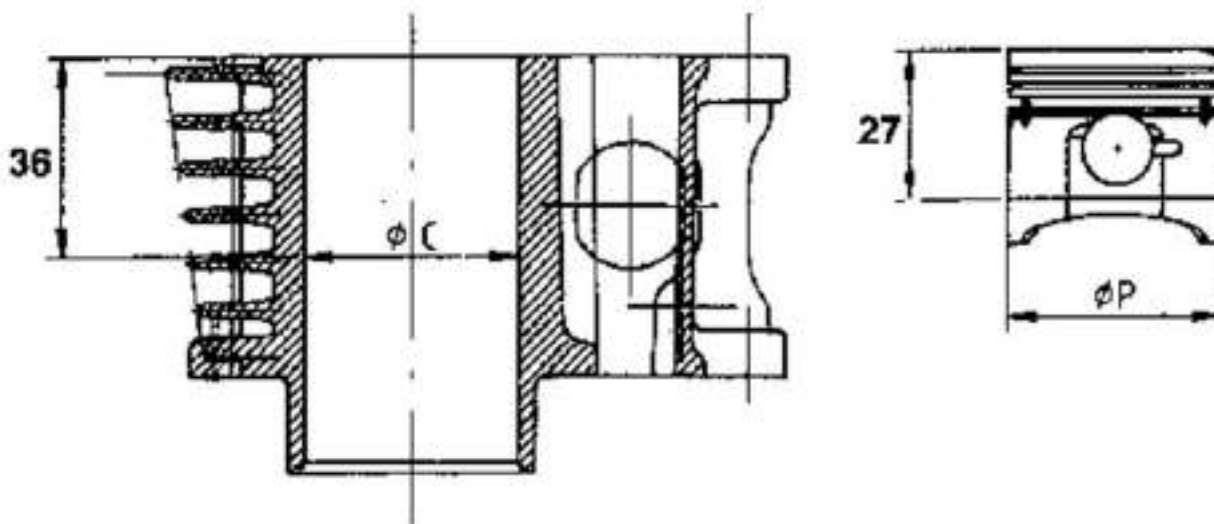
Name	Torque in Nm
Oil decantation labyrinth sheet screws	7 ÷ 8
Oil pump crown screw	8 ÷ 10
Screws fixing oil pump to crankcase	5 - 6
Oil sump screws	8 ÷ 10 Nm
Inlet manifold screw	7 ÷ 9
Manifold/carburettor clamp screw	1,2 ÷ 1,5
Screws fixing cables to starter motor	1.5 ÷ 2.5
Starter motor screws	11 ÷ 13
Transmission cover screws	11 ÷ 13
Start-up lever screw	11 ÷ 13
Crankcase cooling cover screw	2 ÷ 2.5
Clutch assembly nut	55 ÷ 60
Crankshaft pulley nut	18 to 20 + 90° Nm
Driven pulley shaft nut	40 to 44 Nm
Hub oil drainage screw	3 ÷ 5 Nm
Rear hub cover screws	11 ÷ 13
Wheel axle nut	115 ÷ 125
Crankcase half union screw	8 ÷ 10

\*When new stud bolts are assembled, tighten them with 3 turns at 90° after the first tightening at 6-7 N-m, therefore 6-7 N-m + 90 ° + 90 ° + 90 °, in a crosswise manner.

### Overhaul data

### Assembly clearances

#### Cylinder - piston assy.

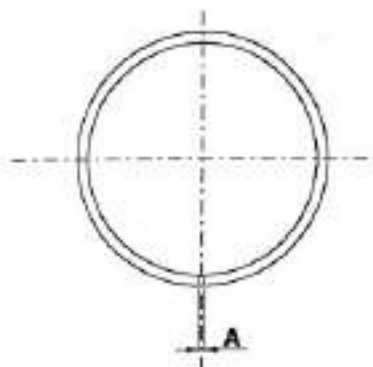


#### PISTON AND CYLINDER MATING

Name	Initials	Cylinder	Piston	Play on fitting
Cylindre Ø C (39 ±0,014)	A	38,986 ÷ 38,993	38,954 ÷ 38,961	0,025 ÷ 0,039
Cylindre Ø C (39 ±0,014)	B	38,993 ÷ 39,000	38,961 ÷ 38,968	0,025 ÷ 0,039
Piston Ø P (38,968 ±0,014)	C	39,000 ÷ 39,007	38,968 ÷ 38,975	0,025 ÷ 0,039

Name	Initials	Cylinder	Piston	Play on fitting
Piston Ø P (38,968 ±0,014)	D	39,007 ÷ 39,014	38,975 ÷ 38,982	0,025 ÷ 0,039
Cylindre 1st oversize Ø C (39,2 ±0,014)	A 1	39,186 ÷ 39,193	39,154 ÷ 39,161	0,025 ÷ 0,039
Cylindre 1st oversize Ø C (39,2 ±0,014)	B1	39,193 ÷ 39,200	39,161 ÷ 39,168	0,025 ÷ 0,039
Piston 1st oversize Ø P (39,168 ±0,014)	C 1	39,200 ÷ 39,207	39,168 ÷ 39,175	0,025 ÷ 0,039
Piston 1st oversize Ø P (39,168 ±0,014)	D 1	39,207 ÷ 39,214	39,175 ÷ 39,182	0,025 ÷ 0,039
Cylindre 2nd oversize Ø C (39,4 ±0,014)	A 2	39,386 ÷ 39,393	39,354 ÷ 39,361	0,025 ÷ 0,039
Cylindre 2nd oversize Ø C (39,4 ±0,014)	B 2	39,393 ÷ 39,400	39,361 ÷ 39,368	0,025 ÷ 0,039
Piston 2nd oversize Ø P (39,368 ±0,014)	C 2	39,400 ÷ 39,407	39,368 ÷ 39,375	0,025 ÷ 0,039
Piston 2nd oversize Ø P (39,368 ±0,014)	D 2	39,407 ÷ 39,414	39,375 ÷ 39,382	0,025 ÷ 0,039
Cylindre 3rd oversize Ø C (39,6 ±0,014)	A 3	39,586 ÷ 39,593	39,554 ÷ 39,561	0,025 ÷ 0,039
Cylindre 3rd oversize Ø C (39,6 ±0,014)	B 3	39,593 ÷ 39,600	39,561 ÷ 39,568	0,025 ÷ 0,039
Piston 3rd oversize Ø P (39,568 ±0,014)	C 3	39,600 ÷ 39,607	39,568 ÷ 39,575	0,025 ÷ 0,039
Piston 3rd oversize Ø P (39,568 ±0,014)	D 3	39,607 ÷ 39,614	39,575 ÷ 39,582	0,025 ÷ 0,039

## Piston rings

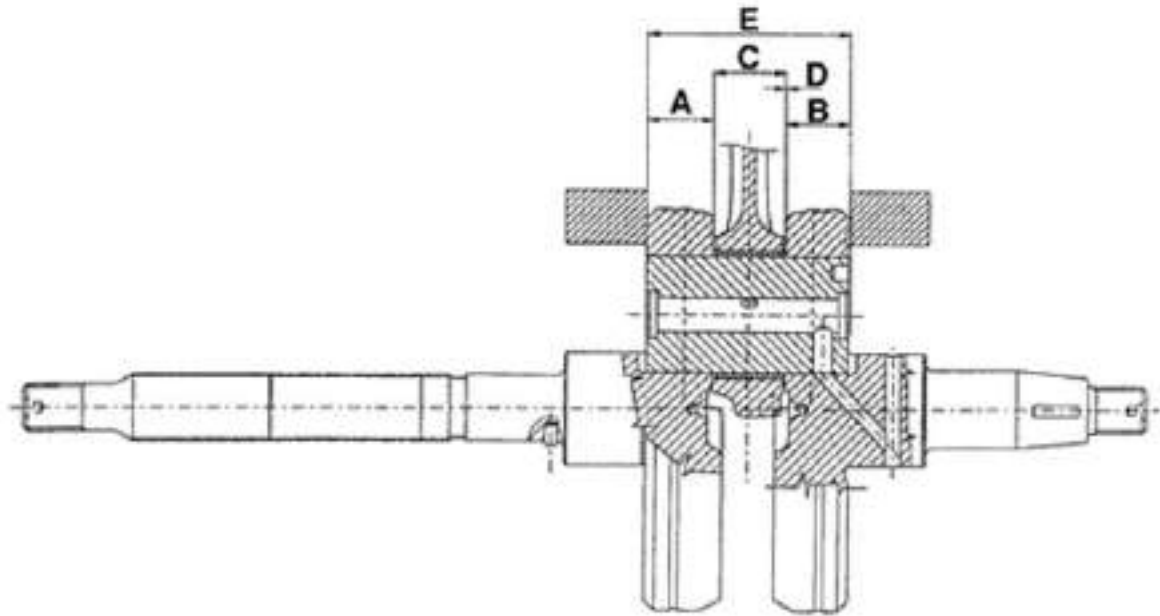


### UPRATING TABLE

Name	Description	Dimensions	Initials	Quantity
1° Compression lining		39 x 1	A	0,08 ÷ 0,20
2° Compression lining		39 x 1	A	0,05 ÷ 0,20
Scraper ring lining		39 x 2	A	0,20 ÷ 0,70
1° Compression lining 1° greater		39,2 x 1	A	0,08 ÷ 0,20
2° Compression lining 1° greater		39,2 x 1	A	0,05 ÷ 0,20
Scraper ring lining 1° greater		39,2 x 2	A	0,20 ÷ 0,70
1° Compression lining 2° greater		39,4 x 1	A	0,08 ÷ 0,20
2° Compression lining 2° greater		39,4 x 1	A	0,05 ÷ 0,20
Scraper ring lining 2° greater		39,4 x 2	A	0,20 ÷ 0,70
1° Scraper ring lining 3° greater		39,6 x 1	A	0,08 ÷ 0,20
2° Scraper ring lining 3° greater		39,6 x 1	A	0,05 ÷ 0,20

Name	Description	Dimensions	Initials	Quantity
Scrapers	ring lining 3° greates	39,6 x 2	A	0,20 ÷ 0,70

**Crankcase - crankshaft - connecting rod**



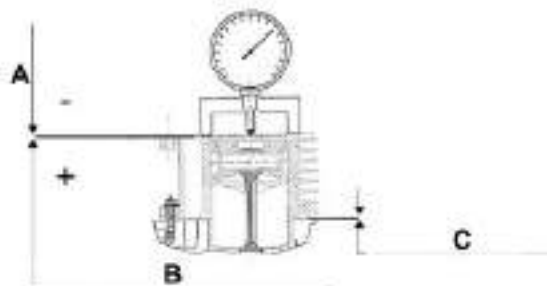
**END PLAY BETWEEN DRIVING SHAFT AND CONNECTING ROD**

Name	Description	Dimensions	Initials	Quantity
Transmission side half shaft		14 +0 -0.005	A	
Flywheel side half shaft		16 +0 -0.005	B	
Connecting rod		14.8 +0.05 -0	C	
Spacing tool		45,00 / assembly games D = 0,15 ÷ 0,30	E	

**Slot packing system**

Shimming method for limiting the compression ratio

$Rc = 11,5 \div 12$



**A** = MEASUREMENT «A» (WITH PISTO AT T.D.C.)

**B** = MEASUREMENT «A» IS TO BE TAKEN WITHOUT ANY GASKET BETWEEN THE CRANKCASE AND THE CYLINDER

**C** = FIT THE GASKET SHOWN IN THE TABLE ACCORDING TO SIZE «A»

N.B.

**MEASUREMENT «A» IS A PISTON RECESS VALUE**

The more the piston protrudes out of the plane generated by the top section of the cylinder, the thicker the gasket to be applied (to recover the compression ratio) and vice-versa.

**THICKNESS (IN FIBER)**

Specification	Desc./Quantity
CYLINDER HEIGHT	57,15 ± 0,05
HEAD GASKET THICKNESS (IN FIBER)	0,95 ± 0,06
MEASUREMENT 0,9 ± 0,05	BASE GASKET THICKNESS 0,4
MEASUREMENT 1 ± 0,05	BASE GASKET THICKNESS 0,5

**THICKNESS (IN STEEL)**

Specification	Desc./Quantity
HEAD GASKET THICKNESS (steel)	0,3 ± 0,05
CYLINDER HEIGHT	57,15 ± 0,05
MEASUREMENT 0,20 ± 0,05	BASE GASKET THICKNESS 0,4
MEASUREMENT 0,30 ± 0,05	BASE GASKET THICKNESS 0,5

**Products****TABLE OF RECOMMENDED PRODUCTS**

Product	Description	Specifications
AGIP ROTRA 80W-90	Rear hub oil	SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications
AGIP CITY HI TEC 4T	Oil to lubricate flexible transmissions (brakes, throttle control and odometer)	Oil for 4-stroke engines
AGIP FILTER OIL	Oil for air filter sponge	Mineral oil with specific additives for increased adhesiveness
AGIP CITY HI TEC 4T	Engine oil	SAE 5W-40, API SL, ACEA A3, JASO MA Synthetic oil
AGIP GREASE MU3	Grease for odometer transmission gear case	Soap-based lithium grease with NLGI 3; ISO-L-XBCHA3, DIN K3K-20
AGIP BRAKE 4	Brake fluid	FMVSS DOT 4 Synthetic fluid
MONTBLANC MOLYBDENUM GREASE	Grease for driven pulley shaft adjusting ring and movable driven pulley housing	Grease with molybdenum disulphide
AGIP GREASE PV2	Grease for steering bearings, bolt seatings for swinging arms and contact surface of driven pulley spring (only pulley side)	Lithium soap and zinc oxide grease NLGI 2; ISO-L-XBCIB2
AGIP GP 330	Grease for brake levers, throttle	White calcium complex soap-based spray grease with NLGI 2; ISO-L-XBCIB2







## INDEX OF TOPICS

TOOLING







TOOL



**TOOLING**

Stores code	Description	
001467Y008	Pliers to extract 17 mm ø bearings	
001467Y029	Bell for bearings, O.D. 38 mm	
004499Y	Bearing extractor. Fitted with: 1 Bell, 2 Sleeve, 3 Screw, 6 Ring, 27 Half rings, 34 Half rings	
005095Y	Engine support	
008119Y009	Tube to assemble shafts and axles	
020004Y	Punch for removing fifth wheels from headstock	

Stores code	Description	
020055Y	Wrench for steering tube ring nut	
020074Y	Tool to align crankshaft	
020150Y	Air heater support	
020151Y	Air heater	
020162Y	Flywheel extractor	
020171Y	Punch for driven pulley roller bearing	
020265Y	Bearing fitting base	

Stores code	Description	
020288Y	Fork to assemble piston on cylinder	
020291y	Valves assembly/disassembly tool	
020306Y	Punch for assembling valve seal rings	
020329Y	MityVac vacuum-operated pump	
020330Y	Stroboscopic light to check timing	
020331Y	Digital multimeter	

Stores code	Description
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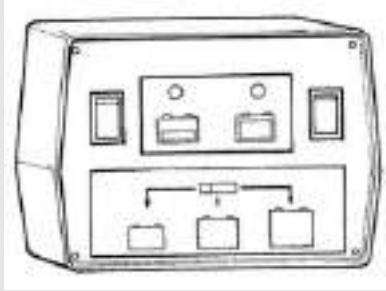
020332Y

Digital rev counter



020333Y

Single battery charger



020334Y

Multiple battery charger



020335Y

Magnetic support for dial gauge




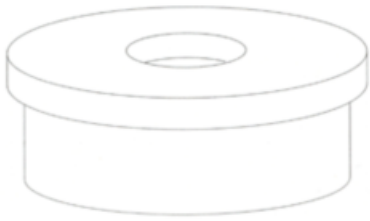




020340Y







Flywheel and transmission oil seals fitting punch







020358Y

37x40-mm adaptor

Stores code	Description	
020359Y	42x47-mm adaptor	
020360Y	Adaptor 52 x 55 mm	
020362Y	12 mm guide	
020363Y	20 mm guide	
020364Y	25-mm guide	
020376Y	Adaptor handle	

Stores code	Description	
020431Y	Valve oil seal extractor	
020432Y	Tool to fit the start-up sector spring	
020439Y	17 mm guide	
020444Y	Test probe removal / fitting tool	
020448Y	Pin lock fitting tool	
020449Y	Piston position check support	
020450Y	Camshaft fitting/removal tool	
020451Y	Drive pulley stop wrench	

Stores code	Description	
020452Y	Tube for removing and refitting the driven pulley shaft	
020456Y	Ø 24 mm adaptor	
020565Y	Flywheel lock calliper spanner	
494929Y	Exhaust fumes analyser	

## INDEX OF TOPICS

**MAINTENANCE**

**MAIN**



## Maintenance chart

### AT 1000 KM OR 4 MONTHS

80'

#### Action

Hub oil - change
Valve clearance - check
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 - check
Vehicle and brake test - road test
Emergency blockings (°) - Check

(\*) Refer to rules «Adjusting the idle speed»

(°) Refer to predelivery operations

### AT 6000 KM OR 12 MONTHS, 18000 KM OR 36 MONTHS, 30000 KM, AT 42000 KM, AT 54000 KM AND AT 66000 KM

70'

#### Action

Engine oil - replacement
Hub oil level - check
Oil filter (net filter) - clean
Variable speed rollers - check or replacement
Brake pads - check condition and wear
Brake fluid level - check
Electrical system and battery - check
Tyres condition and wear - Check
Tyre pressure - check
Vehicle and brake test - road test

### AT 12000 OR 24 MONTHS AND AT 60000 KM

125'

#### Action

Engine oil - replacement
Hub oil level - check
Spark plug / electrode gap - check / replacement
Air filter - clean
Oil filter (net filter) - clean
Idle speed (*) - adjustment
Throttle lever - adjustment
Variable speed rollers - check or replacement
Driving belt - replacement
Odometer gear - greasing
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid level - check
Transmission elements - lubrication
Emergency blockings (°) - Check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Tyres condition and wear - Check
Tyre pressure - check
Vehicle and brake test - road test

\* Refer to rules

(°) Refer to predelivery operations

### **AT 24000 KM OR 48000 KM**

160'

#### **Action**

Engine oil - replacement
Hub oil level - replacement
Spark plug / electrode gap - check / replacement
Air filter - clean
Oil filter (net filter) - clean
Valve clearance - check
Idle speed (*) - adjustment
Throttle lever - adjustment
Variable speed rollers - check or replacement
Driving belt - replacement
Cylinder ventilation system - check
Odometer gear - greasing
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid level - check
Transmission elements - lubrication
Emergency blockings (°) - Check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Tyres condition and wear - Check
Tyre pressure - check
Vehicle and brake test - road test

\* Refer to rules

(°) Refer to predelivery operations

### **AT 36000 KM**

175'

#### **Action**

Engine oil - replacement
Hub oil level - check
Spark plug / electrode gap - check / replacement
Air filter - clean
Oil filter (net filter) - clean
Idle speed (*) - adjustment
Throttle lever - adjustment
Variable speed rollers - check or replacement
Driving belt - replacement
Odometer gear - greasing
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid hoses - replacement
Brake fluid level - check
Transmission elements - lubrication
Emergency blockings (°) - Check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Tyres condition and wear - Check
Tyre pressure - check
Vehicle and brake test - road test

\* Refer to rules

(°) Refer to predelivery operations

### **AT 72000 KM**

210'

**Action**

Engine oil - replacement
Hub oil level - replacement
Spark plug / electrode gap - check / replacement
Air filter - clean
Oil filter (net filter) - clean
Valve clearance - check
Idle speed (*) - adjustment
Throttle lever - adjustment
Variable speed rollers - check or replacement
Driving belt - replacement
Cylinder ventilation system - check
Odometer gear - greasing
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid hoses - replacement
Brake fluid level - check
Transmission elements - lubrication
Emergency blockings (°) - Check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Tyres condition and wear - Check
Tyre pressure - check
Vehicle and brake test - road test

\* Refer to rules

(°) Refer to predelivery operations

**EVERY 3,000 KM**

10'

**Action**

Engine oil - level check/ top-up
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**EVERY 2 YEARS**

**Action**

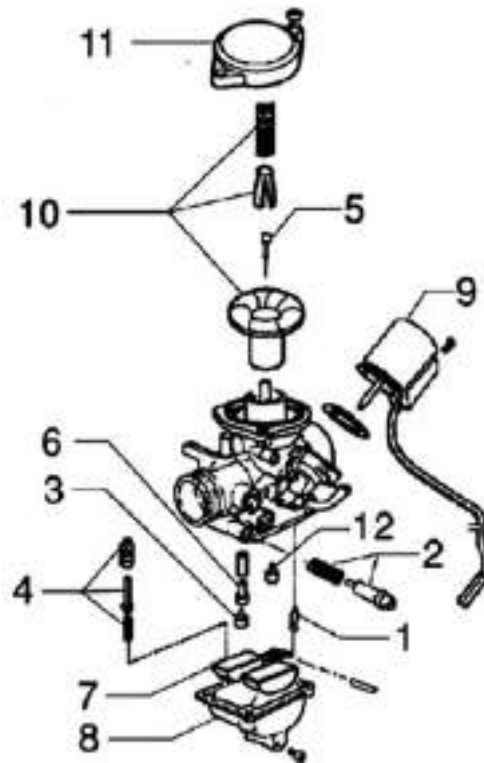
Brake fluid - change
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## Carburettor

- 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 valve in case of wear due to excessive clearance.
- 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**



1. Needle valve - 2. Idle speed adjustment screw - 3. Max jet - 4. Accelerating pump - 5. Tapered pin - 6. Jet holder - 7. Float - 8. Tank - 9. Starter device - 10. Vacuum valve - 11. Cover - 12. Minimum jet.

## Checking the spark advance

The vehicle is provided with a variable spark advance electronic device. Two reference marks for the timing can be found on the flywheel cover as to find out with more precision the reference mark on the fan. To check, use a stroboscopic gun Tecnotest 130/P or similar type. Start the engine and let it run at 1900 revs/min, act on the phase shifter to align the reference mark on the flywheel fan in between the two reference marks on the casing; at the same time, read the spark advance value on the stroboscopic gun display. The value should be 10°.

Repeat the above operation with engine running at 5000-6000 revs/min, spark advance should be 26°.

### CAUTION

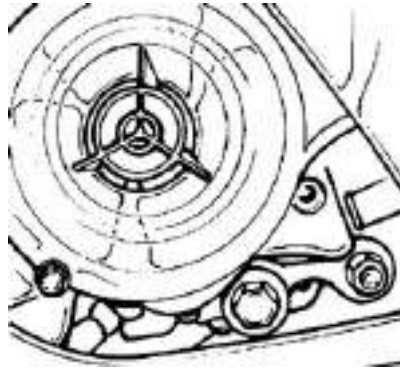
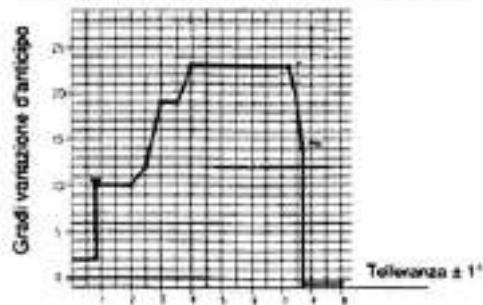
**SHOULD THE FLASH INDICATIONS BE UNSTABLE AND THE RPM INDICATION DOES NOT CORRESPOND WITH THE TRUE ENGINE SPEED VARIATION (FOR EXAMPLE, VALUES SHOWN ARE HALVED), INSTALL A 10 ÷ 15 KΩ RESISTIVE CABLE CONNECTED IN SERIES TO AN HV CABLE. IF THE IRREGULAR READING CONTINUES AFTER THIS OPERATION, CHECK THE COMPONENTS OF THE IGNITION SYSTEM.**

### N.B.

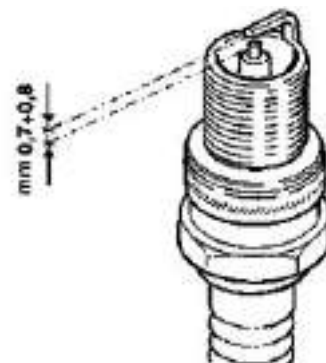
**WHEN THE INDUCTION CLAMP READS THE SIGNAL CORRECTLY, A READING CAN BE CARRIED OUT AT OVER 6000 RPM.**

**RPM LIMITER**

Specification	Desc./Quantity
1 spark out of 7	8200 Revs/min
1 spark out of 3	8300 Revs/min
Suppression of all sparks	8500 Revs/min

**CURVA DI VARIAZIONE ANTICIPO ACCENSIONE****Spark plug**

- Disconnect the cap and remove the spark plug.
- Inspect the plug and if the insulator is chipped or damaged, renew it.
- Measure the spark plug gap with a feeler gauge. If necessary adjust the gap by bending the outer electrode.
- Make sure the washer is in good condition.
- Fit the spark plug, screwing it in first by hand and then tighten it to the prescribed torque with a plug spanner.

**Characteristic****Electrode gap**

0.7 ÷ 0.8 mm

**Spark plug**

Champion RG 4 PHP

Champion RG 4 HC

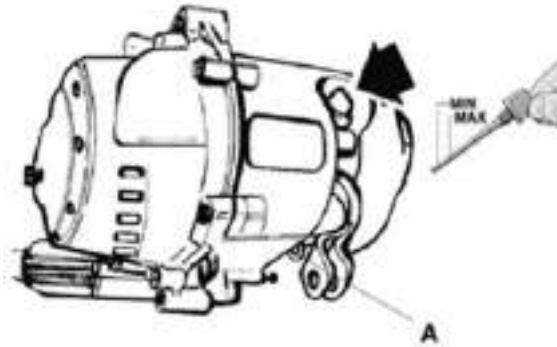
### Locking torques (N\*m)

**Spark plug** 10 ÷ 15 Nm

## Hub oil

### Replacement

- Remove the oil filler plug.
- Unscrew the drain plug (A) shown in the figure and allow the oil to drain out.
- Retighten the drain plug and fill the hub with oil (about 80 cc).
- Check the level by referring to the min. and max. notches. Carry out the check after placing the vehicle on its stand and removing the cap/dipstick **from the fully tightened position.**



### Recommended products

#### AGIP ROTRA 80W-90 rear oil hub

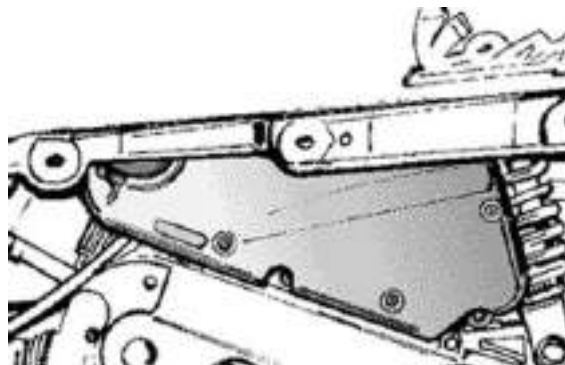
SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications

## Air filter

After removing the lower part of the left-hand side cover, unscrew the four fixing screws and the two knobs (which are exposed by overturning the saddle and removing the helmet compartment), remove the filter cover and then pull out the filter cartridge.

Cleaning:

- Wash the filter with soap and water.
- Dry with a clean cloth without wringing and with compressed air.
- Soak with a 50% fuel-oil mixture.
- Let the filter cartridge drip and then squeeze it between the hands without wringing.



**CAUTION**

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

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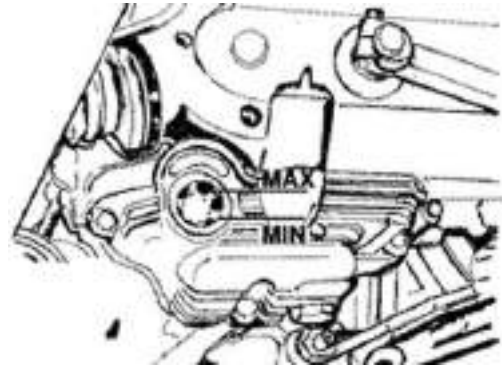
## Engine oil

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### Replacement

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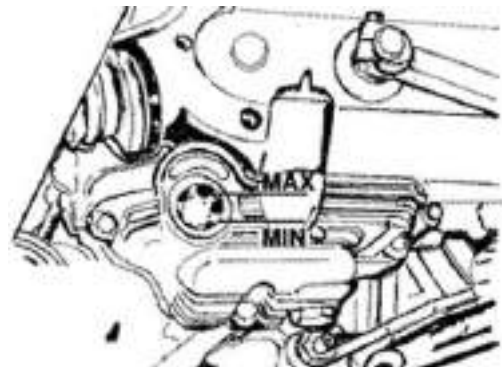
- Loosen the oil filler plug.
- Unscrew the gauze strainer drain plug on the fly-wheel side and allow the oil to drain completely.
- Retighten the drain plug and pour in approximately 600-650 cc of oil.



### Check

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- Put the vehicle on the stand on level ground (cold engine).
- Check that the oil level is between the MIN and MAX marks on the sight.
- The MAX reference mark corresponds to approximately 850 cc of oil in the engine.
- If the oil level is near or below the MIN mark, top up by adding fresh oil, taking care to never exceed the MAX level.



### Recommended products

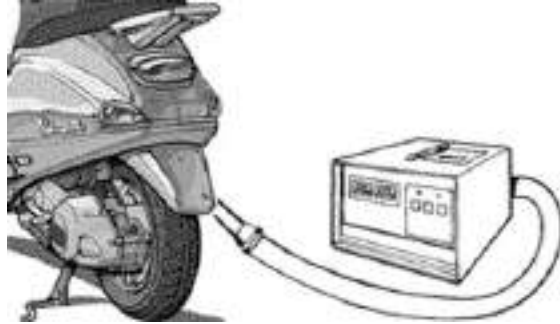
**AGIP CITY HI TEC 4T Oil to lubricate flexible transmissions (brakes, throttle control and odometer)**

Oil for 4-stroke engines

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## CO check

- This check can be required when engine operation is irregular or while adjusting the slow running.
- The test must be carried out after carefully washing all carburettor components and making sure that the air filter is clean and the spark plug is in good condition.



- 1) Warm up the engine by riding at a speed of approximately 50 km/h for ~ 5 minutes. This will allow the automatic starting device to cut out its circuit.
- 2) Switch off the engine for the minimum time required to perform steps 3) and 4).
- 3) Fit an extension tube ~ 50 cm in length to the exhaust gas outlet on the silencer.
- 4) Take special care in ensuring the seal between the silencer and the tube. Insert the exhaust gas analyser probe into the tube.
- 5) Connect the multimeter thermometer to the sump using an oil filler plug specially prepared for the insertion of the probe.
- 6) Start the engine and, before proceeding to tune up the idle speed, ensure that the oil temperature is 70-80° C.
- 7) Allow the idle speed to stabilize for about a minute.
- 8) **Without opening the throttle** and using the specially designed flow screw, adjust the speed of the engine to  $1,650 \pm 50$  rpm.
- 9) Adjust the flow screw until the «CO» percentage is  $3.8 \pm 0.7$  percent.
- 10) **Slowly** rotate the throttle twist grip until the engine reaches a speed of 4,000 rpm, then close the throttle again. Check that the idle speed is the same as specified above. If not, repeat the procedure from step 3).

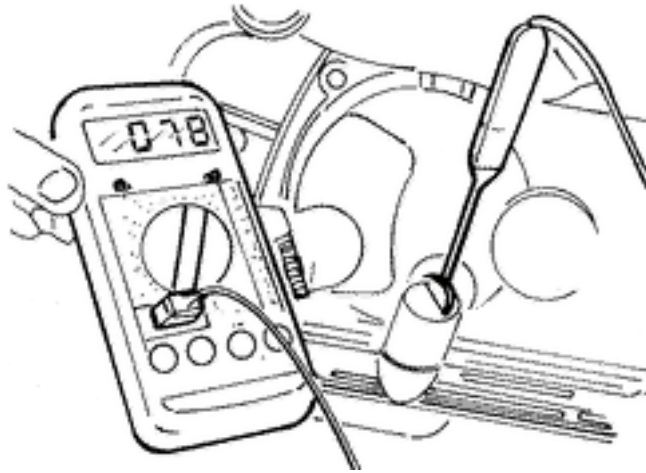
### Specific tooling

**020332Y Digital rev counter**



494929Y Exhaust fumes analyser

020331Y Digital multimeter



## INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

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## Engine

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### Poor performance

#### POOR PERFORMANCE

Possible Cause	Operation
Air filter clogged or dirty	Disassemble, wash sponge with water and shampoo and immerse in a mixture of 50% petrol and Selenia Air Filter oil. Let it drip. Wring out without squeezing it and then refit
Carburettor nozzles clogged or dirty	Dismantle, wash with solvent and dry with compressed air
Dirty or faulty vacuum-operated cock	Check the filter on the cock, remove the petrol and wash the tank, if necessary. Replace the cock as a last resource.
Clutch slipping	Check the clutch system and/or the bell and replace if necessary
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
Lack of compression: parts, cylinder and valves worn	Replace the worn parts
Oil level exceeds maximum	Check for causes and fill to reach the correct level
Excess of encrustations in the combustion chamber	Descale the cylinder, the piston, the head and the valves
Timing failure or timing system parts worn	Reset timing phase or replace any worn parts (refer to 4-stroke 50 cc engine manual)
Muffler obstructed	Replace
Fuel filter on vacuum operated cock blocked	Clean the cock filter
Wrong valve adjustment	Adjust the valve clearance properly
Valve seat distorted	Replace the head assembly
Worn cylinder, Worn or broken piston rings	Replace the piston cylinder assembly or just the piston rings

### Rear wheel spins at idle

#### REAR WHEEL

Possible Cause	Operation
Idling rpms too high	Check the idling speed and, if necessary, adjust the C.O.
Clutch fault	Check the spring/friction mass and the clutch bell
Air filter housing not sealed	Correctly refit the filter housing and replace it if it is damaged
Purifier-carburettor fitting damaged	Replace

### Starting difficulties

#### STARTING PROBLEMS

Possible Cause	Operation
Defective spark plug or with incorrect electrode gap	Check and if necessary replace the spark plug and the electrode gap
Battery flat	Check the state of the battery. If it shows signs of sulphation replace it and bring the new battery into service charging it for eight hours at a current of 1/10 of the capacity of the battery itself
- Engine flooded.	Start up keeping the throttle fully open alternating approximately five seconds of turning it with five seconds still. If however it does not start, remove the spark plug, the engine over with the throttle open being careful to keep the cap in contact with the spark plug and the spark plug grounded but away from its hole. Refit a dry spark plug and start the vehicle.
Vacuum operated cock failure	Check that fuel is adequately supplied through the pipe by applying a vacuum to the suction pipe
Failing automatic starter on the carburettor	Check the electrical wiring and mechanical movement, replace if necessary.

Possible Cause	Operation
Wrong ignition advance	Check flywheel keying on the crankshaft, replace control unit if necessary
Incorrect valve sealing or valve adjustment	Inspect the head and/or restore the correct clearance
Starting rpm too low. Starter motor faulty.	Check starting motor.
Altered fuel characteristics	Drain off the fuel no longer up to standard; then, refill
Carburettor nozzles clogged or dirty	Dismantle, wash with solvent and dry with compressed air

## Engine tends to cut-off at full throttle

### ENGINE TENDS TO CUT OUT AT FULL THROTTLE

Possible Cause	Operation
Maximum jet clogged	Remove the carburettor, wash with solvent and dry with compressed air
Water or condensate in the carburettor tank	Remove the tank, wash with solvent and dry with compressed air or empty the tank through the appropriate bleed screw
Incorrect ignition advance	Use a stroboscopic light to check ignition advance and the flywheel correct keying
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.
Incorrect float level	Restore the correct level in the tank (the float must be parallel to the upper cover contact plane, that is the throttle valve membrane cover)
Fuel supply pipes choked or clogged	Restore the adequate fuel supply
Tank breather hole obstructed	Restore the proper tank aeration
Level in tank too low	Restore the correct level in the tank (the float must be parallel to the upper cover contact plane, that is the throttle valve membrane cover)

## Engine tends to cut-off at idle

### ENGINE TENDS TO STOP WHEN IDLING

Possible Cause	Operation
Air calibrated holes in carburettor blocked	Dismantle, wash with solvent and dry with compressed air
Defective floating valve	Check the proper sliding of the float and the functioning of the valve
Level in tank too high	Restore the correct level in the tank (the float must be parallel to the upper cover contact plane, that is the throttle valve membrane cover)
Automatic choke stays activated	Check that the piston slides freely and that fuel is supplied to the automatic choke. Renew if necessary
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.
Wrong idling adjustment	Correctly adjust the engine idling and check the level of the C.O.
Spark plug defective or faulty	Replace the spark plug with one with the specified degree and check the plug gap
Pressure too low at the end of compression	Check the thermal group seals and replace worn components
Incorrect timing	Time the system and check the timing system components

## High fuel consumption

### EXCESSIVE FUEL CONSUMPTION

Possible Cause	Operation
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 (Se-

Possible Cause	Operation
	lenia Air Filter Oil), then hand dry without squeezing, allow to drip dry and then reassemble.
The starter remains on	Check that the starter runs correctly and it is properly powered
Loose nozzles	Check the maximum and minimum nozzles are adequately fixed in their fittings
Incorrect float level	Check and restore the correct fuel level in the tank

## 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

#### INEFFICIENT BRAKING

Possible Cause	Operation
Worn brake pads or shoes	Replace the brake pads or shoes and check for brake disk or drum wear conditions.
Air bubbles inside the hydraulic braking system	Carefully bleed the hydraulic braking system, (there must be no flexible movement of the brake lever).
Brake disc or drum deformed	Use a dial gauge to check the levelness of the disk with the wheel correctly fitted and the concentricity of the rear drum; check the brake disc screws are locked
Fluid leakage in hydraulic braking system	Elastic fittings, piston seals or brake pump breakdown, replace
Excessive backlash in rear brake control cable	Adjust backlash with the appropriate adjuster on the shoe control lever
The brake fluid has lost its properties	Replace the front brake fluid and top up to the correct level in the pump
Return spring broken	Replace spring.
Shoe control bolt not lubricated	Lubricate with Z2 grease.

### Brakes overheating

#### BRAKES OVERHEATING

Possible Cause	Operation
Defective sliding of pistons	Check calliper and replace any damaged part.
Brake disc or drum deformed	Use a dial gauge to check the levelness of the disk with the wheel correctly fitted and the concentricity of the rear drum; check the brake disc screws are locked

### Electrical system

## Battery

### BATTERY

Possible Cause	Operation
This device requires the most assiduous surveillance and the most diligent maintenance.	This device requires the most assiduous surveillance and the most diligent maintenance. If the vehicle is not used for some time (1 month or more) the battery needs to be recharged periodically. The battery tends to exhaust its power supply in five to six months. If the battery is fitted on a motorcycle, be careful not to invert the connections, keeping in mind that the black earth wire is connected to the negative terminal while the red wire is connected to the terminal marked +.

## Turn signal lights malfunction

### ELECTRICAL EQUIPMENT FAILURE

Possible Cause	Operation
Turn indicators do not turn on	Check turn indicators device and/or wiring as described in the «Electrical system» chapter.

## Steering and suspensions

### Heavy steering

#### STEERING HARDENING

Possible Cause	Operation
Steering hardening	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.

### Excessive steering play

#### EXCESSIVE STEERING CLEARANCE

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

### Noisy suspension

#### SUSPENSION NOISY

Possible Cause	Operation
Noisy suspension	If the front suspension is noisy, check: that the front shock absorber works properly and the ball bearings are good condition. 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. Check that the swinging arm connecting the engine to the chassis and the rear shock absorber work properly

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**Suspension oil leakage****OIL LEAKAGE FROM SUSPENSION**

<b>Possible Cause</b>	<b>Operation</b>
Oil leakage from suspension	Replace the damper.

