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## **Service station manual**

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**633852 IT - 633853 EN - 633854 FR - 633855 DE -  
633856 ES - 633857 PT - 633858 NL - 633859 EL**

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**LXV 125**

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# Service station manual

## LXV 125

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

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# Service station manual

## LXV 125

This service station manual has been drawn up by Piaggio & C. Spa to be used by the workshops of Piaggio-Gilera dealers. It is assumed that the user of this manual for maintaining and repairing Piaggio vehicles has a basic knowledge of mechanical principles and vehicle repair technique procedures. Any significant changes to vehicle characteristics or to specific repair operations will be communicated by updates to this manual. Nevertheless, no mounting 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 special tools, along with the special 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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## INDEX OF TOPICS

CHARACTERISTICS

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## Rules

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

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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.
- 

### 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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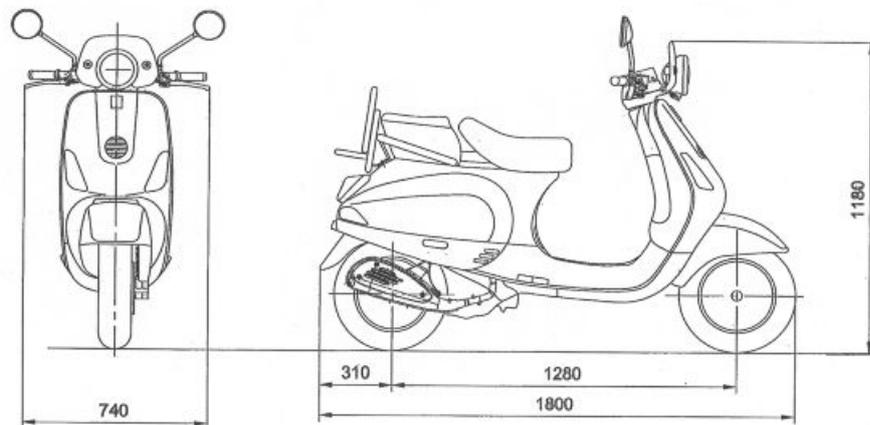
## Vehicle identification

### VEHICLE IDENTIFICATION

Specification	Desc./Quantity
Engine prefix	ZAP M444M
Chassis prefix	ZAP M443010000-0000



## Dimensions and mass



### WEIGHTS AND DIMENSIONS

Specification	Desc./Quantity
Kerb weight	114 ± 5 kg
Overall height	1180 mm
Width	740 mm
Wheelbase	1280 mm
Length	1800 mm

## Engine

### ENGINE

Specification	Desc./Quantity
Engine	Single-cylinder, 4-stroke Piaggio LEADER
Timing system	Single overhead camshaft (SOHC) with 2 valves
Valve clearance	intake 0.10 outlet 0.15
Bore x stroke	57.0 x 48.6 mm
Cubic capacity	124 cc
Carburettor	KEIHIN CVK26
Engine idle speed	1650 ± 100 rpm
Start-up	Electric
Max power to the shaft	10.5 CV at 8250 rpm
Cooling	Forced air circulation.

## Transmission

### TRANSMISSION

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

## Capacities

### CAPACITY

Specification	Desc./Quantity
Engine oil	61 in <sup>3</sup> (1,000 cm <sup>3</sup> )
Rear hub oil	~ 100 cm <sup>3</sup>
Fuel tank capacity	~ 8.5 litres (2 l of which is reserve)

## Electrical system

### ELECTRICAL SYSTEM

Specification	Desc./Quantity
Start-up	Electric
Spark plug	Champion RG6YC- NGK CR7EB

## Frame and suspensions

### FRAME AND SUSPENSIONS

Specification	Desc./Quantity
Chassis	Unitised body made of stamped plate.
Steering and suspensions	Steering tube articulated on the front wheel carrier hub; heli-coidal spring suspension and double-acting hydraulic shock absorber; rear with double-acting shock absorber and coaxial spring adjustable to 4 positions at preloading.

## Brakes

### BRAKES

Specification	Desc./Quantity
Front brake	Disc brake (Ø 200 mm) with hydraulic control (lever on the far right of the handlebar) and fixed calliper.
Rear brake	Ø110 mm drum brake

## Wheels and tyres

### WHEELS AND TYRES

Specification	Desc./Quantity
Front wheel rim	Die-cast aluminium alloy; 2.50 x11"
Front tyre	Tubeless; 110/70-11"
Rear wheel rim	Die-cast aluminium alloy; 3.00 x 10"
Rear tyre	Tubeless; 120/70-10"
Front tyre pressure	1.6 bar
Rear tyre pressure	2 bar
Rear wheel pressure (rider and passenger):	2.3 bar

## Carburettor

### CARBURETTOR SETTING

Specification	Desc./Quantity
Type	CVEK26
Body stamping	CVK
Throttle valve diameter	Ø 26.5
Diffuser diameter	Ø 26.4
Maximum jet	82
Maximum air jet (on the body)	85
Tapered pin stamping	NELA
Throttle valve spring	130 ÷ 180 gr.
Minimum jet	35
Idle air jet (on the body)	150
Idle mixture adjustment screw initial opening	2
Starter jet	42
Starter air jet (on the body)	Ø 1.5
Starter pin travel	10 mm (at 24°)
Starter resistance	20 Ohm (at 24°)

## Kehin

### CARBURETTOR SETTING

Specification	Desc./Quantity
Type	CVEK26
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Throttle valve diameter	Ø 26.5
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Maximum jet	82
Maximum air jet (on the body)	85
Tapered pin stamping	NELA
Throttle valve spring	130 ÷ 180 gr.
Minimum jet	35
Idle air jet (on the body)	150
Idle mixture adjustment screw initial opening	2
Starter jet	42
Starter air jet (on the body)	Ø 1.5

Specification	Desc./Quantity
Starter pin travel	10 mm (at 24°)
Starter resistance	20 Ohm (at 24°)

## Tightening Torques

### LUBRICATION

Name	Torque in Nm
Hub oil drainage cap	15 ÷ 17
Oil filter	4 ÷ 6
Oil pump cover screws	5 - 6
Oil pump screws	5 - 6
Pump control pulley screw	10 ÷ 14
Chain cover screws	4 ÷ 6
Oil sump screws	10 ÷ 14
Minimum oil pressure sensor	12 ÷ 14
Blow-by recovery duct fixing screws	3 - 4

### HEAD AND CYLINDER

Name	Torque in Nm
Ignition spark plug	12 ÷ 14
Head cover screws	11 ÷ 13
Nuts fixing head to cylinder (*)	28 ÷ 30
Head fixing screws (external)	11 ÷ 13
Starter ground screw	7 ÷ 8.5
Flywheel cover screw	1 ÷ 2
Flywheel air manifold screw	3 ÷ 4
Pressure reducer counterweight retainer	7 ÷ 8.5
Camshaft pulley screw	12 ÷ 14
Timing chain tensioner slider screw	10 ÷ 14
Starter ground support screw	11 ÷ 15
Tensioner screws	11 ÷ 13
Timing chain tensioner central screw	5 - 6
Camshaft retention plate screw	5 - 6
Nut fixing muffler to cylinder head	16 ÷ 18
Head intake manifold screw	11 ÷ 13

### TRANSMISSION

Name	Torque in Nm
Drive pulley nut	75 ÷ 83
Transmission cover screw	11 ÷ 13
Driven pulley shaft nut	54 ÷ 60
Rear hub cap screw	24 ÷ 27
Clutch unit nut on driven pulley	45 ÷ 50

### FLYWHEEL

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

(°) Apply LOCTITE 243 threadlock

### CRANKCASE AND CRANKSHAFT

Name	Torque in Nm
Internal engine crankcase bulkhead (transmission-side half shaft) screws	4 ÷ 6
Oil filter on crankcase fitting	27 ÷ 33
Rear brake cam tightening screw	11 ÷ 13
Engine-crankcase coupling screws	11 ÷ 13
Pre-filter cap	24 ÷ 30

Name	Torque in Nm
Starter motor fixing screw	11 ÷ 13
Muffler to crankcase fixing screws	24 ÷ 27
Engine oil drainage cap	24 ÷ 30

### STEERING ASSEMBLY

Name	Torque in Nm
Steering upper ring nut	35 ÷ 40
Lower steering ring nut	12 - 14
Handlebar fixing screw	50 ÷ 55

### FRAME ASSEMBLY

Name	Torque in Nm
Swinging arm pin - frame	44 ÷ 52
Engine-swinging arm bolt	33 ÷ 41
Stand bolt	32 ÷ 40
Swinging arm silent-block containment bolt	33 ÷ 41

### 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

### 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

### REAR SUSPENSION

Name	Torque in Nm
Rear wheel axle	104 ÷ 126
Lower shock absorber clamp	33 ÷ 41
Shock absorber/frame nut:	20 ÷ 25

## Overhaul data

## Assembly clearances

### Cylinder - piston assy.

#### COUPLING BETWEEN PISTON AND ALUMINIUM CYLINDER WITH CAST-IRON LINER

Name	Initials	Cylinder	Piston	Play on fitting
Coupling	A	56.980 ÷ 56.987	56.933 ÷ 56.940	0.040 - 0.054
Coupling	B	56.987 ÷ 56.994	56.940 ÷ 56.947	0.040 - 0.054
Coupling	C	56.994 ÷ 57.001	56.947 ÷ 56.954	0.040 - 0.054
Coupling	D	57.001 ÷ 57.008	56.954 ÷ 56.961	0.040 - 0.054
Coupling 1st increase	A1	57.180 ÷ 57.187	57.133 ÷ 57.140	0.040 - 0.054
Coupling 1st increase	B1	57.187 ÷ 57.194	57.140 ÷ 57.147	0.040 - 0.054
Coupling 1st increase	C1	57.194 ÷ 57.201	57.147 ÷ 57.154	0.040 - 0.054
Coupling 1st increase	D1	57.201 ÷ 57.208	57.154 ÷ 57.161	0.040 - 0.054

Name	Initials	Cylinder	Piston	Play on fitting
Coupling 2nd increase	A2	57.380 ÷ 57.387	57.333 ÷ 57.340	0.040 - 0.054
Coupling 2nd increase	B2	57.387 ÷ 57.394	57.340 ÷ 57.347	0.040 - 0.054
Coupling 2nd increase	C2	57.394 ÷ 57.401	57.347 ÷ 57.354	0.040 - 0.054
Coupling 2nd increase	D2	57.401 ÷ 57.408	57.354 ÷ 57.361	0.040 - 0.054
Coupling 3rd oversize	A3	57.580 ÷ 57.587	57.533 ÷ 57.540	0.040 - 0.054
Coupling 3rd oversize	B3	57.587 ÷ 57.594	57.540 ÷ 57.547	0.040 - 0.054
Coupling 3rd oversize	C3	57.594 ÷ 57.601	57.547 ÷ 57.554	0.040 - 0.054
Coupling 3rd oversize	D3	57.601 ÷ 57.608	57.554 ÷ 57.561	0.040 - 0.054

### PISTON TO CAST IRON CYLINDER COUPLING

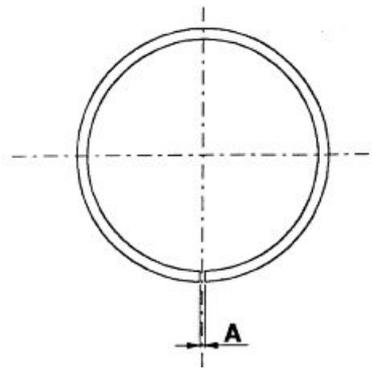
Name	Initials	Cylinder	Piston	Play on fitting
Coupling	M	56.997 ÷ 57.004	56.944 ÷ 56.951	0.046 ÷ 0.060
Coupling	N	57.004 ÷ 57.011	56.951 ÷ 56.958	0.046 ÷ 0.060
Coupling	O	57.011 ÷ 57.018	56.958 ÷ 56.965	0.046 ÷ 0.060
Coupling	P	57.018 ÷ 57.025	56.965 ÷ 56.972	0.046 ÷ 0.060
Coupling 1st oversize	M1	57.197 ÷ 57.204	57.144 ÷ 57.151	0.046 ÷ 0.060
Coupling 1st oversize	N1	57.204 ÷ 57.211	57.151 ÷ 57.158	0.046 ÷ 0.060
Coupling 1st oversize	O1	57.211 ÷ 57.218	57.158 ÷ 57.165	0.046 ÷ 0.060
Coupling 1st oversize	P1	57.218 ÷ 57.225	57.165 ÷ 57.172	0.046 ÷ 0.060
Coupling 2nd oversize	M2	57.397 ÷ 57.404	57.344 ÷ 57.351	0.046 ÷ 0.060
Coupling 2nd oversize	N2	57.404 ÷ 57.411	57.351 ÷ 57.358	0.046 ÷ 0.060
Coupling 2nd oversize	O2	57.411 ÷ 57.418	57.358 ÷ 57.365	0.046 ÷ 0.060
Coupling 2nd oversize	P2	57.418 ÷ 57.425	57.365 ÷ 57.372	0.046 ÷ 0.060
Coupling 3rd oversize	M3	57.597 ÷ 57.604	57.544 ÷ 57.551	0.046 ÷ 0.060
Coupling 3rd oversize	N3	57.604 ÷ 57.611	57.551 ÷ 57.558	0.046 ÷ 0.060
Coupling 3rd oversize	O3	57.611 ÷ 57.618	57.558 ÷ 57.565	0.046 ÷ 0.060
Coupling 3rd oversize	P3	57.618 ÷ 57.625	57.565 ÷ 57.572	0.046 ÷ 0.060

## Piston rings

### SEAL RINGS

Name	Description	Dimensions	Initials	Quantity
Compression ring		57 x 1	A	0.15 ÷ 0.30
Oil scraper ring		57x1	A	0.10 ÷ 0.30
Oil scraper ring		57x2.5	A	0.10 ÷ 0.35
Compression ring 1st oversize		57.2 x 1	A	0.15 ÷ 0.30
Oil scraper ring 1st oversize		57.2x1	A	0.10 ÷ 0.30
Oil scraper ring 1st oversize		57.2x2.5	A	0.10 ÷ 0.35
Compression ring 2nd oversize		57.4x1	A	0.15 ÷ 0.30
Oil scraper ring 2nd oversize		57.4x1	A	0.10 ÷ 0.30
Oil scraper ring 2nd oversize		57.4x2.5	A	0.10 ÷ 0.35
Compression ring 3rd oversize		57.6x1	A	0.15 ÷ 0.30
Oil scraper ring 3rd oversize		57.6x1	A	0.10 ÷ 0.30
Oil scraper ring 3rd oversize		57.6x2.5	A	0.10 ÷ 0.35

Maximum clearance after use: 1 mm



## Crankcase - crankshaft - connecting rod

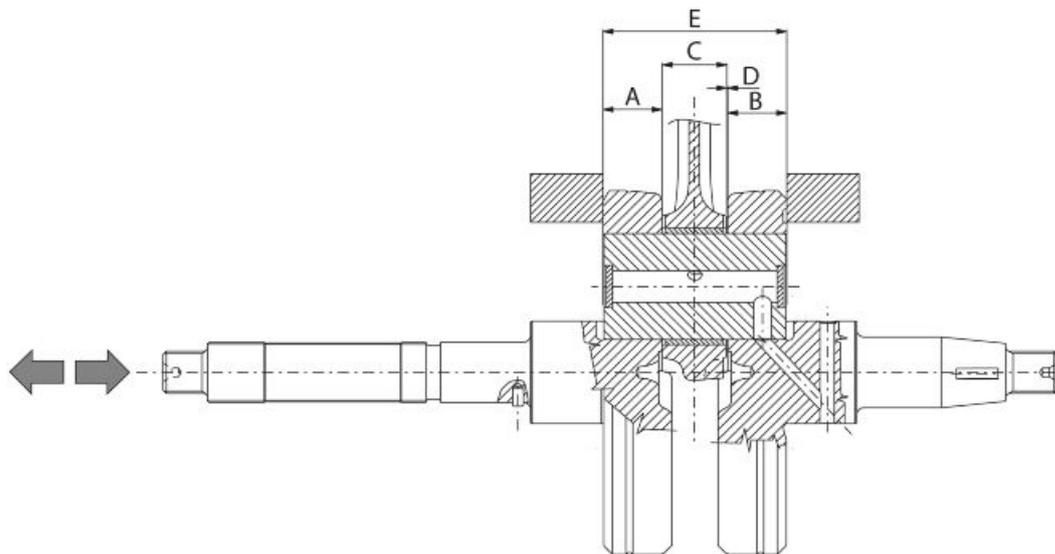
### AXIAL CLEARANCE BETWEEN CRANKSHAFT AND CONNECTING ROD

Name	Description	Dimensions	Initials	Quantity
Half-shaft, transmission side		16.6 +0-0.05	A	D = 0.20 - 0.50
Flywheel-side half-shaft		16.6 +0-0.05	B	D = 0.20 - 0.50
Connecting rod with PP		18 -0.10 -0.15	C	0.20 ÷ 0.50
Crank pin width		51.400	E	

### AXIAL CLEARANCE BETWEEN CRANKSHAFT AND CRANKSHAFT HALF-BEARINGS

Name	Description	Dimensions	Initials	Quantity
Crankshaft			Category 1	28.998 ÷ 29.004
Crankshaft			Class 2	29.004 ÷ 29.010
Crankcase			Category 1	32.953 ÷ 32.959
Crankcase			Category 2	32.959 ÷ 32.965
Crankshaft half-bearing			Category B - blue	1.973 ÷ 1.976
Crankshaft half-bearing			Type C - yellow	1.976 ÷ 1.979
Crankshaft half-bearing			Category E - green	1.979 ÷ 1.982
Crankshaft category 1 - Crankcase category 1			E - E	
Crankshaft category 1 - Crankcase category 2			C - C	
Crankshaft category 2 - Crankcase category 1			C - C	
Crankshaft category 2 - Crankcase category 2			B - B	

*Crankshaft/crankcase axial clearance: 0.15 ÷ 0.40*



### Slot packing system

- Provisionally fit the piston into the cylinder, without any base gasket.
- Assemble a dial gauge on the specific tool
- Set the dial gauge to zero at a contrast plane with an average precharge, for example 5 mm. Keeping the zero setting position, fit 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)
- Calculate the difference between the two measurements: use the chart below to identify the thickness of the cylinder base gasket to be used for refitting. The proper identification of the cylinder base gasket thickness allows maintaining the correct compression ratio.
- Remove the special tool and the cylinder.

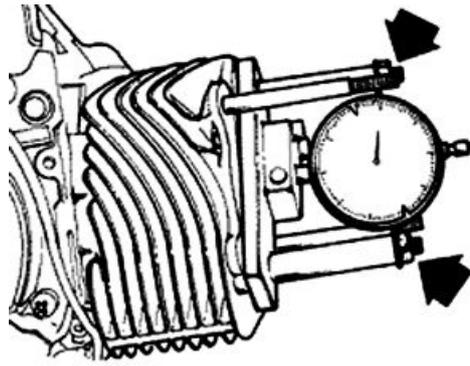
### Characteristic

#### Compression ratio (125)

10.6 : 1

### SHIMMING SYSTEM

Specification	Desc./Quantity
Value measured	0 ÷ 0.1
Thickness	0.8 ± 0.05
Value measured	0.1 ÷ 0.3
Thickness	0.6 ± 0.05
Value measured	0.3 - 0.4
Thickness	0.4 ± 0.05



## Products

### RECOMMENDED PRODUCTS TABLE

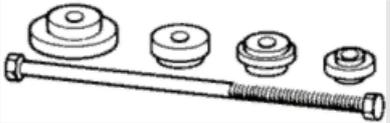
Product	Description	Specifications
AGIP ROTRA 80W-90	Rear hub oil	SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications
AGIP BRAKE 4	Brake fluid	FMVSS DOT 4 Synthetic fluid
AGIP CITY HI TEC 4T	Oil to lubricate flexible transmissions (brakes, throttle control and odometer)	Oil for 4-stroke 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 GP 330	Grease for brake control levers, throttle, stand	White calcium complex soap-based spray grease with NLGI 2; ISO-L-XBCIB2

## INDEX OF TOPICS

TOOLING

TOOL

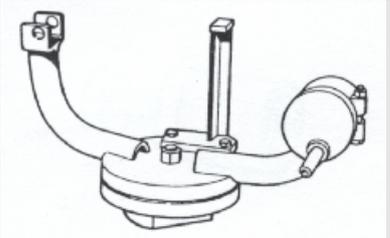
**APPROPRIATE TOOL**

Stores code	Description	
001330Y	Tool for fitting steering seats	

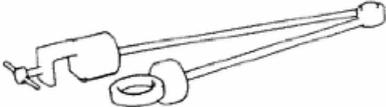
001467Y009	Driver for OD 42-mm bearings	
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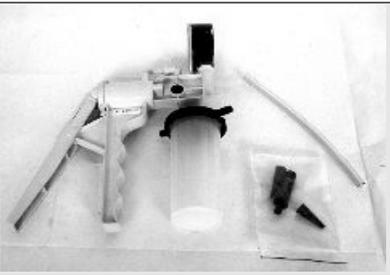
001467Y013	Pliers to extract ø 15-mm bearings	
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002465Y	Pliers for circlips	
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005095Y	Engine support	
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008564Y	Flywheel extractor	
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Stores code	Description	
020004Y	Punch for removing fifth wheels from headstock	
020055Y	Wrench for steering tube ring nut	
020074Y	Support base for checking crankshaft alignment	
020150Y	Air heater support	
020151Y	Air heater	
020193Y	Oil pressure gauge	

Stores code	Description	
020262Y	Crankcase splitting strip	
020263Y	Sheath for driven pulley fitting	
020287Y	Clamp to assemble piston on cylinder	
020306Y	Punch for assembling valve seal rings	
020329Y	MityVac vacuum-operated pump	
020330Y	Stroboscopic light to check timing	

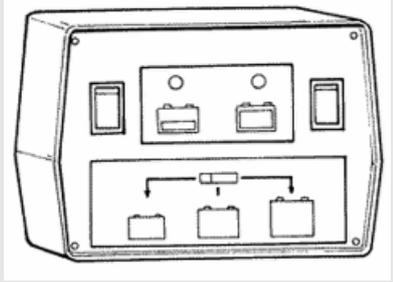
Stores code	Description
020331Y	Digital multimeter



020332Y	Digital rev counter
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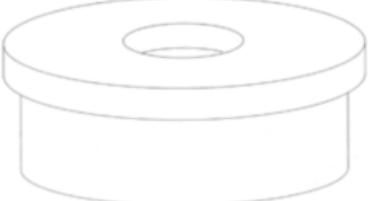


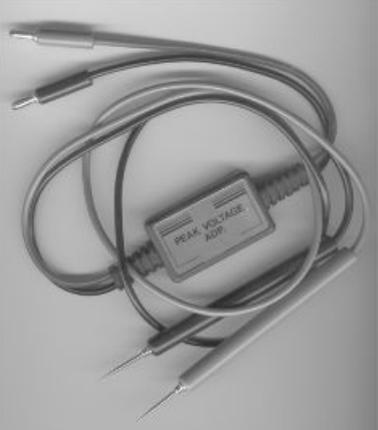
020333Y	Single battery charger
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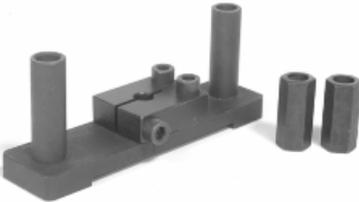
020334Y	Multiple battery charger
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Stores code	Description	
020335Y	Magnetic support for dial gauge	
020357Y	32 x 35 mm adaptor	
020359Y	42x47-mm adaptor	
020360Y	Adaptor 52 x 55 mm	
020363Y	20 mm guide	
020364Y	25-mm guide	

Stores code	Description	
020368Y	driving pulley lock wrench	
020375Y	Adaptor 28 x 30 mm	
020376Y	Adaptor handle	
020382Y011	adapter for valve removal tool	
020409Y	Multimeter adaptor - Peak voltage detection	

Stores code	Description	
020412Y	15 mm guide	
020414Y	28-mm guide	
020423Y	driven pulley lock wrench	
020424Y	Driven pulley roller casing fitting punch	
020425Y	Punch for flywheel-side oil seal	
020426Y	Piston fitting fork	

Stores code	Description	
020427Y	Piston fitting band	
020428Y	Piston position check support	
020430Y	Pin lock fitting tool	
020431Y	Valve oil seal extractor	
020434Y	Oil pressure control fitting	
020444Y	Tool for fitting/ removing the driven pulley clutch	

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Stores code	Description
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020565Y

Flywheel lock calliper spanner



020622Y

Transmission-side oil guard punch



# INDEX OF TOPICS

**MAINTENANCE**

**MAIN**

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**Maintenance chart**
**EVERY 2 YEARS****Action**

Brake fluid - change
----------------------

**EVERY 3000 KM****Action**

Engine oil - level check/ top-up
----------------------------------

**AFTER 1000 KM**

80'

**Action**

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

(\*) See instructions in the «Idle speed adjustment» section

**AFTER 6000 KM, 18000 KM, 54000 KM**

150'

**Action**

Engine oil - replacement
Hub oil level - check
Spark plug electrode gap - check
Air filter - clean
Engine oil - change
Oil filter (net filter) - clean
Valve clearance - adjustment
Variable speed rollers/pads - check
Driving belt - checking
Brake pads - check condition and wear
Brake fluid level - check
Electrical system and battery - check
Centre stand - lubrication
Tyre pressure and wear - check
Vehicle and brake test - road test

**AFTER 12000 KM, 60000 KM**

160'

**Action**

Engine oil - replacement
Hub oil level - check
Air filter - clean
Engine oil - change
Oil filter (net filter) - clean
Spark plug - replacement
Idle speed (*) - adjustment
Throttle lever - adjustment
Pads and variator rollers - replacement

**Action**

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
Safety locks - check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Centre stand - lubrication
Secondary air filter - cleaning
Tyre pressure and wear - check
Vehicle and brake test - road test

(\*) See instructions in the «Idle speed adjustment» section

**AFTER 24000 KM AND AFTER 48000 KM**

205'

**Action**

Engine oil - replacement
Hub oil - change
Air filter - clean
Engine oil - change
Oil filter (net filter) - clean
Spark plug - replacement
Idle speed (*) - adjustment
Throttle lever - adjustment
Pads and variator rollers - replacement
Driving belt - replacement
Cylinder ventilation system - cleaning
Odometer gear - greasing
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid level - check
Transmission elements - lubrication
Safety locks - check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Tyre pressure and wear - check
Secondary air filter - cleaning
Centre stand - lubrication
Vehicle and brake test - road test

(\*) See instructions in «Idle speed adjustment» section

**AT 30000 KM, AT 42000 KM AND AT 66000 KM**

125'

**Action**

Engine oil - replacement
Hub oil level - check
Spark plug electrode gap - check
Air filter - clean
Engine oil - change
Oil filter (net filter) - clean
Slide pads and variator rollers - check
Driving belt - checking
Brake pads - check condition and wear
Brake fluid level - check
Electrical system and battery - check
Centre stand - lubrication
Tyre pressure and wear - check
Vehicle and brake test - road test

**AFTER 36000 KM**

300'

**Action**

Engine oil - replacement
Hub oil - change
Spark plug - replacement
Air filter - clean
Engine oil - change
Oil filter (net filter) - clean
Valve clearance - adjustment
Idle speed (*) - adjustment
Throttle lever - adjustment
Pads and variator rollers - replacement
Driving belt - replacement
Odometer gear - greasing
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid level - check
Flexible brake tubes - replacement
Transmission elements - lubrication
Safety locks - check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Secondary air filter - cleaning
Centre stand - lubrication
Tyre pressure and wear - check
Vehicle and brake test - road test

(\*) See instructions in «Idle speed adjustment» section

**AFTER 72,000 KM**

300'

**Action**

Engine oil - replacement
Hub oil - change
Spark plug - replacement
Air filter - clean
Engine oil - change
Oil filter (net filter) - clean
Valve clearance - adjustment
Idle speed (*) - adjustment
Throttle lever - adjustment
Pads and variator rollers - replacement
Driving belt - replacement
Odometer gear - greasing
Steering - adjustment
Cylinder ventilation system - check
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid level - check
Flexible brake tubes - replacement
Transmission elements - lubrication
Safety locks - check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Secondary air filter - cleaning
Centre stand - lubrication
Tyre pressure and wear - check
Vehicle and brake test - road test

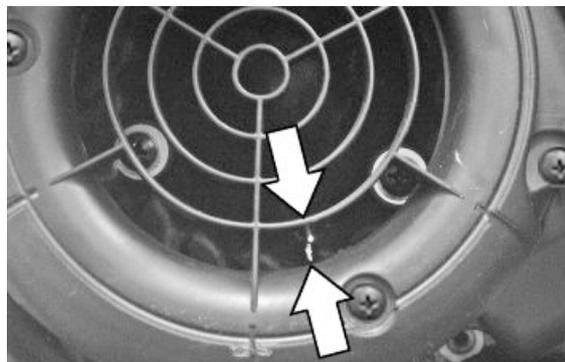
(\*) See instructions in «Idle speed adjustment» section

## Checking the spark advance

The ignition advance is determined electronically on the basis of parameters known by the control unit. For this reason it is not possible to interpret the reference values based on the engine rpm. The ignition advance value is detectable at any time using the diagnostic tester. It is possible to check whether the ignition advance determined by the injection system matches the value actually activated on the engine, by means of the stroboscopic light.

Proceed as follows:

- Remove the spark plug.
- Remove the plastic cover on the flywheel cover shown in the photograph.
- Remove the transmission compartment air intake cover shown in the photograph.
- Rotate the driving pulley fan using a screwdriver until the reference marks between the flywheel and flywheel cover coincide as shown in the photograph.
- Bring the reference mark onto the transmission side between the fan and the transmission cover as shown in the photograph.
- Refit the spark plug.
- Refit the plastic cap on the flywheel cover.
- Adjust the spark gap to the contact position (no reference mark visible) and install it on engine between the spark plug and spark plug cap
- Connect the induction clamp on the spark gap cable respecting the proper polarity (the arrow on the clamp must be pointing at the spark plug).
- Connect the diagnostic tester.
- Start the engine.
- Select the «parameter» function in this menu.



- Select the stroboscopic light command in the traditional four-stroke engine position (1 spark 2 revs).
- Check that the real values of rpm and ignition advance match those measured using the diagnostic tester.

**If the values do not correspond, check:**

- distribution timing
- rpm-timing sensor
- injection control unit

**Specific tooling**

**020460Y Scooter diagnosis and tester**

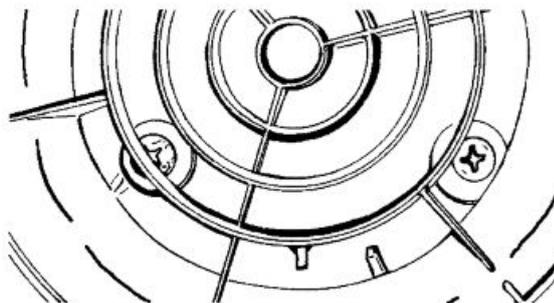
**020330Y Stroboscopic light to check timing**

**020621Y HV cable extraction adaptor**



- To check ignition advance, use the stroboscopic light with induction pincers connected to the spark plug power wire.
- Connect the induction pincers being careful to respect the proper polarity (the arrow stamped on the pincers must be pointing at the spark plug).
- Place the light selector in central position (1 spark = 1 crankshaft turn as in 2-T engines).
- Start the engine and check that the light works properly and the rpm indicator can read also the high rpm (e.g. 8000 rpm).
- If flash unsteadiness or revolution reading error is detected (e.g. half values), increase the resistive load on the spark plug power line (10 ÷ 15 KΩ in series to HV wire).

- Operating on the flash bulb phase difference calibrator, make the reference on the flywheel cover coincide with the fan reference as shown in the photograph. Read the advance degrees indicated by the stroboscopic light and compare them with those specified.



### Characteristic

#### Ignition advance check

$10^{\circ} \pm 1^{\circ}$  at 1650 rpm

## Spark advance variation

### REVOLUTION LIMITER

Specification	Desc./Quantity
Operation threshold	First threshold : $9300 \pm 50$ Second threshold : $9800 \pm 50$
Reactivation threshold	First threshold : $8850 \pm 50$ Second threshold : $9350 \pm 50$
Spark elimination	First threshold : 10 sparks on 15 Second threshold : 15 sparks on 15

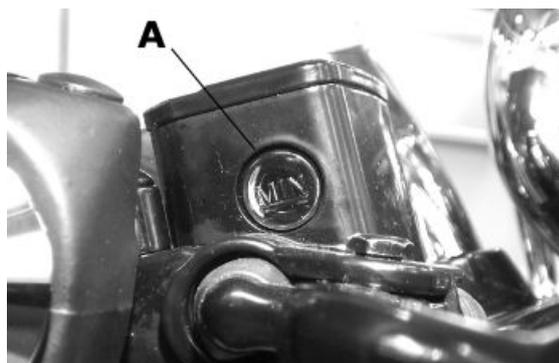
## Braking system

### Level check

Proceed as follows:

- Rest the vehicle on its centre stand with the handlebars perfectly horizontal;
- Check the level of liquid with the related warning light «A».

A certain lowering of the level is caused by wear on the pads.



## Top-up

Proceed as follows:

- Remove the tank cap by loosening the two screws, remove the gasket and top up using only the liquid specified without exceeding the maximum level.

### CAUTION

ONLY USE DOT 4-CLASSIFIED BRAKE FLUID.

### CAUTION



AVOID CONTACT OF THE BRAKE FLUID WITH YOUR EYES, SKIN, AND CLOTHING. IN CASE OF ACCIDENTAL CONTACT, WASH WITH WATER.

### CAUTION

BRAKING CIRCUIT FLUID IS HIGHLY CORROSIVE; MAKE SURE THAT IT DOES NOT COME INTO CONTACT WITH THE PAINTWORK.

### CAUTION

THE BRAKE FLUID IS HYGROSCOPIC, IN OTHER WORDS, IT ABSORBS MOISTURE FROM THE SURROUNDING AIR. IF THE CONTENT OF MOISTURE IN THE BRAKING FLUID EXCEEDS A CERTAIN VALUE, BRAKING WILL BE INEFFICIENT.

NEVER USE BRAKE LIQUID IN OPEN OR PARTIALLY USED CONTAINERS.

UNDER NORMAL CLIMATIC CONDITIONS, THE FLUID MUST BE CHANGED EVERY 20,000 KM OR ANYWAY EVERY TWO YEARS.

### N.B.

SEE THE BRAKING SYSTEM CHAPTER WITH REGARD TO THE CHANGING OF BRAKE FLUID AND THE BLEEDING OF AIR FROM THE CIRCUITS.

## Recommended products

**AGIP BRAKE 4** Brake fluid

FMVSS DOT 4 Synthetic fluid



## Headlight adjustment

Proceed as follows:

1. Place the vehicle in running order and with the tyres inflated to the prescribed pressure, on a flat surface 10 m away from a white screen situated in a shaded area, making sure that the longitudinal axis of the scooter is perpendicular to the screen;
2. Turn on the headlight and check that the borderline of the projected light beam on the screen is not lower than 9/10 of the distance from the

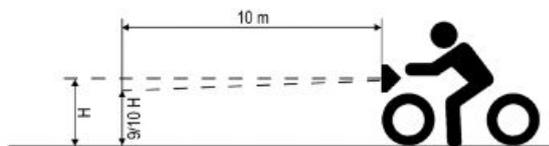


ground to the centre of vehicle headlamp and higher than 7/10;

3. If it is, loosen the headlight support fixing screws and adjust the headlight direction.

**N.B.**

THE ABOVE PROCEDURE COMPLIES WITH THE EUROPEAN STANDARDS REGARDING MAXIMUM AND MINIMUM HEIGHT OF LIGHT BEAMS. REFER TO THE STATUTORY REGULATIONS IN FORCE IN EVERY COUNTRY WHERE THE vehicle IS USED.



## SAS filters inspection and cleaning

Proceed as follows:

- Remove the right-hand side fairing
- Remove the screw on the rear part, to the right of the footrest, indicated in the photograph
- Remove the spoiler terminal



- Remove the screw fixing the SAS valve to the flywheel cover, indicated in the photograph.



- 
- Remove the 6 flywheel cover screws indicated in the photograph and remove the flywheel cover.



- 
- Remove the filter indicated in the photograph
  - Check that the gasket is in good conditions
  - Check the SAS filter housing for dents or deformations
  - Clean the SAS filter carefully. Replace the filter if it is damaged or deformed.

To refit, carry out the removal operations but in reverse order.

**CAUTION**

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

**CAUTION**

**NEVER RUN THE ENGINE WITHOUT THE SECONDARY AIR FILTER**



## INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

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## Engine

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### Poor performance

#### POOR PERFORMANCE

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 (Selenia Air Filter Oil), then hand dry without squeezing, allow to drip dry and then reassemble.
Fuel nozzles or cock 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.
Failing automatic starter on the carburettor	Check the electrical wiring and mechanical movement, replace if necessary.
Excessive driving belt wear	Check it and replace, if necessary
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
Incorrect timing or worn timing system elements	Time the system again or replace the worn parts
Muffler obstructed	Replace
Inefficient automatic transmission	Check the rollers and the pulley movement, replace the damaged parts and lubricate the driven pulley moveable guide with Montblanc Molybdenum Grease
Wrong valve adjustment	Adjust the valve clearance properly
Overheated valves	Remove the head and the valves, grind or replace the valves
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 ROTATES WITH ENGINE AT IDLE

Possible Cause	Operation
Idling rpm too high	Adjust the idle speed
Clutch fault	Check the springs / clutch masses

### Starting difficulties

#### DIFFICULTY STARTING UP

Possible Cause	Operation
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
Faulty spark plug or incorrect ignition advance - Engine flooded.	Replace the spark plug or check the ignition circuit components Try starting-up with the throttle fully open. If the engine fails to start, remove the spark plug, dry it and before refitting, make the motor turn so as to expel the fuel excess taking care to connect the cap to the spark plug, and this in turn to the ground. If the fuel tank is empty, refuel and start up.
Incorrect valve sealing or valve adjustment	Inspect the head and/or restore the correct clearance
Rpm too low at start-up or engine and start-up system damaged	Check the starter motor and the kick-starter unit
Altered fuel characteristics	Drain off the fuel no longer up to standard; then, refill
Vacuum operated cock failure	Check that fuel is adequately supplied through the pipe by applying a vacuum to the suction pipe

Possible Cause	Operation
Failing automatic starter on the carburettor	Check the electrical wiring and mechanical movement, replace if necessary.
Start-up enabling buttons failure	Check continuity using an Ohm meter, with the switch pressed; replace if necessary
Carburettor nozzles clogged or dirty	Dismantle, wash with solvent and dry with compressed air
Air filter obstructed 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.

## Excessive oil consumption/Exhaust smoke

### EXCESSIVE OIL CONSUMPTION/SMOKEY EXHAUST

Possible Cause	Operation
Worn valve guides	Check and replace the head unit if required
Worn valve oil guard	Replace the valve oil guard
Oil leaks from the couplings or from the gaskets	Check and replace the gaskets or restore the coupling seal
Worn or broken piston rings or piston rings that have not been fitted properly	Replace the piston cylinder unit or just the piston rings

## Insufficient lubrication pressure

### POOR LUBRICATION PRESSURE

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

## Engine tends to cut-off at full throttle

### THE MOTOR TENDS TO STOP AT MAXIMUM 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
Level in tank too low	Restore the level in the tank by bending on the float the thrusting reed of the petrol inlet rod so as to have the float parallel to the tank level with the carburettor inverted.

## Engine tends to cut-off at idle

### THE ENGINE TENDS TO STOP AT IDLE SPEED

Possible Cause	Operation
Incorrect idle adjustment	Adjust using the rpm indicator
Incorrect timing	Time the system and check the timing system components
The starter remains on	Check: electric wiring, circuit not interrupted, mechanical movement and power supply; replace if necessary
Faulty spark plug or incorrect ignition advance	Replace the spark plug or check the ignition circuit components
Pressure too low at the end of compression	Check the thermal group seals and replace worn components
Minimum nozzle dirty	Wash the nozzle with solvent and dry with compressed air

## High fuel consumption

### **EXCESSIVE FUEL CONSUMPTION**

Possible Cause	Operation
Air filter blocked or dirty. Starter inefficient	Clean according to the procedure Check: electric wiring, circuit continuity, mechanical sliding and power supply
Loose nozzles	Check the maximum and minimum nozzles are adequately fixed in their fittings
Incorrect float level	Restore the level in the tank by bending on the float the thrusting reed of the petrol inlet rod so as to have the float parallel to the tank level with the carburettor inverted.

## Transmission and brakes

### Clutch grabbing or performing inadequately

#### **IRREGULAR CLUTCH PERFORMANCE OR SLIPPAGE**

Possible Cause	Operation
Slippage or irregular functioning	Check that there is no grease on the masses. Check that the faying surface between the clutch masses and the clutch bell is mainly in the middle and with equivalent specifications on the three masses. Check that the clutch bell is not scored or worn abnormally Never run the engine without the clutch bell

### Insufficient braking

#### **INEFFICIENT OR NOISY BRAKING**

Possible Cause	Operation
Worn brake pads or shoes	Replace the brake pads or shoes and check for brake disk or drum wear conditions.
Front brake disk loose or deformed	Check the brake disc screws are locked; use a dial gauge and a wheel mounted on the vehicle to measure the axial shift of the disc.
Air bubbles inside the hydraulic braking system	Carefully bleed the hydraulic braking system, (there must be no flexible movement of the brake lever).
Fluid leakage in hydraulic braking system	Failing elastic fittings, plunger or brake pump seals, replace
Excessive backlash in the rear brake control cable	Adjust the backlash with the appropriate adjuster located on the back part of the crankcase.

### Brakes overheating

#### **BRAKES OVERHEATING**

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

## Electrical system

### Battery

#### BATTERY

Possible Cause	Operation
Battery	The battery is the electrical device in the system that requires the most frequent inspections and thorough maintenance. If the vehicle is not used for some time (1 month or more) the battery needs to be recharged periodically. The battery runs down completely in the course of 5 ÷ 6 months. If the battery is fitted on a motorcycle, be careful not to invert the connections, keeping in mind that the black ground wire is connected to the negative terminal while the red wire is connected to the terminal marked+. Follow the instructions in the ELECTRICAL SYSTEM chapter for the recharging of the batteries.

### Turn signal lights malfunction

#### TURN INDICATOR NOT WORKING

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

### Steering and suspensions

#### 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

### NOISY SUSPENSION

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. Finally, check the locking torque of the wheel axle nut, the brake calliper and the disc. 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

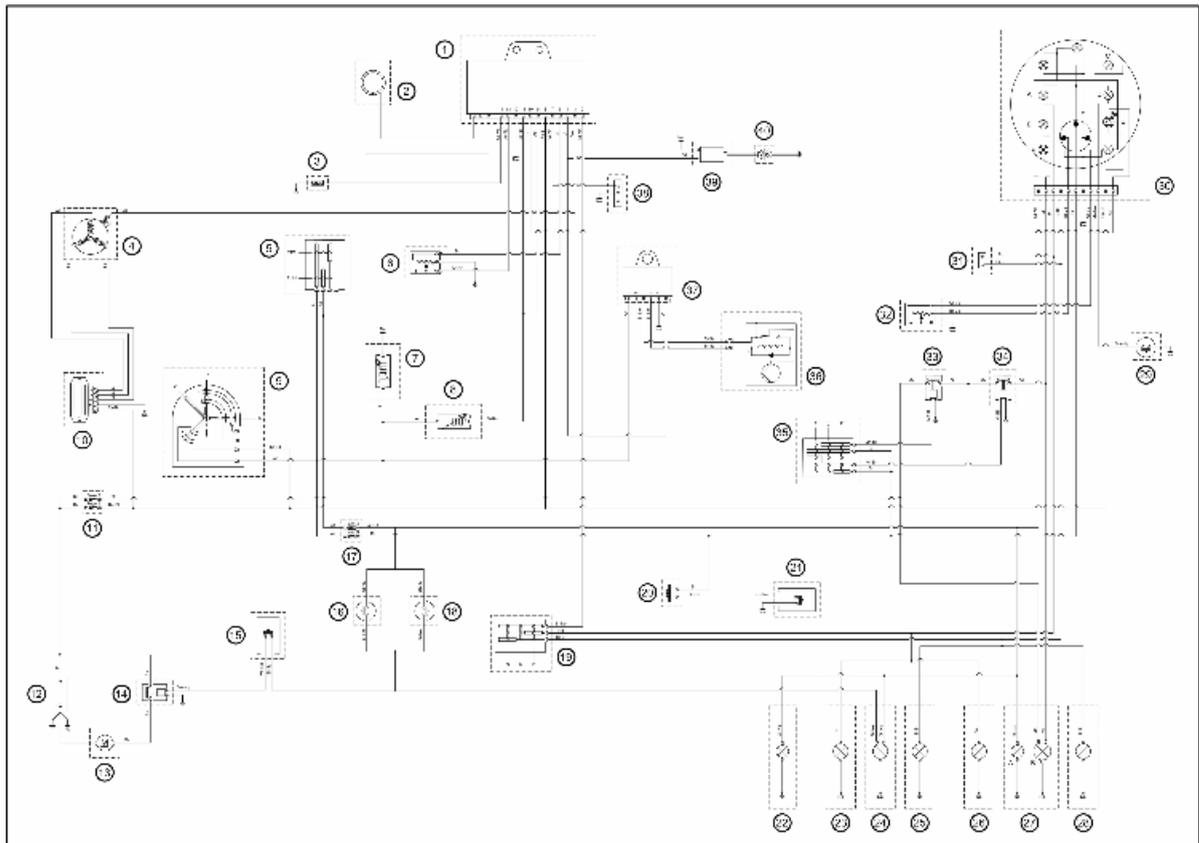
Possible Cause	Operation
Oil leakage from suspension	Replace the damper.

