PIAGGIO

SERVICE STATION MANUAL

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X9 Evolution 125

SERVICE STATION MANUAL

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The descriptions and illustrations given in this publication are not binding. While the basic specifications as described and illustrated in this booklet 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.
Not all versions shown in this publication are available in all countries. The availability of single models should be checked at the official Piaggio sales network.

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SERVICE STATION MANUAL
X9 Evolution 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 concerning 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.

INDEX OF TOPICS

INDEX OF TOPICS

This section describes the general specifications of the vehicle.

Rules

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

Safety rules

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

Maintenance rules

- Use original PIAGGIO spare parts and lubricants recommended by the Manufacturer. Non-original or non-conforming spares may damage the vehicle.
- Use only the appropriate tools designed for this vehicle.
- Always use new gaskets, sealing rings and split pins upon refitting.
- After removal, clean the components using non-flammable or low flash-point solvents. Lubricate all the work surfaces, except 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 measurement. Using unsuitable coupling members and tools may damage the vehicle.
- When carrying out maintenance operations on the vehicle that involve the electrical system, make sure the electric connections have been made properly, particularly the ground and battery connections.

Vehicle identification

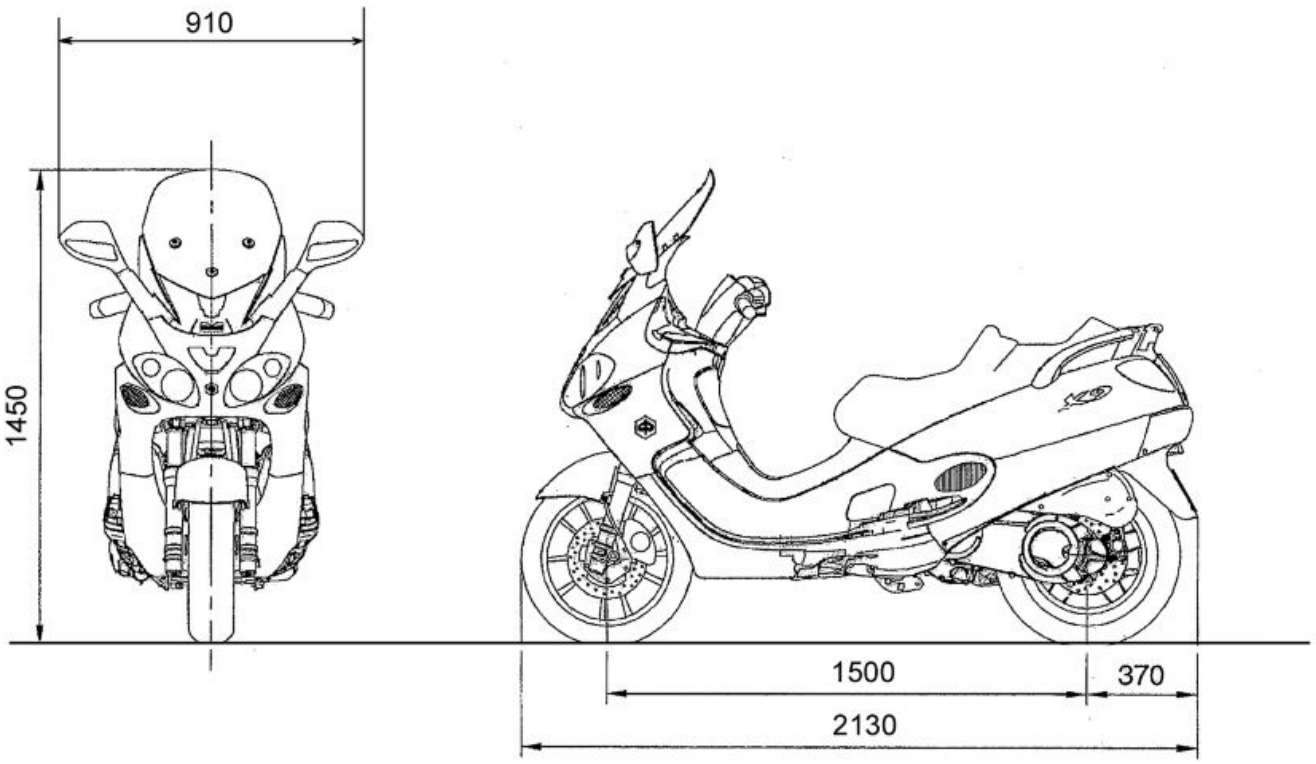
Chassis prefix: ZAPM481000000 ÷ 1001

Engine prefix: M482M

Dimensions and mass

WEIGHT AND DIMENSIONS

Specification	Desc./Quantity
Kerb weight	172±5 kg
Saddle height	790 mm
Wheelbase	1500 mm
Overall length	2130 mm
Overall height	1450 mm
Overall width	910 mm



Engine

TECHNICAL DATA

Specification	Desc./Quantity
Type	Single-cylinder, 4-stroke
Timing system	4 valves, single overhead camshaft, chain-driven.
Cubic capacity	124 cm³
Bore x stroke	57 x 48.6 mm
Compression ratio	12 ± 0.5: 1
Carburettor	KEIHIN CVK 29
ignition advance (before TDC)	10° at 2000 rpm
Valve clearance	intake: 0.10 mm discharge: 0.15 mm
Spark plug	CHAMPION RG4HC
Alternative spark plug	NGK CR8EB
Idle speed	1650 ± 100 rpm
Max. power	11 kW at 10,000 rpm
Max. torque	12 Nm at 8000 rpm
Maximum speed	105 km/h

Transmission

TRANSMISSIONS

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

Capacities

CAPACITY

Specification	Desc./Quantity
Rear hub	150 cm³
Cooling system	~ 1.2 l
Engine oil	~ 1000 cm³
Fuel tank (including a ~ 2.5 l reserve)	~ 14.5 l

Electrical system

ELECTRICAL COMPONENTS

Specification	Desc./Quantity
Generator	Three-phase alternating current
Battery	12V -10 Ah
Ignition type	Electronic capacitive discharge ignition (CDI) and variable advance, with separate HV coil.

Frame and suspensions

CHASSIS AND SUSPENSIONS

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

Brakes

BRAKES

Specification	Desc./Quantity
Rear	Ø 240 mm stainless steel disc with Brembo "Serie Oro" floating calliper with Ø 34 mm twin plungers
Integral braking system	Left lever acts on the left front and rear discs, through a valve that distributes the pressure; the right lever acts on the right front disc only
Front	Ø 240 mm stainless steel double disc with Ø 34 mm Brembo "Serie Oro" floating calliper (front Right) / Ø 32 (front Left)

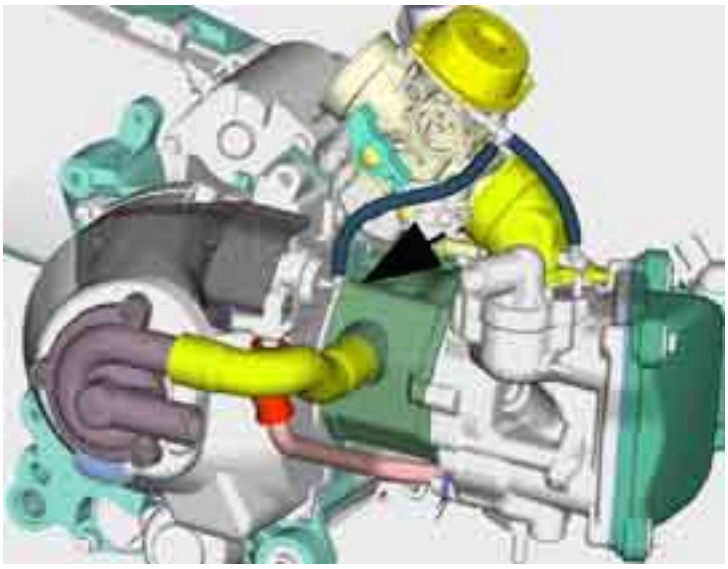
Wheels and tyres

WHEELS AND TYRES

Specification	Desc./Quantity
Tyre pressure (when cold)	Front: 2.1 bar Rear: 2.3 bar (2.5 bar with driver and luggage)
Front tyre	Without inner tube: 120/70-14" 55P
Rear tyre	Without inner tube: 140/60-14" 64P
Front wheel	alloy rim: 14'' x 3.50
Rear wheel	alloy rim: 14'' x 3.50

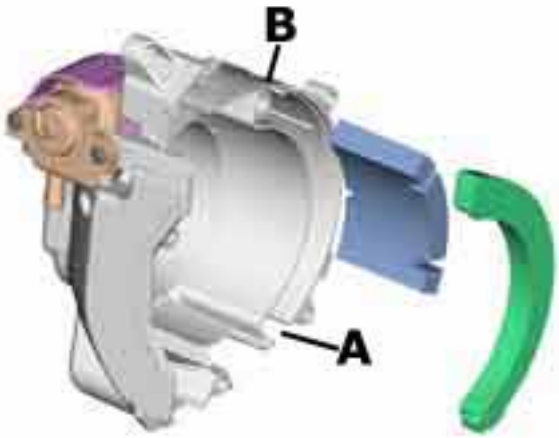
Secondary air

The SAS for 125cc leader engines operates in a similar manner to the SAS for 2T engines.
The differences are the following:
instead of entering through the muffler as for 2T engine, the secondary air enters directly in the discharge pipe on the head.