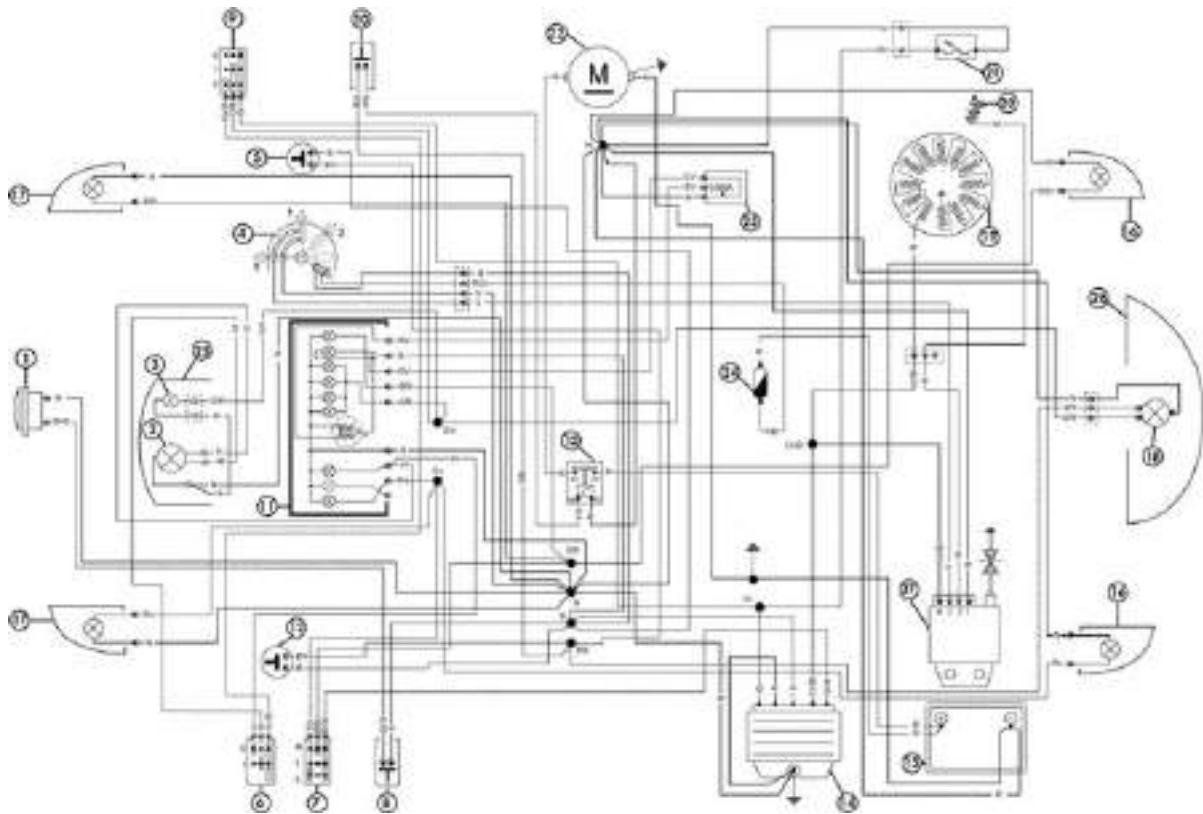
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## INDEX OF TOPICS

ELECTRICAL SYSTEM

ELE SYS





**ELECTRICAL EQUIPMENT**

	Specification	Desc./Quantity
1	Horn	
2	Headlight bulb	12V-35/35W
3	Parking light bulb	12V-5W
4	Key switch	
5	Front brake stop button	
6	Light switch	
7	Turn indicator switch	
8	Horn button	
9	Light switch	
10	Starter button	
11	Speedometer with fuel gauge and warning lights - 12V-1.2W reserve fuel warning light bulb, 2 x 12V-2W turn indicator warning light bulbs, 12V-1.2W high beam warning light bulb, 12V-1.2W instrument lighting bulb, 12V-1.2W lights-on warning light bulb.	
12	Rear stop light switch	
13	Starter remote control	
14	Voltage regulator	
15	Battery	12V - 9Ah
16	Rear turn indicator bulbs	Two, 12V-10W, spherical
17	Front direction indicator lights	N° 2, 12V-10W, spherical
18	Brake light button on rear brake	12V-21/5W
19	Magneto flywheel	
20	Pick - up	
21	Automatic starter	
22	Starter motor	
23	Fuel level sending unit	
24	Fuse	10 A
25	Headlight assembly	
26	Rear light assembly	
27	Electronic ignition device	

Wiring colour chart:

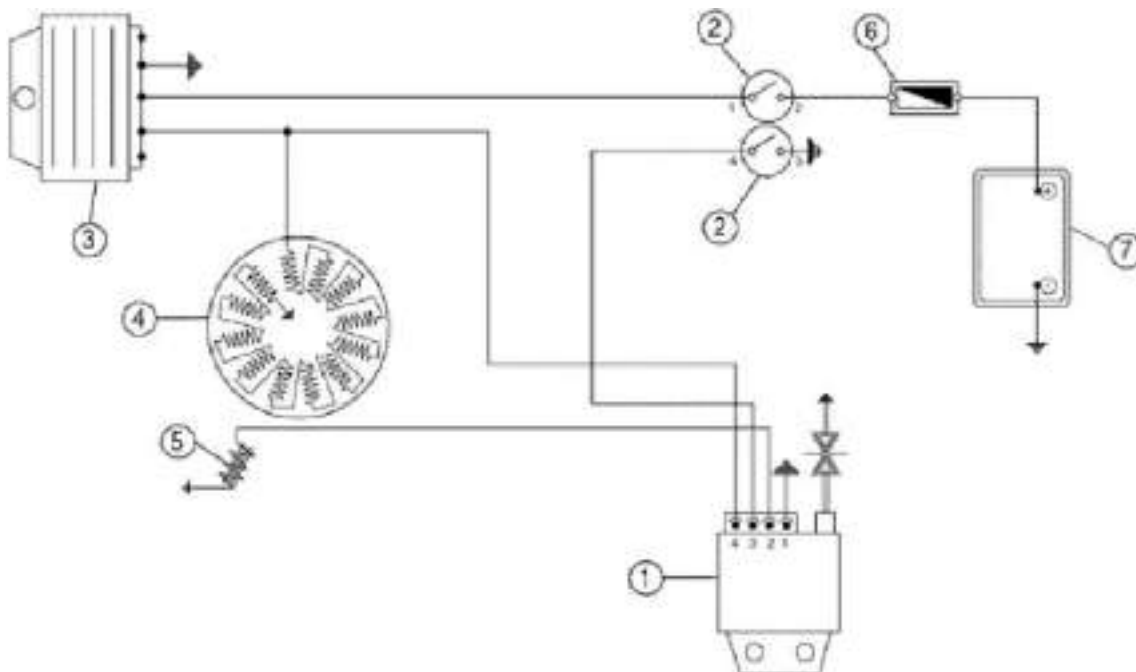
**B**=White - **BI**=Blue - **G**=Yellow - **M**=Brown - **N**=Black - **BV**=White-Green - **GN**=Yellow-Black - **Gr**=Grey - **Rs**=Pink - **R**=Red - **Vi**=Purple - **V**=Green - **VN**=Green-Black - **BN**=White-Black - **BBI**=White-Blue - **GV**=Yellow-Green - **Ar**=Orange - **GrBI**=Grey-Blue - **GrN**=Grey-Black - **BR**=White-Red - **RN**=Red-Black - **BIN**=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**

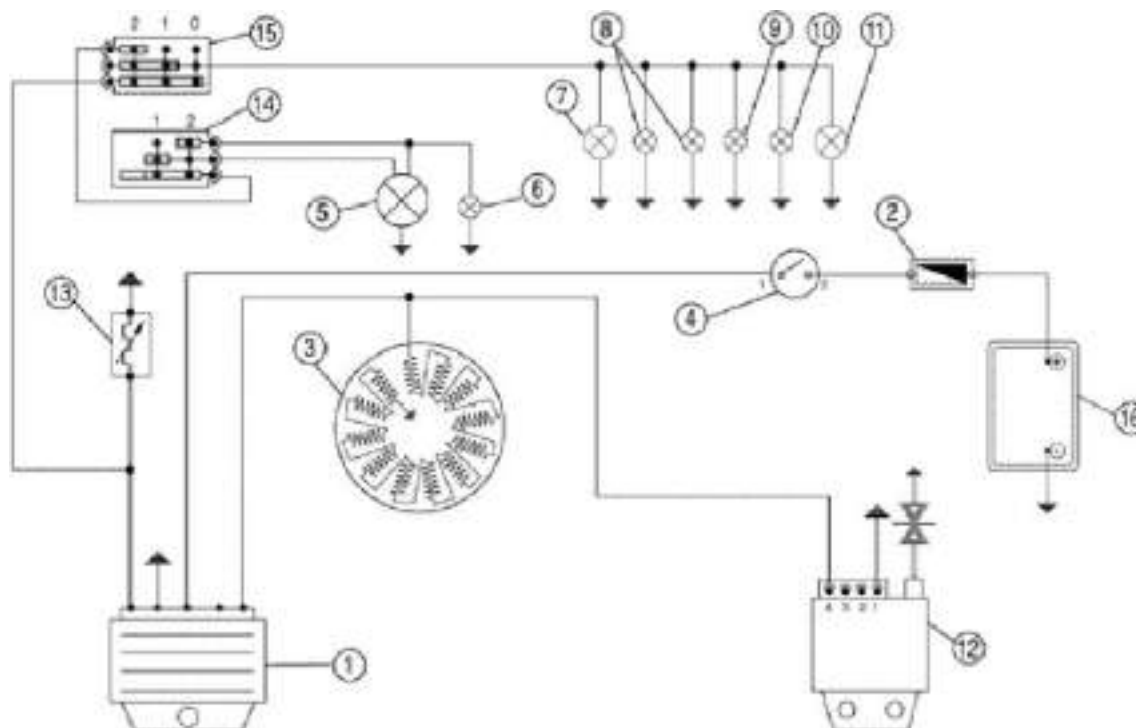
**Ignition**



**IGNITION SECTION**

	Specification	Desc./Quantity
1	Electronic ignition device	
2	Key switch contacts	
3	Voltage regulator	
4	Magneto flywheel	
5	Pick - up	
6	Main fuse	10A
7	Battery	12V - 9Ah

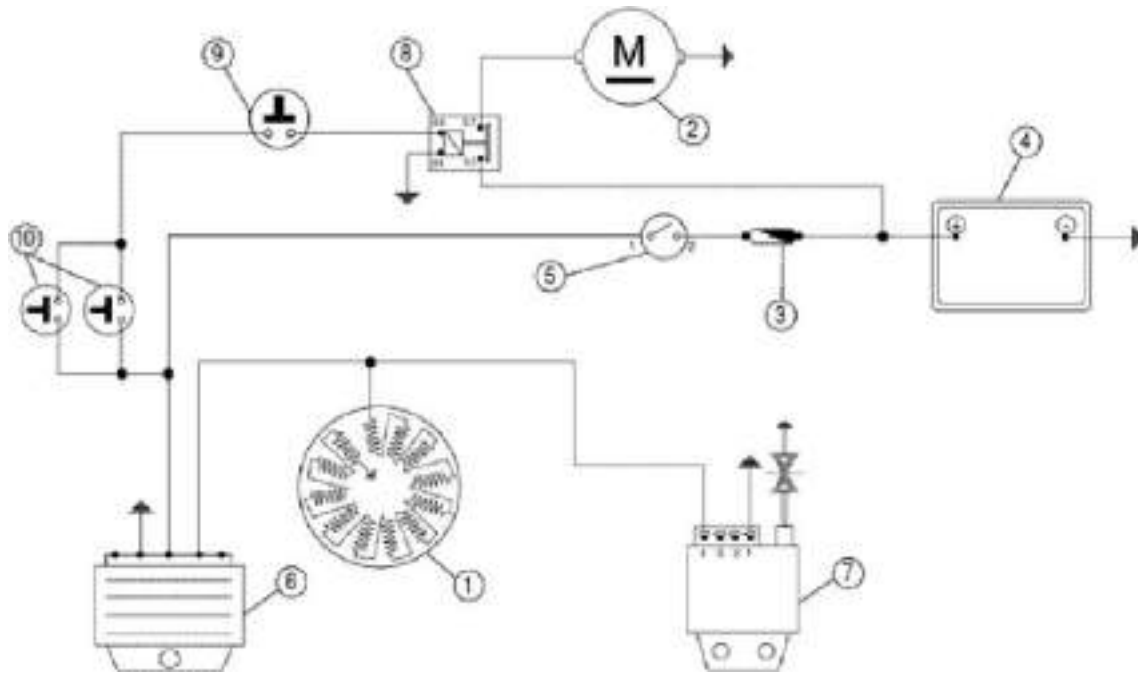
Headlights and automatic starter section



**LIGHTS**

	Specification	Desc./Quantity
1	Voltage regulator	
2	Main fuse	10A
3	Magneto flywheel	
4	Key switch contacts	
5	Headlight bulb	12V-35/35W
6	High-beam warning light	12V - 1.2W
7	Parking light bulb	12V- 5W
8	2 Instrument lighting bulbs	12V- 1,2W
9	1 Instrument panel lighting bulb	12V- 2W
10	Lights-on warning, 1 light bulb	12V-1,2W
11	Rear light bulb, 1 light bulb	12V-5/21W
12	Electronic ignition device	
13	Automatic starter	
14	Light switch	
15	Light switch	
16	Battery	12V - 9Ah

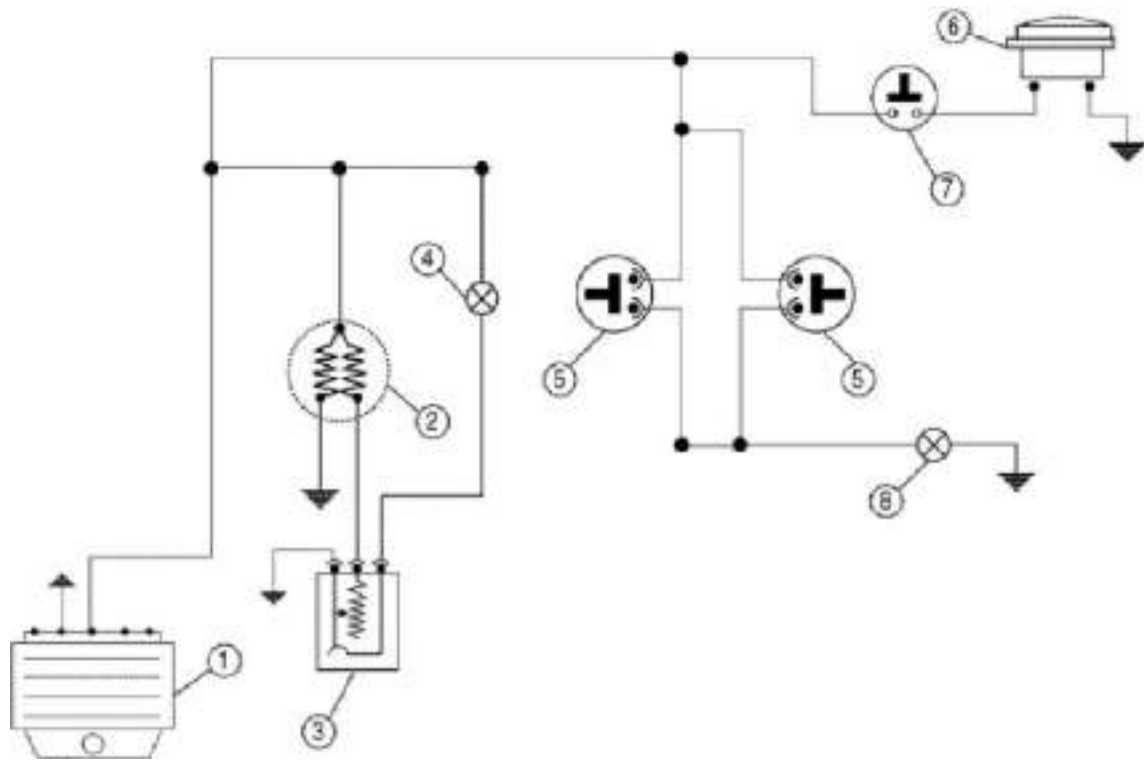
**Battery recharge and starting**



**BATTERY RECHARGE AND STARTING**

	Specification	Desc./Quantity
1	Magneto flywheel	
2	Starter motor	
3	Main fuse	10A
4	Battery	12V - 9Ah
5	Key switch contacts	
6	Voltage regulator	
7	Electronic ignition device	
8	Starter remote control	
9	Starter button	
10	Front and rear brake light button	

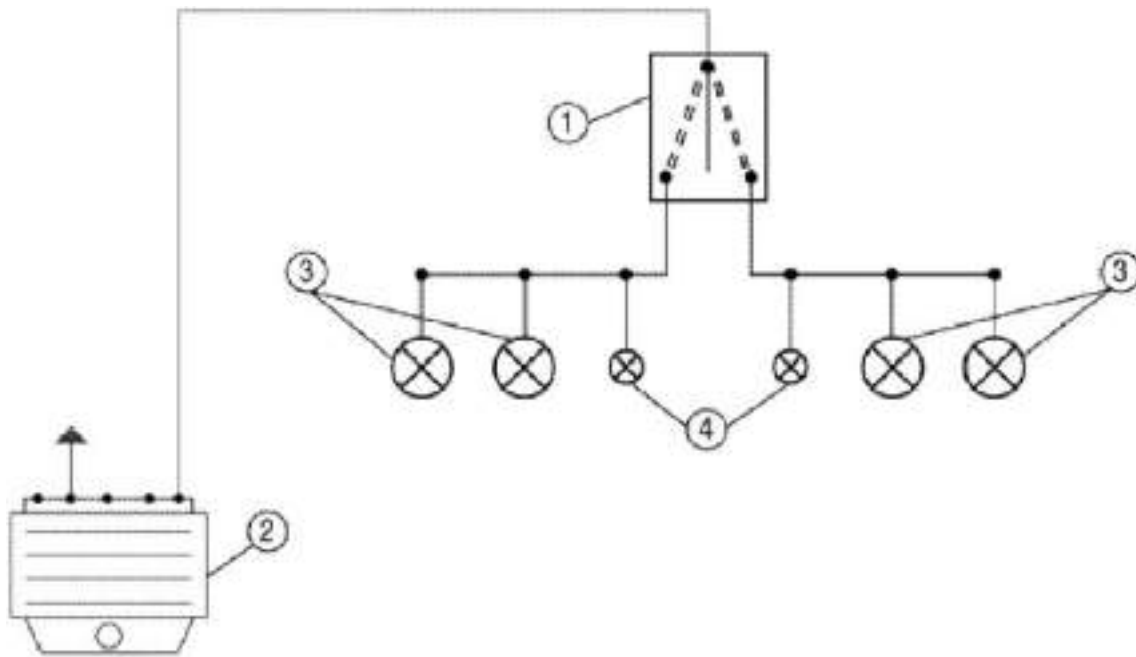
Level indicators and enable signals section



**SAFETY SWITCHES**

	Specification	Desc./Quantity
1	Voltage regulator	
2	Fuel gauge	
3	Fuel level sending unit	
4	Low fuel warning light	
5	Front and rear brake light button	
6	Horn	12V
7	Horn button	
8	Brake light filament	12V-21W

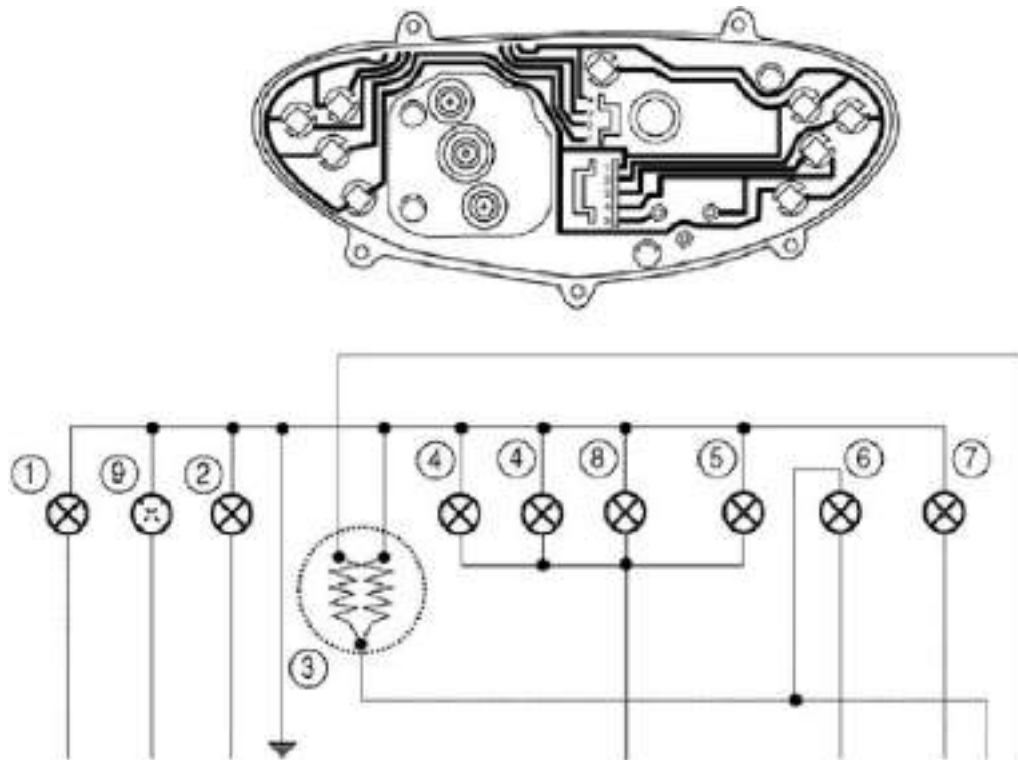
Turn signal lights



**TURN SIGNAL LIGHTS**

	Specification	Desc./Quantity
1	Turn indicator switch	
2	Voltage regulator	
3	4 Turn indicator bulbs	12V-10W
4	Two (2) turn signal warning light bulbs	12V - 2W

Instruments and warning lights control board



**WARNING LIGHTS AND GAUGES PANEL**

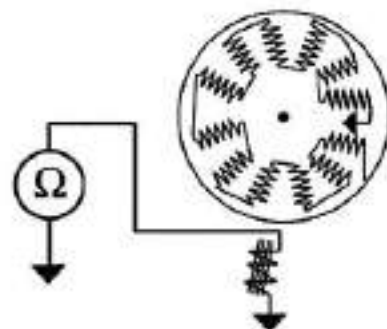
	Specification	Desc./Quantity
1	Left turn indicator warning light	12V - 2W
2	High-beam warning light	12V - 1.2W
3	Fuel Level indicator	
4	Instrument panel lighting bulb	12V-1,2W
5	Headlight warning light	12V 1.2W
6	Reserve fuel light	12V-1,2W
7	Right turn indicator warning light	12V - 2W
8	Dashboard light bulbs	12V-2W
9	Available warning light	

**Checks and inspections**

In case the cause of ignition failure or malfunction cannot be easily identified at sight, first of all replace the control unit by another one in operating conditions.

Remember that the engine must be off to disconnect and replace the control unit.

If after replacement the vehicle starts properly, the control unit is failing and must be replaced.

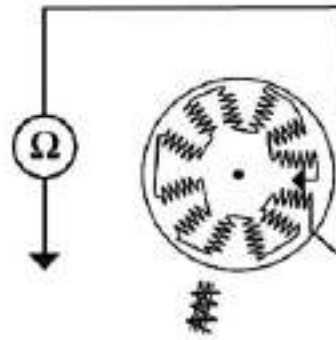


If faulty or failed operation persists, conduct the following checks on the generator and on the stator components:

After a visual inspection of the electrical connections, it is possible to perform measurements on the stator winding and pick-up (see table), using the specific multimeter.

If, during the checks on the charge coil and the pick-up, anomalies are found, replace the stator and other faulty parts.

Disconnect the connector on the flywheel housing and measure the resistance between each of the two contacts and the earth.



**Specific tooling**

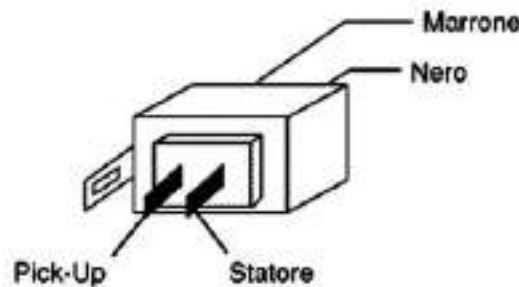
020331Y Digital multimeter

**PICK-UP CHECK**

	Specification	Desc./Quantity
1	1) Brown cable and earth	~ 170 Ω

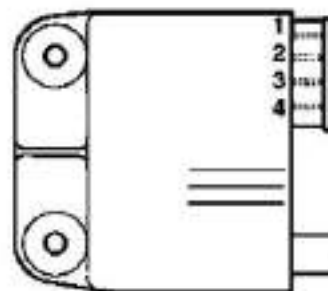
**STATOR WINDING CHECK**

	Specification	Desc./Quantity
1	1) Black cable and earth	~ 1 Ω



**Ignition circuit**

All the control operations of the system that require the disconnection of cables (checks of the connections and the devices making up the ignition circuit) must be done with the engine off: if this is not done, the controls might be irreparably damaged.





## Voltage regulator check

The malfunctioning of the voltage regulator might cause the following problems depending on the type of fault:

- 1) Bulbs burnt out (regulator in short circuit).
- 2) The lighting and electrical starter system do not work (regulator interrupted).
- 3) Battery fails to charge
- 4) Turn indicators failure

The regulator is provided with earth supplied from the electrical equipment, therefore the regulator body does not supply earth to the internal circuits. Check the insulation between each terminal of the regulator and its body, using the specific tester.

### 1) BURSTING LIGHT BULBS

Replace the voltage regulator as this is definitely faulty.

### 2) HEADLIGHTS AND CHOKE NOT-OPERATIONAL

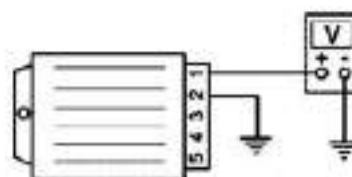
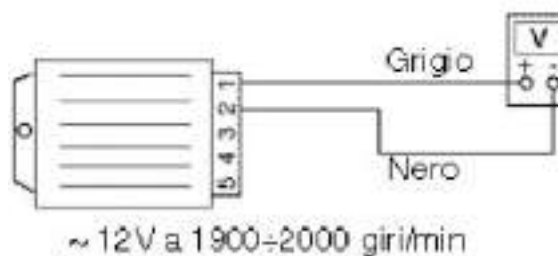
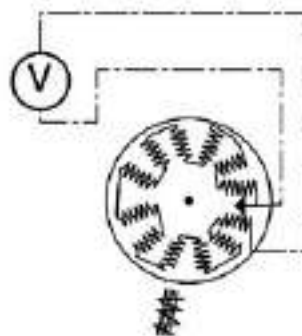
In order to leave the AC free from absorptions, so to carry out voltage checks, please proceed as follows. Remove the handlebar covers. Detach the connections from the headlight and the 5 PIN connector from the dashboard. Remove the taillight bulb. Remove the automatic choke connector from the system.

Access the voltage regulator, start the engine and let it run at idle.

Insert the positive terminal from the tester (setting the tester on AC mode) on terminal no. 1 (yellow-black wire) and the negative terminal on terminal no. 2 (black wire); check for voltage (see figure).

If voltage is present, check the wiring from the headlight to the voltage regulator, and the operation of the light switch.

If no voltage is found, put the negative terminal to earth; if this provides voltage readings, check the earth wire (terminal no. 2) on the regulator (black wire); otherwise, replace the regulator as certainly faulty.



As a last test it is possible to check the output voltage from the stator:

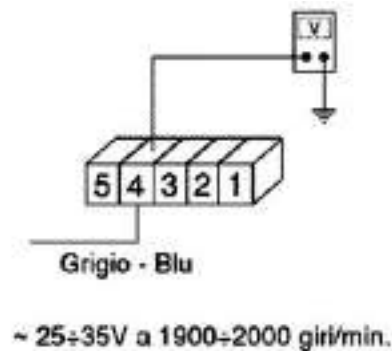
-Detach the regulator connector and interpose the tester in AC mode, between the Gray-Blue wire (4) and earth (see figure).

-The voltage output at 2,000 rpm must be approx. 25 - 35V

If this test also gives no voltage, replace the regulator as certainly faulty.

#### N.B.

TO MEASURE THE ABOVE VOLTAGE USE AN ANALOGUE TESTER THAT CAN MEASURE ALTERNATING VOLTAGES AND KEEP THE ENGINE AT IDLE TO HAVE AN ALTERNATING VOLTAGE OF A FREQUENCY AS CLOSE AS POSSIBLE TO 50HZ SO AS TO DETECT THE EFFICIENT VOLTAGE VALUE SUPPLIED BY THE REGULATOR (ABOUT 12V).



## Recharge system voltage check

### 3) BATTERY DOES NOT RECHARGE

The fault in the DC section of the voltage regulator may cause, depending on the type of failure, the following faults:

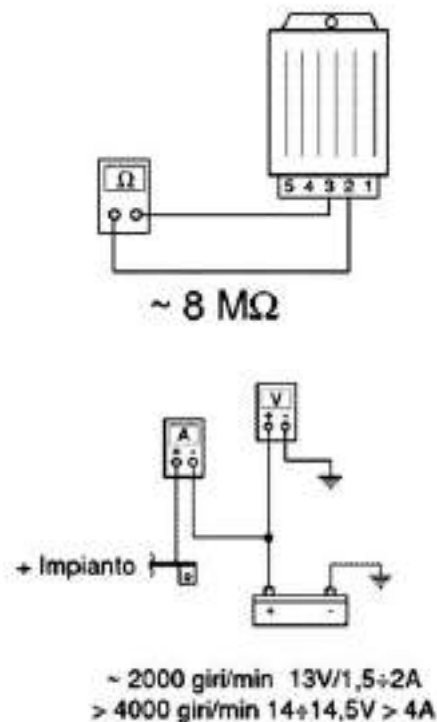
**a) Bursting of protection fuse due to excessively high voltage (regulator short-circuited) and resulting in the battery not recharging.**

**b) Battery not recharging (regulator circuit interrupted).**

#### Interventions

a) Bursting of protection fuse (regulator short-circuited).

Check the wiring running from the fuse to the ignition key-switch is not damaged, as this may create a short-circuit with earth (thus excluding possible regulator failures); if the protection fuse bursts only after the ignition key-switch is turned to "ON", and with the regulator connector detached, it is then necessary to check the wirings and systems downstream the key-switch are not short-circuited with earth.



Proceed by measuring the resistance between contacts 3 (White) and 2 (Black) from the voltage regulator (with the connector detached).

If the reading differs excessively from the figures shown, replace the regulator as short-circuited.

b) Battery not recharging (regulator circuit interrupted).

To check for the presence of faults on the recharging section of the voltage regulator, it is necessary to initially operate on the battery, using two testers (one for voltages and one for currents), as shown in the second figure, and follow the operations given below:

Start the engine (connecting, temporarily, the red wire to the positive terminal of the battery, so to avoid damaging the instrument measuring the current).

Check the voltage at idle is at least 13V (charged battery) and the recharge current is 1.5 - 2A with the lighting system and the choke device excluded, as described in the chapter "CHECKING THE VOLTAGE REGULATOR".

As the engine speed increases, so do the recharge current and voltage, and at speeds above 4,000 rpm, a recharging current of approx. 4.5A must be observed; reactivating the lighting system and choke device, and operating the stop light and horn, current values of  $\geq 5A$  may be found, with voltage readings of 14 - 14.5V (regulator threshold voltage).

**If the readings do not match the above figures, replace the regulator; otherwise check wiring and connections.**

#### **Electric characteristic**

##### **Resistance of voltage regulator**

~ 8 M $\Omega$

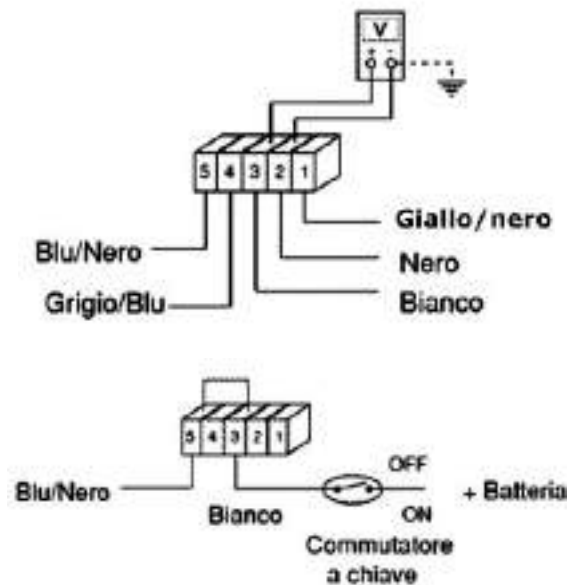
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## Turn signals system check

### 4) TURN INDICATORS NOT WORKING

If the turn indicators do not work, do the following:

- Disconnect the regulator connection and insert the multimeter probes between the white cable (3) and the black one (2).
  - Turn the key switch to ON and check that the battery is getting voltage. If no voltage is detected, repeat the test now between the white cable and the earth; if there is no voltage even after this operation, check the wiring and the contacts of the key switch and the battery. If voltage in the battery is detected (black cable), check the regulator earth wiring.
  - If the above tests have positive results, jump the contacts 5 (blue/black) and 3 (white) on the connector, set the key switch to ON and the turn indicator switch left and right to see when the lights are steadily on (as they are powered directly from the battery).
- If even after this operation the turn indicators fail to turn on, check that the wiring is not damaged and the switch works properly. If these last two tests have a positive result, replace the regulator because it is certainly not functioning properly.



### Specific tooling

020331Y Digital multimeter

## Sealed battery

### INSTRUCTIONS FOR REFRESHING THE STOCK CHARGE OF AN OPEN CIRCUIT

#### 1) Voltage check

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

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

#### 2) Constant voltage battery charge mode

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

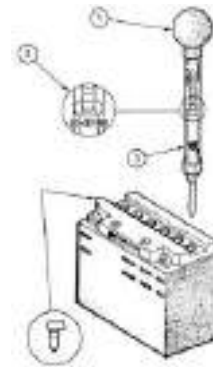
#### 3) Constant current battery charge mode

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

#### WARNING

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

- 1 Hold the vertical tube
- 2 Look at the level
- 3 The float must be freed



## Dry-charge battery

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

#### 1) Check the level of the electrolyte

The electrolyte level must be checked frequently and must reach the upper level. Only use distilled water, to restore this level.

If it is necessary to add water too frequently, check the vehicle's electrical system: the battery works overcharged and is subject to quick wear.

## 2) Load status check

After restoring the electrolyte level, check its density using an appropriate densitometer (see the figure). When the battery is charged, you should detect a density of 30 to 32 Bé corresponding to a specific weight of 1.26 to 1.28 at a temperature of no lower than 15° C.

A density reading of less than 20° Bé indicates that the battery is completely flat and it must therefore be recharged.

After charging the battery, check each element electrolyte level and density. If the scooter is not used for a given time (1 month or more) it will be necessary to periodically recharge the battery.

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, remembering that the earth 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.

Regular bench charging must be carried out with the specific battery charger, (single) or (multiple), setting the battery charger selector to the type of battery to be recharged. Connections to the power supply source must be implemented by connecting the corresponding poles (+ to+ and - to -).

## 4) Cleaning the battery

The battery should always be kept clean, especially on its top side, and the terminals should be coated with Vaseline.

### **WARNING**

- Before recharging the battery, remove the plugs of each cell. Keep the battery away from naked flames or sparks when charging.

Remove the battery from the vehicle removing the negative clamp first.

### **CAUTION**

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

### **CAUTION**

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

### **CAUTION**

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

## Specific tooling

**020333Y Single battery charger**

**020334Y Multiple battery charger**

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1)- Remove the short closed tube and the caps, then pour sulphuric acid into the cells using the type specified for batteries, with a specific gravity of 1.26, corresponding to 30° Bé, at a minimum temperature of 15°C until the upper level is reached.

2) - Leave to rest for at least 2 hours; then, restore the level with sulphuric acid.

3)- Within the following 24 hours, recharge with the specific battery charger (single) or (multiple) at a density of about 1/10 of the battery nominal capacity and until the acid density is about 1.27, corresponding to 31° Bé, and these values are stabilised.

4) - Once the charge is over, level the acid (by adding **distilled water**). Close and clean carefully.

5)- Once the above operations have been performed, install the battery in the vehicle ensuring the connections between the wiring and the battery terminals are correct.

**WARNING**

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

**Specific tooling**

**020333Y Single battery charger**

**020334Y Multiple battery charger**

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**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, flush abundantly with water for about 15 minutes and seek immediate medical attention.

In the event of accidental ingestion of the fluid, immediately drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Seek immediate medical attention

Batteries produce explosive gases; keep clear of free flames, sparks or cigarettes; ventilate the area when recharging the battery indoors.

Always protect your eyes when working close to batteries.

**Keep out of the reach of children.**

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## Exhaust assy. Removal

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- Remove the 2 fixing nuts from the manifold to the head



- Unscrew the 2 screws fixing the muffler to the housing; then remove the whole muffler paying attention to the interference between its supporting bracket and the cooling cover.



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## Removal of the engine from the vehicle

### Disassembling engine from frame

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- Disconnect the battery.
- Remove the muffler assembly.
- Remove the rear wheel.
- Remove the rear brake mechanical transmission.
- Disconnect the electric terminals.
- Remove the throttle grip transmission.
- Disconnect the tubing (petrol-vacuum operated cock control).
- Disconnect the swinging arm on the engine side
- Disconnect the rear shock absorber lower clamping

**WARNING**

Be very careful when handling fuel.

**CAUTION**

When installing the battery, first attach the positive cable and then the negative cable.

**WARNING**

Wear safety goggles when using hitting tools.

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## INDEX OF TOPICS

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## Automatic transmission

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### Transmission cover

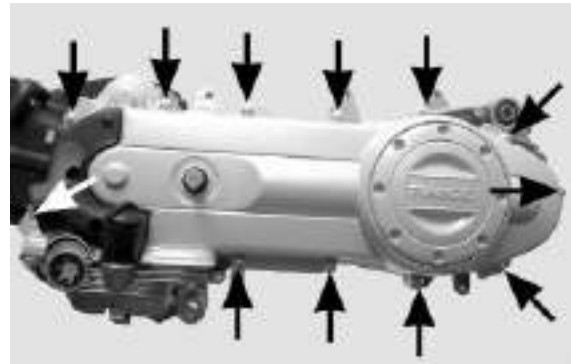
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- Remove the 12 fixing screws.
- Remove the oil filling cap and then slide out the cover.

If this operation is carried out directly on the vehicle, it is necessary to remove the transmission cooling coupling and the air filter housing retainers.

**N.B.**

**USE A MALLET ON THE APPROPRIATE COUPLINGS TO REMOVE THE COVER.**



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### Kickstart

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- To remove the start up pinion push the starter lever to facilitate extracting the pinion.
- Remove the kick-start screw and lever.
- Remove the seeger ring and the washer indicated in the figure.
- Pull out the toothed sector.

**WARNING**

**THE SECTOR KEEPS THE SPRING SET, BE CAREFUL SO AS NOT TO CAUSE ANY ACCIDENTS**

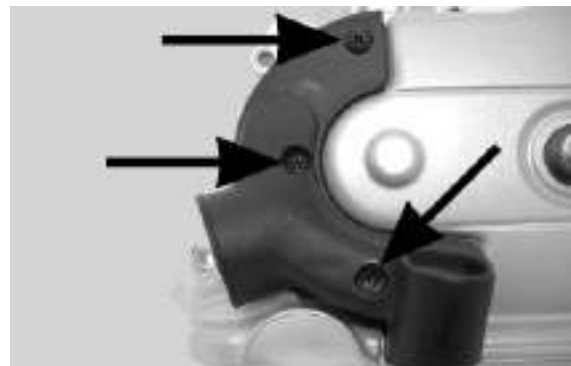


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### Air duct

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



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## Removing the driven pulley shaft bearing

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

**N.B.**

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



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## Refitting the driven pulley shaft bearing

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

**N.B.**

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

**CAUTION**

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

---

## Removing the driven pulley

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

**N.B.**

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

### Specific tooling

**020565Y Flywheel lock calliper spanner**



## Inspecting the clutch drum

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

### Characteristic

#### Clutch bell diameter/standard value

Ø 107+0.2 +0 mm

#### Clutch bell diameter/max. value allowed after use

Ø 107.5 mm

#### Eccentricity measured /max.

0.20 mm



## Removing the clutch

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

### CAUTION

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



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

### Specific tooling

**020444Y Tool for fitting/ removing the driven pulley clutch**



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## 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



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## Pin retaining collar

- Remove the collar with the aid of 2 screwdrivers.



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



## Removing the driven half-pulley bearing

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

### CAUTION

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

### Specific tooling

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



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

### N.B.

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

### Specific tooling

020376Y Adaptor handle

020363Y 20 mm guide



## Inspecting the driven fixed half-pulley

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



### Characteristic

**Stationary driven half-pulley/Standard diameter**

Ø 33.965 to 33.985 mm

**Stationary driven half-pulley / Minimum diameter admitted after use**

Ø 33.96 mm

## Inspecting the driven sliding half-pulley

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

### Characteristic

**Mobile driven half-pulley/ Maximum diameter allowed**

Ø 34.08 mm



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

### Recommended products

**AGIP GREASE SM 2 Grease for the tone wheel revolving ring**

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



- Make sure the pins and collar are not worn, reassemble the pins and collar.
- Use a greaser with a curved spout to lubricate the driven pulley unit with around 6 gr. of grease. This operation must be done through one of the holes inside the bushing until grease comes out of the opposite hole. This procedure is necessary to prevent the presence of grease beyond the O-ring.

### Recommended products

**AGIP GREASE SM 2 Grease for the tone wheel revolving ring**

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

## Refitting the driven half-pulley bearing

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

### CAUTION

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

### Specific tooling

**020376Y Adaptor handle**





020456Y Ø 24 mm adaptor

020362Y 12 mm guide

020171Y Punch for Ø 17 mm roller case

## Inspecting the clutch spring

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



### Characteristic

#### Standard length

118 mm

#### Minimum length allowed after use

XXXX

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



### 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 SO AS TO PREVENT A VARIATION IN THE RETURN SPRING LOAD.

### Characteristic

#### Minimum thickness permitted:

1 mm

## Refitting the clutch

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



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

**CAUTION**

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

**CAUTION**

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

**Locking torques (N\*m)**

Nut locking clutch unit on pulley  $55 \div 60$  Nm

**Refitting the driven pulley**

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

**Specific tooling**

020565Y Flywheel lock calliper spanner

**Locking torques (N\*m)**

Driven pulley shaft nut 40 to 44 Nm

**Drive-belt**

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

**Characteristic**

Transmission belt/Minimum width

17.5 mm



## Removing the driving pulley

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



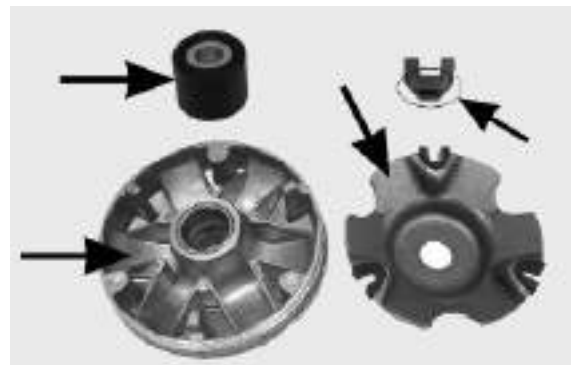
- Remove the belt, washer and remove the mobile half-pulley with its bushing, being careful that the rollers and contrast plate fitted loosely on it do not come off.