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## INDEX OF TOPICS

ELECTRICAL SYSTEM

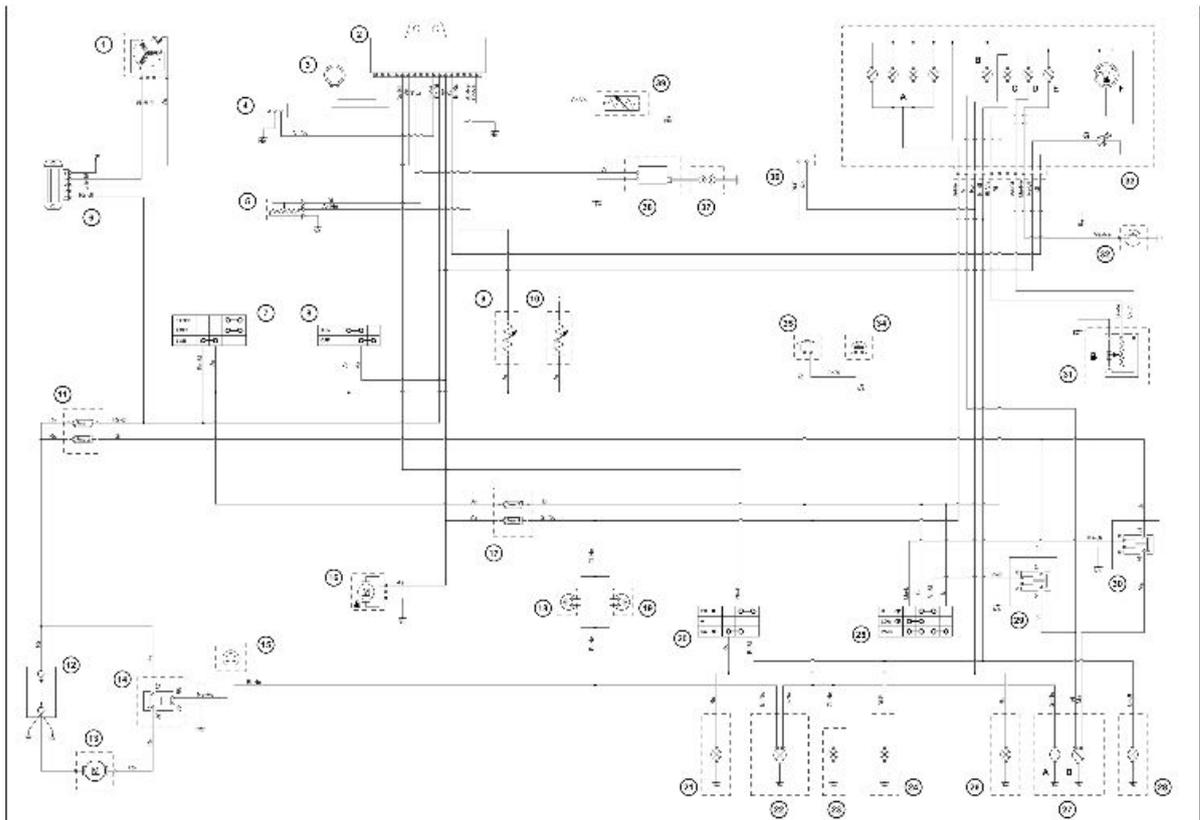
ELE SYS



**LEGENDA (Con pompa elettrica):**

1. Dispositivo di accensione elettronica
2. Antenna immobilizer
3. Sensore di temperatura esterna
4. Volano magnete - Pick-up
5. Deviatore arresto motore
6. T.P.S.
7. Riscaldatore carburatore
8. Starter automatico
9. Commutatore a chiave
10. Regolatore di tensione
11. Fusibili principali
12. Batteria
13. Motorino di avviamento
14. Teleruttore di avviamento
15. Pulsante di avviamento
16. Pulsante di stop sul freno posteriore
17. Fusibili secondari
18. Pulsante di stop sul freno anteriore
19. Commutatore lampeggiatori

- 20.** Clacson
- 21.** Pulsante clacson
- 22.** Lampada illuminazione targa
- 23.** Indicatore di direzione posteriore sinistro
- 24.** Lampada luce di stop e di posizione posteriore
- 25.** Indicatore di direzione posteriore destro
- 26.** Indicatore di direzione anteriore sinistro
- 27.** Proiettore completo
  - A. Lampada per luce di posizione
  - B. Lampada per luce abbagliante e anabbagliante
- 28.** Indicatore di direzione anteriore destro
- 29.** Sensore pressione olio
- 30.** Gruppo strumenti
  - A. Spia indicatori di direzione
  - B. Spia luce abbagliante
  - C. Spia riserva carburante
  - D. Spia pressione olio
  - E. Spia immobilizer
- 31.** Predisposizione spia acustica indicatori di direzione
- 32.** Trasmettitore livello carburante
- 33.** Relé luce anabbagliante
- 34.** Relé luce abbagliante
- 35.** Deviatore luci con sprazzo
- 36.** Pompa carburante
- 37.** Dispositivo di gestione pompa
  - 1. +Chiave
  - 3. Massa pompa
  - 4. +Pompa
  - 5. Massa
  - 6. Giri motore
- 38.** Presa per diagnostica
- 39.** Bobina A.T.
- 40.** Candela

**KEY:**

1. Magneto flywheel
2. Electronic ignition device
3. Immobilizer aerial
4. Diagnostics socket
5. TPS potentiometer
6. Voltage regulator
7. Key switch
8. Engine stop switch
9. Automatic starter
10. Carburettor heater
11. Fuse-box
12. Battery
13. Starter motor
14. Starter remote control
15. Starter button
16. Fuel pump
17. Fuse-box
18. STOP button on front brake
19. STOP button on rear brake

- 20. Turn indicator switch
- 21. Left turn rear indicator lamp
- 22. Rear headlight assembly with tail light/stop light bulb
- 23. License plate bulb
- 24. Right turn rear indicator lamp
- 25. Light switch
- 26. Left turn front indicator lamp
- 27. Front headlight assembly with high-/low-beam light bulb
- 28. Right turn front indicator lamp
- 29. High-beam light remote control
- 30. Low-beam light remote control
- 31. Fuel level warning light control
- 32. Low oil warning light control
- 33. Instrument panel
- 34. Horn button
- 35. Horn
- 36. Turn indicator sound alarm wiring
- 37. Spark plug
- 38. High voltage coil
- 39. external temperature sensor

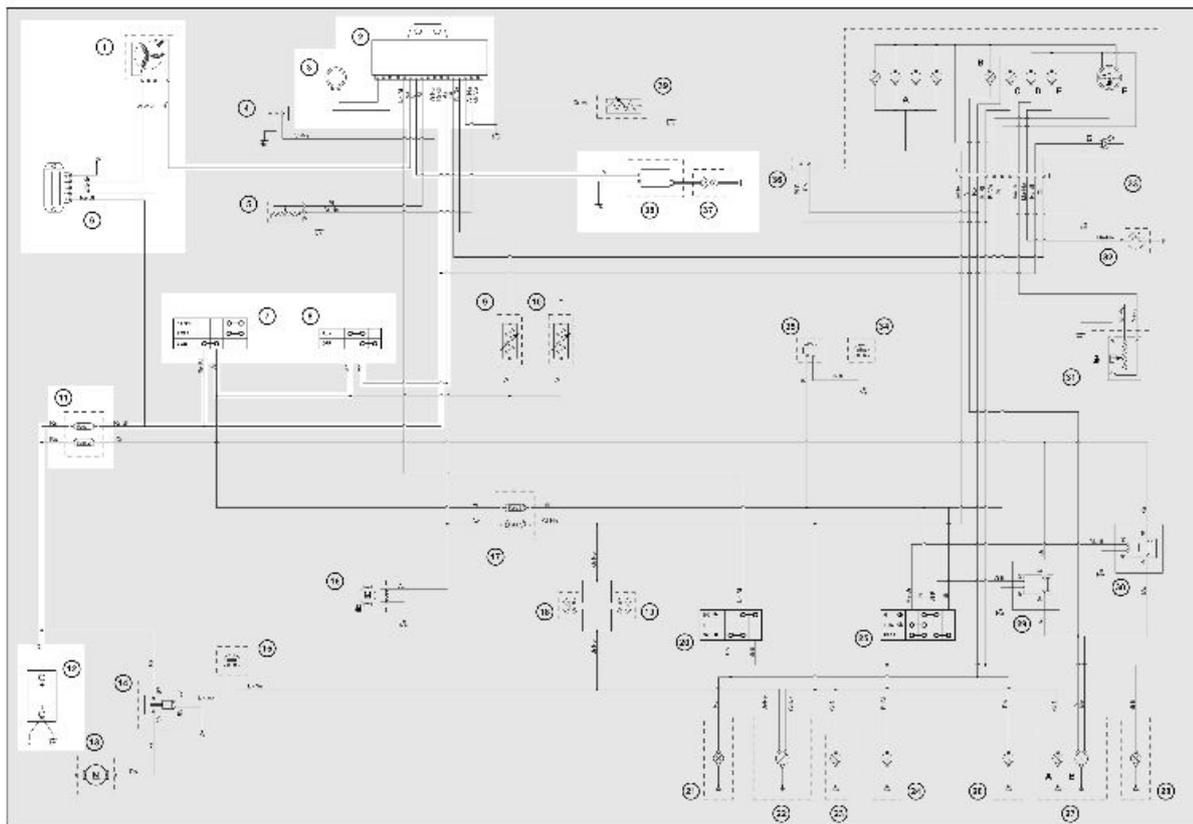
**Ar** = Orange, **Az** = Sky Blue, **Bi** = White, **Bl** = Blue, **Gi** = Yellow, **Gr** = Grey, **Ma** = Brown, **Ne** = Black, **Ro** = Pink, **Rs** = Red, **Ve** = Green, **Vi** = Purple

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## Conceptual diagrams

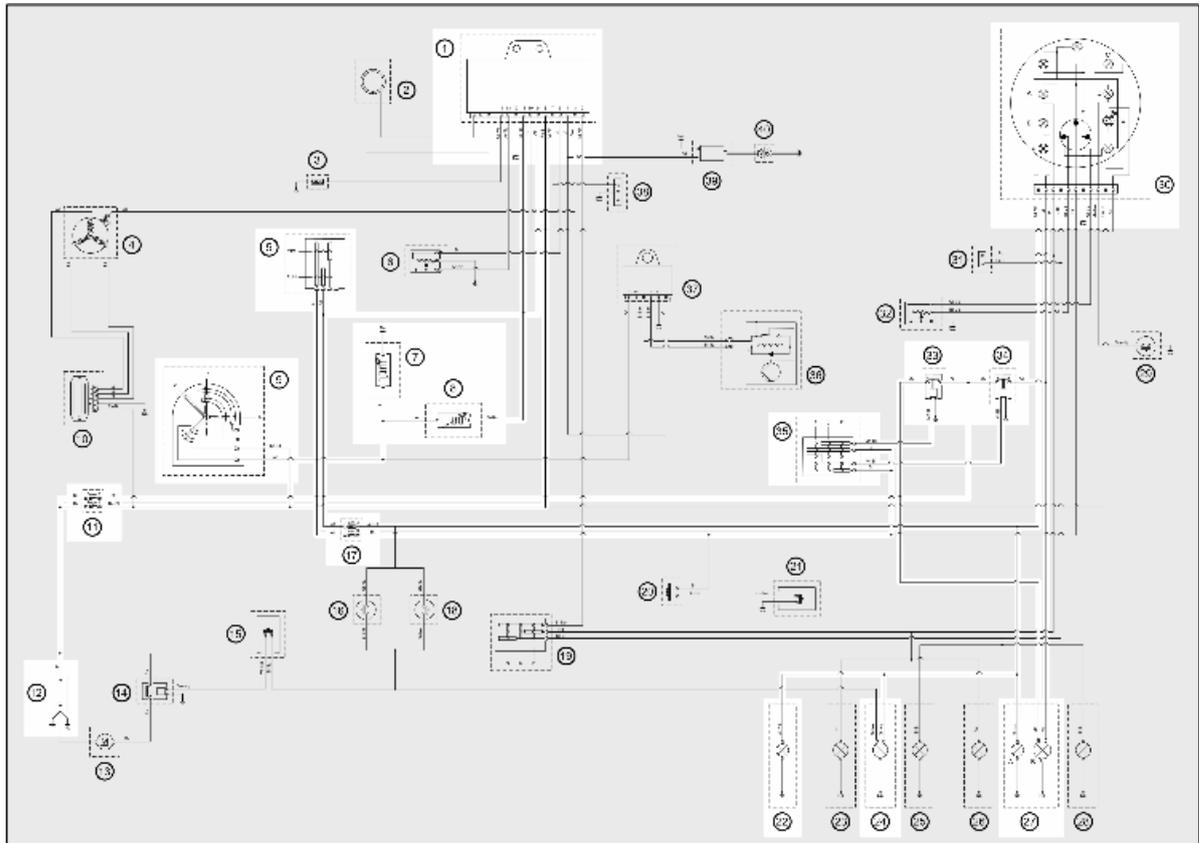
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**KEY:**

- 1. Magneto flywheel
- 2. Electronic ignition device
- 3. Immobilizer aerial
- 6. Voltage regulator
- 7. Key switch
- 8 Engine stop switch
- 11. Fuse-box
- 12. Battery
- 37. Spark plug
- 38. High voltage coil

## Headlights and automatic starter section



### LEGENDA (Con pompa elettrica):

- 1. Dispositivo di accensione elettronica
- 5. Deviatore arresto motore
- 7. Riscaldatore carburatore
- 8. Starter automatico
- 9. Commutatore a chiave
- 11. Fusibili principali
- 12. Batteria
- 17. Fusibili secondari
- 22. Lampada illuminazione targa
- 24. Lampada luce di stop e di posizione posteriore
- 27. Proiettore completo
- A. Lampada per luce di posizione
- B. Lampada per luce abbagliante e anabbagliante
- 30. Gruppo strumenti
- A. Spia indicatori di direzione
- B. Spia luce abbagliante
- C. Spia riserva carburante

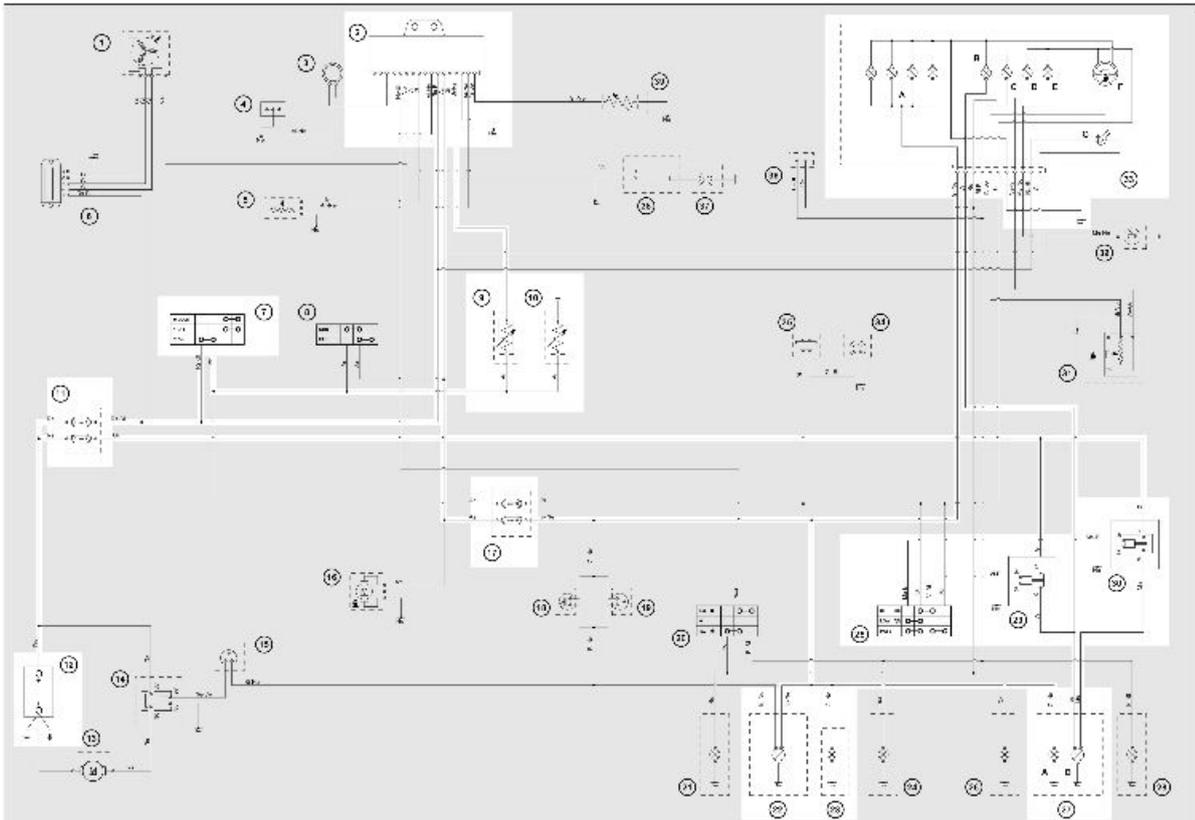
D. Spia pressione olio

E. Spia immobilizer

**33.** Relé luce anabbagliante

**34.** Relé luce abbagliante

**35.** Deviatore luci con sprazzo



**KEY:**

**2.** Electronic ignition device

**7.** Key switch

**9.** Automatic starter

**10.** Carburettor heater

**11.** Fuse-box

**12.** Battery

**17.** Fuse-box

**22.** Rear headlight assembly with tail light/stop light bulb

**23.** License plate bulb

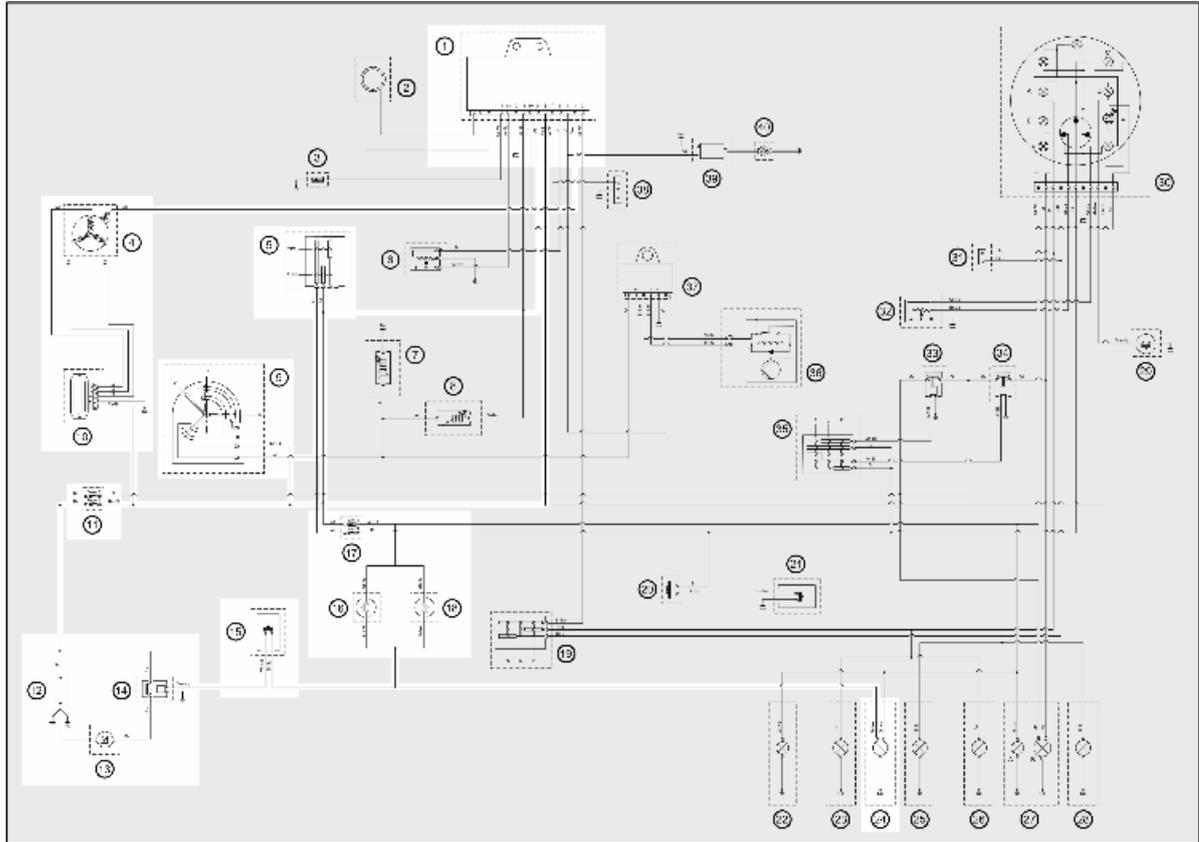
**25.** Light switch

**27.** Front headlight assembly with high-/low-beam light bulb

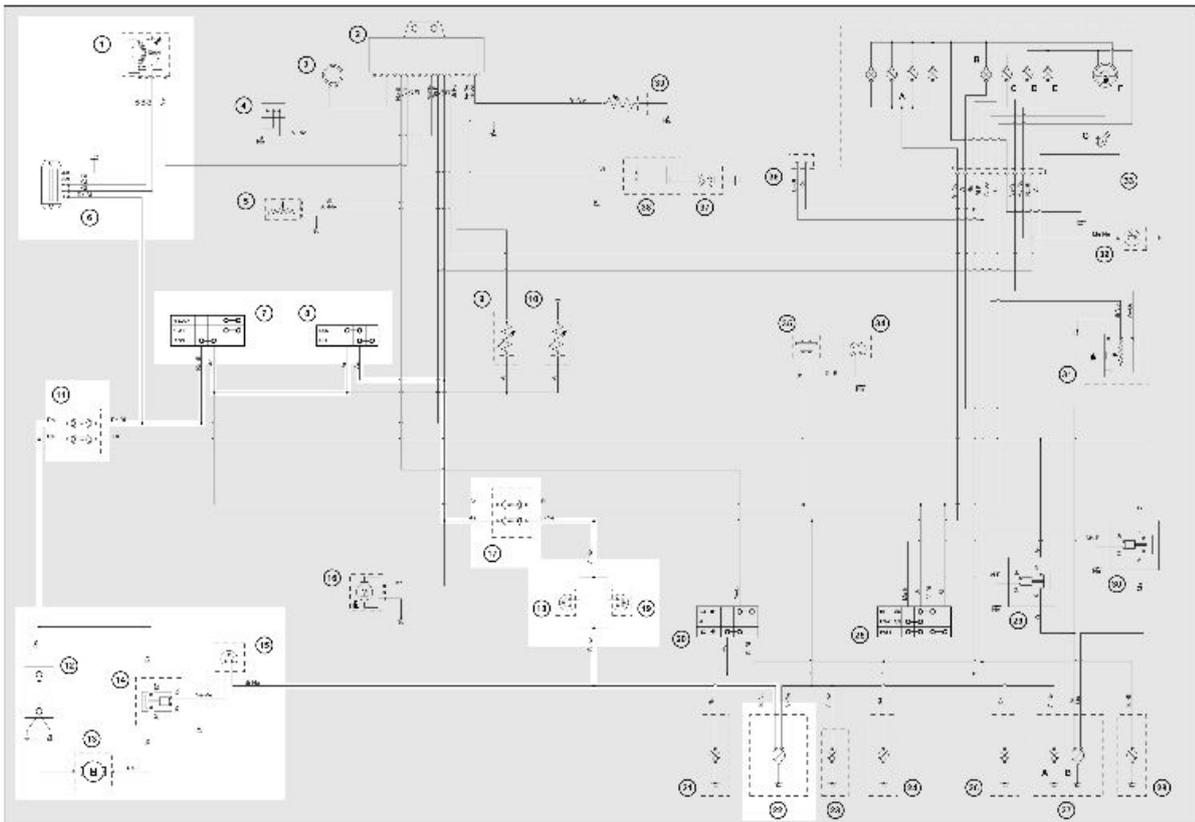
**29.** High-beam light remote control

**30.** Low-beam light remote control

## 33. Instrument panel

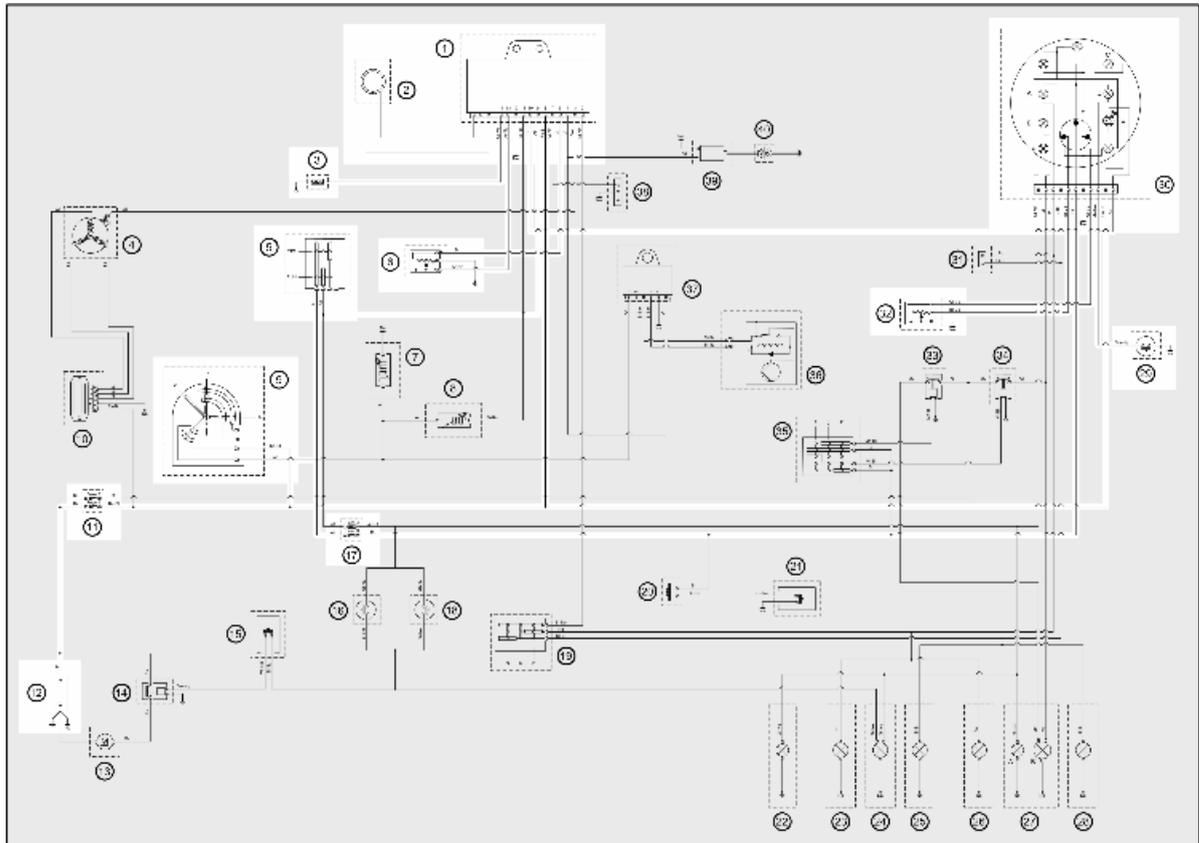
**Battery recharge and starting****LEGENDA (Con pompa elettrica):**

1. Dispositivo di accensione elettronica
4. Volano magnete - Pick-up
5. Deviatore arresto motore
9. Commutatore a chiave
10. Regolatore di tensione
11. Fusibili principali
12. Batteria
13. Motorino di avviamento
14. Teleruttore di avviamento
15. Pulsante di avviamento
16. Pulsante di stop sul freno posteriore
17. Fusibili secondari
18. Pulsante di stop sul freno anteriore
24. Lampada luce di stop e di posizione posteriore

**KEY:**

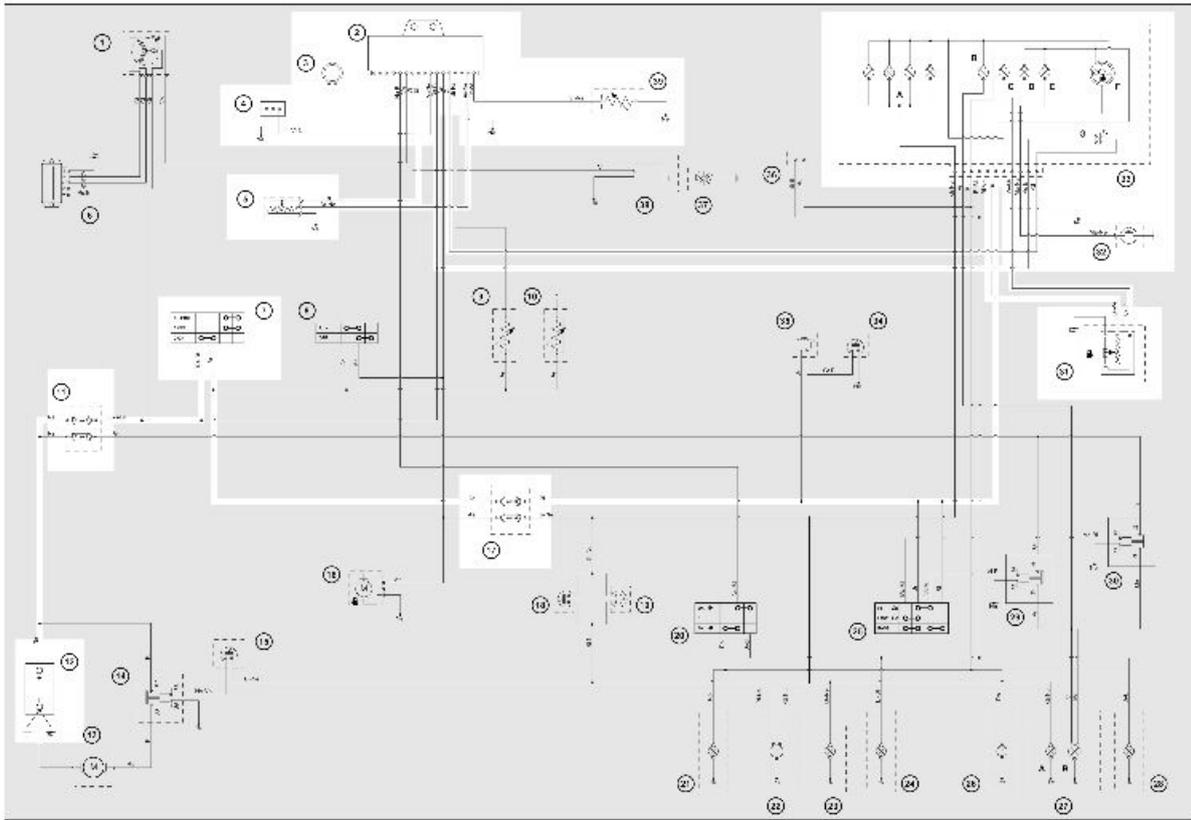
- 1. Magneto flywheel
- 6. Voltage regulator
- 7. Key switch
- 8 Engine stop switch
- 11. Fuse-box
- 12. Battery
- 13. Starter motor
- 14. Starter remote control
- 15. Starter button
- 17. Fuse-box
- 18. STOP button on front brake
- 19. STOP button on rear brake
- 22. Rear headlight assembly with tail light/stop light bulb

## Level indicators and enable signals section



### LEGENDA (Con pompa elettrica):

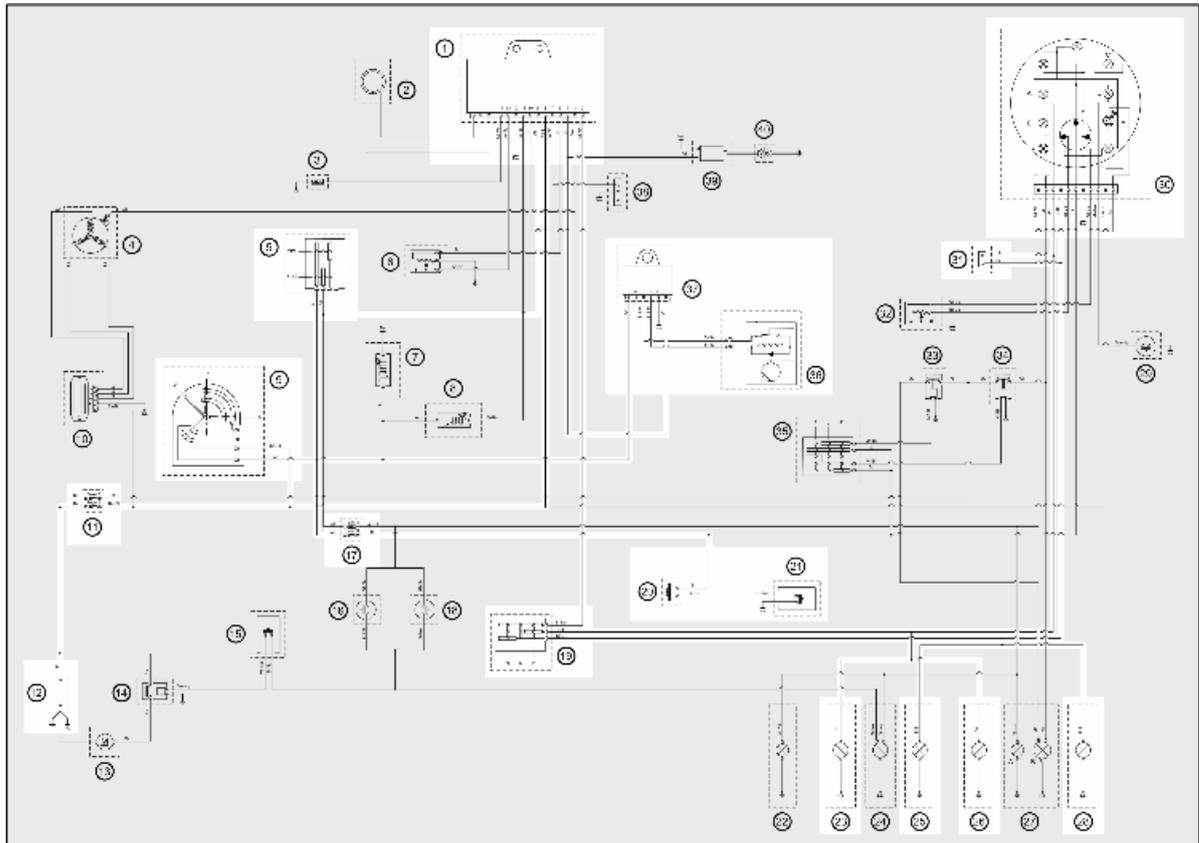
1. Dispositivo di accensione elettronica
2. Antenna immobilizer
3. Sensore di temperatura esterna
5. Deviatore arresto motore
6. T.P.S.
9. Commutatore a chiave
11. Fusibili principali
12. Batteria
17. Fusibili secondari
29. Sensore pressione olio
30. Gruppo strumenti
- A. Spia indicatori di direzione
- B. Spia luce abbagliante
- C. Spia riserva carburante
- D. Spia pressione olio
- E. Spia immobilizer
32. Trasmettitore livello carburante



**KEY:**

- 2. Electronic ignition device
- 3. Immobilizer aerial
- 4. Diagnostics socket
- 5. TPS potentiometer
- 7. Key switch
- 11. Fuse-box
- 12. Battery
- 17. Fuse-box
- 31. Fuel level warning light control
- 32. Low oil warning light control
- 33. Instrument panel
- 39. external temperature sensor

## Devices and accessories



### LEGENDA (Con pompa elettrica):

- 1. Dispositivo di accensione elettronica
- 5. Deviatore arresto motore
- 9. Commutatore a chiave
- 11. Fusibili principali
- 12. Batteria
- 17. Fusibili secondari
- 19. Commutatore lampeggiatori
- 20. Clacson
- 21. Pulsante clacson
- 23. Indicatore di direzione posteriore sinistro
- 25. Indicatore di direzione posteriore destro
- 26. Indicatore di direzione anteriore sinistro
- 28. Indicatore di direzione anteriore destro
- 30. Gruppo strumenti
- A. Spia indicatori di direzione
- B. Spia luce abbagliante
- C. Spia riserva carburante

D. Spia pressione olio

E. Spia immobilizer

**31.** Predisposizione spia acustica indicatori di direzione

**36.** Pompa carburante

**37.** Dispositivo di gestione pompa

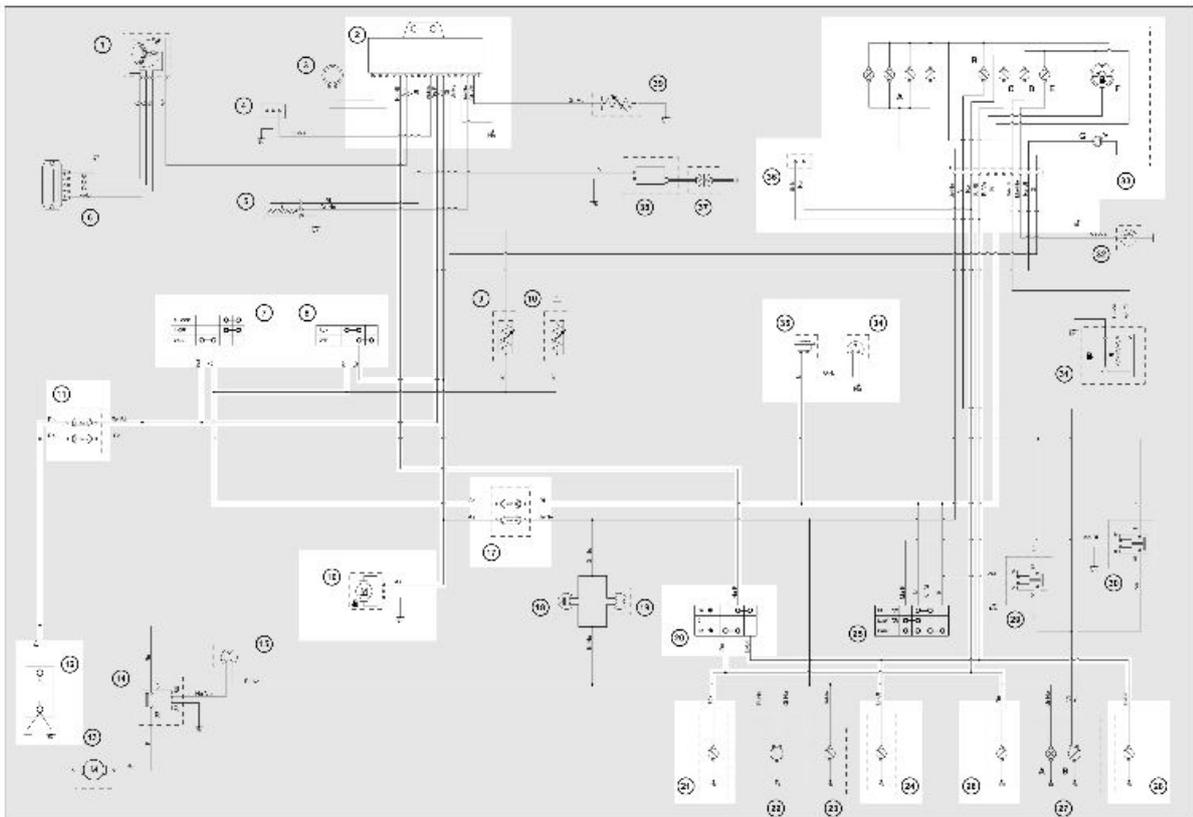
1. +Chiave

3. Massa pompa

4. +Pompa

5. Massa

6. Giri motore



**KEY:**

**2.** Electronic ignition device

**7.** Key switch

**8.** Engine stop switch

**11.** Fuse-box

**12.** Battery

**16.** Fuel pump

**17.** Fuse-box

**20.** Turn indicator switch

**21.** Left turn rear indicator lamp

- 24. Right turn rear indicator lamp
  - 26. Left turn front indicator lamp
  - 28. Right turn front indicator lamp
  - 33. Instrument panel
  - 34. Horn button
  - 35. Horn
  - 36. Turn indicators sound alarm wiring
- 

## Checks and inspections

This section is devoted to the checks on the electrical system components.

---

## Immobiliser

L'impianto di accensione elettronica viene gestito dalla centralina nella quale è integrato il sistema Immobilizer. L'Immobilizer è un sistema antifurto che permette il funzionamento del veicolo solo se questo viene avviato mediante delle chiavi codificate e riconosciute dalla centralina. Il codice è integrato in un trasponder inserito nel corpo della chiave. Questo consente un funzionamento trasparente al conducente che non deve eseguire alcuna operazione aggiuntiva alla normale rotazione della chiave.

L'impianto Immobilizer è composto dai seguenti componenti:

- centralina
- antenna immobilizer
- chiave master con trasponder incorporato (chiave rossa) con impugnatura grande
- chiave di servizio con trasponder incorporato (chiave nera) con impugnatura piccola
- bobina A.T.
- led diagnostico

Il led diagnostico svolge anche la funzione di lampeggio deterrente. Questa funzione si ottiene ogni volta che il commutatore a chiave viene posizionato in "OFF" o se l'interruttore di arresto di emergenza viene commutato in "OFF" e, al fine di non pregiudicare la carica della batteria, rimane attiva per 48 ore. Quando il commutatore a chiave viene posizionato in "ON" si interrompe la funzione di lampo deterrente e di seguito avviene un lampo di conferma del passaggio in "ON". La durata di questo lampo varia in funzione della programmazione della centralina. Nel caso in cui il led risulti spento indipendentemente dalla posizione del commutatore a chiave e/o non venga inizializzato il quadro strumenti, verificare:

- presenza tensione batteria
- efficienza fusibile n° 1
- presenza delle alimentazioni alla centralina come di seguito specificato:

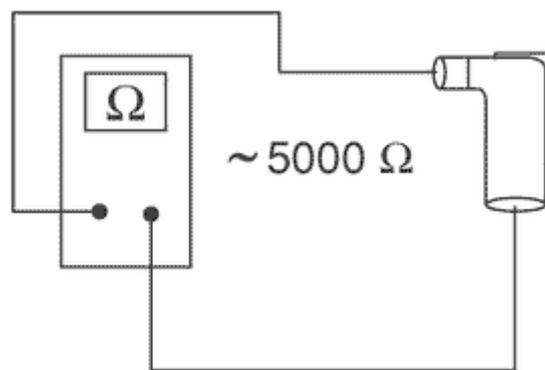
**Con interruttore chiave in OFF:**

- presenza tensione batteria fra i terminali 8-12 e terminale 8-massa telaio del connettore grande (alimentazione fissa). Nel caso non vi fosse tensione verificare efficienza fusibile n° 1 e relativo cablaggio.

**Con interruttore chiave in ON, interruttore arresto emergenza motore in RUN:**

- presenza tensione batteria fra i terminali 9-12 e terminale 9-massa telaio del connettore grande (alimentazione sotto quadro). Nel caso non vi fosse tensione verificare i contatti del commutatore a chiave, efficienza fusibile n° 1 e relativo cablaggio. Verificare efficienza interruttore arresto di emergenza motore.

**Virgin circuit**



When the ignition system is not encrypted, any key will start the engine but limited to 2000 rpm. The keys can only be recognised if the control unit has been programmed properly. The data storage procedure for a previously not programmed control unit provides for the recognition of the master as the first key to be stored to memory: this becomes particularly important because it is the only key that enables the control unit to be wiped clean and reprogrammed for the memorisation of the service keys. The master and service keys must be used to code the system as follows:

- Insert the Master key, turn it to «ON» and keep this position for two seconds (lower and upper limits 1 to 3 seconds).
- Insert the service key and turn it to "ON" for 2 seconds.
- If you have copies of the key, repeat the operation with each key.
- Insert the MASTER key again and turn it to "ON" for 2 seconds.

The maximum time to change keys is 10 seconds.

During a single data storage sequence a maximum of 7 service keys are allowed.

It is essential to adhere to the times and the procedure. If you do not, start again from the beginning. Once the system has been programmed, master key transponder, decoder and control unit are strictly matched. With this link established, it is now possible to encode new service keys, in the event of losses, replacements, etc. Each new programming deletes the previous one so, in order to add or eliminate keys, you must repeat the procedure using all the keys you intend to keep using. If a service key should become un-coded, the efficiency of the high voltage circuit shielding must be thoroughly inspected: In any case it is advisable to use resistive spark plugs.

## Characteristic

### MASTER key:

RED KEY

### SERVICE key.

BLACK KEY

## Diagnostic codes

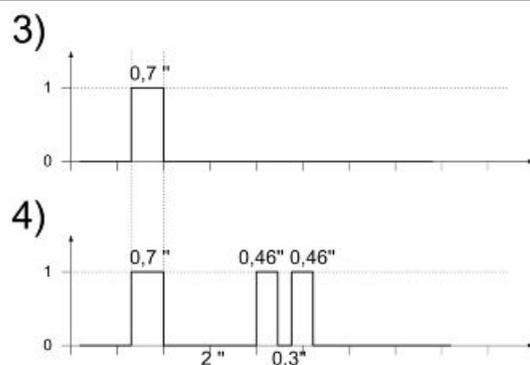
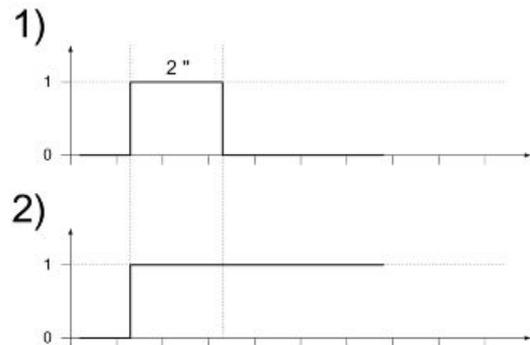
The immobiliser system is tested each time the ignition-key switch is turned from OFF to ON. During this diagnosis phase a number of control unit statuses can be seen and various light codes displayed. Regardless of the code transmitted, if at the end of the diagnosis the led remains off permanently, the ignition is enabled. If, however, the led remains on permanently, it means the ignition is inhibited:

**1. Previously unused control unit - key inserted:** a single 2 second flash is displayed, after which the LED remains off permanently. The keys can be stored to memory, the vehicle can be started but with a limitation imposed on the number of revs.

**2. Previously unused control unit - transponder absent or cannot be used:** The LED is permanently ON; in this condition, no operations are possible, including starting of the vehicle.

**3. Programmed control unit - the service key in (normal condition of use):** a single 0.7-second flash is displayed, after which the LED remains off steadily. The engine can be started.

**4. Programmed control unit - Master key in:** a 0.7 sec. flash is displayed followed by the LED remaining off for 2 sec. and then by short 0.46 sec. flashes the same number of times as there are keys stored in the memory including the Master key. When the diagnosis has been completed, the



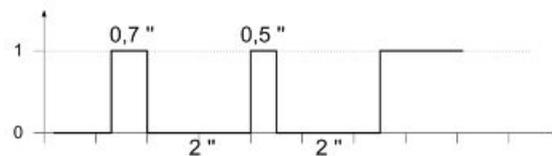
LED remains permanently OFF. The engine can be started.

**5. Programmed control unit - fault detected:** a light code is displayed according to the fault detected, after which the LED remains on steadily. The engine cannot be started. The codes that can be transmitted are:

- Code 1 flash
- 2-flash code
- 3-flash code

### Diagnostic code - 1 flash

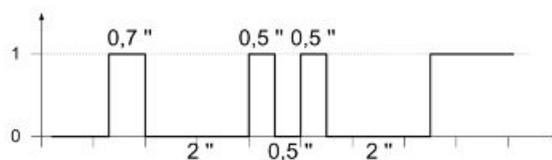
The one-flash code indicates a system where the serial line is not present or is not detected. Check the Immobilizer aerial wiring and change it if necessary.



### Diagnostic code - 2 flashes

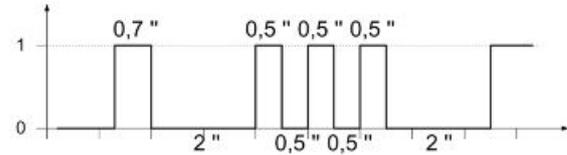
A two-flash code shows a system where the control unit does not show the transponder signal. This might depend on the inefficiency of the immobiliser aerial or the transponder.

Turn the switch to ON using several keys: if the code is repeated even with the Master key, check the aerial wiring and change it if necessary. If this is not the case, replace the defective key and/or reprogram the control unit. Replace the control unit if the problem continues.



## Diagnostic code - 3 flashes

A three-flash code indicates a system where the control unit does not recognise the key. Turn the switch to ON using several keys: if the error code is repeated even with the Master key, replace the control unit. If this is not the case, perform a re-programming.



## Ignition circuit

All the control operations of the system that entail disconnecting cables (to check 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 irretrievably damaged.

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

The Pick-Up is connected to the control unit by a single cable; therefore, the control unit is connected to the Pick-Up by the chassis and the engine ground lead.

To avoid disturbances in the ignition system during start-up, it is very important that the engine-chassis ground connection bonding is efficient.

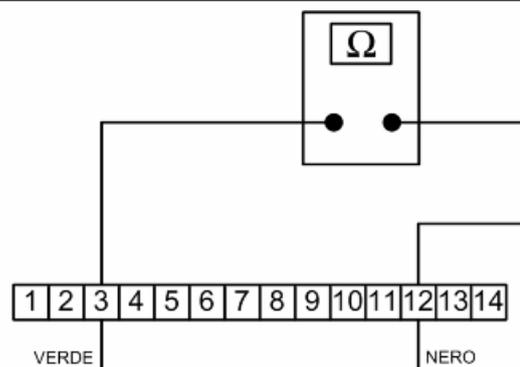
## No spark plug

Once the lack of power to the spark plug has been detected and the led indicates it can be ignited, follow this procedure:

### - Pick-Up check.

Disconnect the control unit connector and check that the cable between terminal No. 3 (Green) and terminal No. 12 (Black) is not interrupted.

The check includes the Pick-Up and its power line. If a break in the circuit is found, check again the flywheel and the engine earth connectors. If non-conforming values are measured, replace the Pick-Up; otherwise, repair the cable harness.



### Electric characteristic

**Pick-up resistance value**

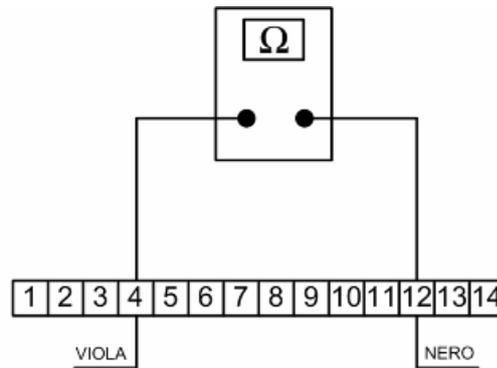
Pick-up resistance value:  $105 \div 124$  Ohm

**- HV primary coil check**

Disconnect the control unit connector and check that the cable between terminal No. 4 (violet) and terminal No. 12 (black) is not interrupted (see figure).

If non-conforming values are measured, check again the HV primary coil directly on the positive and negative terminals.

If the values are correct, repair the cable harness or reset the connections; otherwise, replace the HV coil

**Electric characteristic****High voltage coil primary resistance value**

High voltage coil primary resistance value:  $0.4 \div 0.5$  Ohm

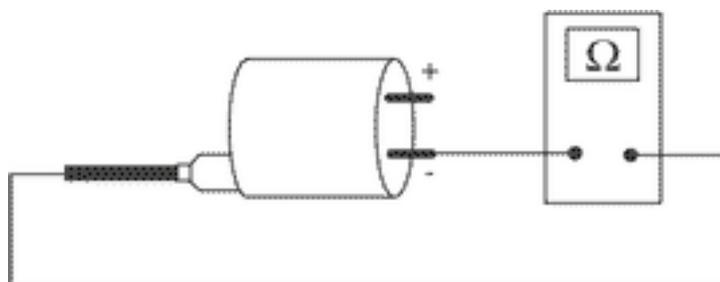
**- HV coil secondary check**

Disconnect the spark plug cap from the HV cable and measure the resistance between the HV cable terminal and the HV coil negative terminal (see figure).

If non-conforming values are measured, replace the HV coil. To carry out a more complete diagnosis, check the peak voltage with the multimeter adaptor.

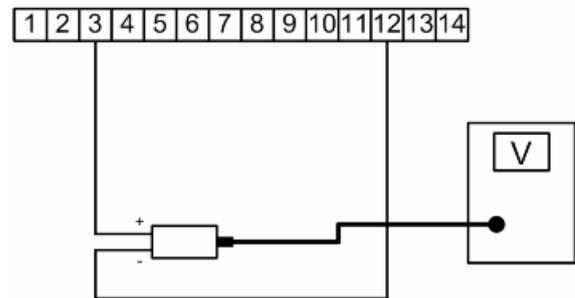
**Specific tooling****020409Y Multimeter adaptor - Peak voltage detection****Electric characteristic****High voltage coil secondary resistance value**

High voltage coil secondary resistance value:  $\sim 3000 \pm 300$  Ohm



**- Pick-Up**

Disconnect the control unit connector and connect the positive terminal to connector No. 3 and the negative terminal to connector No. 12 (see figure). Use the start-up system to run the engine and measure the voltage produced by the Pick-Up. Replace Pick-Up if non-conforming values are measured.

**N.B.**

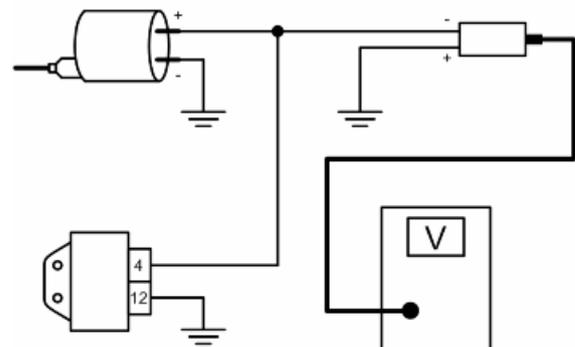
**THE MULTIMETER MUST BE SELECTED TO DETECT CONTINUOUS VOLTAGE.**

**Electric characteristic****Pick-Up voltage value**

Pick-Up voltage value: > 2 Volt

**- H.V. coil**

With the control unit and HV coil connected to the circuit, measure the voltage of the coil primary during the start-up test with the voltage peak adaptor and connect the positive terminal to the earth one and the negative to the coil positive connector. If non-conforming values are measured, replace the control unit.



**THE POSITIVE TERMINAL OF THE HV COIL PRIMARY IS BLACK.**

**Electric characteristic****High voltage coil voltage value**

High voltage coil voltage value: > 100 Volt

**Battery recharge circuit**

The recharge system is provided with a three phase alternator with permanent flywheel.

The alternator is directly connected to the voltage regulator.

In turn, the latter is directly connected to earth and to the battery positive passing through the 15A safety fuse.

This system therefore requires no connection to the key switch.

The three- phase generator provides good recharge power and at low revs a good compromise is achieved between generated power and idle stability.

For this reason, it is very important that the idle speed is adjusted as prescribed.

**Specific tooling**

**020333Y Single battery charger**

## 020334Y Multiple battery charger

### Stator check

- With a tester, check the circuit between connections 5-3 and 5-1 is not interrupted.

- Check the earth isolation on the three phases of stators 5-earth, 3-earth, 1-earth.

Stage indicative resistance: 0.7 - 0.9  $\Omega$

Minimum oil pressure switch check

- With a tester, check the circuit between connections 4 and ground (with engine off) is not interrupted.

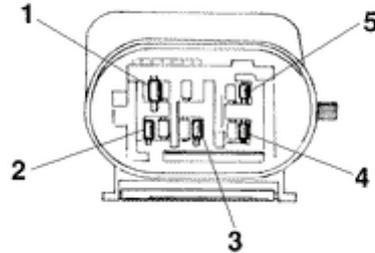
Pick-Up check

- Check that there is a resistance of about 105  $\div$  124  $\Omega$  at 20° C between connection 2 and ground.

- In case of values different from the ones stated, replace the defective parts.

**N.B.**

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



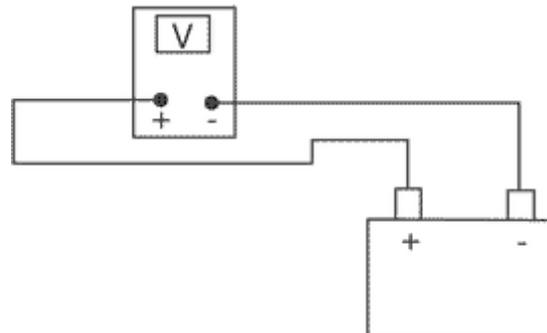
### Voltage regulator check

With a perfectly charged battery and lights off, measure voltage at the battery poles with a high running engine.

The voltage should not exceed 15.2 Volt.

In case higher voltages are detected, replace the regulator.

In case of voltage values lower than 14 Volt, check the stator and the corresponding cable harness.



### Recharge system voltage check

Connect an ammeter induction clamp to the voltage regulator positive terminal, measure the battery voltage and turning on the vehicles lights with engine off, wait for the voltage to set at about 12 V. Start the engine and measure the current generated by the system with lights on and a high running engine.

In case the generated current value is lower than 10A, repeat the test using a new regulator and/stator alternatively.

## Choke Inspection

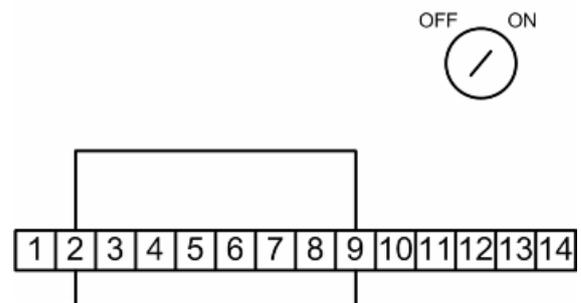
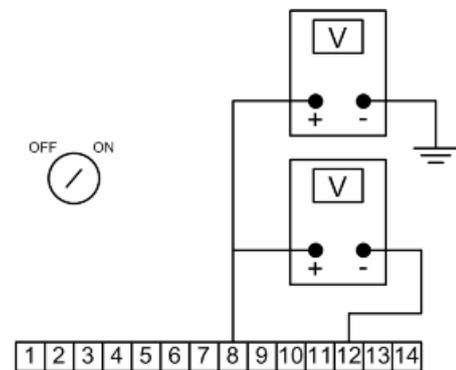
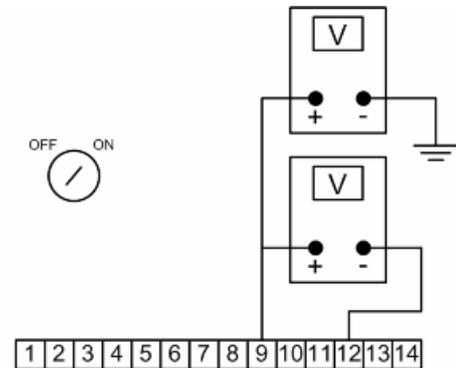
With the connector connected to the system, check if there is voltage in both battery terminals while the engine is running.

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

If no voltage is detected, connect the multimeter negative terminal to the earth terminal and the positive terminal to the automatic starter orange cable; with the key switch set to «ON» and the engine emergency cut-off switch set to RUN, check there is voltage in the battery; If there is no voltage, check the wiring connections to the key switch and that fuse No.1 works properly.

If there is voltage, check again the ignition control unit connector. After disconnecting the starter, start up the engine and keep it at idle speed and check there is voltage when the multimeter positive terminal is connected to terminal No. 8 (Red/Blue) and the negative one to terminal No. 11 (White/Red).

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

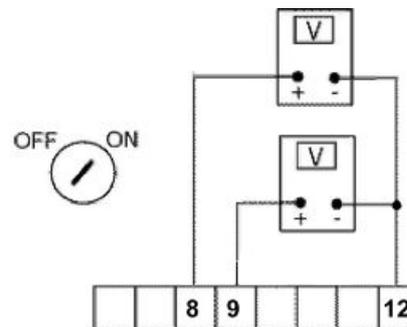
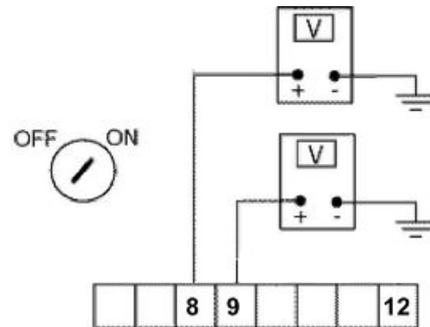


## Turn signals system check

- If the turn indicators do not work, proceed as follows:

- Disconnect the control unit connector and check that there is voltage between terminal No. 9 (Blue) and terminal No. 12 (Black) and the earth connection with the key switch set to "ON".