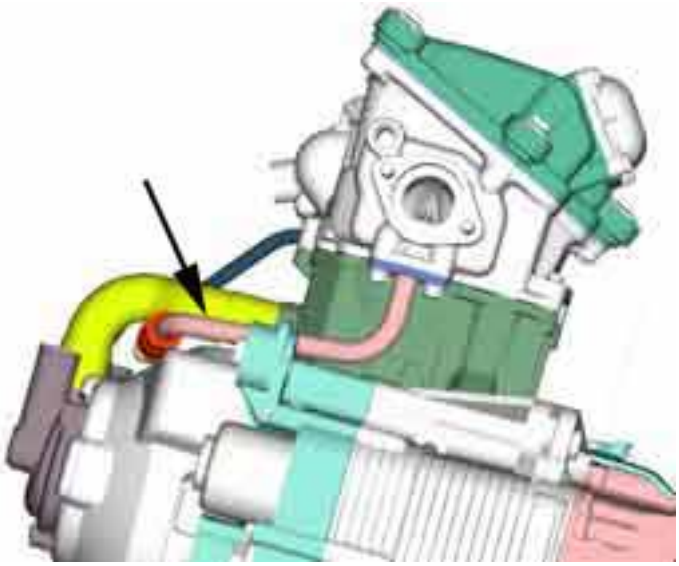
The 2T reed valve has a diaphragm. The unit, indicated by an arrow in the figure, has a cut-off connected to the depression intake on the inlet manifold that cuts the air inlet in deceleration, to avoid explosions in the muffler.

Air is drawn through the opening «**A**», goes through the first filter and is channelled through the opening «**B**».



Air gets to the second filter «**B**» through the opening shown in the figure. Now, the filtered air enters the diaphragm device, and then is channelled to the head.

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



125cc Version

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Carburettor	Keihin	Walbro
Vacuum type	CVK 30	WVF-7G*
Body stamping	CVK	7G
Stamping	303A	
Max. jet	105	108
Minimum jet	35	36

Carburettor	Keihin	Walbro
Max. air jet	70	115
Minimum air jet	130	100
Throttle valve spring	100 ± 160 g	100 g
Minimum mixture set screw initial opening	2 ± 1/4	2 5/8 ± 1/2
Tapered pin stamping	NDYA	51C
Tapered pin notches position from top	Fixed position	2
Diffuser nozzle	Ø 2.8	Ø 2.7
Starter air jet	Ø 1.5 (body)	200
Starter diffuser jet		130
Starter jet	42	50
Starter device resistance	~ 20 Ω	~ 40 Ω
Diffuser	Ø 29	Ø 29 (30.3x27.0)

* The identification letter can vary with each carburettor update.

Kehin

KEHIN CARBURETTOR

Specification	Desc./Quantity
Depression carburettor	CVEK-30
Body stamping	CVEK
Stamping	303A
Max. jet	105
Minimum jet	35
Max. air jet	70
Throttle valve spring	100 ÷ 160 g
Minimum mixture set screw initial opening	2 ± ¼
Tapered pin stamping	NDYA
Tapered pin notches position from top	Fixed position
Diffuser nozzle	Ø 2.8
Starter diffuser jet	
Starter jet	42
Starter device resistance	~ 20 Ω
Diffuser	Ø 29
125 keihn - Minimum air jet	130
125 keihn - Maximum air jet	70

N.B.

* **THE IDENTIFICATION LETTER MAY VARY WITH EACH CARBURETTOR UPDATE.**

Walbro

WALBRO CARBURETTOR

Specification	Desc./Quantity
Venturi diffuser	Ø 29 (30.3x27)
Starter device resistance	~ 40 Ω
Starter jet	50
Starter diffuser jet	130
Starter air jet	200

Specification	Desc./Quantity
Diffuser nozzle	Ø 2.7
Tapered pin notches from above	2
Tapered pin stamping	51C
Minimum mixture set screw initial opening	2 5/8 ± 1/2
Throttle valve spring	100 g
Minimum air jet	100
Max. air jet	115
Minimum jet	36
Max. jet	108
Stamping	
Body stamping	7GO
125 Walbro: Minimum jet	100
125 Walbro: Max. jet	115

N.B.

*** THE IDENTIFICATION LETTER MAY VARY WITH EACH CARBURETTOR UPDATE.**

200cc Version

Carburettor	Keihin	Walbro
Vacuum type	CVK30	WVF-7H*
Body stamping	CVK	7H
Stamping	303A	
Max. jet	100	118
Minimum jet	38	34
Max. air jet	70	150
Minimum air jet	115	50
Throttle valve spring	150 ÷ 250 g	120 g
Minimum mixture set screw initial opening	± 1/4	3 ± 1/4
Tapered pin stamping	NDWA	465
Tapered pin notches position from top	Fixed position	3
Diffuser nozzle	Ø 2.8	Ø 2.7
Starter air jet		200
Starter diffuser jet	Ø 1.5 (body)	130
Starter jet	42	50
Starter device resistance	~ 20 Ω	~ 40 Ω
Diffuser	Ø 29	Ø 29 (30.3x27.0)

ò The identification letter can vary with each carburettor update.

Kehin

KEHIN CARBURETTOR

Specification	Desc./Quantity
Depression carburettor	CVEK-30
Body stamping	CVEK

Specification	Desc./Quantity
Stamping	303A
Tapered pin notches position from top	Fixed position
Max. air jet	70
Diffuser nozzle	Ø 2.8
Starter jet	42
Starter device resistance	~ 20 Ω
Diffuser	Ø 29
Tapered pin stamping	NDWA
Minimum mixture set screw initial opening	± ¼
Throttle valve spring	150 ÷ 250 g
Minimum air jet	115
Minimum jet	38
Max. jet	100
Starter air jet	Ø 1.5 (body)
Starter diffuser nozzle	Ø 1.5 (body)

N.B.

THE IDENTIFICATION LETTER CAN VARY WITH EACH CARBURETTOR UPDATE

Walbro

WALBRO CARBURETTOR

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

N.B.

THE IDENTIFICATION LETTER CAN VARY WITH EACH CARBURETTOR UPDATE

Tightening Torques

TECHNICAL SERVICE NOTES

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

REAR BRAKE

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

FRONT BRAKE

Name	Torque in Nm
Oil bleed screw	8 ÷ 12
Disc tightening screw (°)	5 ÷ 6
Brake fluid pipe-calliper fitting	16 ÷ 20

Name	Torque in Nm
Brake fluid pump-hose fitting	16 ÷ 20
Tightening screw for calliper support to the fork	45 ÷ 55

REAR SUSPENSION

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

FRONT SUSPENSION

Name	Torque in Nm
Fork leg screw	6 ÷ 7
Front wheel axle	45 ÷ 50
Fork plate screw	25 ÷ 34

CHASSIS

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

STEERING

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

ENGINE - COOLING

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

CRANKCASE AND CRANKSHAFT

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

ENGINE - FLYWHEEL

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

ENGINE - TRANSMISSION

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

ENGINE - CYLINDER HEAD

Name	Torque in Nm
Manifold-silencer retaining bolt	15 ÷ 20
Nut fixing muffler to cylinder head	16 ÷ 18
Camshaft retention plate screw	4 ÷ 6
Timing chain tensioner central screw	5 ÷ 6
Timing chain tensioner support screw	11 ÷ 13
Start up counterweight support screw	11 ÷ 15
Timing chain tensioner slider screw	10 ÷ 14
Inlet manifold screws	11 ÷ 13
Tappet set screw lock nut	6 ÷ 8
Starter ground screw	7 ÷ 8.5
Head fixing side screws	11 ÷ 12
Nuts fixing head to cylinder (*)	27 ÷ 29
Tappet cover screws	6 ÷ 7
Spark plug	12 ÷ 14

LUBRICATION

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

N.B.