### Specific tooling

**020451Y Starting ring gear lock**

## Inspecting the rollers case

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



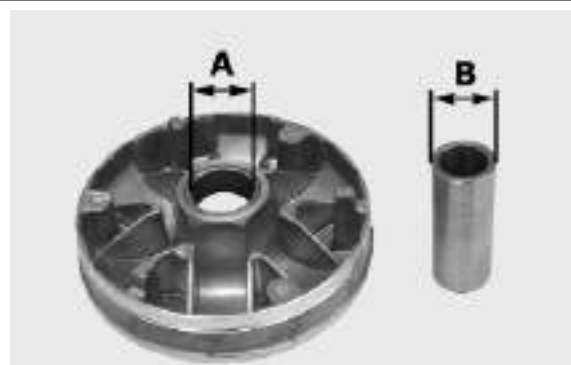
- Check that the internal bushing shown in the figure is not abnormally worn and measure inside diameter «A».
- Measure outside diameter «B» of the pulley sliding bushing shown in the figure.

### CAUTION

**DO NOT LUBRICATE OR CLEAN THE BUSHING.**

### Characteristic

**Driving pulley / Maximum diameter:**



20.12 mm

**Driving pulley/ Standard diameter:**

20.021 mm

**Driving pulley bushing/ Diameter maximum:**

XXX mm

**Driving pulley bushing/ Standard diameter:**

20 -0.020/-0.041mm

## Refitting the driving pulley

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

**N.B.**

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



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

- With the specific tool, tighten the lock nut to 20 Nm and then perform a final 90° locking in order to prevent the rotation of the driving pulley.

**N.B.**

**REPLACE THE NUT WITH A NEW ONE AT EVERY REFIT  
CAUTION**

**UPON FITTING THE DRIVING PULLEY UNIT IT IS OF UTMOST IMPORTANCE THAT THE BELT IS FREE INSIDE IN ORDER TO AVOID WRONG TIGHTENING AND CONSEQUENTLY DAMAGING THE CRANKSHAFT KNURLING.**



### Specific tooling

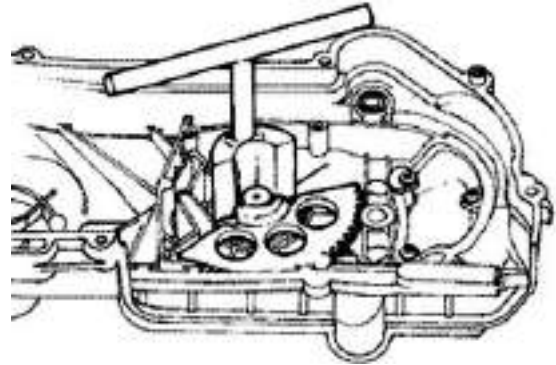
**020451Y Starting ring gear lock**

### Locking torques (N\*m)

**Crankshaft pulley nut 18 to 20 + 90° Nm**

## Refitting the transmission cover

- Check the following for wear: toothed section, toothed section shaft, cover seat bushing, pinion shaft and its seating in the crankcase and the return spring.
- Remove the damaged components.
- Grease the spring.
- Remove the toothed sector and load the spring with an appropriate tool.
- Refit the washer, the seeger and the Kick-start lever.



### Recommended products

#### AGIP GREASE MU3 Grease for odometer transmission gear case

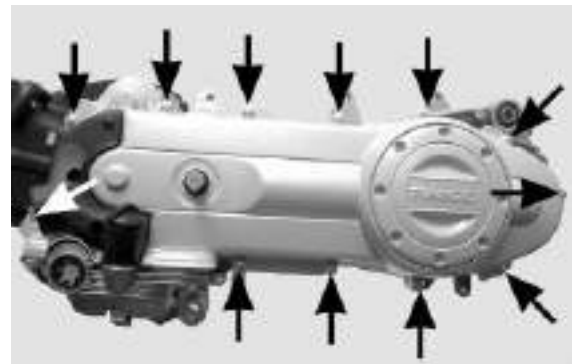
Soap-based lithium grease with NLGI 3; ISO-L-XBCHA3, DIN K3K-20

- Insert the pinion in its seating by pushing the starter lever.
- Fit the intake throat and tighten the 3 screws.

- Make sure the oil sump presents centring dowels and sealing gaskets.
- Replace the cover tightening the 12 screws to the prescribed torque.
- Refit the oil filling cap.

### Locking torques (N\*m)

Transmission cover screws 11 ÷ 13 Nm

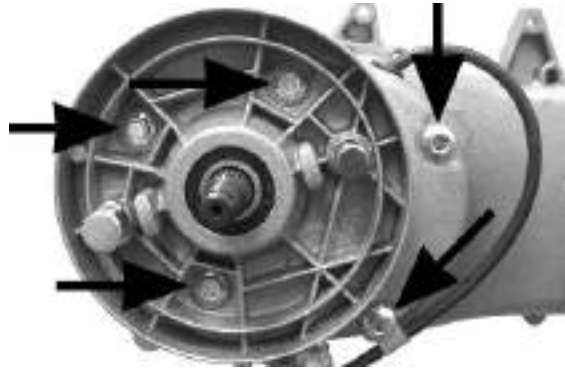


## End gear

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## Removing the hub cover

- Drain the rear hub oil
- Remove driven pulley
- Remove the rear brake shoes
- Remove the 5 screws fixing the cover to the crankcase
- Remove the cover with the wheel axle and pull it out
- Remove the intermediate gear with the appropriate shim washers



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## Removing the wheel axle bearings

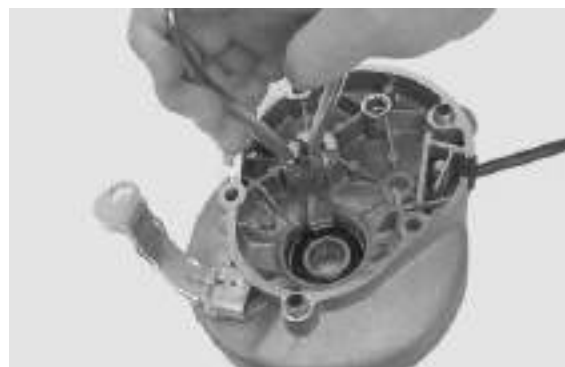
- Remove the oil seal and the seeger ring.
- Fix the hub cover properly to avoid damaging the sealing surface with the housing
- Remove the wheel axle bearing using the specific tool

### Specific tooling

**020363Y 20 mm guide**

**020376Y Adaptor handle**

**020477Y Adaptor 37 mm**





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## Removing the driven pulley shaft bearing

- Remove the seeger ring
- Heat the engine crankcase but do not direct the hot air towards the bearing
- Extract the driven pulley shaft together with the bearing with a few mallet blows



- Remove the bearing off the driven pulley shaft using the specific tool and a press

**N.B.**

**USE THE SPECIFIC TOOL ON THE SIDE WITH THE SMALLER INTERNAL DIAMETER**

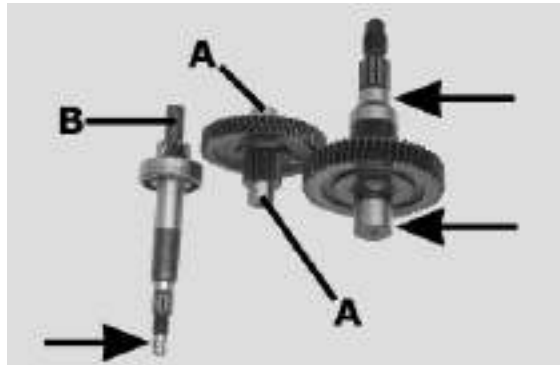
### Specific tooling

**020452Y Tube for removing and refitting the driven pulley shaft**



## 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.
- Check capacity ( A ) of the transmission gear (wear, deformations, etc.)
- Check the pulley shaft seating: Superficial wear ( B ) may indicate irregularities in the crankcase seatings or in the pulley shaft capacities



## Inspecting the hub cover

- Check that the fitting surface is not dented or distorted.
- If faults are found, replace the hub cover.



## Refitting the wheel axle bearing

- Support the hub cover on a wooden surface
- Heat the hub cover using the thermal gun.
- Preassemble the bearing on the specific punch using grease and then insert the bearing in its seating
- Refit the seeger ring and the oil seal using the 42 x 47 mm adaptor



**N.B.**

**POSITION THE OIL SEAL WITH THE SEALING LIP FACING THE HUB INTERNAL SIDE**

### Specific tooling

**020150Y Air heater support**

**020151Y Air heater**

**020376Y Adaptor handle**



020363Y 20 mm guide

020359Y 42x47-mm adaptor



## Refitting the hub bearings

- Remove the wheel axle on the cover and pay attention not to damage the sealing lip of the oil seal
- Apply a thin layer of grease on the two shim washers of the intermediate gear and fit one on the cap so that it does not interfere with the wheel axle gear when placing the transmission shaft



## Refitting the hub cover

- Apply product recommended for surfaces on the hub cap and refit cap on the crankcase
- Fit the 5 screws and tighten them to the specified torque.

**N.B.**

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

### Recommended products

**Loctite 510 Liquid sealant**



Gasket

### Locking torques (N\*m)

hub cap screws 24 - 26

## Flywheel cover

### Cooling hood

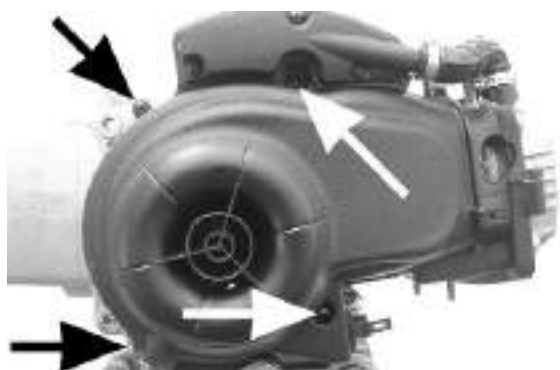
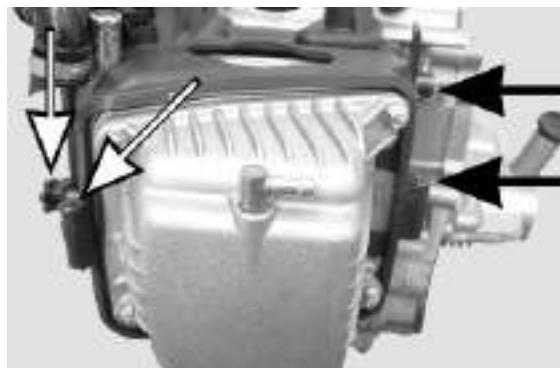
- Remove the manifold and the carburettor undoing the 2 fixing screws on the head
- Remove the fastening clamp of the secondary air pipe and disconnect it
- Remove the 4 front coupling screws (1 of them is a knob) and the side fixing screw at the crankcase base.
- Remove the 4 side screws
- Extract the 3 covers - Remove the cover sealing gaskets on the head
- For refitting, repeat the removal steps but in reverse order

#### CAUTION

TAKE CARE TO CORRECTLY POSITION THE FLYWHEEL CONNECTOR.

#### N.B.

WHEN REFITTING THE COVER, TAKE CARE NOT TO DAMAGE THE STATOR WIRING.



---

## Cooling fan

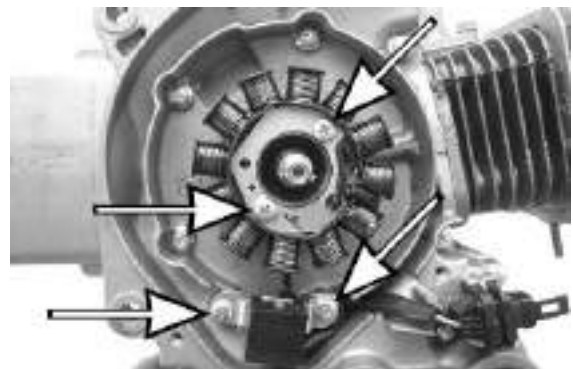
- Remove the cooling fan by undoing the 3 screws fixing it to the rotor
- When refitting the fan, pay attention that the screw holes in the fan and the rotor coincide, then tighten screws at the specified torque.



---

## Removing the stator

- Remove the 2 Pick-Up screws and the 2 stator fixing screws indicated in the figure.
- Remove the stator and its wiring.



---

## Refitting the stator

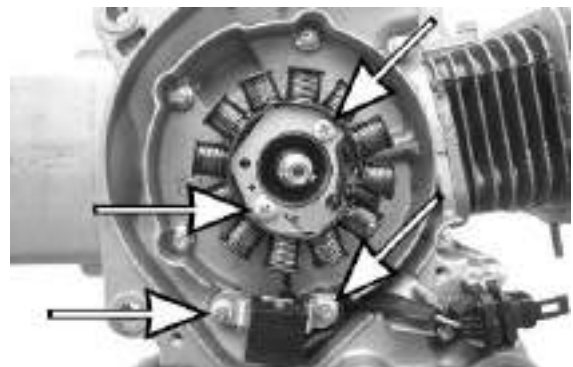
- Refit the stator and flywheel carrying out the removal procedure in reverse, tightening the retainers to the specified torque.

**N.B.**

**THE PICK-UP CABLE MUST BE POSITIONED ADHERING TO THE FUSION TONGUE ON THE CRANKSHAFT IN SUCH A WAY AS TO AVOID BEING CRUSHED BY THE FAN COVER ASSEMBLY.**

### Locking torques (N\*m)

Pick-up screws 3 ÷ 4 Stator screws 3 ÷ 4



---

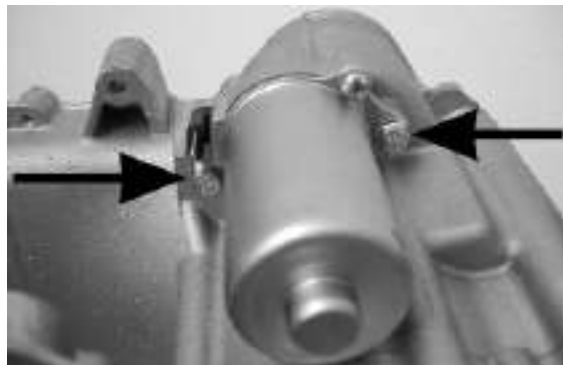
## Flywheel and starting

---

---

## Removing the starter motor

- Unscrew the screw on the power positive contact and disconnect the cable
- Unscrew the 2 screws fixing the starter motor to the crankcase and recover the power wiring.



---

## Removing the flywheel magneto

- Lock the rotation of the flywheel using the calliper spanner.
- Remove the nut.

**CAUTION**

THE USE OF A CALLIPER SPANNER OTHER THAN THE ONE SUPPLIED COULD DAMAGE THE STATOR COILS



- Extract the flywheel with the extractor.

**Specific tooling**

**020565Y Flywheel lock calliper spanner**

**020162Y Flywheel extractor**



---

## Inspecting the flywheel components

- Check that the flywheel internal magnets are in good conditions.
- Check that the flywheel riveted joints are correctly tightened.
- Check there are no deformations that may cause rubbing on the stator and the Pick-Up.
- Check that the stator winding, its ferromagnetic support and the pick-up are in good conditions.



---

## Starter gear rim

- Check the tothing is level and in good conditions



---

## Intermediate gear

- Check that the keying tothing on the crown and the starter motor are in good conditions.
- Check that the bendix opens and returns adequately.



## Refitting the flywheel magneto

- Refit the stator and the pick-up being careful to pass the wiring through the appropriate crankcase couplings.
- Refit the flywheel to the crankshaft being careful to respect the keying, then lock rotation with the specific tool and tighten the nut to the prescribed torque.

### N.B.

A VARIATION OF THE AIR GAP DISTANCE CAN LEAD TO A VARIATION IN THE IGNITION ADVANCE SUCH AS TO CAUSE PINGING, KNOCKING ETC.

### Specific tooling

020565Y Flywheel lock calliper spanner

### Locking torques (N\*m)

Flywheel nut 52 ÷ 58



## Refitting the starter motor

- Install the starter motor in its seating in the crankcase.
- Tighten the screw on the head side but do not lock it, screw the second screw inserting the earth cable (black), then tighten the 2 screws at the prescribed torque.
- Tighten the locking screw of the positive cable (red) on the side contact.



### N.B.

REFIT THE REMAINING PARTS AS DESCRIBED IN THE CYLINDER HEAD, TIMING, LUBRICATION, FLYWHEEL AND TRANSMISSION CHAPTERS.

### Locking torques (N\*m)

Starter motor screws 11 ÷ 13

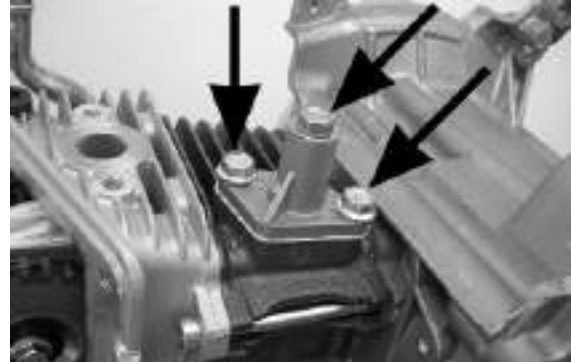
## Cylinder assy. and timing system

## Removing the timing system drive

- Temporarily loosen the tensioner central screw and remove it together with the spring.
- Unscrew the 2 retainers indicated in the figure and remove the chain tightener support being careful to recover the sealing gasket.

### N.B.

**SHOULD THE GASKET NOT BE IN GOOD CONDITIONS, REPLACE IT AFTER CAREFULLY CLEANING THE FAYING SURFACE IN ORDER TO AVOID ENGINE OIL LEAKS**



- Remove the driving pulley
- Remove the oil pump chain
- Remove the tappet cover
- Remove the central screw and the Belleville washer indicated in the figure and lock the camshaft crown with the specific tool.

### N.B.

**TO FACILITATE REMOVING THE HEAD COMPONENTS, SET THE CRANKSHAFT TO THE TIMING POINT (TDC OF THE COMPRESSION END).**



## Specific tooling

### 020565Y Flywheel lock calliper spanner

- Remove the camshaft control pulley and the washer below.
- Remove the pinion of the crankshaft timing control
- To remove the chain lower guiding pad, remove the head by pulling it upwards

### N.B.

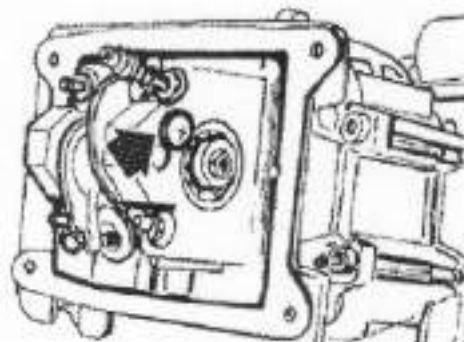
**IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE DIRECTION OF ROTATION IS MAINTAINED.**

## See also

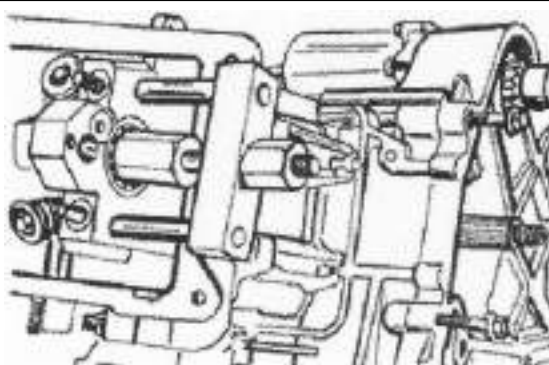
[Removal](#)  
[Removing the driving pulley](#)

## Removing the cam shaft

- Remove the bearing clamping screw indicated in the figure.



- Remove the entire camshaft with bearing using the specific tool shown in the figure.
- Take out the camshaft bearing with the aid of the specific tool, being careful to mount a screw on the camshaft in order to protect its thread.



### N.B.

IF A BEARING SEPARATES FROM THE CAMSHAFT, IT IS ESSENTIAL TO FIT A NEW BEAR.

### Specific tooling

**020450Y Camshaft fitting/removal tool**

**004499Y Camshaft bearing extractor**

**004499Y001 Bearing extractor bell**

**004499Y002 Bearing extractor screw**

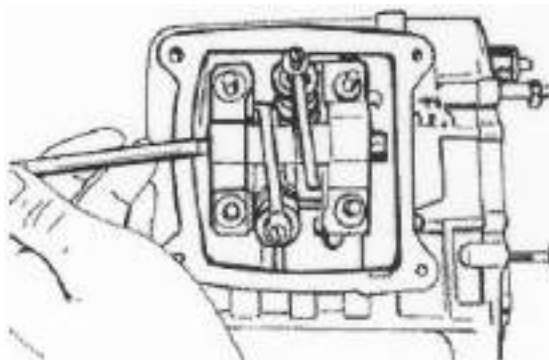
**004499Y006 Bearing extractor ring**

**004499Y027 Bearing extractor part**

- Pull out the rocking lever bolt operating on the flywheel hole and remove the rocking levers at the same time.

### N.B.

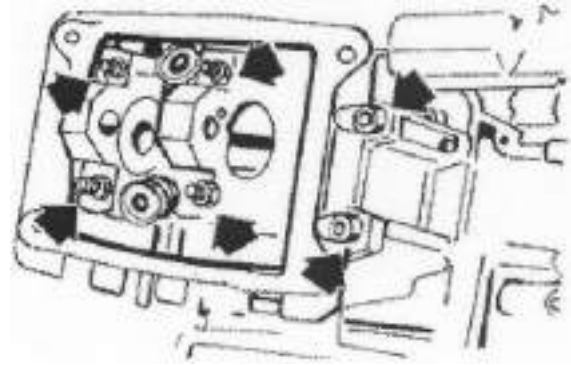
MARK THE ASSEMBLY POSITION OF THE ROCKING LEVERS IN ORDER TO AVOID MISPLACING THE INTAKE AND DISCHARGE ENDS.





## Removing the cylinder head

- Remove the cooling covers, the timing control, the camshaft and the rocking levers.
- 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.

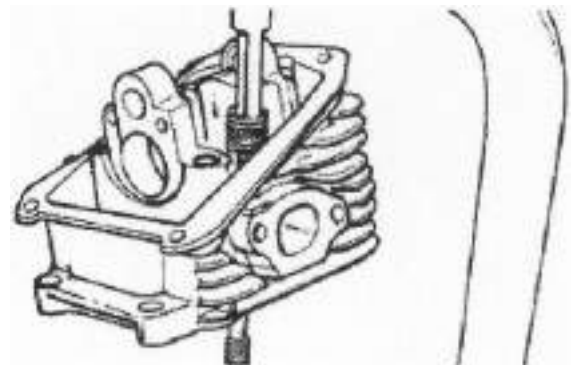


### N.B.

IF NEEDED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, PINS AND ROCKING LEVERS WITHOUT REMOVING THE DRIVING PULLEY UNIT. REMEMBER TO HOLD THE TIMING CHAIN WITH A PIECE OF METAL CABLE AND TO ADJUST THE CHAIN TIGHTENER UPON RE-FITTING.

## Removing the valves

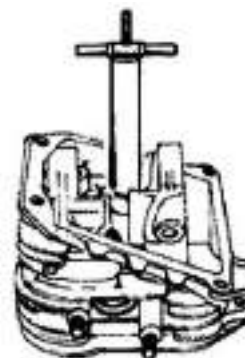
- Using the specific tool fitted with the element shown in the figure, remove the cotters, the plates and the spring between the valves.



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

### Specific tooling

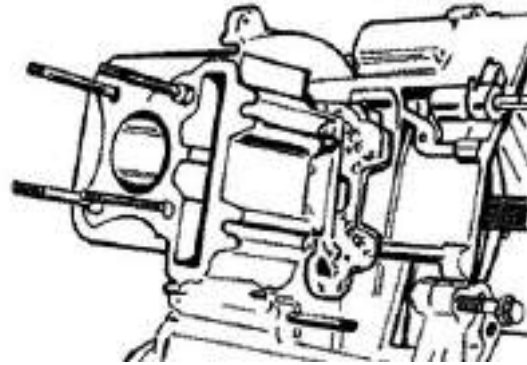
020431Y Valve oil seal extractor



## Removing the cylinder - piston assy.

- Remove the cylinder paying attention to the 2 cylinder centring dowels in the housing.
- Remove the cylinder base gasket.

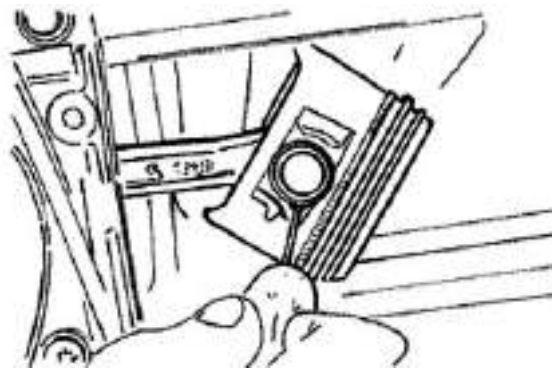
To avoid damaging the piston, keep it fixed while removing the cylinder.



- Remove the two stop rings, the wrist pin and the piston.
- Remove the 3 piston rings.

### N.B.

BE CAREFUL NOT TO DAMAGE THE PISTON RINGS DURING REMOVAL.



## Inspecting the small end

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

### N.B.

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

### Characteristic

**Max. diameter admitted: check the small end**

13.030 mm

**Standard diameter check the small end**

13 +0.025+0.015mm



### Inspecting the wrist pin

- Measure the outer diameter of the gudgeon pin.

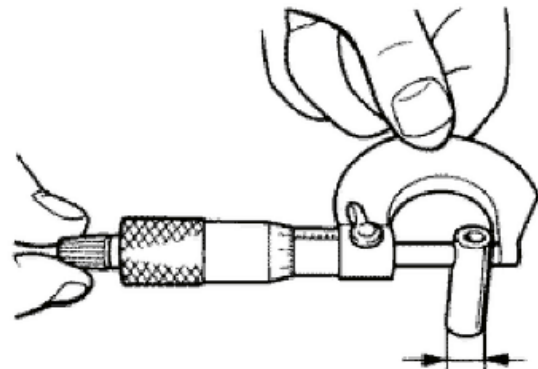
**Characteristic**

**Standard diameter gudgeon pin**

13 -0-0.004mm

**Minimum admissible diameter pin**

12.990 mm



### Inspecting the piston

- Calculate the piston pin coupling clearance.

**Fitting clearance**

**Pin coupling clearance**  $13 +0.010+0.005\text{mm}$   $0.005 \div 0.014 \text{ mm}$

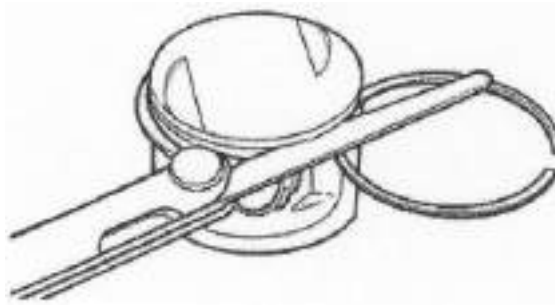


- Measure the outside diameter of the piston, perpendicular to the gudgeon pin axis.
- Carry out the measurement at 27 from the piston crown as shown in the figure.

- Carefully clean the sealing rings housings with the aid of an old piston ring.
- Measure the coupling clearance between the sealing rings and the piston grooves using a thickness gauge, as shown in the figure.
- If the clearances detected exceed the limits specified in the table, the piston and the piston rings should be replaced.

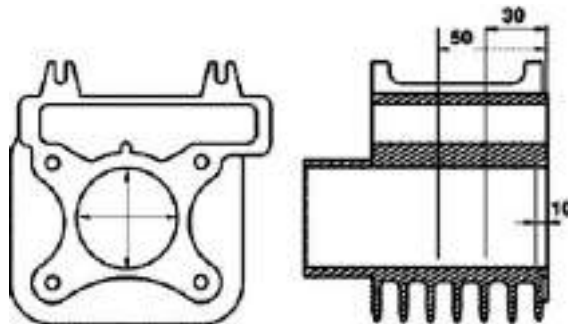
**PISTON**

Name	Description	Dimensions	Initials	Quantity
Top piston ring		0.030 ÷ 0.065 mm		0.080 mm
Middle piston ring		0.020 ÷ 0.055 mm		0.070 mm
oil scraper		0.040 ÷ 0.160 mm		0.20 mm



## Inspecting the cylinder

- Using a bore meter, measure the inner cylinder diameter at three different points according to the directions shown in the figure.
- Check that the coupling surface with the head is not worn or misshapen.
- Pistons and cylinders are classified into categories based on their diameter. The coupling is carried out in pairs (A-A, B-B, C-C, D-D).

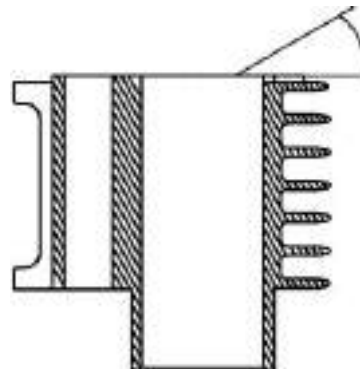


### Characteristic

#### Maximum allowable run-out:

0.05 mm

- The cylinder rectifying operation should be carried out with a surfacing that respects the original angle. at 120° crossed.
- The cylinder surface roughness should be of R.A.= 0.30 ÷ 0.50.
- This is indispensable for a good seating of the sealing rings, which in turn minimises oil consumption and guarantees optimum performance.
- The pistons are oversized due to cylinder rectification and are subdivided into two categories 1st and 2nd with 0.2-0.4mm oversize. They are also classified into 4 categories A-A, B-B, C-C, D-D.



## Inspecting the piston rings

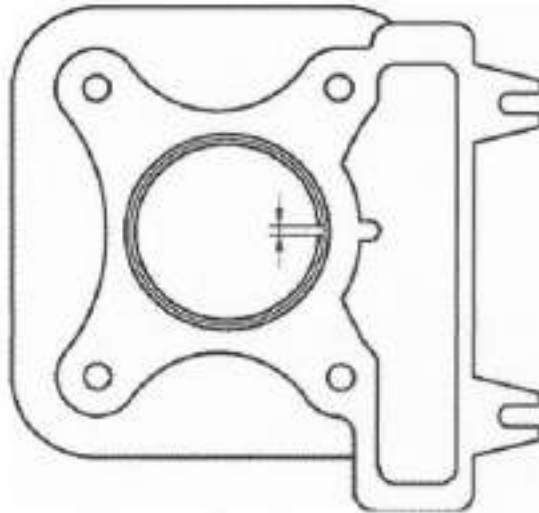
- Alternately insert the three sealing rings into the cylinder, in the area where it retains its original diameter. Using the piston, insert the rings perpendicularly to the cylinder axis.
- Measure the opening, see figure, of the sealing rings using a thickness gauge.
- If any measurements are greater than specified, replace the piston rings.

**N.B.**

**BEFORE REPLACING ONLY THE PISTON RINGS, ENSURE THAT THE CLEARANCE BETWEEN THE PISTON RINGS AND THE PISTON RING GROOVES, AND BETWEEN THE PISTON AND THE CYLINDER, IS AS SPECIFIED. IN ANY CASE, NEW PISTON RINGS USED IN COMBINATION WITH A USED CYLINDER MAY HAVE DIFFERENT BEDDING CONDITIONS THAN THE STANDARD.**

### SEALING RINGS

Name	Description	Dimensions	Initials	Quantity
Top piston ring		0.08 ÷ 0.20 mm		0.35 mm
Middle piston ring		0.05 ÷ 0.20 mm		0.30 mm
oil scraper		0.20 ÷ 0.70 mm		0.80 mm

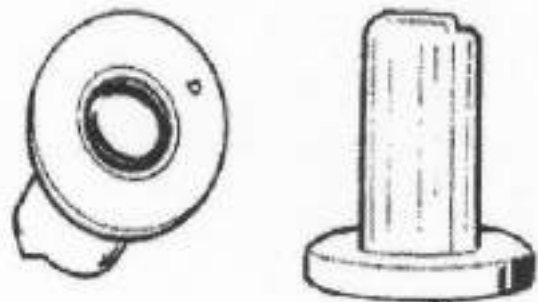


## Removing the piston

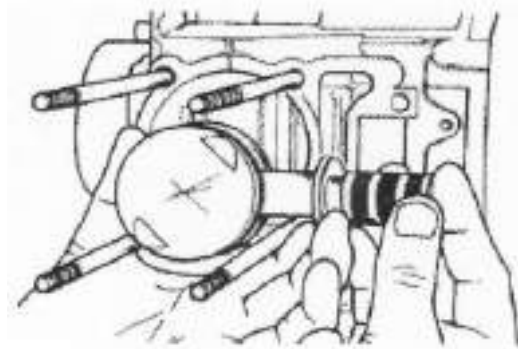
- Install piston and wrist pin onto the connecting rod, aligning the piston arrow the arrow facing towards the exhaust.
- Fit the pin stop ring onto the appropriate tool.

### Specific tooling

#### 020448Y Pin lock fitting tool



- With the opening in the position indicated on the tool, set the lock ring into position in the tool with the punch.
- Rest the tool on the piston paying attention that the 90° chamfered side faces upwards as indicated in the figure.
- Fit the gudgeon pin stop using the plug.



### CAUTION

**USING A HAMMER TO POSITION THE RINGS CAN DAMAGE THE LOCKING HOUSING.**

## Choosing the gasket

This engine is manufactured with two different head gasket solutions:

- Fibre gasket drw. 969244 0.95 mm thick.
- Steel gasket drw. 969393 0.3 mm thick.

In order to guarantee an adequate compression ratio, the gaskets match cylinders with different heights:

- **Fibre gaskets with cylinder 56.45 mm high**
- **Fibre gaskets with cylinder 57.15 mm high**

In order to carry out the revision both gaskets should be present on the spare parts.

All pin-piston-cylinder units supplied with the spare parts present cylinders 57.15 mm high

- Provisionally fit the piston into the cylinder, without any base gasket.
- Fit a dial gauge on the specific tool, then rest both on a stop surface.
- Zero set the dial gauge on the stop surface. Keeping the zero position, assemble the tool on the cylinder and lock it with 2 nuts as shown in the figure.
- Rotate the crankshaft until TDC (the inverted point of the dial gauge rotation)
- Measure piston protrusion compared with the head plane and determine the gasket thickness to be used according to the table below. By correctly identifying the cylinder base gasket thickness, an adequate compression ratio is maintained.
- Remove the specific tool and the cylinder.

### Characteristic

#### Standard compression ratio

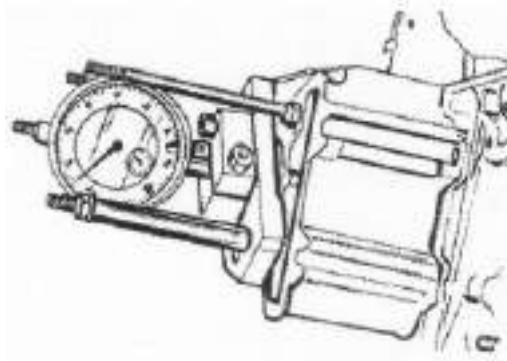
C.R.  $11.5 \div 12 \div 1$

#### **CYLINDER BASE GASKET THICKNESS**

Specification	Desc./Quantity
Cylinder height	56.45 ± 0.05
Head gasket thickness (fibre)	0.95 ± 0.06
Measure detected	0.9 ± 0.05
Base gasket thickness	0.4
Measure detected	1 ± 0.05
Base gasket thickness	0.5

#### **CYLINDER BASE GASKET THICKNESS**

Specification	Desc./Quantity
Cylinder height	57.15 ± 0.05
Head gasket thickness (steel)	0.3 ± 0.05
Measure detected	0.20 ± 0.05
Base gasket thickness	0.4
Measure detected	0.30 ± 0.05
Base gasket thickness	0.5



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 GETS INSIDE THE CYLINDER, THE THINNER THE HEAD GASKET TO BE APPLIED SHOULD BE (TO RECOVER THE COMPRESSION RATIO) AND VICE VERSA.

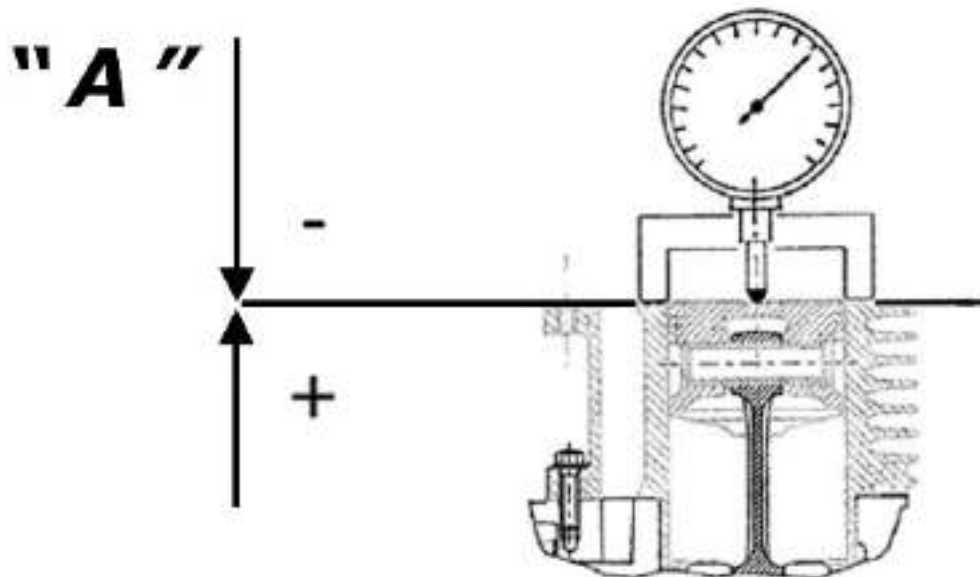
**Characteristic**

Shimming system to control the compression ratio

CR: 11.1 ÷ 12.9

**PISTON PROTRUSION CHECK**

Name	Measure A	Thickness
shimming_1	0.05 ÷ 0.25	0.35
shimming_2	0.25 ÷ 0.40	0.25

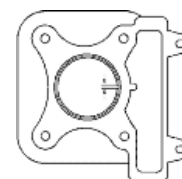


## Refitting the piston rings

- Alternately insert the three sealing rings into the cylinder, in the area where it retains its original diameter. Using the piston, insert the rings perpendicularly to the cylinder axis.
- Measure the opening, see figure, of the sealing rings using a thickness gauge.
- If any measurements are greater than specified, replace the piston rings.

### N.B.

**BEFORE REPLACING ONLY THE PISTON RINGS, ENSURE THAT THE CLEARANCE BETWEEN THE PISTON RINGS AND THE PISTON RING GROOVES, AND BETWEEN THE PISTON AND THE CYLINDER, IS AS SPECIFIED. IN ANY CASE, NEW PISTON RINGS USED IN COMBINATION WITH A USED CYLINDER MAY HAVE DIFFERENT BEDDING CONDITIONS THAN THE STANDARD.**



### SEALING RINGS

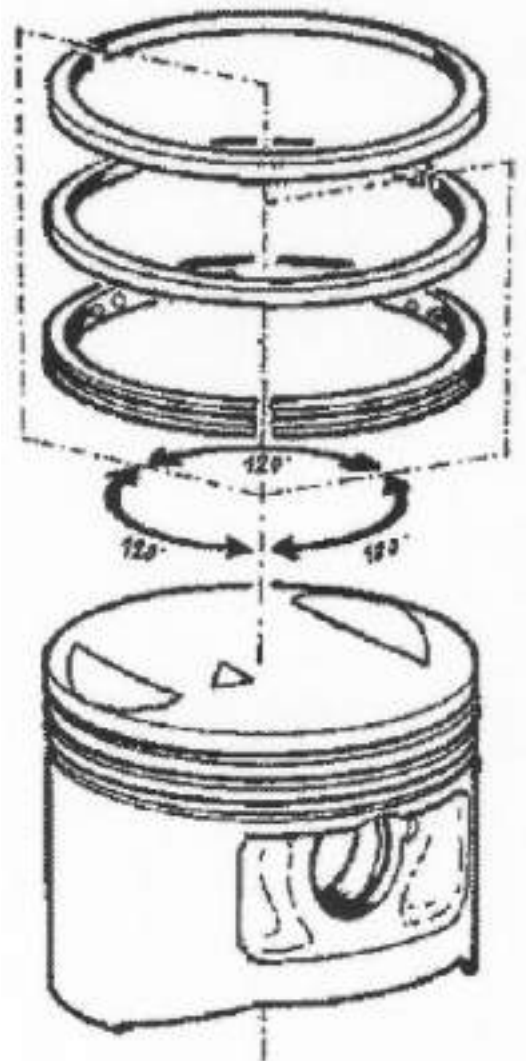
Name	Description	Dimensions	Initials	Quantity
Top piston ring		0.08 ÷ 0.20 mm		0.35 mm
Middle piston ring		0.05 ÷ 0.20 mm		0.30 mm
oil scraper		0.20 ÷ 0.70 mm		0.80 mm



- Fit the oil scraper ring starting from the spring, taking care that the spring ends do not superimpose. Fit the two piston rings so that their gaps and that of the oil scraper ring are never aligned.
- Fit the 2nd sealing ring with the identifying letter «T» facing towards the piston crown.
- Fit the 1st sealing ring with the reference letter «T» facing towards the piston crown.
- Offset the ring gaps by 120° to each other as shown in the figure.
- Lubricate the components with engine oil.

**N.B.**

IN ORDER TO OBTAIN A GOOD BEDDING, THE 2 SEALING PISTON RINGS ARE MADE OF CONE SHAPED CONTACT SECTION TO THE CYLINDER. AS A RESULT IT IS IMPORTANT TO RESPECT THE FITTING INSTRUCTION TO ASSEMBLY THE RINGS WITH THE "T" MARK FACING UPWARDS.



## Refitting the cylinder

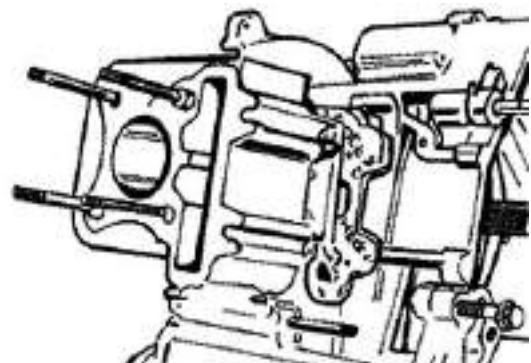
- Fit the base gasket of the chosen thickness, previously determined.
- Fit the cylinder as shown in the figure
- The piston can be kept out of the housing plane using the appropriate tool.