- Check that the same happens between terminal No. 8 (Red/Blue) and terminal No. 12 (Black) and earth connection.

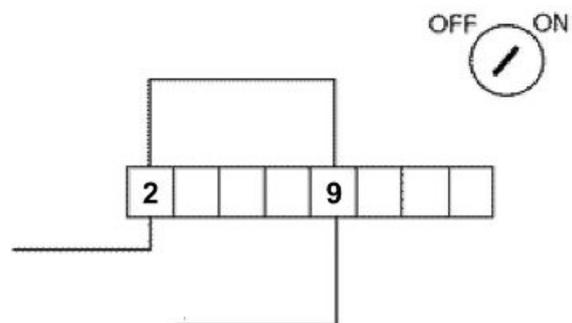


If no voltage is detected, check the cable harness and the connections; otherwise, proceed as follows:

- Jump terminals No.2 (Black/Blue) and No.9 (Sky blue), see figure, and turn the turn indicator switch alternatively to the left and the right with the key switch in "ON" and check that the lights turn on.

If they do, replace the control unit because it is faulty.

If they do not turn on, check the control unit-turn indicator switch connection cable harness; then, repeat the test.



## Fuses

L'impianto elettrico è protetto da due fusibili da 15A «**B**» collocati accanto alla batteria e da due fusibili da 7,5A «**A**» collocati sotto la calandra anteriore. Per rimuovere la calandra anteriore è necessario togliere, con l'ausilio di un cacciavite, la placchetta con il logo Piaggio posto sullo scudo anteriore quindi rimuovere la vite sottostante

### CAUTION



IN ORDER TO AVOID DAMAGING THE ELECTRICAL SYSTEM, NEVER DISCONNECT THE WIRING WHILE THE ENGINE IS RUNNING. DO NOT TIP THE SCOOTER TOO MUCH IN ORDER TO AVOID DANGEROUS LEAKAGE OF BATTERY ELECTROLYTE.

### CAUTION

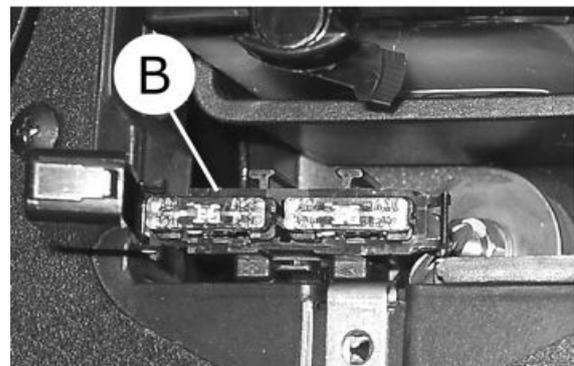
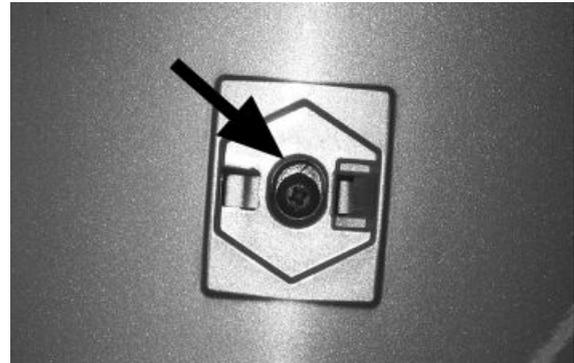


MODIFICATIONS OR REPAIRS TO THE ELECTRICAL SYSTEM, PERFORMED INCORRECTLY OR WITHOUT STRICT ATTENTION TO THE TECHNICAL SPECIFICATIONS OF THE SYSTEM, CAN CAUSE ERRORS IN FUNCTIONING AND RISK OF FIRE.

### CAUTION



BEFORE REPLACING A BLOWN FUSE, FIND AND SOLVE THE FAILURE THAT CAUSED IT TO BLOW. NEVER TRY TO REPLACE THE FUSE WITH ANY OTHER MATERIAL (E.G., A PIECE OF ELECTRIC WIRE).



## BULBS

	Specification	Desc./Quantity
1	High/low beam light bulb	Type: Halogen (H4) Power: 12V - 55/60W Quantity: 1
2	Front tail light bulb	Type: All glass Power: 12V 5W Quantity: 1
3	Front turn indicator bulb	Type: Spherical Power: 12V - 10W Quantity: 1 RHS + 1 LHS
4	Rear turn indicator light bulb	Type: Spherical Power: 12V - 10W Quantity: 1 RHS + 1 LHS
5	Stop and tail light bulb	Type: Spherical Power: 12V 21/5W Quantity: 1
6	12V - 2W warning light bulbs	Type: All glass Function: Turn indicators, engine oil, fuel reserve, high-beam light Quantity: 4

	Specification	Desc./Quantity
7	Instrument panel light bulbs	<b>Type:</b> All glass <b>Power:</b> 12V 1.2W <b>Quantity:</b> 4
8	License plate light bulb	<b>Type:</b> ALL GLASS <b>Power:</b> 12V - 5W <b>Quantity:</b> 1

## Sealed battery

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

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

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

### INSTRUCTIONS FOR THE RENEWAL RECHARGE AFTER OPEN-CIRCUIT STORAGE

#### 1) Voltage check up

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

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

#### 2) Constant voltage battery charge mode

- Constant voltage charge equal to 14.40 ÷ 14.70V
- Initial charge voltage equal to 0.3 ÷ 0.5 for Nominal capacity
- Charge time:  
10 to 12 h recommended  
Minimum 6 h  
Maximum 24 h

#### 3) Constant current battery charge mode

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

## Dry-charge battery

### 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

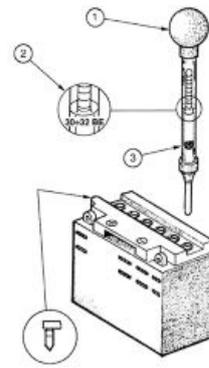
Batteries produce explosive gases; keep clear of free flames, sparks or cigarettes; ventilate the area when recharging the battery indoors.

Always protect your eyes when working close to batteries.

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

**Commissioning dry-charged batteries :**

- 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 Be 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 using the specific battery charger (single) or (multiple) at a density of about 1/10 of the battery nominal capacity until fully charged; check that the acid density is about 27, corresponding to 31 Be, and that 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 on the vehicle ensuring that it is wired up properly.



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

**WARNING**

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

**Specific tooling**

**020333Y Single battery charger**

**020334Y Multiple battery charger**

**Battery maintenance**

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

**1) Electrolyte level check**

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 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.

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 ground wire (**black**) marked (-) must be connected to the **-negative** clamp while the other two **red** wires marked (+) must be connected to the clamp marked with the **+positive** sign.

### 3) Recharging the battery

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

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) Battery cleaning

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 SPARKS AND NAKED FLAMES AWAY FROM THE BATTERY WHILE RECHARGING.**

#### **CAUTION**

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

#### **CAUTION**

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

#### **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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## INDEX OF TOPICS

ENGINE FROM VEHICLE

ENG VE

## Exhaust assy. Removal

- 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.



## Removal of the engine from the vehicle

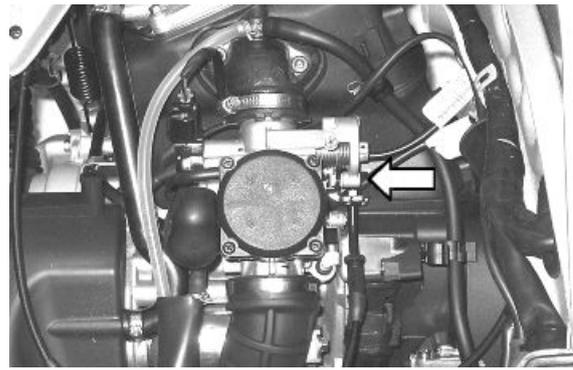
- Remove the left and right side fairings
- Remove the helmet compartment
- Remove the full muffler assembly.
- Remove the 3 rear brake transmission fixing screws indicated in the photograph
- Disconnect the rear brake transmission unscrewing the set screw



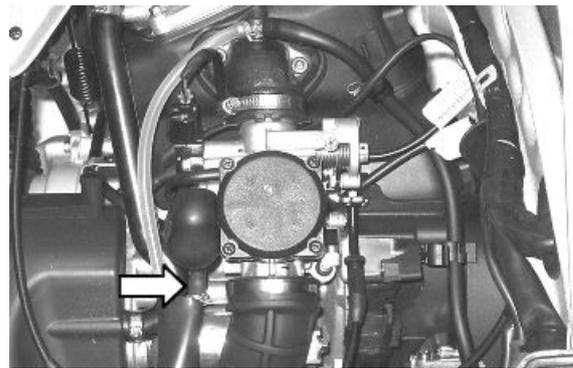
- Disconnect the belt cooling tube and the swinging arm retaining spring shown in the photograph
- Disconnect the spark plug tube



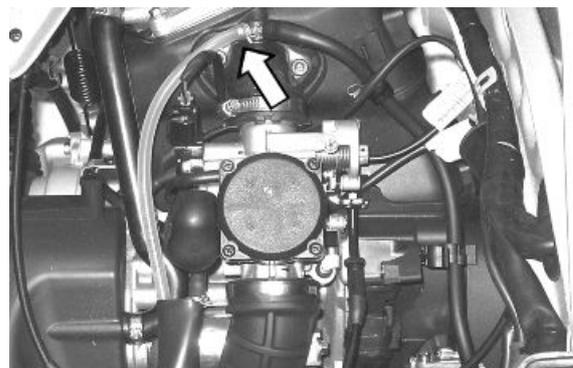
- 
- Remove the throttle control cable from the carburettor, indicated in the photograph



- 
- Remove the fuel supply pipe from the carburettor



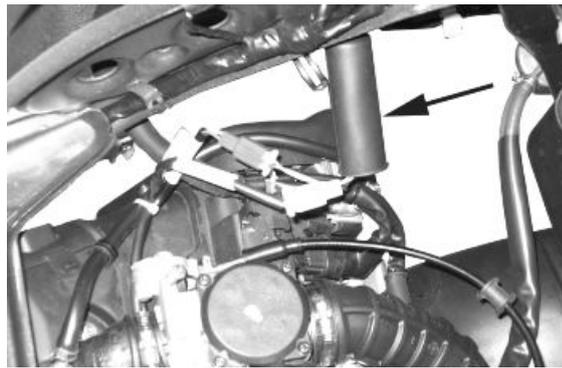
- 
- Remove the fuel valve low-pressure pipe from the manifold as shown in the photograph



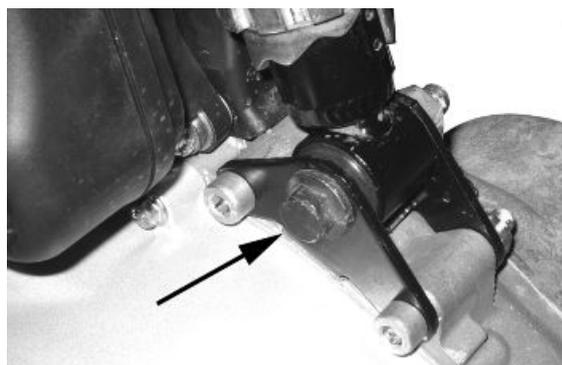
- 
- Remove the flywheel wiring connector, the earth terminal and the starter motor positive cable indicated in the figure



- Remove the protection sheath indicated in the figure and disconnect the automatic starter, carburettor heater and TPS connectors



- Unscrew the engine pin-swinging arm nut on the right-hand side of the vehicle and slide off the pin on the left hand side
- Support the vehicle adequately (with a jack) and remove the shock absorber lower clamping. The engine is now free.



# INDEX OF TOPICS

ENGINE

ENG

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

## Automatic transmission

### Transmission cover

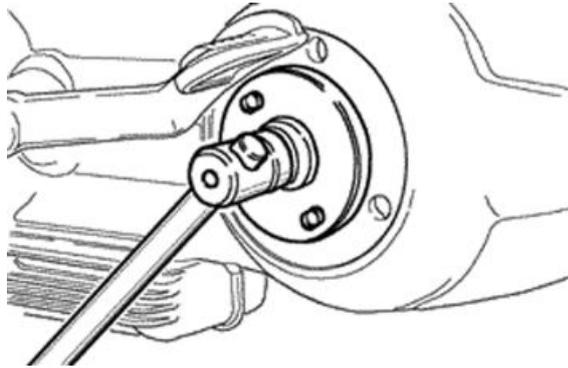
- To remove the transmission cover it is necessary to remove the rear plastic cover first by inserting a screwdriver in the corresponding slotted holes.

Using the clutch bell lock wrench, remove the driven pulley axle locking nut and recover the washer.

- Remove the cap/dipstick from the engine oil filling hole.

- Remove the 10 screws and the earth cable fastened under one of them.

- Remove the transmission cover. If this operation is performed directly on the vehicle, it is necessary to remove the cooling air coupling and the three air filter housing retainers.



### Specific tooling

**020423Y driven pulley lock wrench**

### Kickstart

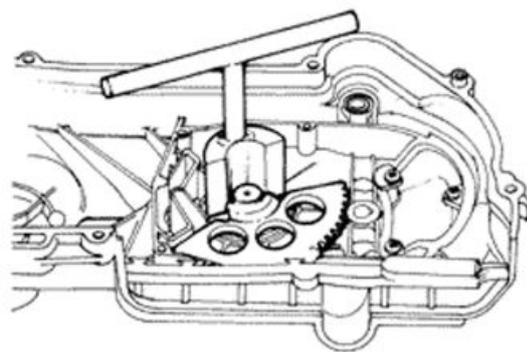
- Check the following for wear: toothed section, toothed section shaft, cover seat bushing, pinion shaft and its seating in the crankcase and the return spring.

- Remove the damaged components.

- Lubricate the spring with the recommended grease.

- Remove the toothed sector and load the spring with an appropriate tool.

- Refit the washer, the seeger ring and the Kickstart lever.



### Specific tooling

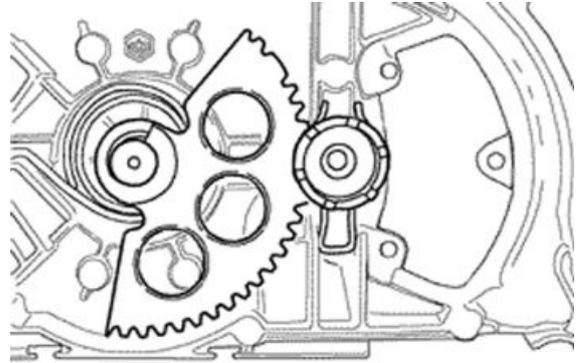
**020432Y Tool to fit the start-up sector spring**

### Recommended products

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

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

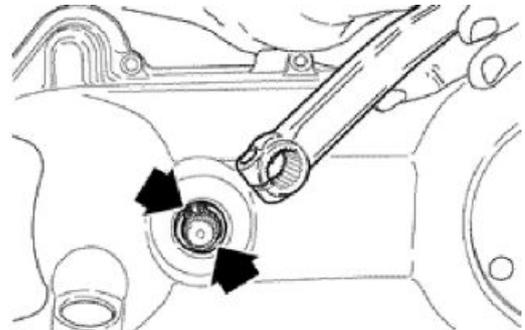
- Operating the starter lever, load the spring and introduce the pinion in its seat.
- Refit the intake throat with the 3 screws and the Kick-starter cover with the 4 screws. Tighten the screws to the prescribed torque.



- Remove the start-up pinion pushing the starter lever.
- Unscrew the kick starter screw, remove the lever.
- Remove the seeger ring and the washer indicated in the figure.
- Pull out the toothed section.

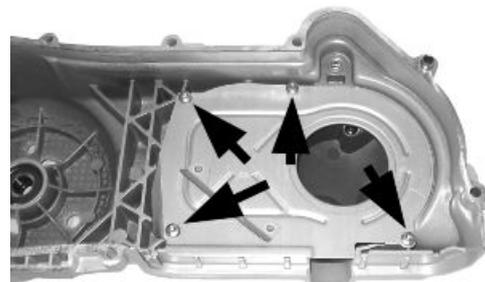
#### WARNING

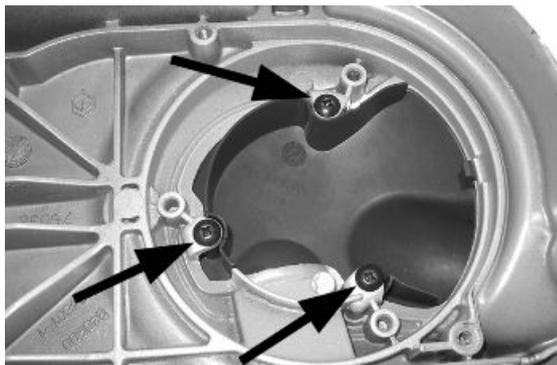
THE SECTION KEEPS THE SPRING SET, BE CAREFUL SO AS NOT TO CAUSE ANY ACCIDENTS



### Air duct

- Unscrew the Torx screws fixing the air manifold bulkhead and remove the bulkhead.
- Remove the 3 screws, then take out the manifold as well as the filter.





## Removing the driven pulley shaft bearing

- Remove the clip from the inside of the cover.
- Use the specific tools to remove the bearing from the crankcase.

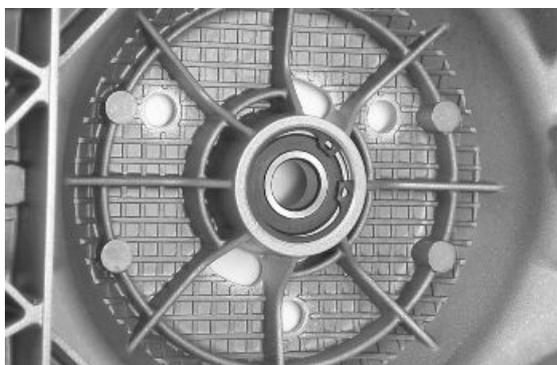
### CAUTION

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

### Specific tooling

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm



## Refitting the driven pulley shaft bearing

- Heat up the crankcase inside with the hot air gun.
- Insert the bearing in its housing, refit the Seeger ring.

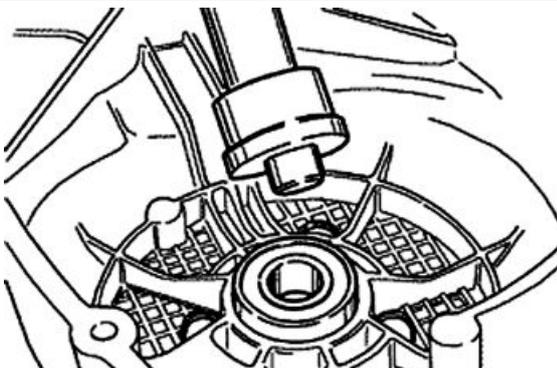
### N.B.

ALWAYS REPLACE THE BEARING WITH A NEW ONE UPON REFITTING.

### Specific tooling

020151Y Air heater

020376Y Adaptor handle



020357Y 32 x 35 mm adaptor

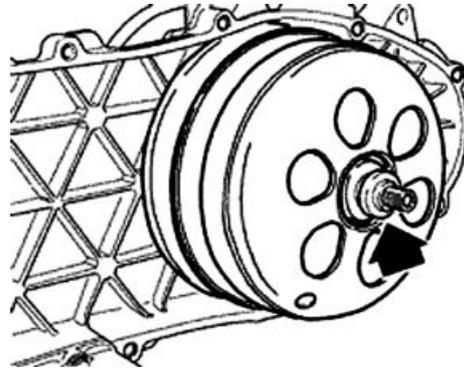
020412Y 15 mm guide

## Removing the driven pulley

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

**N.B.**

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



## Inspecting the clutch drum

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

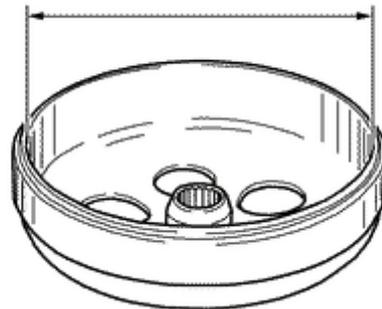
### Characteristic

#### Max. value clutch bell

Max. value:  $\varnothing$  134.5 mm

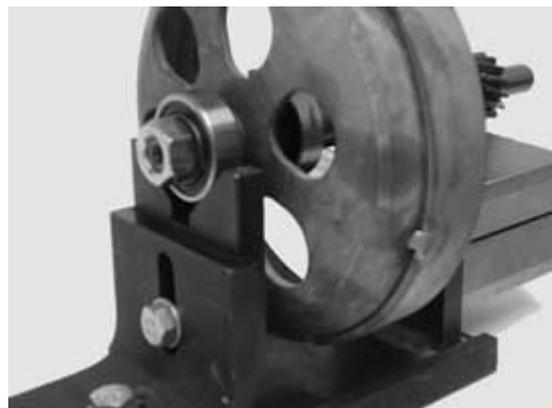
#### Clutch bell standard value

Standard value:  $\varnothing$  134 - 134.2 mm

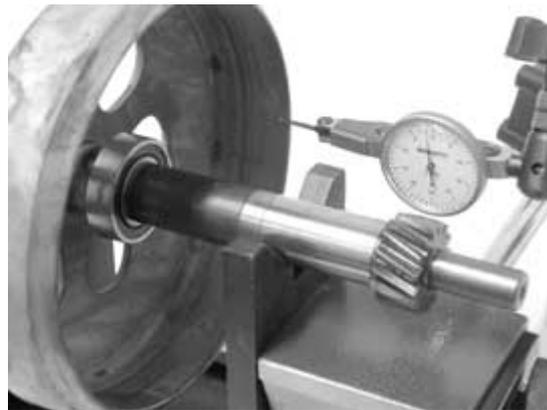


### Checking the bell working surface eccentricity

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



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



### Specific tooling

**020074Y Support base for checking crankshaft alignment**

**020335Y Magnetic support for dial gauge**

### Characteristic

**clutch bell inspection: Limit eccentricity.**

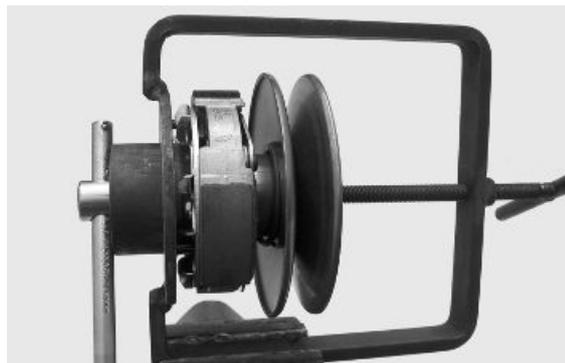
Admissible limit eccentricity: 0.15 mm

## Removing the clutch

- Prepare the locking tool for the driven pulley with the pins half-screwed in the tool set to «C».



- Fit the driven pulley unit in the tool so as the bolt get into the masses clutch support holes. Afterwards make the support screw make contact with a minimum force.



- Using the specific wrench, inserted 46 mm from the side, remove the clutch central locking nut.

- Separate the driven pulley into its components (clutch with fan and contrast spring with plastic fittings).

### CAUTION

**THE TOOL MUST BE FIRMLY FIXED IN THE VICE AND THE CENTRAL SCREW MUST NOT BE TIGHTENED WITH EXCESSIVE TORQUE AS THIS MAY DAMAGE THE PULLEY OR DEFORM THE SPECIFIC TOOL.**

### Specific tooling

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

**020444Y009 46x55 Wrench**

## Inspecting the clutch

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

### N.B.

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

### CAUTION

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

### Characteristic

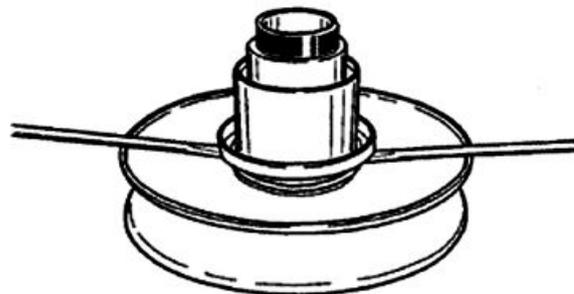
#### Check minimum thickness

1 mm



## Pin retaining collar

- Remove the collar with the aid of 2 screwdrivers.
- Remove the 3 guide pins and the movable half-pulley.



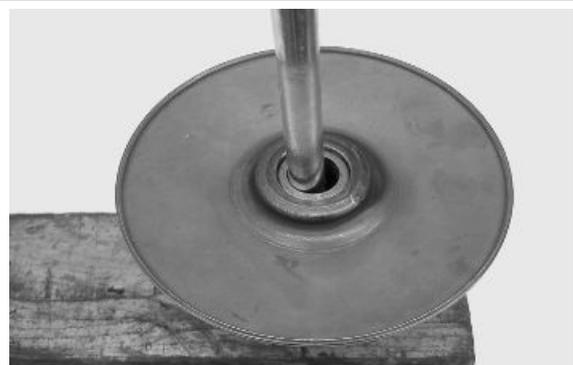
## Removing the driven half-pulley bearing

- Remove the retaining ring using two flat blade screwdrivers.
- Using a hammer and pin, knock the ball bearing out as shown in the figure.
- Remove the roller bearing using the specific extractor.

### N.B.

REST THE HALF-PULLEY ON A WOOD SURFACE TO AVOID DAMAGING THE THREADED RINGLET OF THE DRIVEN PULLEY UPON REMOVING IT.

### Specific tooling



020375Y Adaptor 28 x 30 mm

020376Y Adaptor handle

020439Y 17 mm guide



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## Inspecting the driven fixed half-pulley

- Measure the external diameter of the pulley bushing.

### Characteristic

#### Minimum diameter permitted

Ø 40.96 mm

#### Standard diameter

Ø 40.965 mm



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## 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

#### Minimum admissible diameter

Ø 41.08 mm

#### Standard diameter

Ø 41.035 mm



## Refitting the driven half-pulley bearing

- Assemble a new roller case using the specific punch, fit the bearing with the label facing outward and insert it completely up to the punch on the half-pulley.

**N.B.**

**REST THE HALF-PULLEY ON A WOOD SURFACE TO AVOID DAMAGING THE THREADED RINGLET OF THE DRIVEN PULLEY UPON REMOVING IT.**

### Specific tooling

**020424Y Driven pulley roller casing fitting punch**



- To assemble the new ball bearing insert it completely down in its housing with the specific punch and finally assemble the Seeger ring.

### Specific tooling

**020375Y Adaptor 28 x 30 mm**

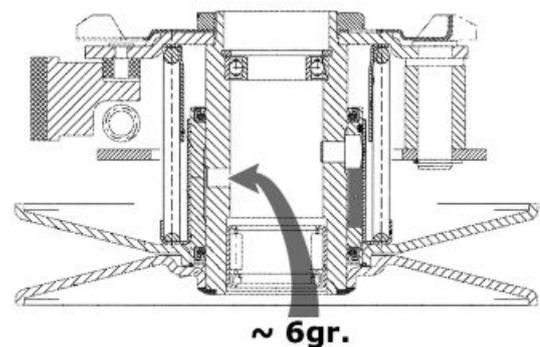
**020376Y Adaptor handle**

**020439Y 17 mm guide**



## Refitting the driven pulley

- Check that the facing surfaces between the 2 half-pulleys and the belt do not show any signs of wear, scoring and grease.
- Insert the new oil seals and O-rings on the movable half-pulley.
- Assemble the half-pulley on the ringlet with the appropriate protection sheath.
- Make sure the pins and collar are not worn, re-assemble the pins and collar.
- Use a greaser with a curved spout to lubricate the driven pulley unit with around 6 g of grease. This operation must be done through one of the holes inside the bushing until grease comes out of the opposite hole. This operation is necessary to avoid the presence of grease beyond the O-rings.



### Specific tooling

**020263Y Sheath for driven pulley fitting****Recommended products****AGIP GREASE SM 2 Grease for the tone wheel revolving ring**

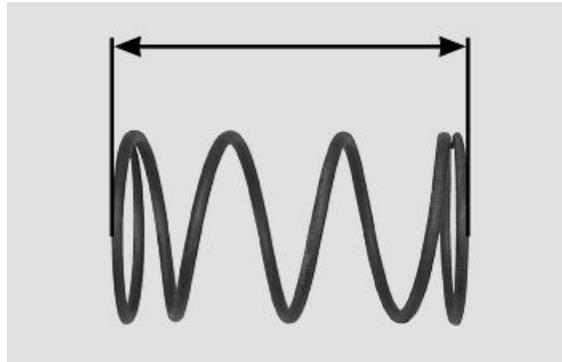
Soap-based lithium grease containing NLGI 2 Molybdenum disulphide; ISO-L-XBCHB2, DIN KF2K-20

**Inspecting the clutch spring**

- Measure the unloaded length of the spring of the movable driven half-pulley.

**Characteristic****Standard length:**

106 mm

**Refitting 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.

**N.B.**

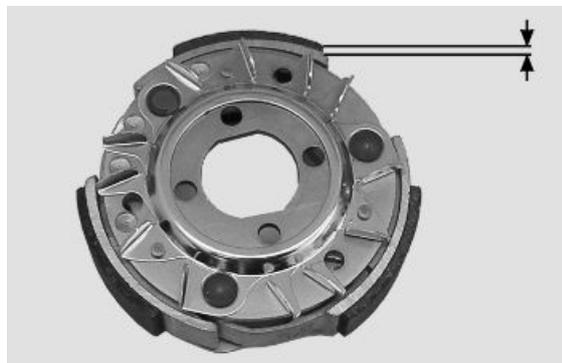
UPON RUNNING-IN, THE MASSES MUST EXHIBIT A CENTRAL CONTACT SURFACE AND MUST NOT BE DIFFERENT FROM ONE ANOTHER. VARIOUS CONDITIONS CAN CAUSE THE CLUTCH TO TEAR.

**CAUTION**

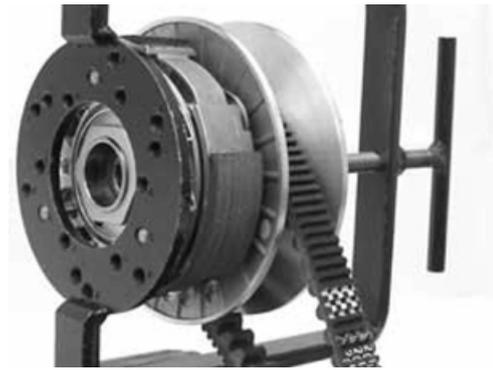
DO NOT OPEN THE MASSES USING TOOLS SO AS TO PREVENT A VARIATION IN THE RETURN SPRING LOAD.

**Characteristic****Minimum thickness permitted:**

1 mm



- Support the driven pulley spring compressor appropriate tool with the control screw in vertical axis.
- Arrange the tool with the medium length pins screwed in position "C" on the inside.
- Introduce the adapter ring 11 with the chamfering facing upwards.
- Insert the clutch on the adapter ring.
- Lubricate the end of the spring that abuts against the servo-system closing collar.
- Insert the spring with its plastic holder in contact with the clutch.
- Insert the driving belt into the pulley unit according to their direction of rotation.
- Insert the pulley unit with the belt into the tool.
- Slightly preload the spring.
- Make sure that the clutch is perfectly inserted into the adapter ring before proceeding to tighten the clutch nut.
- Place the tool in the clamp with the control screw on the horizontal axis.
- Fully preload the spring.
- Apply the clutch fixing nut and tighten it to the prescribed torque using the special 46x55 wrench.
- Loosen the tool clamp and insert the belt according to its direction of rotation.
- Lock the driven pulley again using the specific tool.
- Preload the clutch return spring with a traction/rotation combined action and place the belt in the smaller diameter rolling position.
- Remove the driven pulley /belt unit from the tool.



**N.B.**

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

**N.B.**

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

### Specific tooling

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

**020444Y011 adapter ring**

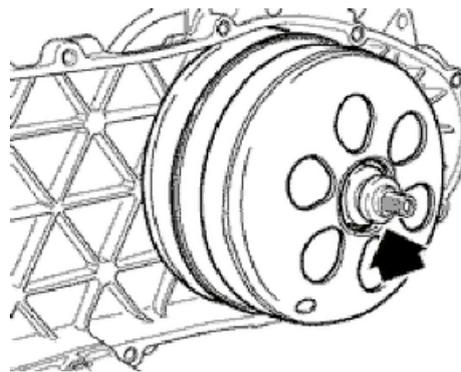
**020444Y009 46x55 Wrench**

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

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

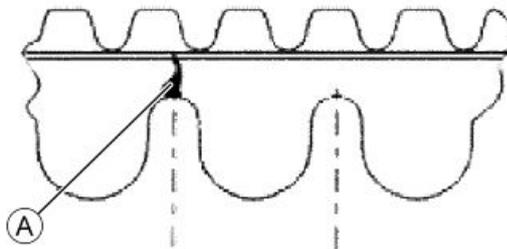
### Refitting the driven pulley

- Reassemble the clutch bell and spacer.

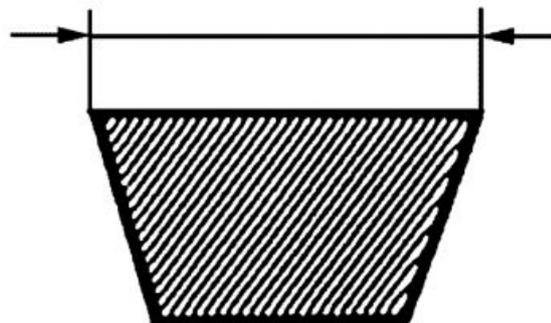


### Drive-belt

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



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

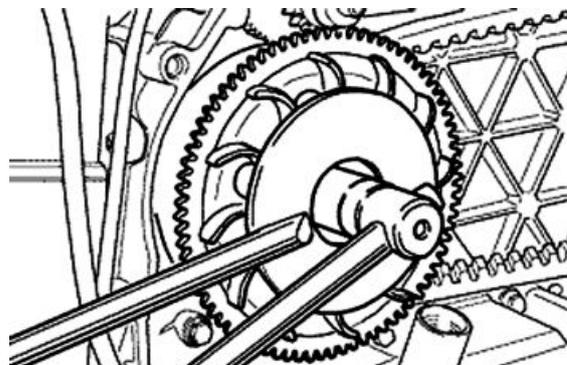


#### **BELT SIZE**

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

## Removing the driving pulley

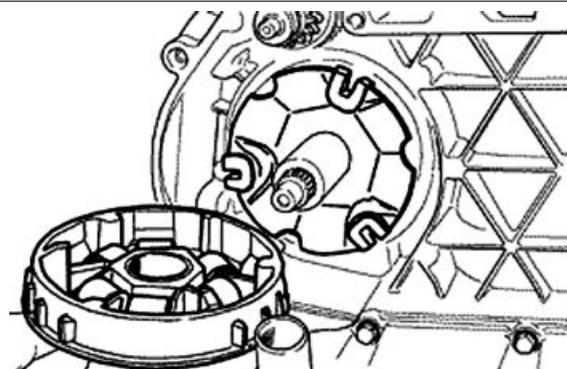
- Lock the driving pulley with the specific tool as shown in the figure.
- Disassemble the central nut and the Belleville washer, remove the drive and the 2 washers.
- Remove the stationary half pulley and the steel washer.



### Specific tooling

**020368Y driving pulley lock wrench**

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



## Inspecting the rollers case

- Check that the internal bushing is not abnormally worn and measure inner diameter.

**N.B.**

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

### BUSHING ROLLER CONTAINER

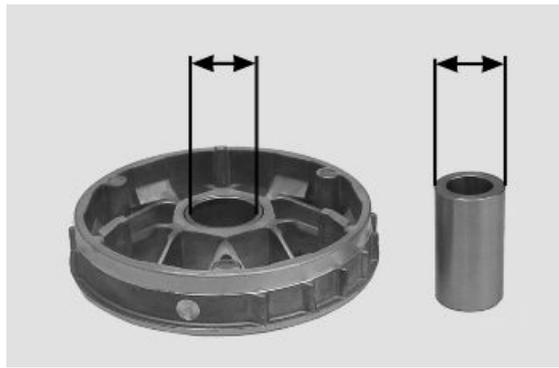
Specification	Desc./Quantity
Maximum allowable diameter	Ø 26.121 mm
Standard diameter	Ø 26+0 +0.021 mm

### BUSH SLIDE PULLEY

Specification	Desc./Quantity
Minimum diameter permitted	Ø 25.950 mm
Standard diameter	Ø 26-0.020 -0.041 mm

### VARIABLE SPEED ROLLERS

Specification	Desc./Quantity
Minimum diameter permitted	Ø 18.5 mm
Standard diameter	Ø 26±0.1 mm



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



## Refitting the driving pulley

- Reassemble the parts of the unit (internal lining, fixed half-pulley, external lining, drive and nut), spread threadlock on the thread and screw the nut to the prescribed torque.
- Avoid the half-pulley rotation using a calliper spanner

**N.B.**

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

### Specific tooling

**020368Y driving pulley lock wrench**

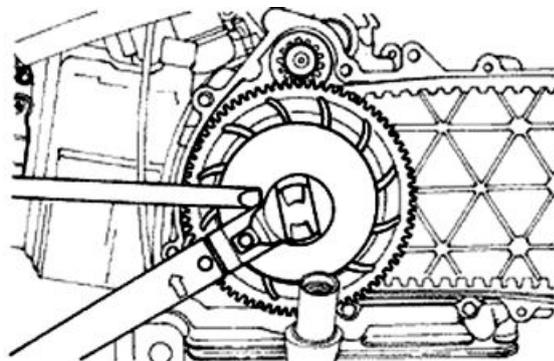
### Recommended products

**Loctite 243 Medium strength threadlock**

Loctite 243 medium-strength threadlock

### Locking torques (N\*m)

**Locking torque 75 ÷ 83**



## Refitting the transmission cover

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



### Specific tooling

**020423Y driven pulley lock wrench**

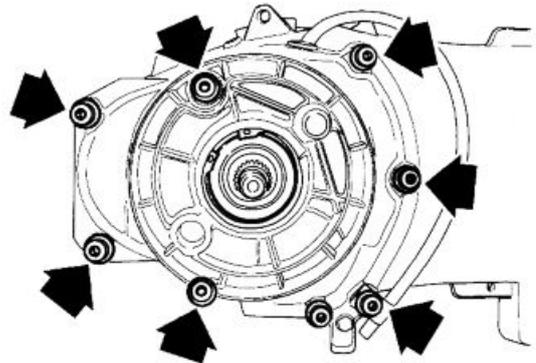
### Locking torques (N\*m)

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

## End gear

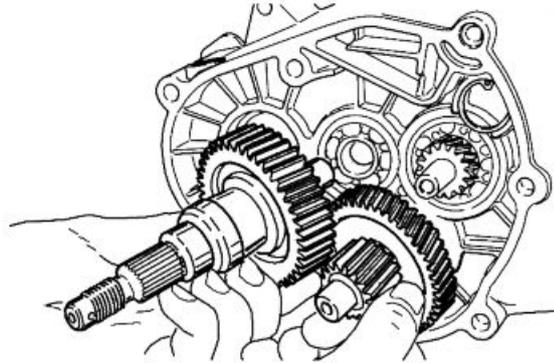
### Removing the hub cover

- Empty the rear hub through the oil drainage tap located inside the hub cover
- Remove the brake shoe and relevant spring
- Remove the 7 flanged screws as shown in the figure.
- Remove the rubber cover and the brake pad lever sliding unscrewing the relevant retaining screw to reach the rear of the cover
- Take off the hub cover and relevant gaskets



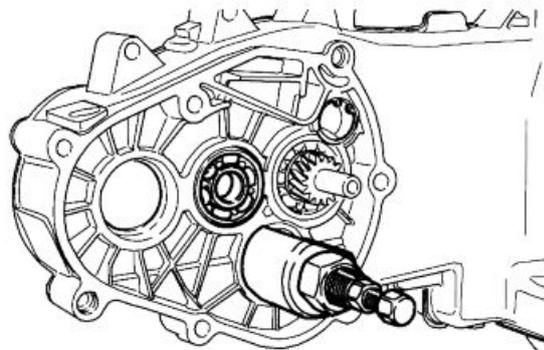
## Removing the wheel axle

Remove the intermediate gear and the complete hub cover.



## Removing the hub bearings

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



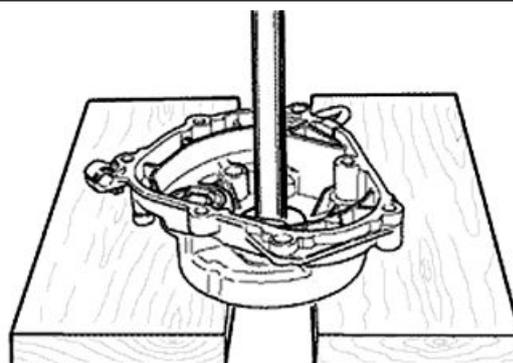
### Specific tooling

**001467Y009 Driver for OD 42-mm bearings**

**001467Y013 Pliers to extract  $\varnothing$  15-mm bearings**

## Removing the wheel axle bearings

- Take out the clip on the outside of the gearbox cover.
- Remove the bearing with the adequate tools adequately supporting the hub cover, as shown in the figure.



### Specific tooling

**020376Y Adaptor handle**

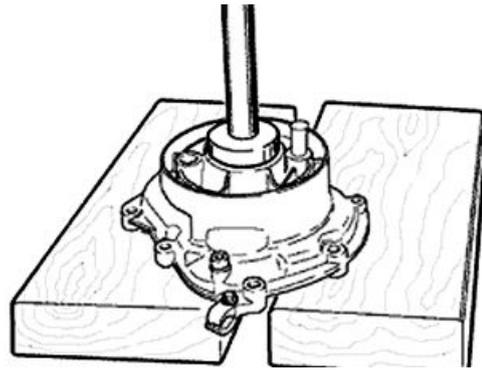
**020364Y 25-mm guide**

With the appropriate tools, remove the oil seal as shown in the figure.

### Specific tooling

020376Y Adaptor handle

020359Y 42x47-mm adaptor



## Removing the driven pulley shaft bearing

If it is necessary to remove the driven pulley shaft, from the relevant bearing and oil seal, remove driven pulley.

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

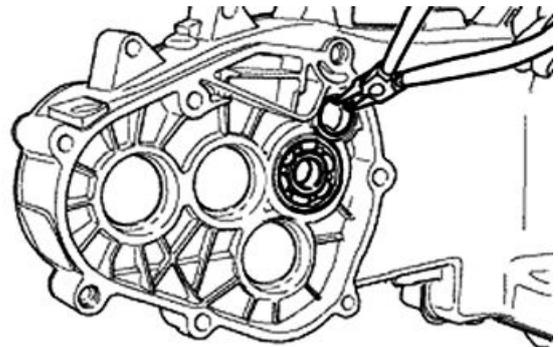
With the sectional punch, remove the driven pulley shaft bearing.

### Specific tooling

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm

020363Y 20 mm guide



### See also

[Removing the driven pulley](#)

## Inspecting the hub shaft

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



## Inspecting the hub cover

- Check that the fitting surface is not dented or distorted.
  - Check the capacity of the bearings and the brake camshaft.
  - If faults are found, replace the hub cover.
- 

## Refitting the driven pulley shaft bearing

- Heat up the parts using the specific heat gun

### Specific tooling

**020150Y Air heater support**

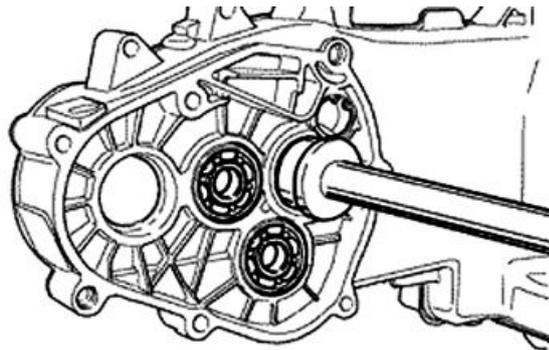
**020151Y Air heater**

- Reassemble the driven pulley axle bearing positioning it with ball bearing in view from the inside of the hub cover using the adequate tools

### Specific tooling

**020376Y Adaptor handle**

- Refit the Seeger ring with the opening facing the bearing as shown in the figure and fit a new oil guard flush with the crankcase.



---

## Refitting the wheel axle bearing

- Heat up the parts using the specific heat gun

### Specific tooling

**020151Y Air heater**

**020150Y Air heater support**

- The wheel axle bearing on the cover, should be assembled with the specific tools

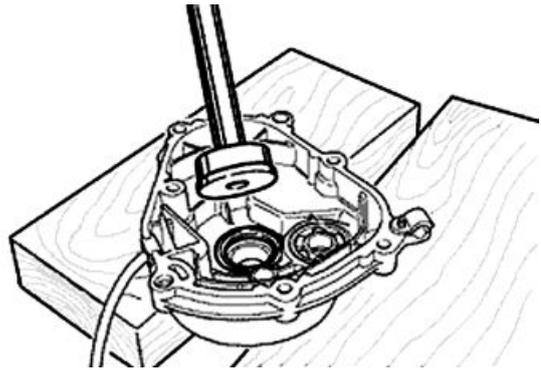
### Specific tooling

**020364Y 25-mm guide**

**020360Y Adaptor 52 x 55 mm**

**020376Y Adaptor handle**

- Assemble the Seeger ring.
- Assemble the oil seal flush with the internal surface as shown in the figure to the hub using the adequate tools and with the seal lip towards the inside of the hub.



### Specific tooling

020376Y Adaptor handle

020360Y Adaptor 52 x 55 mm

---

## Refitting the hub cover bearings

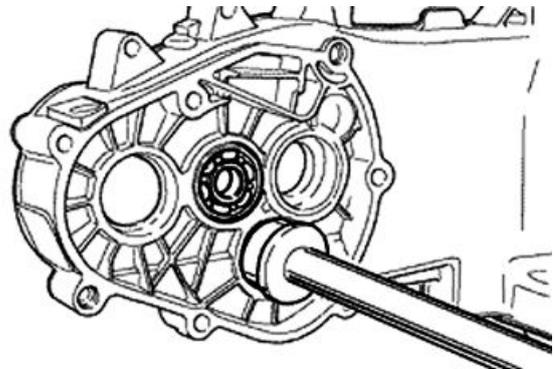
- For the fitting of the hub box bearings the engine crankcase and the cover must be heated with the specific heat gun.

### Specific tooling

020150Y Air heater support

020151Y Air heater

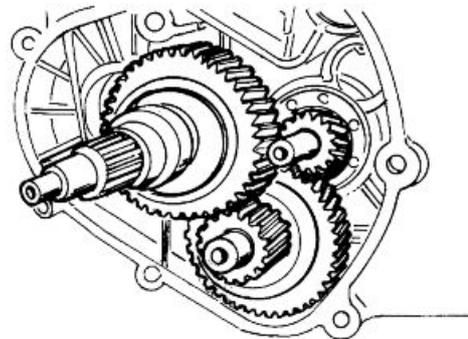
- The three 15 mm bearings must be fitted using the appropriate tools.



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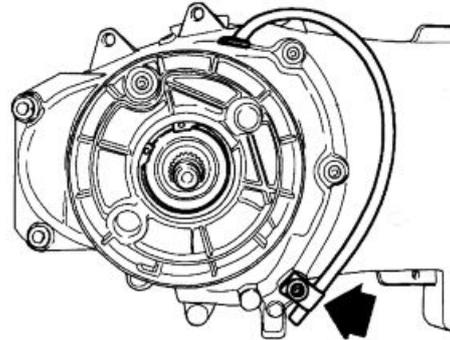
## Refitting the hub bearings

- Insert the cover prepared in the crankcase taking care of inserting the gear of the pulley shaft on the intermediary gear.



## Refitting the ub cover

- Fit a new gasket together with the centring dowels.
- Fit the gearbox cover, making sure the breather pipe is in the correct position.
- Screw the 7 screws to the specified torque, positioning the support plate of the pipe in the position shown in the figure.



### Locking torques (N\*m)

Locking torque 24 ÷ 27

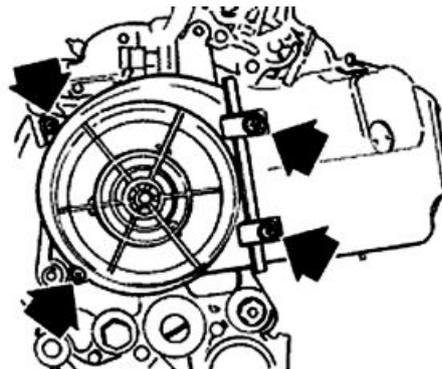
## Flywheel cover

### Cooling hood

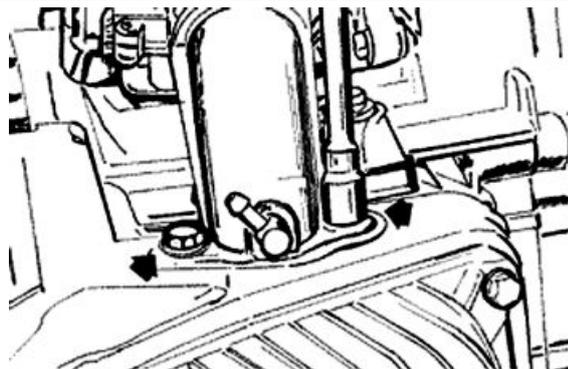
- Remove the housing acting on the 4 retaining screws.

#### CAUTION

DURING REMOVAL SLIDE THE HOUSING CONNECTOR ON THE HOUSING.



- Loosen the clamp and remove the carburettor from the manifold.
- Remove the complete manifold acting on the 2 retainers as shown in the figure.
- Remove the 2 self threading screws, left and right and the lateral base retaining screw on the crankcase base.
- Take off the housings.
- Remove the gasket seal of the housing on the head.



#### N.B.

IF THE FLYWHEEL HOUSING IS NOT REMOVED, IT IS ALSO NECESSARY TO REMOVE THE TWO KNOB SCREWS.

On the vehicles equipped with the engines mentioned if they are losing a full circle at full gas, we suggest to intervene on the vacuum socket inserting on the inlet manifold widening the hole from 0.4 mm to 1.5

mm. Remember that such operation must have performed on a disassembled manifold which must be cleaned afterwards.

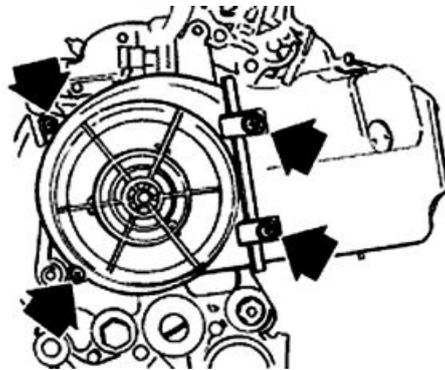
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## Cooling fan

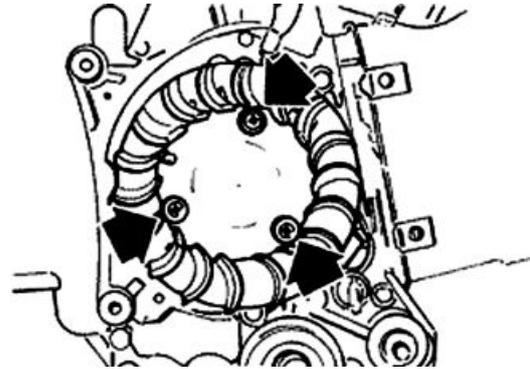
- Refit the parts in reverse order of the removal operation.
- Make sure that there are spacers with the two rear retainers of the housing.
- The long spacers should be in a high position.

### CAUTION

TAKE CARE TO CORRECTLY POSITION THE FLYWHEEL CONNECTOR.



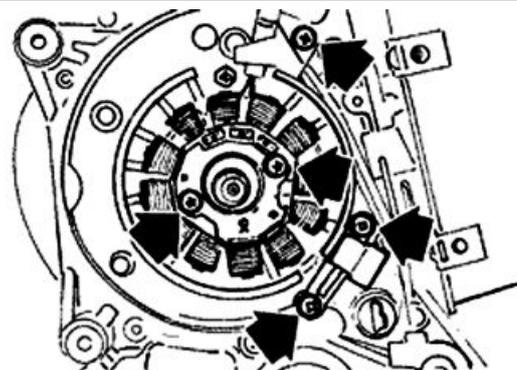
- 
- Remove the cooling fan by acting on the three fixings indicated in the figure.



---

## Removing the stator

- Remove the electric terminal of the minimum oil pressure switch.
- Remove the two Pick-Up screws and the one for the wiring harness bracket as well as the two stator fixing screws shown in the figure.
- Remove the stator and its wiring.



## Refitting the stator

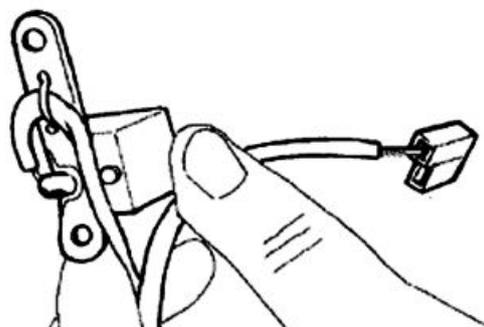
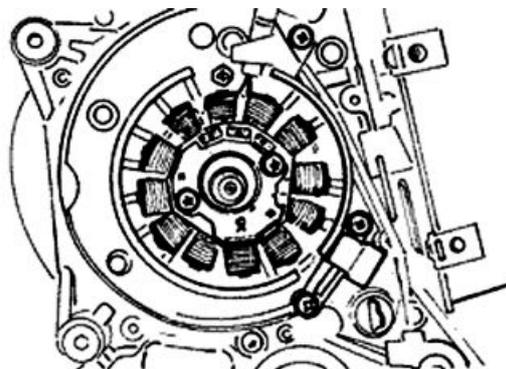
- Refit the stator and flywheel carrying out the removal procedure in reverse, tightening the retainers to the specified torque.
- Place the cable harness as shown in the figure.