Before fitting the nuts, lubricate them with engine oil

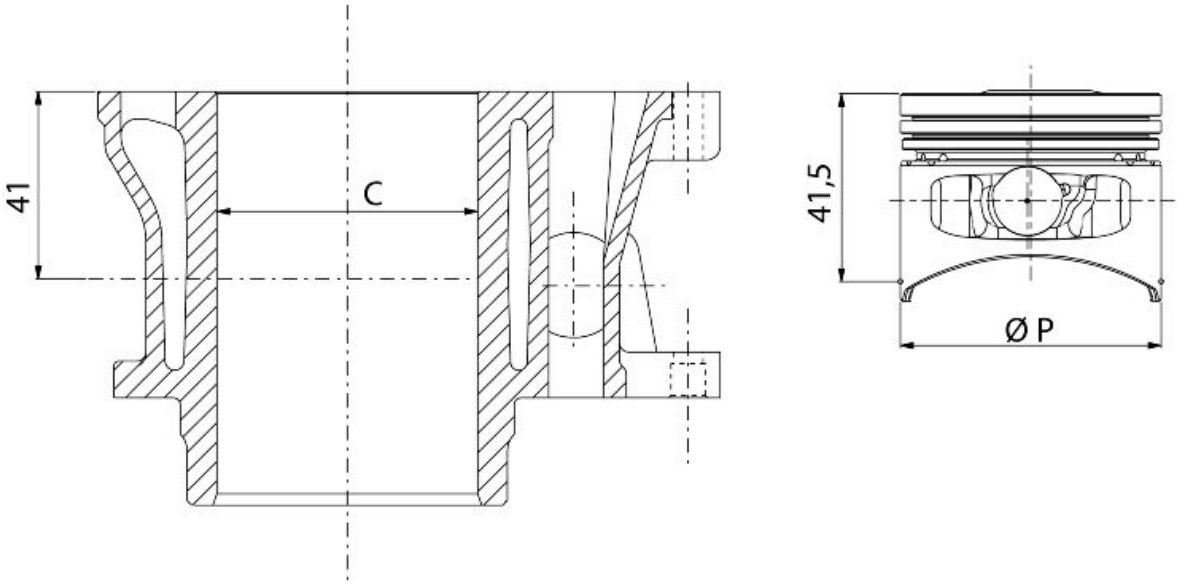
N.B.

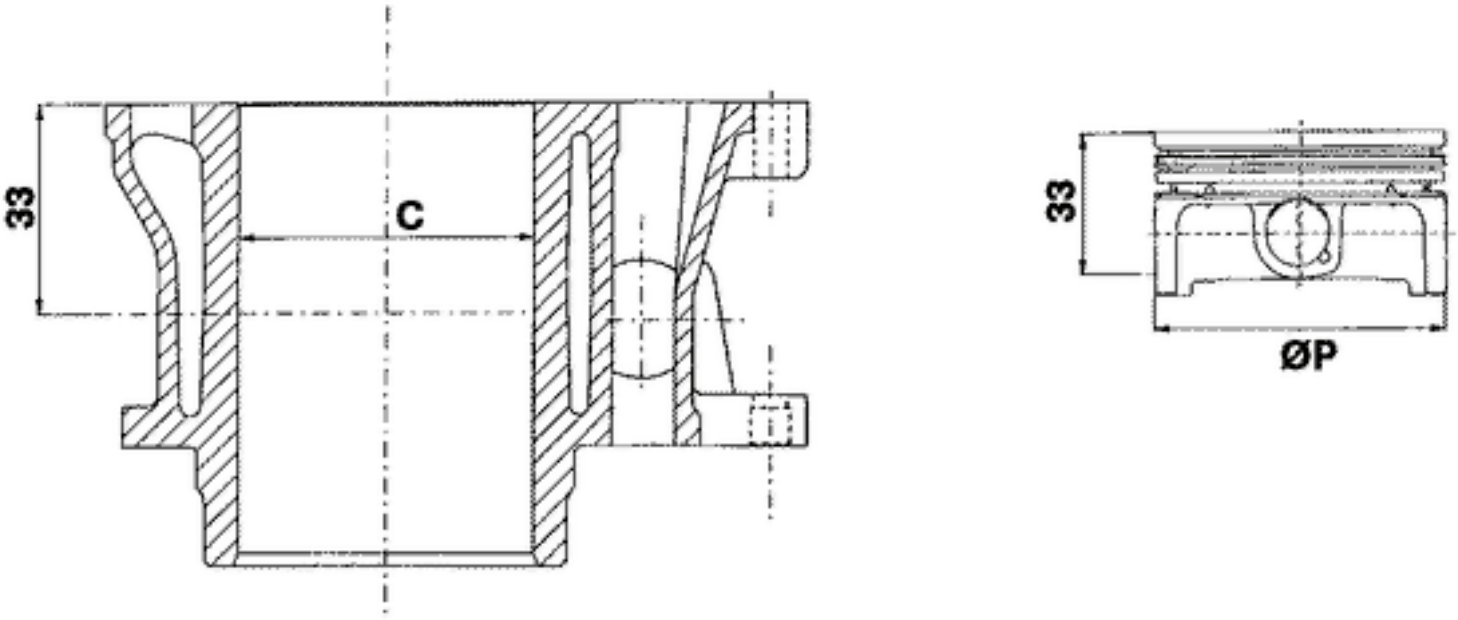
Use new nuts

Cylinder - piston assy.

ENGINE 125 COUPLING CATEGORIES

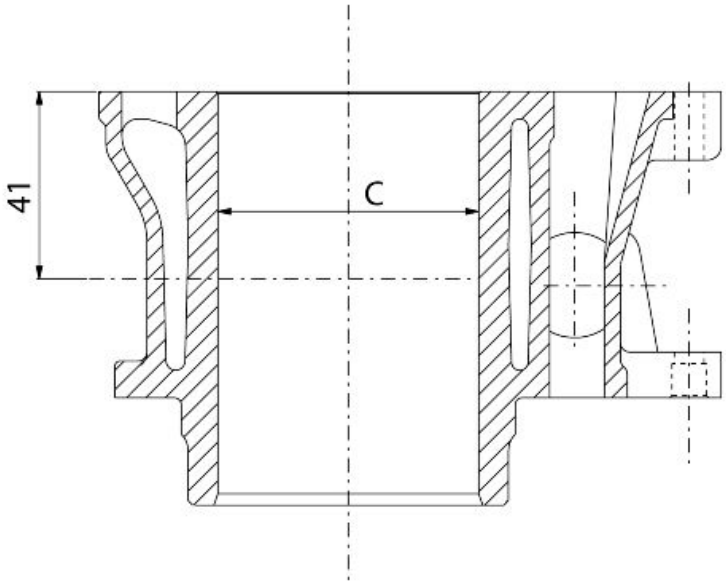
Name	Initials	Cylinder	Piston	Play on fitting
Cylinder	A	56.997 ÷ 57.004	56.945 ÷ 56.952	0.045 - 0.059
Cylinder	B	57.004 ÷ 57.011	56.952 ÷ 56.959	0.045 - 0.059
Piston	C	57.011 ÷ 57.018	56.959 ÷ 56.966	0.045 - 0.059
Piston	D	57.018 ÷ 57.025	56.966 ÷ 56.973	0.045 - 0.059
Cylinder 1st Oversize	A1	57.197 ÷ 57.204	57.145 ÷ 57.152	0.045 - 0.059
Cylinder 1st Oversize	B 1	57.204 ÷ 57.211	57.152 ÷ 57.159	0.045 - 0.059
Piston 1st Oversize	C 1	57.211 ÷ 57.218	57.159 ÷ 57.166	0.045 - 0.059
Piston 1st Oversize	D 1	57.218 ÷ 57.225	57.166 ÷ 57.173	0.045 - 0.059
Cylinder 2nd Oversize	A2	57.397 ÷ 57.404	57.345 ÷ 57.352	0.045 - 0.059
Cylinder 2nd Oversize	B 2	57.404 ÷ 57.411	57.352 ÷ 57.359	0.045 - 0.059
Piston 2nd Oversize	C 2	57.411 ÷ 57.418	57.359 ÷ 57.366	0.045 - 0.059
Piston 2nd Oversize	D 2	57.418 ÷ 57.425	57.366 ÷ 57.373	0.045 - 0.059
Cylinder 3rd Oversize	A 3	57.597 ÷ 57.604	57.545 ÷ 57.552	0.045 - 0.059
Cylinder 3rd Oversize	B 3	57.604 ÷ 57.611	57.552 ÷ 57.559	0.045 - 0.059
Piston 3rd Oversize	C 3	57.611 ÷ 57.618	57.559 ÷ 57.566	0.045 - 0.059
Piston 3rd Oversize	D 3	57.618 ÷ 57.625	57.566 ÷ 57.573	0.045 - 0.059