**N.B.**

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

### Specific tooling

#### 020288Y Fork to assemble piston on cylinder



If the four cylinder stud bolts should be replaced in this kind of engine, it is necessary to tighten the head nuts strictly following the procedure below.

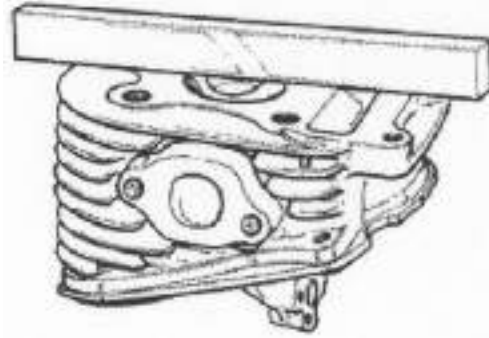
The procedure is different from that indicated in the vehicle manuals:

Head nuts tightening (only for stud bolts replacement)  $6 \div 7 \text{ N} \cdot \text{m} + 90^\circ + 90^\circ + 90^\circ$

The  $45^\circ$  rotation reduction of the key is necessary to avoid stud bolt stretching.

## Inspecting the cylinder head

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



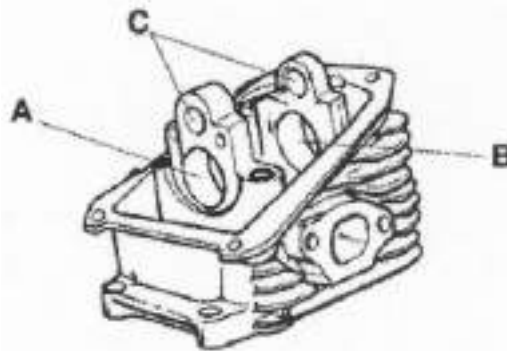
### Characteristic

**Maximum admitted unevenness: Head check**

0.05 mm

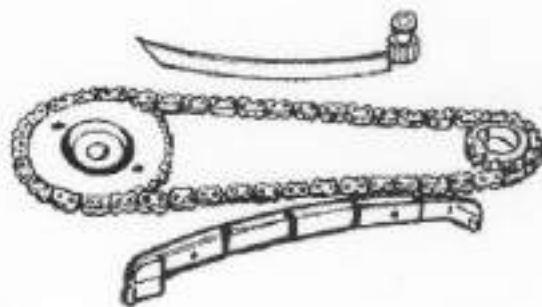
### HEAD CHECK

Specification	Desc./Quantity
Standard diameter (mm) A	$\varnothing 32.015 \div 32.025 \text{ mm}$
Standard diameter (mm) B	$\varnothing 16.0 \div 16.018$
Standard diameter (mm) C	$\varnothing 11.0 \div 11.018$



## Inspecting the timing system components

- Check that the guide shoe and the tensioner shoe are not worn out.
- Ensure that the camshaft drive pulley, the chain assembly and the sprocket wheel are not worn.
- If signs of wear are found, replace the parts. If the chain, pinion or pulley are worn, replace the whole assembly.

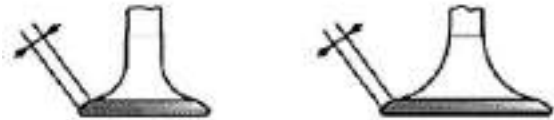


- Remove the central screw and the tensioner spring. Check that the one-way mechanism is not worn.
- Check the condition of the tensioner spring.
- If examples of wear are found, replace the whole assembly.



## Inspecting the valve sealings

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



### Characteristic

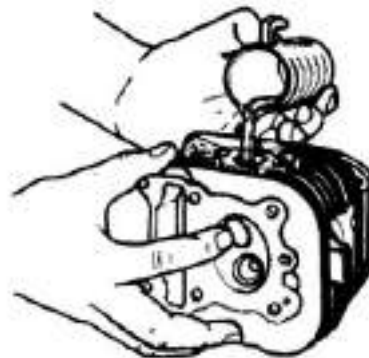
#### Sealing surface width: Intake

1.5 mm

#### Sealing surface width: Drainage

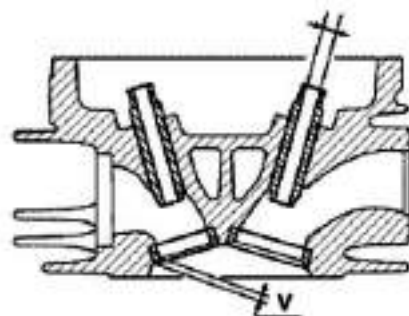
1.6 mm

- Insert the valves into the cylinder head.
- Test the 2 valves alternatively.
- 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

- Remove any carbon formation from the valve guides.
- Measure the inside diameter of each valve guide.
- Take the measurement at three different heights in the rocker arm push direction.



### Characteristic

#### Discharge guide: Standard diameter

5 +0+0.012mm

#### Discharge guide: Wear limit

5.022 mm

#### Intake guide: Standard diameter

5 +0+0.012mm

**Intake guide: Wear limit**

5.022 mm

- 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.
- Check width of the impression on the valve seat «V»

**Characteristic**

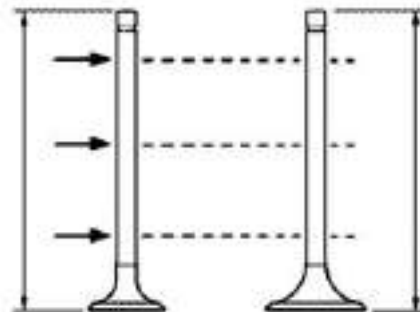
**Wear limits:**

Max. 1.6 mm.

---

## Inspecting the valves

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



**Characteristic**

**Minimum diameter allowed: Intake**

4.970 mm

**Minimum admissible diameter drainage**

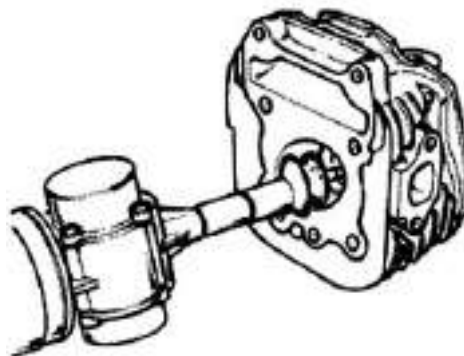
4.960 mm

**Fitting clearance**

**Standard clearance: Intake** 0.015 ÷ 0.042 mm

**Standard clearance: drainage** 0.025 ÷ 0.052 mm

- Check that there are no signs of wear on the contact surface with the articulated register terminal.
- If the sealing surface on the valves is wider than the specified limit, damaged in one or more points or curved, replace the valve with a new one.



**Characteristic**

**Valve standard length: Intake**

70.1 mm

**Valve standard length: drainage**

69.2 mm

**Fitting clearance**

**Max. clearance allowed: Intake** 0.052 mm **Max.**

**clearance allowed: drainage** 0.062 mm

- 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

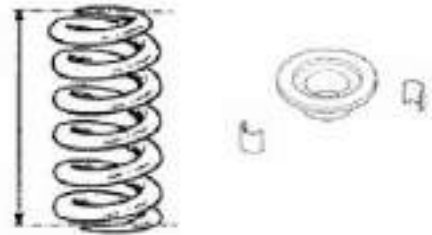
grinding, keep the cylinder head in a horizontal position. This will prevent the lapping compound residues from penetrating between the valve stem/guide coupling.

**CAUTION**

**TO AVOID SCORING THE CONTACT 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.**

## Inspecting the springs and half-cones

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

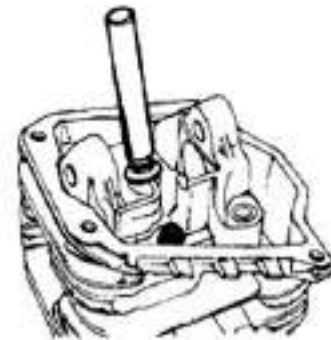


## Refitting the valves

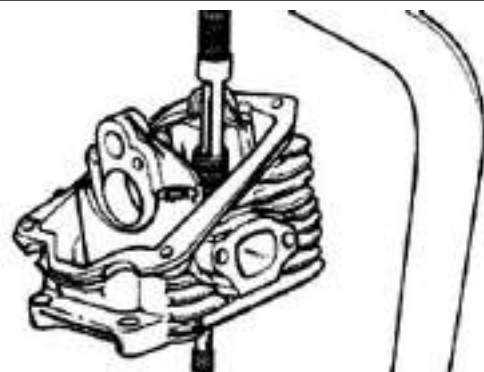
- Lubricate the valve guides with graphite grease.
- Place the lower plates of the valve spring on the head.
- Use the punch to fit the 2 sealing rings one at a time.

### Specific tooling

**020306Y Punch for assembling valve seal rings**



- Fit the valves, the springs and the upper plates.
- Using the appropriate tool, compress the springs and insert the cotters in their seats.



## Inspecting the cam shaft

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

### Characteristic

**Standard diameter - Bearing A:**

$\varnothing 12 +0.002 +0.010$

mm **Standard diameter - Bearing B:**

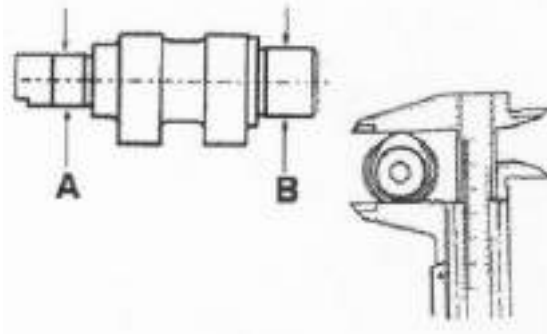
$\varnothing 16-0.015 -0.023$  mm

**Minimum diameter allowed - Bearing A:**

$\varnothing 11.98$  mm

**Minimum diameter allowed - Bearing B:**

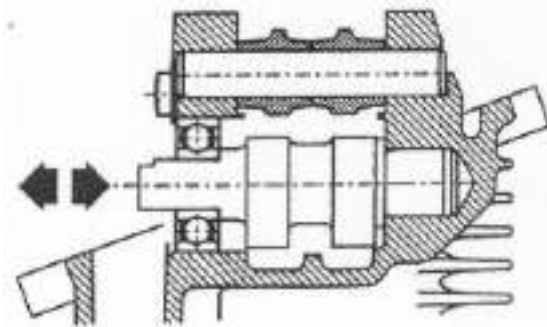
$\varnothing 15.96$  mm



- 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.

### N.B.

**A BALL BEARING IS FITTED ON BEARING «A»; CONSEQUENTLY, BEARING «B» IS THE MOST IMPORTANT AS IT WORKS DIRECTLY ON THE HEAD ALUMINIUM**



### Characteristic

**Standard height - Intake:**

25.935 mm

**Standard height - Discharge:**

25.935 mm

### Fitting clearance

**Maximum admissible axial clearance** 0.5 mm

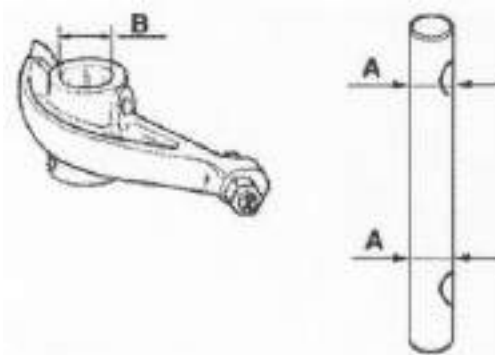
- Check there are no signs of scoring or wear on the rocking lever bolt.

- Measure the diameter «A».

- Measure the internal diameter of each rocking lever. level «B».

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

- In case of anomalies, replace the damaged components.



### Characteristic

**Minimum admissible diameter**

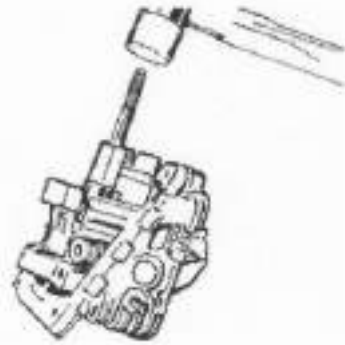
Ø 10.970 mm

**Maximum diameter allowed:**

Ø 11.030 mm

**Refitting the head and timing system components**

- Fix the head on a workbench.
- Screw the tool to fit the camshaft fully down on the bearing's inner track.
- Fit the camshaft fully into its seating together with the bearing with the aid of a mallet.
- Remove the tool.
- Fit the head gasket after cleaning the faying surface carefully.
- Insert the head in the cylinder stud bolts and tighten the 4 fixing nuts to the prescribed torque.

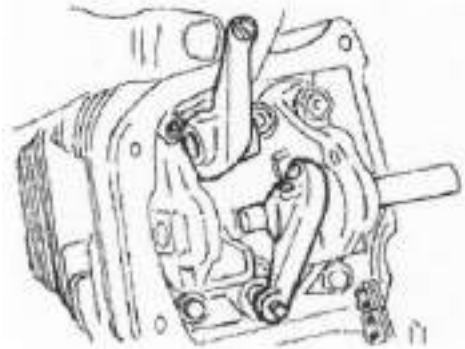
**Specific tooling****020450Y Camshaft fitting/removal tool****Locking torques (N\*m)**

**Head-cylinder stud bolt nuts:** 6 ÷ 7 +135° +90° Nm  
 first fitting, upon refitting tighten again at 6 ÷ 7 90° +90° Nm

- Loosen the rocking lever registers.
- Fit the pin, the intake rocking lever and the discharge rocking lever.
- Lubricate the 2 rocking levers through the holes.

**N.B.**

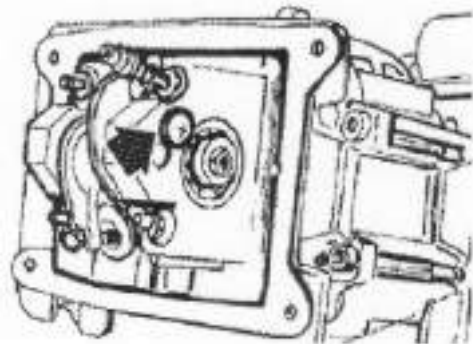
**IF A BEARING SEPARATES FROM THE CAMSHAFT, IT IS ESSENTIAL TO FIT A NEW BEARING.**



- Screw the limit screw for the pin and the camshaft with the washer indicated in the figure and tighten it to the prescribed torque.

**Locking torques (N\*m)**

**Rocking lever axle and camshaft bearing screw** 3 ÷ 4 Nm



- Finish the head tightening following the procedure below: screw the four head nuts to an initial torque at two crossed passes. Afterwards tighten the nuts with 2 turns of 90° each to be done at two crossed passes.

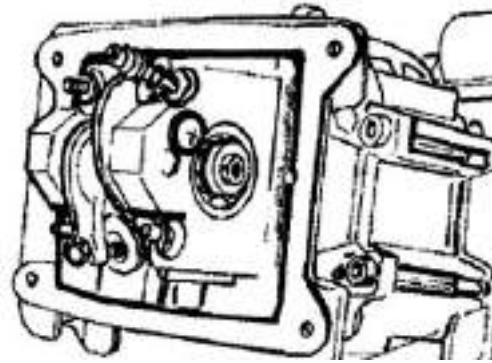
- Finish the tightening of the head to the crankcase with the 2 side screws.

**N.B.**

**SHOULD THE CRANKCASE OR THE CYLINDER STUD BOLTS BE REPLACED, IT IS NECESSARY TO CARRY OUT AN INITIAL TIGHTENING PLUS OTHER 3 TURNS OF 90° EACH AT 3 CROSSED PASSES**

**Locking torques (N\*m)**

**Head-cylinder stud bolt nuts:**  $6 \div 7 +135^\circ +90^\circ$  Nm  
 first fitting, upon refitting tighten again at  $6 \div 7 90^\circ +90^\circ$  Nm  
**Head cover screws**  $8 \div 10$  Nm



**Refitting the timing chain**

- Insert the timing chain pads in their corresponding seatings, the screw and the spacer as indicated in the figure.

- Tighten to the prescribed torque and check the tensioner pad moves adequately.

- Insert the timing pinion in driving shaft with the chamfered side facing the insertion (towards the main bearing).

- Loop the timing chain around the sprocket on the crankshaft.

**Locking torques (N\*m)**

**Chain tensioner pad screw**  $5 \div 7$  Nm

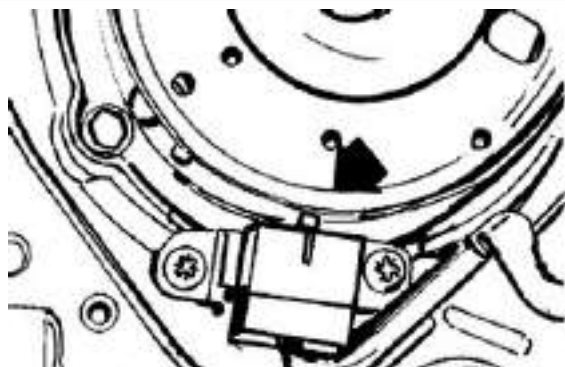
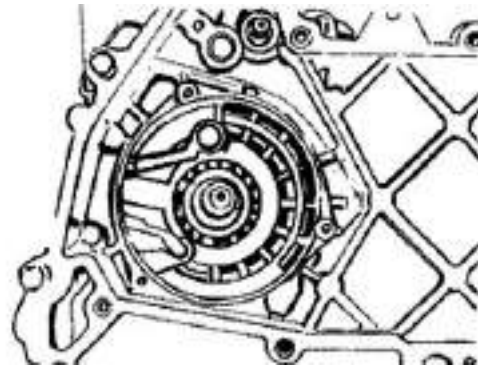
- Refit the spacer on the cam shaft.

- Rotate the engine so that the piston is at top dead centre, using the reference marks on the flywheel and the crankcase.

- With this operation, insert the chain on the camshaft control pulley and make the reference notch coincide with the point on the head.

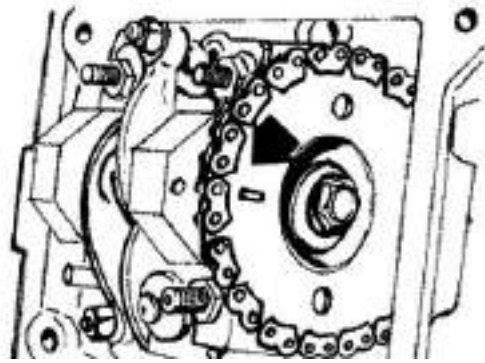
- Fit the pulley on the camshaft.

- Fit the belleville washer so that the outer rim touches the pulley.





- Bring the screw closer but without reaching its final locking point.



- Push the tensioner pad lightly so as to check the correct timing.
- Use the specific tool to lock the camshaft crown gear and tighten the screw.
- Adjust valve clearance.
- Replace the O-Ring on the tappet cover.
- Fit the tappet cover and lock it with the 4 fixing screws indicated in the figure.

### Specific tooling

**020565Y Flywheel lock calliper spanner**

### Locking torques (N\*m)

**Camshaft pulley screw 12 ÷ 14 Head cover screw 8 ÷ 10 Nm**

- 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 spring with the central screw and tighten it to the prescribed torque.
- Fit the spark plug.

### Characteristic

#### Recommended spark plug

NGK CR 9EB - CHAMPION RG 4HC

#### Electric characteristic

##### Electrode gap

0.7 ÷ 0.8 mm

### Locking torques (N\*m)

**Timing chain tensioner screw 8 ÷ 10 Nm Timing chain tensioner central screw 5 - 6 Ignition spark plug 10 ÷ 15 Nm**

## Refitting the rocker-arms cover

- Carry out the removal procedure but in reverse order and tighten the four fixing screws to the specified torque.

**N.B.**

**FIT A NEW O-RING ON THE TAPPET COVER.**

### Locking torques (N\*m)

**Timing chain tensioner screws  $8 \div 10$  Nm**



## Refitting the intake manifold

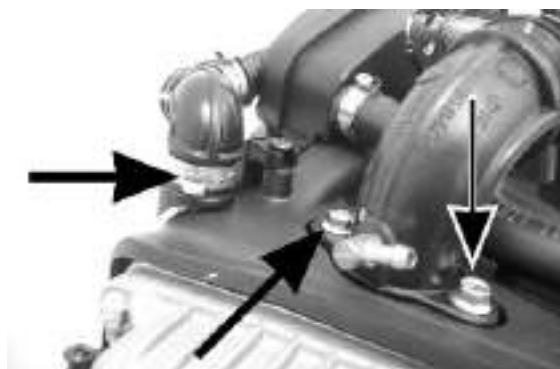
- Fit the cover sealing gaskets on the head.
- Fit the 2 covers.
- Fit the inlet manifold and do up the 2 screws to the specified torque.
- Fit the carburettor on the inlet manifold and lock the clamp.
- Fit the secondary air pipe and fix it with the appropriate clamp.

**N.B.**

**FIT THE CARBURETTOR THROUGH THE SUPPLEMENT ON THE MANIFOLD.**

### Locking torques (N\*m)

**Inlet manifold screw  $7 \div 9$  Nm**



## Crankcase - crankshaft

- First remove the following units:

Driving pulley Driven pulley

Final reduction greasing

Oil pump Flywheel with stator

Cylinder-piston-head unit

Starter motor with cables.

### See also

[Removing the starter motor](#)

[Removing the driven pulley](#)

[Removing the stator](#)

[Removal](#)

[Removing the cylinder - piston assy.](#)

[Removing the driving pulley](#)

## Splitting the crankcase halves

- Remove the ten crankshaft coupling screws.
- Separate the crankcase halves keeping the half casing driving shaft engaged on the transmission side.
- Remove the crankshaft.

### CAUTION

IF YOU FAIL TO DO THIS, THE CRANKSHAFT MIGHT ACCIDENTALLY FALL.



- Remove the oil guard on the flywheel side.

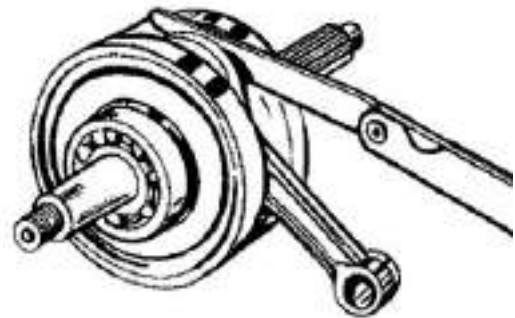
### CAUTION

THE CENTRIFUGAL OIL FILTER IS IN THE FLYWHEEL AXLE SHAFT. CONSEQUENTLY, DO NOT WASH WITH SOLVENTS OR BLOW COMPRESSED AIR SO THAT NO IMPURITIES LEAK OUT. A CENTRIFUGAL OIL FILTER'S LIFE IS THE SAME AS THE ENGINE'S AND IS MAINTENANCE FREE.

- Check the axial clearance on the connecting rod.

### Fitting clearance

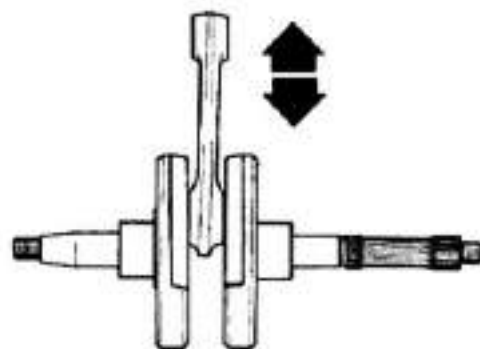
Connecting rod endfloat - standard clearance  $0.15 \div 0.30$  mm  
Connecting rod endfloat - standard clearance 0.5 mm



- Check the correct radial clearance of the connecting rod by holding the driving shaft with your hands and, with a dial gauge fitted to the rod small end, measuring the clearance, move the connecting rod vertically as shown in the figure.

### Fitting clearance

Connecting rod radial - standard clearance  $0.006 \div 0.018$  mm  
Connecting rod max. - radial clearance 0.25 mm

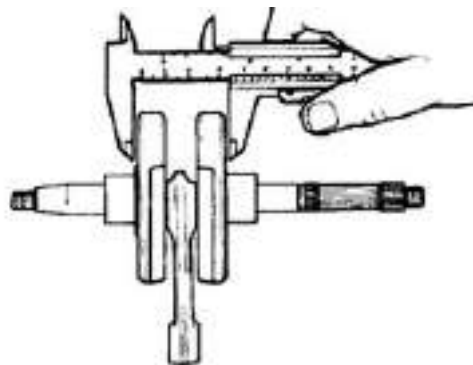


- Check that the half shaft surfaces are not scored and with the aid of a gauge check the driving shaft width as indicated in the figure.

### Characteristic

### Standard measure

45 mm



## Removing the crankshaft bearings

- Remove the flywheel bearing fitted on the driving shaft using the specific tool.

### Specific tooling

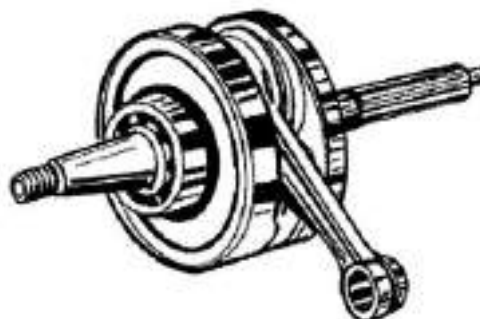
004499Y Camshaft bearing extractor

004499Y001 Bearing extractor bell

004499Y002 Bearing extractor screw

004499Y006 Bearing extractor ring

004499Y034 Bearing extractor part



## Refitting the crankshaft bearings

- Heat a new main bearing in an oil bath at 120°.  
 - Place the driving shaft on the support base and insert the bearing with the aid of an adequate piece of tube if necessary.

### N.B.

USE A NEW BEARING WHEN REFITTING

### WARNING

THE CENTRIFUGAL OIL FILTER IS IN THE FLYWHEEL AXLE SHAFT. DO NOT WASH WITH SOLVENTS OR BLOW COMPRESSED AIR SO THAT NO IMPURITIES LEAK OUT.

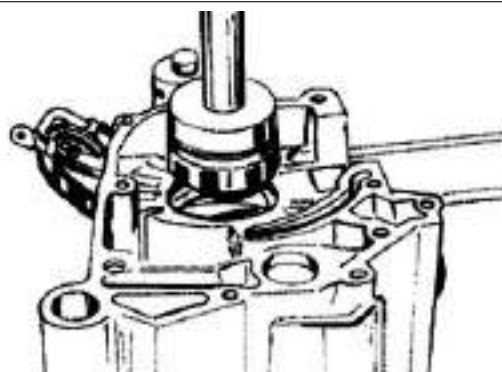
### Specific tooling

020265Y Bearing fitting base

008119Y009 Tube to assemble shafts and axles



- Support the crankcase on a surface and place it with the driving shaft axle in a vertical position.
- Warm the crankcase at ~ 120° C with a thermal gun (and support).
- Fit the punch with guide and adaptor, place the bearing on the punch using grease (to keep it from falling).
- Insert the bearing in the crankcase; if needed, use a mallet but do so with extreme care so as not to damage the engine crankcase limit stop.



### Specific tooling

**020359Y 42x47-mm adaptor**

**020364Y 25-mm guide**

**020376Y Adaptor handle**

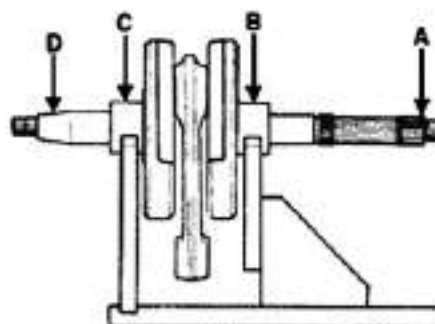
**020360Y Adaptor 52 x 55 mm**

## Inspecting the crankshaft alignment

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

**N.B.**

IF VALUES OTHER THAN THOSE ALLOWED ARE DETECTED, TRY STRAIGHTENING THE CRANKSHAFT BY INSERTING A WOODEN WEDGE BETWEEN THE HALF SHAFTS OR BY CLOSING THEM WITH A VICE AS NEEDED. IF EVEN AFTER THIS OPERATION THE VALUES ARE NOT THOSE ADMITTED, REPLACE THE CRANKSHAFT.



### Characteristic

**Off-line maximum admitted - A**

0.15 mm

**Off-line maximum admitted - B**

0.02 mm

**Off-line maximum admitted - C**

0.02 mm

**Off-line maximum admitted - D**

0.10 mm

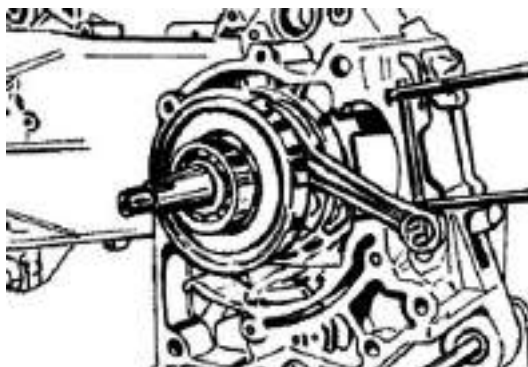
- Check that the driving shaft cone, the tab seat, the oil seal capacity, the toothed gear and the threaded tangs are in good working order.
- In case of failures, replace the driving shaft.

### Specific tooling

## 020074Y Support base for checking crankshaft alignment

### Refitting the crankcase halves

- Be careful to place the two centring dowels preferably on the flywheel side half casing.
- Insert the crankshaft on the half casing on the transmission side.



- Fit the gasket recommended for surfaces on the half casing on the transmission side after greasing the two faying surfaces carefully.
- Insert the flywheel half casing.
- Fit the 10 screws and tighten them to the prescribed torque.



**N.B.**

**WHEN FITTING THE HALF CASING AND THE CRANKSHAFT, TAKE CARE NOT TO DAMAGE THE SHAFT THREADED TANGS.**

#### Recommended products

**Loctite 510 Liquid sealant**

Gasket

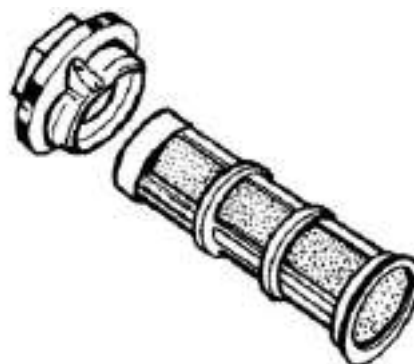
#### Locking torques (N\*m)

**Half casing joint bolts: 8 ÷ 10 Nm**

- Fit a new O-Ring on the mesh oil filter and on the filling cap; lubricate the rings.
- Insert the filter on the engine and lock the cap to the prescribed torque.

#### Locking torques (N\*m)

**Engine oil pre-filter cover: 25 ÷ 28 Nm**



### Lubrication

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## Crankshaft oil seals

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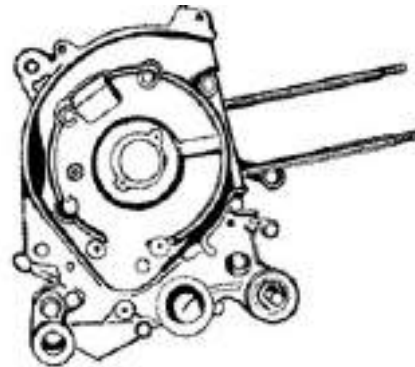
### Removal

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- Check that the chain contrast pad is not worn.
- Otherwise, replace the pad or fit it inverted to make it work on the other side.
- Any operation on the chain cover oil seal should be carried out placing the cover on the workbench on the covering plate side of the oil pump chain.
- Remove the oil seal with a tube section of 30 mm in diameter ( $\varnothing$  32 mm Max).



- 
- Extract the flywheel oil seal from the crankcase being careful not to damage or score the crankcase.



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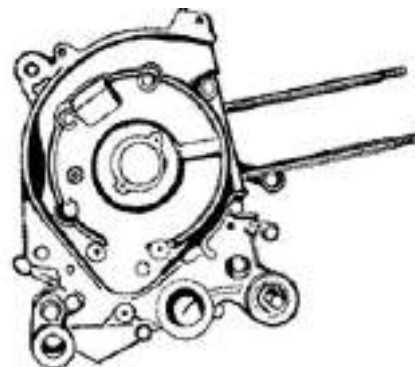
### Refitting

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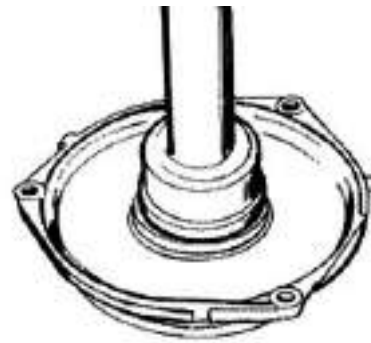
- Apply engine oil on the oil seal and it seating on the crankcase.
- From the outside and using the specific punch, place the oil seal fully down until it reaches the bottom of the seating in the crankcase.

**N.B.**

**FAILURE TO USE THE SPECIFIC TOOL CAN RESULT IN AN INCORRECT DEPTH POSITION AND AS A CONSEQUENCE IN INADEQUATE OIL SEALING.**



- Fit a new oil seal on the outer rim with the help of the specific tools below.
- Fit a new O-ring and lubricate it with grease.
- Install the cover on the engine crankcase, insert the three screws and place the cover in its position.
- Tighten the 3 screws to the prescribed torque.



### Specific tooling

**020376Y Adaptor handle**

**020358Y 37x40-mm adaptor**

### Locking torques (N\*m)

**Timing chain/oil pump compartment cover screws 4 ÷ 5 Nm**

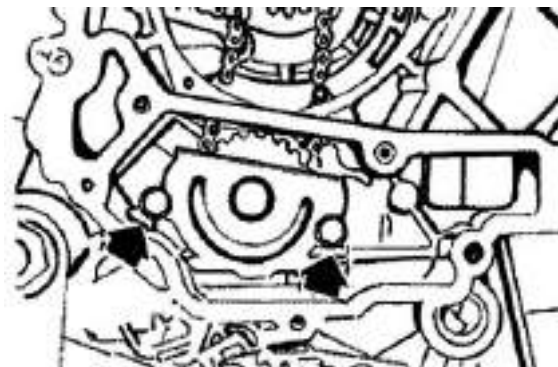
## Oil pump

### Removal

- Remove the chain compartment cover undoing the 3 fixing screws indicated in the figure.
- Take out the cover using the appropriate fusion couplings on the cover with a pair of pliers

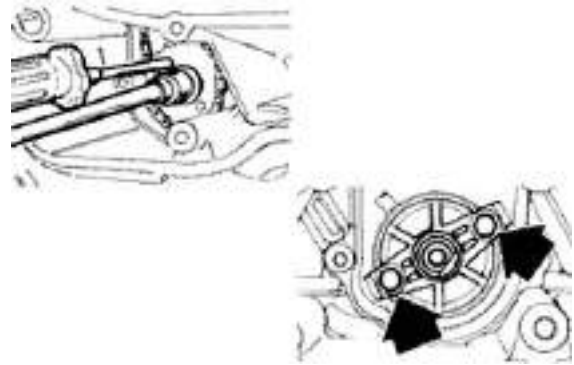


- Undo the 2 clamping screws in the figure and remove the cover over the pump control crown gear.
- Block the rotation of the oil pump control gear with a screwdriver inserted through one of its pump holes.





- Remove the central screw and the belleville washer
- Remove the chain with the crown gear.
- Remove the pinion of the crankshaft control.
- Remove the oil pump by undoing the 2 screws indicated in the figure.
- Remove the oil pump seal.



**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 a degreasing solvent and compressed air.
- Reassemble the rotors in the pump body, keeping the two reference marks visible. Replace the clip.

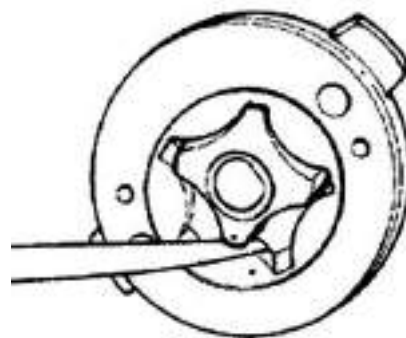


- Measure distance between rotors (inner rotor/ outer rotor) with a thickness gauge in the position shown in the picture.

### Characteristic

**Admissible maximum clearance 1**

0.15 mm

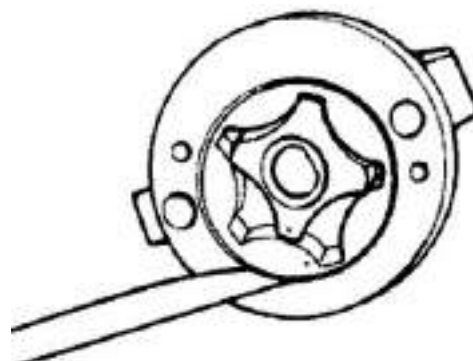


Measure the distance between the outer rotor and the pump body (see figure).

### Characteristic

**Admissible maximum clearance 2**

0.20 mm



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

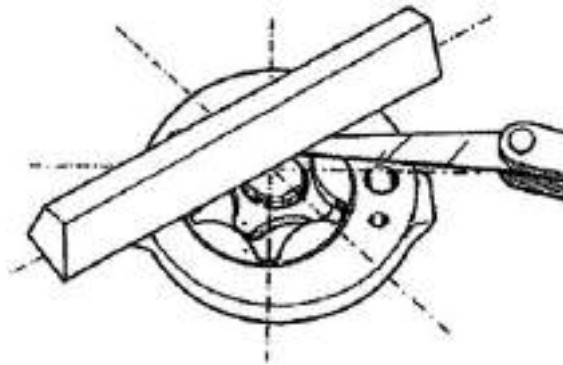
**N.B.**

**MAKE SURE THE TRUED BAR IS POSITIONED PROPERLY ON THE TWO POINTS ON THE PUMP BODY.**

**Characteristic**

**Admissible maximum clearance 3**

0.09 mm



## Refitting

- Check there are no signs of wear on the oil pump shaft or body.
- Check there are no signs of scoring or wear on the oil pump cover.
- If you detect non-conforming measurements or scoring, replace the faulty parts or the assembly.
- Fit the cover on the pump being careful to align the holes (2 on the cover and 2 on the pump body) fixing the oil pump on the crankcase.
- Fit the oil pump on the crankcase by tightening the two screws to the prescribed torque.
- Fit the pulley on the pump, the central screw to the specified torque and the belleville washer.
- Check that there is no seizing and/or friction during the pulley rotation.

**N.B.**

**FIT THE BELLEVILLE WASHER SO THAT ITS OUTER (CURVED) RIM TOUCHES THE PULLEY.**

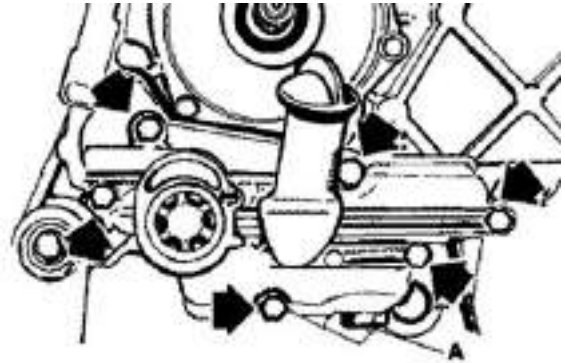
**Locking torques (N\*m)**

**Central screw 12 ÷ 14 Nm Cover screws 0.7 ÷ 0.9 Nm Oil pump screws 5 - 6**



## Removing the oil sump

- Remove the oil filling cap, the transmission cover, the complete driving pulley assembly with belt and pinion.
- Unscrew the oil drainage cap «A» shown in the figure and drain out all the oil from the sump.
- Remove the 6 screws indicated in the figure.



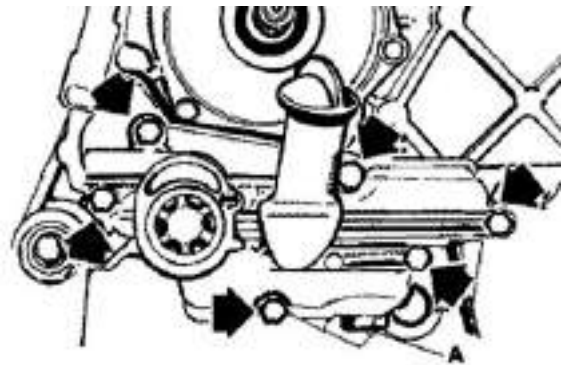
## Refitting the oil sump

- Clean and grease the faying surfaces.
- Apply LOCTITE 510 on the sump surface and tighten the 6 fixing screws to the specified torque.
- Refit the driving pulley assembly, the belt, the pinion and the transmission cover.

**WHEN TESTING THE LUBRICATION SYSTEM, REFER TO THE "CRANKCASE AND CRANKSHAFT" CHAPTER, REGARDING LUBRICATION OF THE CRANKSHAFT AND CONNECTING ROD**

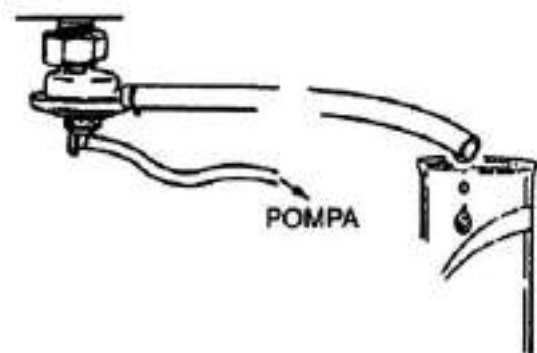
### Locking torques (N\*m)

**Oil sump screws  $8 \div 10$  Nm**



## Fuel supply

- Disconnect the fuel supply and the suction taking pipe from the carburettor.
- Check that there are no fuel leaks between the two tubes.
- Close the fuel outlet pipe.
- By means of the MITIVAC pump apply 0.1 bar of suction to the tap.
- Make sure that the suction is kept stable and that there are no fuel leaks.
- Reconnect the suction pipe to the manifold.
- Position the fuel pipe with the outlet at the point of the tap.
- Turn the engine by using the starter for five seconds with the carburettor at minimum.