**N.B.**

THE PICK-UP WIRE SHOULD BE POSITIONED BETWEEN THE UPPER SCREW AND THE REFERENCE PIN AS SHOWN IN THE DETAIL DRAWING.

### Locking torques (N\*m)

Stator screw 3 ÷ 4



## Flywheel and starting

### Removing the flywheel magneto

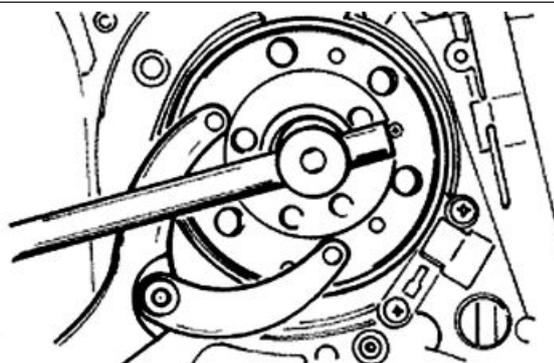
- Lock the rotation of the flywheel using the calliper spanner.
- Remove the nut.

**CAUTION**

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

### Specific tooling

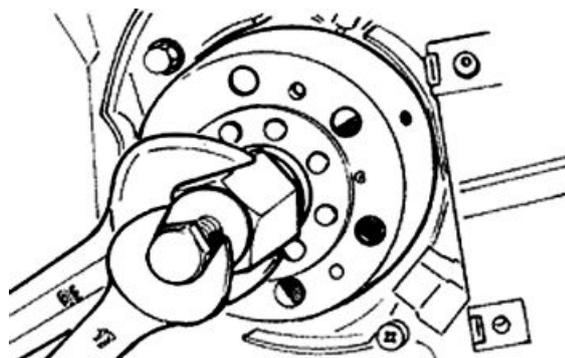
020565Y Flywheel lock calliper spanner



- Extract the flywheel with the extractor.

### Specific tooling

008564Y Flywheel extractor



---

## Inspecting the flywheel components

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

---

## Refitting the flywheel magneto

- Fit the flywheel being careful to insert the key properly.
- Lock the flywheel nut to the prescribed torque
- Check that the Pick-Up air gap is between  $0.34 \div 0.76$  mm.

The air gap cannot be modified when assembling the Pick-Up.

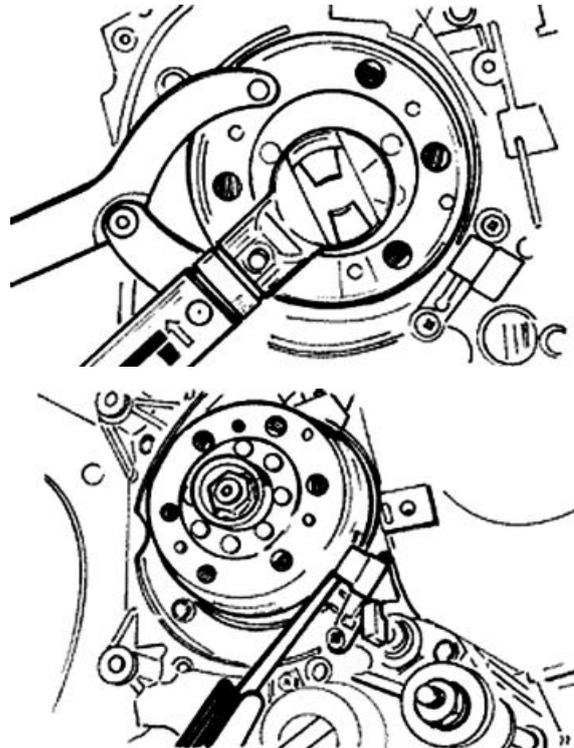
Different values result from deformations visible on the Pick-Up support.

**N.B.**

**A VARIATION IN THE AIR GAP DISTANCE MODIFIES THE IGNITION SYSTEM IDLE SPEED**

### Locking torques (N\*m)

Flywheel nut  $52 \div 58$




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## Refitting the starter motor

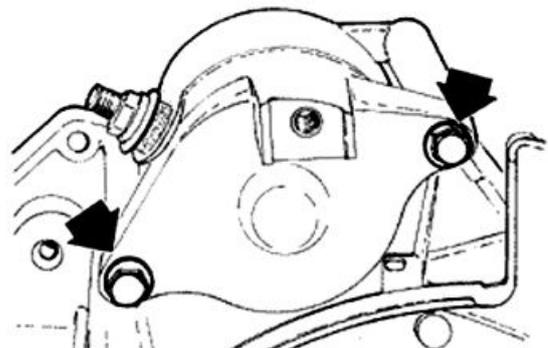
- Fit a new O-ring on the starter and lubricate it.
- Fit the starter on the crankcase, locking the two screws to the prescribed torque.

**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  $11 \div 13$




---

## Cylinder assy. and timing system

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## Removing the timing system drive

- Remove the parts listed below first: transmission cover, belt driving pulley, oil pump pulley cover and pinion separator washer.
- Remove the tappet cover.
- Remove the central screw fastener and the automatic valve-lifter retaining cover, as shown in the figure.
- Remove the return spring of the automatic valve lifter assembly and the automatic valve lifter assembly and its end of stroke washer.
- Loosen the central screw on the tensioner first.
- Remove the two fixings shown in the figure.
- Remove the tensioner with its gasket.
- Remove the internal hex screw and the counterweight shown in the figure.
- Remove the camshaft command pulley and its washer.
- Remove the command sprocket wheel and the timing chain.
- Remove the screws indicated in the figure, the spacer bar and the tensioner pad.

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

### **N.B.**

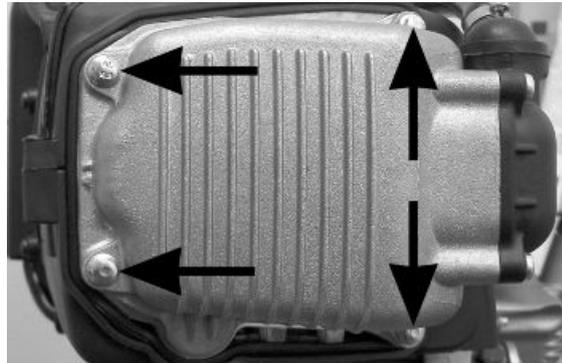
**IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.**

### **See also**

Transmission cover

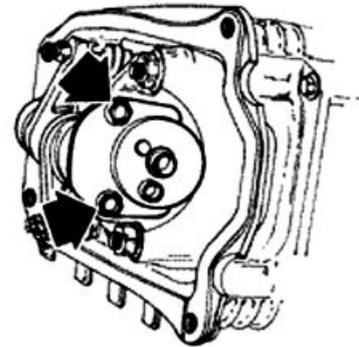
[Removal](#)

[Removing the driving pulley](#)

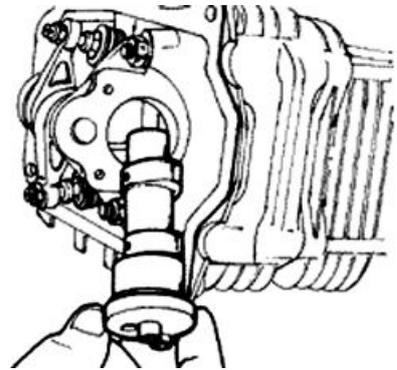


## Removing the cam shaft

- Remove the two screws and the cam shaft re-tainer shown in the diagram.



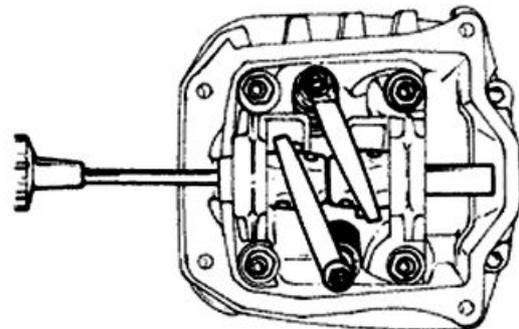
- Remove the cam shaft.



- Remove the pin of the rocking levers from the flywheel side holes.
- Remove the rocking levers and the elastic washer.

**N.B.**

**MARK THE ROCKING LEVERS ASSEMBLE POSITION, SO AS TO AVOID THE INVERSION OF INLET WITH THE OUTLET.**

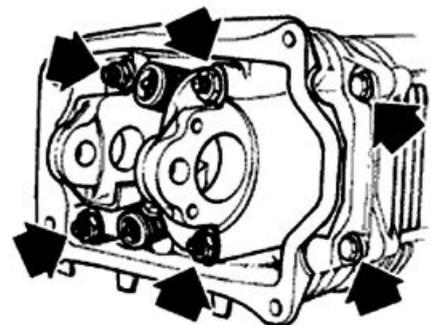


## Removing the cylinder head

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

**N.B.**

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



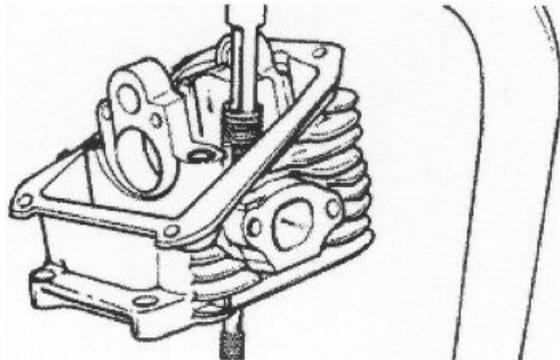
## Removing the valves

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

### Specific tooling

**020382Y Valve cotters equipped with part 012 removal tool**

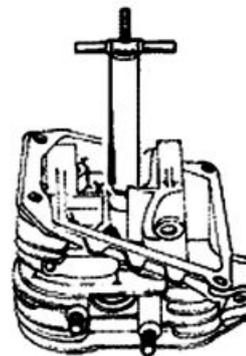
**020382Y011 adapter for valve removal tool**



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

### Specific tooling

**020431Y Valve oil seal extractor**

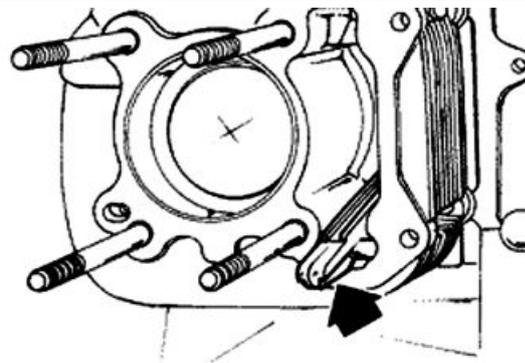


## Removing the cylinder - piston assy.

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

### CAUTION

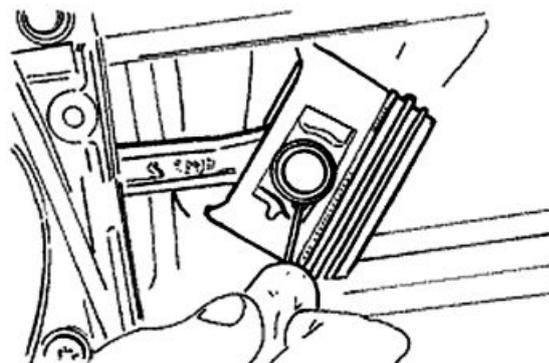
**TO AVOID DAMAGING THE PISTON, SUPPORT IT WHILE REMOVING THE CYLINDER.**



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

### 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 CRANK-SHAFT" CHAPTER".

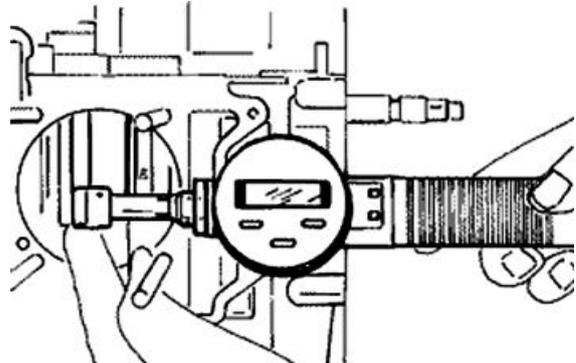
### Characteristic

**Rod small end check-up: Maximum diameter**

15.030 mm

**Rod small end check-up: Standard diameter**

15 +0.015+0.025 mm



## Inspecting the wrist pin

- Check the outer diameter of the gudgeon pin.

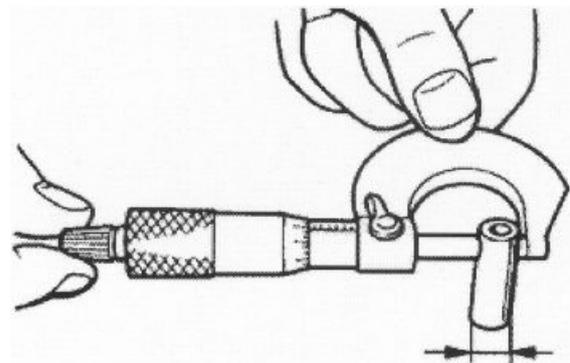
### Characteristic

**Standard pin diameter**

14.996 ÷ 15 mm

**Minimum diameter permitted**

Ø 14.994 mm



- Calculate the piston pin coupling clearance.

### N.B.

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

### Characteristic

**Piston pin bore - standard diameter**

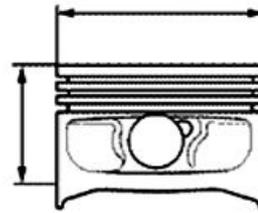
Ø 15+0.001 +0.006



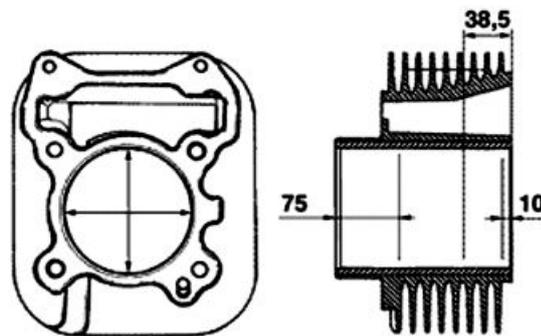
- Measure the outside diameter of the piston, perpendicular to the gudgeon pin axis.
- Measure 36.5 mm from the piston crown's shown in the figure.

**N.B.**

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



- 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).

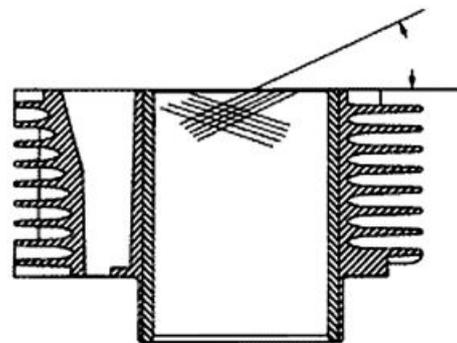


**Characteristic**

**Maximum allowable run-out:**

0.05 mm

- The cylinder rectifying operation should be carried out with a surfacing that respects the original angle.
- The cylinder surface roughness should be 0.9 micron.
- 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 three categories 1st, 2nd, 3rd with 0.2-0.4-0.6 mm oversize. They are also classified into 4 categories A-A, B-B, C-C, D-D.



**Inspecting the piston**

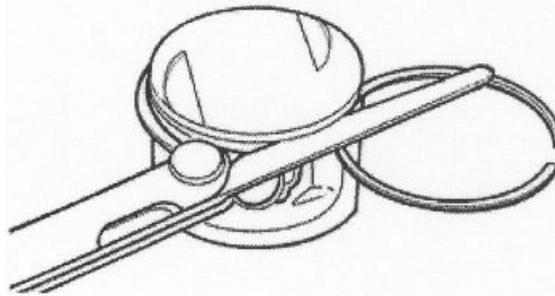
- Carefully clean the seal housings.
- Measure the coupling clearance between the seal rings and the grooves using suitable sensors, as shown in the diagram.
- If the clearance is greater than that indicated in the table, replace the piston.

**STANDARD COUPLING CLEARANCE**

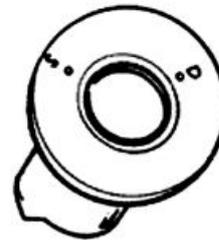
Name	Description	Dimensions	Initials	Quantity
Top piston ring		0.025 ÷ 0.070		
Middle piston ring		0.015 ÷ 0.060		
oil scraper		0.015 ÷ 0.060		

**MAXIMUM ADMITTED CLEARANCE AFTER USE**

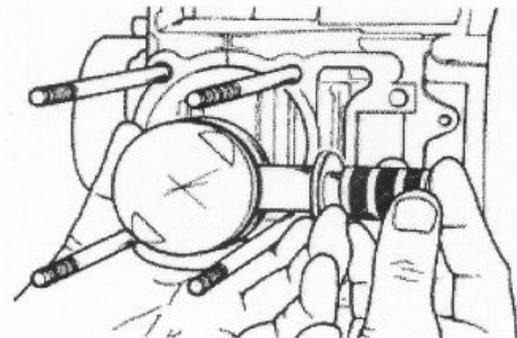
Name	Description	Dimensions	Initials	Quantity
Top piston ring		0.080 mm		
Middle piston ring		0.070 mm		
oil scraper		0.070 mm		

**Removing the piston**

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

**Specific tooling****020430Y Pin lock fitting tool**

- With the opening in position indicated on the tool, take stop ring in the closed position using the punch.
- Fit the wrist pin stop using the plug as shown in the figure

**N.B.**

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

**CAUTION**

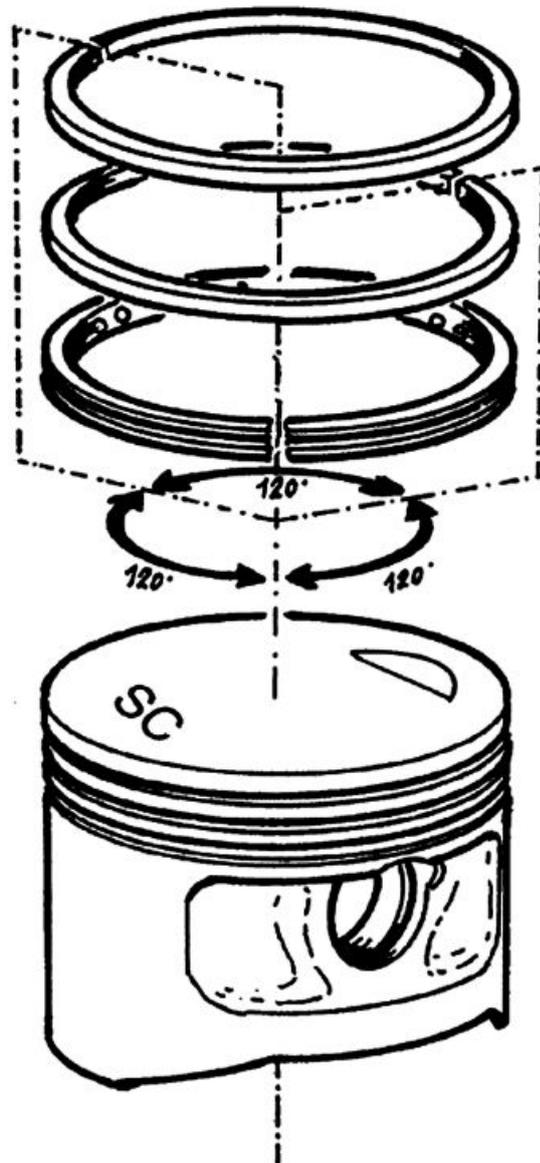
**USING A HAMMER TO POSITION THE RINGS CAN DAMAGE THE LOCKING HOUSING.**

## Refitting the piston rings

- Place the oil scraper spring on the piston.
- Refit the oil scraper ring with the join of spring ends on the opposite side from the ring gap and the word 'TOP' towards the crown of the piston. The tapered side of the middle piston ring should always be facing away from the crown of the piston.
- Fit the middle piston ring with the identification letter facing the crown of the piston. In any case, the step must be facing opposite the piston top.
- Fit the top piston ring with the word 'top' or the reference mark facing the crown of the piston.
- Offset the piston ring gaps on the three rings by  $120^\circ$  to each other as shown in the figure.
- Lubricate the components with engine oil.

### N.B.

SO AS TO OBTAIN THE BEST CONFIGURATION THE 2 SEALING RINGS ARE MADE WITH A CONTACT CONICAL CYLINDER SECTION.



## Refitting the cylinder

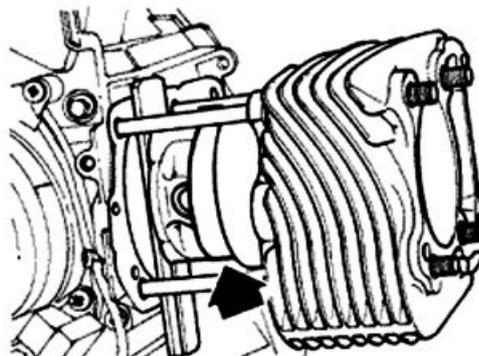
- Insert the cylinder base gasket with the thickness determined above.
- Using the fork support and the piston ring retaining band, refit the cylinder as shown in the figure.

### N.B.

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

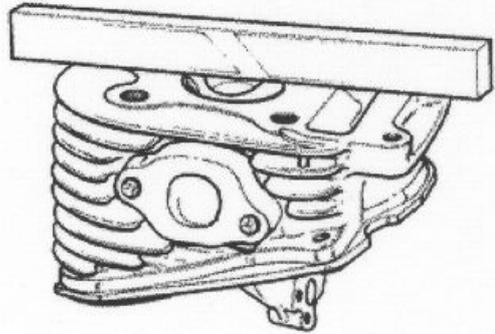
### Specific tooling

020426Y Piston fitting fork



**020427Y Piston fitting band****Inspecting the cylinder head**

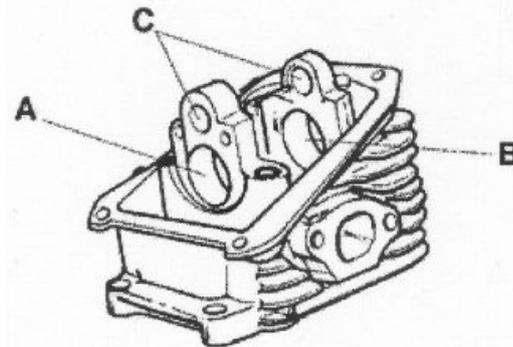
- Using a trued bar check that the cylinder head surface is not worn or distorted.
- Check that the camshaft and rocking lever pin bearings show no signs of wear.
- Check that the cylinder head cover surface, the intake manifold and the exhaust manifold are not worn.

**Characteristic****Maximum admitted unevenness: Head check**

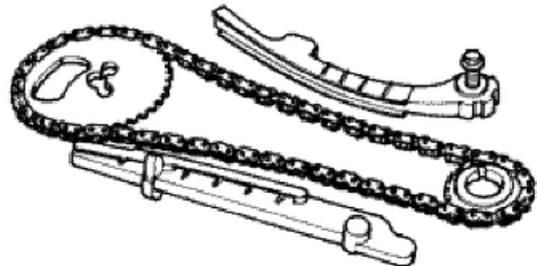
0.05 mm

**STANDARD DIAMETER**

Specification	Desc./Quantity
Standard diameter	A $\varnothing 32.5 \div 32.525$
Standard diameter	B $\varnothing 20 \div 20.021$
Standard diameter	C $\varnothing 12 \div 12.018$

**Inspecting the timing system components**

- Check that the guide shoe and the tensioner shoe are not worn out.
- Ensure that the camshaft drive pulley, the chain assembly and the 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.

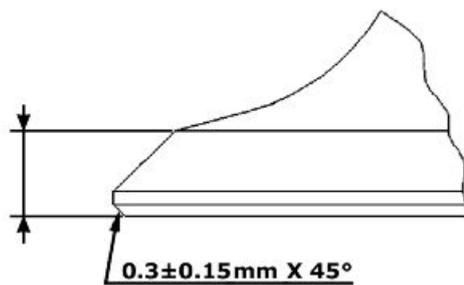


### Inspecting the valve sealings

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

#### VALVE SEAL SURFACE

Specification	Desc./Quantity
Inlet valve - seal surface	2.4 ÷ 2.8 mm
Outlet valve - seal surface	2.2 ÷ 2.6 mm



### Inspecting the valve housings

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

#### Characteristic

##### Standard drainage guide diameter

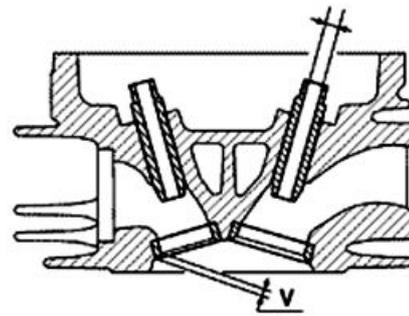
5.012 mm

##### Standard inlet guide diameter

5.012 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

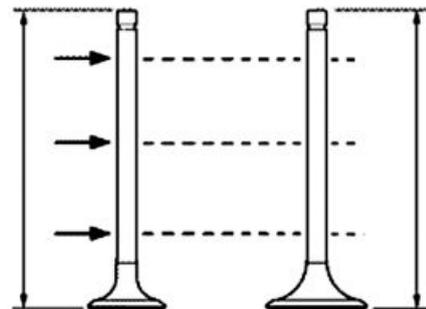
#### Wear limits:

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 valve and valve guide.



### Characteristic

#### Minimum diameter admitted - Inlet:

4.96 mm

#### Minimum diameter admitted - Outlet:

4.95 mm

#### Standard clearance - Inlet:

0.013 ÷ 0.040 mm

#### Standard clearance - Outlet:

0.025 ÷ 0.052 mm

#### Maximum clearance admitted- Inlet:

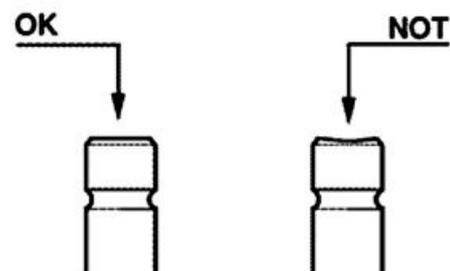
0.062 mm

#### Maximum clearance admitted - Outlet:

0.072 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

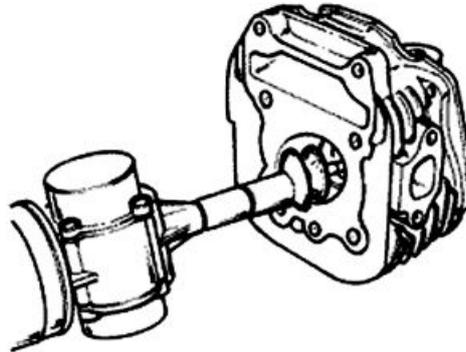
#### Standard valve length - Inlet:

80.6 mm

#### Valve standard length: drainage

79.6 mm

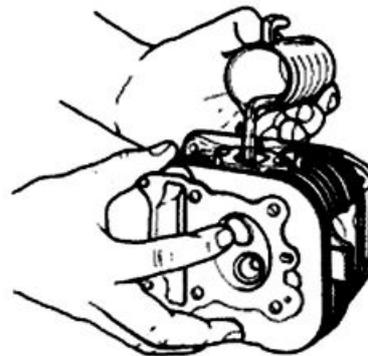
- If the checks above give no failures, you can use the same valves. For best sealing results, it is advisable to grind the valves. Grind the valves gently with a fine-grained lapping compound. During grinding, keep the cylinder head in a horizontal position. This will prevent the lapping compound residues 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.**

- 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.



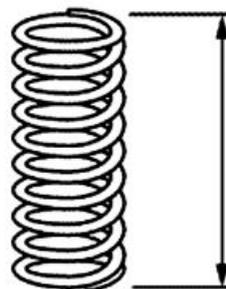
## Inspecting the springs and half-cones

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

**Characteristic**

**Valve spring length**

33.9 ÷ 34.4 mm

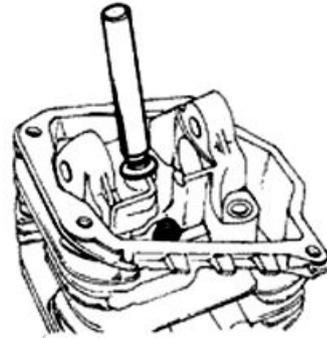


## Refitting the valves

- Lubricate the valve guides with engine oil.
- 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**

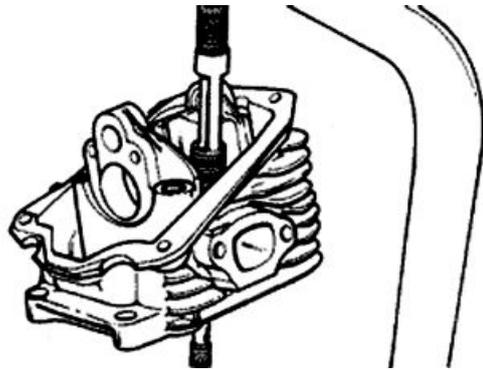


- Fit the valves, the springs and the spring retaining caps. Using the appropriate tool with adapter 11, compress the springs and insert the cotters in their seats.

### Specific tooling

**020382Y Valve cotters equipped with part 012 removal tool**

**020382Y011 adapter for valve removal tool**



## Inspecting the cam shaft

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

### Characteristic

**Standard diameter Bearing A**

Ø: 32.5 mm -0.025 -0.050 mm

**Standard diameter Bearing B**

20 -0.020 -0.041 mm

**Minimum admitted diameter bearing A**

Ø: 32.440 mm

**Minimum admitted diameter bearing B**

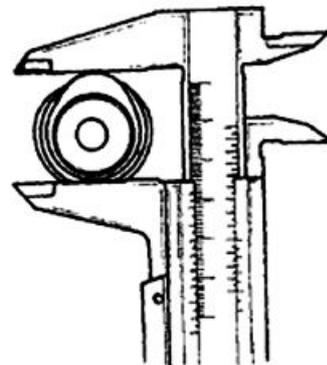
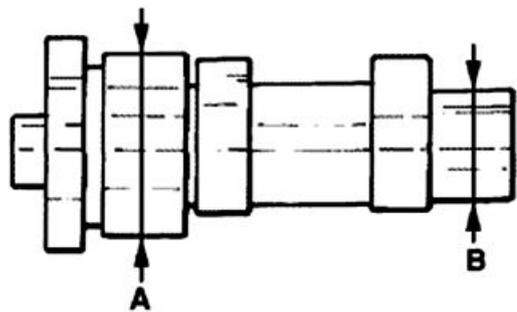
Ø: 19.950 mm

**Inlet cam height**

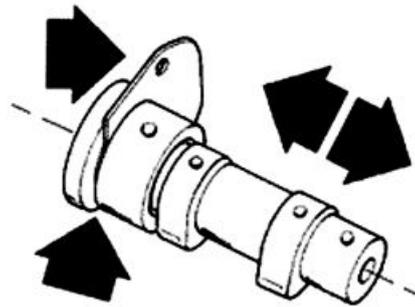
27.512 mm

**Outlet cam height**

27.212 mm



- Check there is no wear on the cam shaft retaining plate and its associated groove on the cam shaft.
- If any of the above dimensions are outside the specified limits, or there are signs of excessive wear, replace the defective components with new ones.

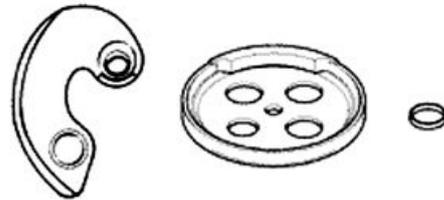


### Characteristic

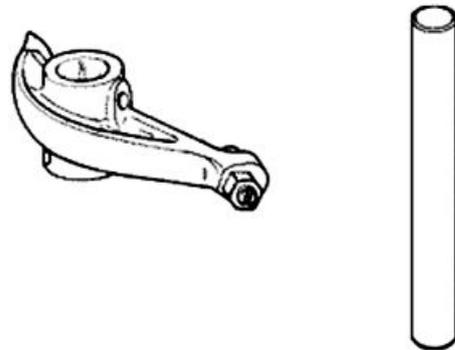
#### Maximum axial clearance admitted

0.42 mm

- Check there are no signs of wear on the automatic valve-lifter cam, or the end-of stroke roller, or the rubber buffer on the automatic valve-lifter retaining cover.
- Check that the valve lifting spring has not yielded.
- Replace any defective or worn components.



- Check there are no signs of scoring or wear on the rocking lever bolt.
- Check there are no signs of wear on the pad from contact with the cam and on the jointed adjustment plate.
- Measure the internal diameter of each rocking lever.
  - Check that the elastic washer dedicated to the axle clearance of the rocking levers is not worn.
- In case of anomalies, replace the damaged components.



### Characteristic

#### Minimum diameter permitted

Ø 11.970 mm

#### Maximum diameter admitted

Ø 12.030 mm

## Refitting the head and timing system components

- Fit the timing chain guide pad.
- Insert the head and cylinder centring dowels, fit the head gasket and the head on the cylinder.

-Screw the nuts and lock them in a crossed sequence and in 2 or 3 stages to the specific torque.

### Locking torques (N\*m)

#### Locking torque 28 ÷ 30

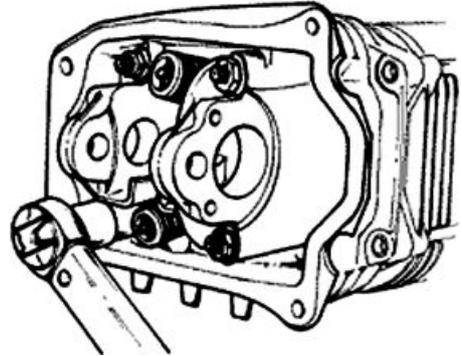
- Fit the two screws on the outside of the timing chain side and tighten them to the specified torque.

**N.B.**

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

### Locking torques (N\*m)

#### Locking torque 11 ÷ 13



- Fit the timing chain sprocket wheel on the crankshaft, with the chamfer facing the insertion side.

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

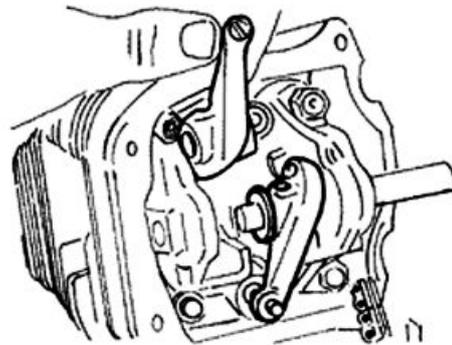
- Fit the tensioner pad by the cylinder head.

- Fit the spacer and the screw fastener.

- Fit the pin, the outlet rocking lever, the spring washer and the inlet rocking lever.

- Lubricate the 2 rocking levers through the holes at the top.

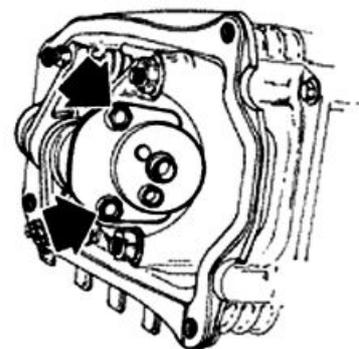
- Lubricate the 2 bearings and insert the camshaft in the cylinder head with the cams opposing the rocking levers.



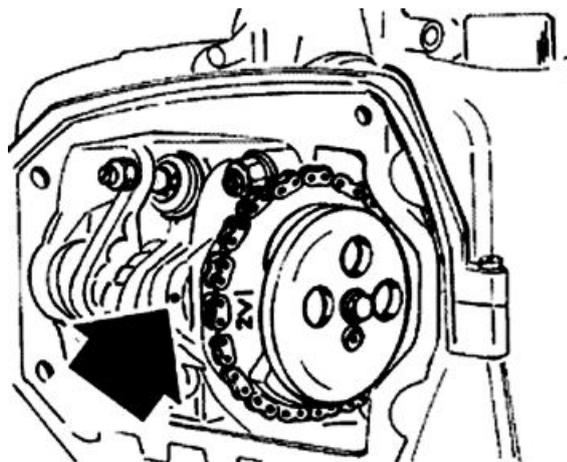
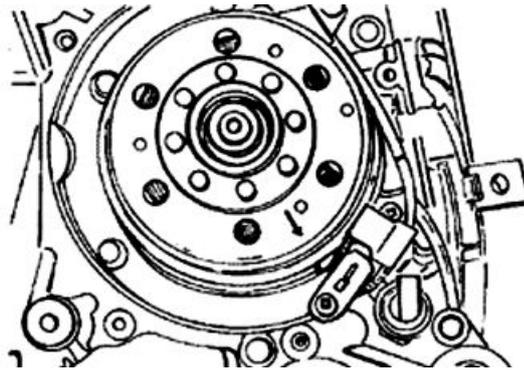
- Insert the retention plate and tighten the two screws shown in the figure to the prescribed torque.

### Locking torques (N\*m)

#### Locking torque 4 ÷ 6



- 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.
- While doing so, fit the chain onto the control camshaft pulley and keep the reference 2V in correspondence with the reference mark on the head.
- Fit the pulley onto the camshaft.
- Assemble the counterweight with the corresponding fixing screw and tighten to the specified torque.



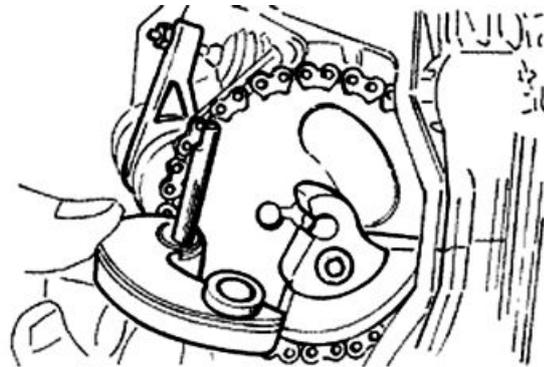
### Locking torques (N\*m)

Locking torque 7 ÷ 8.5

- Fit the end-stop ring on the automatic valve-lifter cam and fit the automatic valve-lifter cam to the cam shaft.
- Fit the automatic valve-lifter return spring.
- During this operation the spring must be loaded approximately 180°.

#### N.B.

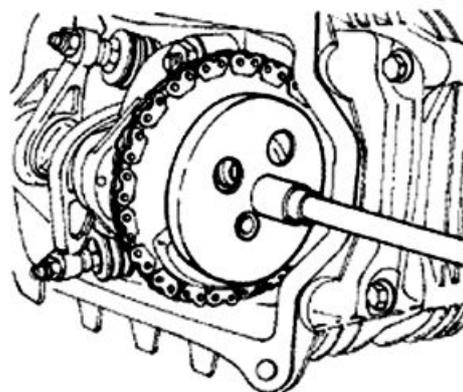
**GREASE THE END STOP RING TO PREVENT IT COMING OUT AND FALLING INTO THE ENGINE.**



- Fit the automatic valve-lifter retaining dish, using the counterweight screw fastener as a reference.
- Tighten the clamping screw to the prescribed torque.

### Locking torques (N\*m)

Locking torque 12 - 14



- 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.

**Locking torques (N\*m)****Locking torque 11 ÷ 13**

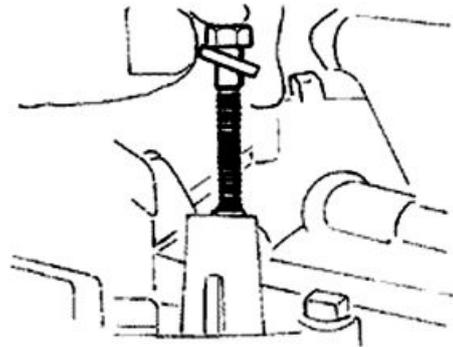
- Insert the chain tensioning screw, together with the spring and washer, tightening it to the prescribed torque.

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

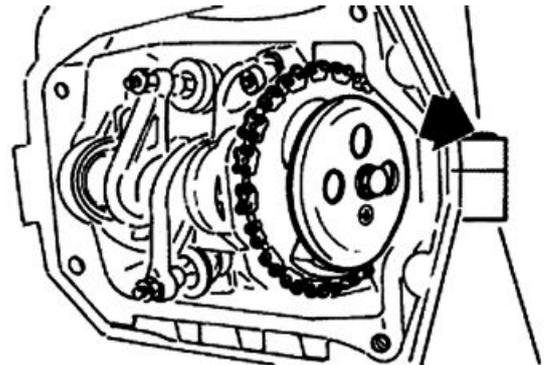
- Adjust the valve clearance.
- Fit the spark plug

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

0.8 mm

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

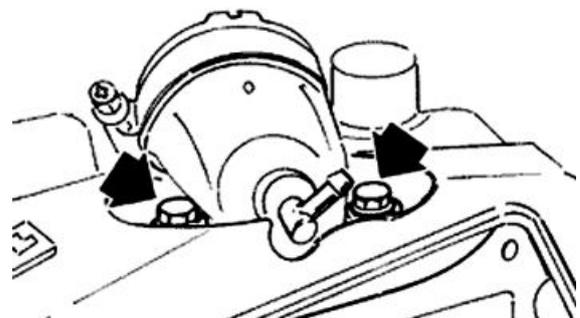
- Assemble the casing sealing gasket on the head.
- On the fitting direction, use the supplements on the timing side as reference.
- Assemble the screw fixing the housing to the crankcase to the specified torque and the 2 self-threading screws joining the half-shells.
  - Take care that the gasket is well inserted in its housing during the assembly stage.
  - Place the spark plug access cap.

**Locking torques (N\*m)****Locking torque 3 ÷ 4**

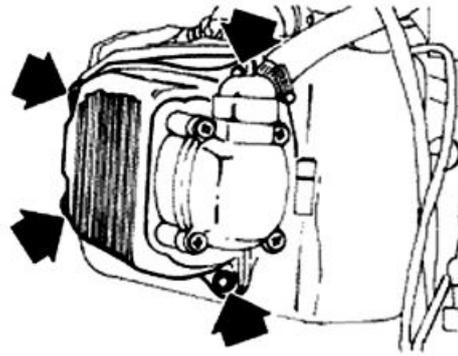
- Fit the inlet manifold and lock the 2 screws to the specified torque.
- Fit the carburettor onto the inlet manifold and lock the clamp

**N.B.**

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

**Locking torques (N\*m)****Locking torque 11 ÷ 13**

- Refit the cylinder head cover, tightening the 4 clamping screws to the prescribed torque.
- Refit the fan and the housing.
- Reassemble the oil pump control, the chain compartment cover, the by-pass and the oil sump as described in the lubrication chapter.
- Reassemble the driving pulley, the belt and the transmission cover as described in the transmission chapter.

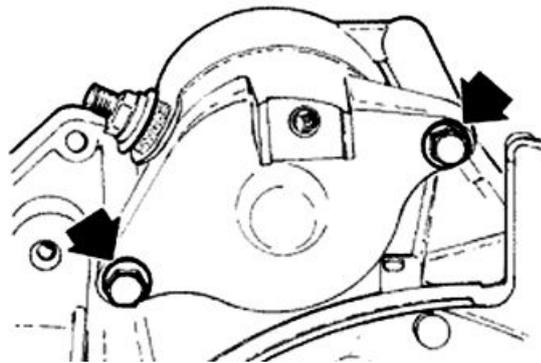


### Locking torques (N\*m)

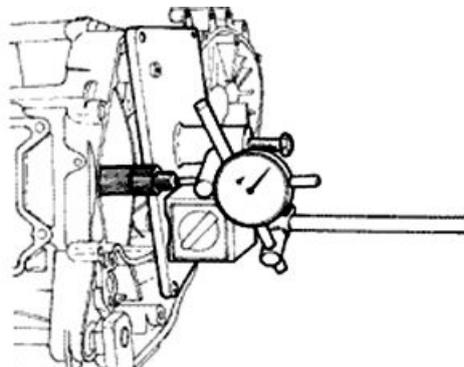
Locking torque 11 ÷ 13

## Crankcase - crankshaft

- Precautionary remove the following units: transmission cover, driving pulley, driven pulley and belt, rear hub cover, gears, bearings and oil seals as described in the transmission chapter.
- Remove the oil sump, the by-pass, the chain compartment cover and the oil pump as in the lubrication chapter.
- Remove the flywheel cover, the fan, the flywheel and the stator as described in the magneto flywheel chapter.
- Remove the oil filter and the oil pressure bulb.
- Remove the cylinder-piston-head unit as described in the cylinder head timing system chapter.
- Remove the 2 retainers indicated in the figure and the starter motor.



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



### Specific tooling

020262Y Crankcase splitting strip

020335Y Magnetic support for dial gauge

### Characteristic

Standard clearance

0.15 ÷ 0.40 mm

## Splitting the crankcase halves

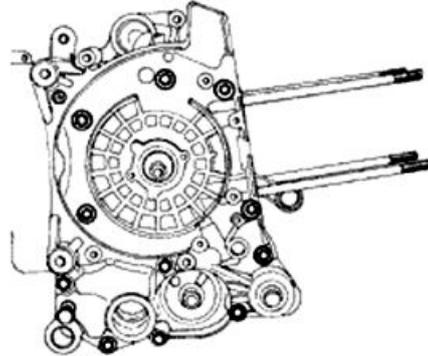
Remove the 11 coupling screws to the crankcase.

- Separate the crankcase while keeping the crankshaft in one of the two halves of the crankcase.

Remove the crankshaft.

### CAUTION

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

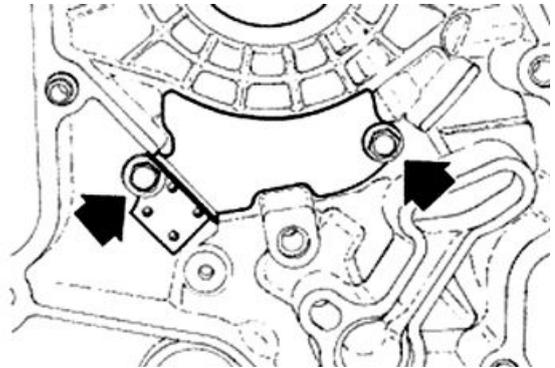


- Remove the coupling gasket of the crankcase halves.

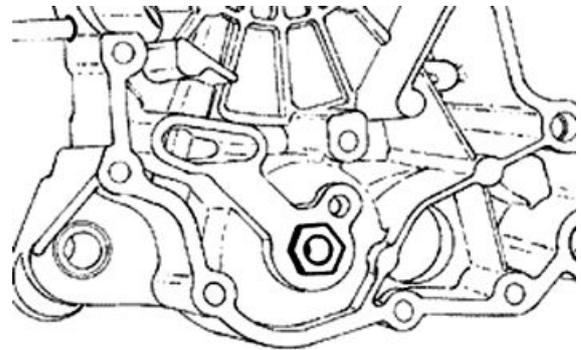
- Remove the two screws and the internal cover shown in the diagram.

### CAUTION

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



- Remove the oil guard on the flywheel side.
- Remove the oil filter fitting shown in the diagram



- Check the axial clearance on the connecting rod.

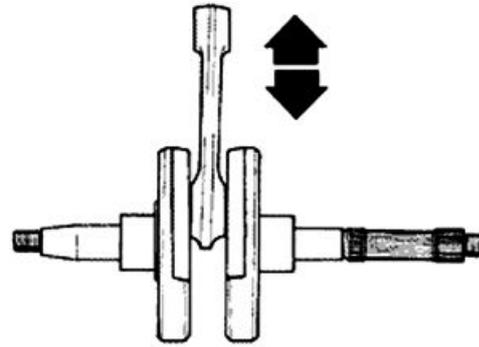
### Characteristic

#### Standard clearance

0.20 ÷ 0.50 mm



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



**CAUTION**

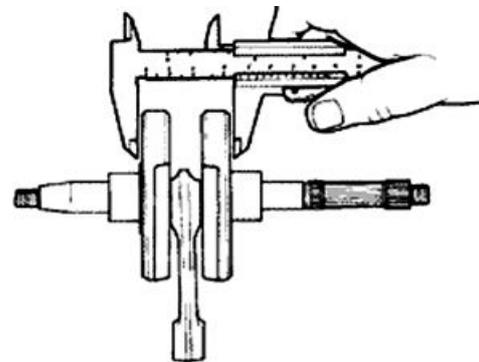
BE CAREFUL NOT TO LET THE MEASUREMENT BE AFFECTED BY THE UNIONS WITH THE CRANKSHAFT ENDS.

**Characteristic**

**Standard clearance**

0.036 ÷ 0.054 mm

- If the axial clearance between crankshaft and crankcase is exceeding and the crankshaft does not have any defect, the problem must be due to either excessive wear or wrong machining on the crankcase.



**CAUTION**

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

**Characteristic**

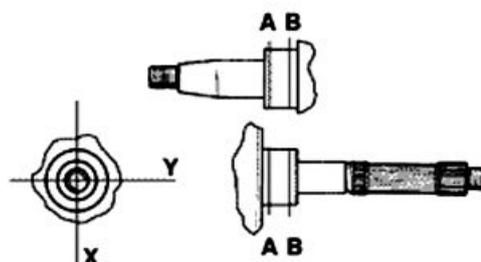
**Distance between the shoulders**

55.67 ÷ 55.85 mm

- Check the diameters of both the bearings of the crankshaft in accordance with the axes and surfaces shown in the figure. The half-shafts are classified in two categories Cat. 1 and Cat. 2 as shown the chart below.

**STANDARD DIAMETER**

Specification	Desc./Quantity
Category 1	28.998 ÷ 29.004
Class 2	28.004 ÷ 29.010



## Inspecting the crankshaft alignment

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

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

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

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

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

**N.B.**

**THE MAIN BEARINGS ARE NOT GRINDABLE**

### Specific tooling

**020074Y Support base for checking crankshaft alignment**

### Characteristic

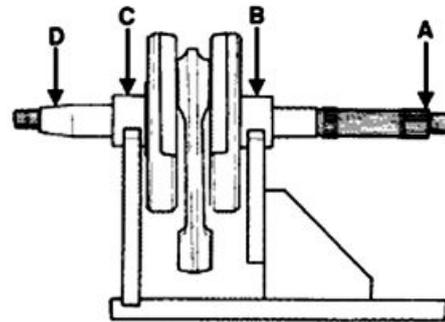
#### Off-line maximum admitted

**A** = 0.15 mm

**B** = 0.01 mm

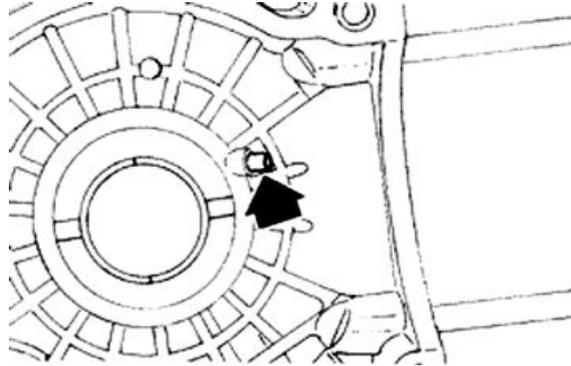
**C** = 0.01 mm

**D** = 0.10 mm



## Inspecting the crankcase halves

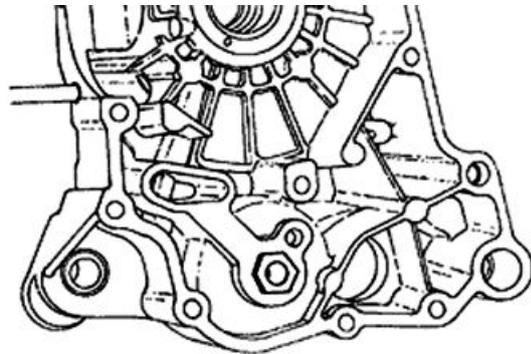
- Before proceeding to check the crankcase halves, thoroughly clean the all surfaces and oil ducts.
- On the transmission side crankcase half, take particular care cleaning the housing and oil ducts for the following components: the oil pump, the oil by-pass valve, the main bushings and the cooling jet on the transmission side (see diagram).
- Take particular care, also, that there are no signs wear in the oil by-pass valve housing (see Chapter Lubrication), as this could prevent a good seal in the valve, which regulates the oil pressure.



### N.B.

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

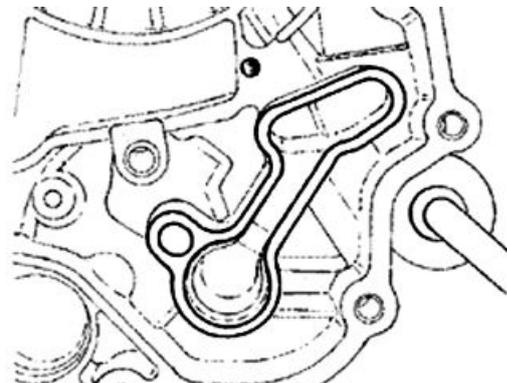
- On the flywheel side crankcase half, take particular care cleaning the oil ducts for the main bushings, the oil duct for the jet that lubricates the cylinder head and the oil drainage duct at the flywheel side oil seal.