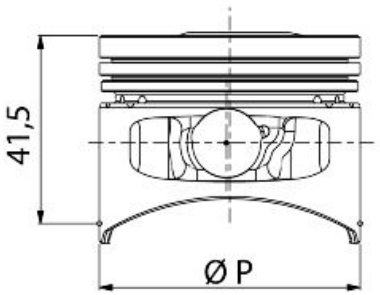




ENGINE 200 COUPLING CATEGORIES

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





ENGINE 125 COUPLING CATEGORIES

Name	Initials	Cylinder	Piston	Play on fitting
Cylinder	A	56.997 ÷ 57.004	56.945 ÷ 56.952	0.045 - 0.059
Cylinder	B	57.004 ÷ 57.011	56.952 ÷ 56.959	0.045 - 0.059
Piston	C	57.011 ÷ 57.018	56.959 ÷ 56.966	0.045 - 0.059
Piston	D	57.018 ÷ 57.025	56.966 ÷ 56.973	0.045 - 0.059
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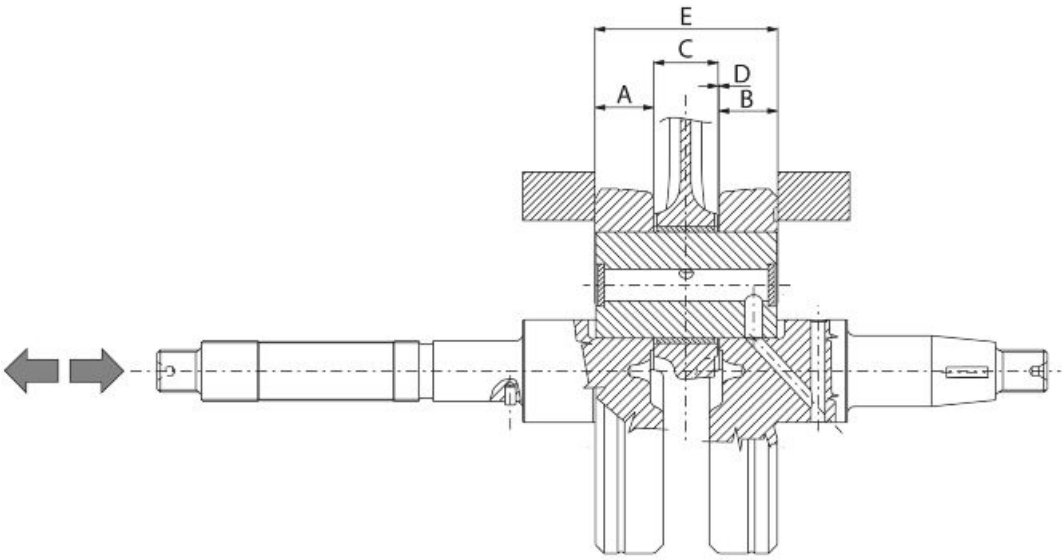
Piston 2nd Oversize	C 2	57.411 ÷ 57.418	57.359 ÷ 57.366	0.045 - 0.059
Piston 2nd Oversize	D 2	57.418 ÷ 57.425	57.366 ÷ 57.373	0.045 - 0.059
Cylinder 3rd Oversize	A 3	57.597 ÷ 57.604	57.545 ÷ 57.552	0.045 - 0.059
Cylinder 3rd Oversize	B 3	57.604 ÷ 57.611	57.552 ÷ 57.559	0.045 - 0.059
Piston 3rd Oversize	C 3	57.611 ÷ 57.618	57.559 ÷ 57.566	0.045 - 0.059
Piston 3rd Oversize	D 3	57.618 ÷ 57.625	57.566 ÷ 57.573	0.045 - 0.059

Crankcase - crankshaft - connecting rod

CRANKSHAFT

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

Crankshaft to connecting rod axial clearance



CRANKSHAFT/ CRANKCASE AXIAL CLEARANCE

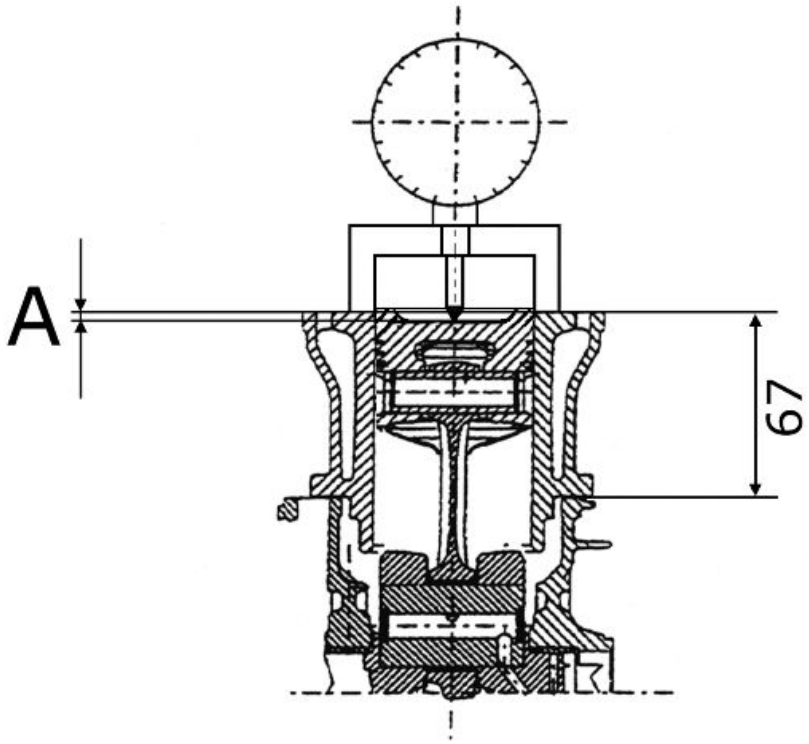
Name	Description	Dimensions	Initials	Quantity
Half-shaft, transmission side		16,6 +0-0,05	A	D = 0.20 ÷ 0.50
Flywheel-side half shaft		16,6 +0-0,05	B	D = 0.20 ÷ 0.50
Connecting rod		18 -0.10 -0.15	C	D = 0.20 ÷ 0.50
Spacer tool		51.4 +0.05	E	D = 0.20 ÷ 0.50

Slot packing system

Characteristic

Compression ratio, 200 models

Cr: 11÷12 :1



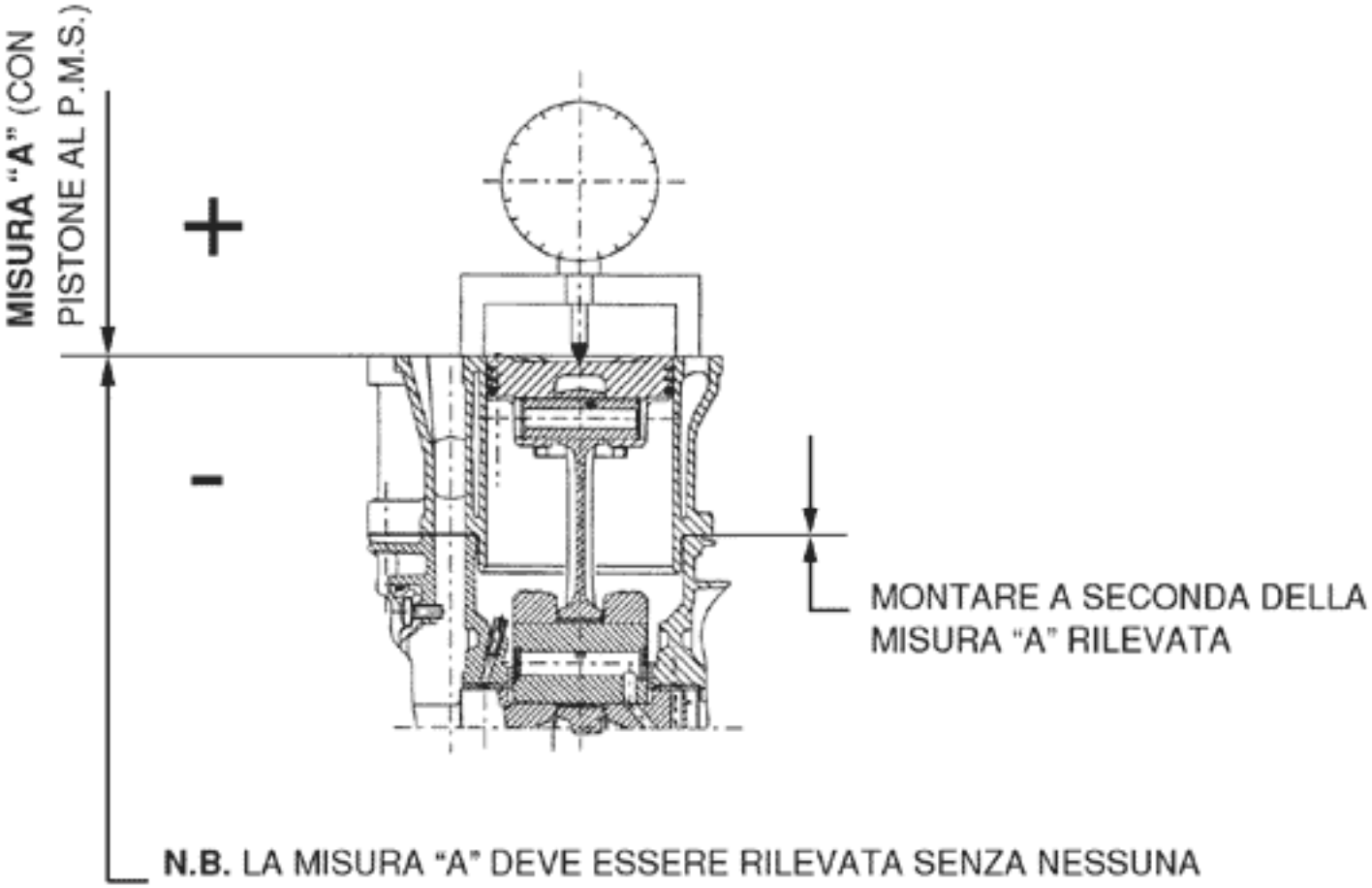
Measurement «**A**» to be taken, is a value of piston re-entry. It indicates by how much the plane formed by the piston crown descends below the plane formed by the upper part of the cylinder. The further the piston falls inside the cylinder, the less the base gasket to be applied (to recover the compression ratio) and vice versa.