- Take up the fuel by means of a graded burette.

**N.B.**

THE MEASUREMENT MAY BE FALSIFIED BY THE INCORRECT NUMBER OF REVS OR BY THE WRONG POSITION OF THE TUBE.. IN THIS CASE, THE TENDENCY IS TO OBTAIN A REDUCED FUEL FLOW RATE. THE SUCTION OUTLET ON THE MANIFOLD HAS A SECTION INTENTIONALLY REDUCED FOR THE PURPOSE OF ENHANCING THE SUCTION PULSATION AND THEREBY GUARANTEE A CONSTANT TAP FLOW RATE.

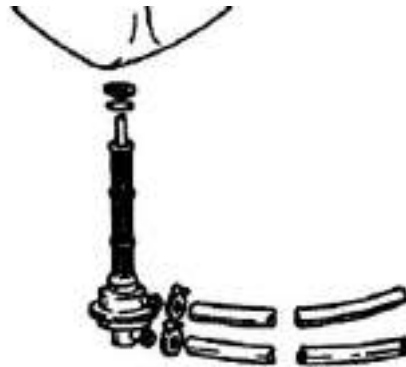
**Specific tooling**

020329Y MityVac vacuum-operated pump

**Characteristic****Minimum flow rate**

20 cc

- Completely empty the gas tank.
- Remove the petrol delivery tube and the suction tube.
- Loosen the clip and remove the tap.
- Clean the tank and the filter of the tap with a specific solvent.
- Refit the tap making sure that there is an O-Ring.
- Turn the tap to the direction it had before it was removed and block the clip.

**N.B.**

THE FILTER CAN BE UNSCREWED FROM THE COCK TO FACILITATE CLEANING.

**Removing the carburettor**

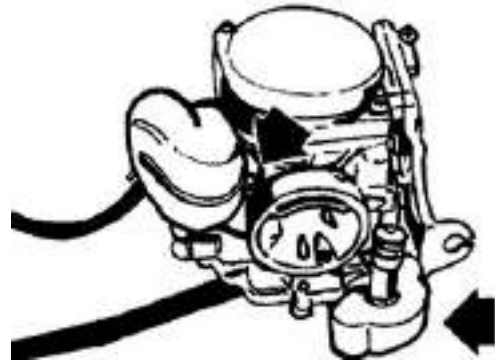
- To detach the carburettor from the engine, remove the two clamps anchoring the carburettor to the inlet manifold and the air intake coupling to the filter.
- Remove the fuel supply pipe.
- Disconnect the starter connection.
- Detach the accelerator cable with the sheath that connects the plate and the support.
- Remove the carburettor.



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

**CAUTION**

THE CARBURETTOR FEATURES AN ANTIVIBRATION RUBBER BUFFER FITTED ON THE LOWER SUPPLEMENT OF THE ACCELERATING PUMP BODY. UPON REFITTING THE CARBURETTOR ON THE ENGINE, MAKE SURE THIS BUFFER IS PRESENT SO THAT THE PETROL IN THE TANK DOES NOT EMULSIFY.

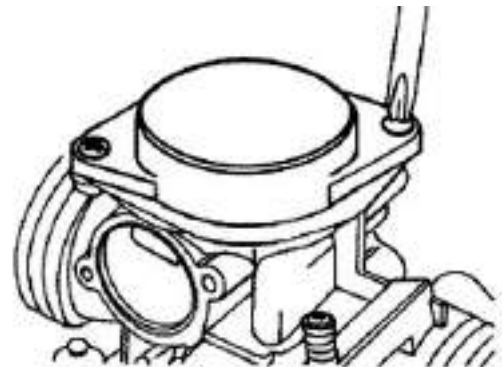


- Remove the 2 fixing screws indicated in the figure, the vacuum chamber cover and the spring.

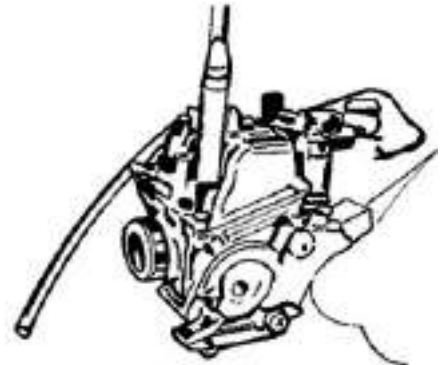
- Remove the vacuum valve together with the diaphragm; the pin, the spring and its plastic guide.

**WARNING**

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



- Remove the 3 fixing screws and the tank with the gasket.



- Remove the tank components following the procedure below.

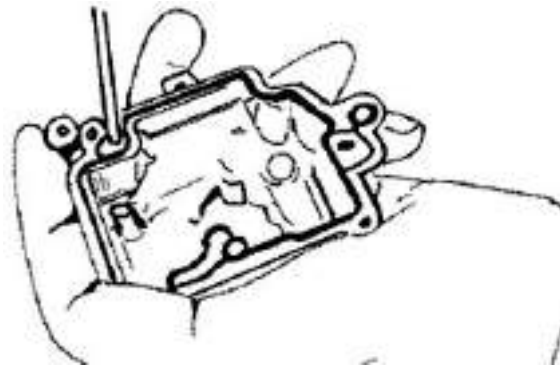
- Undo the 2 screws fixing the intake pump diaphragm cover.



- 
- Remove the cover being careful with the spring below, then remove the spring, take out the rubber protection and the diaphragm together with the pipe O-Ring.



- 
- Remove the accelerating pump jet together with the ball spring.



- 
- Remove the screw indicated in the figure fixing the float pin.
  - Remove the float and the plunger.



- 
- Remove the maximum nozzle.
  - Remove diffuser.
  - Remove the minimum nozzle.

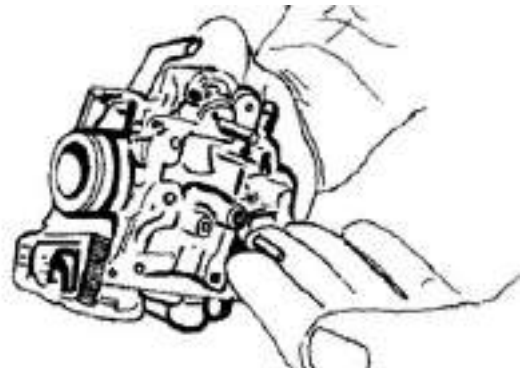




- Remove the sprayer tilting the carburettor body.

**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 idle flow screw with the O-ring and the spring.

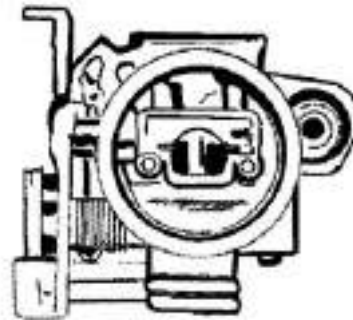


**CAUTION**

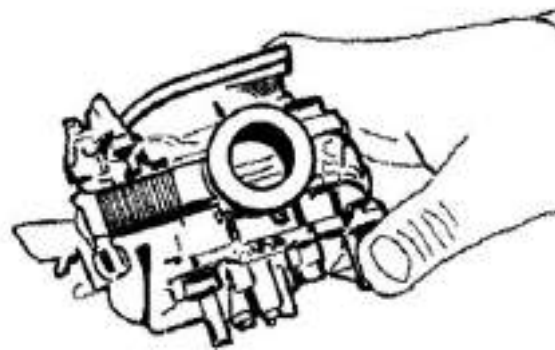
**DO NOT ATTEMPT REMOVING PARTS EMBEDDED IN THE CARBURETTOR BODY SUCH AS: FUEL SUPPLY PIPE, PIN SEATING, STARTER NOZZLE, THROTTLE VALVE CONTROL VALVE SHAFT. DO NOT REMOVE THROTTLE-SHAFT CONNECTION SCREWS. THE FIXING SCREWS ARE CAULKED AFTER THE ASSEMBLY AND THEIR REMOVAL DAMAGES THE SHAFT.**

## Refitting the carburettor

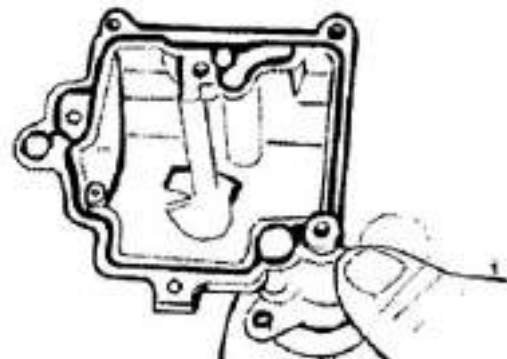
- Before refitting, wash the carburettor body accurately with a degreasing solvent and compressed air.
- Pay special attention to the fuel supply pipe and the plunger seat.



- For the minimum circuit, make sure the following points are properly cleaned: air gauging, outlet section controlled by the 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.
- The acceleration nozzle outlet is extremely small and is oriented to the throttle valve.



- Check that the carburettor body has the closing ball for the idle circuit pipe.
- 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.**



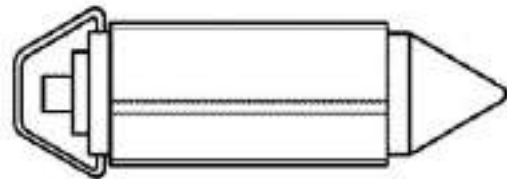
- Wash and blow the minimum nozzle properly and reassemble it.



- Accurately wash and blow the components of the maximum circuit, the sprayer, the diffuser and the nozzle.
- Introduce the sprayer in the carburettor body with the bigger cylindric part directed to the diffuser.
- Fit the diffuser.
- 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 rod and that there are no fuel infiltrations.
- Replace it in case of anomalies.
- Fit the float together with the pin and rod in its position and lock it with its screw.



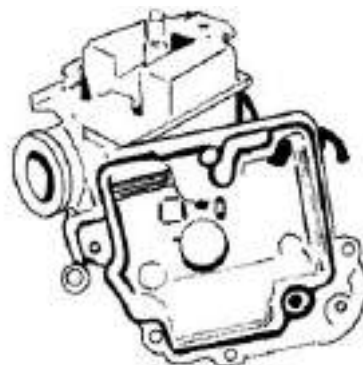
**N.B.**

**INTRODUCE THE RETURN SPRING ON THE FLOAT PLATE ADEQUATELY**

- Insert the ball in the corresponding accelerating pump.
- Fit the spring.
- Fit the accelerating pump nozzle.

**WARNING**

**WHEN REFITTING, PAY SPECIAL ATTENTION TO THE COMPONENTS AS THEY ARE SMALL.**



- Check the diaphragm is in good conditions and remove the remaining components of the accelerating pump following these steps:
- Insert the O-Ring in the pipe.
- Insert the diaphragm together with the pin and its spring.

**N.B.**

**REPLACE THE DIAPHRAGM IF THERE ARE SIGNS OF UNDULATIONS, CRACKS OR HARDENING.**

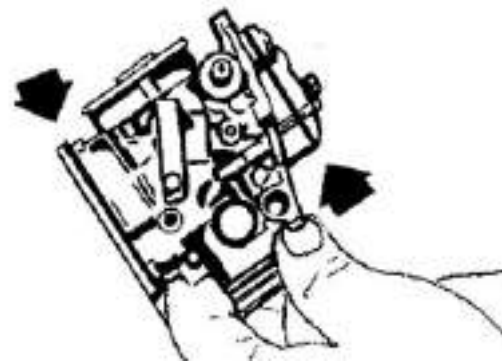


- Fit the accelerating pump diaphragm cover and tighten the 2 fixing screws making sure the spring below is correctly positioned.
- Fit the rubber bellows protecting the pin in the upper part of the accelerating pump.



## Level check

- Tilt the carburettor so that the needle valve at the fuel supply is closed and the float weight does not affect it.
- Check that the diaphragm closing line and the float central line are parallel as shown in the figure.



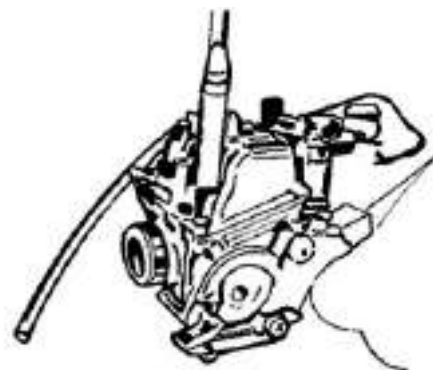
- Blow air in to the tank and then assembly it and its gasket on the carburettor body with the 3 fixing screws.

**N.B.**

**-ALWAYS USE NEW RINGS AND GASKETS FOR REFITTING.**

**WARNING**

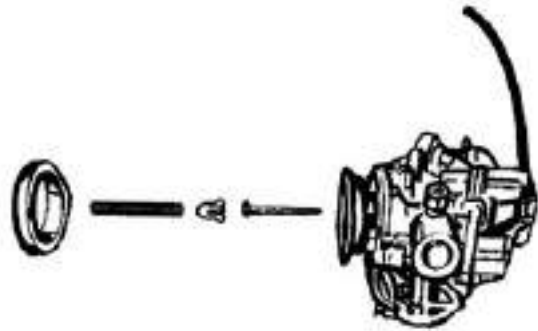
**THE SCREW IN THE TANK BOTTOM IS A BLEEDING ONE AND CONSEQUENTLY IT ONLY REQUIRES CLEANING.**



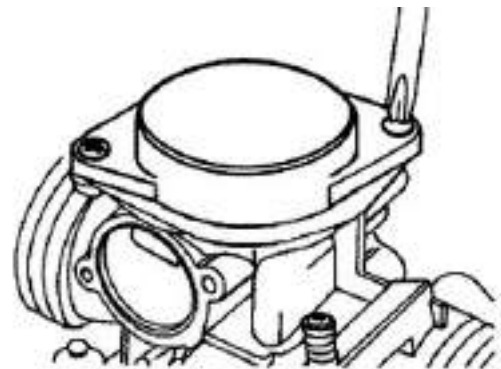
- Insert the diaphragm into the throttle valve.
- Insert the tapered pin together with the plastic support and the contrast spring into the throttle valve.

**N.B.**

**PLACE THE SPRING PLASTIC SUPPORT WITH ITS TEETH FACING THE INNER SIDE OF THE MEMBRANE TO BE ABLE TO FIT THE LOWER END OF THE THROTTLE VALVE SPRING.**

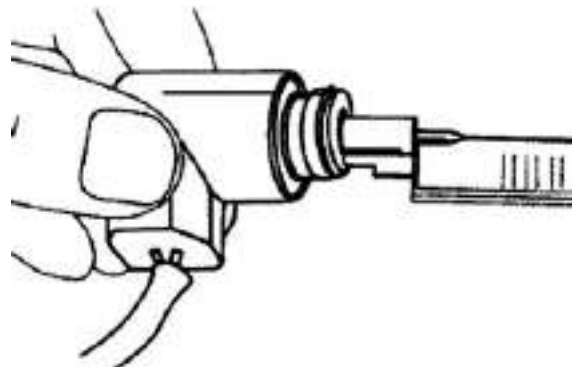


- Fit the vacuum chamber cover with the 2 fixing screws paying special attention to the spring.



## Inspecting the automatic choke device

- Check that the automatic starter piston is not deformed or rusty.
- Check that the piston slides freely in its seating.
- Check that the piston sealing O-Ring 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.

**Characteristic****Protrusion value**

11 mm

**ambient temperature**

24° C

- The starter should disconnect progressively by means of electrical heating.
- Check the starter resistance when adjusted to the ambient temperature.



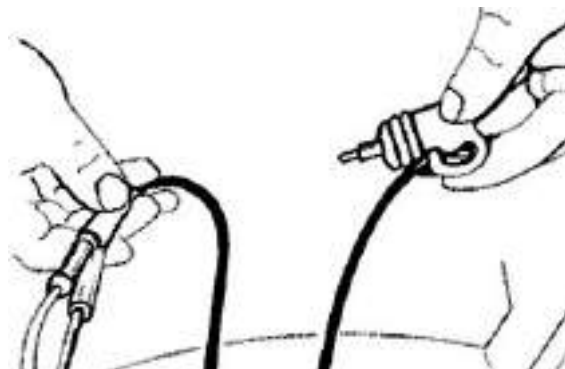
**Characteristic  
ambient temperature**

24° C

**Electric characteristic  
Automatic starter resistance**

$6 \Omega \pm 5 \%$

- Use battery to power the automatic starter and check that 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  
Battery**

12V-9Ah

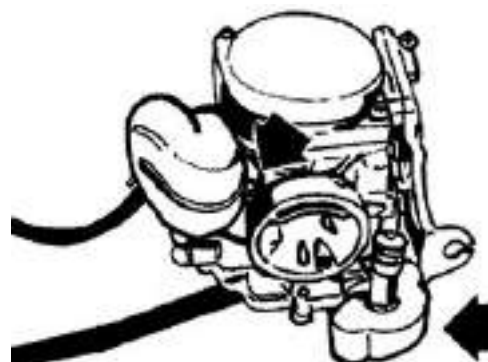
**max. protrusion**

15 mm

**max. time**

15 min

- Fit the starter, the support bracket and the protection with the screw indicated in the figure.



- Insert rubber pipes for tank ventilation.
- Insert the O-Ring, the washer, the spring and the idle flow screw in their seatings.



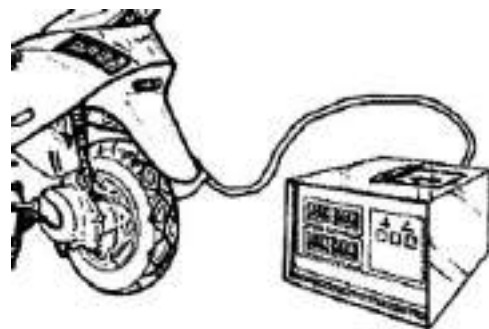
- Refit the carburettor on the engine and connect again the accelerator cable with the sheath and the support plate and the electrical connection of the starter.
- Reconnect the fuel supply pipe and tighten the 2 clamping screw fixing the carburettor to the inlet manifold and the air inlet coupling to the filter.



## Adjusting the idle

- The engine does not require frequent idle speed adjustments, but it is essential to strictly follow certain rules when adjusting the idle speed.
- Before adjusting the carburettor make sure to respect requirements on lubrication, 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 10 minutes at a speed as close as possible to the maximum one.
- Connect the vehicle to the exhaust fumes analyser inserting the probe into a sealed extension pipe placed at the muffler exit end.



### **N.B.**

THE EXTENSION TUBE IS INDISPENSABLE SO AS NOT TO SEND POLLUTED EXHAUST FUMES TO THE AMBIENT OXYGEN. IT IS ESSENTIAL 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.

### **Characteristic**

**Pipe ideal length**

40 ÷ 50 cm

- Connect the tester thermometer to the sump, using a cover with oil expressly prepared for probes.
- Start the engine and before adjusting the idle speed, make sure that the oil temperature is between 70÷80 °C.



### Specific tooling

**020331Y Digital multimeter**

- Using the rpm indicator in the analyser or a separate one, adjust the idle screw.

**N.B.**

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

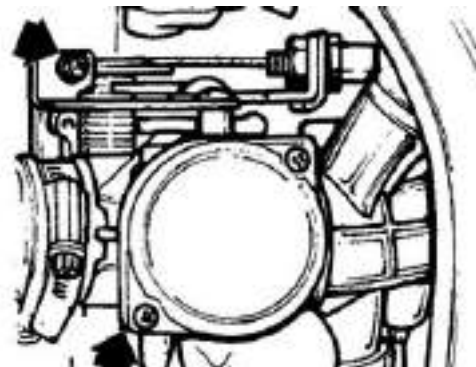
### Specific tooling

**020332Y Digital rev counter**

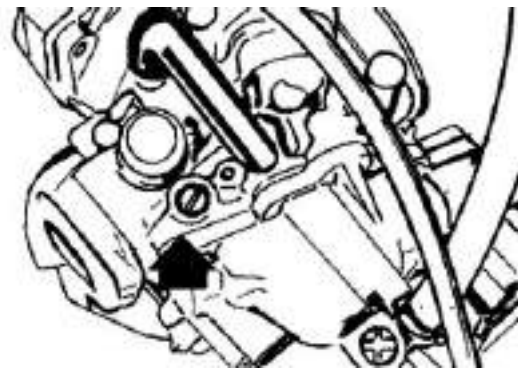
### Characteristic

#### Idle speed

about 1900/2000 rpm



- Adjust the flow screw until a percentage of carbon monoxide (CO) is obtained. 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.



### Characteristic

#### CO adjustment

3,2% ± 0,5

- When the oil temperature, the numbers of revs and the percentage of carbon monoxide are respected the idle carburetion is considered correct.
- Further information can be drawn from the analyser:
  - carbon dioxide percentages (CO<sub>2</sub>), the percentage of carbon dioxide has an inverted course compared to the percentage of (CO), values over 13% 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 obtain 200 ÷ 400 PPM, these emission values are deemed normal for an engine with a diagram of timing 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 is difficult to adjust CO values, check accurately:

- That the automatic starter is efficient.
  - That the tapered pin-housing is efficient
  - Tank level adjustments
-

## INDEX OF TOPICS

**S**SUSPENSIONS

**SUSP**



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## Front

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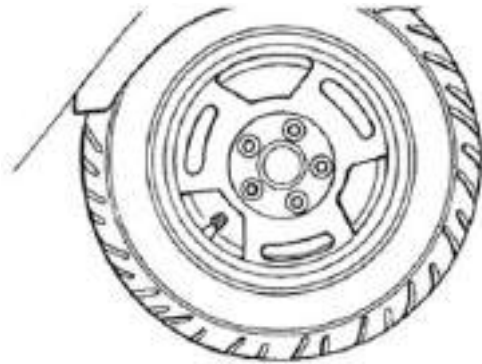
### Removing the front wheel

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- Remove the five Allen screws that fix the wheel to the hub.

**N.B.**

**BEFORE REMOVING THE WHEEL HUB, REMOVE THE BRAKE CALLIPER.**

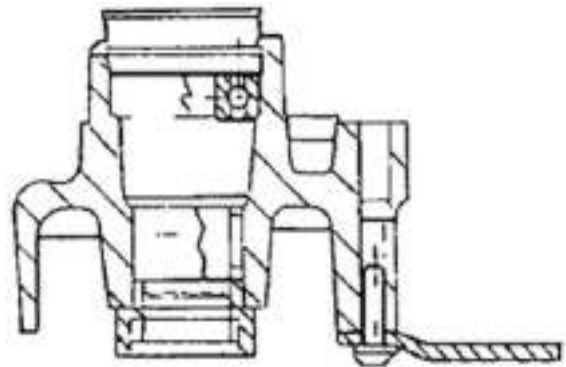



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### Front wheel hub overhaul

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- Remove the needle bearing by driving it out from the ball bearing side using a suitable drift.
- Drive out the ball bearing from the needle bearing side.



- Fit the needle bearing by means of the specially designed drift.
- Fit the ball bearing.
- Position the seal ring and the circlip.

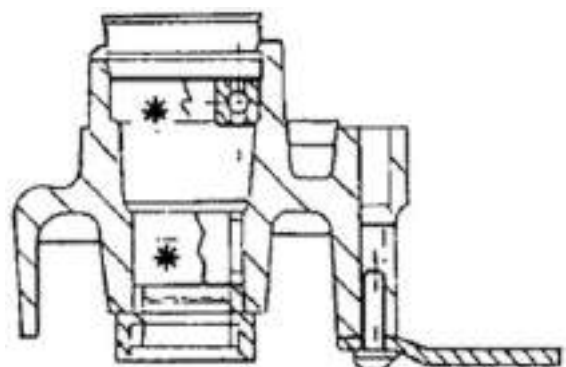
**CAUTION**

**BEFORE REFITTING, SMEAR THE PARTS WITH JOTA 3 FS GREASE IN THE AREAS MARKED WITH AN ASTERISK.**

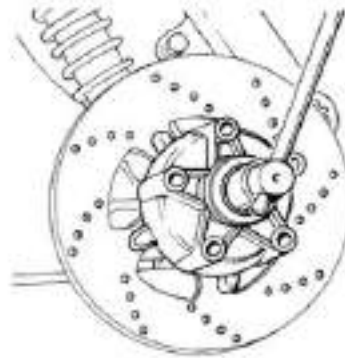
#### Recommended products

**AGIP GREASE MU3 Grease for odometer transmission gear case**

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



-Loosen the central nut (see figure) to remove the hub.

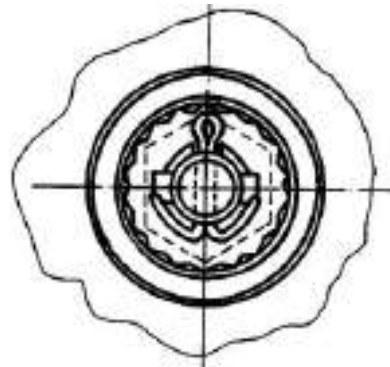


- Remove the brake calliper by removing the two screws.

- Remove the split pin and the nut cap.

**WARNING**

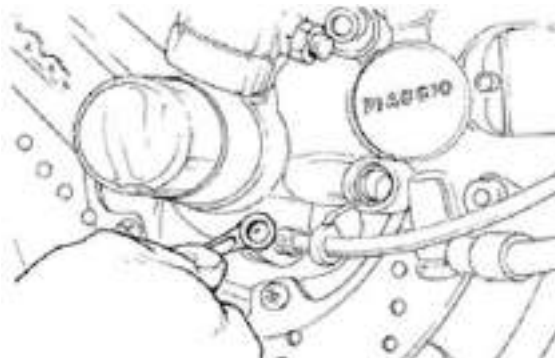
-ALWAYS USE NEW SPLIT PINS FOR REFITTING.



-Slacken the brake calliper screw and the plate screw as shown in the figure.

-Remove the rubber seal and the speedo gear.

-Fit the new gear by following the steps in reverse order.

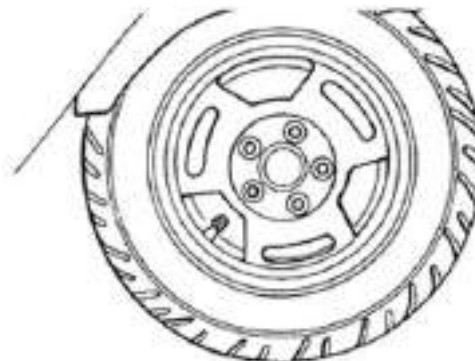


## Refitting the front wheel

- When refitting, tighten the 5 screws to the specified torque

**Locking torques (N\*m)**

**Nut tightening torque 20 to 25 N\*m**



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## Handlebar

---

### Removal

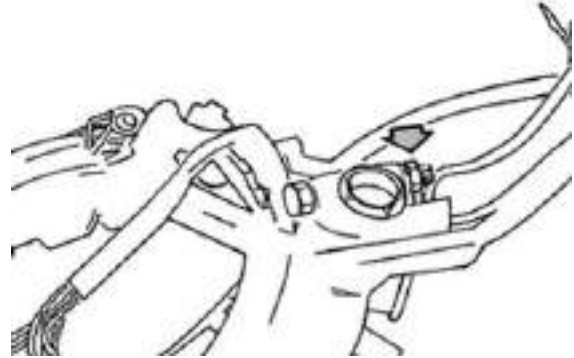
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Remove the handlebar cover before carrying out this operation,.

- After removing the transmissions and disconnecting the electrical terminals, remove the terminal fixing the handlebar to the steering.
- Check all components and replace faulty parts.

**N.B.**

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



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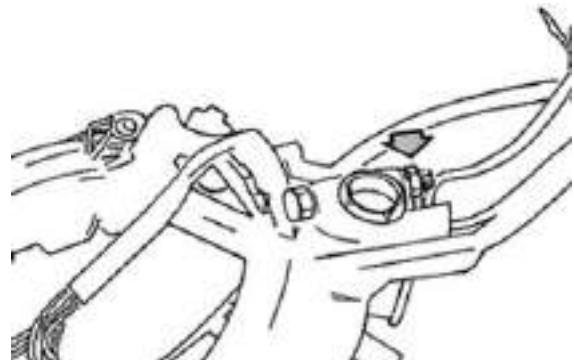
### Refitting

---

Carry out the operations in the reverse order to the removal, observing the prescribed tightening torque.

**Locking torques (N\*m)**

Handlebar lock nut 45 ÷ 50



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## Front fork

---

### Removal

---

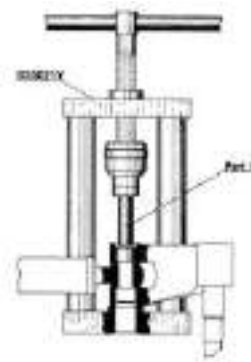
After removing the upper seat, lean the vehicle on one side and extract the steering tube completely from the fork.

**Specific tooling**

**020055Y Wrench for steering tube ring nut**



- Use the specific tool, fitted with part 1\*, and operate the handgrip until the pin and the Nadella are simultaneously ejected in the direction opposite the tool thrusting force.
- To eject the second Nadella, use the tool fitted with part 2\* instead of part 1, on the side opposite the one shown in the figure.

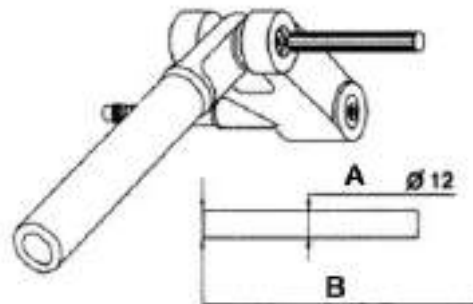


\* Supplied with the tool

### Specific tooling

#### 020021Y Front suspension service tool

- Press and remove the wedging washer with the help of a pointed end.
- For the second washer, repeat the operation using the punch on the side opposite to the one shown in the figure.



A = Ø12 Punch

B = Sharp-edged end

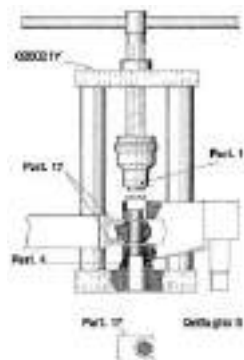
## Overhaul

### CAUTION

**USE NEW ROLLER CASINGS, PIN, SEALING RINGS AND DUST GUARDS FOR REFITTING.**

## Refitting

- Lubricate the sealing rings with mineral oil and half-fill the roller casings with grease.
- Insert the seal ring on the pin and the roller bushing with wedging washers at the same time.
- Remove the specific tool, then the part 5 (guiding) partially ejected in the previous assembly stage; leave part 4\* always fitted.
- Replace part 3 with part 16\* on the stem.



- Push, from the handgrip, the wedging washer - roller casing - seal ring unit, placing part 16 until it stops on the swinging hub
- Repeat the operation described above using the tool fitted with part 16 and part 22\* instead of part 4 on the stem, on the side opposite the one shown in the figure to refit the second wedging washer - roller casing - sealing ring unit.

\* Supplied with the tool

### Specific tooling

#### 020021Y Front suspension service tool

#### 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

- Fit both dust guard rings «C» on the swinging hub as shown in the detail drawing «A».
- Connect the swinging hub to the steering tube with the guide pin, part 5\*.
- Use the specific tool fitted with part 3\* on its stem and with part 4 at the bottom of the tool.
- Insert the previously greased pin on the swinging hub and with the tool handgrip, move part 3 until it stops on the steering tube.
- After fitting the pin, insert the two spacers, part 17\*, slightly hitting with the mallet.

\* Supplied with the tool

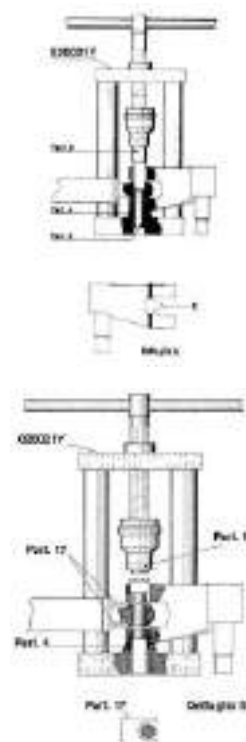
### Specific tooling

#### 020021Y Front suspension service tool

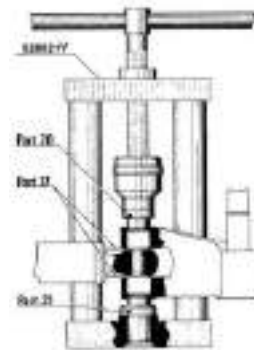
#### Recommended products

#### 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

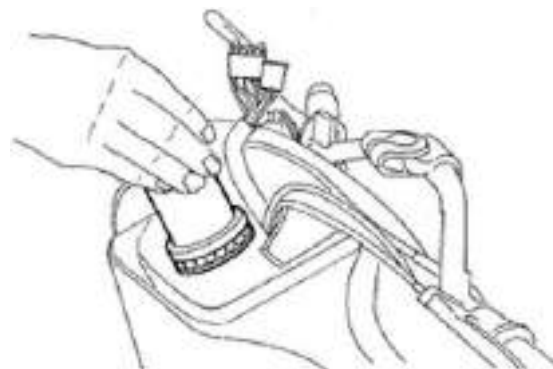


- Use the tool fitted with part 20\* and part 21\* on its stem as shown in the figure.
- Push the two roller casings with the handgrip until their bottoms make contact with the pin end.



**Specific tooling**

**020055Y Wrench for steering tube ring nut**



- Use the tool fitted with parts 3 and 4, as indicated to fit the pin, and press operating the handgrip, until wedging the washers on the swinging hub.
- Remove the spacers, part 17, fill with grease the area between the steering tube and the swinging hub, and place the dust guard rings in that place.

\* Supplied with the tool

**N.B.**

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

**Specific tooling**

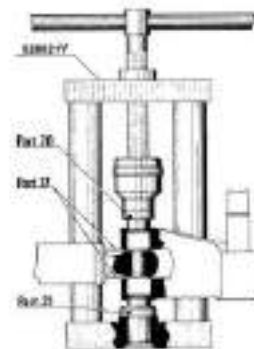
**020021Y Front suspension service tool**

**001330Y Tool for fitting steering seats**

**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



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## Steering column

---

### Removal

- Use the specific tool both to remove the lower seat of the upper bearing and to remove the upper seat of the lower bearing fitted on the chassis.

**N.B.**

**TO REMOVE THE LOWER SEAT OF THE LOWER STEERING BEARING JUST USE A SCREWDRIVER AS A LEVER BETWEEN THE SEATING AND THE SLEEVE.**

### Specific tooling

**020004Y Punch for removing fifth wheels from headstock**



---

### Overhaul

- The front suspension service operation is useful to replace the connecting parts between the steering tube and the swinging hub of the front wheel holder, provided that the steering tube and the wheel holder hub are in excellent conditions.

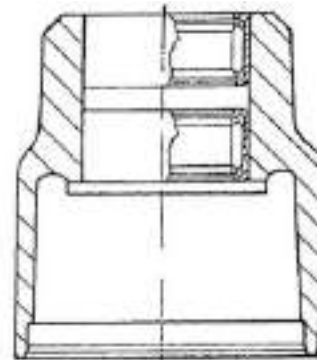
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## Shock-absorber - calliper bracket

---

### Removal

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



## Refitting

- Refit the parts in reverse order of the removal operation.

### CAUTION

BEFORE CARRYING OUT REFITTING OPERATIONS IN THE AREAS MARKED WITH AN ASTERISK, LUBRICATE THEM WITH THE RECOMMENDED PRODUCT

### Specific tooling

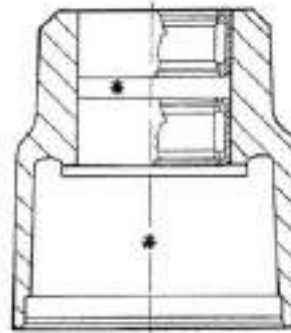
020036Y Punch

020037Y Punch

### 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



## Steering bearing

### Removal

- Lubricate the races and balls with grease.
- Tighten to the specified torque and then turn the tool 120° anti-clockwise.

### Specific tooling

020055Y Wrench for steering tube ring nut

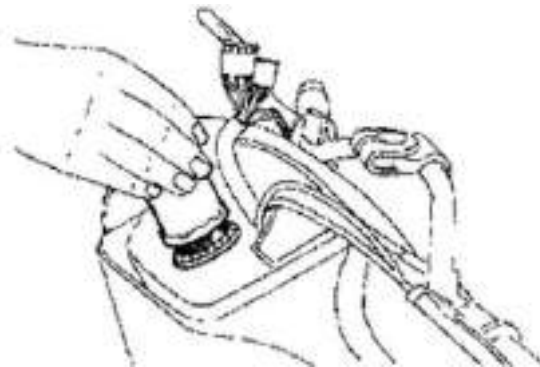
### Recommended products

**AGIP GREASE PV2 Grease for control levers on the engine**

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

### Locking torques (N\*m)

Tightening torque: 8 ÷ 10 Nm





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## Refitting

### Specific tooling

020055Y Wrench for steering tube ring nut

Locking torques (N\*m)

Tightening torque 30 ÷ 40



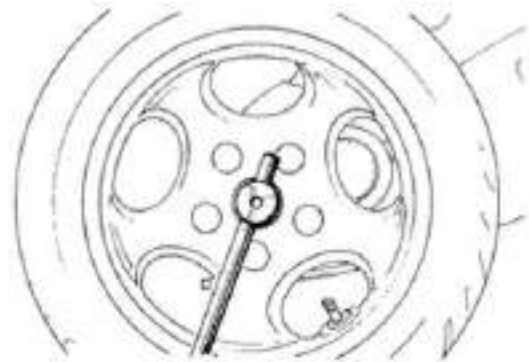
---

## Rear

---

### Removing the rear wheel

- Straighten the split pin and remove the cap.
- Remove the wheel acting on the central fixing point.



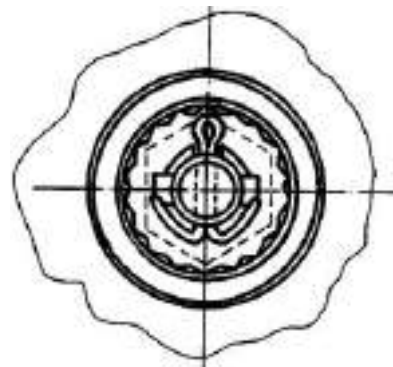
---

### Refitting the rear wheel

- Fit the wheel, tighten the nut to the prescribed torque.
- Refit the cap and the split pin folding it correctly as shown in the figure.

Locking torques (N\*m)

Locking torque 137 ÷ 152 Nm

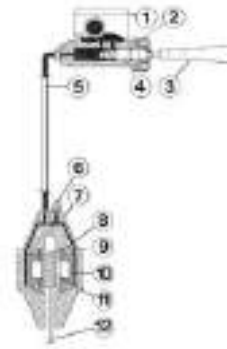


## INDEX OF TOPICS

**B**RAKING SYSTEM

**BRAK SYS**

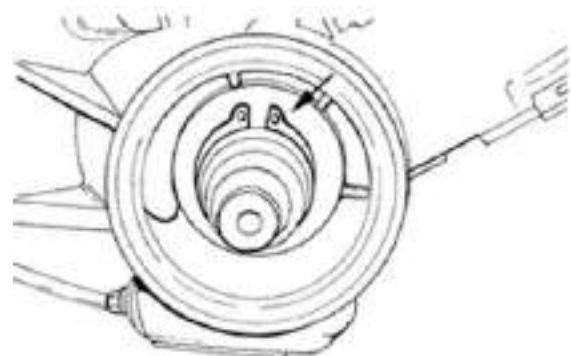
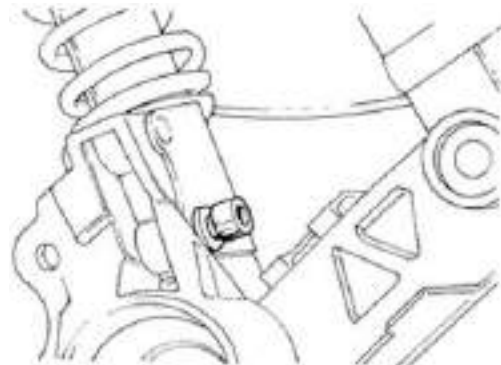
1. Tank cover.
- 2 - Pump body.
- 3 - Brake lever.
- 4 - Pump plunger.
- 5- Oil delivery hose.
- 6 - Protection cap for air bleed screw.
- 7- Calliper.
- 8- Dust guard
- 9- Piston sealing ring.
- 10- Piston.
- 11 - Brake pad.
- 12 - Brake disc.



## Front brake calliper

### Removal

- Slacken the two fixings between the support and the shock absorber.
- Remove the circlip from the wheel spindle.
- Remove the speedometer cable.
- Withdraw the calliper support.



### Overhaul

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

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

**CAUTION**

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

Fit to the calliper body:

- the sealing rings (1-2);
- the plungers (3);
- bed the O-Ring gasket (4) on a calliper body.
- Couple the internal body with the external one with assembling bolts. Refitting the pads and purging air (see previous sections).
- Place the calliper on the disc and lock it to the support by tightening the bolts.
- Lock the pipe joint to the calliper at the prescribed torque.