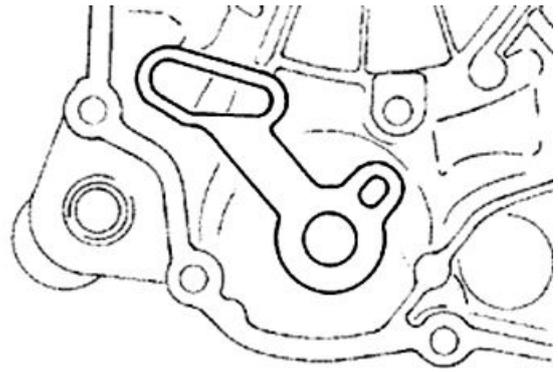
### N.B.

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

- Inspect the mating surfaces on the crankcase halves for scratches or deformation, taking particular with the surfaces that mate with the cylinder and the mating surfaces between the crankcase halves.
- Defects in the crankcase coupling gasket or the surfaces indicated in the figure can cause a drop in the oil pressure and affect the lubricating pressure for the main bushings and the connecting rod.



- Check the main bearing seats that limit axial clearance in the crankshaft show no signs of wear. The dimension between these seats is measured by way of the procedure described previously for measuring the crankshaft axial clearance and dimensions.



## Inspecting the crankshaft plain bearings

- To obtain a good bushing lubrication it is necessary to have both an optimal lubricating pressure (4 bar) and a good oil flow rate; the bushings must be correctly positioned so as not to obstruct the oil supply channels.

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

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

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

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

### **N.B.**

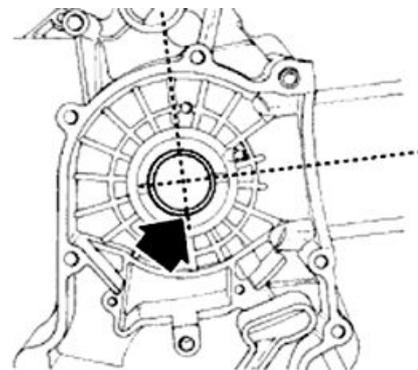
**TO KEEP THIS POSITION OF THE BUSHINGS ON THE CRANKCASE, FITTING IS FORCED ON STEEL RINGS INSERTED IN THE CASTING OF BOTH CRANKCASE HALVES.**

### **Characteristic**

#### **Standard driving depth**

1.35 ÷ 1.6

- Check the inside diameter of the main bushings in the three directions indicated in the diagram.
- Repeat the measurements for the other bushing half. see diagram.
- The standard bushing diameter after driving is variable on the basis of a coupling selection.



- The bushing housings in the crankcase are classified into 2 categories - Cat. 1 and Cat. 2 - just like those for the crankshaft.

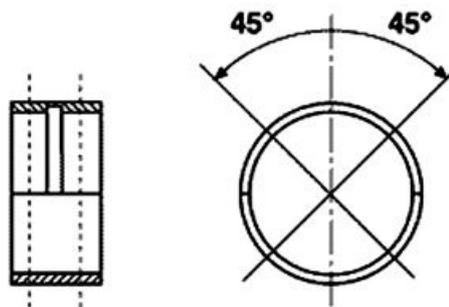
3 - The main bushings are subdivided into 3 thickness categories; see the table below:

**N.B.**

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

**MAIN BEARINGS**

Specification	Desc./Quantity
B	Blue
C	Yellow
E	Green

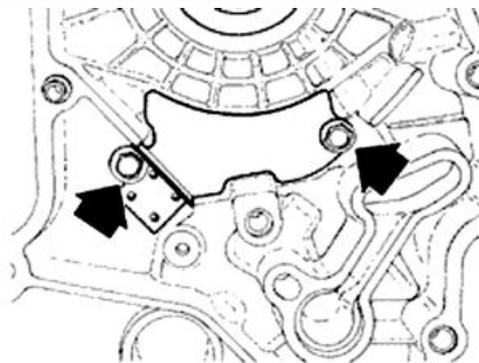


**Refitting the crankcase halves**

- Fit the internal bulkhead by locking the two screws to the prescribed torque.

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

**Locking torque 4 ÷ 6**

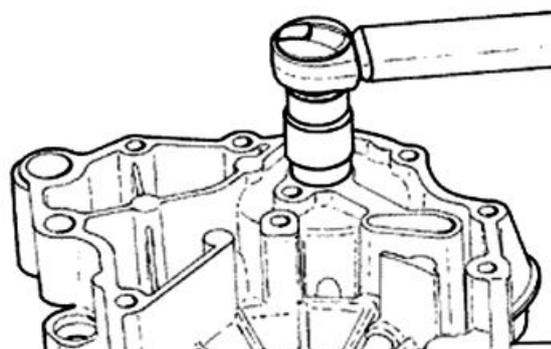


- Fit the oil filter joint and tighten it to the prescribed torque.

- Place a new gasket on one of the crankcase halves, preferably on the transmission side, together with the locating dowels.

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

**Locking torque 27 ÷ 33**



- Lubricate the main bushings and insert the crankshaft in the transmission side crankcase half.
- Reassemble the two crankcase halves.
- Fit the 11 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.

### Locking torques (N\*m)

Locking torque 11 ÷ 13

- Lubricate the flywheel oil seal.
- Use the appropriate tool to assemble the oil seal.
- Fit a new O-ring on the pre-filter and lubricate it.
- Insert the pre-filter on the engine with its corresponding cover to the specific torque.

**N.B.**

REMOVE ANY EXCESS FROM THE CRANKCASE COUPLING GASKET ON THE CYLINDER PLANE, TO ENSURE BETTER SEALING PERFORMANCE.

**N.B.**

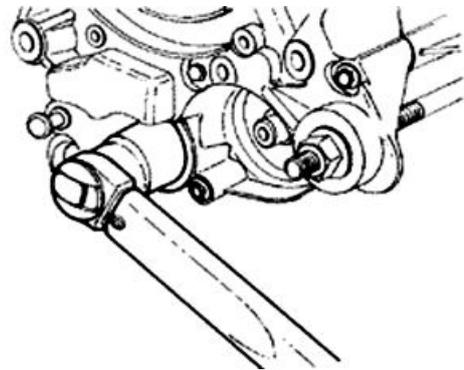
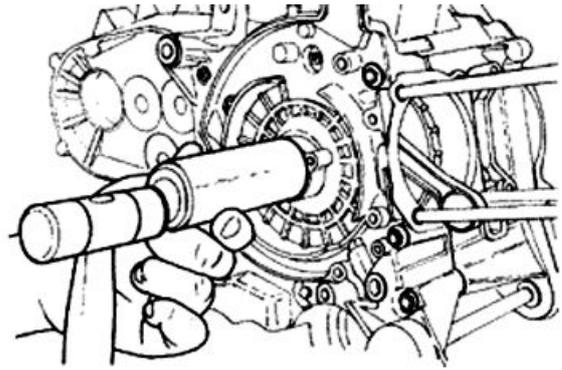
FAILURE TO USE THE SPECIFIC TOOL CAN RESULT IN AN INCORRECT DEPTH POSITION AND AS A CONSEQUENCE IN INADEQUATE OIL SEALING.

### Specific tooling

020425Y Punch for flywheel-side oil seal

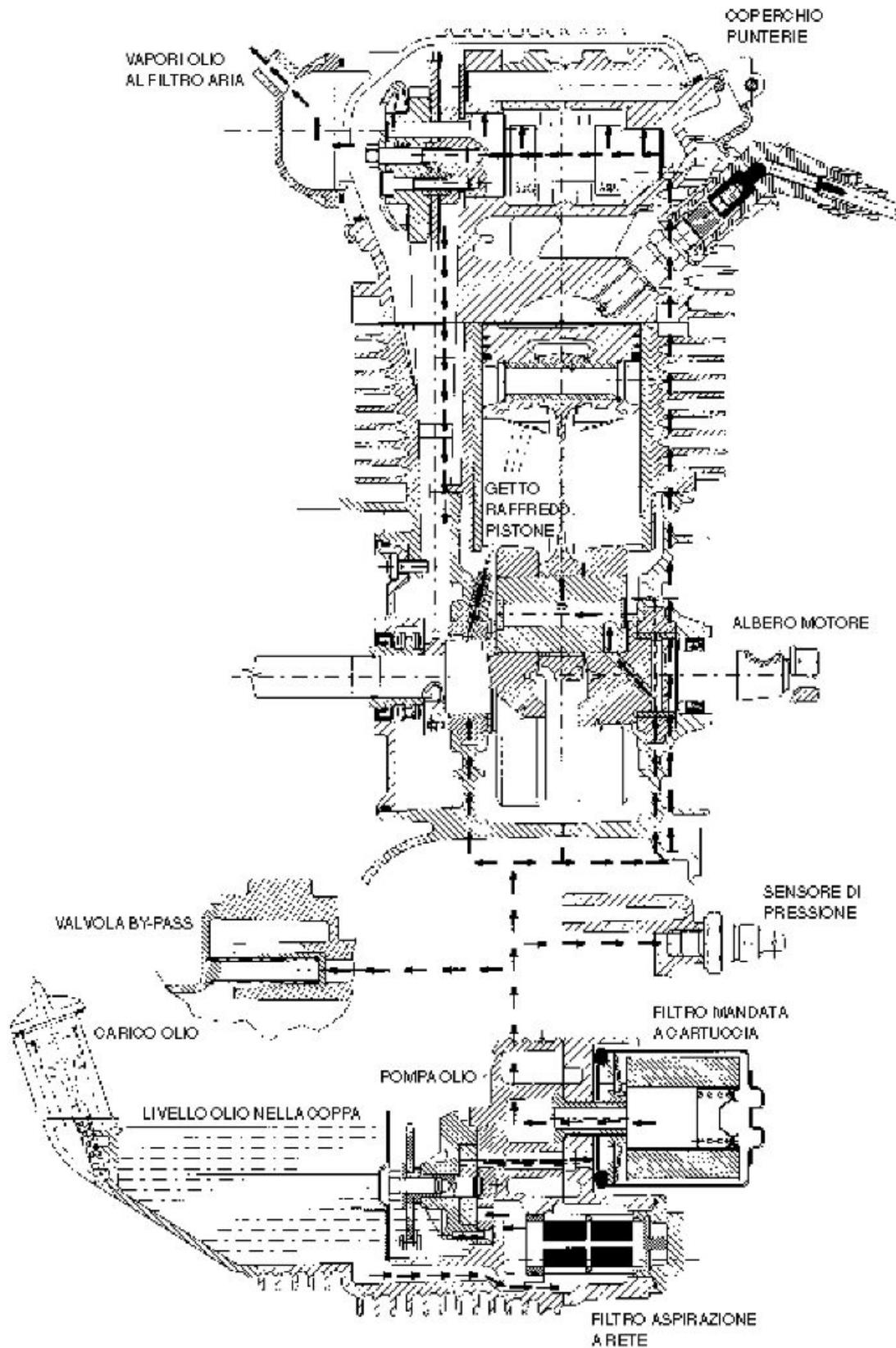
### Locking torques (N\*m)

Locking torque 24 ÷ 30



## Lubrication

Conceptual diagrams



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## Oil pressure check

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- After removing the cover protections as described in the "Flywheel" chapter, disconnect the electrical connexion of the minimum oil pressure switch and then remove the switch.
- With the engine idling at 1650 rpm and the oil temperature at  $\sim 90^{\circ}\text{C}$ , check that the oil pressure is between  $0.5 \div 1.2$  atm.
- With the engine idling at 6000 rpm and the oil temperature at  $\sim 90^{\circ}\text{C}$ , check that the oil pressure is between  $3.2 \div 4.2$  atm.
- Remove the appropriate tools once the measurement is complete, refit the oil pressure switch and washer, tightening it to the prescribed torque and fit the fan cover.
- If the oil pressure is outside the specified limits, in the following order, check: the oil filter, the oil by-pass valve, the oil pump and the crankshaft seals.

**N.B.**

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

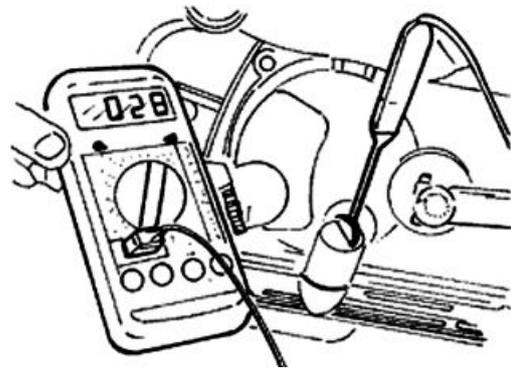
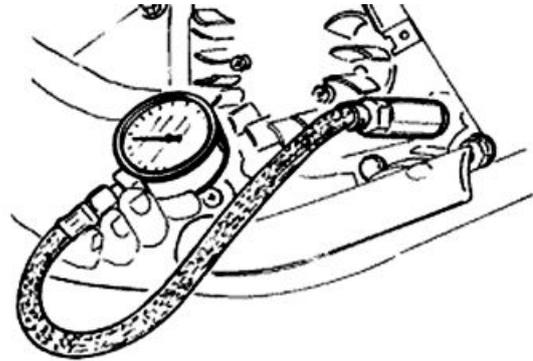
### Characteristic

#### Minimum pressure admitted

3.2 atm.

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

**Locking torque**  $12 \div 14$  (also valid for the control connector).



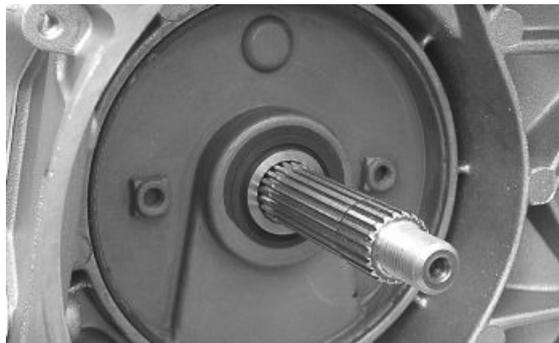
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## Crankshaft oil seals

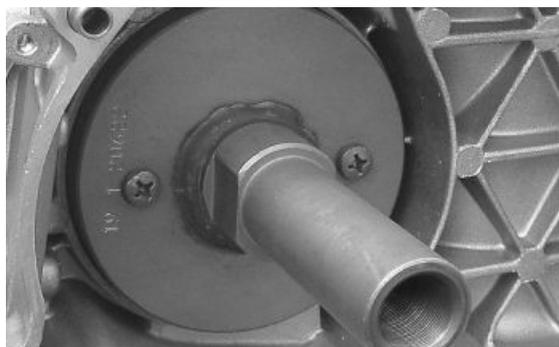
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## Removal

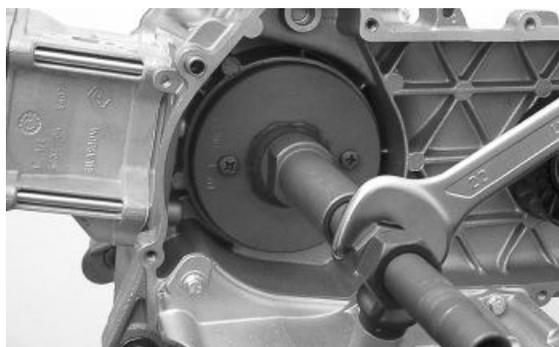
- First remove the transmission cover and the complete driving pulley



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



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



### Specific tooling

**020622Y Transmission-side oil guard punch**

## Refitting

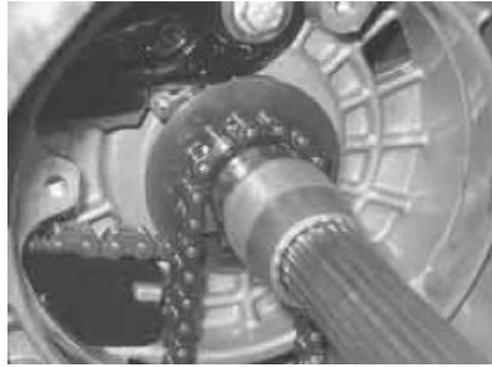
- Prepare the new oil guard, lubricating the sealing lip. Warning: do not lubricate the surface for keying onto the engine crankcase.

### CAUTION

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



- 
- Preassemble the oil seal with the appropriate tool, positioning the screws
  - Place the sheath over the crankshaft



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

**CAUTION**

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



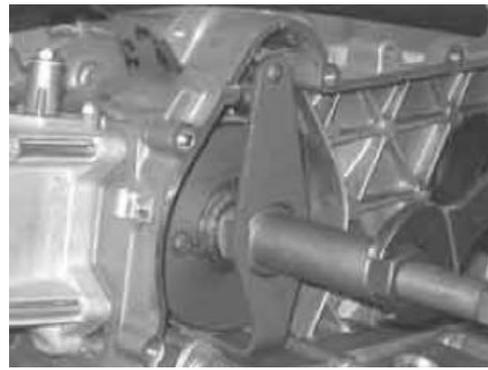
- 
- Orientate the oil guard by inserting the bracket which is part of the specific tool.



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



- Use the nut to move the base of the tool until you can see end of the oil seal driving stroke



- Remove all of the tool components following the procedure in reverse order

#### CAUTION

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

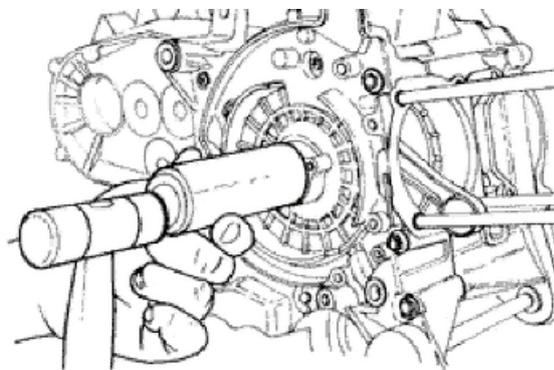
Assemble a new oil seal on the flywheel side using the specific tool as shown in the photograph

#### N.B.

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

#### Specific tooling

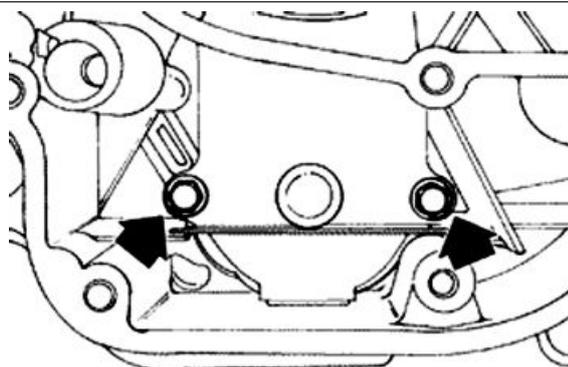
**020425Y Punch for flywheel-side oil seal**



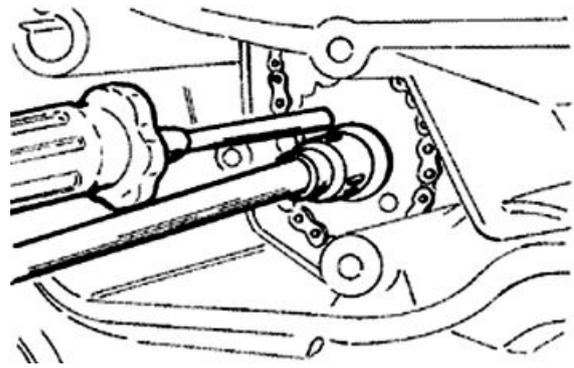
## Oil pump

### Removal

- Remove the cover of the pump control pulley using the two retainers, as shown in the figure.
- Block the rotation of the oil pump control pulley using a screwdriver inserted through one of its two holes.

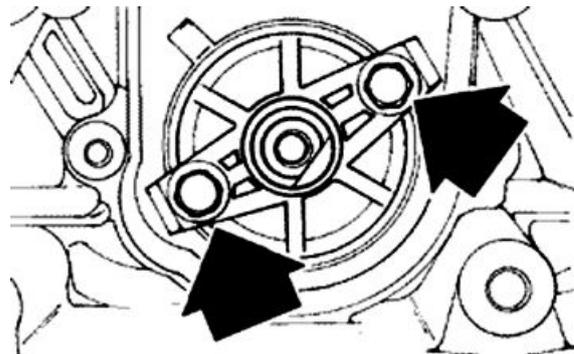


- Remove the central screw with Belleville washer, as shown in the diagram.
- Remove the chain with the pulley.
- Remove the crankshaft control pinion.



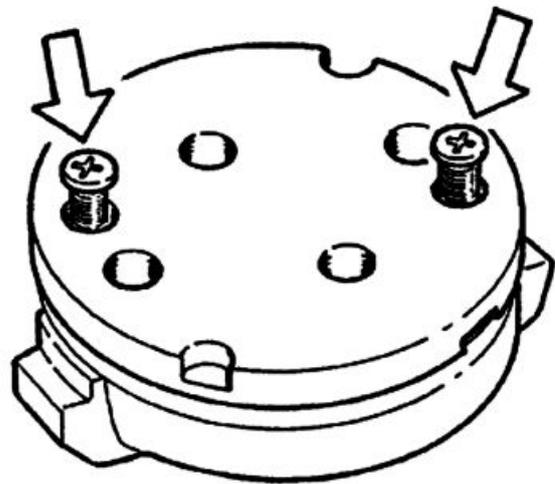
- Remove the oil pump acting on the 2 retainers as shown in the figure.
- Remove the oil pump seal.

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

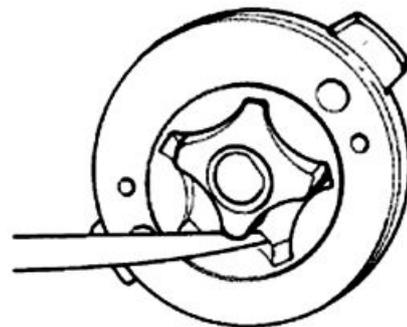


- Using a thickness gauge, check the distance between the rotors in the position shown in the figure.

### Characteristic

#### Maximum clearance admitted

0.12 mm

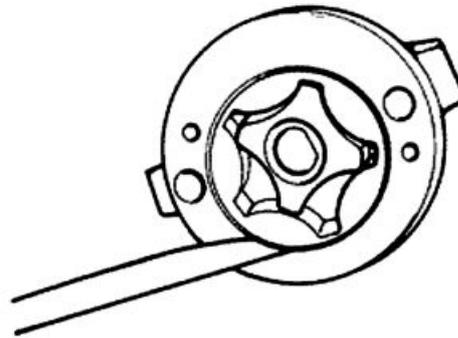


Measure the distance between the outer rotor and the pump body; see figure.

### Characteristic

**Admissible limit clearance:**

0.20 mm

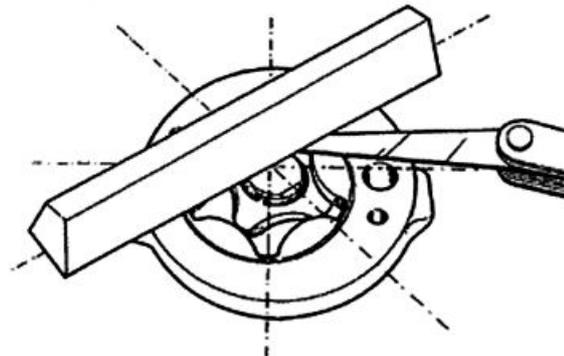


Check the axial clearance of the rotors with a trued bar as reference, as shown in the figure.

### Characteristic

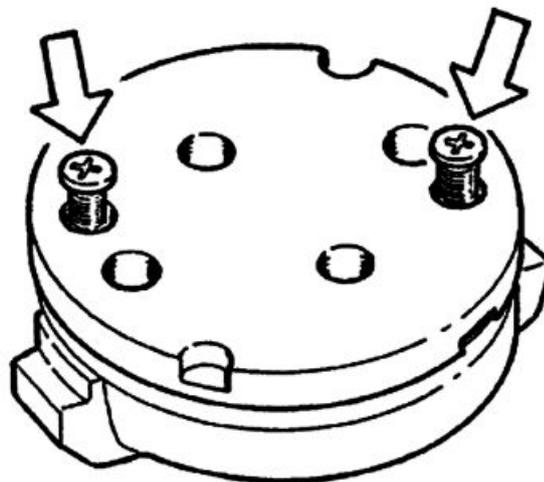
**Limit values admitted:**

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 pulley to the pump, the central screw to the specified torque and the belleville washer.
- Fit the oil pump cover, by tightening the two screws to the prescribed torque.



### N.B.

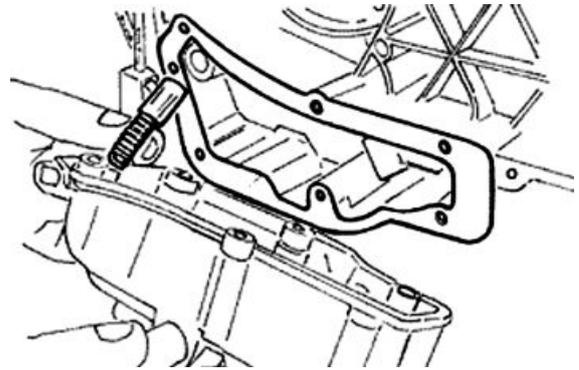
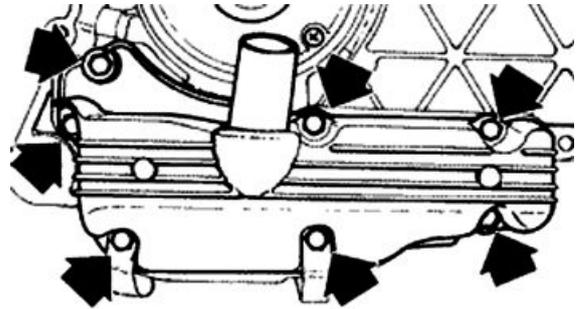
**FIT THE BELLEVILLE WASHER SO THAT ITS OUTER (CURVED) RIM TOUCHES THE PULLEY.**

### Locking torques (N\*m)

**Central screw 12 ÷ 14 Nm Cover screws 0.7 ÷ 0.9 Nm**

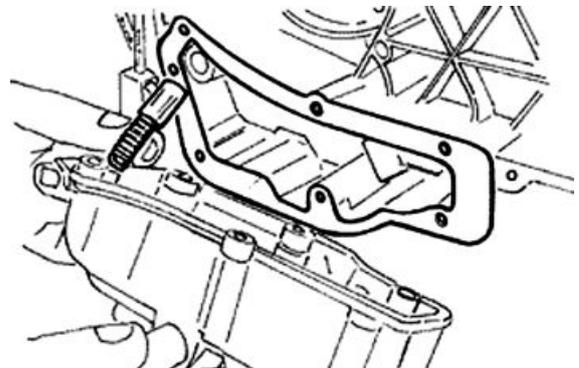
## Removing the oil sump

- Remove the oil filler plug, the transmission cover, the complete drive pulley assembly with belt and the sprocket wheel, as described in the Transmission chapter.
- Drain the oil from the sump as described above.
- Remove the 7 screws indicated in the figure and the 2 rear brake transmission fixing brackets.
- Remove the spring, the by-pass piston and the gasket shown in the second image.



## Inspecting the by-pass valve

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



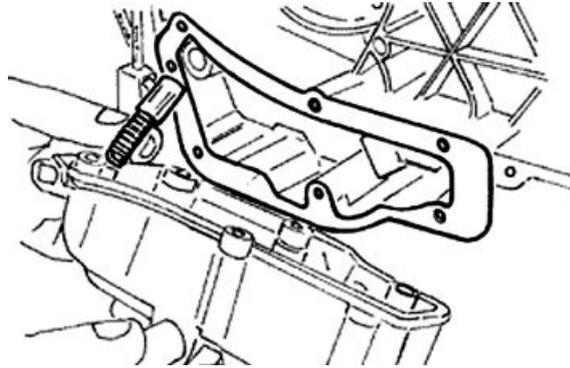
### Characteristic

**By-pass check up: Standard length**

54.2 mm

## Refitting the oil sump

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



### Locking torques (N\*m)

Locking torque 11 ÷ 13

## SAS valve

### Inspecting the one-way valve

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



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

If anomalies are detected, replace the pump.

**N.B.**

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

**N.B.**

**ABSENCE OF VIBRATION INDICATES INEFFICIENT SEALING**

### Specific tooling

**020329Y MityVac vacuum-operated pump**

## Inspecting the cut-off

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



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

**N.B.**

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

**N.B.**

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



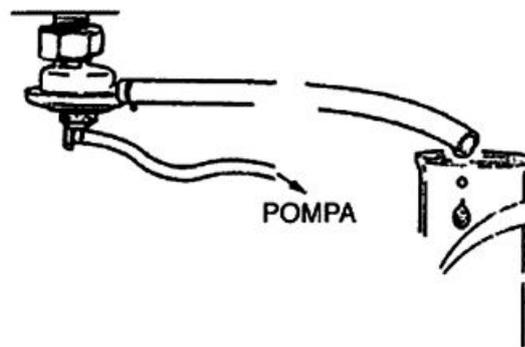
### Specific tooling

**020329Y MityVac vacuum-operated pump**



## Fuel supply

- 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 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 OUT-**

LET 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

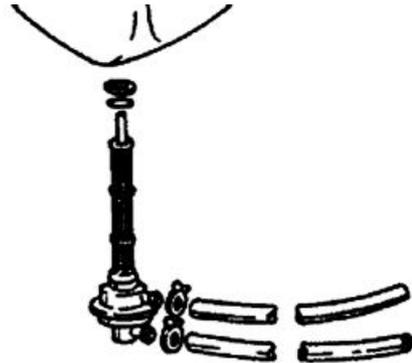
020329Y MityVac vacuum-operated pump

### 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.

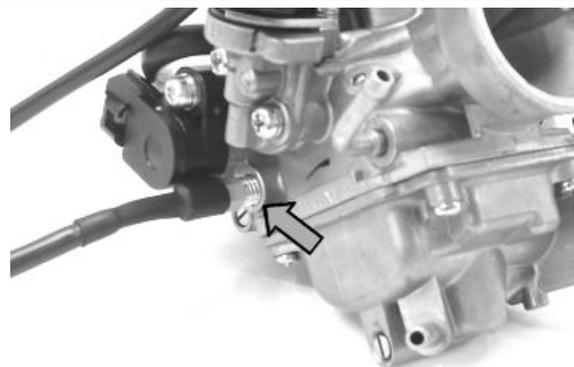
THE FILTER CAN BE UNSCREWED FROM THE COCK TO FACILITATE CLEANING.

## Removing the carburettor

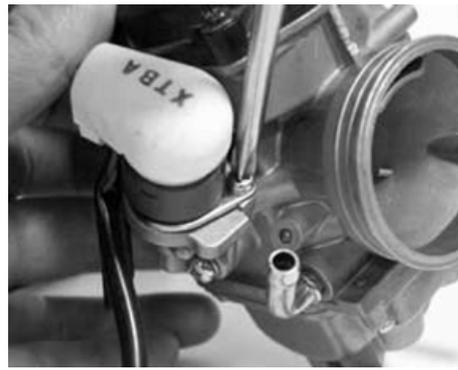
- To detach the carburettor from the engine, it is necessary to move the air filter and remove the throttle control transmission, the automatic starter connection, the clamps anchoring the carburettor to the filter housing and to the inlet manifold, the air delivery pipe to the diaphragm, the heater,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



- Remove the heater



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



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



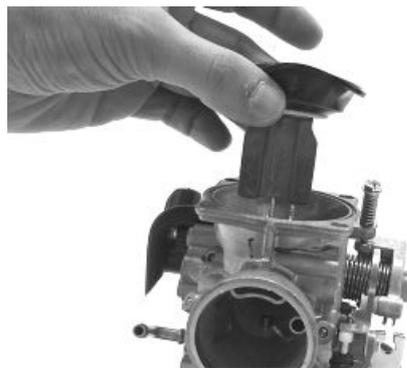
- 
- Remove the 4 fixing screws shown in the figure and the vacuum chamber cover.

**WARNING**

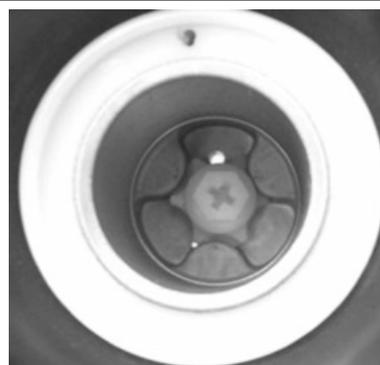
DURING THE REMOVAL OF THE CARBURETTOR COVER TAKE SPECIAL CARE NOT TO RELEASE THE SPRING ACCIDENTALLY.



- 
- Remove the vacuum valve together with the diaphragm.



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



- 
- Remove the 4 screws indicated in the figure.



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



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

**N.B.**

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

**N.B.**

**AVOID REMOVING THE PISTON OF THE PUMP AND ITS CONTROL.**

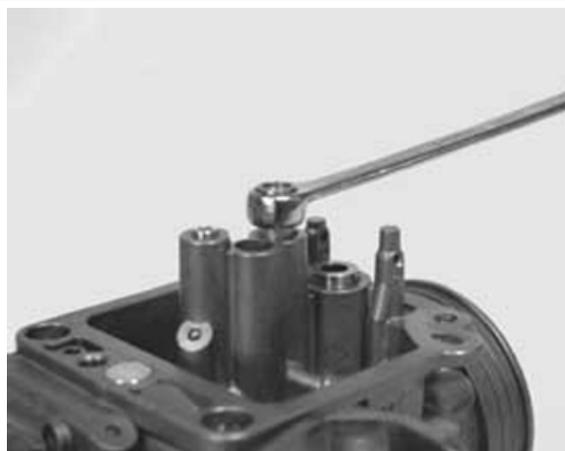


Adequately support the carburettor and using a rod and hammer remove the float pin acting from the throttle control side.

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



- Remove the maximum nozzle.





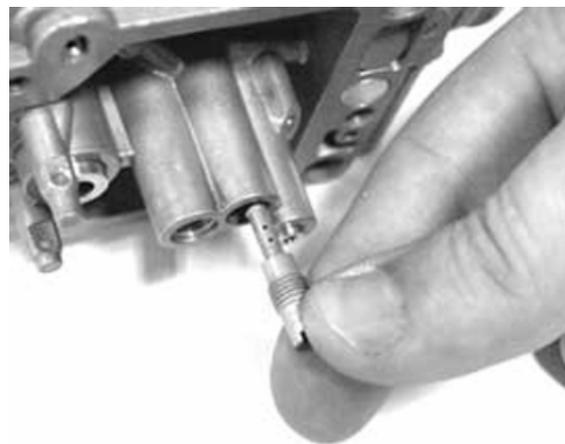
-Remove diffuser.



- Remove the sprayer.

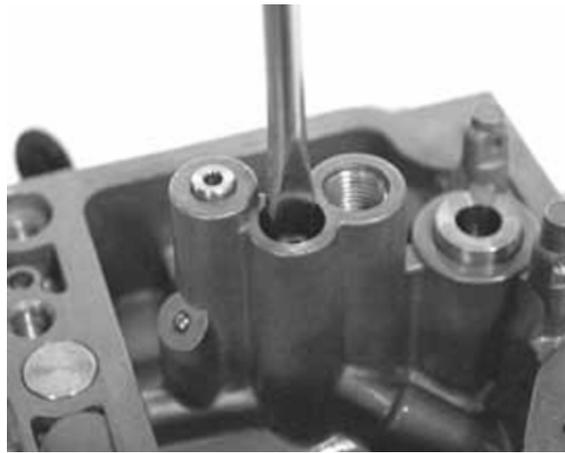
**N.B.**

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



---

-Remove the minimum nozzle.



- Remove the minimum flow set screw and the spring.

**CAUTION**

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



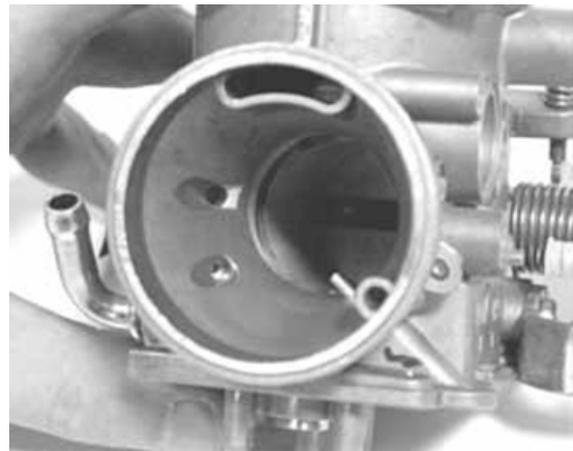
---

## Refitting the carburettor

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



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



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



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

**N.B.**

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

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

**N.B.**

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

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



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



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



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

**N.B.**

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

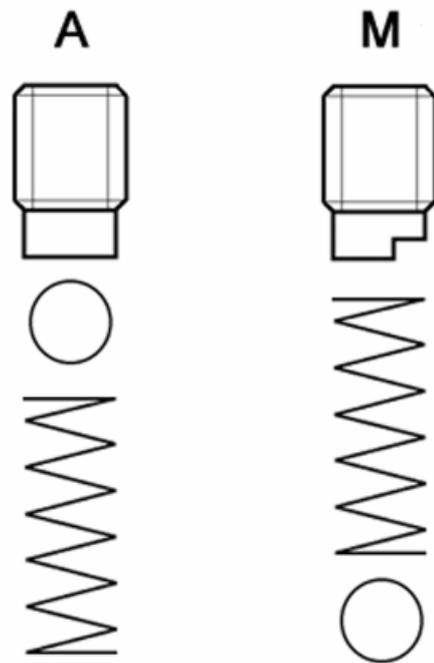
- Remove the drainage screw from the tank, wash and blow it properly and make sure the acceleration pump pipes are clean.
- Operate the acceleration pump piston repeatedly and blow with compressed air.
- Reassemble the acceleration pump valves following this order:

#### INTAKE VALVE (A)

- Spring
- Ball
- Nozzle

#### IN VALVE (M)

- Ball
- Spring
- Nozzle



#### N.B.

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

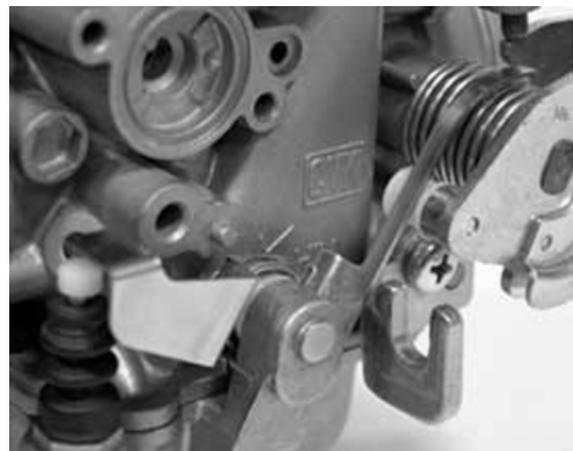
- Check the screw tightness introducing a small amount of fuel in the tank.
- Assemble a new gasket on the tank.
- Assemble the tank on the carburettor body fastening the 4 screws.
- Check that the control roller is free to rotate in its own seat.

#### N.B.

**MAKE SURE THE TANK GASKET IS CORRECTLY INTRODUCED**

#### N.B.

**AVOID DEFORMING THE ACCELERATION PUMP CONTROL ROCKING LEVER.**



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



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

---

## Level check

---

- Place the carburettor inclined as shown in the figure.



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

---

## Inspecting the valve and needle

---

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

**N.B.**

**THE VALVE CAN BE INSERTED IN ONLY ONE POSSIBLE POSITION.**



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



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



### Inspecting the automatic choke device

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



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

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

**N.B.**

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

**Characteristic**

**Check the automatic starter: Kehin: Protrusion value**

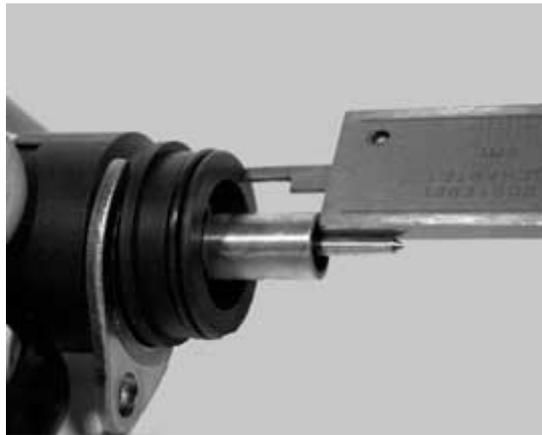
10 mm at about 20°C

**Check the automatic starter: Keihin maximum time**

5 min

**Starter resistance:**

20 Ohm

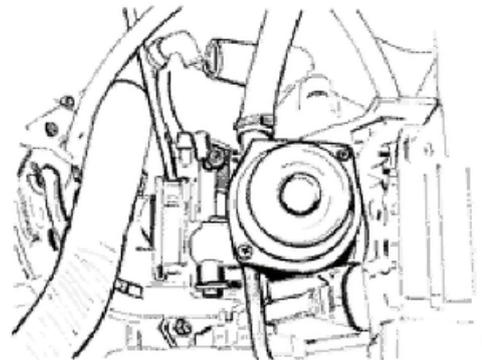
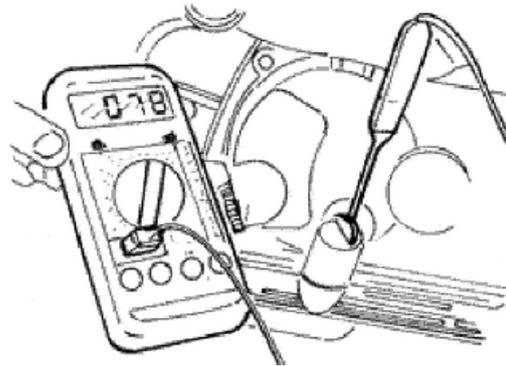


## Adjusting the idle

- 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 the lubrication requirements, valve clearance, and complying timing, spark plug should be in optimum conditions, air filter clean and sealed, and the exhaust system tight.
- Warm up the engine by running it at least 5 minutes at approximately 50 kph.
- Connect a millimetre thermometer (020331y) on 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.
- Using the rpm indicator of the analyser or an independent one (020332y), adjust the idle set screw until 1600 ÷ 1700 rpm is obtained.

**N.B.**

**THE WASTED SPARK IGNITION SYSTEM OFFERS REMARKABLE POWER. READINGS MAY NOT BE ACCURATE IF INADEQUATE RPM INDICATORS ARE USED. CORRECT COUPLING OF THE RPM INDICATOR WILL BE INDICATED WHEN IT CAN READ RPM OVER 6000 ÷ 8000**



## INDEX OF TOPICS

**S**SUSPENSIONS

**SUSP**

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Front suspension

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

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## Front

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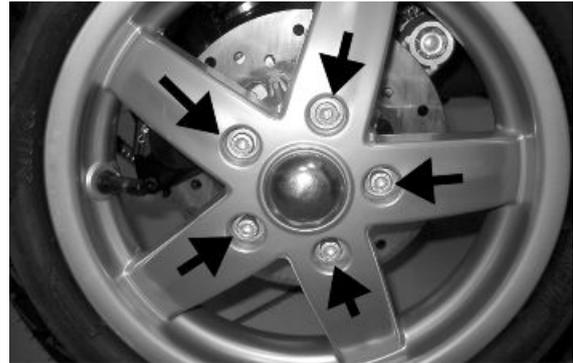
### Removing the front wheel

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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 ball bearing check seeger ring indicated in the photograph



Extract the ball bearing using the specific tool

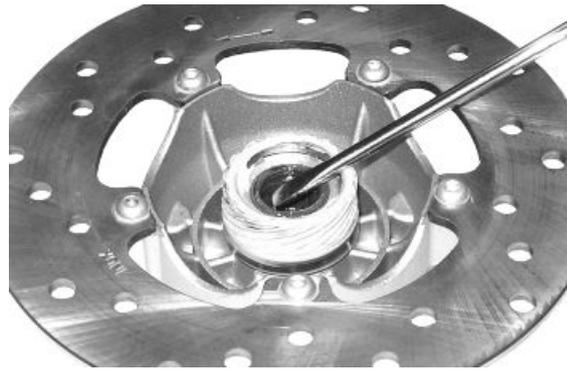
#### Specific tooling

**001467Y014 Pliers to extract  $\varnothing$  15-mm bearings**

**001467Y017 Bell for bearings, OD 39 mm**



- Remove the oil seal on the roller bearing side using a screwdriver.



- Remove the roller bearing using the specific tool

### Specific tooling

**020376Y Adaptor handle**

**020456Y Ø 24 mm adaptor**

**020363Y 20 mm guide**



- Heat the roller bearing seat with a heat gun
- Use the specific tool to introduce and push the bearing until it stops, with the shielded side facing out
- Refit the ball bearing check seeger ring

### Specific tooling

**020151Y Air heater**

**020376Y Adaptor handle**

**020357Y 32 x 35 mm adaptor**

**020412Y 15 mm guide**



- Use the specific tool to fit and push the roller casing until it stops
- Refit the oil seal on the roller bearing side
- Lubricate the area between the roller bearing and the ball bearing

### Specific tooling

**020038Y Punch**

### Recommended products

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



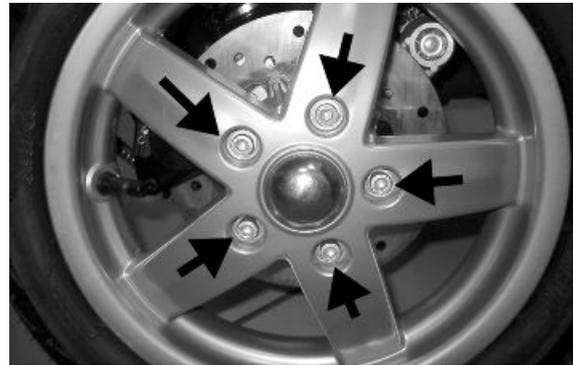
Soap-based lithium grease with NLGI 3; ISO-L-XBCHA3, DIN K3K-20

## 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



## Handlebar

### Removal

Before carrying out these operations, remove the instrument panel.

- 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.**

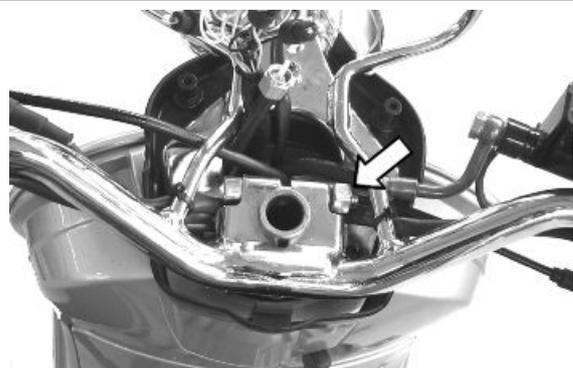


### Refitting

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



## Steering column

### Removal

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

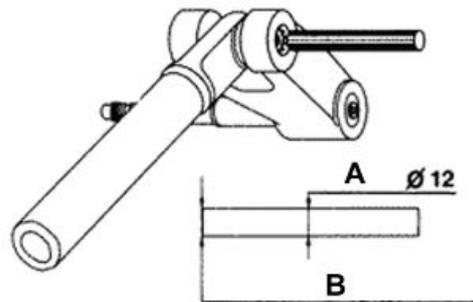
#### Specific tooling

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



### Overhaul

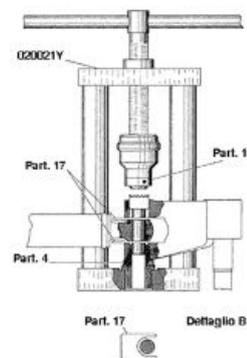
- Press and remove the wedging washer with the help of a pointed end.
- For the second washer, repeat the operation using the punch on the side opposite to the one shown in the figure.



**A** = Ø12 Punch

**B** = Sharp-edged end

- 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

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

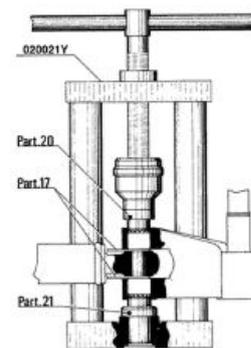
**020021Y Front suspension service tool**

**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



- 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

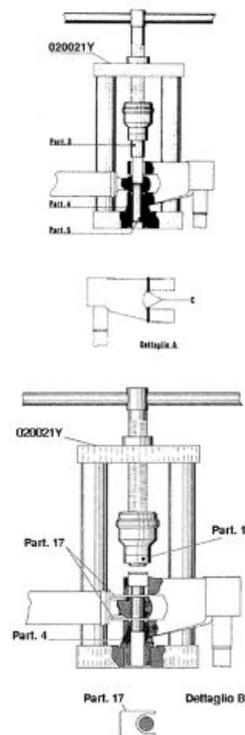
**Specific tooling**

**020021Y Front suspension service tool**

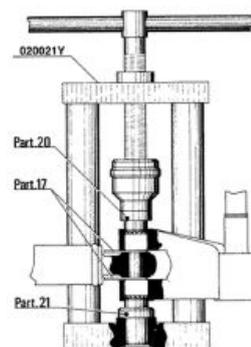
**Recommended products**

**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

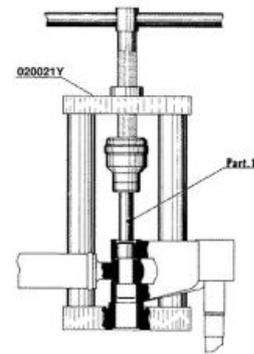


- Use the tool fitted with part 20\* and part 21\* on its stem as shown in the figure.
- Push the two roller casings with the handgrip until their bottoms make contact with the pin end.



- 
- 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

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-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.

### Refitting

#### CAUTION

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

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When fitting the fork, lubricate with the steering bearing tracks with the recommended grease. Tighten the lower ring nut "A" and the upper ring nut "B" to the specified torque

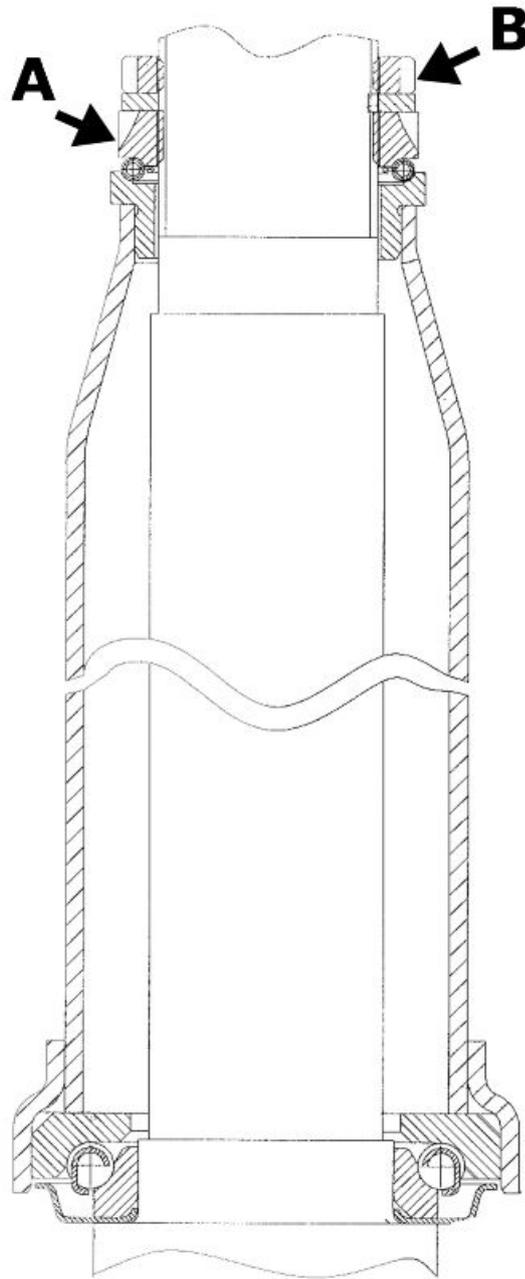
**Recommended products**

**AGIP GREASE PV2 Grease for the steering bearings, pin seats and swinging arm**

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)**

**Steering lower ring nut 8 ÷ 10 Steering upper ring nut 35 ÷ 40**

**Front shock absorber**

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## Removal

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- Remove the steering tube
- Remove the shock absorber lower clamps
- Remove the shock absorber upper clamps



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## Refitting

To refit, carry out the removal operations in reverse order, observing the prescribed tightening torques.