N.B.

NO GASKETS AND SEALS SHOULD BE ASSEMBLED BETWEEN THE CRANKCASE AND CYLINDER AND THE DIAL GAUGE EQUIPPED WITH SUPPORT SHOULD BE SET TO ZERO FOR MEASUREMENT «A» TO BE TAKEN WITH THE PISTON AT TOP DEAD CENTRE POSITION AND ON A RECTIFIED PLANE.

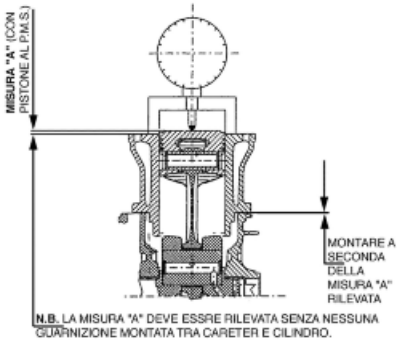
VERSION 200 WITH FIBRE HEAD GASKET (1.1)

Name	Measure A	Thickness
Shimming 200 - Cylinder 67 - Head gasket 1.1 - Base gasket 0.4	1.70 ÷ 1.60	0.4 ± 0.05
Shimming 200 - Cylinder 67 - Head gasket 1.1 - Base gasket 0.6	1.60 ÷ 1.40	0.6 ± 0.05
Shimming 200 - Cylinder 67 - Head gasket 1.1 - Base gasket 0.8	1.40 ÷ 1.30	0.8 ± 0.05



ENGINE 200 SHIMMING

Name	Measure A	Thickness
200	1.40 ÷ 1.30	0.8 ± 0.05
200	1.60 ÷ 1.40	0.6 ± 0.05
200	1.70 ÷ 1.60	0.4 ± 0.05



ENGINE 125 SHIMMING

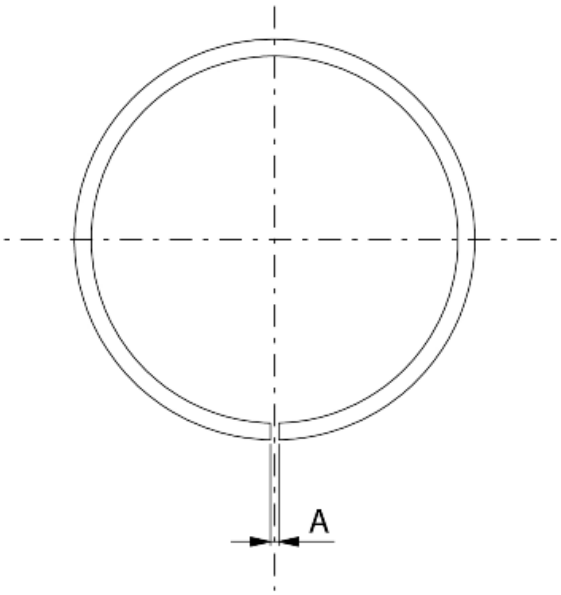
Name	Measure A	Thickness
125	2.2 ÷ 2.4	0.4 ± 0.05

Name	Measure A	Thickness
125	2.4 ÷ 2.6	0.6 ± 0.05

N.B.

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

Oversizes



ENGINE 125 OVERSIZE

Name	Description	Dimensions	Initials	Quantity
Compression ring		57 x 1	A	0.15 ÷ 0.30
Oil scraper ring		57 x 1	A	0.10 ÷ 0.30
Oil scraper ring		57 x 2.5	A	0.15 ÷ 0.35
Compression ring 1st oversize		57.2 x 1	A	0.15 ÷ 0.30
Oil scraper ring 1st Oversize		57.2 x 1	A	0.10 ÷ 0.30
Oil scraper ring 1st Oversize		57.2 x 2.5	A	0.15 ÷ 0.35
Compression ring 2nd Oversize		57.4 x 1	A	0.15 ÷ 0.30
Oil scraper ring 2nd Oversize		57.4 x 1	A	0.10 ÷ 0.30
Oil scraper ring 2nd Oversize		57.4 x 2.5	A	0.15 ÷ 0.35
Compression ring 3rd Oversize		57.6 x 1	A	0.15 ÷ 0.30
Oil scraper ring 3rd Oversize		57.6 x 1	A	
Oil scraper ring 3rd Oversize		57.6 x 2.5	A	0.15 ÷ 0.35

ENGINE 200 OVERSIZE

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

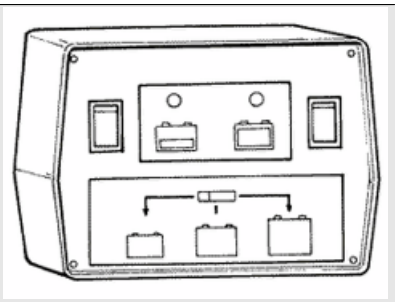
Products

RECOMMENDED PRODUCTS TABLE

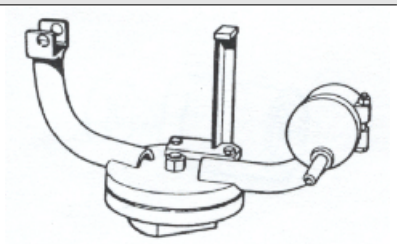
Product	Description	Specifications
AGIP ROTRA 80W-90	Rear hub oil	SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications
AGIP CITY HI TEC 4T	Oil to lubricate flexible transmissions (throttle control)	Oil for 4-stroke engines
AGIP FILTER OIL	Oil for air filter sponge	Mineral oil with specific additives for increased adhesiveness
AGIP GP 330	Calcium complex soap-based grease with NLGI 2; ISO-L-XBCIB2	Grease (brake control levers, throttle grip)
AGIP CITY HI TEC 4T	Engine oil	SAE 5W-40, API SL, ACEA A3, JASO MA Synthetic oil
AGIP BRAKE 4	Brake fluid	FMVSS DOT 4 Synthetic fluid
SPECIAL AGIP PERMANENT fluid	coolant	Monoethylene glycol-based antifreeze fluid, CUNA NC 956-16

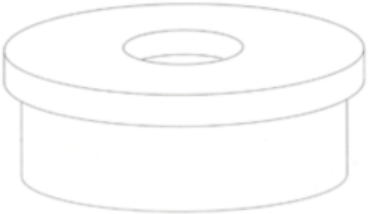
INDEX OF TOPICS

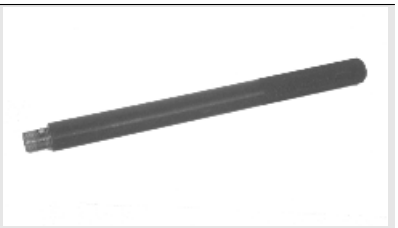
APPROPRIATE TOOLS

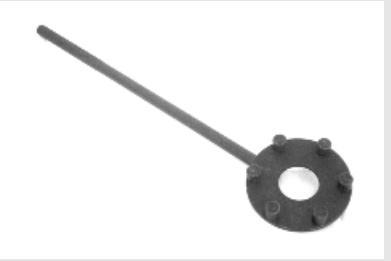
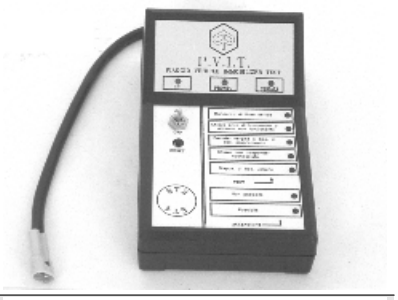
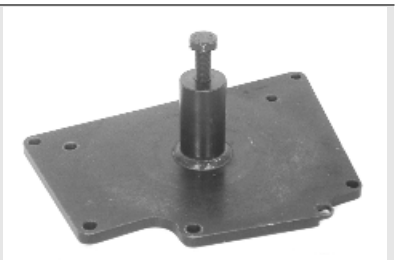
Stores code	Description	
020151Y	Air heater	
020331Y	Digital multimeter	
020333Y	Single battery charger	
020334Y	Multiple battery charger	
001467Y014	Pliers to extract ø 15-mm bearings	