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

**The sealing rings must be immersed in the operating liquid;** the use of the **PRF1** protection is tolerated.

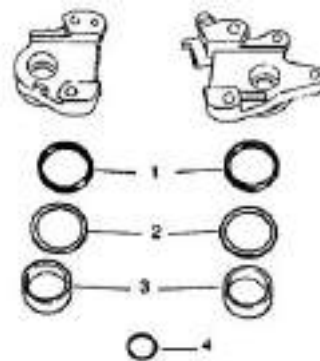
**CAUTION**

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

**Locking torques (N\*m)**

**Screw tightening calliper to the support 20 ÷ 25 Attachment to the calliper 25 ÷ 30 Nm**

- 1 DUST GUARDS
- 2 SEALING RINGS
- 3 PLUNGERS
- 4 O-RING GASKET

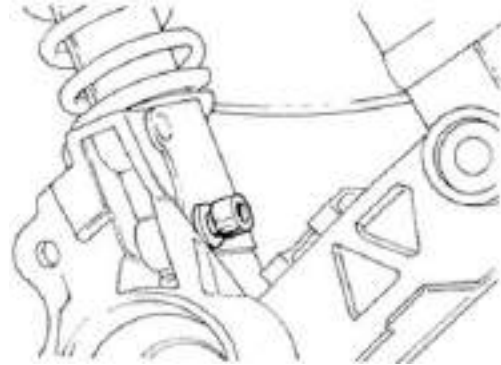


## Refitting

- Perform the disassembly steps in reverse order.
- Fit a new O-ring.
- Torque the two screws to the prescribed value.
- Fit the spacer and O-ring on the wheel spindle.

### Locking torques (N\*m)

Tightening torque 20 ÷ 25



## Front brake disc

### Removal

- Should the brake disc be replaced, when refitting the hub, apply recommended product on the fixing bolts.

Tighten to the specified torque.

**N.B.**

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

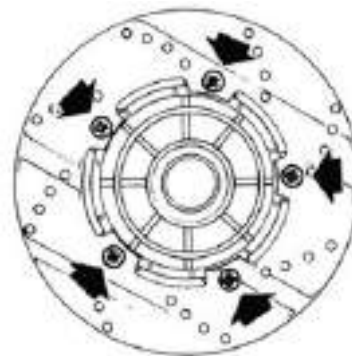
### Recommended products

#### Loctite 242 product description

Apply LOCTITE medium type 242 threadlock

### Locking torques (N\*m)

tightening torque 5 ÷ 6.5 Nm



## Disc Inspection

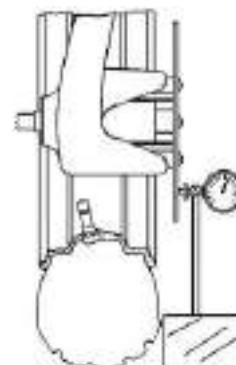
### Specific tooling

020335Y Magnetic support for dial gauge

### Characteristic

#### Max oscillation allowed

0.1 mm.



## Front brake pads

### Removal

- Pads must be replaced when the friction material thickness reaches the wear limit.

- To replace:

remove the protection cover, the bolt and the leaf spring. Slide off the pads and replace them once the plungers are down. Carry out these operations in reverse order to fit.



#### CAUTION

**BEFORE USING THE BRAKE, OPERATE THE LEVER A FEW TIMES.**

## Front brake pump

### Removal

- Bleed the circuit and drain the brake fluid through the bleeding screw located on the calliper and actuate the brake lever until no more fluid flows out.

-Remove the oil pump from the handlebar; remove the brake lever and then remove the wheel cylinder.

1 - Tank cap screw.

2. Tank cover.

3. Diaphragm.

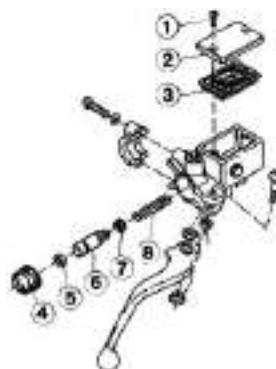
4. Bellows.

5. Sealing ring.

6. Piston.

7. Gasket.

8 - Spring



#### CAUTION

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

**RUBBER PARTS SHOULD NEVER BE LEFT IN ALCOHOL FOR LONGER THAN 20 SECONDS.**

**AFTER WASHING, THE PIECES MUST BE DRIED WITH A BLAST OF COMPRESSED AIR AND A CLEAN CLOTH.**

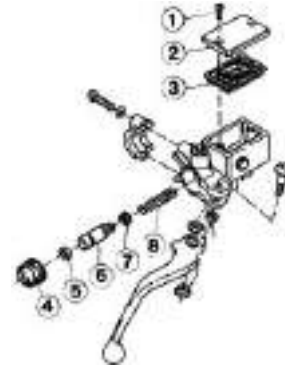
THE SEALING RINGS MUST BE IMMERSSED IN THE OPERATING LIQUID.

## Refitting

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

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

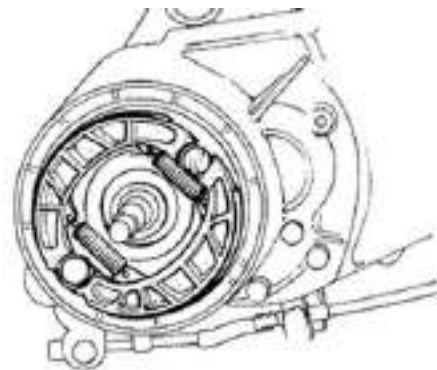
- 1 - Tank cap screw.
2. Tank cover.
3. Diaphragm.
4. Bellows.
5. Sealing ring.
6. Piston.
7. Gasket.
8. Spring.



## Rear drum brake

Once the muffler and the wheel have been removed, follow these steps:

1. Remove the shoe spring using the specific spanner.
2. Remove the shoe with the aid of a lever.
3. Refit the new shoes giving a few taps with the mallet.
4. Attach the spring using the specific pliers.



### Specific tooling

**020325Y Brake-shoe spring calliper**

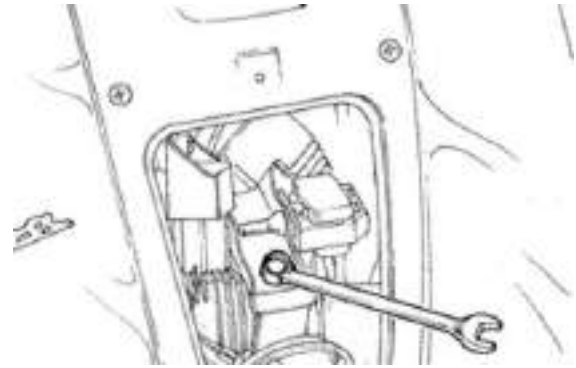
## INDEX OF TOPICS

CHASSIS

CHAS



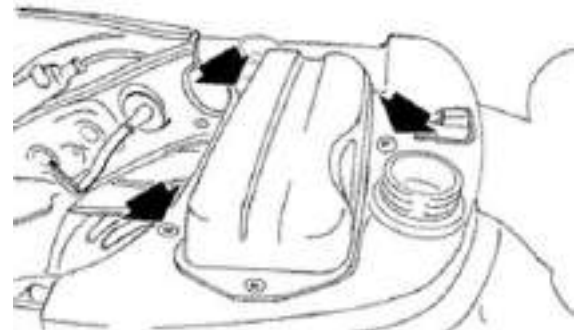
- 
- Remove the screw and disconnect the electric terminals.



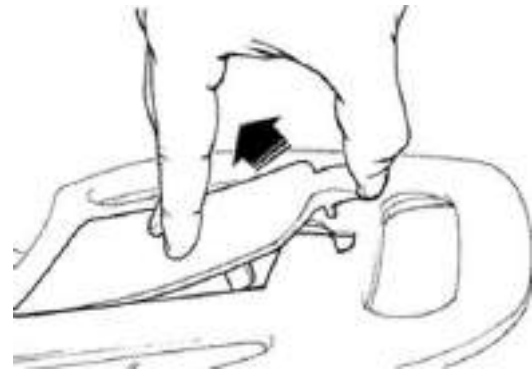
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## Rear rack

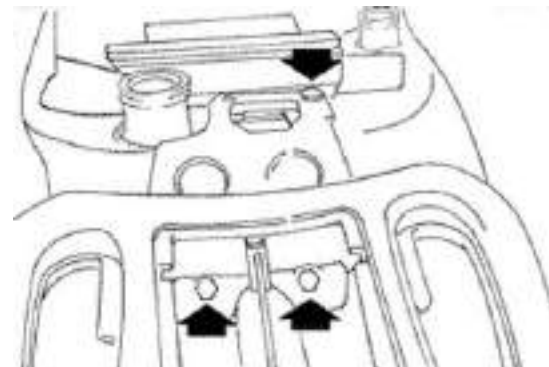
- 
- Tip up the saddle.
  - Remove the helmet compartment.
  - Remove the plastic fairing under the saddle after unscrewing the three screws shown in the figure.



- 
- Remove the plastic cover on the luggage-carrier.



- 
- Unscrew the three screws and remove the luggage-carrier.

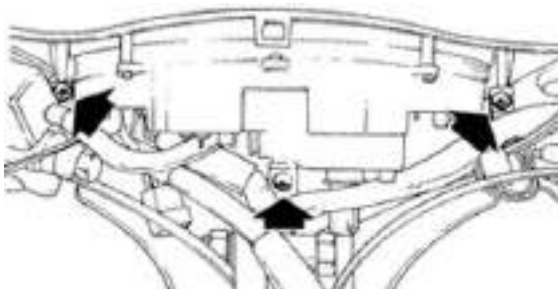


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## Rear handlebar cover

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Undo the screws as shown in the figure and remove the handlebar rear section.

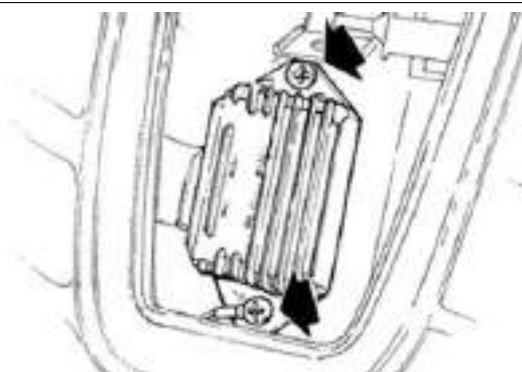


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## Instrument panel

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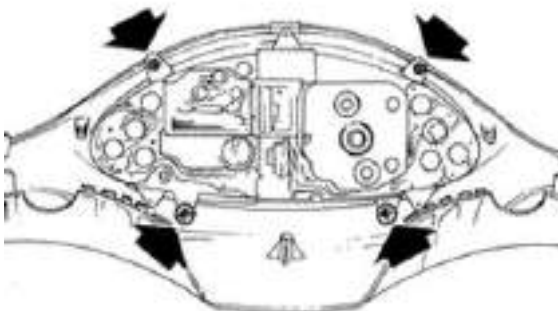
Loosen the two screws and disconnect the terminal block.



- Remove the rubber hood and then the retaining clip as shown in the figure.



Operate the 4 screws shown in the figure to replace the instrument panel.

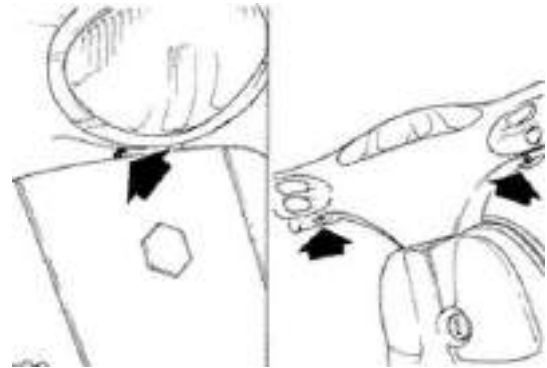


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## Front handlebar cover

---

-Remove the handlebar front fairing as shown in the figure.

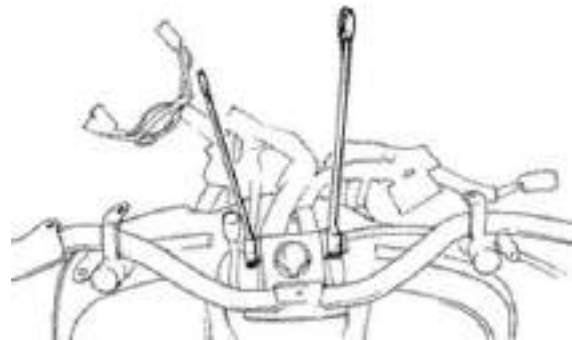


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- To remove the handlebars, use 2 spanners (17-13 mm) as shown in the figure after detaching the LH and RH controls.

### Locking torques (N\*m)

Handlebar lock nut 45 ÷ 50

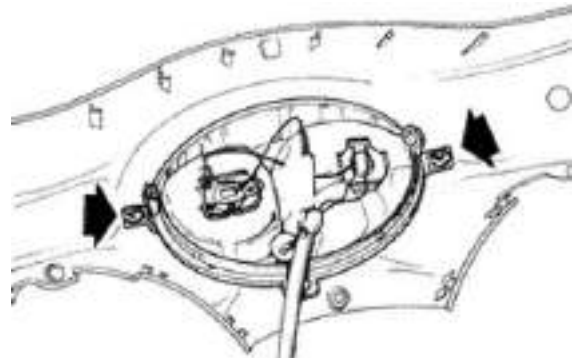


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## Headlight assy.

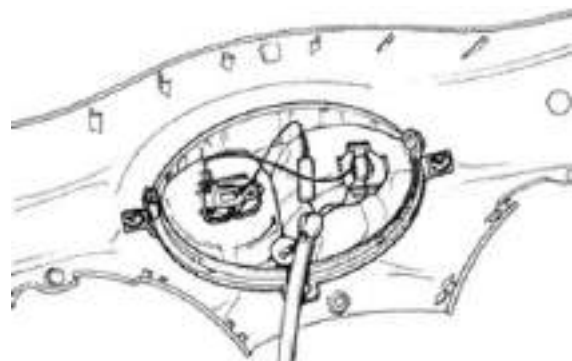
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To replace the headlight, unscrew the 2 screws.



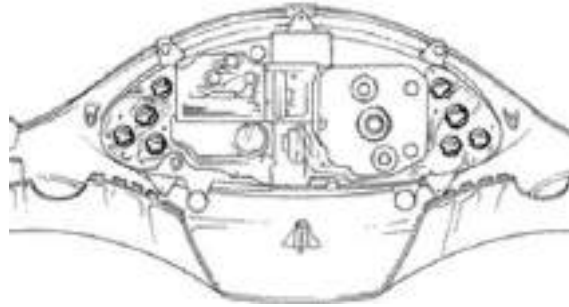
---

-Remove the bulbs as shown in the figure.



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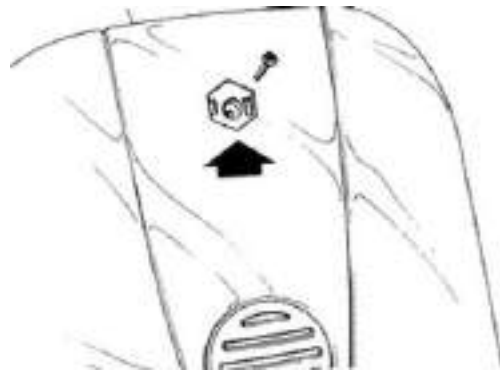
The bulbs have a bayonet fitting. Simply rotate them 1/4 of a turn to extract and replace them.



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## Legshield

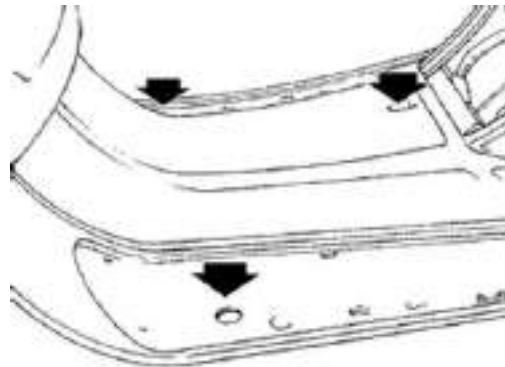
- To replace the grille, first remove the Piaggio emblem and then the screw located underneath



---

## Footrest

- Operate on the 3 screws shown in the figure once the glove-box and fairing have been removed.



## Side fairings

---

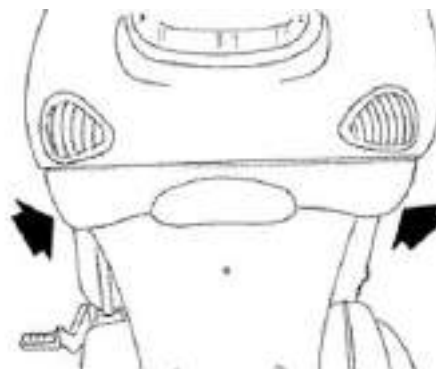
- Remove the screws under the footboard mat, then remove the two side fairings, by disengaging the interlocking elements.



## License plate holder

---

- Unscrew the 2 side screws and the 2 nuts at the back of the splash guard.
- Unclip the number plate light.



## Rear central cover

---

- Unscrew the screw as shown in the figure, then remove the spark plug access door.

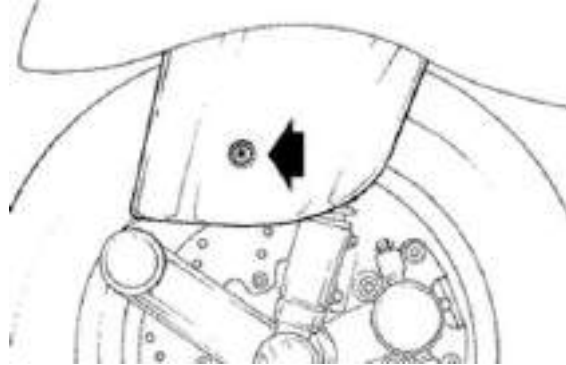


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## Front mudguard

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- Unscrew the screw as shown in the figure and remove the plastic fairing.



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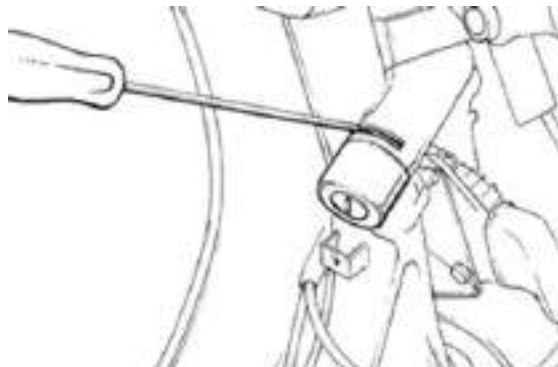
## Top-case

---

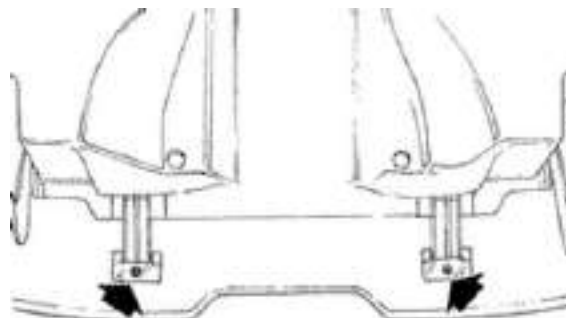
### Front

---

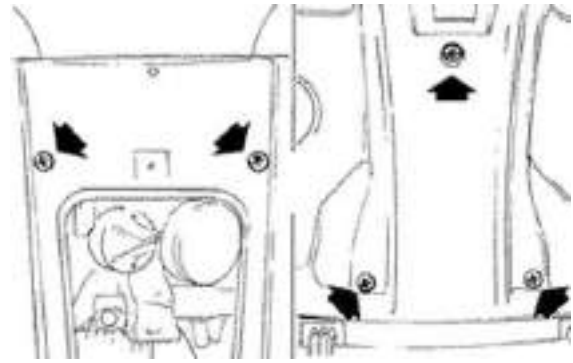
- Press the spring clip with a screwdriver and withdraw the switch lock. To remove the part of the lock that is left inside the steering tube, you must first disassemble the steering tube.



- 
- Loosen the 2 screws and detach the door.



- Unscrew the 2 screws shown in the figure placed under the front grille.
- Remove the 3 screws shown in the figure, placed inside the glove-box; they can be reached after opening the glove-box door.



# INDEX OF TOPICS

**P**RE-DELIVERY

**P**RE DE



---

## Aesthetic inspection

- Paintwork
- Joins between plastic fairings
- Damage
- Cleanness

---

## Tightening torques inspection

### Fastenings check

- All tightening torques
- External fairing screws

### SAFETY LOCKS

Name	Torque in Nm
Handlebar tightening	40 ÷ 50
Lower steering ring nut	8 ÷ 10
Upper steering ring nut	30 ÷ 40
Front wheel axle nut	75 ÷ 90
Rear wheel nut	137 ÷ 152
Rear shock absorber-engine nut	33 ÷ 41
Shock absorber - chassis nut	20 ÷ 25
Engine-swinging arm bolt	33 ÷ 41
Floating arm-frame pin	44 ÷ 52

---

## Electrical system

- Check that voltage is at least 12.6V; if not, recharge the battery according to directions.

Check the following devices:

- Keyswitch
- Headlight full/dipped beam, panel indicator lights, side lights
- Headlight adjustment
- Taillight
- Brake light (front and rear brake)
- Turn signals and relative indicators
- Speedometer and instrument panel lighting
- Horn
- Start button

### CAUTION

**TO ENSURE BEST PERFORMANCE, BATTERY MUST BE CHARGED BEFORE USE ONLY IF VOLTAGE IS BELOW 12,7V. FAILURE TO RECHARGE THE BATTERY BEFORE ITS FIRST USE MAY SHORTEN THE BATTERY'S LIFE.**

**WHEN INSTALLING THE BATTERY ON THE VEHICLE CONNECT THE POSITIVE LEAD BEFORE THE NEGATIVE LEAD.**

**NEVER USE A FUSE WITH A HIGHER RATING THAN THE PRESCRIBED VALUE. THE USE OF UNSUITABLY RATED FUSES CAN RESULT IN WIDESPREAD DAMAGE TO THE VEHICLE, INCLUDING FIRE.**

**WARNING**

**KEEP THE BATTERY WELL CLEAR OF NAKED FLAMES AND SPARKS DURING CHARGING. REMOVE THE BATTERY FROM THE VEHICLE BY DISCONNECTING THE NEGATIVE LEAD FIRST.**

**PROTECT THE EYES WHEN WORKING WITH BATTERIES OR IN THEIR IMMEDIATE VICINITY. KEEP BATTERIES AWAY FROM CHILDREN. BATTERY ELECTROLYTE CONTAINS SULPHURIC ACID. BATTERY ELECTROLYTE IS POISONOUS AND CAUSES SEVERE BURNS. AVOID CONTACT WITH THE EYES, SKIN AND CLOTHES. DO NOT FORCE OR DAMAGE THE EXTERNAL CASE.**

**IN CASE OF CONTACT WITH THE EYES AND/OR SKIN, WASH THE AFFECTED AREA WITH PLENTY OF CLEAN WATER FOR ABOUT 15 MINUTES AND SEEK MEDICAL ASSISTANCE IMMEDIATELY.**

**IN THE CASE OF INGESTION OF ELECTROLYTE DRINK PLENTY OF WATER OR VEGETABLE OIL AND CALL A DOCTOR IMMEDIATELY.**

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**Levels check**

- Brake fluid
- Hub oil
- Engine oil level

---

**Road test**

- Cold start.
- Speedometer check.
- Throttle check.
- Riding stability.
- Front and rear brake efficiency.
- Front and rear shock-absorbers.
- Unusual noises.
- Hot engine restart.
- Leakages (after trial run).

---

**Functional inspection**

- Brake lever excursion.
- Throttle excursion and adjustment.
- Homogeneous steering turning.

**Other**

- Tyre inflation pressure
- Locks
- Mirrors and accessories
- Toolkit, user handbook, guarantee certificate and customer service card

**CAUTION**

**CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.**

**CAUTION**

**NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES OR TYRES MAY BURST.**

**WARNING**

**BE VERY CAREFUL WHEN HANDLING FUEL.**

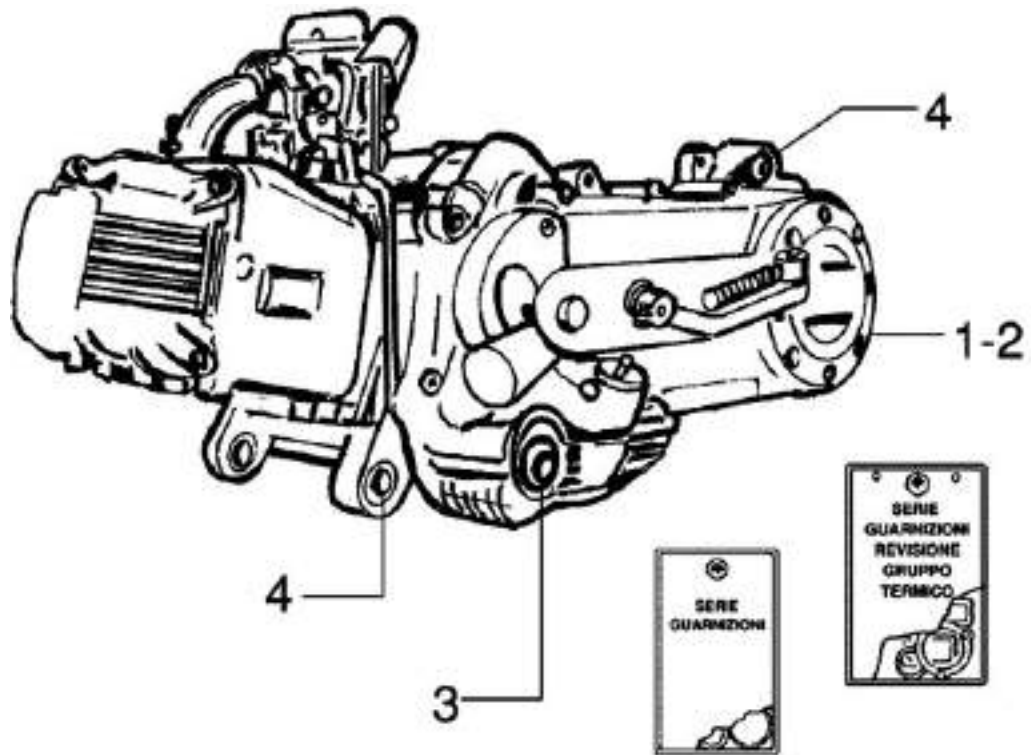
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# INDEX OF TOPICS

TIME

TIME

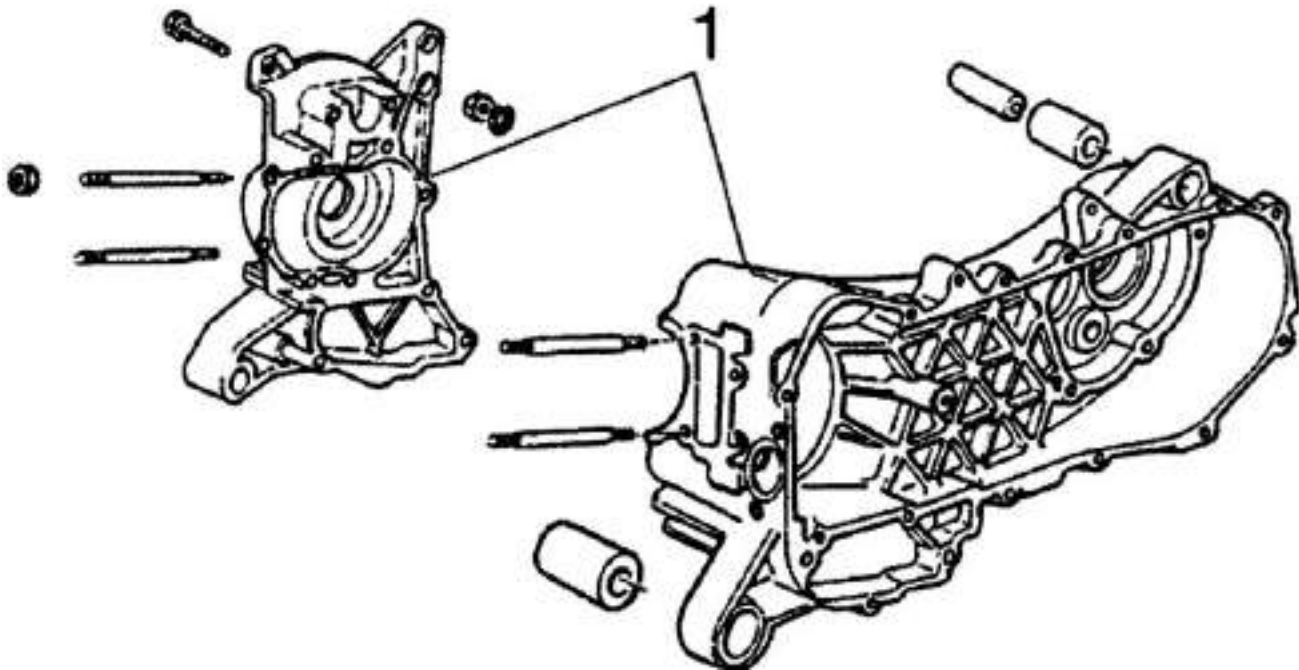
Engine



**ENGINE**

	Code	Action	Duration
1	001001	Engine from frame - Removal and re-fit.	
2	001127	Engine - Complete service	
3	003064	Engine oil - Change	
4	003057	Engine retainer - Tighten nuts	

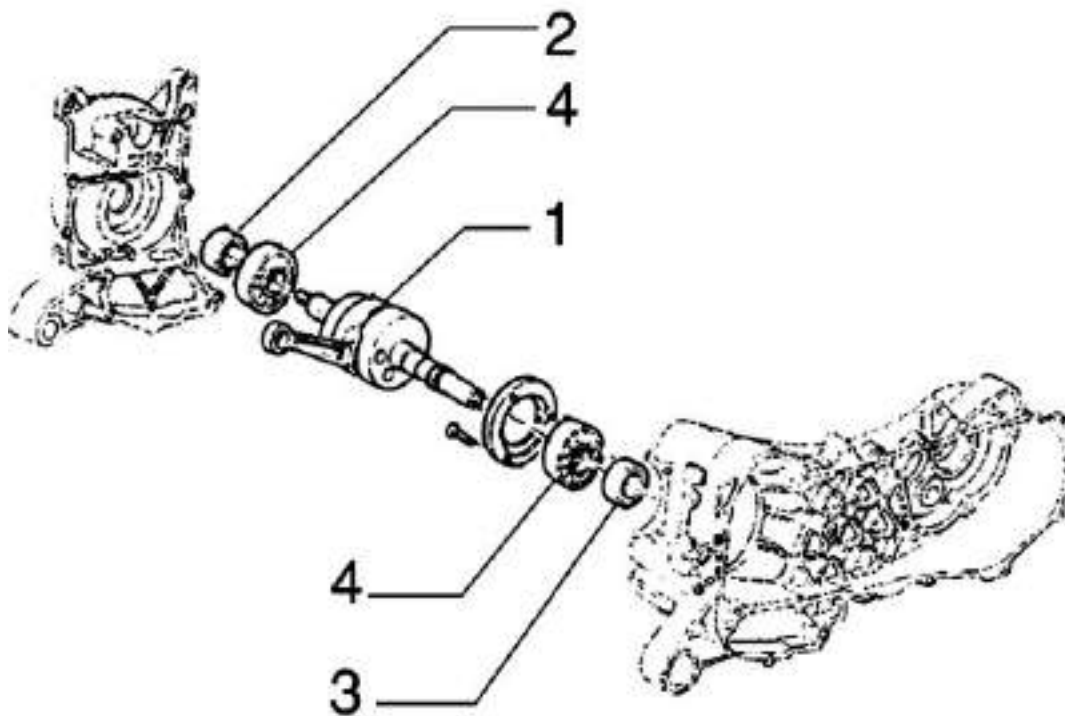
### Crankcase



#### CRANKCASE

	Code	Action	Duration
1	001133	Engine crankcase - replace	

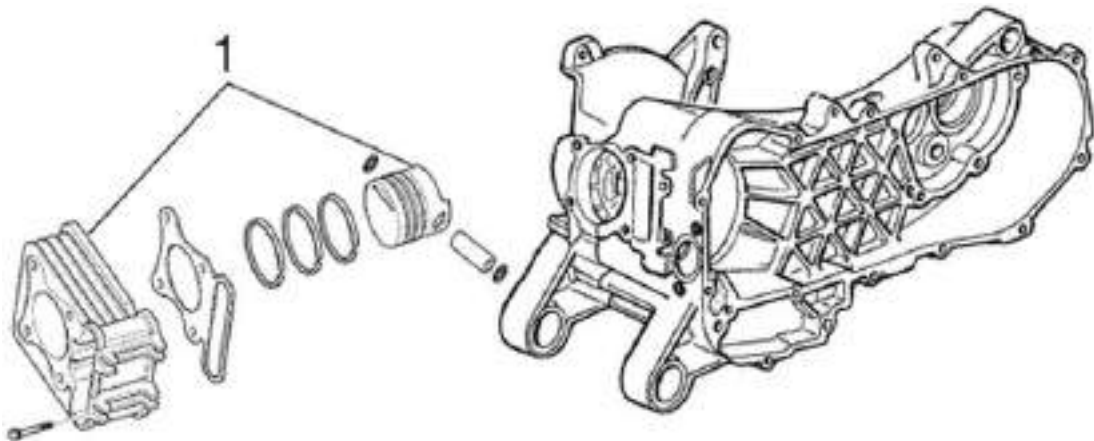
### Crankshaft



**CRANKSHAFT**

	Code	Action	Duration
1	001117	Crankshaft - Replacement	
2	001099	Oil seal, flywheel side - Replacement	
3	001100	Oil seal, clutch side - Replacement	
4	001118	Main bearings - Replacement	

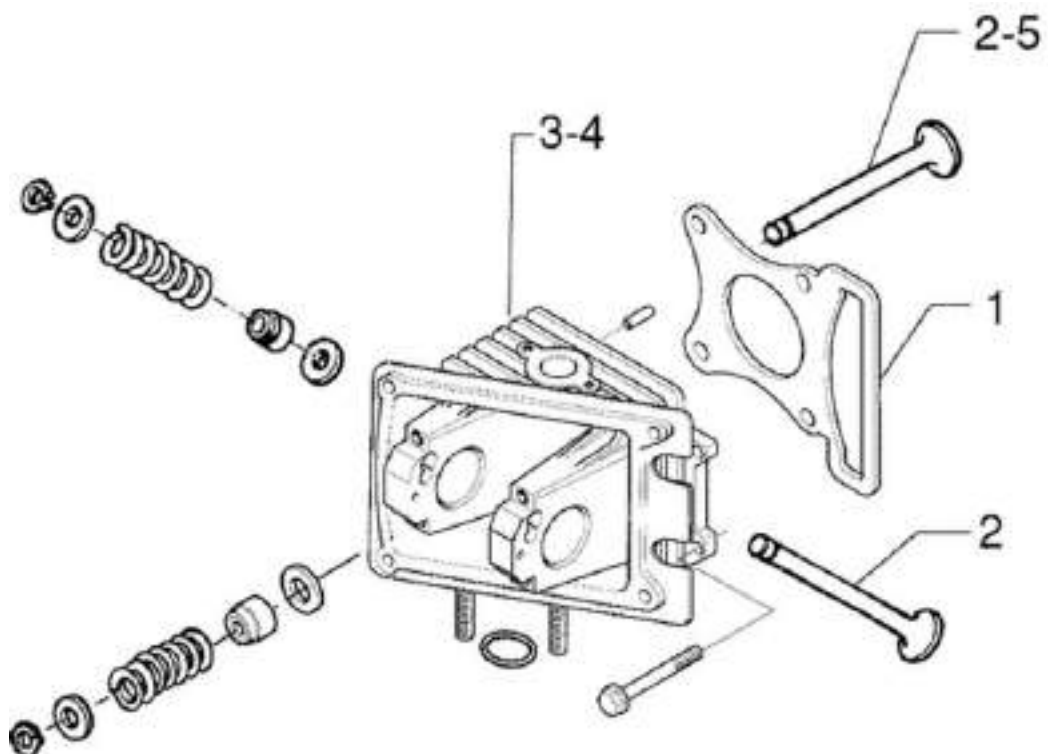
**Cylinder assy.**



**CYLINDER ASSY.**

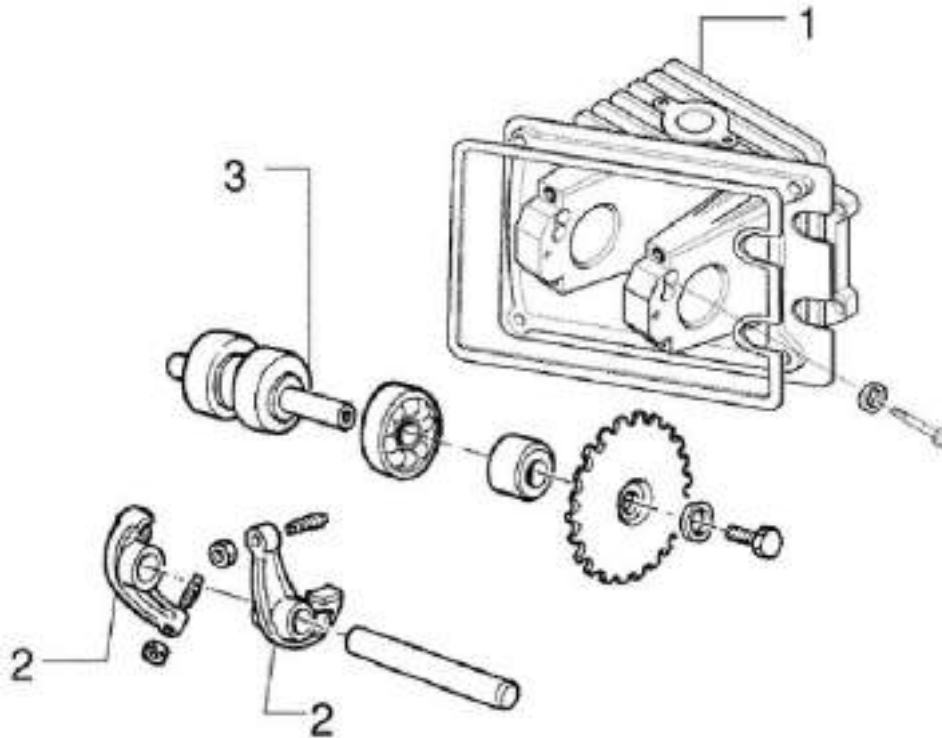
	Code	Action	Duration
1	001002	Cylinder piston - Replacement	

**Cylinder head assy.**



**HEAD**

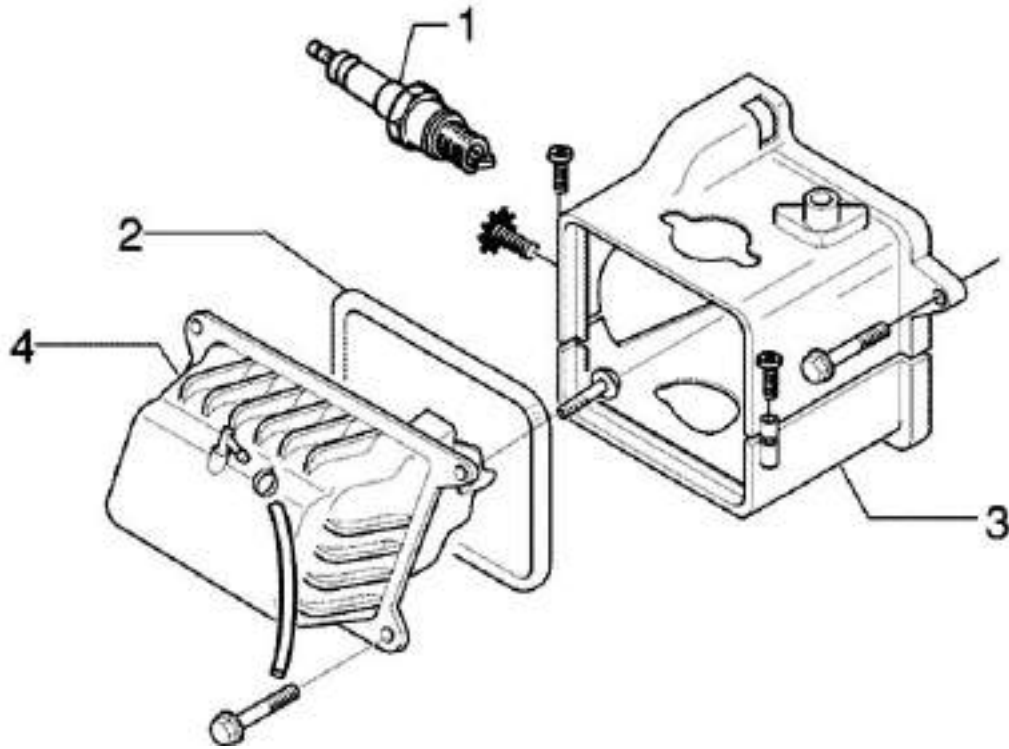
	Code	Action	Duration
1	001056	Head gasket - change	
2	001045	Valves - Replacement	
3	001079	Head parts - Disassembly / assembly	
4	001126	Head - Replacement	
5	001049	Valves - Adjustments	

**Rocker arms support assy.****CAMSHAFT SUPPORT**

	Code	Action	Duration
1	003056	Head/Cylinder - Nut tightening	
2	001148	Rocking lever valve - Replacement	
3	001044	Camshaft - Replacement	