### Locking torques (N\*m)

shock absorber lower clamp 20 - 27 shock absorber upper clamp 20 ÷ 30

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## Shock-absorber - calliper bracket

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### Removal

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- Remove the front wheel hub with the brake disc
- Remove the front shock absorber lower clamps



- Remove the bracket locking seeger ring
- Unscrew the bracket



- Before refitting the bracket in the wheel axle, place the O-ring as shown in the photograph so that it is correctly placed after fitting the bracket.
- Refit the washer and the Seeger ring.
- Refit the lower screws fixing the shock absorber to the bracket and tighten at the prescribed torque



### Locking torques (N\*m)

Lower shock absorber clamp 20 ÷ 27

## Overhaul

- The bracket for the shock absorber -calliper attachment has two roller bearings separated one from the other as shown in the photograph



- Remove the two roller bearings from the bracket with the specific tool operating on the shock absorber attachment side as shown in the photograph



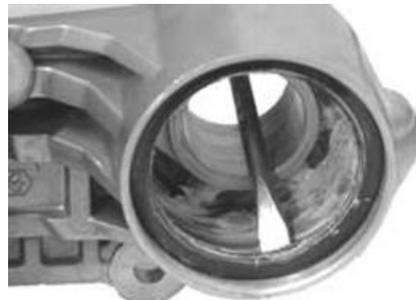
### Specific tooling

**020376Y Adaptor handle**

**020441Y 26 x 28 mm adaptor**

**020365Y 22 mm guide**

- Remove the oil seal on the wheel hub side with the screwdriver as shown in the photograph



- Suitably hold the brake calliper - shock absorber attachment bracket
- Fit a new oil seal and move it until it stops using the specific tool

**Specific tooling****020376Y Adaptor handle****020360Y Adaptor 52 x 55 mm**

- Assemble a new roller bearing on the shock absorber side and move it until it stops using the specific tool

**Specific tooling****020036Y Punch**

- Suitably hold the brake calliper - shock absorber attachment bracket
- Assemble a new roller bearing on the wheel hub side and move it until it stops using the specific tool

**Specific tooling****020037Y Punch**

## Refitting

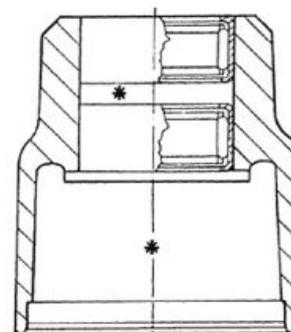
- Refit the parts in reverse order of the removal operation.

**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

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## Steering bearing

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### 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 SCREW-DRIVER AS A LEVER BETWEEN THE SEATING AND THE SLEEVE.**

### Specific tooling

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

- Remove the fifth wheel fitting and the dust guard on the steering tube as shown in figure, using the specific tool. Proceed giving a few taps with the mallet.



### Specific tooling

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

- Refit the fifth wheel fitting and the dust guard on the steering tube until they stop, using the specific tool.



### Specific tooling

#### 006029Y Punch for fitting fifth wheel seat on steering tube

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## Rear

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### Removing the rear wheel

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

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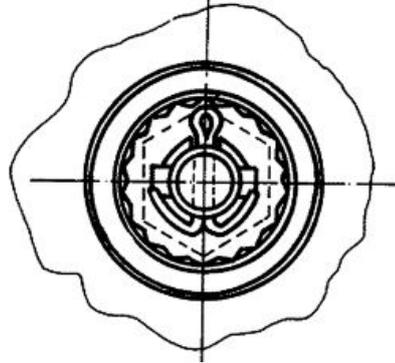
## Refitting the rear wheel

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- 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



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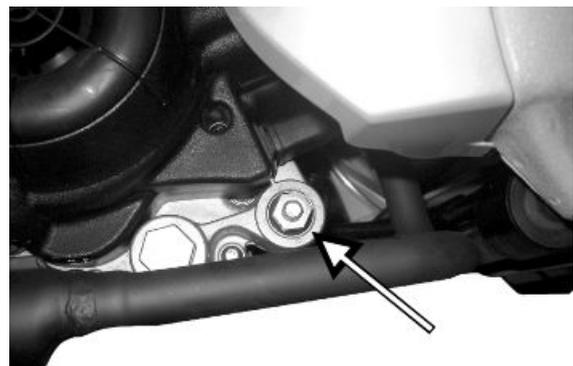
## Swing-arm



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## Removal

Remove the swinging arm acting on the three clamps shown in the figure.



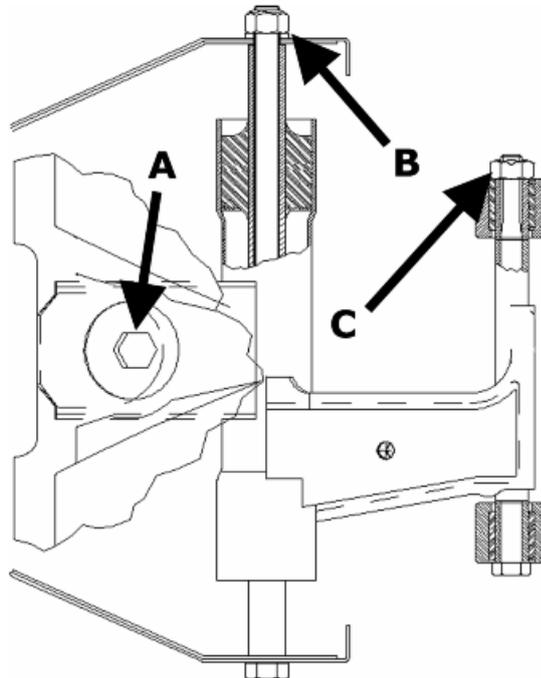


## Refitting

For rifting, respect the locking torques

### Locking torques (N\*m)

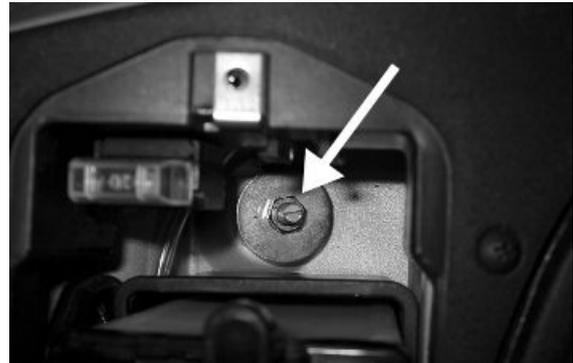
Part C 33 ÷ 41 Part B 44 ÷ 52 Part A 33 ÷ 41



## Shock absorbers

## Removal

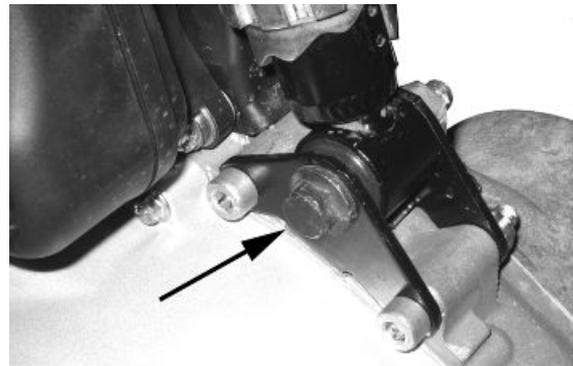
- To replace the shock absorber remove the battery access flap to reach and remove the shock absorber/ frame anchoring nut. Then remove the shock absorber/engine anchorage nut.
- When refitting, tighten the shock absorber/chassis anchoring nut and the shock absorber/engine pin to the prescribed torque.



### Locking torques (N\*m)

Shock absorber/engine pin torque 33 to 41 N-m

Shock absorber/frame nut torque 20 to 25 Nm



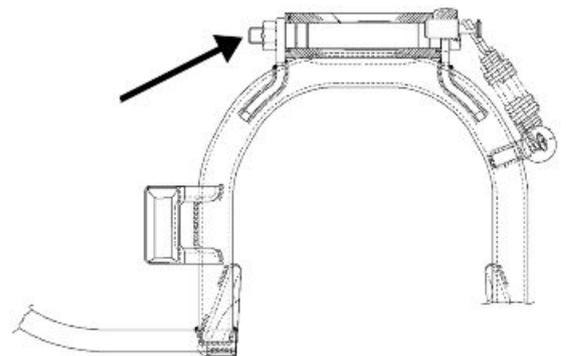
## Centre-stand

### Replace complete stand

- Undo the screw marked in the figure.
- When refitting, secure to the prescribed torque.

### Locking torques (N\*m)

Centre stand screw 32 ÷ 40



## INDEX OF TOPICS

**B**RAKING SYSTEM

**BRAK** SYS

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## Front brake calliper

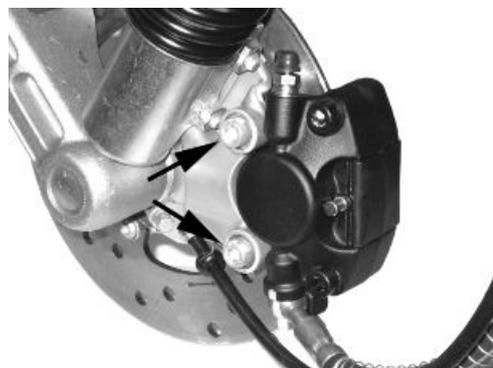
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### Removal

- Remove the front wheel.
- Remove the pad retention pin.
- Using a pin partially remove the brake pad retention pin.
- Remove the screws fixing the brake calliper to the crankcase then remove the brake calliper complete with pipe.
- Complete the extraction of the pad retention pin, the spring and the pads.

**N.B.**

**IF BRAKE CALLIPER REPLACEMENT OR SERVICE IS NEEDED, BEFORE REMOVING THE CALLIPER CLAMPS TO THE SUPPORT BRACKET, LOOSEN THE OIL JOINT FITTING.**




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### Overhaul

- Remove the front brake calliper
- Suitably hold the brake calliper in a clamp
- Remove the two calliper coupling screws as shown in the photo
- Remove the two pistons from the calliper body with the aid of short blasts of compressed air through the brake fluid holes
- Remove the dust ring and the O-ring of each half calliper.
- Remove the O-rings in the half calliper.

**N.B.**

**WHEN REMOVING THE O-RINGS, BE CAREFUL NOT TO SCRATCH THE HALF CALLIPER SEATS**





- Check there are no scorings on the pistons and their seats; otherwise, replace them.
- Wash and blow all the components carefully
- Fit the O-rings and new dust guards
- Refit the pistons in their seats being careful to lubricate with brake fluid
- Recouple the half callipers and lock the two screws at the specified torque



### Locking torques (N\*m)

Calliper coupling screw 22 ÷ 27



## Refitting

- Insert the brake pads in the calliper.
- Insert the pad fixing pin and the retention screw being careful to position the terminals of it pointing towards the bleed screw as shown in the photo.
- Insert the clip on the pad fixing pin



### N.B.

FAILURE TO RESPECT THE PAD POSITIONING REQUIREMENTS WITH RESPECT TO THE DIRECTION OF ROTATION COULD COMPROMISE PROPER BRAKE FUNCTIONING AND NOISELESSNESS.



- 
- Keep the brake pads in contact with the pistons and insert the calliper in the brake disc.
  - Fix the calliper to the fork with the two screws with elastic washer at the prescribed torque



- Fix the brake pipe joint to the calliper and tighten at the prescribed torque
- Purge the circuit and refit the front wheel

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

**Brake calliper support clamping 20 ÷ 25 Nm Brake pipe connection 20 to 25 N\*m**

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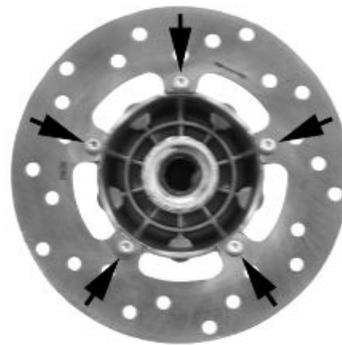
**Front brake disc**

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## Removal

- Remove the front wheel
- Remove the front brake calliper
- Remove the hub and the disc operating on the wheel axle nut
- Adequately support the hub with the disc and operating on the five screws shown in the photograph, remove the brake disc



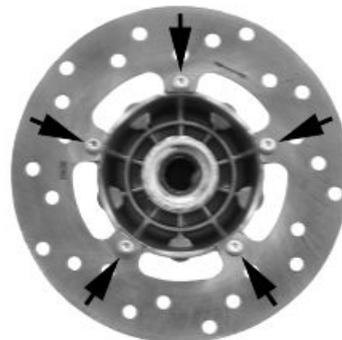
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## Refitting

- Carry out the operations in the reverse order from the removal being careful to respect the direction of disc rotation shown by the arrow printed on it
- Tighten the 5 screws to the specified torque

### Locking torques (N\*m)

**Brake disc screws: 6 +0.5 -1 Nm**



## Disc Inspection

- Remove the front wheel
- Use a micrometer to check the disc thickness as shown in the photograph
- Repeat the measurement in at least 6 points on the disk
- Remove the front brake calliper
- In order to secure the appropriate tool adequately use a metal plate with M8 threaded hole and fix it to one of the two front brake calliper attachment points
- Place the dial gauge on the disk outer edge
- Make the wheel hub turn and check the disk deviation



### Specific tooling

**020335Y Magnetic support for dial gauge**

### Characteristic

**Standard thickness:**

4 +0.2-0.2 mm

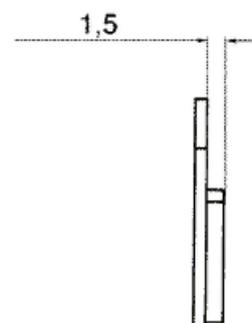
**Max. deviation allowed:**

0.1 mm

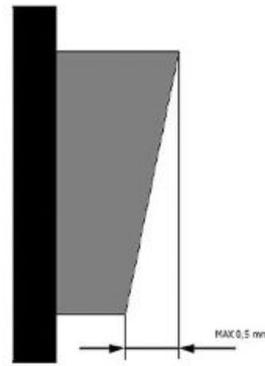
## Front brake pads

### Removal

- Remove the front wheel
- Remove the brake calliper
- Remove protection cover, the bolt and the leaf spring
- Remove the pads
- Check that there are no flaws or warping. If there are, replace them.
- Check the thickness of the friction material is more than 1.5 mm. If it is not, replace it
- The replacement must be made with greater residual thickness if the pad has not worn evenly. A



0.5 mm thickness difference in the residual friction material is permitted



## Refitting

- Insert the brake pads
- Insert the fixing pin being careful to position the clip with the ends towards the bleed screw as in the photo.
- Insert the lock on the bolt and then the protection cover
- Fix the rear brake calliper to the bracket and tighten the two screws to the specified torque.

### CAUTION

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

### Locking torques (N\*m)

Rear brake calliper tightening screw 20 ÷ 25 Nm



## Fill

## Front

- Remove the rubber cap from the bleed screw.
- Insert a rubber pipe in the bleed screw to permit the brake fluid to be recovered.
- With the right-hand brake lever, load the system and bring it up to the required pressure.
- Keeping the right-hand brake lever pulled, loosen the bleed screw to purge the air. Then tighten the bleed screw
- Release the brake lever
- Repeat the operation until only brake fluid comes out of the rubber pipe.
- Remove the fluid recovery pipe and refit the rubber cap over the bleed screw.
- Top up the brake fluid to the right level in the reservoir.



If necessary, bleeding can be done using a special vacuum pump

**N.B.**

**DURING PURGING FREQUENTLY CHECK THE LEVEL TO PREVENT AIR GETTING INTO THE SYSTEM THROUGH THE PUMP.**

**N.B.**

**DURING THE BLEEDING OPERATIONS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE BODYWORK SO AS NOT TO DAMAGE IT. FURTHERMORE, DURING THE BLEEDING OPERATIONS REGARDING THE BRAKE CALLIPERS, MAKE SURE THE BRAKE FLUID DOES NOT COME INTO CONTACT WITH THE DISC BRAKES AND WITH THE BRAKE PADS. FAILURE TO COMPLY WITH THIS NORM WILL ENDANGER THE PROPER WORKING AND EFFICIENCY OF THE BRAKING SYSTEM**

### Specific tooling

020329Y MityVac vacuum-operated pump

### Locking torques (N\*m)

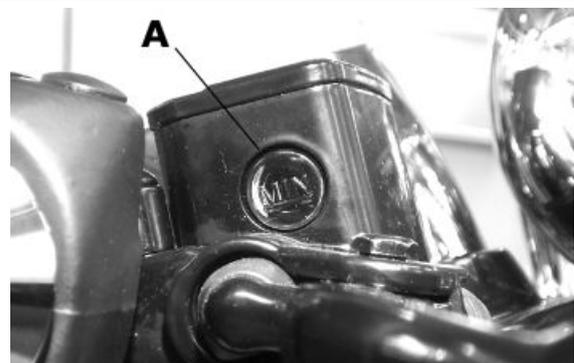
System bleed calliper fitting: 20 ÷ 25 Nm

## Brake fluid level check

Proceed as follows:

- Rest the vehicle on its centre stand with the handlebars perfectly horizontal;
- Check the level of liquid with the related warning light «**A**».

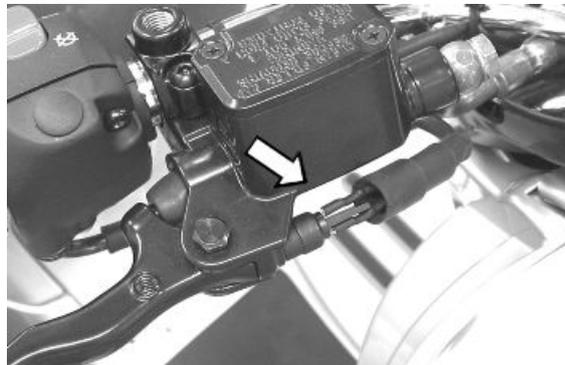
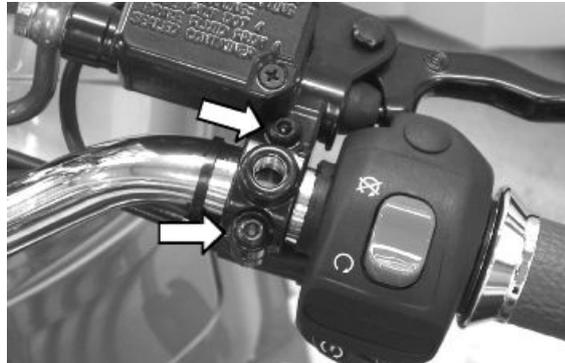
A certain lowering of the level is caused by wear on the pads.



## Front brake pump

### Removal

- Remove the two screws fixing the brake pump to the handlebar indicated in the photograph
- Remove the oil pipes joint from the pump collecting the brake oil in a container
- Remove the connector to the stop light switch



### Overhaul

Proceed as follows:

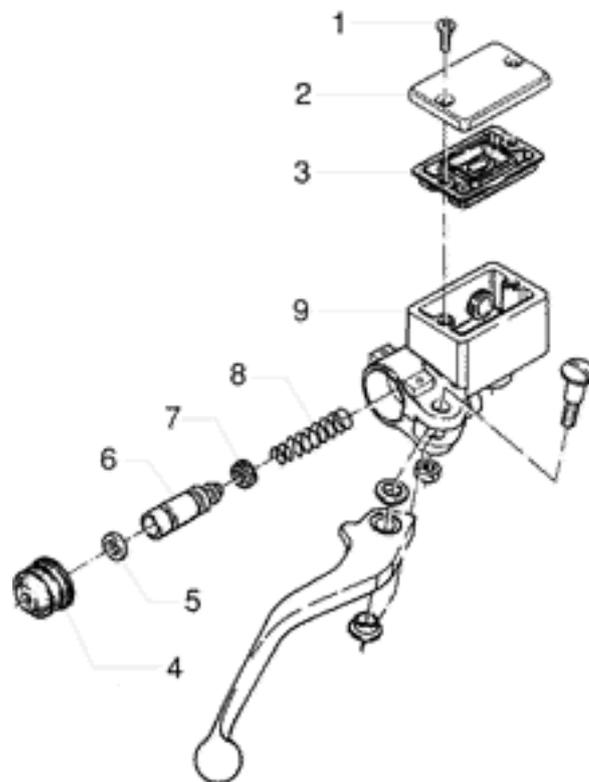
- 1) Remove the brake lever by loosening the retaining screw; open the cover (2) and take out the diaphragm (3);
- 2) remove the cap (4) and take out the internal parts in order;
- 3) Check that:
  - The body of the pump shows no signs of internal damage or corrosion;
  - The plunger shows no sign of damage or abnormal wear;
  - The plunger return spring is in good condition.

#### CAUTION

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

1. Reservoir cap screw
2. Reservoir cap.
3. Diaphragm.
4. Bellows.
5. Sealing ring
6. Piston.
7. Gasket.

- 8. Spring.
- 9. Reservoir



## Refitting

For refitting purposes carry out the removal operations but in reverse order respecting the tightening torque and purge the circuit.

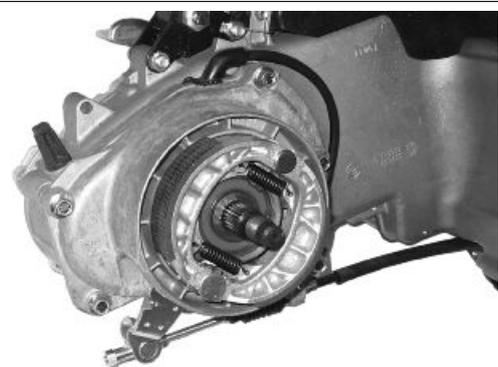
### Locking torques (N\*m)

Oil pipe joint to the pump: 20 - 25 Brake pump fixing screws to the handle bar:  $7 \div 10$  Nm

## 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

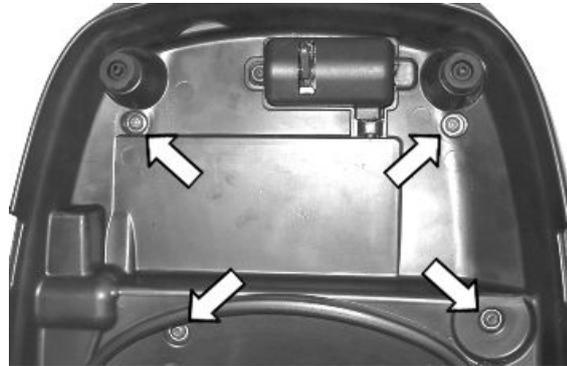
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## Seat

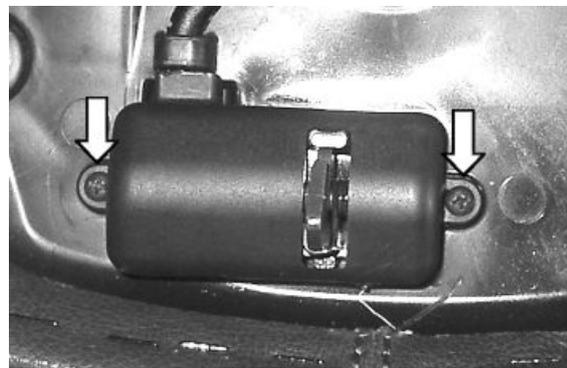
### Remove the saddle opening cable

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Remove the four screws shown in the figure and the rear seat from the chassis saddle.

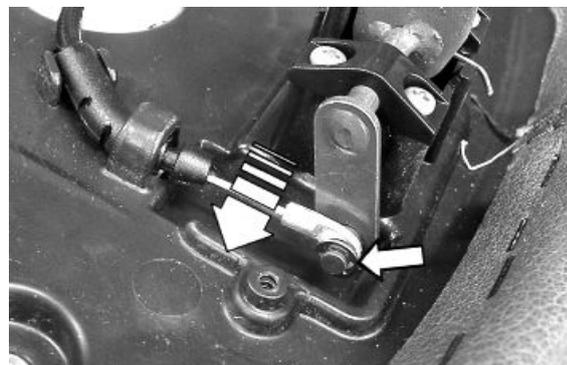


Unscrew the two screws of saddle fixing hook cover.



To remove the cable and the sheath:

- Remove the elastic ring and unscrew the cable end from the seat on the saddle fixing hook.
- Remove the other end of the cable from the fixing seat on the locking block.



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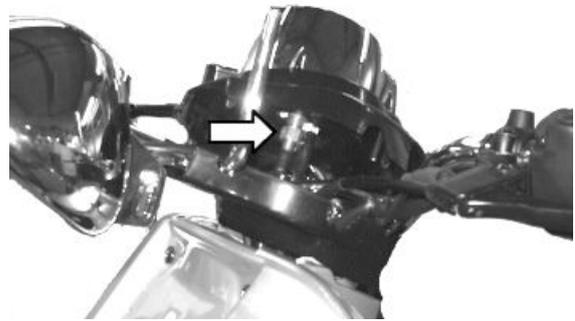
## Instrument panel

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- Remove the front grille
- Remove the shield back plate
- Remove the two fixing screws of the instrument panel.



- 
- Remove the odometer cable.
  - Remove the connector of the electric connections from the instrument panel

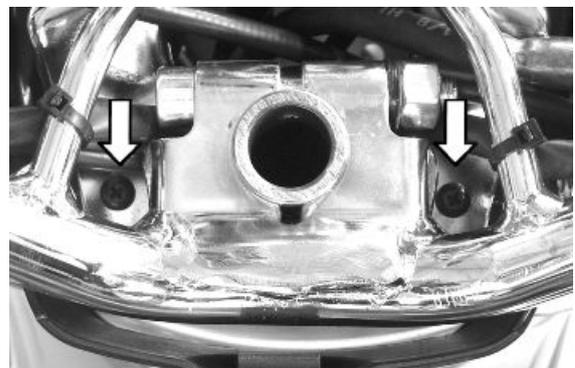


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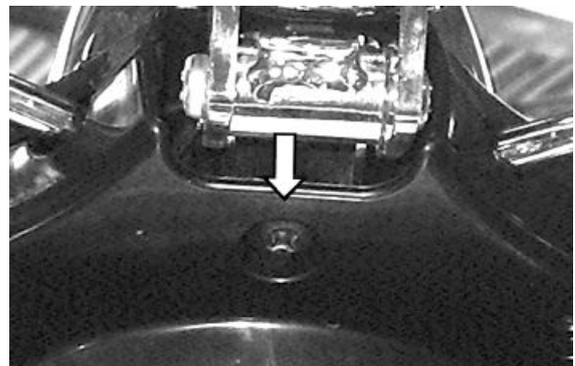
## Instrument panel lower shell

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- Remove the instrument panel
- Remove the handlebar
- Remove the two screws indicated in the figure.



- 
- Remove the screw indicated in the figure, placed under the handlebar light fitting



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## Headlight assy.

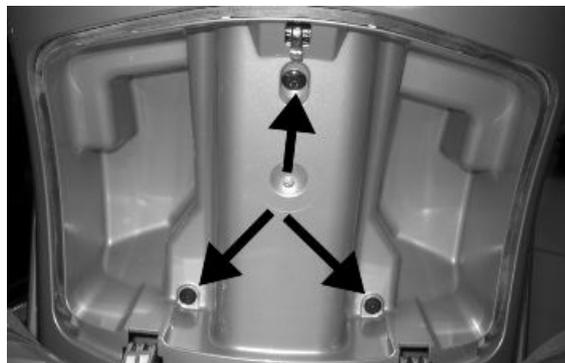
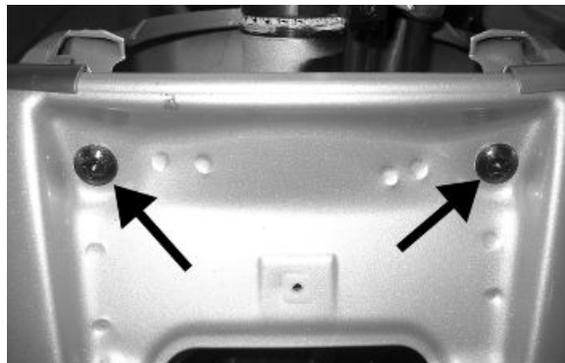
- Remove the four fixing screws from the light support.



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## Knee-guard

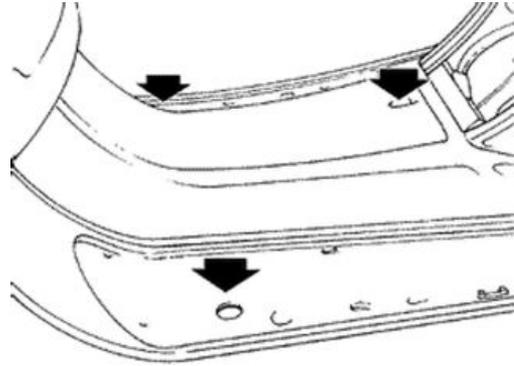
- Remove the front grille.
- Unscrew the 2 screws shown in the figure placed under the front grille.
- Remove the 3 screws shown in the figure, placed inside the glove-box; they can be reached after opening the glove-box door.



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## Footrest

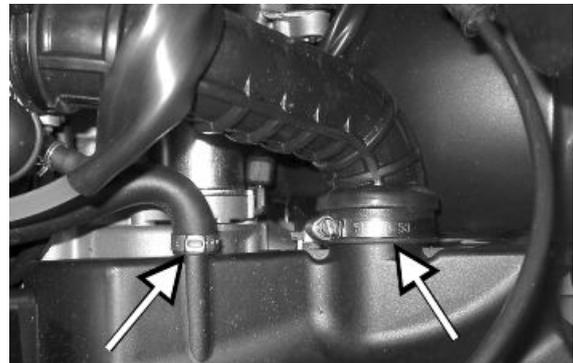
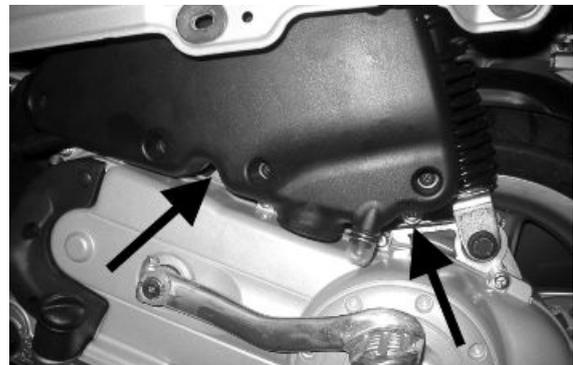
- Operate on the 3 screws shown in the figure once the glove-box and fairing have been removed.



---

## Air filter

- Remove the helmet compartment.
- after removing the side fairing, remove the 2 screws fixing the filter box to the engine, indicated in the figure.
- Remove the two clamps indicated in the figure



## Front mudguard

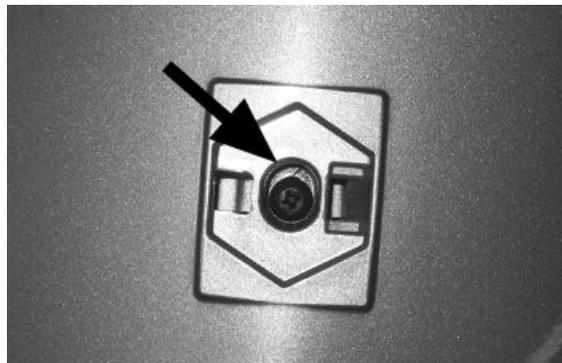
- Release the front brake pipes from the calliper and the cable from the odometer
- Remove the steering tube
- Remove the three mudguards-steering tube clamps indicated in the figure



---

## Front central cover

- Remove the "PIAGGIO" clip-on badge
- Unscrew the screw indicated in the figure
- Remove the grille



# INDEX OF TOPICS

**P**RE-DELIVERY

**P**RE DE

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## Aesthetic inspection

### Appearance check:

- Paintwork
- Fitting of plastics
- Scratches
- Dirt

---

## Tightening torques inspection

### Lock check

- Safety locks
- clamping screws

### Safety locks

---

Rear shock absorber upper fixing

---

Rear shock absorber lower fixing

---

Front wheel axle nut

---

Wheel hub nut

---

Frame - swinging arm bolt \*

---

Swinging arm bolt - Engine

---

Engine arm pin - Frame arm

---

Handlebar lock nut

---

Steering lower ring nut

---

Upper steering ring nut

---

## Electrical system

### Electrical system:

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

**CAUTION**

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

**WARNING**

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

**CAUTION**

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

**WARNING**

**BATTERY ELECTROLYTE IS TOXIC AND IT MAY CAUSE SERIOUS BURNS. IT CONTAINS SULPHURIC ACID. AVOID CONTACT WITH EYES, SKIN AND CLOTHING.**

**IN CASE OF CONTACT WITH EYES OR SKIN, RINSE WITH ABUNDANT WATER FOR ABOUT 15 MINUTES AND SEEK MEDICAL ATTENTION AT ONCE.**

**IF IT IS SWALLOWED, IMMEDIATELY DRINK LARGE QUANTITIES OF WATER OR VEGETABLE OIL. SEEK IMMEDIATE MEDICAL ATTENTION.**

**BATTERIES PRODUCE EXPLOSIVE GAS; KEEP THEM AWAY FROM NAKED FLAMES, SPARKS AND CIGARETTES. IF THE BATTERY IS CHARGED IN A CLOSED PLACE, TAKE CARE TO ENSURE ADEQUATE VENTILATION. ALWAYS PROTECT YOUR EYES WHEN WORKING CLOSE TO BATTERIES.**

**KEEP OUT OF THE REACH OF CHILDREN**

**CAUTION**

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

---

## Levels check

Level check:

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

## Road test

**Test ride**

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

## Static test

Static control after the test ride:

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

**CAUTION**

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

**CAUTION**

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

---

## Functional inspection

Functional check up:

Braking system (hydraulic)

- Lever travel

Braking system (mechanical)

- Lever travel

Clutch

- Proper functioning check

Engine

- Throttle travel check

Others

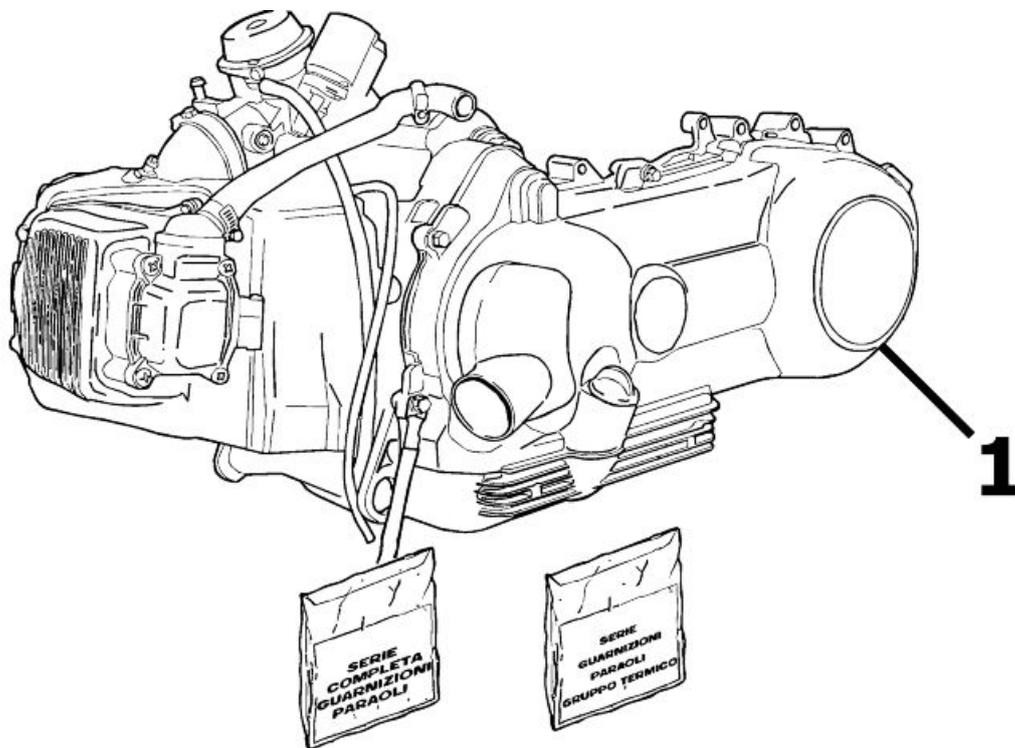
- Check documentation
  - Check the frame and engine numbers
  - Tool kit
  - License plate fitting
  - Check locks
  - Check tyre pressures
  - Installation of mirrors and any accessories
-

# INDEX OF TOPICS

TIME

TIME

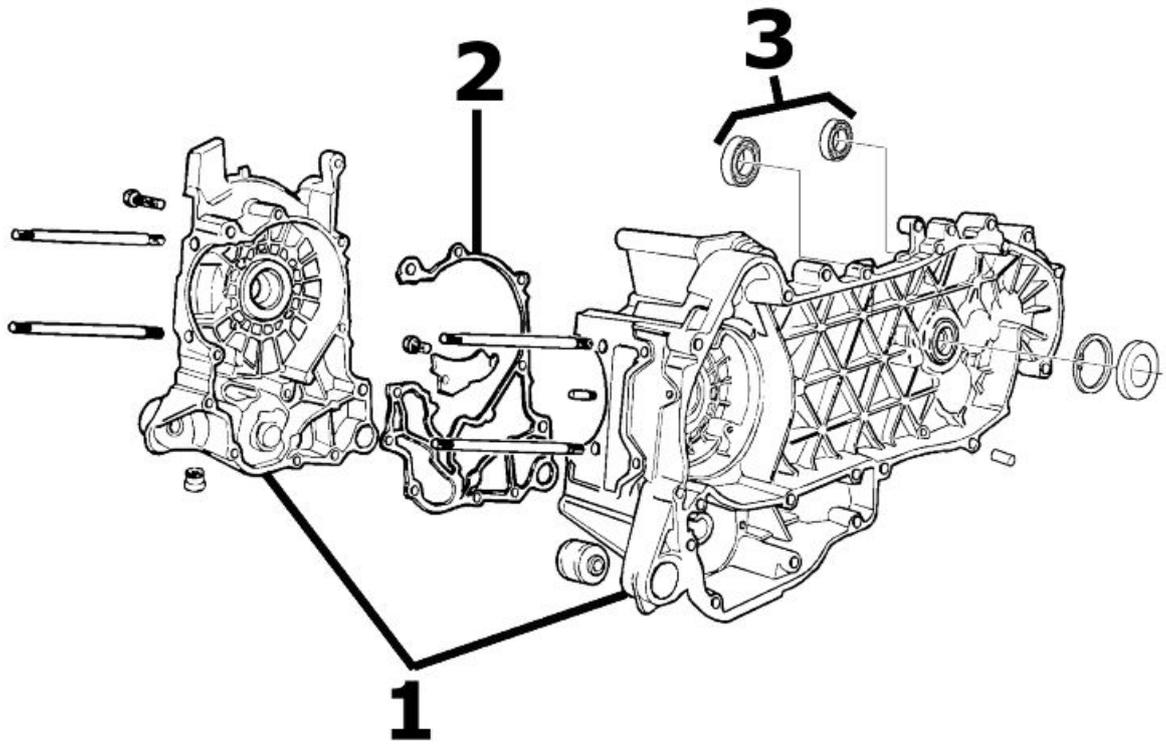
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**Engine****ENGINE**

	Code	Action	Duration
1	001001	engine from frame - removal and re-fitting	

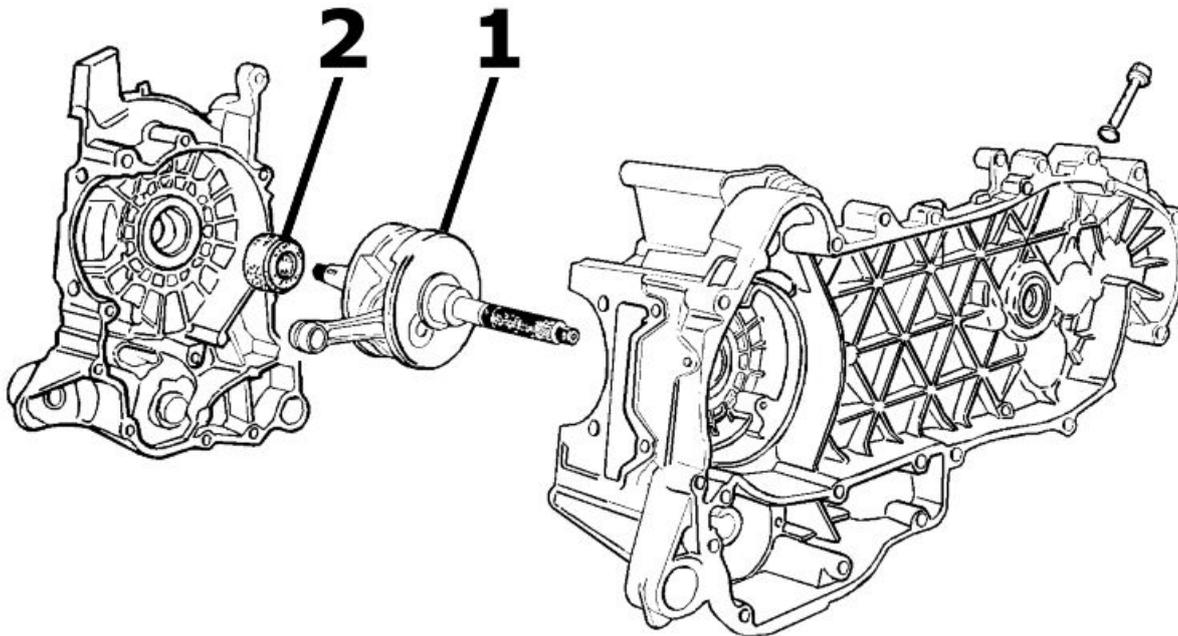
---

## Crankcase

**CRANKCASE**

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

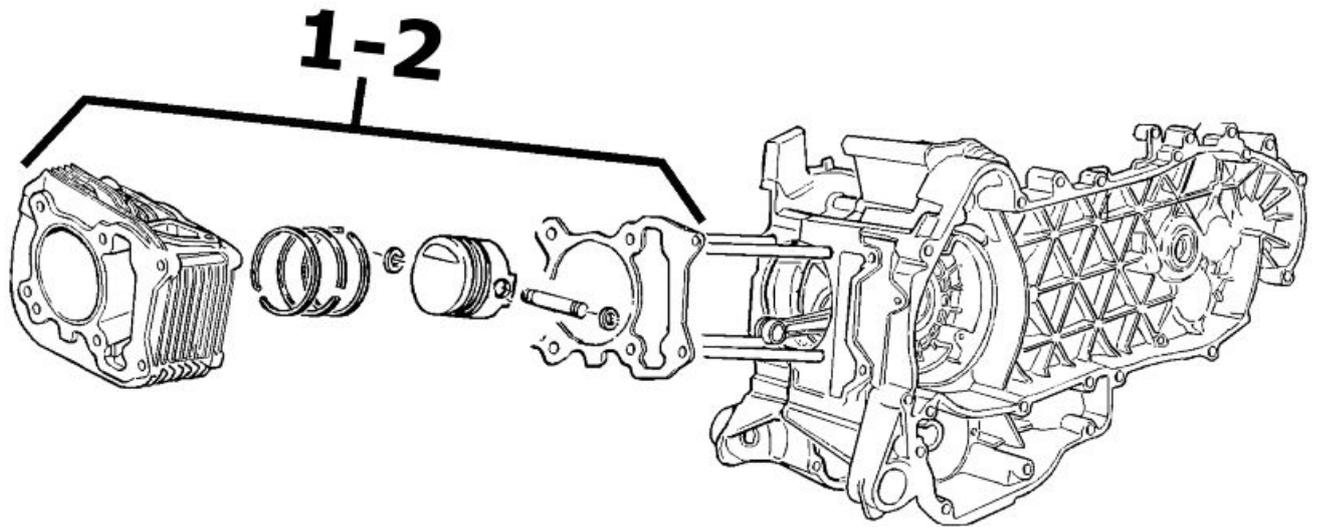
## Crankshaft



### CRANKSHAFT

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001117	Crankshaft - Replacement	
2	001099	Oil seal, flywheel side - Replacement	

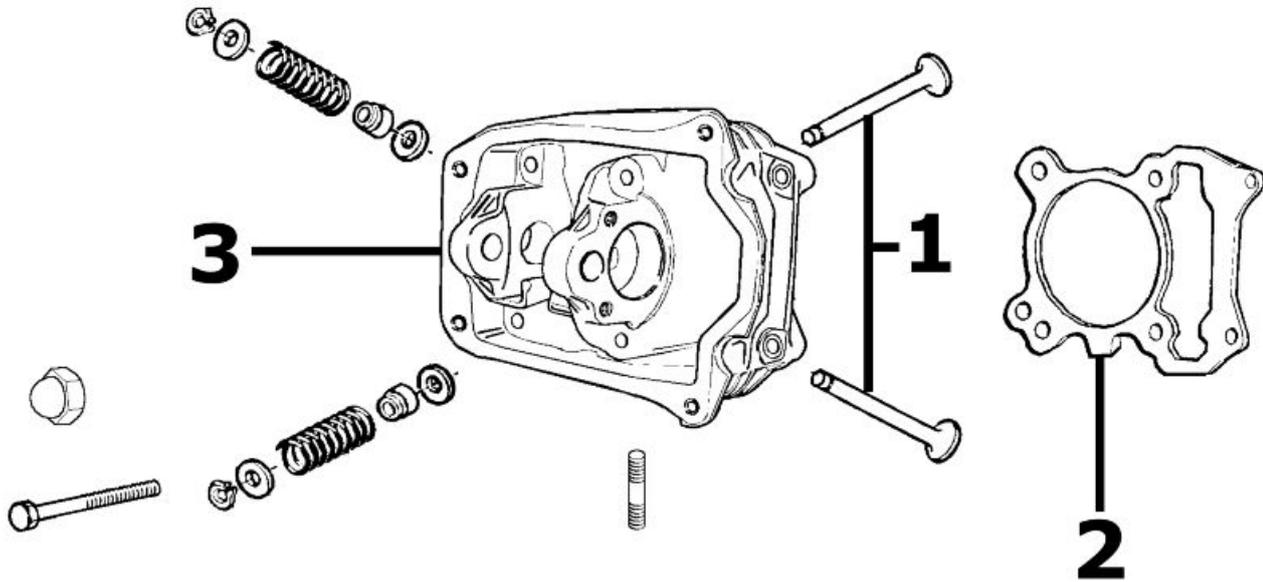
**Cylinder assy.**



**CYLINDER GROUP**

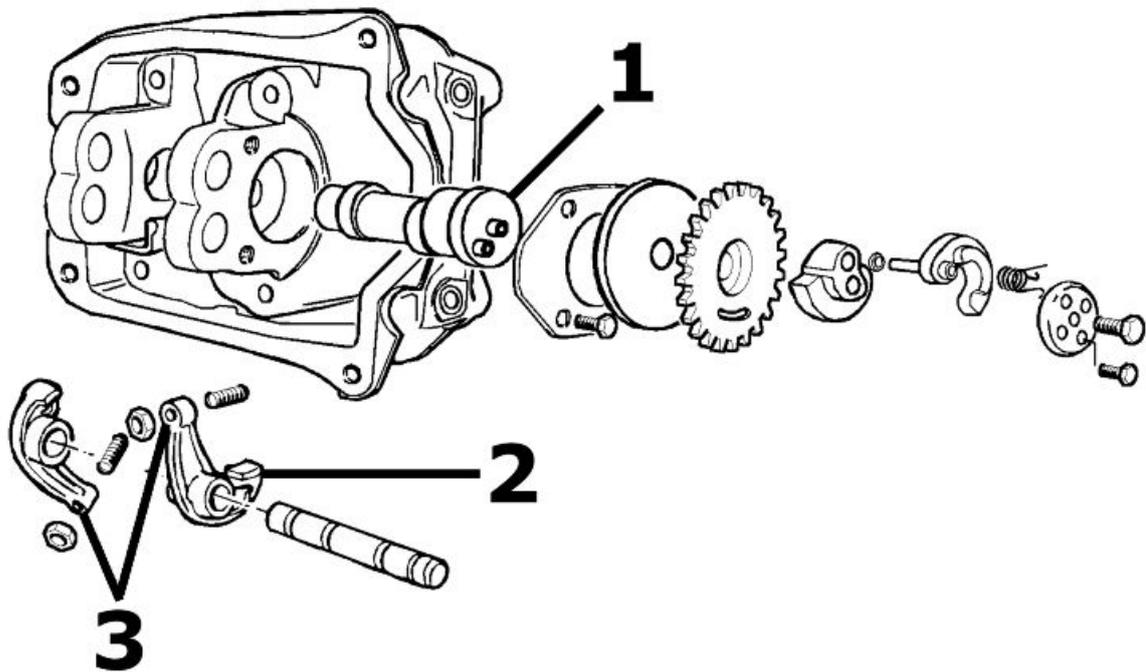
	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001002	Cylinder-Piston - Replacement	
2	001107	Cylinder / piston - Inspection / cleaning	

## Cylinder head assy.

**HEAD UNIT**

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

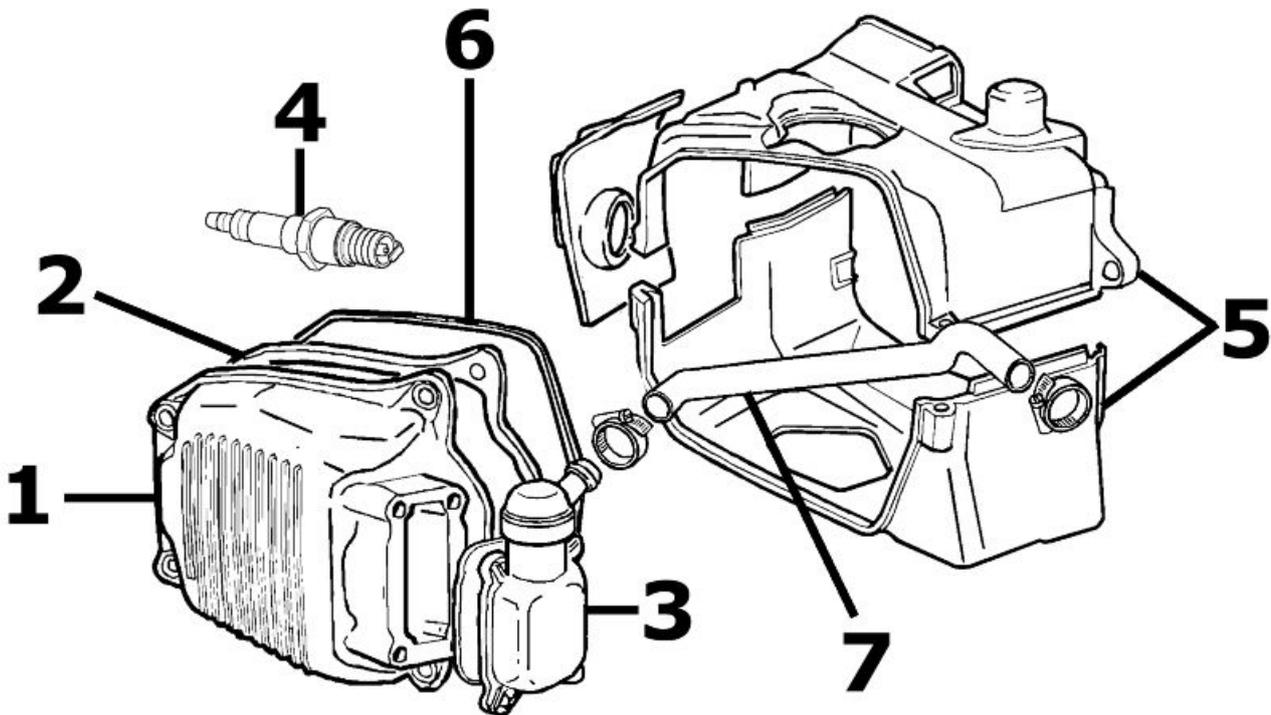
Rocker arms support assy.