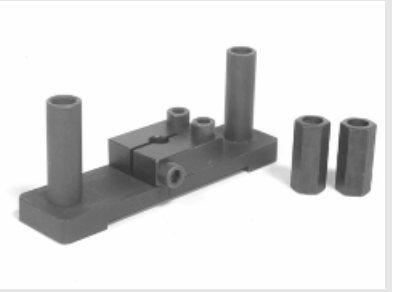
Stores code	Description	
020412Y	15 mm guide	
020335Y	Magnetic support for dial gauge	
020565Y	Flywheel lock calliper spanner	
020439Y	17 mm guide	
020359Y	42x47-mm Adaptor	

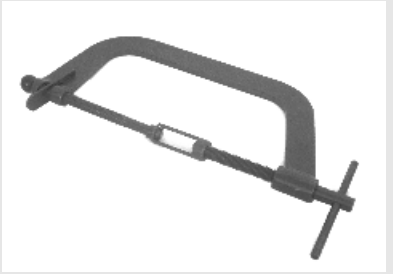
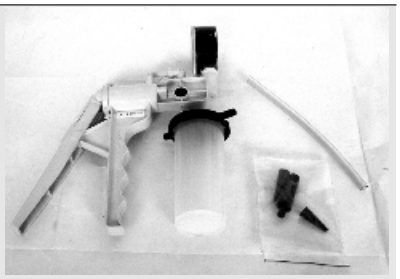
Stores code	Description	
020363Y	20 mm guide	
020459Y	Punch for fitting bearing on steering tube	
020458Y	Puller for lower bearing on steering tube	
005095Y	Engine support	
008564Y	Flywheel extractor	
020434Y	Oil pressure control fitting	

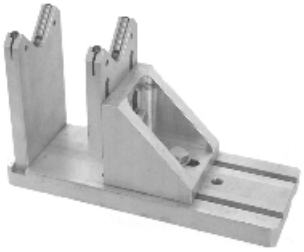
Stores code	Description	
020382Y011	adapter for valve removal tool	
020424Y	Driven pulley roller casing fitting punch	
020431Y	Valve oil seal extractor	
020193Y	Oil pressure gauge	
020306Y	Punch for assembling valve sealing rings	
020360Y	52x55-mm Adaptor	

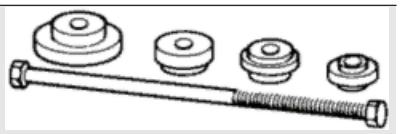
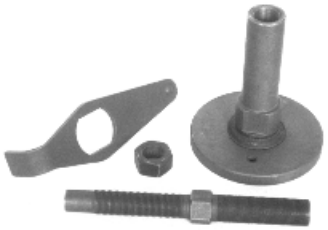
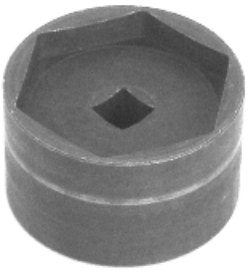
Stores code	Description	
020364Y	25-mm guide	
020375Y	Adaptor 28 x 30 mm	
020376Y	Adaptor handle	
020444Y	Tool for fitting/ removing the driven pulley clutch	
020330Y	Stroboscopic light to check timing	
001467Y035	Belle for OD 47-mm bearings	

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

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

Stores code	Description	
020382Y	Valve cotters equipped with part 012 removal tool	
020455Y	10-mm guide	
020442Y	Pulley lock wrench	
020440Y	Water pump service tool	
020329Y	MityVac vacuum-operated pump	
020357Y	32x35-mm Adaptor	

Stores code	Description	
020409Y	Multimeter adaptor - Peak voltage detection	
020456Y	Ø 24 mm adaptor	
020332Y	Digital rev counter	
020074Y	Support base for checking crankshaft alignment	
020055Y	Wrench for steering tube ring nut	

Stores code	Description	
002465Y	Pliers for circlips	
001330Y	Tool for fitting steering seats	
020454Y	Tool for fitting piston pin stops (200 - 250)	
020622Y	Transmission-side oil guard punch	
020444Y011	adapter ring	
020444Y009	wrench 46 x 55	
001467Y	Extractor for bearings for holes	

Stores code	Description	
001467Y013	Pliers to extract ø 15-mm bearings	
020444Y010	adapter ring	

INDEX OF TOPICS

Maintenance chart

EVERY 2 YEARS

Action
Coolant - change
Brake fluid - change
Secondary air filter (external / internal) - Clean

EVERY 3000 KM

Action
Engine oil - level check/ top-up

AFTER 1,000 KM OR 4 MONTHS

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

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

AFTER 6000 KM OR 12 MONTHS

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

AFTER 12000 KM AND AFTER 60000 KM

Action
Engine oil - replacement
Hub oil level - check
Spark plug / electrode gap - check / replacement
Air filter - clean
Engine oil - change
Idle speed (*) - adjustment
Sliding block / variable speed rollers - change
Throttle lever - adjustment
Coolant level - check
Steering - adjustment
Brake control levers - greasing
Brake pads - check condition and wear
Brake fluid level - check

Action
Transmission elements - lubrication
Safety locks - check
Suspensions - check
Electrical system and battery - check
Headlight - adjustment
Tyre pressure and wear - check
Vehicle and brake test - road test
Driving Belt - replacement

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

AT 18000 KM AND AT 54000 KM

Action
Engine oil - change
Hub oil level - check
Spark plug/ electrode gap - check
Air filter - clean
Oil filter -Replacement
Valve clearance - Check
Sliding blocks / variable speed rollers - check
Coolant level - check
Radiator - external cleaning/ check
Brake pads - check condition and wear
Brake fluid level - check
Electrical system and battery - check
Tyre pressure and wear - check
Vehicle and brake test - road test
Driving Belt - replacement

AT 24000 KM AND AT 48000 KM

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

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

AT 30000 KM, AT 42000 KM AND AT 66000 KM

Action
Hub oil level - check
Spark plug/ electrode gap - check
Air filter - clean
Variable speed rollers - check or replacement
Driving belt - checking
Coolant level - check
Brake pads - check condition and wear
Brake fluid level - check
Electrical system and battery - check

Action
Tyre pressure and wear - check
Vehicle and brake test - road test
Engine oil - change
Oil filter -Replacement

AFTER 36000 KM

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

AFTER 72000 KM

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

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

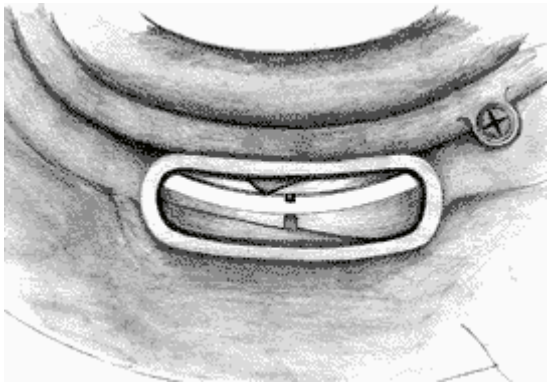
Carburettor

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

WARNING

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

Checking the spark advance



- To check 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).
- Remove the plastic cover from the slot on the flywheel cover.
- Operating on the flash corrector displacement of the bulb, make the reference on the flywheel cover coincide with level on the water pump drive. Read the advance degrees indicated by the stroboscopic light.

Characteristic

Ignition advance

10° ± 1° at 2,000 rpm

- Make sure the advance degrees match the rotation rpm.
- If failures are found, check the Pick-Up and the control unit power supply (positive-negative), replace the control unit if necessary.

- The brand new control unit prevents that the engine rotation exceeds 2000 rpm.
- The programmed control unit allows the engine to rotate within the prescribed limits.