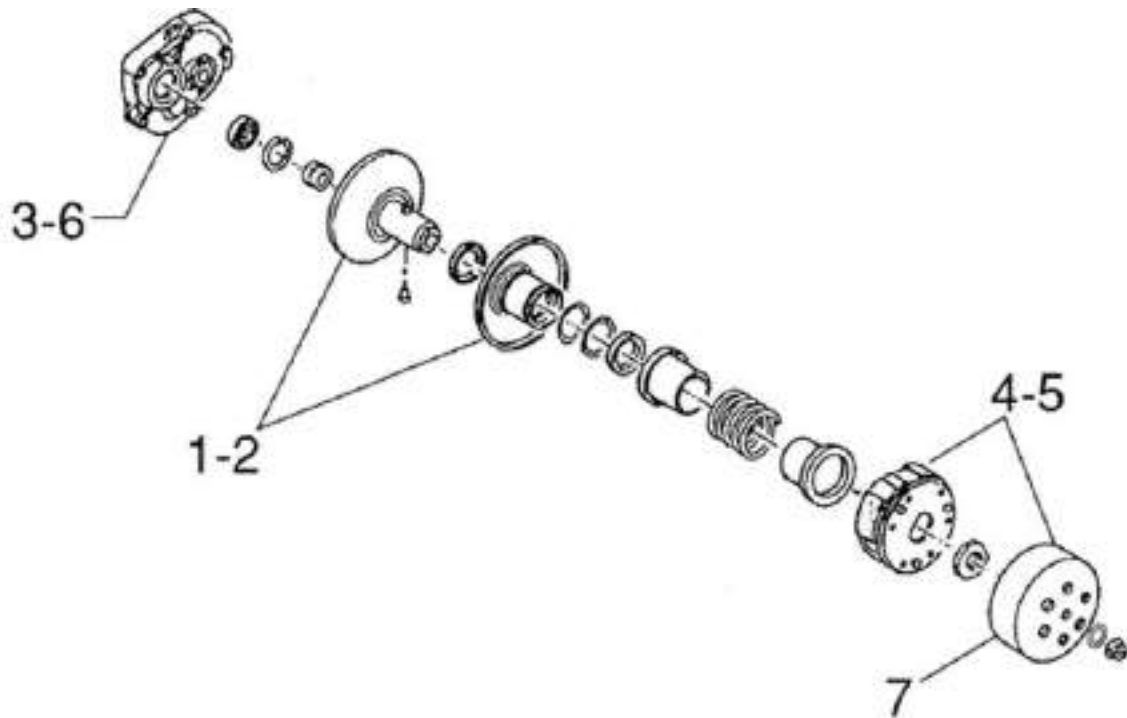
Cylinder head cover



**HEAD COVER**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001093	Spark plug - Replacement	
2	001088	Head cover gasket - change	
3	001097	Cooling hood - Replacement	
4	001089	Head cover - change	

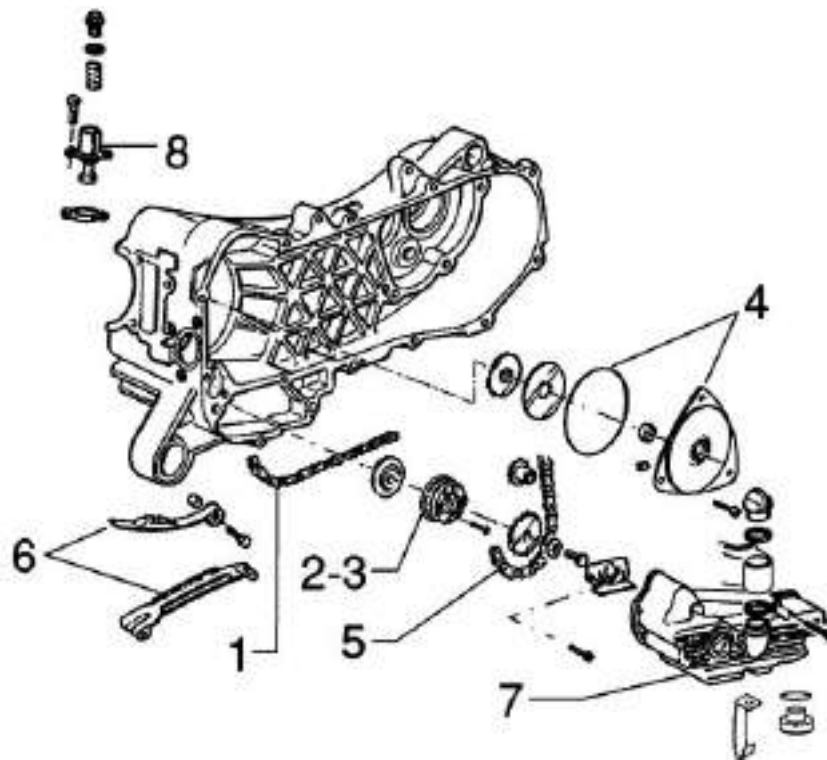
## Driven pulley



### DRIVEN PULLEY - CLUTCH

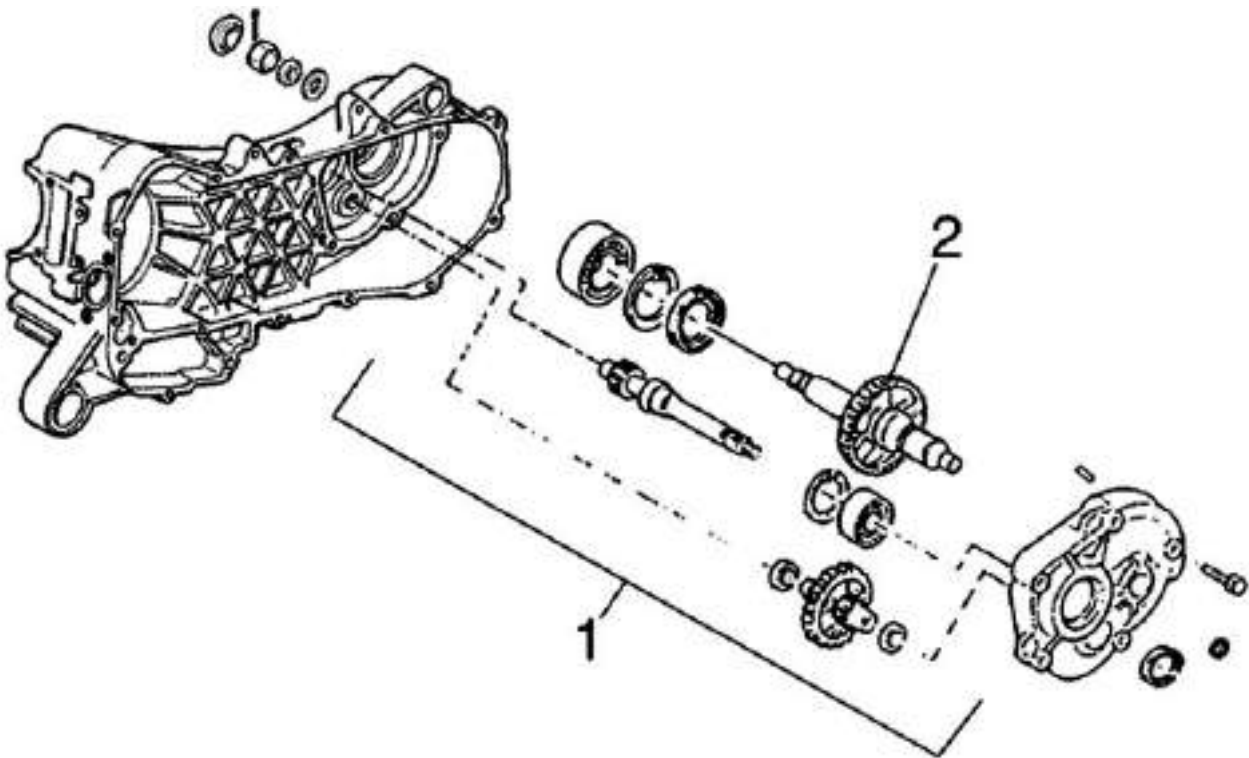
	Code	Action	Duration
1	001110	Driven pulley- Replacement	
2	001012	Driven pulley - Overhaul	
3	003065	Gear casing oil - Replacement	
4	001022	Clutch - Replacement	
5	003072	Clutch assembly - Wear check	
6	001156	Reduction gearing cover - Replacement	
7	001155	Clutch bell housing - Replacement	

Oil pump



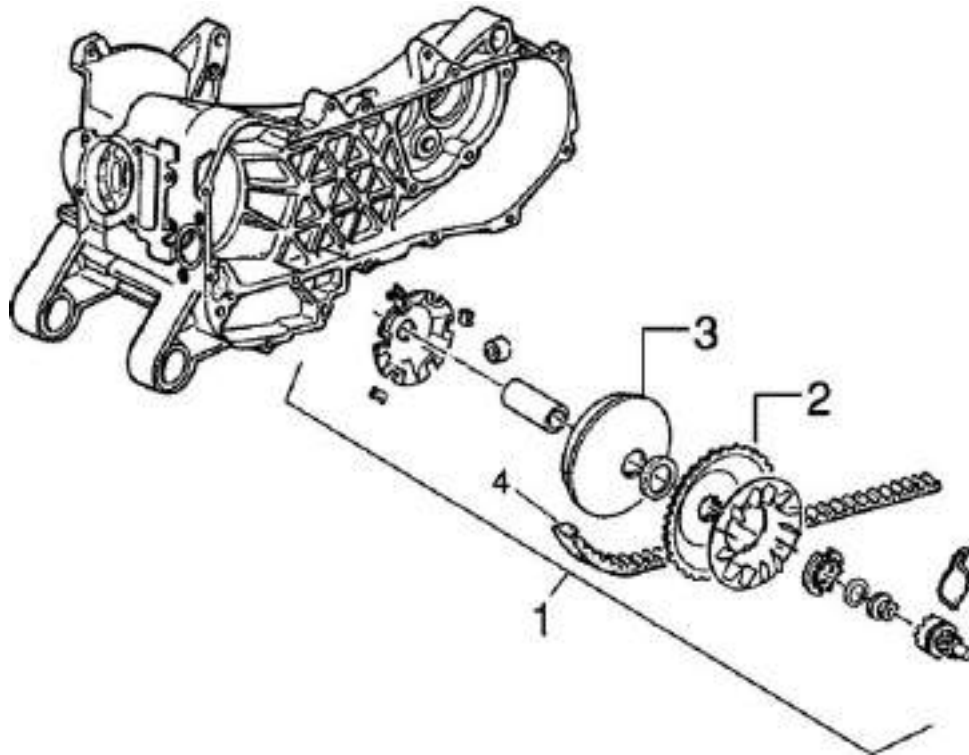
**OIL PUMP**

	Code	Action	Duration
1	001051	Belt/Timing chain - change	
2	001112	Oil pump - change	
3	001042	Oil pump - overhaul	
4	001121	Chain cover oil seal - Replacement	
5	001122	Oil pump chain - change	
6	001125	Chain guide pads - change	
7	001130	Oil sump - change	
8	001129	Chain tightener - overhaul and re- place	

**Final gear assy.****REDUCTION GEAR**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001010	Gear reduction unit - Inspection	
2	004125	Rear wheel axle - Replacement	

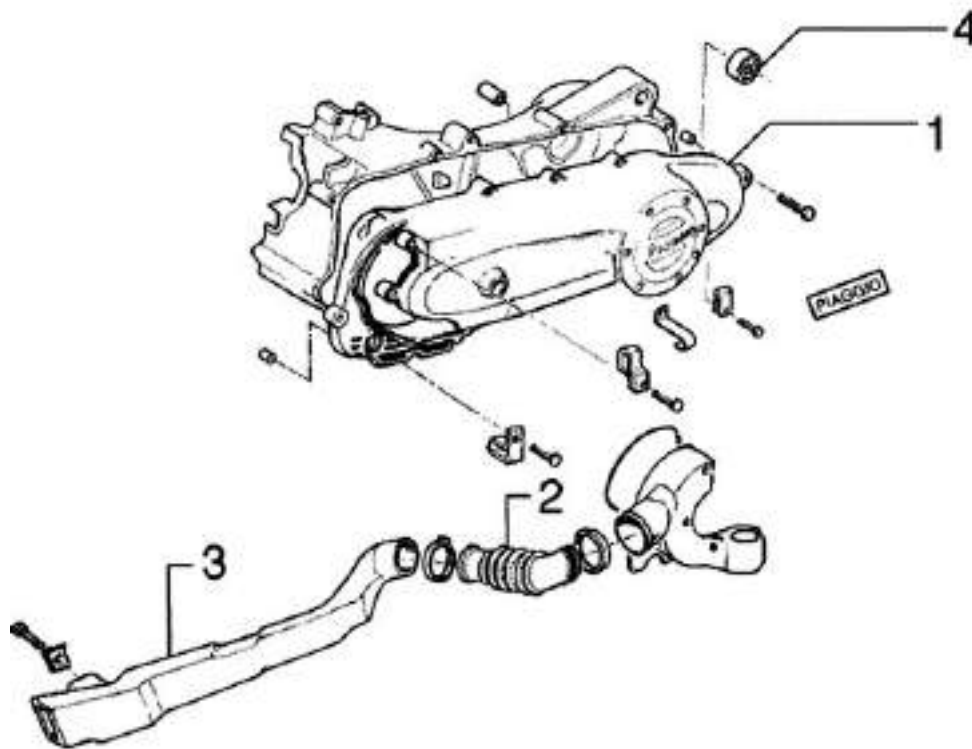
**Driving pulley**



**DRIVING PULLEY**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001006	Driving pulley - Overhaul	
2	001086	Driving half-pulley - replace	
3	001066	Driving pulley - Removal and refitting	
4	001011	rear-view belt - Replacement	

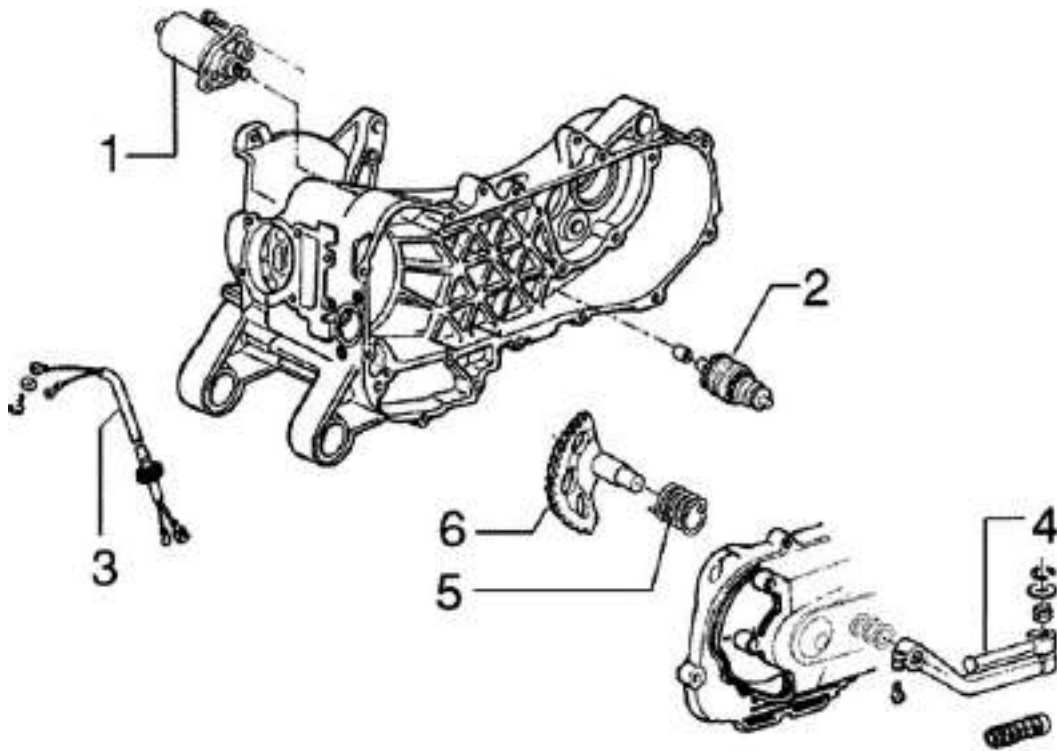
## Transmission cover



### TRANSMISSION COVER

	Code	Action	Duration
1	001096	Transmission crankcase cover - replace	
2	001132	Transmission air intake pipe - Replacement	
3	001131	Transmission air intake - Replacement	
4	001135	Transmission cover bearing - Replacement	

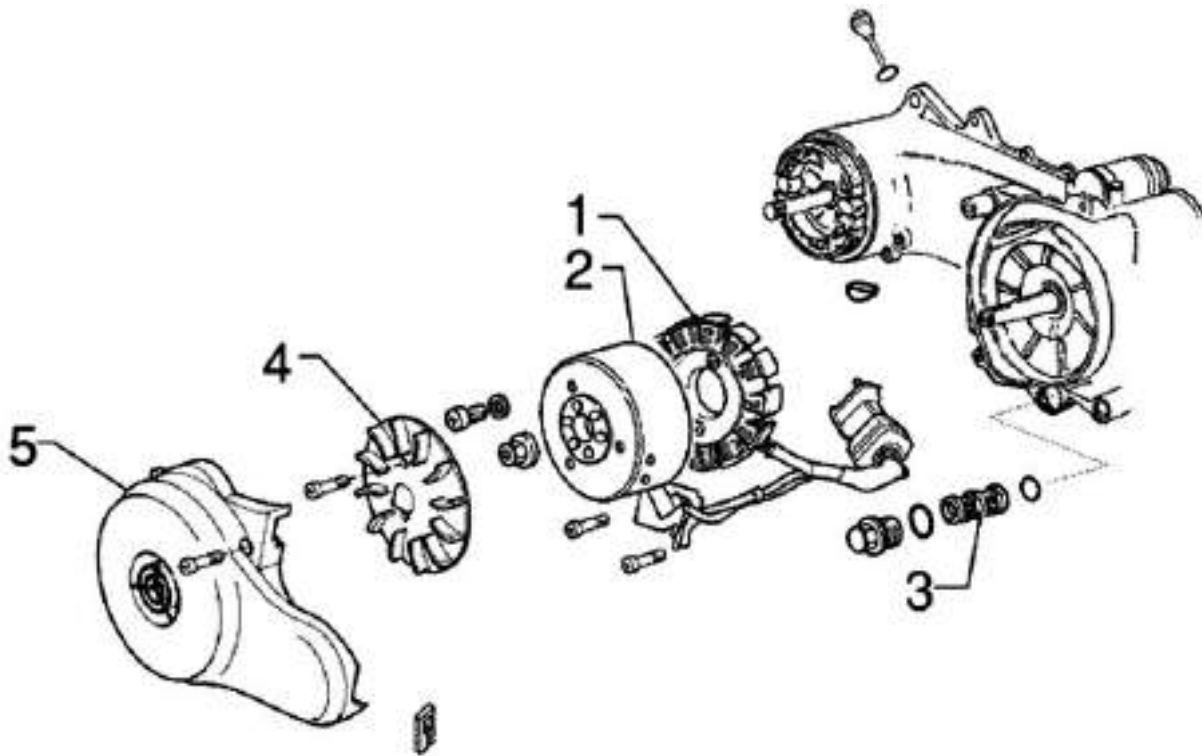
**Starter motor**



**STARTER MOTOR - START UP LEVER**

	Code	Action	Duration
1	001020	Starter motor - change	
2	001017	Starter sprocket wheel - replace	
3	005045	Starter motor with cables unit - Re-plac.	
4	001084	Starter lever - Replacement	
5	008008	Starter spring pack - Replacement	
6	001021	Kick starter - Inspection	

## Flywheel magneto

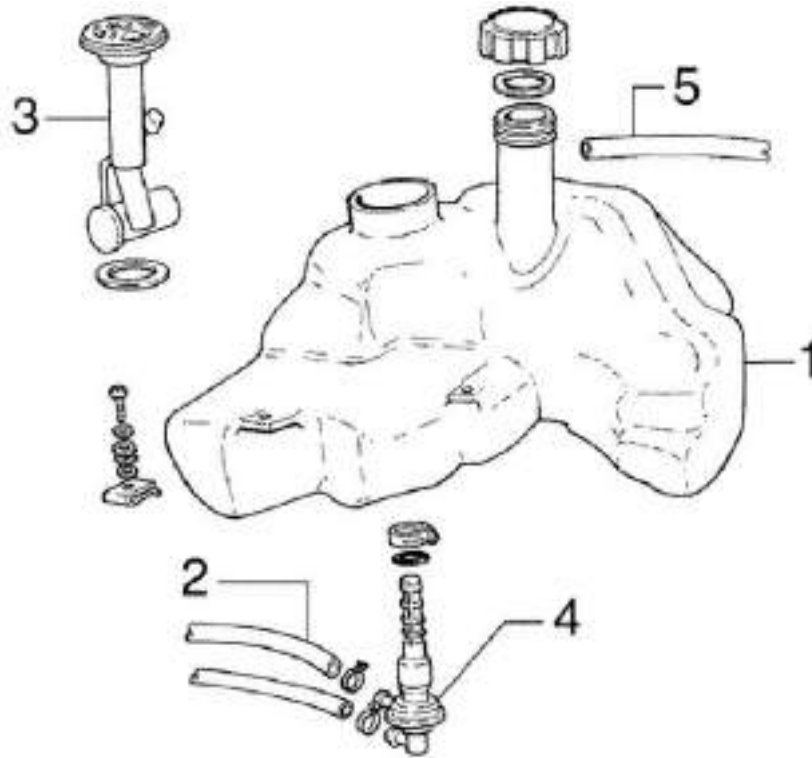


### FLYWHEEL FAN

	Code	Action	Duration
1	001067	Stator - Fitting and Refitting	
2	001058	Flywheel - Replacement	
3	001102	Net oil filter - change / Cleaning	
4	001109	Cooling fan - Replacement	
5	001087	Flywheel cover - Replacement	

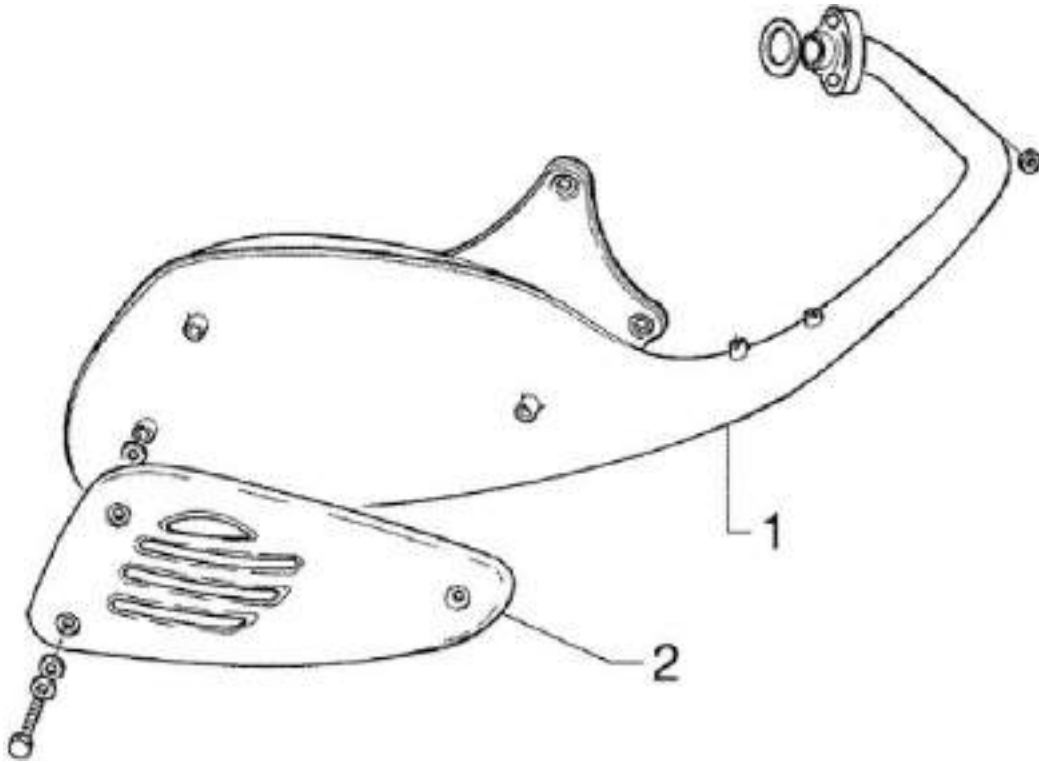


Carburettor



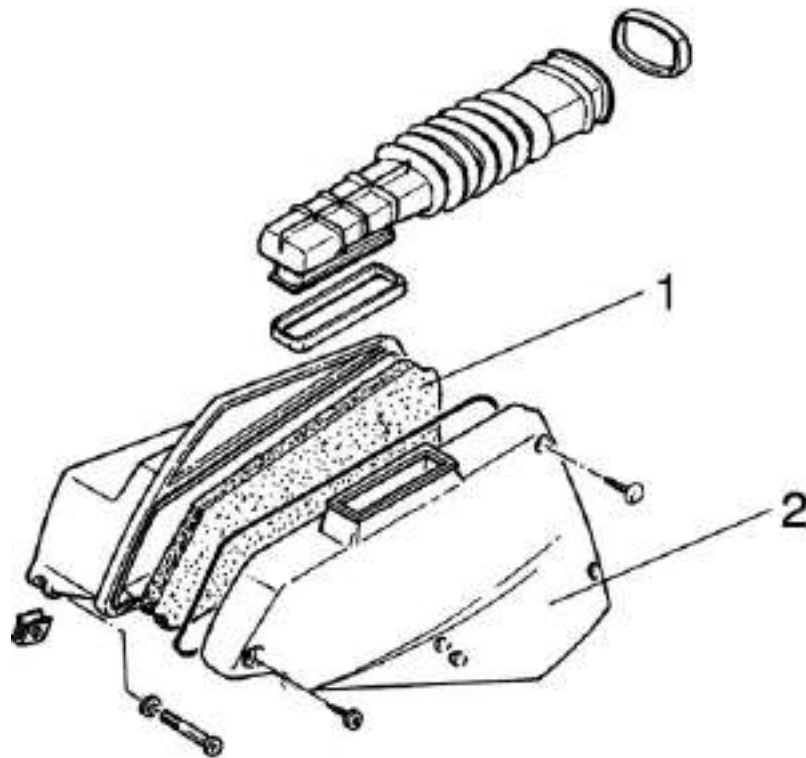
**FUEL TANK**

	Code	Action	Duration
1	004005	Fuel tank - Replacement	
2	004110	Fuel tank hose - Replacement	
3	005010	Tank float - Replacement	
4	004007	Fuel valve - Replacement	
5	004109	Fuel tank breather - Replacement	

**Exhaust pipe****MUFFLER**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001009	Muffler - Replacement	
2	001095	Muffler guard - Replacement	

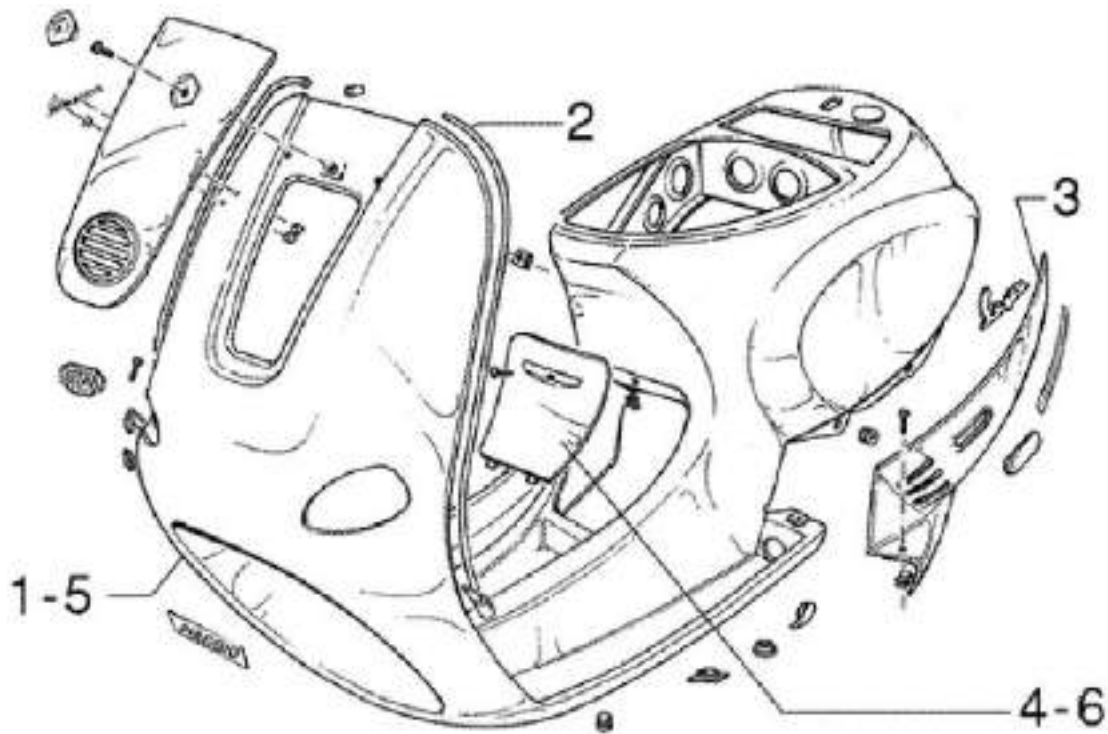
**Air cleaner**



**AIR FILTER**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001014	Air filter - Replacement /Cleaning	
2	001015	Air filter box - Replacement	

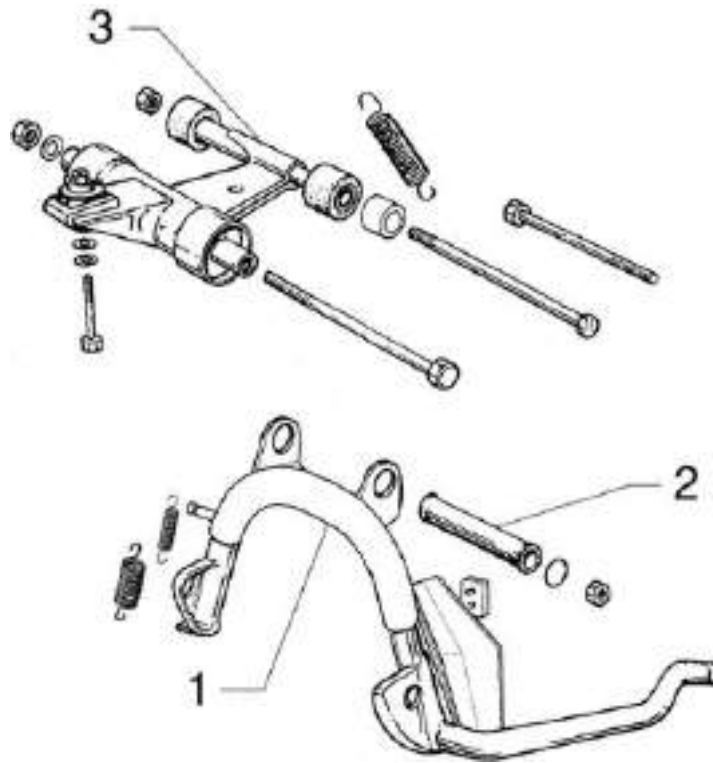
## Frame



### FRAME

	Code	Action	Duration
1	004001	Frame - replace	
2	004023	Shield rim - Replacement	
3	004012	Rear fairings - Removal and refitting	
4	004059	Spark plug inspection flap - Replacement	
5	006001	Frame - Painting	
6	006032	Door - Painting	

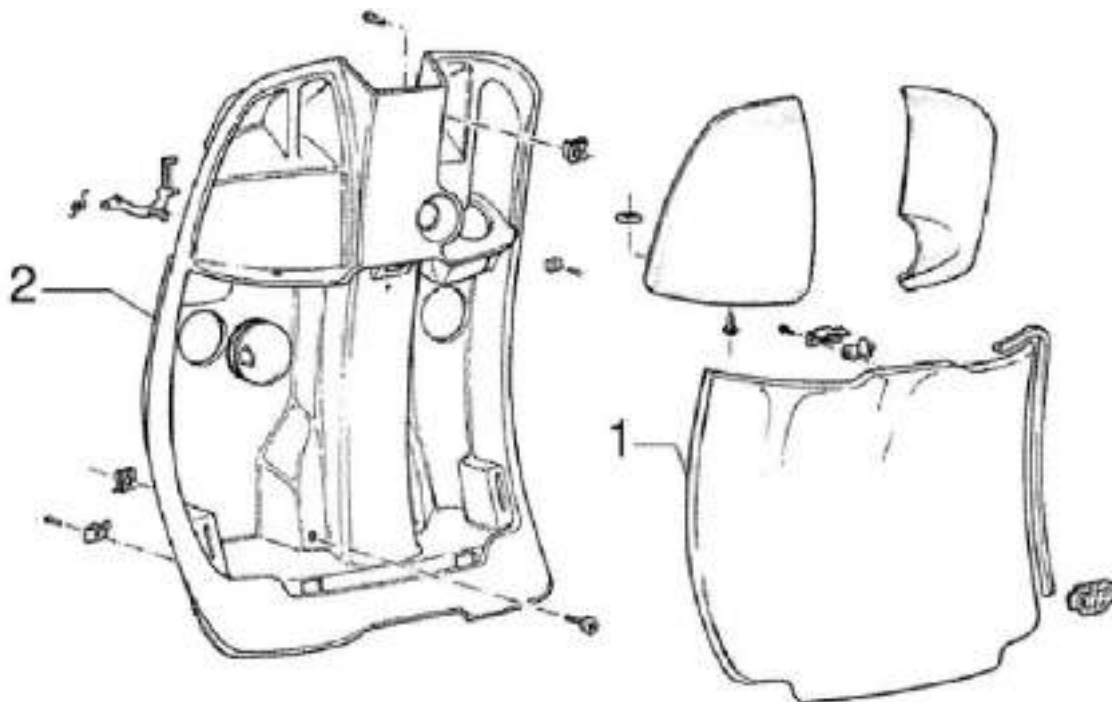
Centre-stand



**STAND**

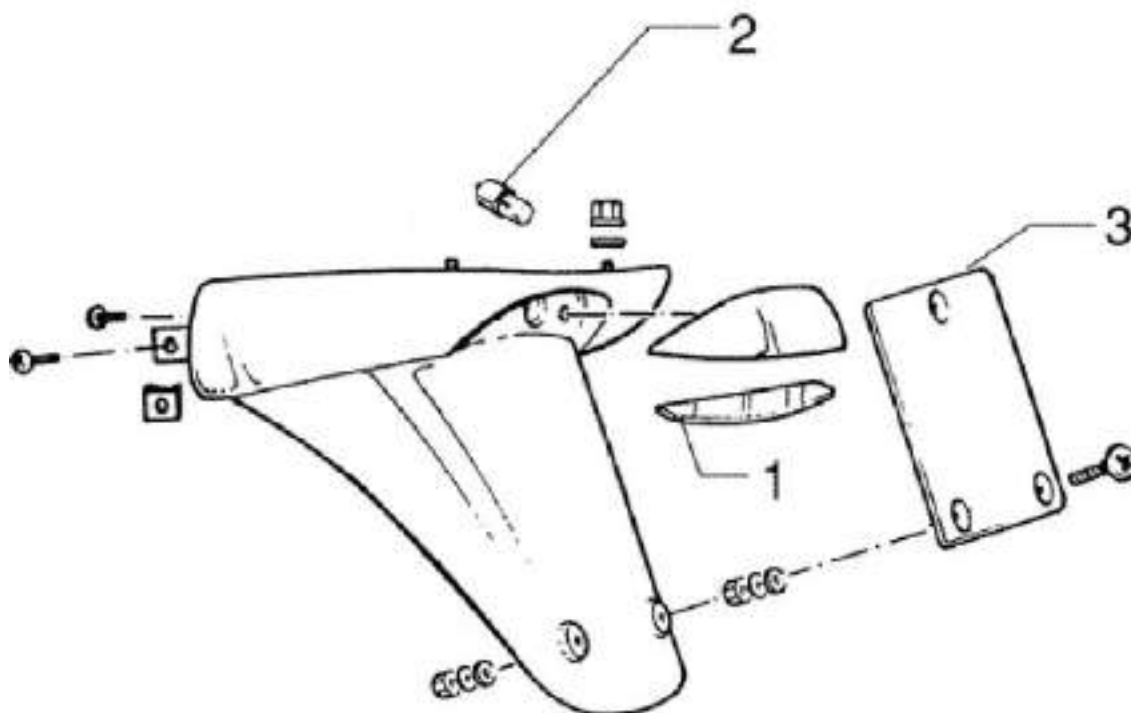
	Code	Action	Duration
1	004004	Stand - Replacement	
2	001053	Stand bolt - Replacement	
3	001072	Swinging arm - Engine-chassis connection - Replacement	

## Rear cover

**GLOVE COMPARTMENT**

	Code	Action	Duration
1	004081	Glove box door - Replacement	
2	004083	Glove box - Replacement	

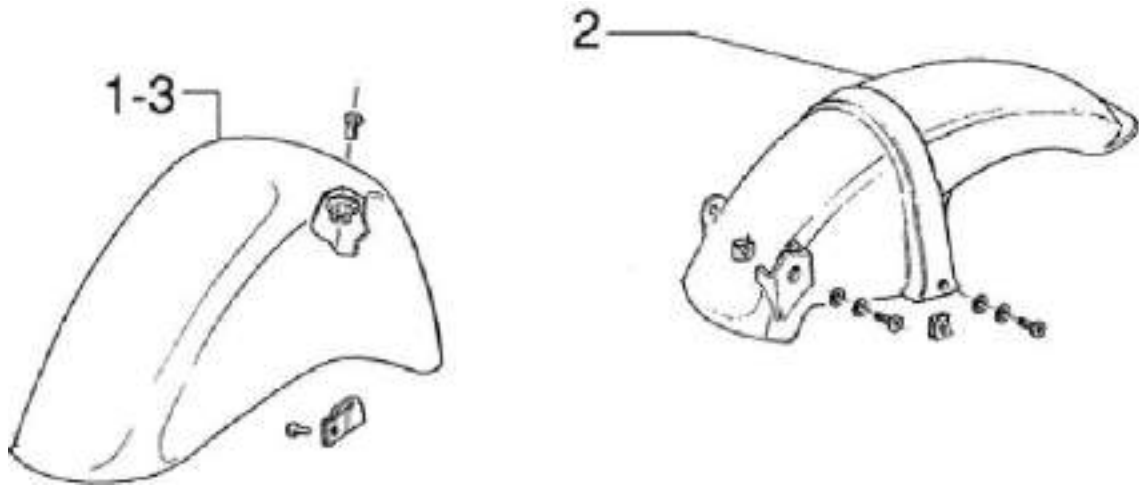
## Plate holder



**NUMBER PLATE HOLDER**

	Code	Action	Duration
1	005032	Licence plate light glass - Replacement	
2	005031	Licence plate light bulb - Replacement	
3	005048	Licence plate holder - Replacement	

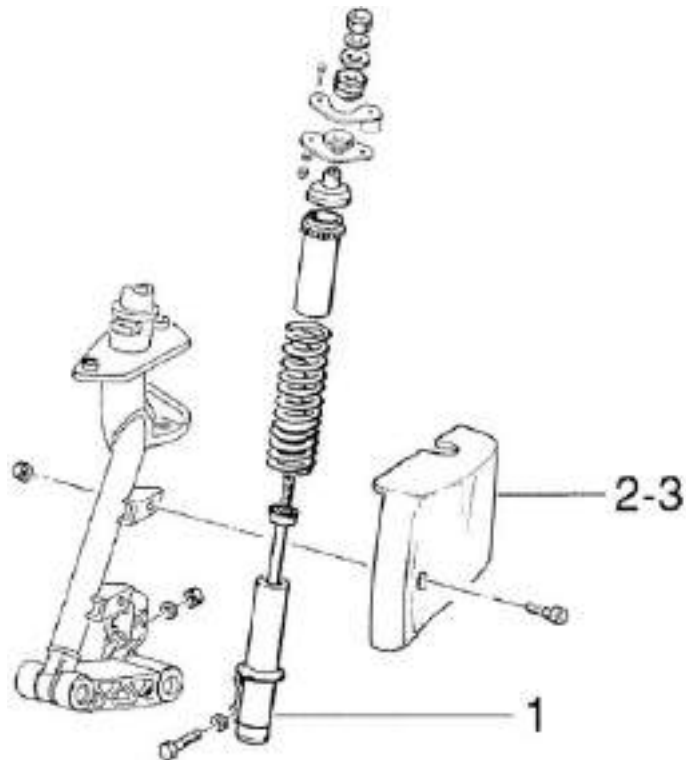
**Mudguard**



**MUDGUARDS**

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

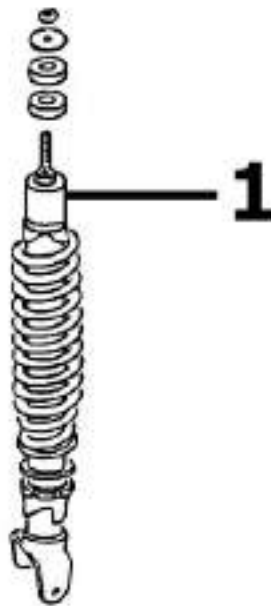
## Rear shock-absorber



### FRONT SHOCK ABSORBER COVER

	Code	Action	Duration
1	003011	Front shock absorber - Removal and Refitting	
2	003044	Shock absorber cover - Replacement	
3	006038	Shock absorber cover - Painting	