**ROCKING LEVER SUPPORT UNIT**

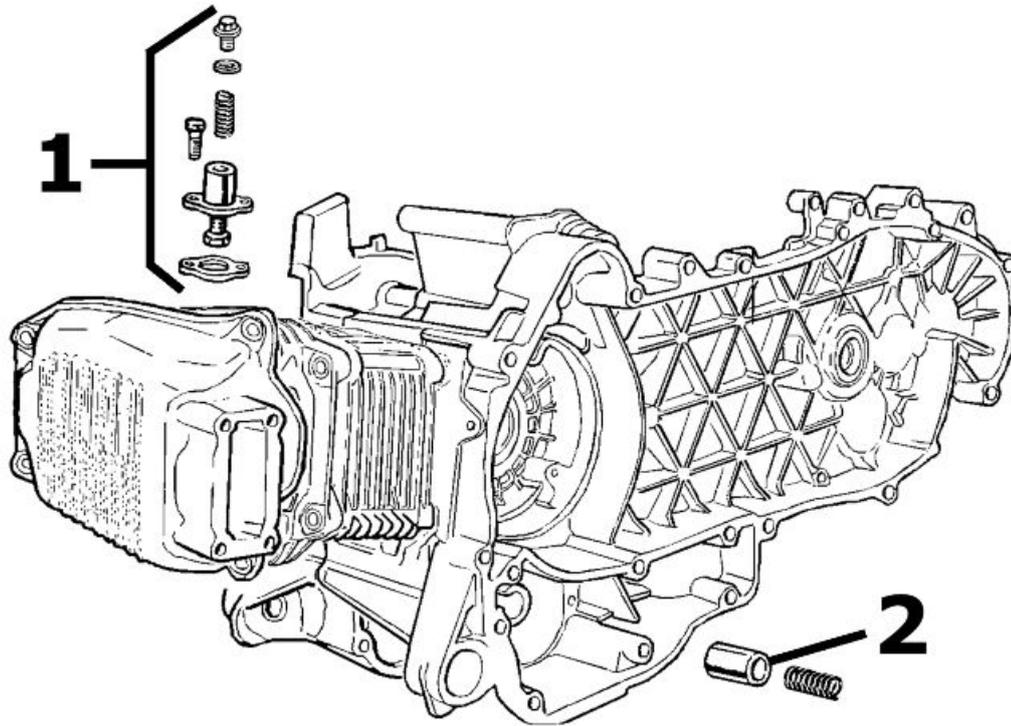
	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001044	Camshaft - Replacement	
2	001148	Rocking lever valve - Replacement	
3	001049	Valves - Adjustments	

## Cylinder head cover

**HEAD COVER**

	Code	Action	Duration
1	001089	Head cover - Replacement	
2	001088	Head cover gasket - Replacement	
3	001159	Oil vapour recovery tank - Service	
4	001093	Spark plug - Replacement	
5	001097	Cooling hood - Replacement	
6	001091	Head cover sealing ring	
7	001074	Oil vapour recovery pipe - Replacement	

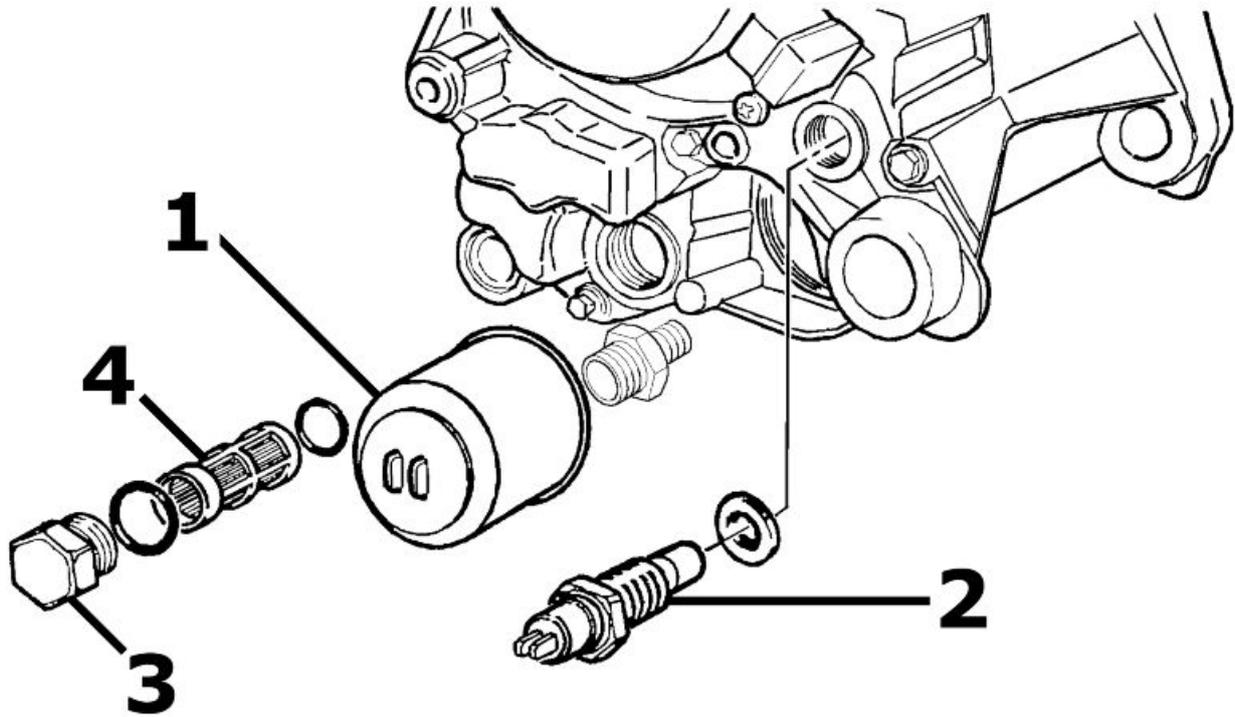
**Chain tensioner**



**CHAIN TIGHTENER**

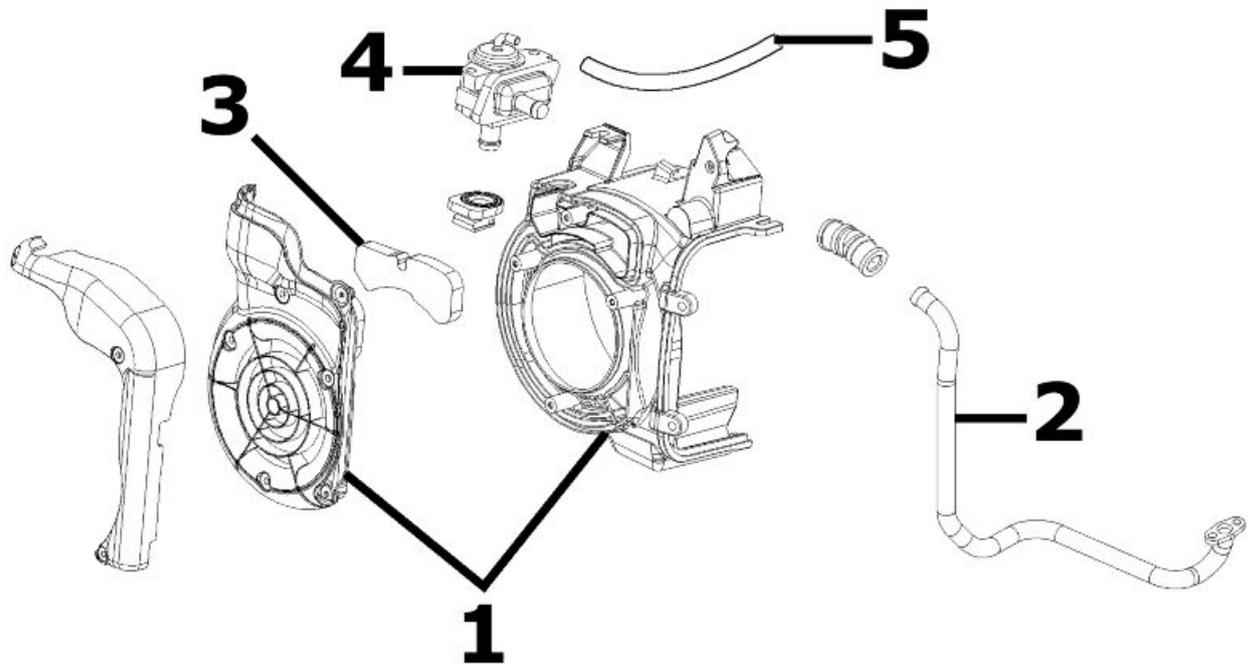
	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001129	Chain tensioner - Service and Replacement	
2	001124	By pass lubrication - Replacement	

## Oil filter

**OIL FILTER**

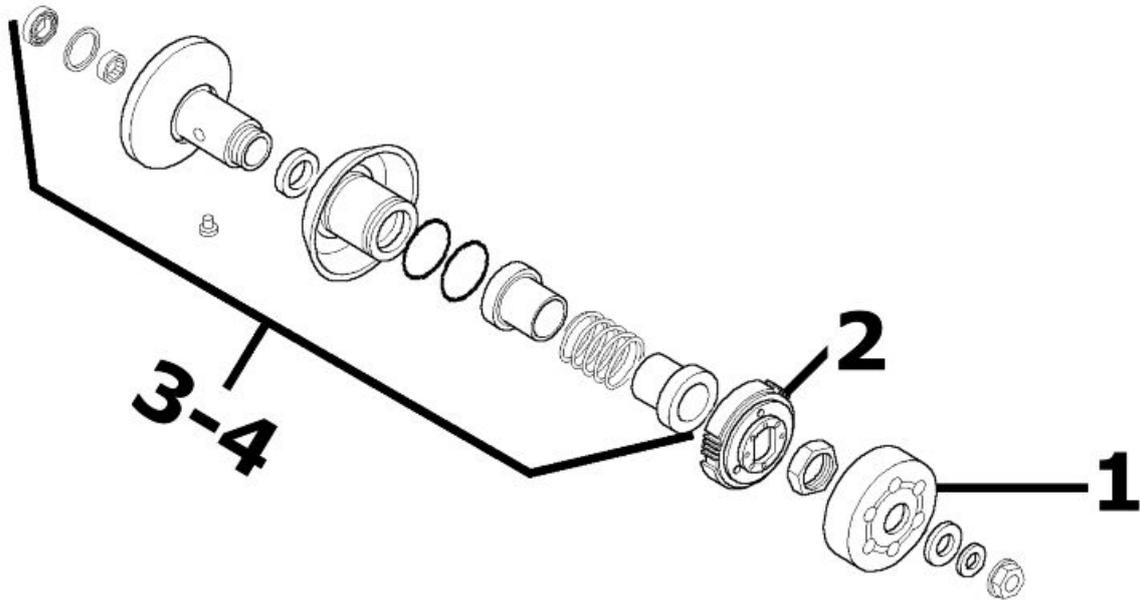
	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001123	Oil filter - Replacement	
2	001160	Oil pressure sensor - Replacement	
3	003064	Engine oil - Change	
4	001102	Net oil filter - Replacement / Cleaning	

## Flywheel cover

**FLYWHEEL COVER**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001087	Flywheel cover - Replacement	
2	001163	Muffler secondary air connection - Replacement	
3	001161	Secondary air filter - Replacement / Cleaning	
4	001174	SAS valve - Replacement	
5	001164	Crankcase secondary air connection - Replacement	

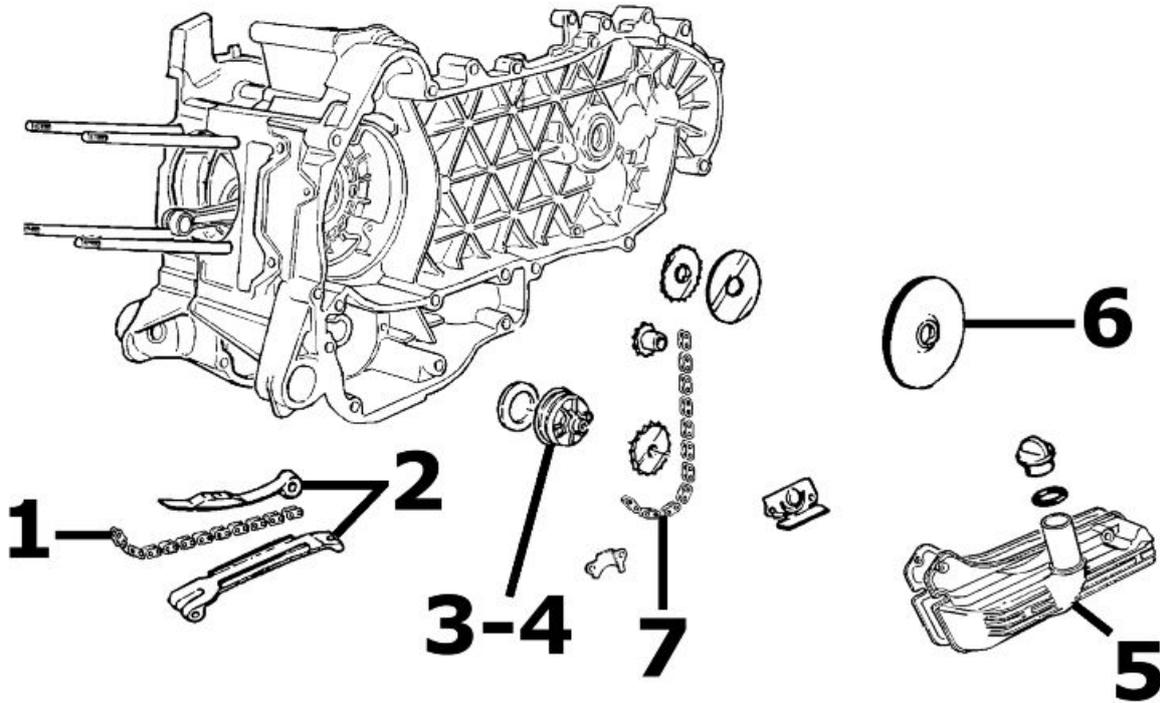
## Driven pulley



### DRIVEN PULLEY

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

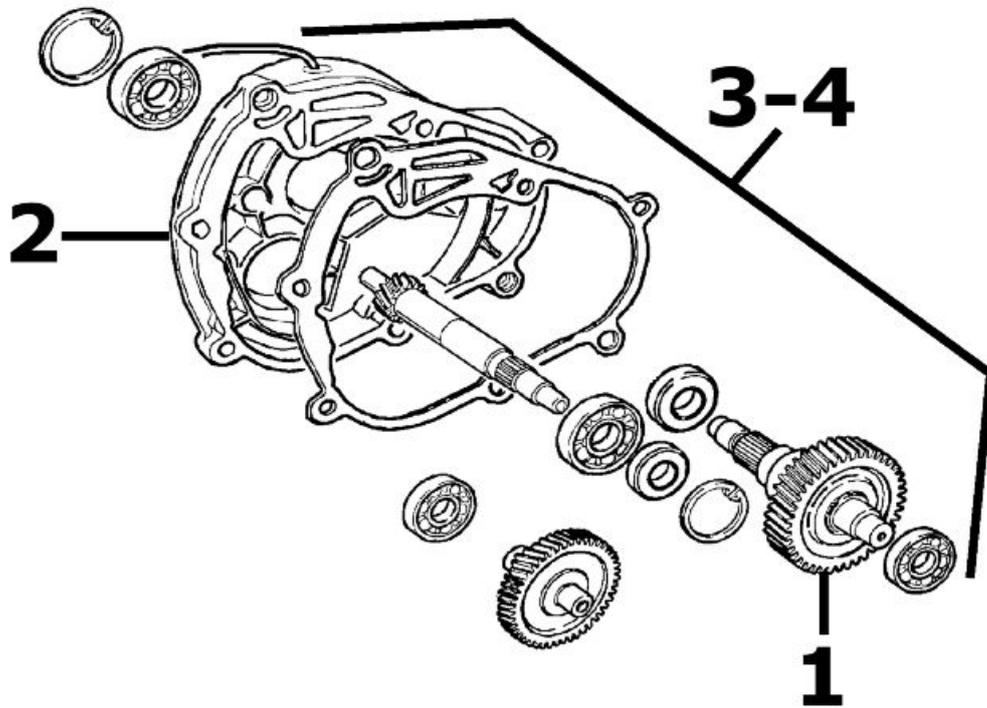
Oil pump



**OIL PUMP**

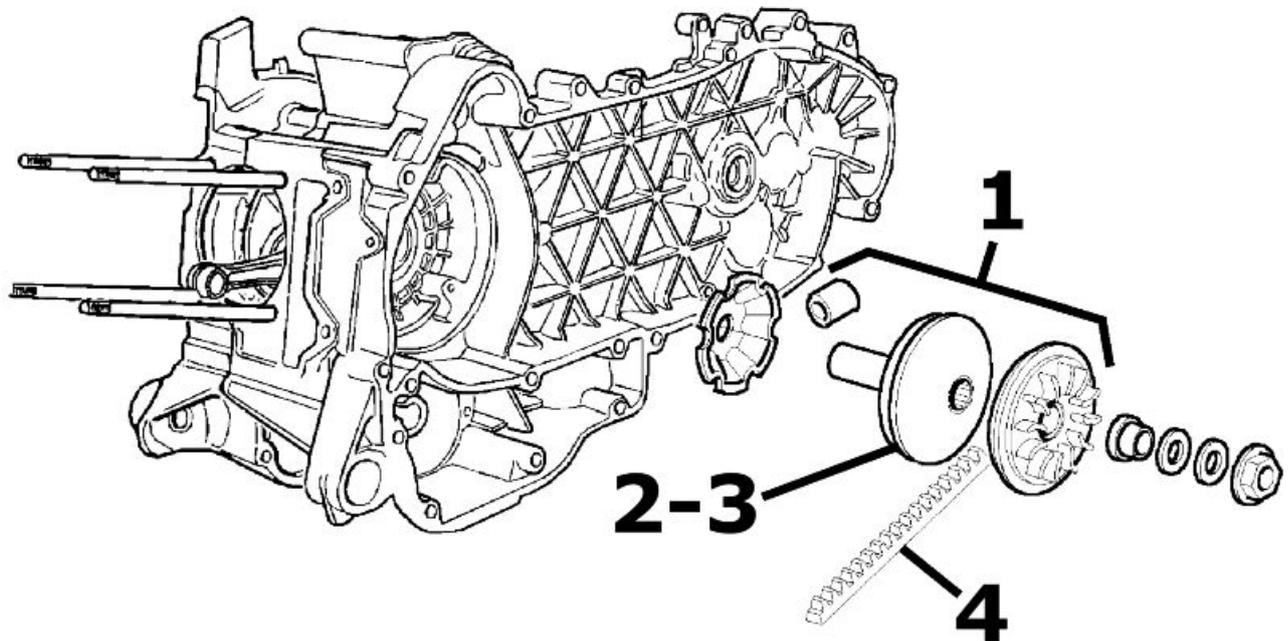
	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001051	Belt/Timing chain - Change	
2	001125	Chain guide pads - Replacement	
3	001042	Oil pump - Service	
4	001112	Oil pump - change	
5	001130	Oil sump - Replacement	
6	001100	Oil seal, clutch side - Replacement	
7	001122	Oil pump chain - Replacement	

## Final gear assy.

**FINAL REDUCTION GEAR ASSEMBLY**

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

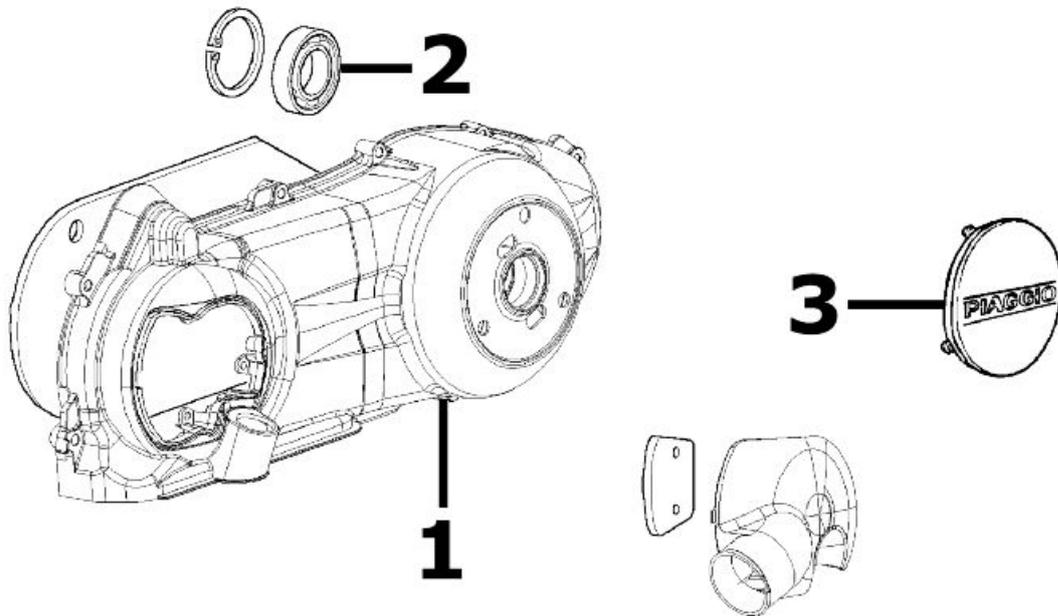
## Driving pulley



### DRIVING PULLEY

	Code	Action	Duration
1	001066	Drive pulley - Removal and refitting	
2	001086	Driving half-pulley - Replacement	
3	001177	Variator rollers / shoes - Replacement	
4	001011	Driving belt - Replacement	

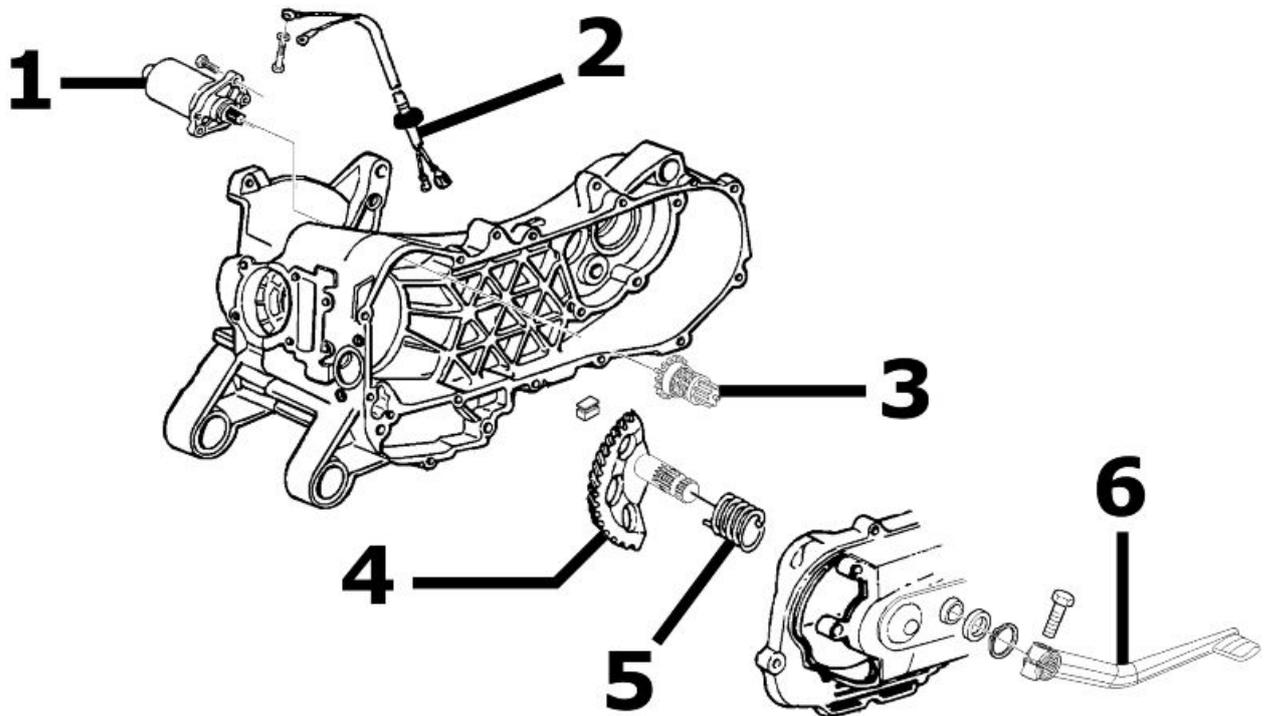
## Transmission cover



### TRANSMISSION COVER

	Code	Action	Duration
1	001096	Transmission crankcase cover - Replacement	
2	001135	Transmission cover bearing - Replacement	
3	001065	Transmission cover - Removal and Refit	

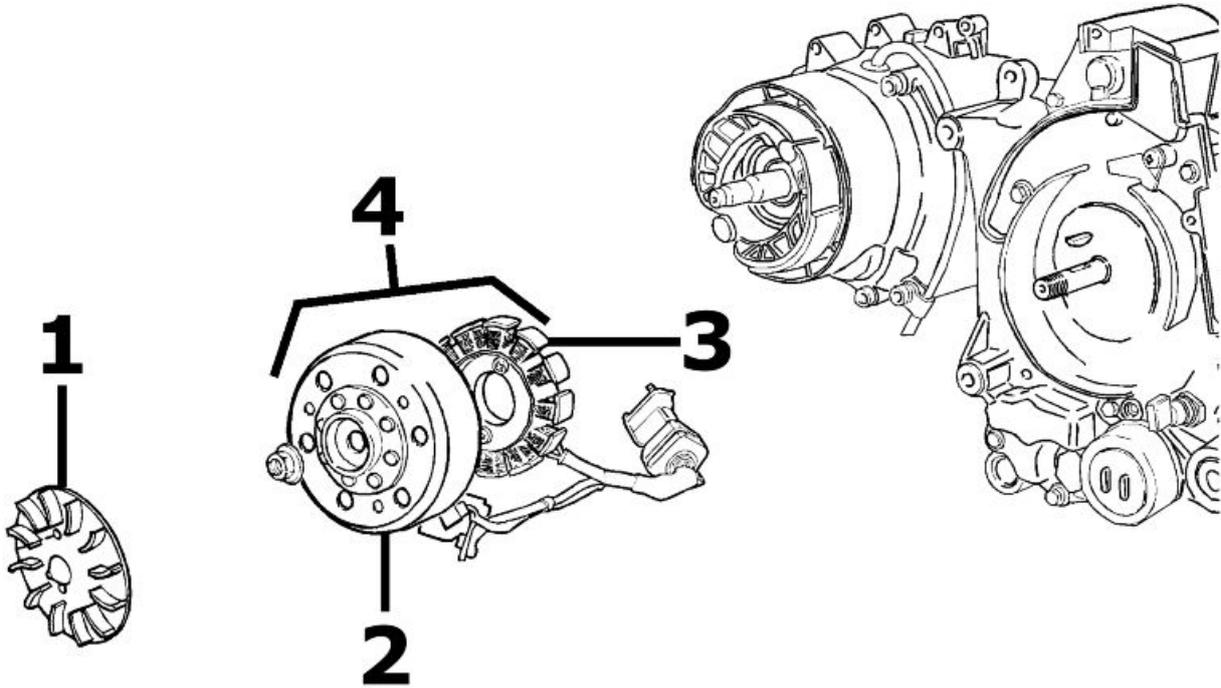
**Starter motor**



**ELECTRICAL START-UP**

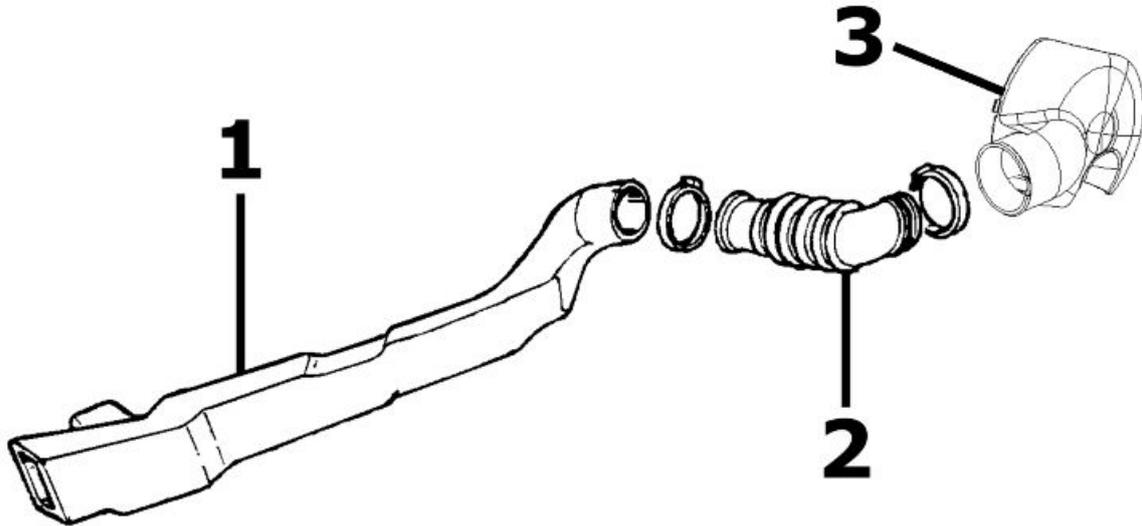
	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001020	Starter motor - Replacement	
2	005045	Starter motor cable harness - Replacement	
3	001017	Starter sprocket wheel - Replacement	
4	001021	Kick starter - Inspection	
5	008008	Starter spring pack - Replacement	
6	001084	Starter lever - Replacement	

## Flywheel magneto



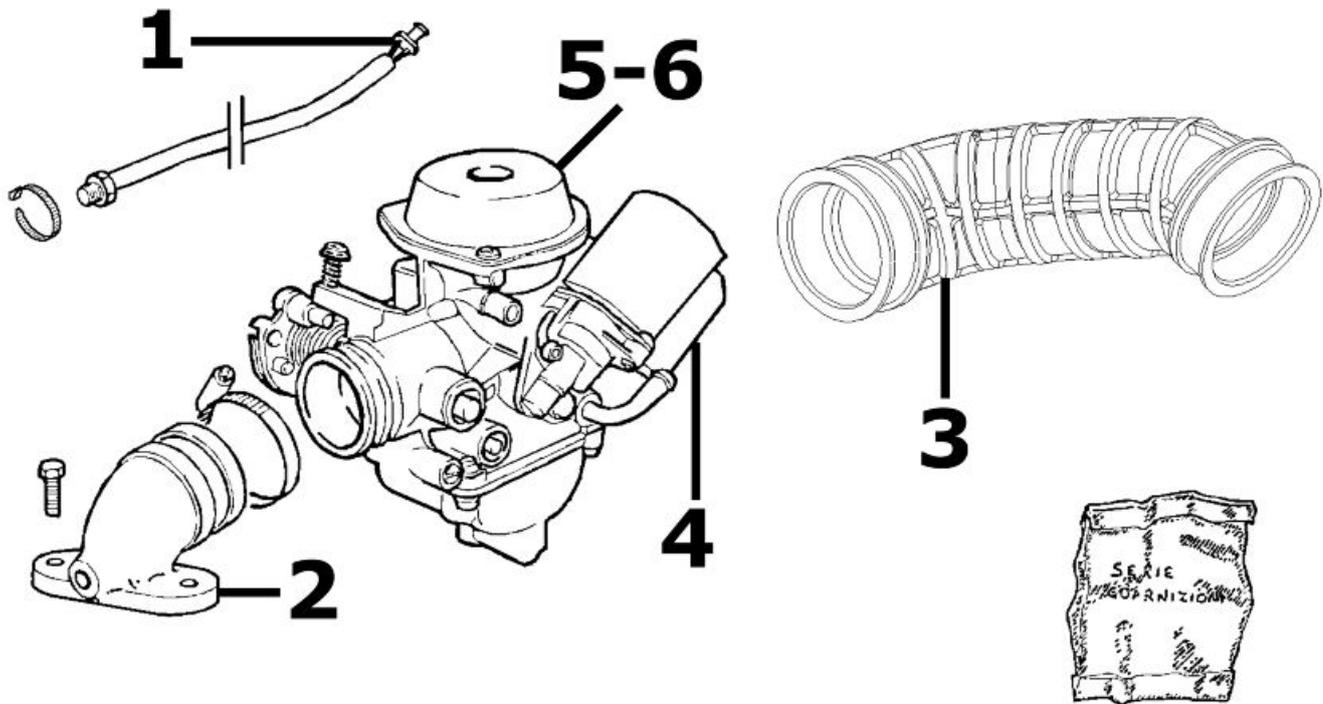
### MAGNETO FLYWHEEL

	Code	Action	Duration
1	001109	Cooling fan - Replacement	
2	001173	Rotor - Replacement	
3	001067	Stator - Removal and Refitting	
4	001058	Flywheel - Replacement	

**Belt cooling duct****BELT COOLING PIPE**

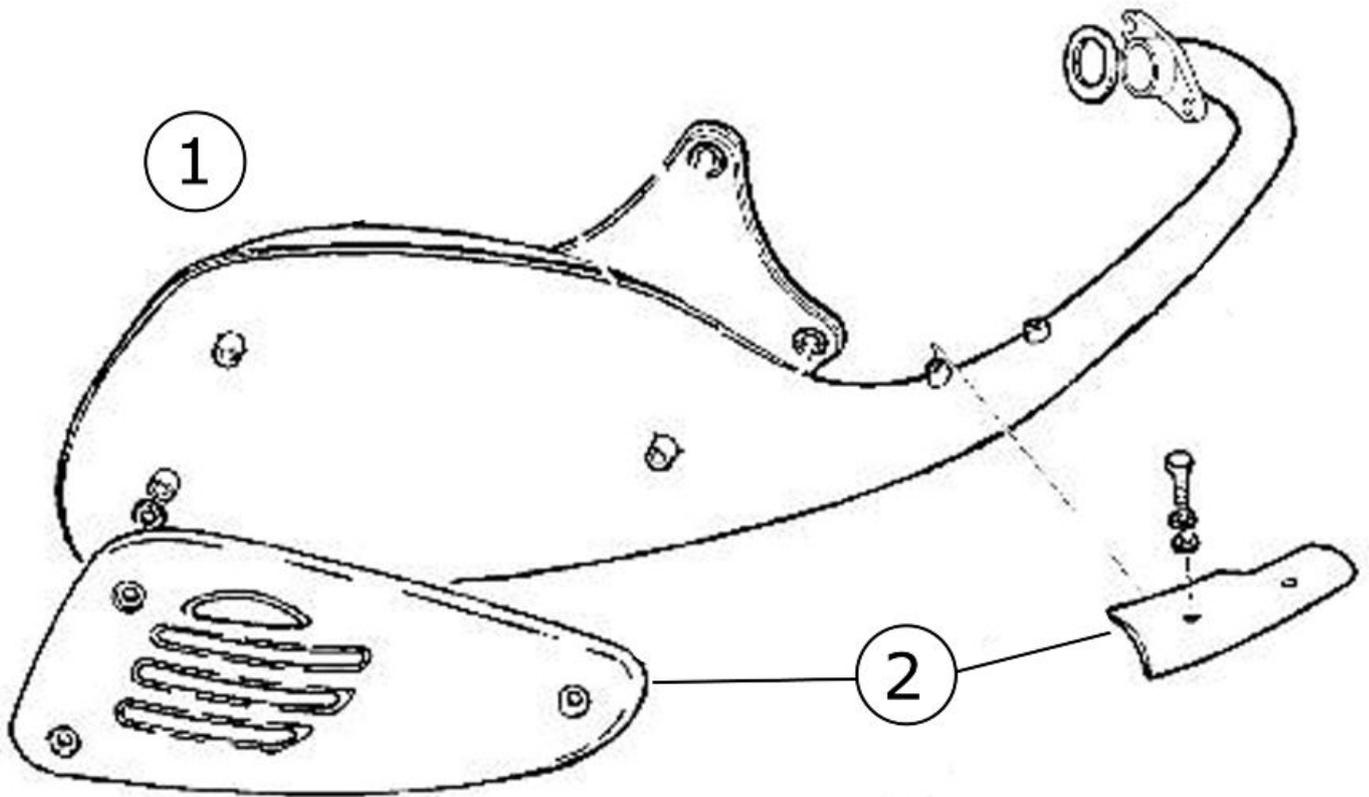
	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001170	Air manifold - replacement	
2	001132	Transmission air inlet pipe - Replacement	
3	001131	Transmission air intake - Replacement	

## Carburettor

**CARBURETTOR**

	Code	Action	Duration
1	001082	Carburettor heating resistor - Replacement	
2	001013	Intake manifold - change	
3	004122	Air cleaner carburettor fitting - Replacement	
4	001081	Automatic choke - Replacement	
5	001008	Carburettor - Inspection	
6	001063	Carburettor - Replacement	

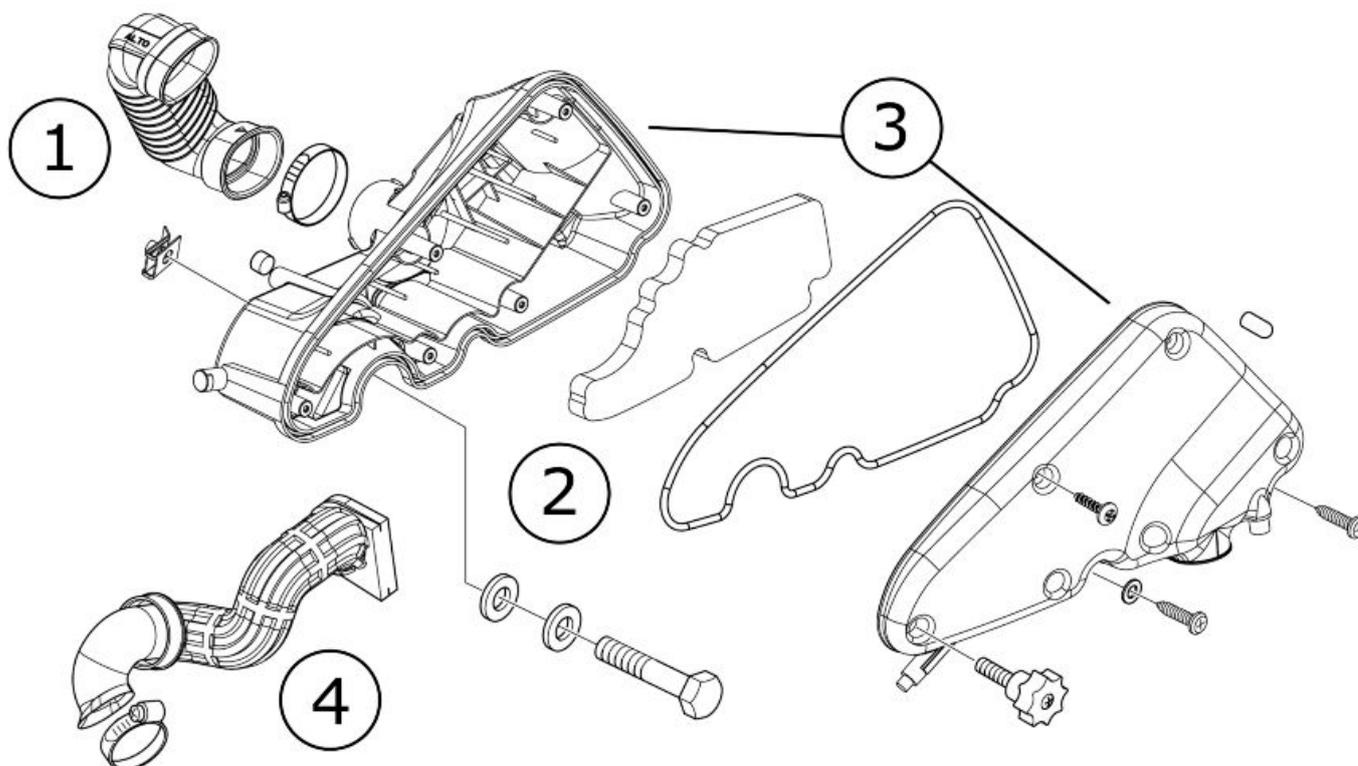
Exhaust pipe



**MUFFLER**

	Code	Action	Duration
1	001009	Muffler - Replacement	
2	001095	Muffler guard - Replacement	

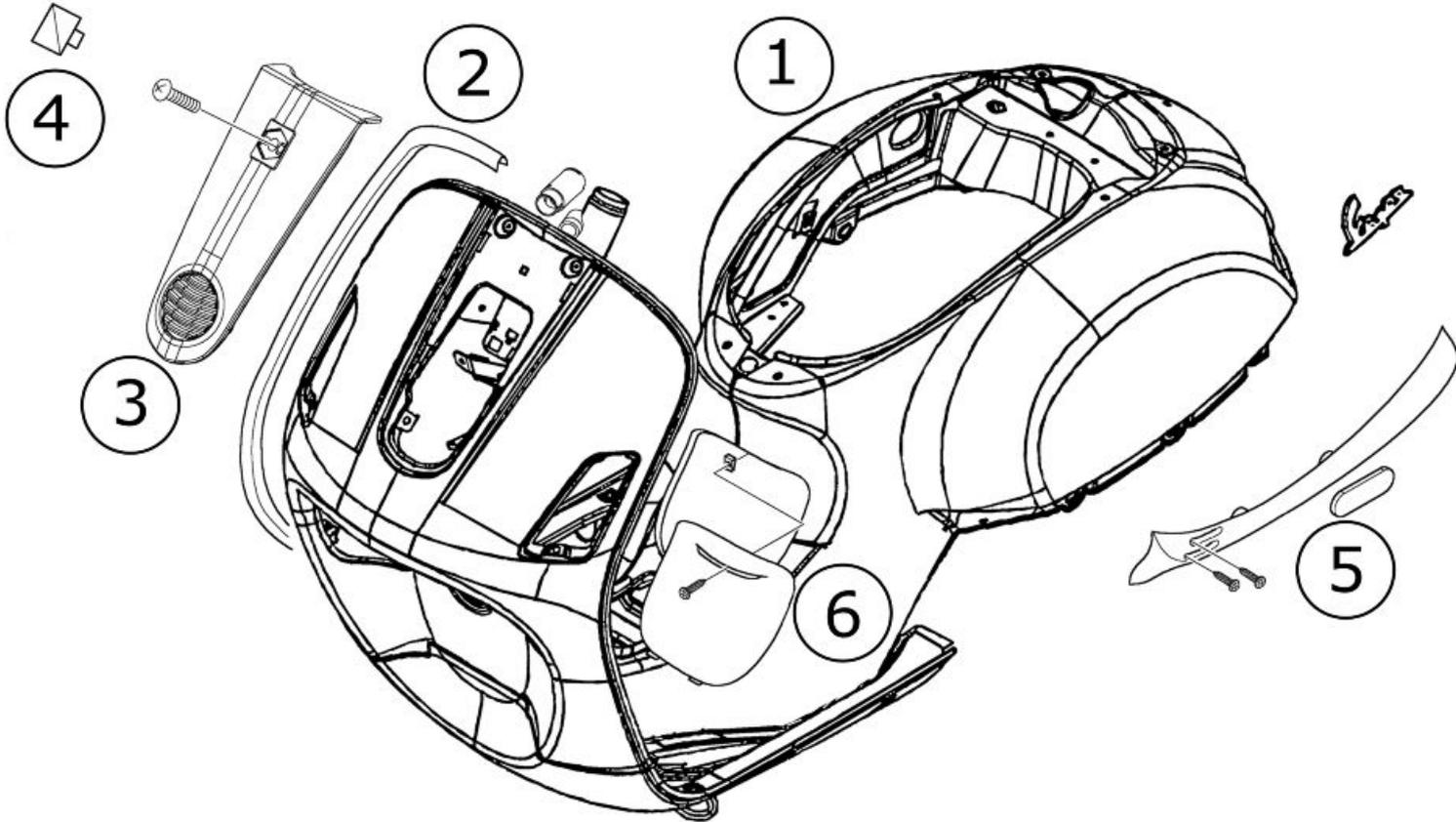
## Air cleaner



### AIR CLEANER

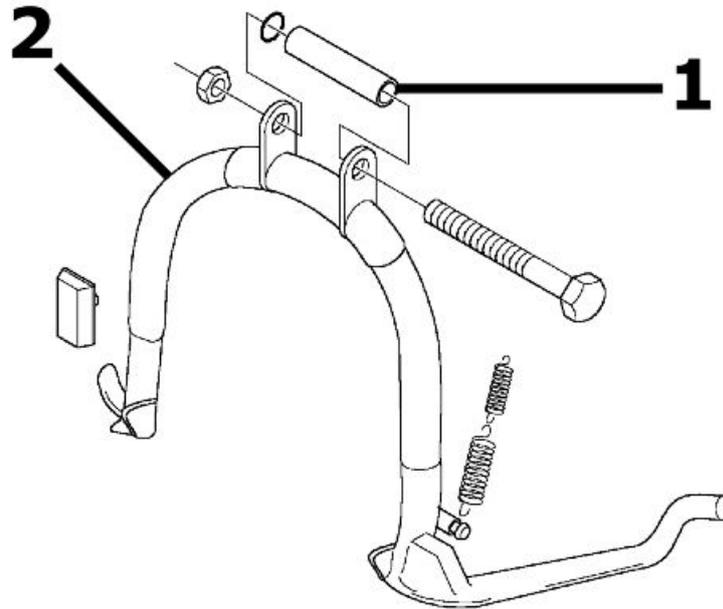
	Code	Action	Duration
1	004122	Air cleaner carburettor fitting - Replacement	
2	001014	Air filter - Replacement / cleaning	
3	001015	Air filter box - Replacement	
4	001027	Body / air cleaner union - Replacement	

Frame



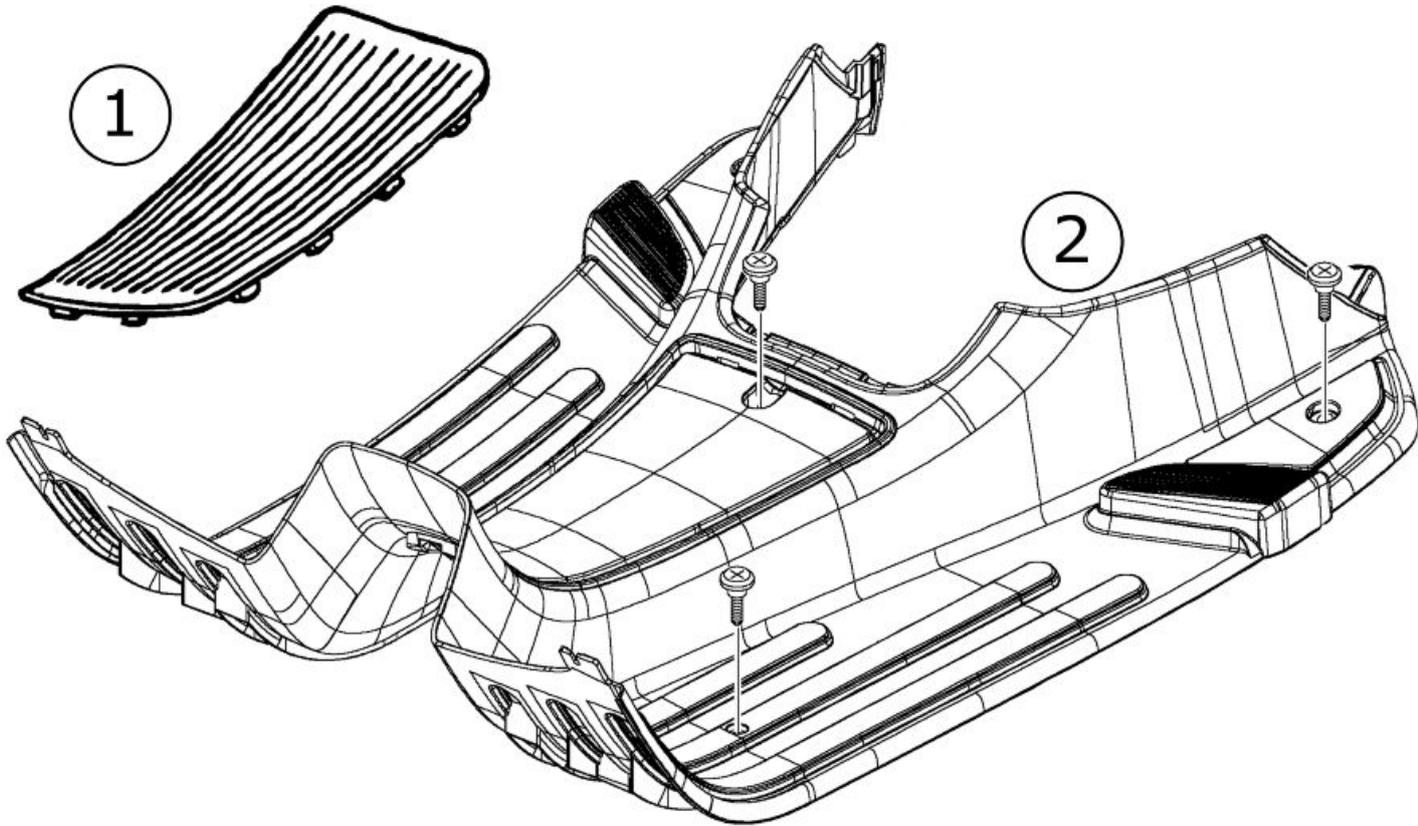
**FRAME**

	Code	Action	Duration
1	004001	Chassis - Replacement	
2	004023	Shield rim - Replacement	
3	004149	Shield central cover - Replacement	
4	004159	Plates / Stickers - Replacement	
5	004012	Rear side panels - Replacement	
6	004059	Spark plug inspection flap - Replacement	

**Centre-stand**

<b>STAND</b>			
	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001053	Stand bolt - Replacement	
2	004004	Stand - Replacement	

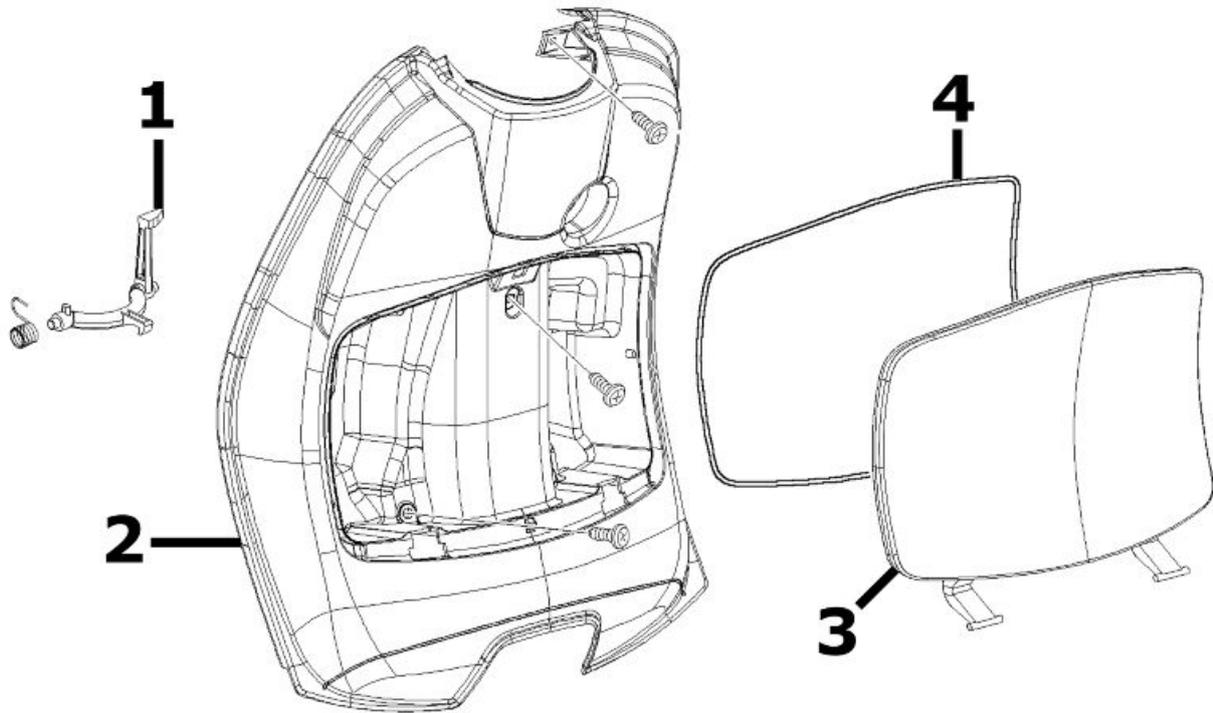
Footrests



**FOOTREST**

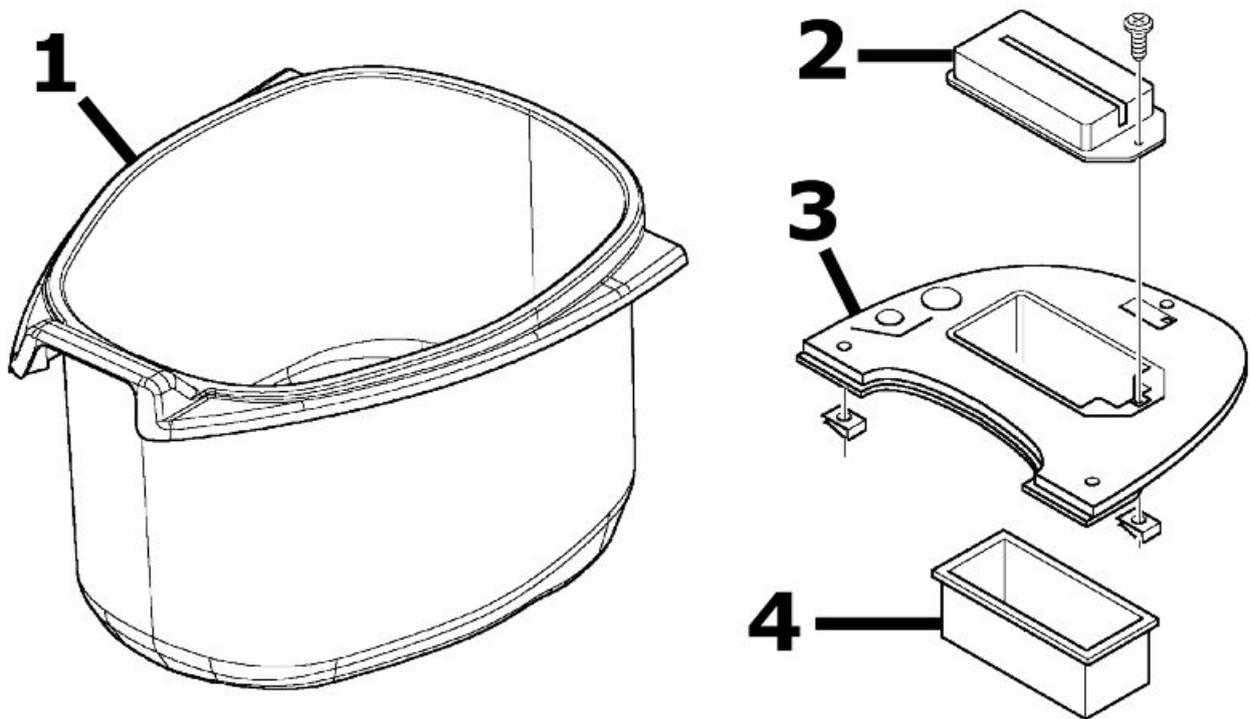
	Code	Action	Duration
1	004078	Front/rear footrest rubber - Replacement	
2	004178	Footrest - Replacement	