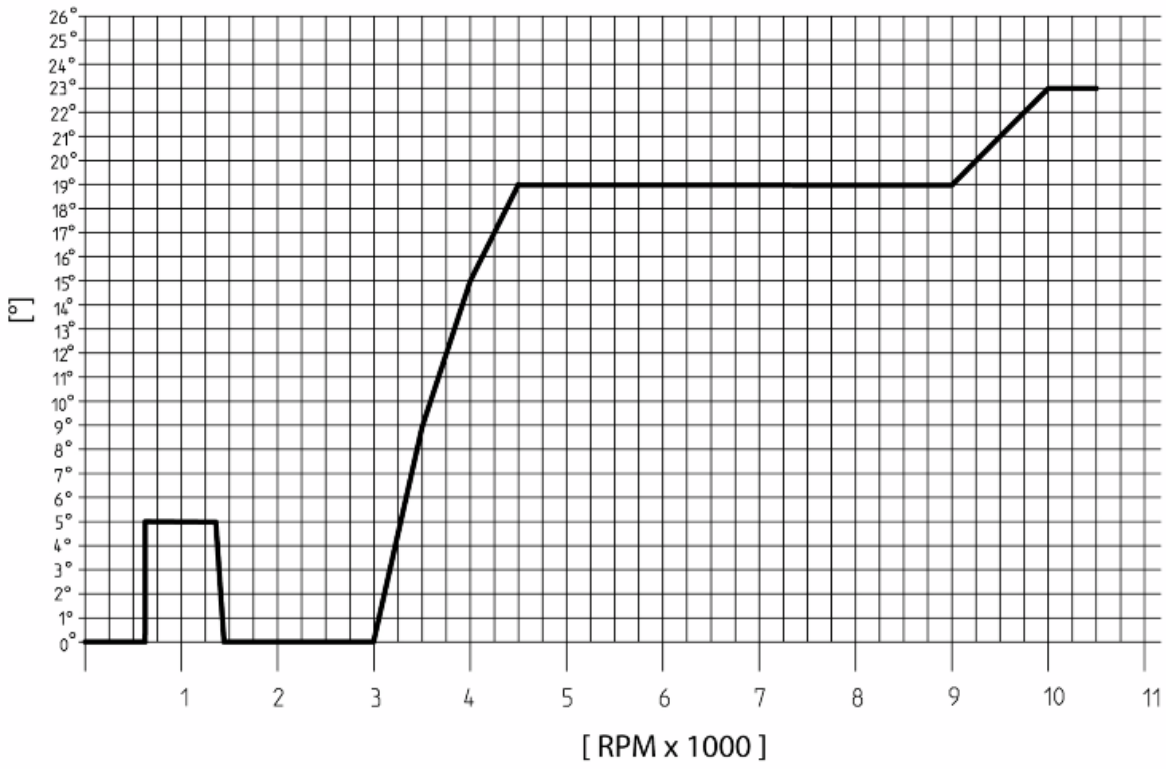
Specific tooling

020330Y Stroboscopic light to check timing

Spark advance variation

REVOLUTION LIMITER

Specification	Desc./Quantity
Operation threshold	First threshold : 10700 ±50 Second threshold : 11000 ±50
Reactivation threshold	First threshold : 10600±50 Second threshold : 10900±50
Spark elimination	First threshold : 1 spark on 7 Second threshold : 2 sparks on 3



Spark plug

To service the spark plug the engine must be cold, proceed as follows:

- Undo the knob located inside the rear boot and remove the saddle.

- Remove the spark plug cap.

- Use the supplied spanner (with retaining rubber ring) to remove the spark plug.

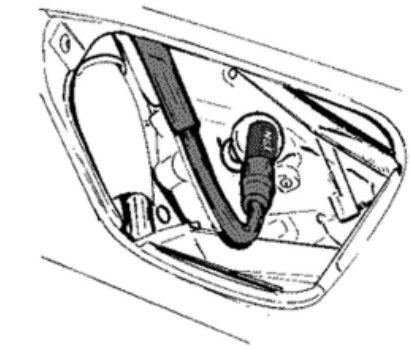
- Disconnect and remove the spark plug cable.

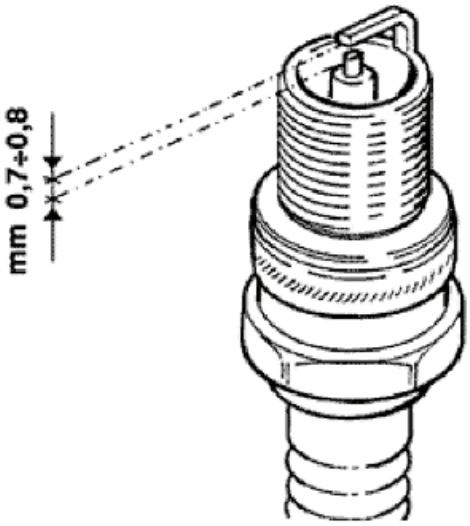
- Examine it carefully and replace it if the insulator is chipped or cracked.

- Measure electrode gap with a thickness gauge and, if necessary, adjust the gap by carefully bending the outer electrode forward or away.

- Make sure the sealing washer is in good condition.

- Fit the spark plug, screw it manually and lock it to the prescribed torque with a spark plug spanner.





CAUTION

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

Characteristic

Spark plug

NGK CR 8EB

Spark plug

CHAMPION RG6YC

Spark plug: electrode distance

0.7 mm ÷ 0.8 mm

Locking torques (N*m)

Spark plug **12 ÷ 14**

Hub oil

-Remove the oil cap «**A**».

- Unscrew the oil drainage cap "**B**" and drain out all the oil.

- Screw on the drainage plug and fill up the hub with oil (about 150 cc)

Check

- Rest the vehicle on its centre stand on an even surface. - Unscrew the oil dipstick, dry it with a clean cloth and reinsert it, screwing it in thoroughly.- Take out the dipstick and check that the oil level reaches the 2nd notch from the bottom.- Screw the dipstick back into place completely.

Recommended products

AGIP ROTRA 80W-90 Rear hub oil

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

Locking torques (N*m)

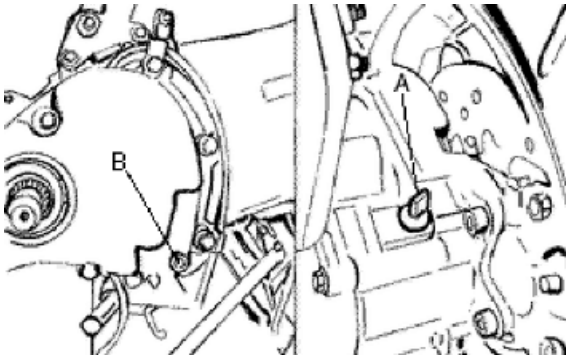
Hub oil drainage plug 15 ÷ 17

Replacement

-Remove the oil cap «**A**».

- Unscrew the oil drainage cap "**B**" and drain out all the oil.

- Screw on the drainage plug and fill up the hub with oil (about 150 cc)



Air filter

- To clean the filtering element proceed as follows: remove the 4 filter cover fixing screws indicated in the figure; remove the cover and take out the paper filtering element, clean with compressed air and refit.

- Make sure the filtering element is in the correct position.

- Check that the air passage sections are not damaged or deformed.

- Check the correct sealing of the coupling between the filter housing and the cover.

N.B.

FAILURE TO OBSERVE THESE INSTRUCTIONS MAY RESULT IN WRONG VACUUM INSIDE THE FILTER HOUSING, WHICH IN TURN MAY PRODUCE VARIATIONS IN CARBURETION.

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

- Wash with water and neutral soap.

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

-Saturate with a 50% mixture of gasoline and oil.

-Drip dry the filtering element and then squeeze it between your hands without wringing.

CAUTION

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

CAUTION

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

Engine oil

Replacement

Engine oil and cartridge filter change

- Loosen the oil cap/dipstick.

- Unscrew the drainage plug from the mesh filter on the flywheel side, and let the oil drain off.

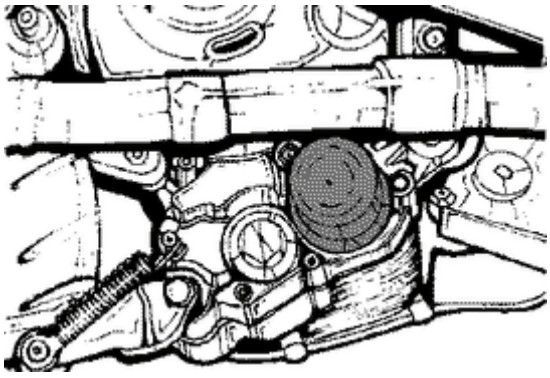
- Unscrew and remove the oil cartridge filter using the protruding appendixes.

- Install a new oil filter taking care to lubricate the filter sealing O-rings with engine oil.

- Tighten the drainage plug and refill with ~ 600-650 cm^3 of oil.

- Start up the engine and keep it running for some minutes, and then turn it off:

- Wait for a few minutes, then unscrew the cap-dipstick and check the level. Fill up with the recommended oil until the MAX level is reached.



Check

- Park the vehicle on level ground and lift onto its centre stand (with engine cold).

- Remove the cap/dipstick when at its **fully screwed** position and check that the oil level is between the MAX and MIN marks.

- The MAX level reference indicates ~ 1000 cm³ in the engine.
- When the oil level is below the MAX mark, top-up with oil but without exceeding the MAX level.

Recommended products

AGIP CITY HI TEC 4T Engine oil

SAE 5W-40 Synthetic oil that exceed the requirements of API SL, ACEA A3, JASO MA specifications

Level check

SAS filters inspection and cleaning

Undo the 3 fixing screws "A", remove the secondary air filter cover and then take out the filtering element "B".

- Wash with water and neutral soap.

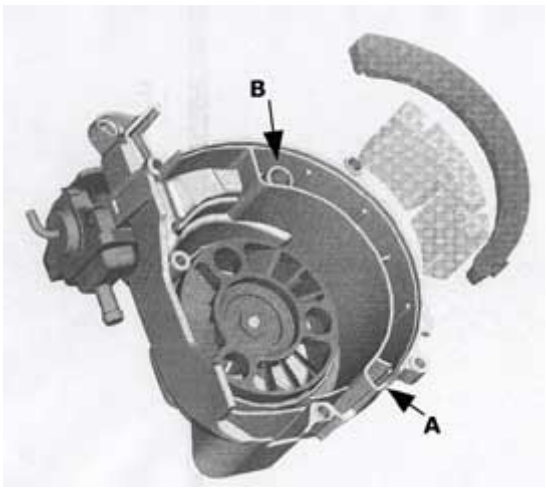
-Dry with a clean cloth and short blasts of compressed air.