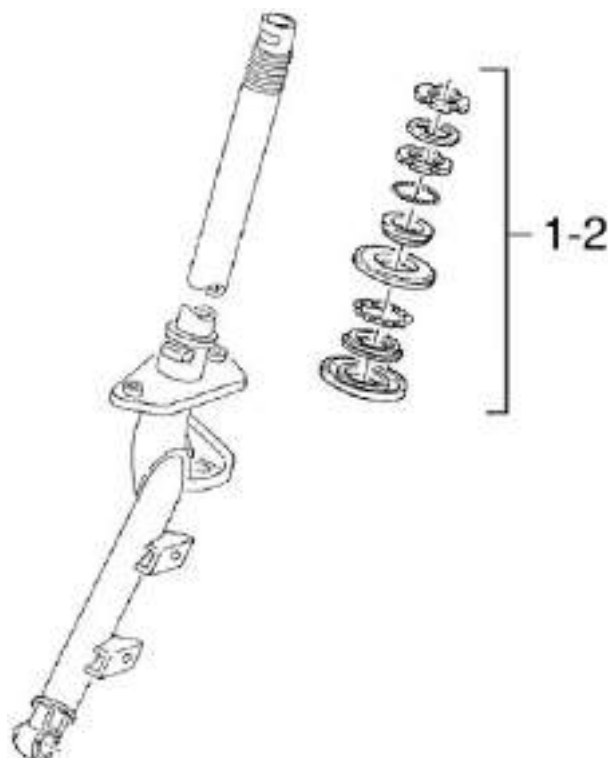




**REAR SHOCK ABSORBER**

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

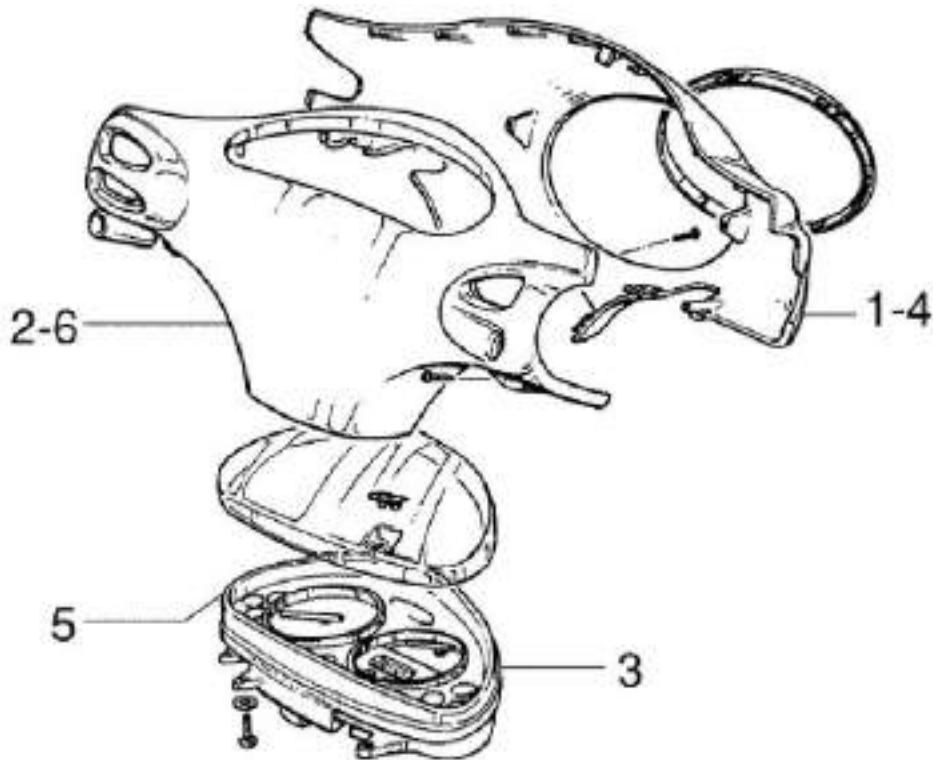
**Steering column bearings**



### STEERING COLUMN BEARINGS

	Code	Action	Duration
1	003002	Steering fifth wheel - Replacement	
2	003073	Steering clearance - Adjustment	

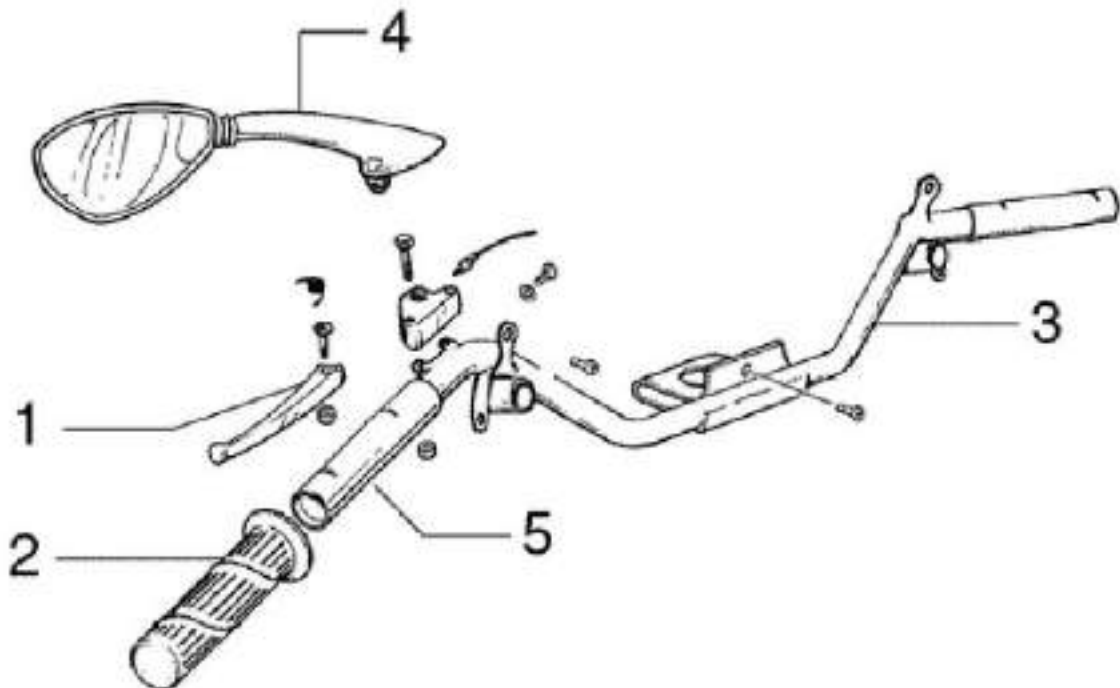
### Handlebar covers



### ODOMETER - HANDLEBAR COVERS

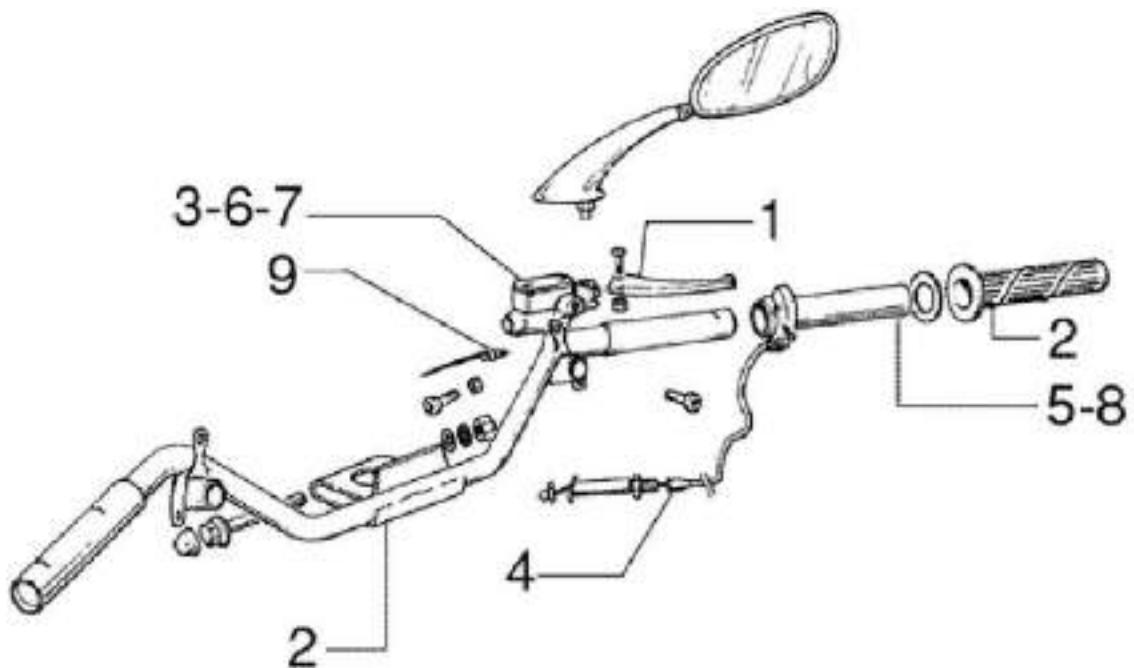
	Code	Action	Duration
1	004018	Handlebar front section - Replacement	
2	004019	Handlebar rear section - Replacement	
3	005014	Odometer - Replacement	
4	006013	Handlebar front part - Painting	
5	005038	Instrument panel warning light bulbs - Replacement	
6	006014	Handlebar rear part - Painting	

Handlebar components



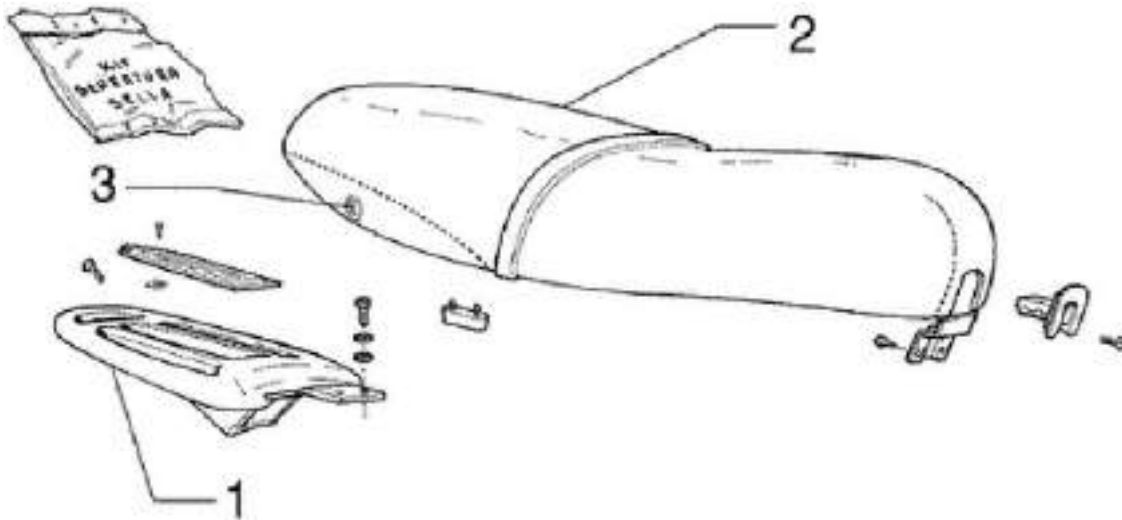
**HANDLEBAR COMPONENTS**

	Code	Action	Duration
1	002037	Brake or clutch lever - Replacement	
2	002071	Left hand grip - Replacement	
3	003001	Handlebar - Removal and refitting	
4	004066	Driving mirror - Replacement	
5	003075	Handlebar left control - Replacement	



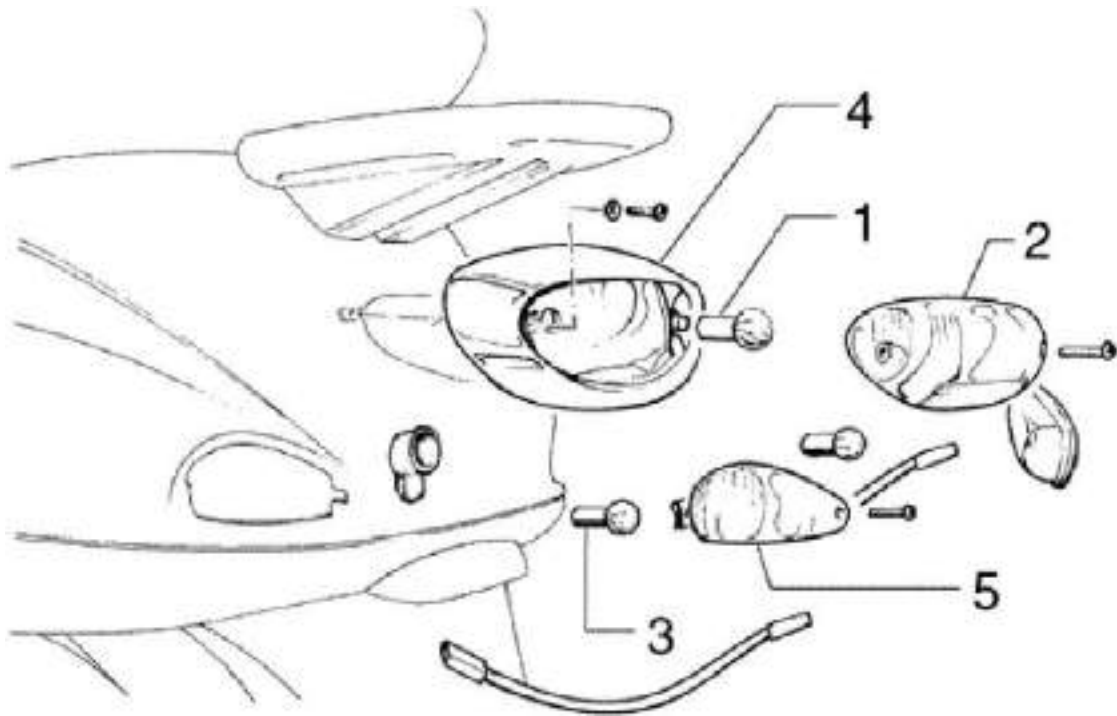
**HANDLEBAR COMPONENTS**

	Code	Action	Duration
1	002037	Brake or clutch lever - Replacement	
2	002059	Right hand grip - Replacement	
3	003067	Front brake fluid - Renewal	
4	003074	Handlebar right control - Replacement	
5	002047	Front brake fluid and air bleeding system - Replacement	
6	002024	Front brake pump - Removal and Re-fitting	
7	002063	Throttle control transmission - Replacement	
8	005017	Stop switch - Replacement	

**Seat****SADDLE**

	Code	Action	Duration
1	004008	Luggage rack - Replacement	
2	004003	Saddle - Replacement	
3	004054	Seat lock hook - Replacement	

Turn signal lights



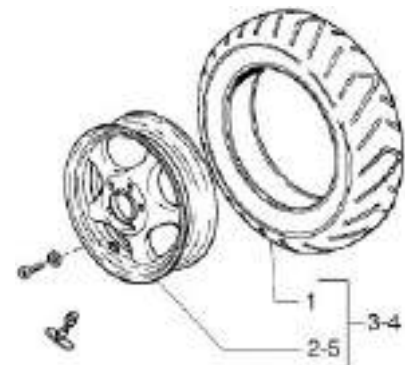
**REAR RED LAMP**

	Code	Action	Duration
1	005066	Rear light bulbs - Replacement	
2	005028	Rear light assembly glass - Replacement	
3	005068	Rear turn indicator bulb - Replacement	
4	005005	Taillight - Replacement	
5	005022	Rear turn indicators - Replacement	

Front wheel

**FRONT WHEEL**

	Code	Action	Duration
1	003047	Front tyre - replace	
2	003037	Front wheel rim - Removal and Refitting	
3	004123	Front wheel - Replacement	
4	003063	Tyre pressure - Check	
5	006018	Wheel rim - Paintwork	



**Grease tone wheel c drive**

Please take note that the code has been introduced:

900001 - Tone wheel drive greasing - 15'.

Never mistake the codes 002011 (moven sensor replacemen

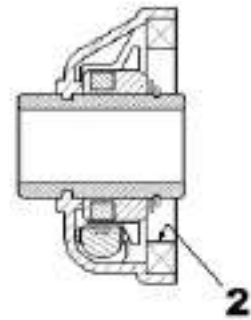
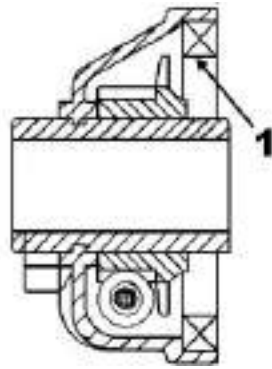
and 005089 (tone wheel replacemen

the event of noise of indicated componen

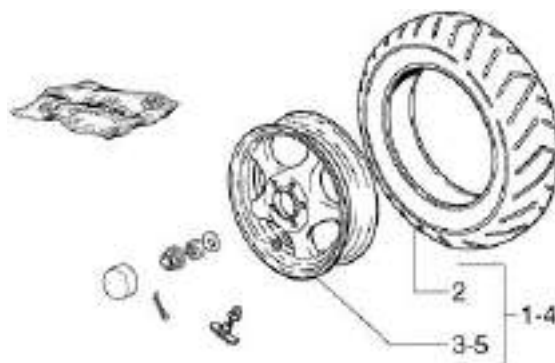
The grease recomnded is TUTELA MR

(soap-based lithium grease with Molybdenum disulphide).

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



**Rear wheel**

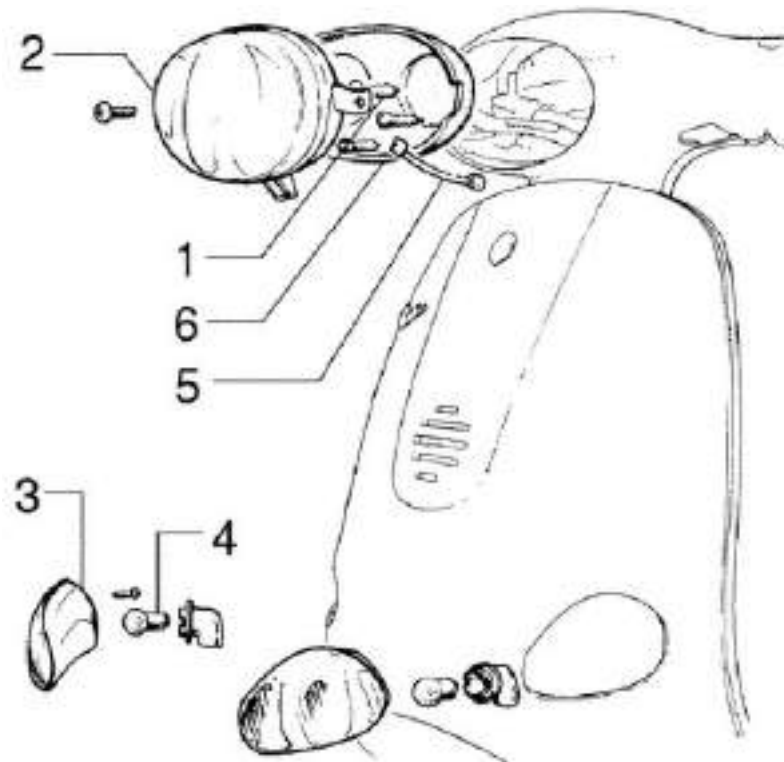


**REAR WHEEL**

	Code	Action	Duration
1	001016	Rear wheel - Replacement	
2	004126	Rear wheel tyre - Replacement	
3	001071	Rear wheel rim - Replacement	

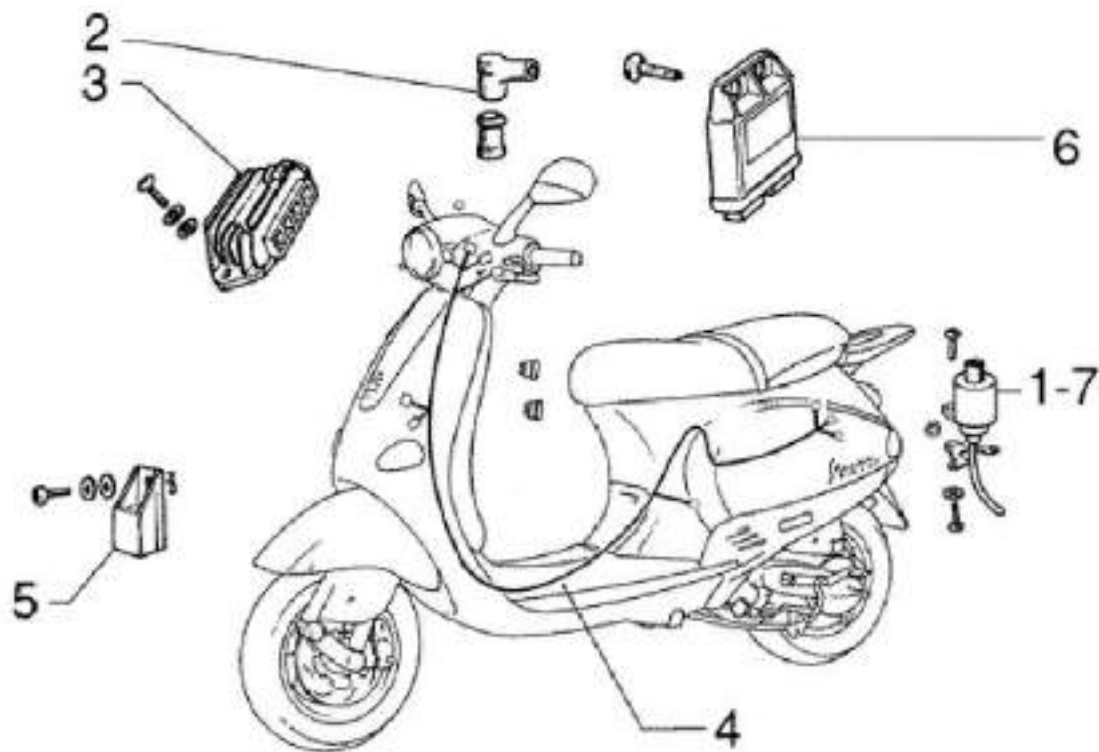
	Code	Action	Duration
4	003063	Tyre pressure - Check	
5	006018	Wheel rim - Paintwork	

**Electric devices**



**HEADLIGHT**

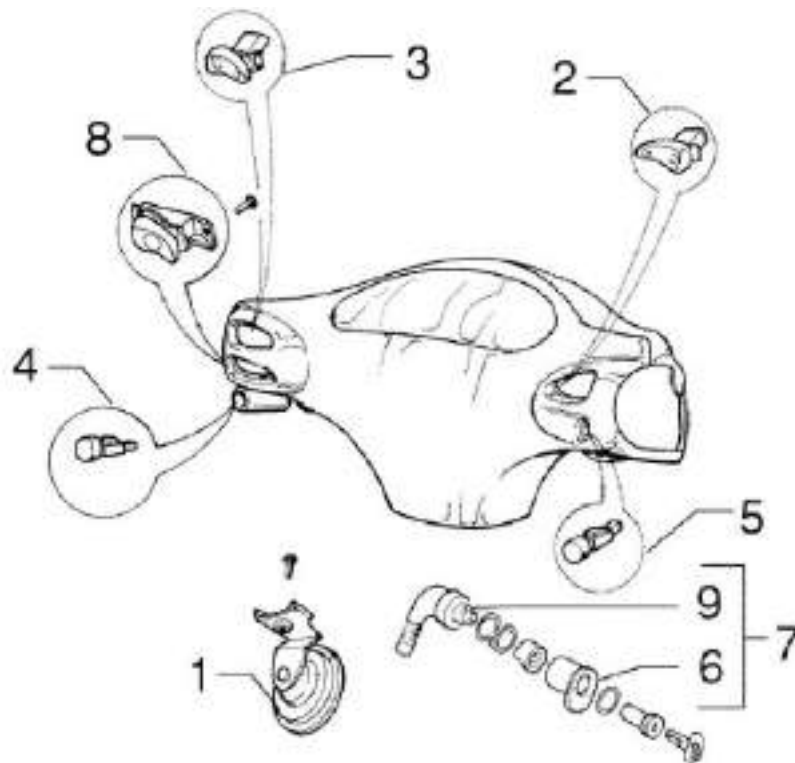
	Code	Action	Duration
1	005008	Front headlamp bulbs - Replacement	
2	005002	Front headlamp - Replacement	
3	005012	Front turn indicator - Replacement	
4	005067	Front turn indicator bulb - Replacement	
5	005044	Front lights cable unit- Replacement	
6	004020	Headlight frame - Replacement	



### ELECTRICAL DEVICES

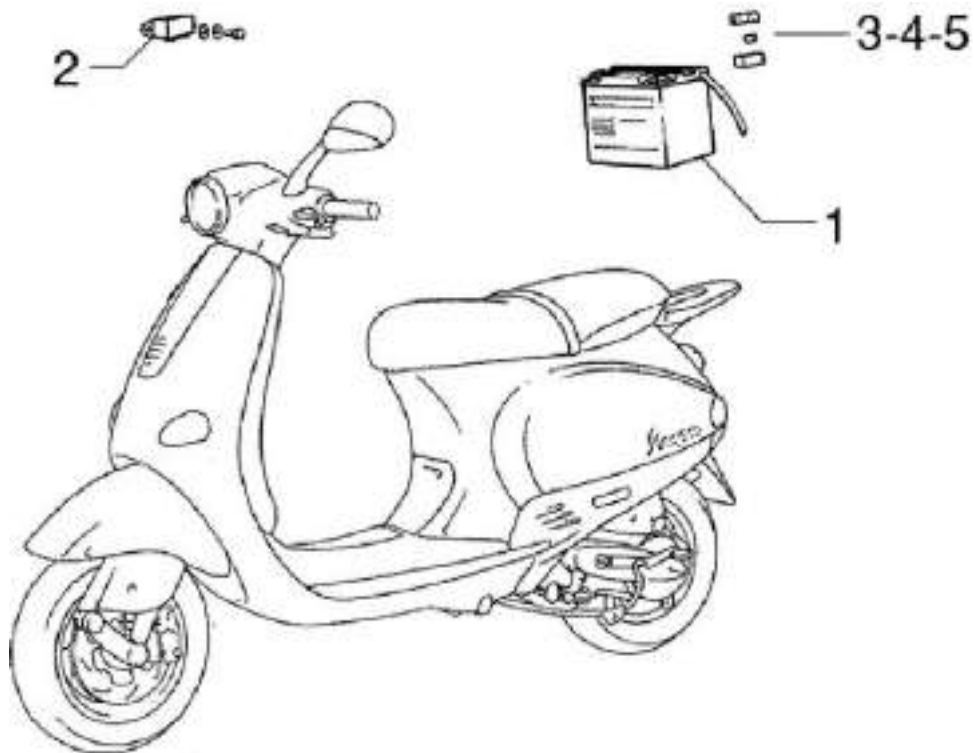
	Code	Action	Duration
1	001069	HV coil - Replacement	
2	001094	Spark plug cap - Replacement	
3	005009	Voltage regulator - Replacement	
4	005001	Electrical system - Removal and re-fitting	
5	005035	Headlight remote control - Replacement	
6	001023	Control unit - Replacement	
7	005074	Choke control device - Replacement	





**ELECTRIC DEVICES**

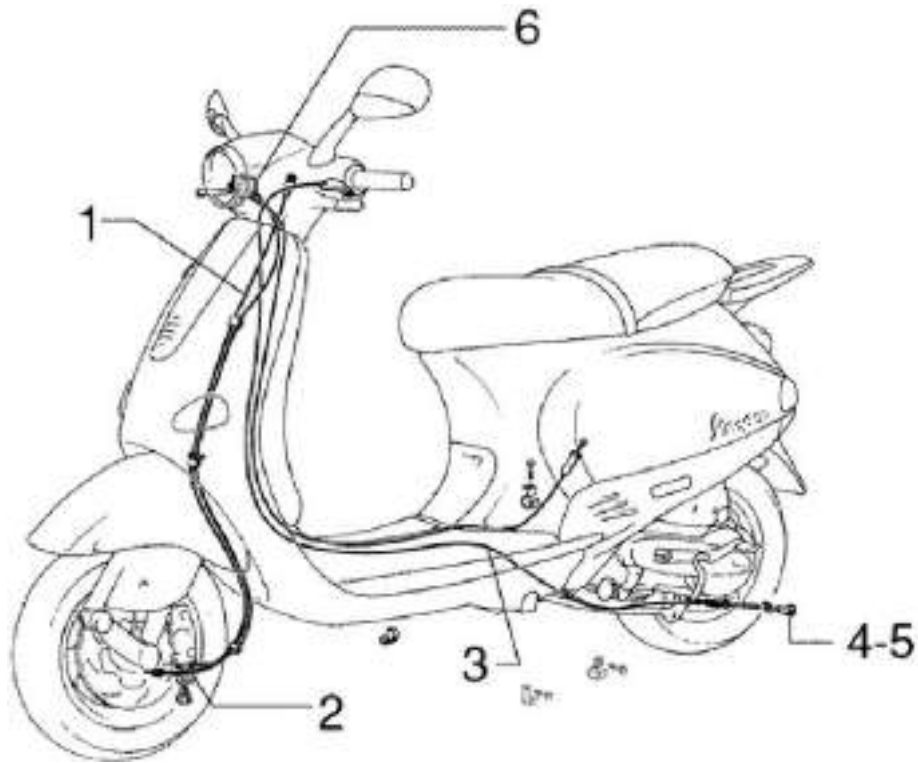
	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	005003	Horn - Replacement	
2	005006	Light switch or turn indicators - Replacement	
3	005039	Headlight switch - Replacement	
4	005040	Horn button - Replacement	
5	005041	Starter button - Replacement	
6	004010	Antitheft lock - replace	
7	004096	Lock series - Replacement	
8	005069	Left switch - Replacement	
9	005016	Key switch - Replacement	



### **ELECTRIC DEVICES**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	005007	Battery - Replacement	
2	005011	Start-up remote control switch - Replacement	
3	005019	Fuse terminal block - Replacement	
4	005024	Battery fuse - Replacement	
5	005025	Battery fuse holder - Replacement	

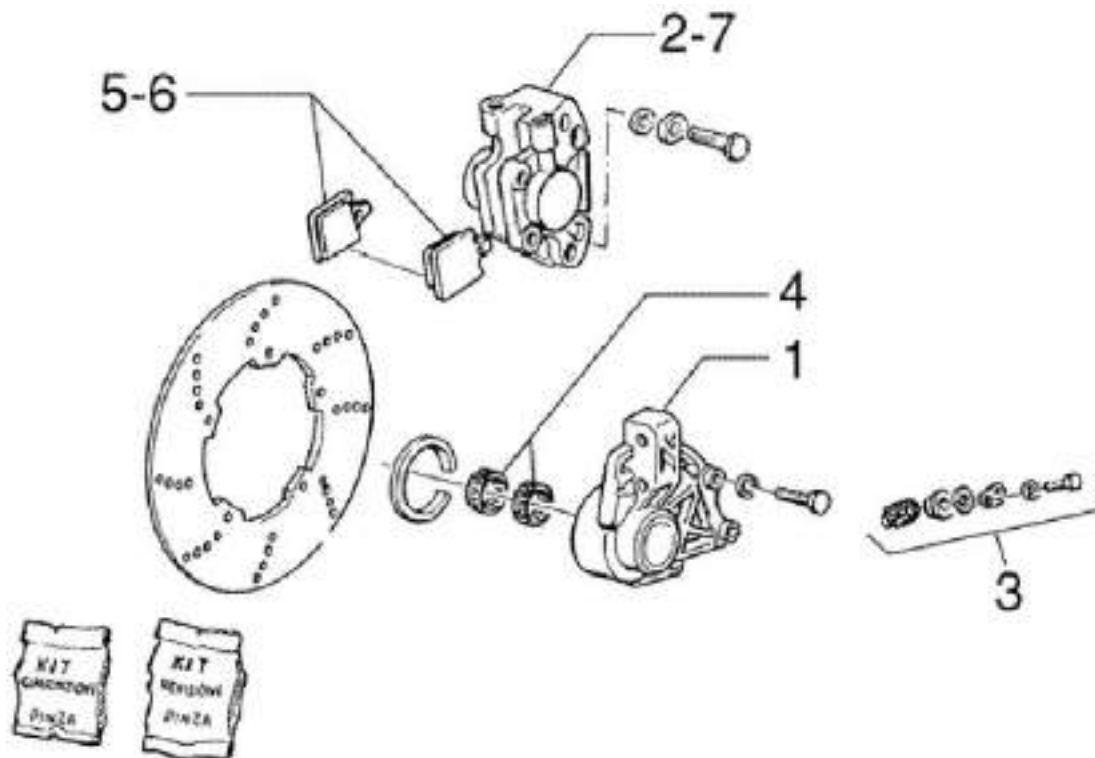
**Transmissions**



**TRANSMISSIONS**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	002051	Odometer transmission assembly - Replacement	
2	002049	Odometer cable - Replacement	
3	002053	Rear brake transmission complete - Replacement	
4	002043	Rear brake cable - Replacement	
5	003060	Rear brake cable - Adjustment	
6	002021	Front brake piping - Replacement	

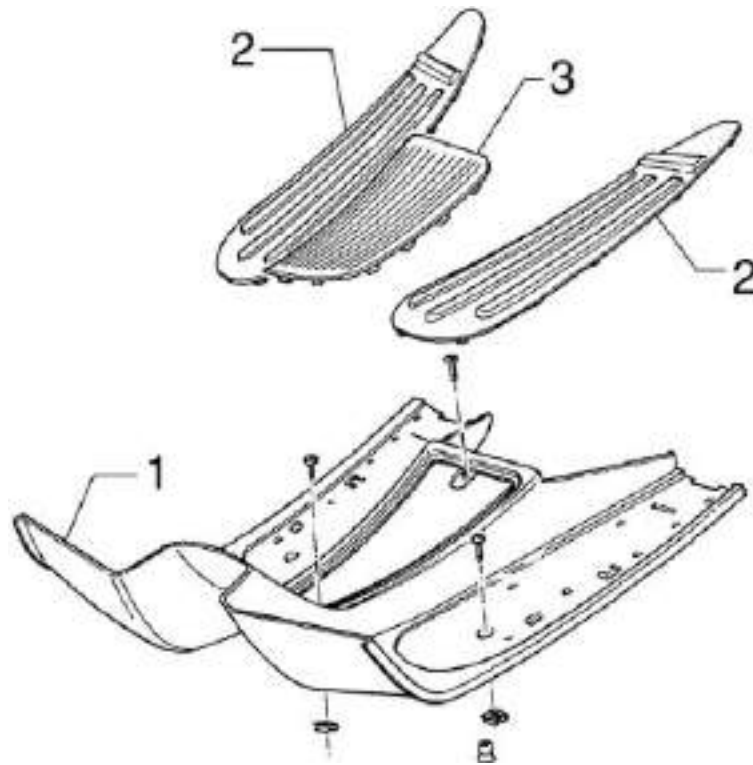
## Brake callipers



### BRAKE CALIPER

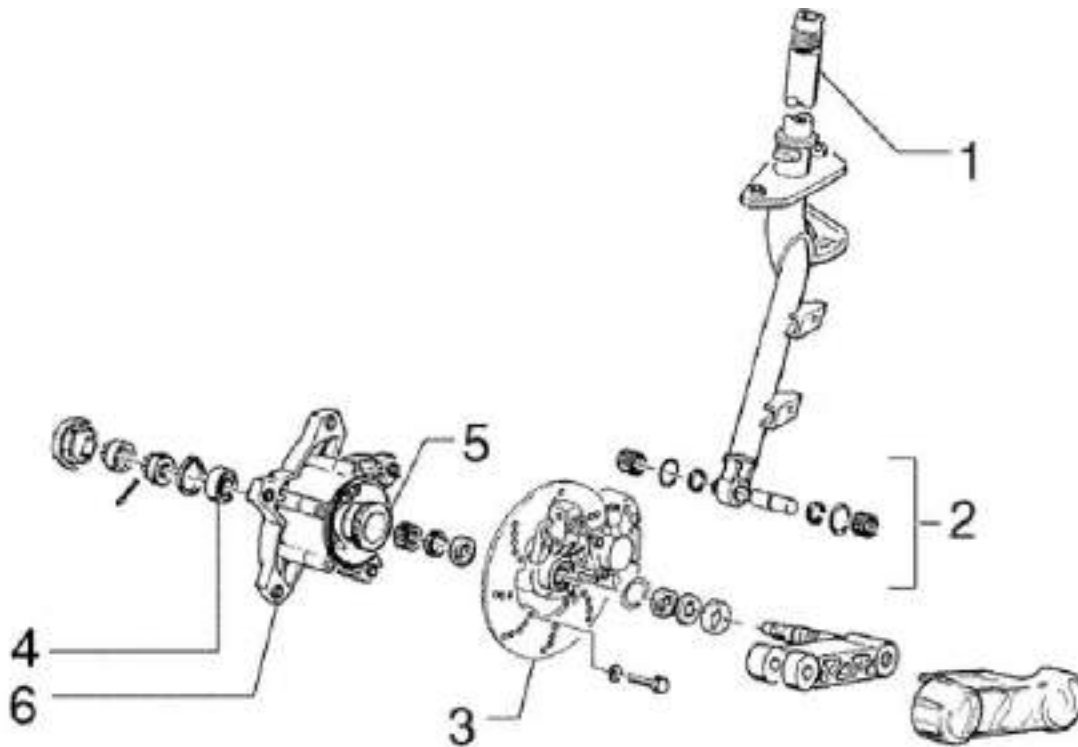
	Code	Action	Duration
1	003035	Shock absorber support and brake calliper - Replacement	
2	002039	Front brake calliper - Removal and Refitting	
3	002011	Odometer movement sensor - Replacement	
4	003036	Shock abs. and brake caliper support bearings - Replacement	
5	003070	Front brake pads / Shoes - Check wear	
6	002007	Front brake shoes/pads - Remov. and Refitt	
7	003002	Steering fifth wheel - Replacement	
8	003073	Steering clearance - Adjustment	

## Footrests

**MATS**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	004015	Footrest - Removal and Refitting	
2	004078	Front/rear footboard rubber cover - Replacement	
3	004075	Front mat - Replacement	

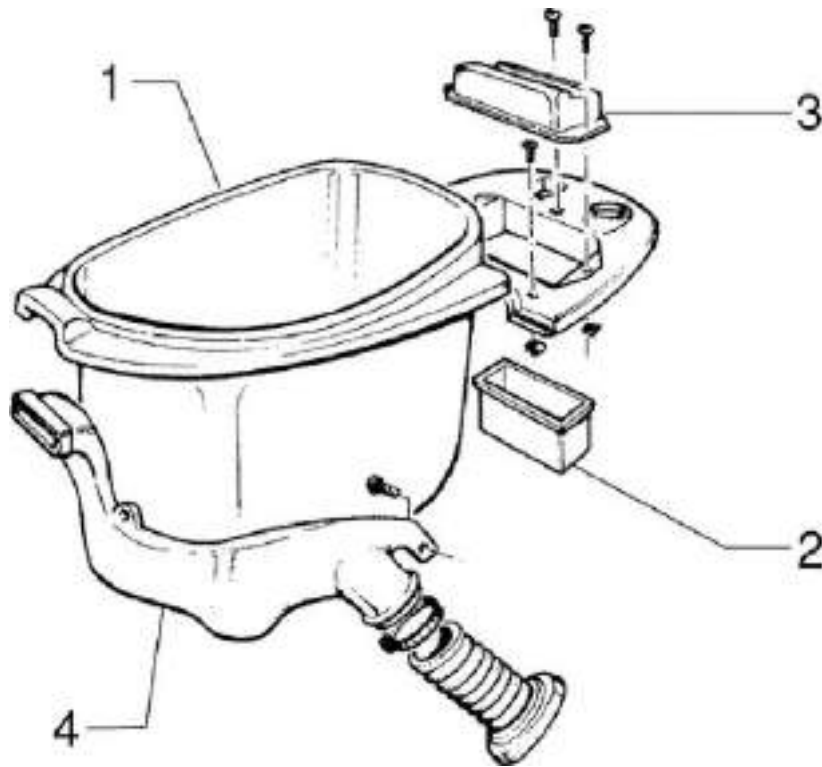
## Steering column



### STEERING

	Code	Action	Duration
1	003045	Steering tube - Replacement	
2	003010	Front suspension - Service	
3	002041	Brake disc - Replacement	
4	003040	Front wheel bearings - Replacement	
5	001064	Odometer reel - Replacement	
6	003033	Front wheel hub- Replacement	

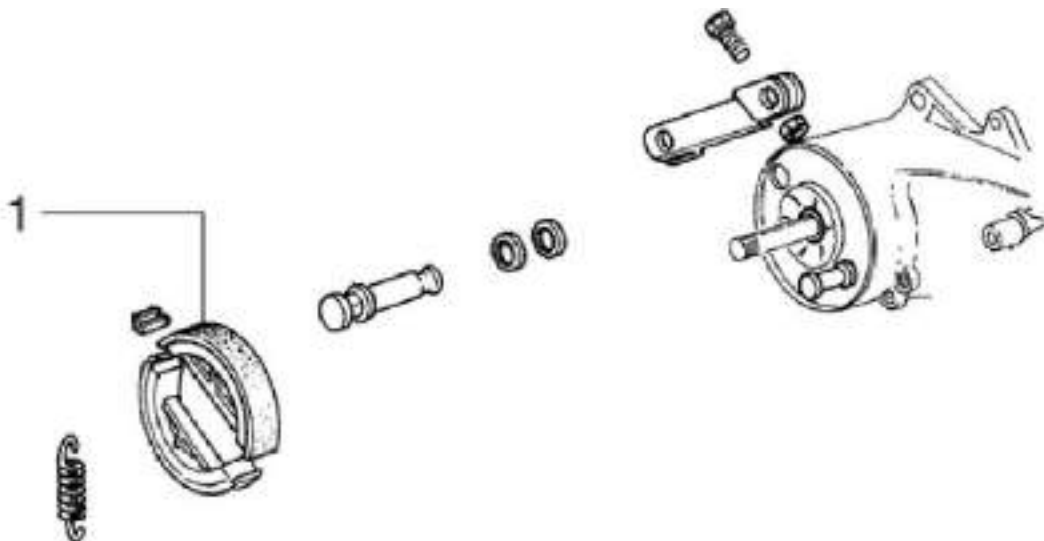
Helmet bay



**HELMET CARRIER**

	Code	Action	Duration
1	004016	Helmet compartment - Removal and Refitting	
2	004071	Battery compartment - Replacement	
3	005046	Battery cover - Replacement	
4	001027	Body / air cleaner union - Replacement	

Braking system



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**BRAKE LEVER**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	002002	Shoes - Rear brake pads - Replacement	

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## **A**

Air filter: 30

## **B**

Battery: 38, 44, 53

Brake: 131, 133–135, 180

## **C**

Carburettor: 10, 28, 108, 112, 161

## **E**

Engine oil: 31

## **F**

Fuel: 36, 107

## **H**

Headlight: 139

Hub oil: 30

## **I**

Identification: 8

Instrument panel: 138

## **M**

Maintenance: 7, 25

## **O**

Odometer:

## **S**

Saddle:

Spark plug: 29

Stand:

## **T**

Tank:

Transmission: 9, 37, 59, 69, 158

Tyres: 10