## Rear cover

**SHIELD BACK PLATE**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	004174	Trunk levers - Replacement	
2	004065	Front shield, rear part - Removal and refitting	
3	004081	Glove box door - Replacement	
4	004082	Trunk gasket - Replacement	

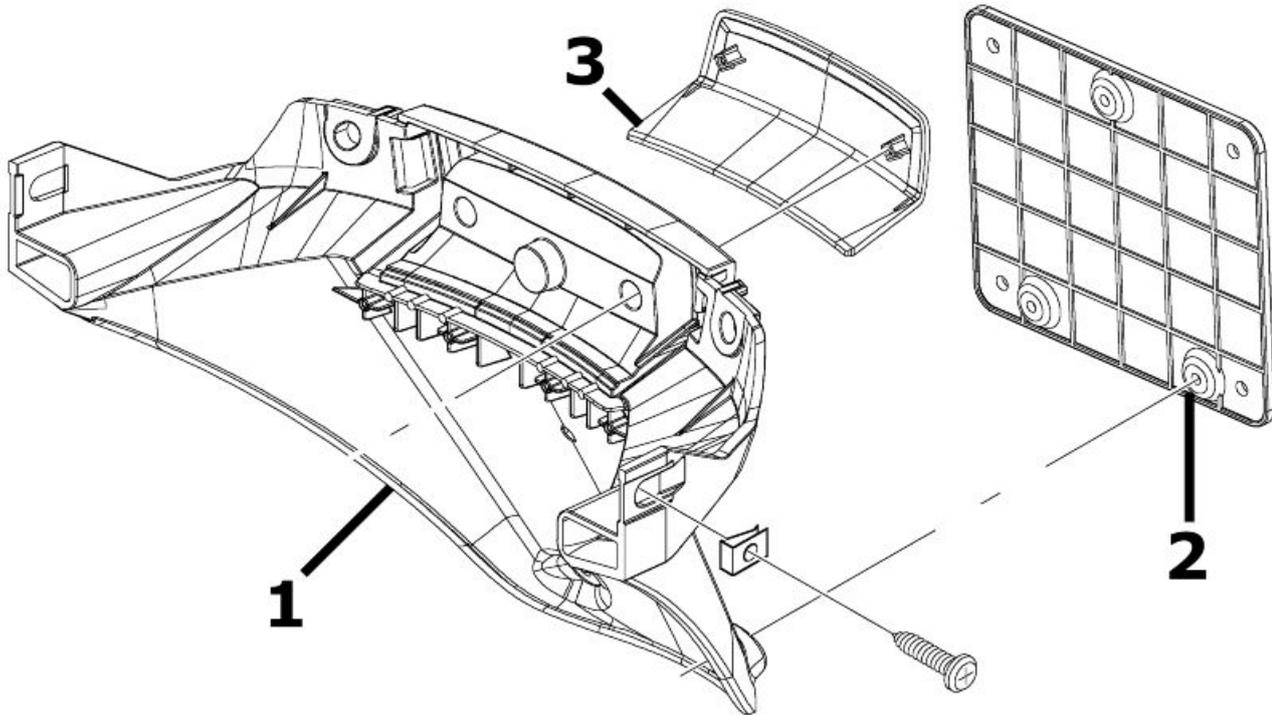
## Underseat compartment



### HELMET COMPARTMENT

	Code	Action	Duration
1	004016	Helmet compartment - Replacement	
2	005046	Battery cover - change	
3	004011	Central chassis cover - Replacement	
4	004071	Battery compartment - replacement	

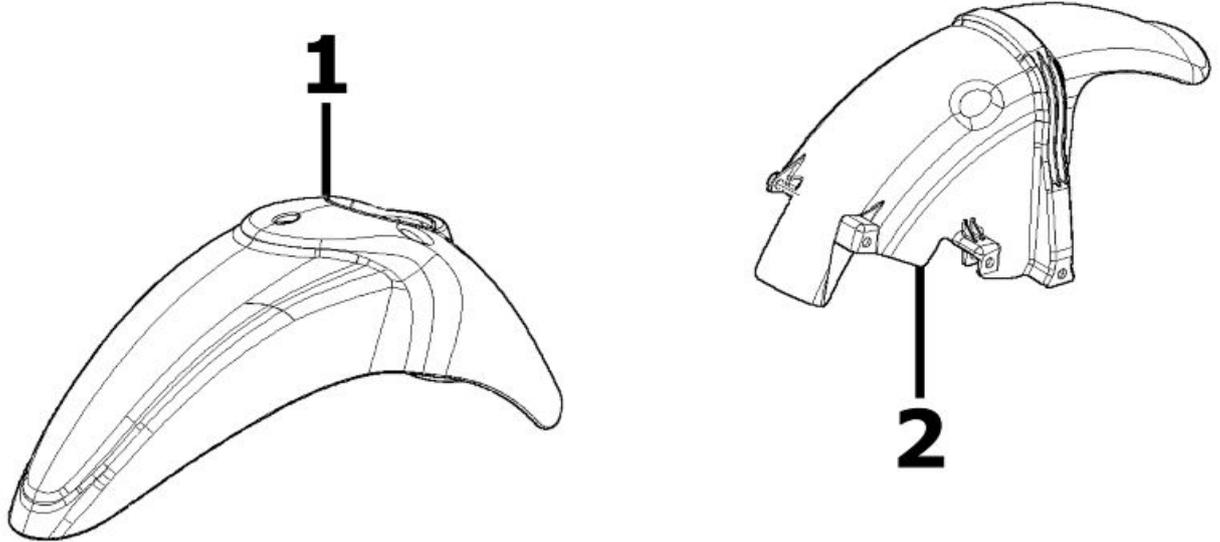
## Plate holder



### LICENSE PLATE HOLDER

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	004136	License plate support - Replacement	
2	005048	Licence plate holder - Replacement	
3	005032	Licence plate light glass - Replacement	

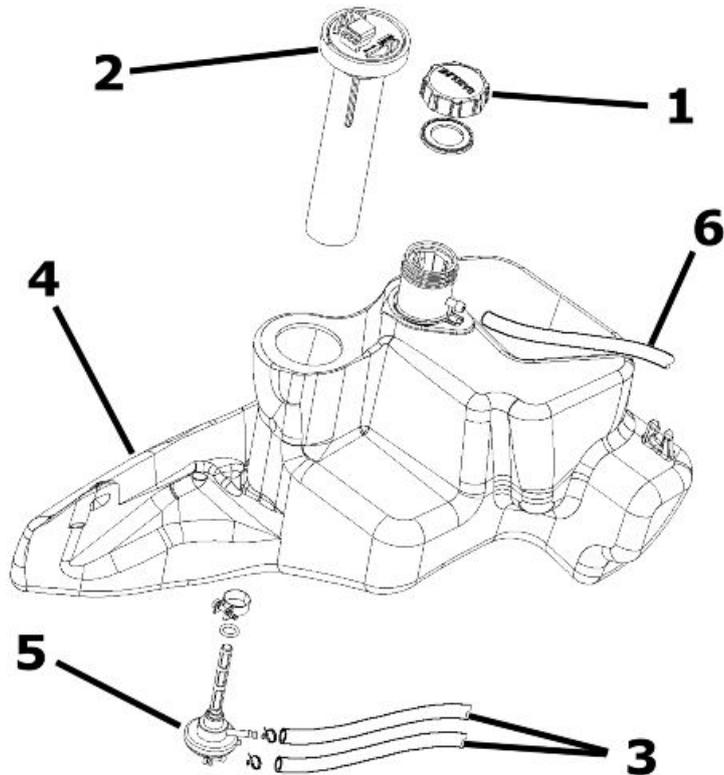
**Mudguard**



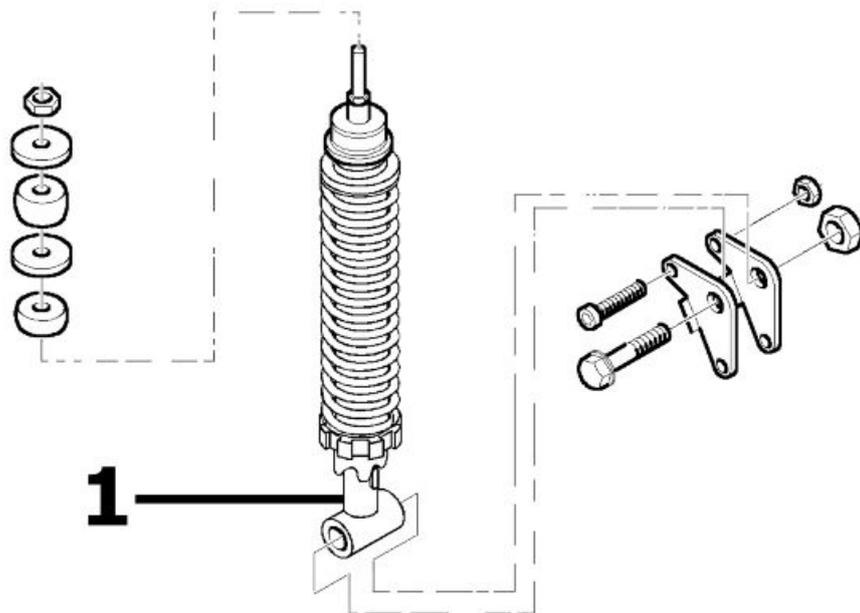
**MUDGUARDS**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	004002	Front mudguard - Replacement	
2	004009	Rear mudguard - Replacement	

## Fuel tank

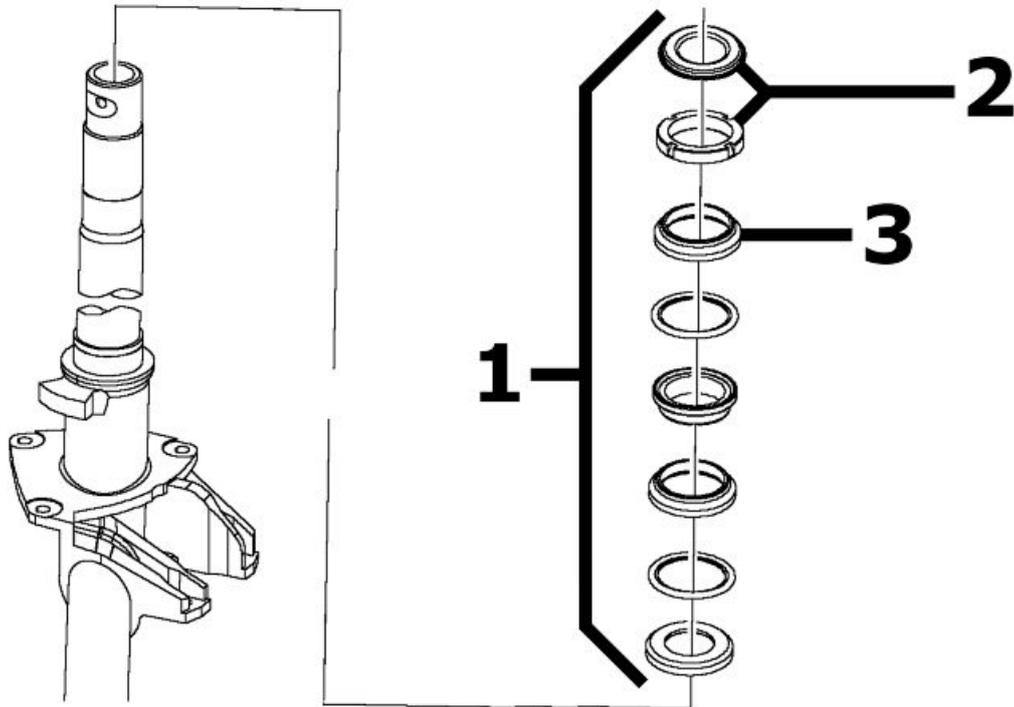
**FUEL TANK**

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

**Rear shock-absorber****REAR SHOCK ABSORBER**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	003007	Rear shock absorber - Removal and Refitting	

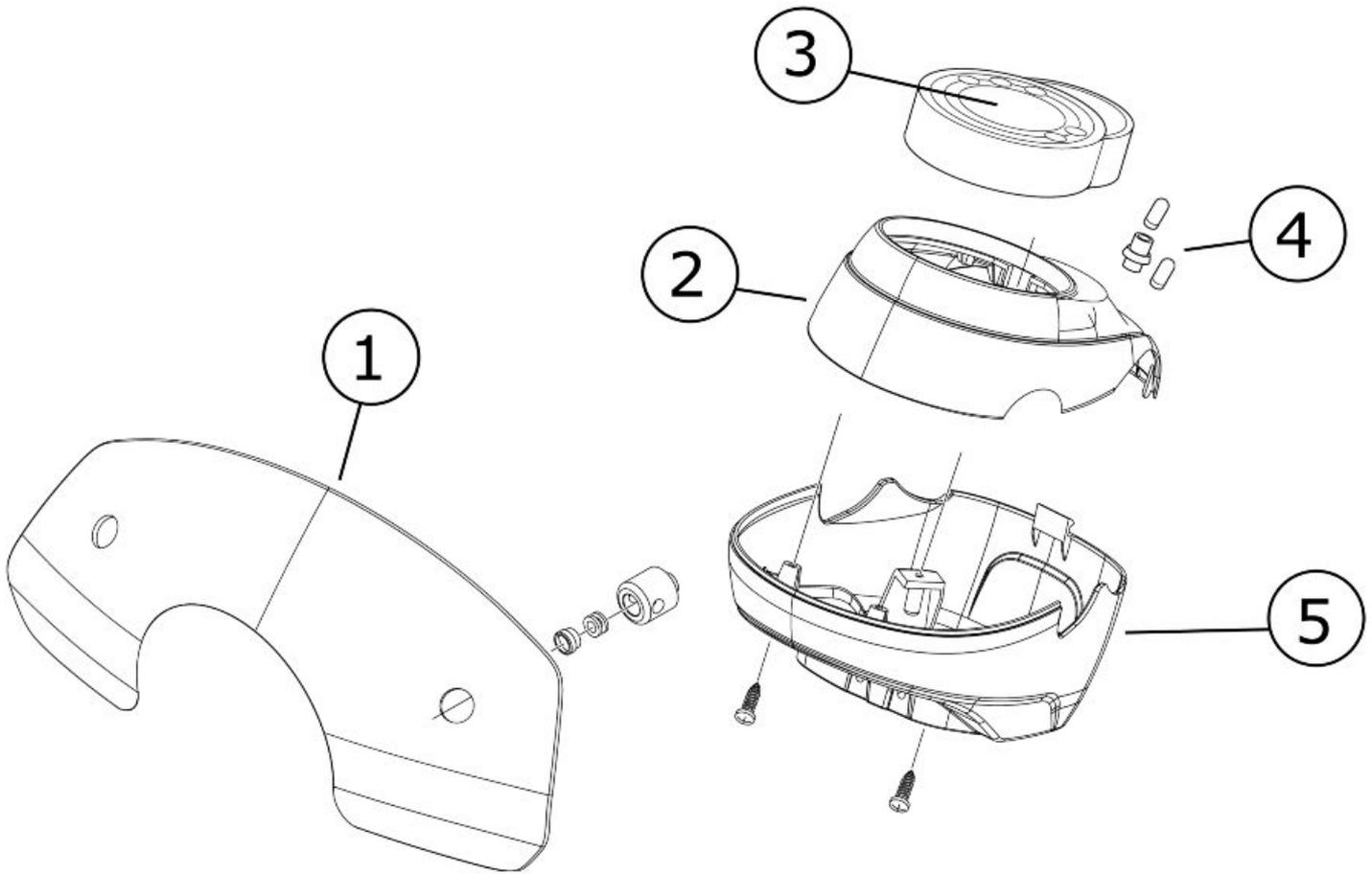
## Steering column bearings



### STEERING FIFTH WHEELS

	Code	Action	Duration
1	003002	Steering fifth wheel - Replacement	
2	003073	Steering clearance - Adjustment	
3	004119	Bearing / upper steering fifth wheel - Replacement	

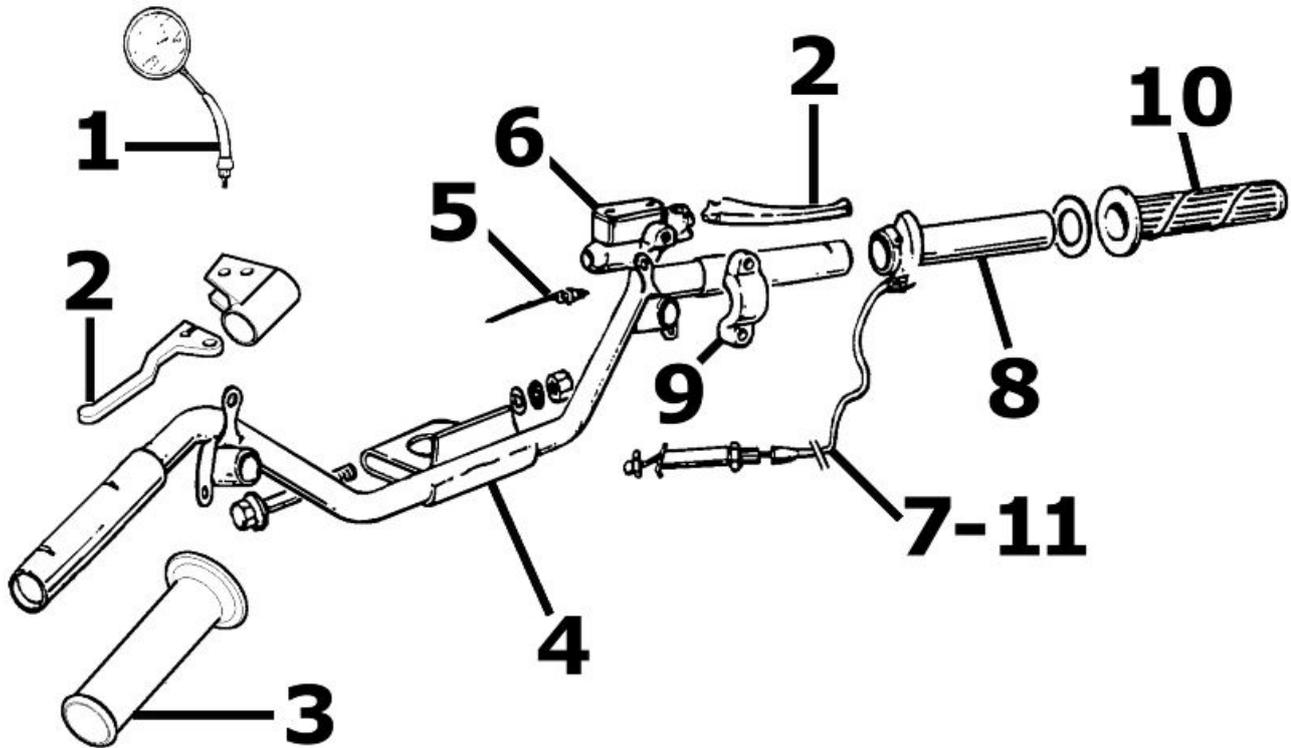
Handlebar covers



**ODOMETER - HANDLEBAR COVERS**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	004053	Spoiler - Replacement	
2	004018	Handlebar front section - Replacement	
3	005014	Odometer - Replacement	
4	005038	Instrument panel warning light bulbs - Replacement	
5	004019	Handlebar rear section - Replacement	

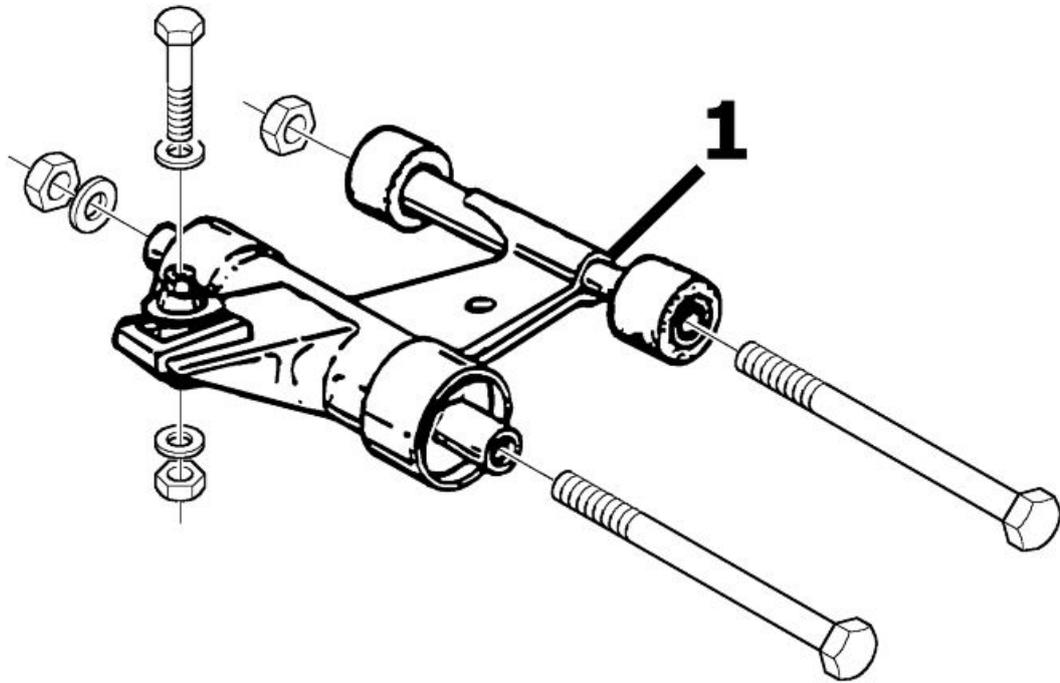
## Handlebar components



### HANDLEBAR COMPONENTS

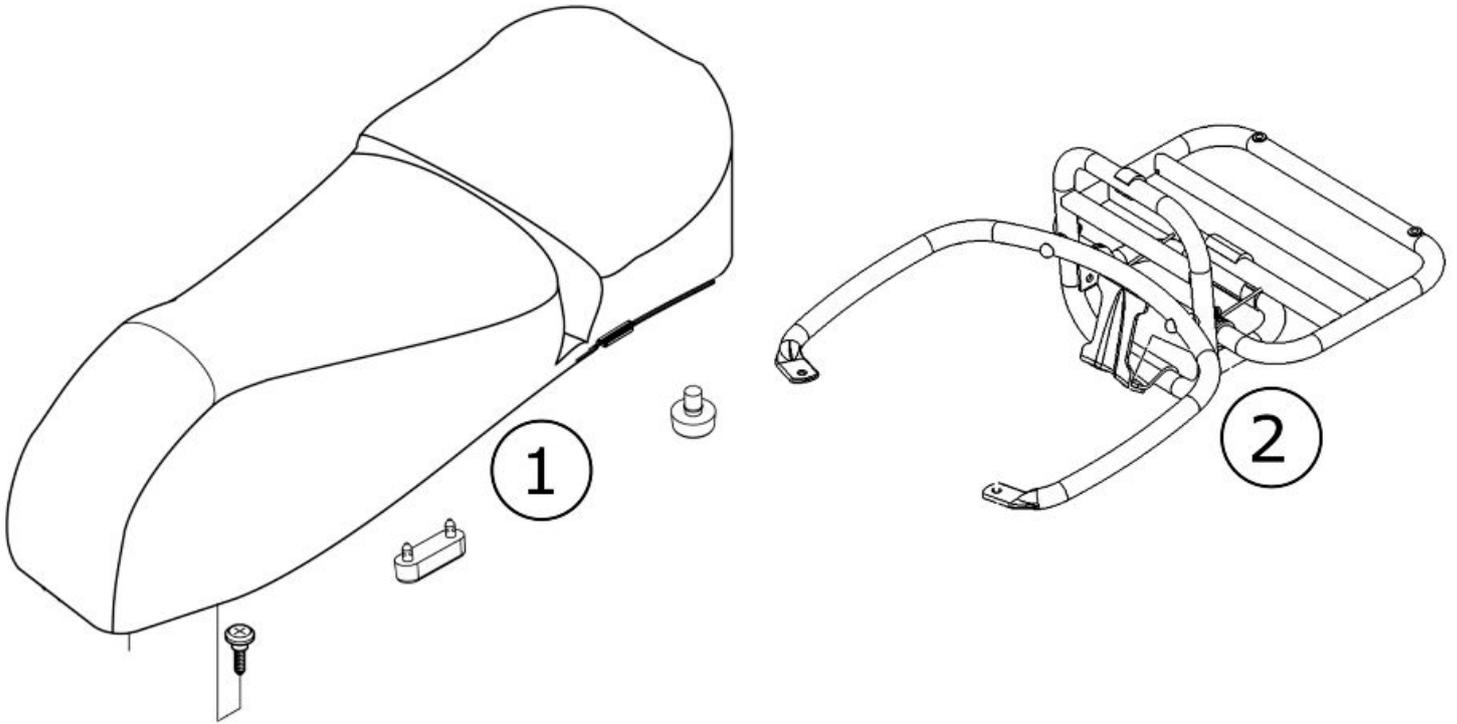
	Code	Action	Duration
1	004066	Driving mirror - Replacement	
2	002037	Brake or clutch lever - Replacement	
3	002071	Left hand grip - Replacement	
4	003001	Handlebar - Removal and refitting	
5	005017	Stop switch - Replacement	
6	002024	Front brake pump - Removal and Refitting	
7	003061	Accelerator transmission - Adjustment	
8	002060	Complete throttle control - Replacement	
9	004162	Mirror support and/or brake pump fitting U-bolt - Replacement	
10	002059	Right hand grip - Replacement	
11	002063	Throttle control transmission - Replacement	

**Swing-arm**



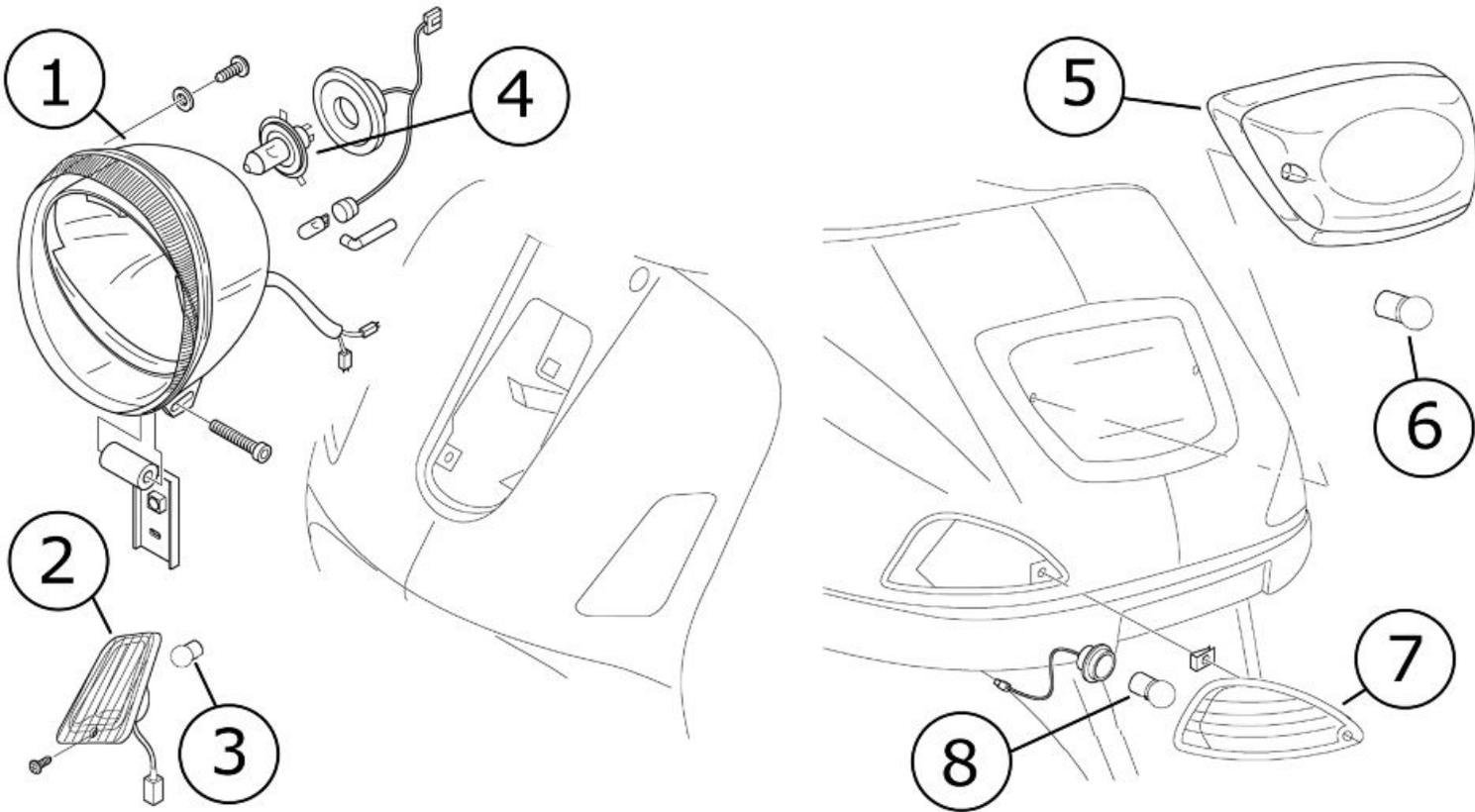
**SWINGING ARM**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	001072	Swinging arm - Engine-chassis connection - Replacement	

**Seat****SADDLE**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	004003	Saddle - Replacement	
2	004008	Luggage rack - Replacement	

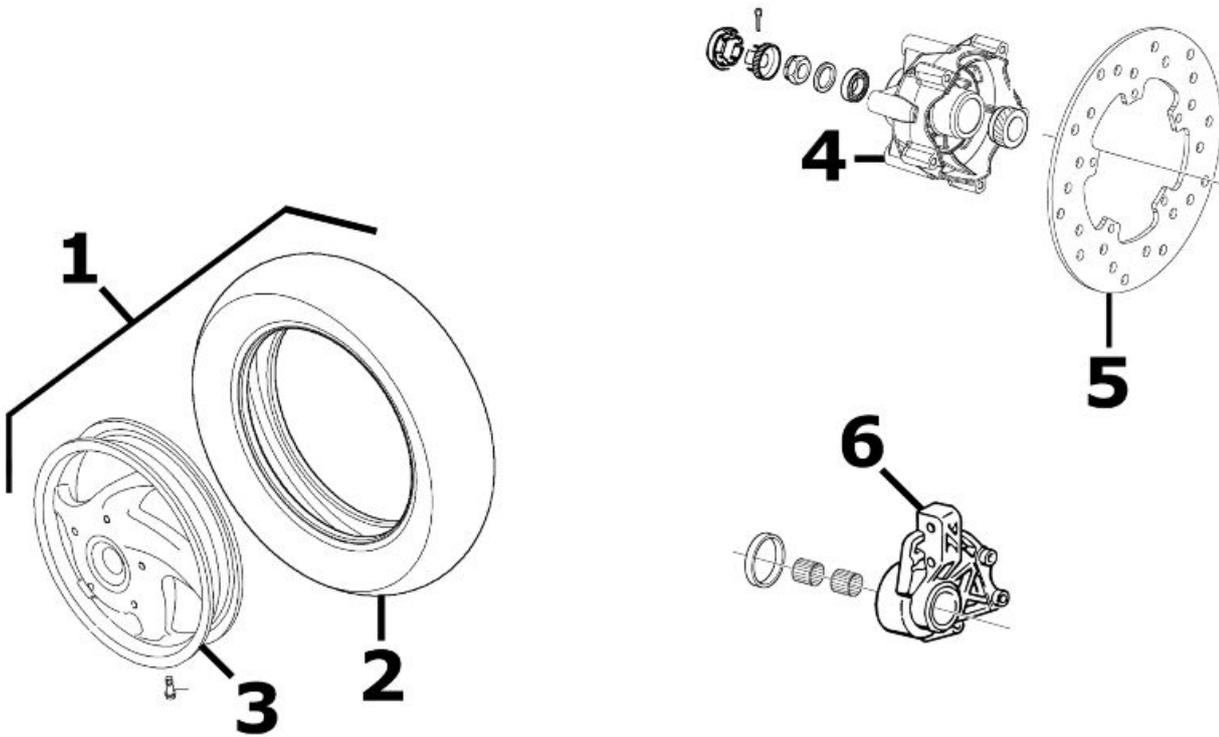
**Turn signal lights**



**TURN INDICATOR LIGHTS**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	005002	Front headlamp - Replacement	
2	005012	Front turn indicator - Replacement	
3	005067	Front turn indicator bulb - Replacement	
4	005008	Front headlamp bulbs - Replacement	
5	005005	Taillight - Replacement	
6	005066	Rear light bulbs - Replacement	
7	005022	Rear turn indicators - Replacement	
8	005068	Rear turn indicator bulb - Replacement	

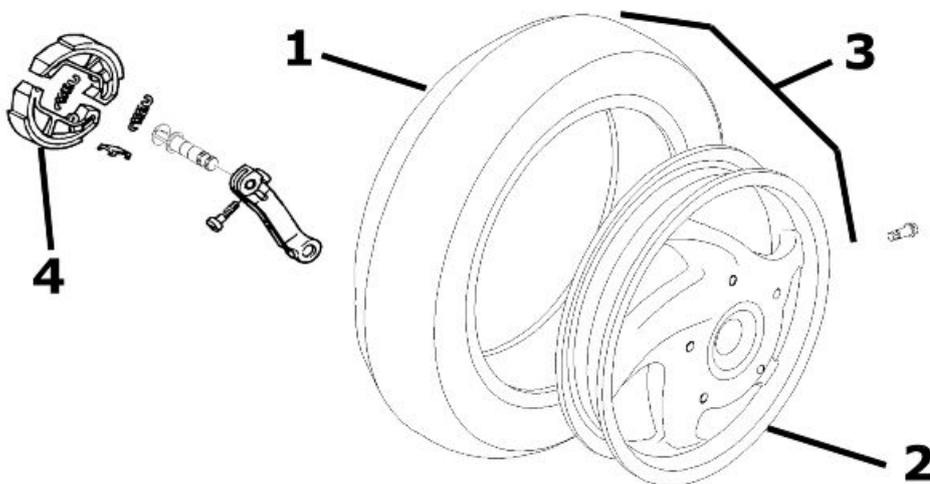
**Front wheel**



**FRONT WHEEL**

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

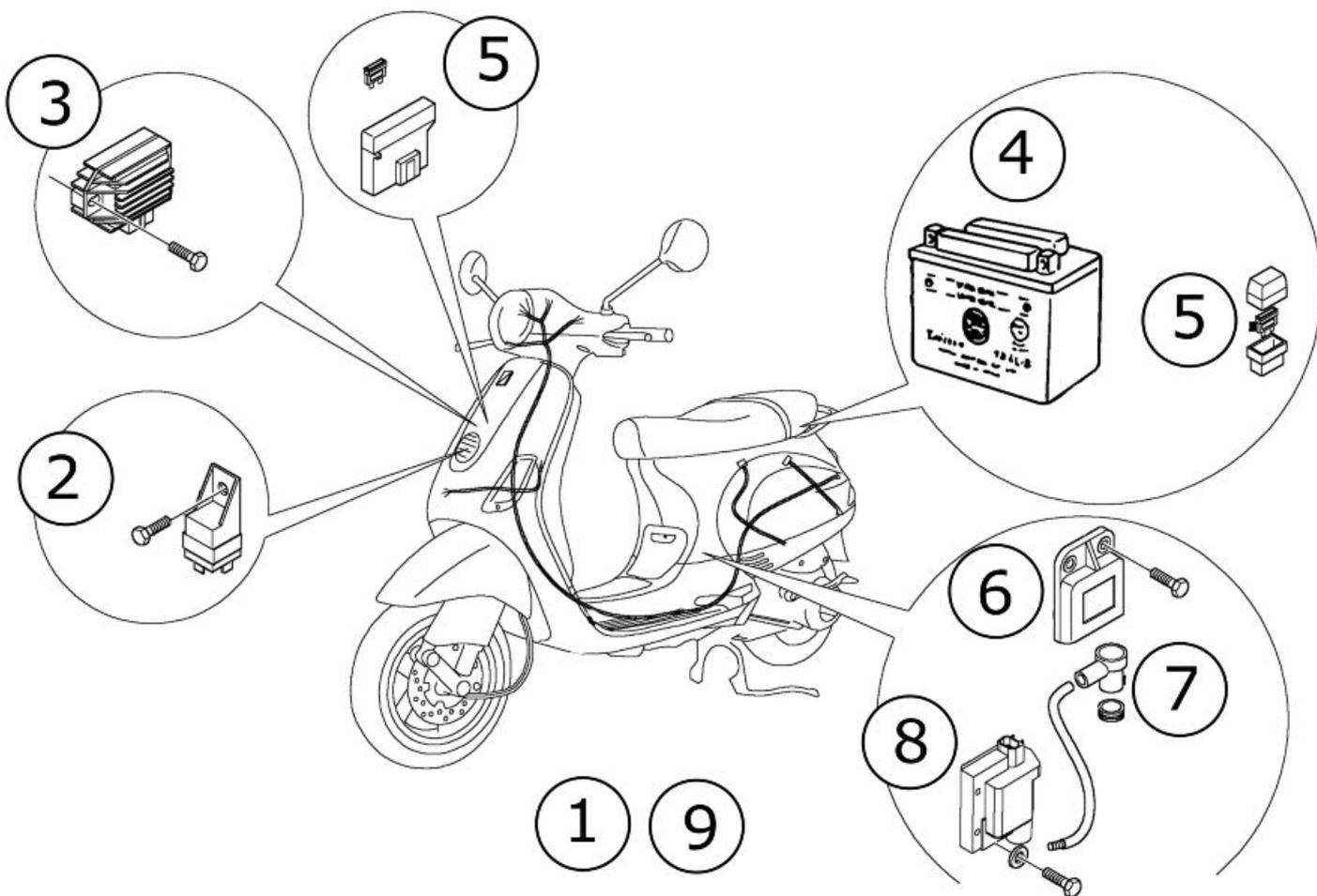
**Rear wheel**



**REAR WHEEL**

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

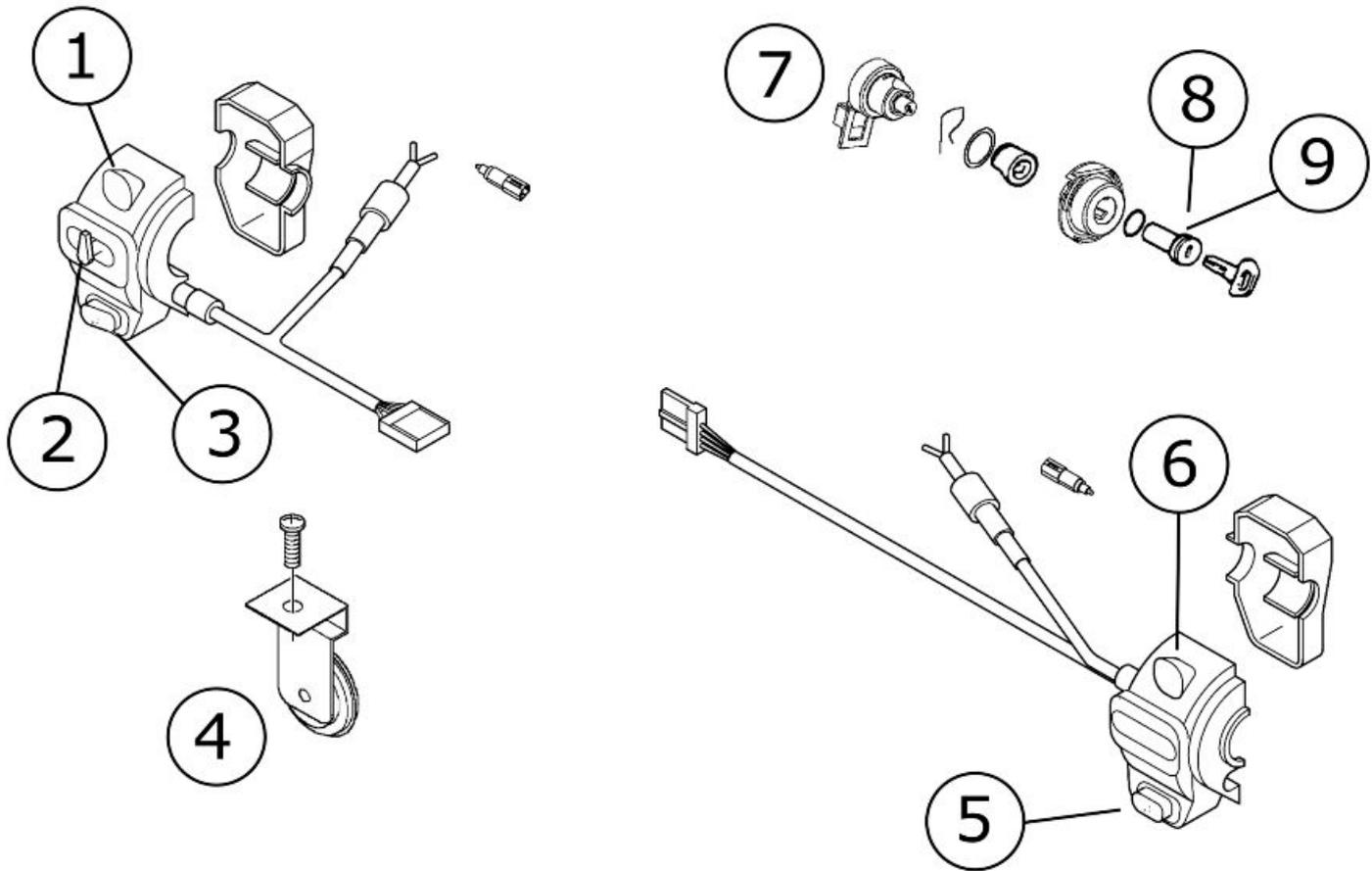
**Electric devices**



**ELECTRICAL COMPONENTS**

	Code	Action	Duration
1	005001	Electrical system - Replacement	
2	005011	Start-up remote control switch - Replacement	
3	005009	Voltage regulator - Replacement	
4	005007	Battery - Replacement	
5	005052	Fuse (1) - Replacement	
6	001023	Control unit - Replacement	
7	001094	Spark plug cap - Replacement	
8	001069	HV coil - Replacement	
9	005114	Electrical system - Service	

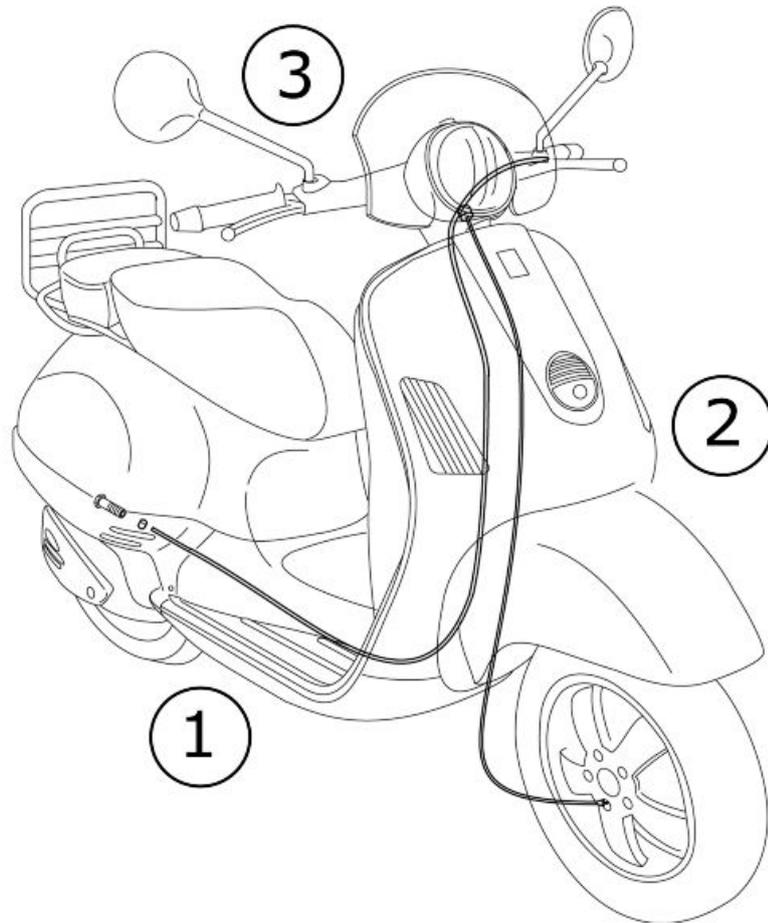
**Electronic controls**



**ELECTRICAL CONTROLS**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	005039	Headlight switch - Replacement	
2	005006	Light switch or turn indicators - Replacement	
3	005040	Horn button - Replacement	
4	005003	Horn - Replacement	
5	005041	Starter button - Replacement	
6	005077	Emergency stop switch - Replacement	
7	005016	Key switch - Replacement	
8	004096	Lock series - Replacement	
9	004010	Anti-theft lock - Replacement	

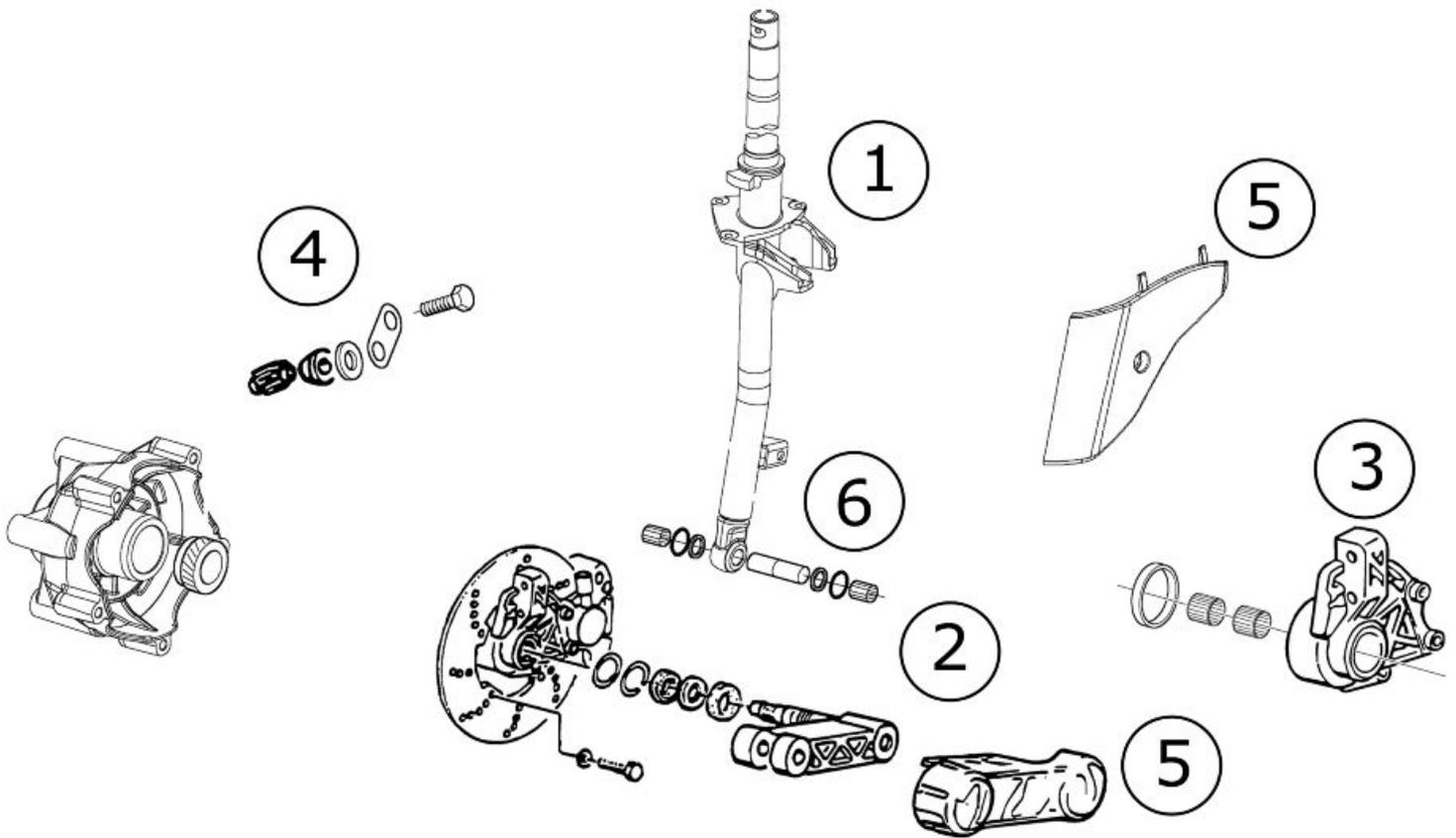
## Transmissions



### TRANSMISSIONS

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	002053	Rear brake transmission complete - Replacement	
2	002051	Odometer transmission assembly - Replacement	
3	002049	Odometer cable - Replacement	

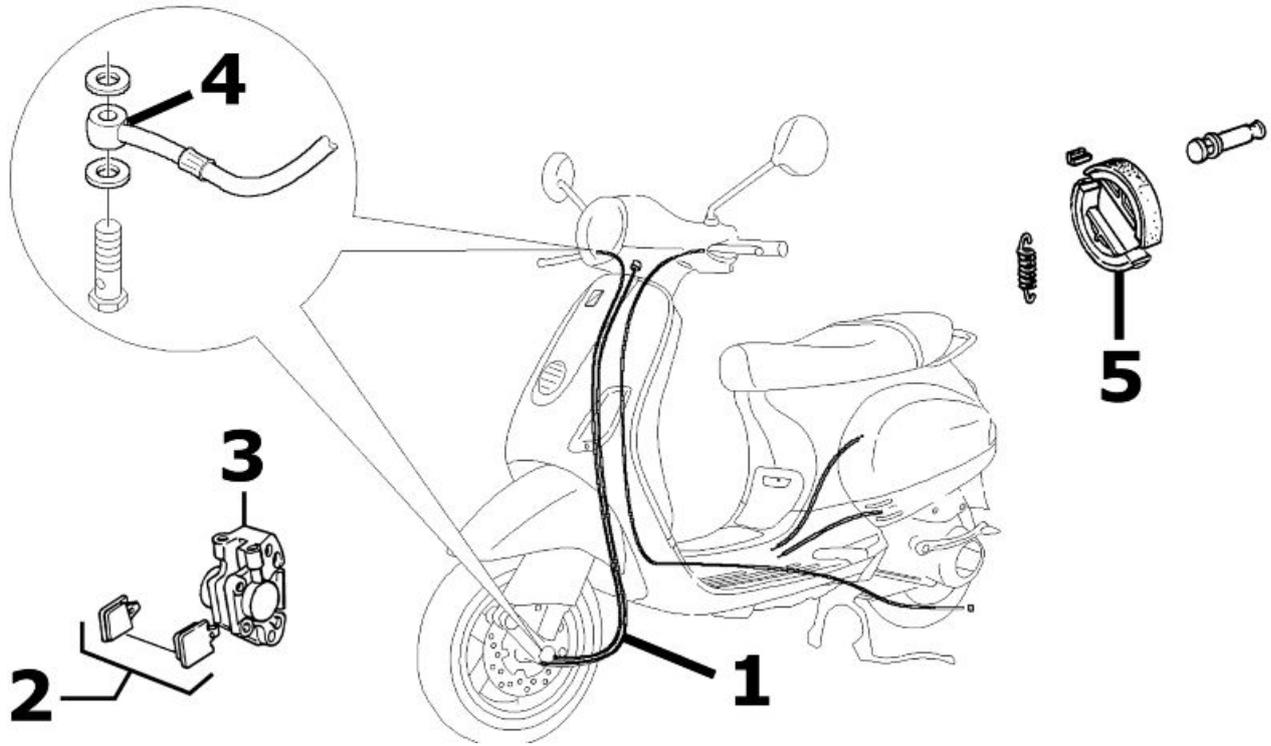
**Front suspension**



**FRONT SUSPENSION**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	003045	Steering tube - Replacement	
2	003010	Front suspension - Service	
3	003035	Shock absorber support and brake calliper - Replacement	
4	001064	Odometer reel - Replacement	
5	003044	Shock absorber cover - Replacement	
6	003038	Front wheel axle - Removal and Re-fit.	

**Braking system**



**BRAKING SYSTEM**

	<b>Code</b>	<b>Action</b>	<b>Duration</b>
1	002021	Front brake hose - Remov. and Refitt.	
2	002007	Front brake shoes/pads - Remov. and Refitt	
3	002039	Front brake calliper - Removal and Refitting	
4	002047	Front brake fluid and air bleeding system - Replacement	
5	002002	Shoes - Rear brake pads - Replacement	

## **A**

Air filter: 177

## **B**

Battery: 40, 51, 63, 68

Brake: 163, 165, 167, 169–171

Brake fluid: 169

## **C**

Carburettor: 9, 133, 138, 202

## **F**

Fuel: 39, 132, 212

Fuses: 67

## **H**

Headlight: 33, 176

## **I**

Identification: 7

Instrument panel: 175

## **M**

Maintenance: 6, 27

## **O**

Odometer:

Oil filter: 192

## **S**

Saddle:

Shock absorbers: 160

Spark plug: 61

Stand:

Start-up:

## **T**

Tank: 212

Transmission: 8, 39, 76, 89, 98, 198

Tyres: 9