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

- Wash with water and neutral soap.

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

Check that the filter casing is clean paying special attention to "A" and "B" passages

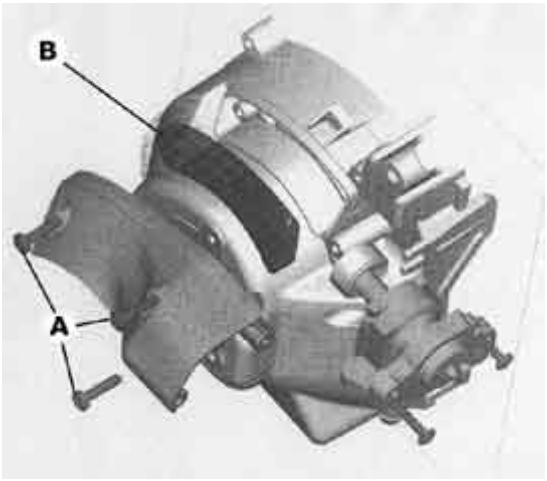


CAUTION

NEVER RUN THE ENGINE WITHOUT THE SECONDARY AIR FILTER

CAUTION

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



Insert the filter into its housing.

Fit the valve support with the 3 screws

Insert the rubber spacer on the valve and proceed with the assembly on the support.

Fix the support with the 2 screws.

Fit the pre-filter and position it matching the 2 references shown in the figure.

Fit the sealing gasket.

Align the drive with the reference on the crankcase cover.

Place the flywheel in the TDC position and align the references as shown in the figure.

Check the correct fitting of the 2 reference dowels and fit the engine cover.

Be careful to properly fit the flywheel connector to the relative supplements.

Secure the rotor cover by using a new gasket with the 4 screws.

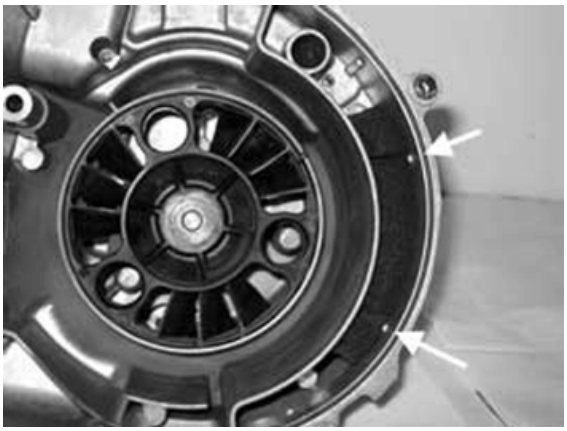
Connect the flywheel connector and the valve control vacuum-operated pipe.

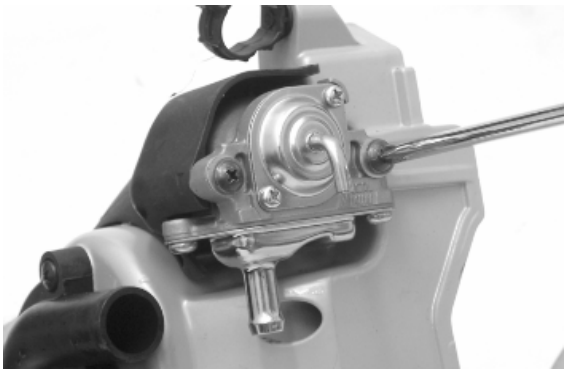
Fit the coupling to the valve and position it as shown in the figure.

Lock the upper clamp.

Fix the metal tube to the head using the gasket and the 2 screws.

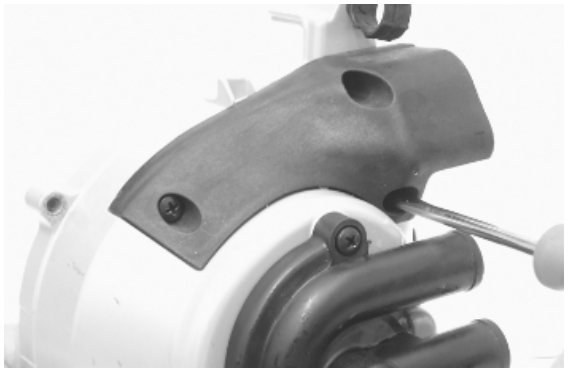
Lock the lower clamp connecting manifold / pipe.

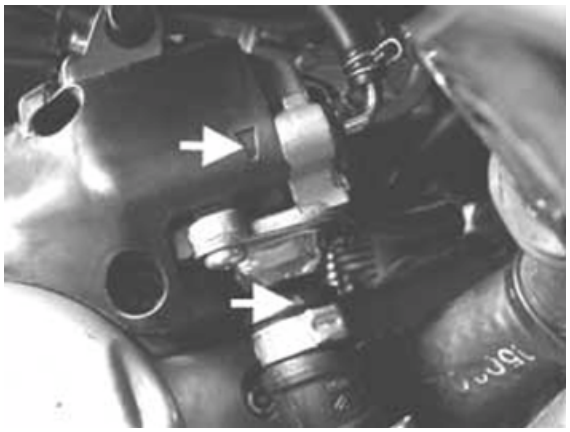


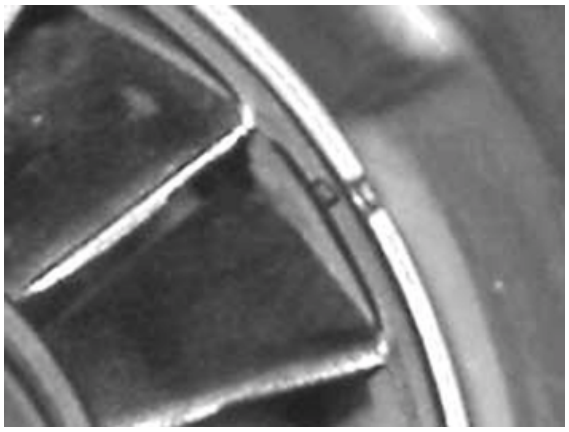


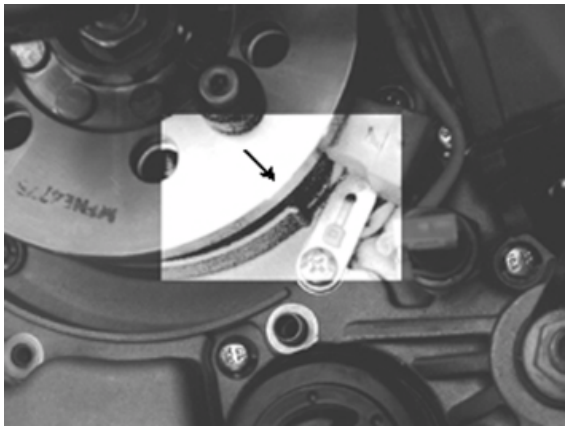
Locking torques (N*m)

Stator assembly screws (°) 3 ÷ 4









INDEX OF TOPICS

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

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

Engine

Poor performance

POOR PERFORMANCE

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

Starting difficulties

DIFFICULT STARTING

Possible Cause	Operation
Altered fuel characteristics	Drain off the fuel no longer up to standard; then, refill
Rpm too low at start-up or engine and start-up system damaged	Check the starter motor, the system and the torque limiter
Incorrect valve sealing or valve adjustment	Inspect the head and/or restore the correct clearance
- Engine flooded.	Try starting-up with the throttle fully open. If the engine fails to start, remove the spark plug, dry it and before refitting, make the motor turn so as to expel the fuel excess taking care to connect the cap to the spark plug, and this in turn to the ground. If the fuel tank is empty, refuel and start up.
Automatic starter failure	Check: mechanical movement, electric connection and fuel supply, replace if required.
Air filter blocked or dirty.	Remove the sponge, wash with water and car shampoo, then soak it in a mixture of 50% petrol and 50% specific oil. Press with your hand without squeezing, allow it to drip dry and refit.
Faulty spark plug or incorrect ignition advance	Replace the spark plug or check the ignition circuit components
The carburettor is dirty; fuel pump or vacuum valve damaged	Remove, wash with solvent and dry with compressed air or replace
Battery flat	Check the charge of the battery, if there are any sulphur marks, replace and use the new battery following the instructions shown in the chapter

Possible Cause	Operation
Intake coupling cracked or clamps incorrectly tightened	Replace the intake coupling and check the clamps are tightened
Defective floating valve	Check the proper sliding of the float and the functioning of the valve
Carburettor nozzles clogged	Dismantle, wash with solvent and dry with compressed air
Fuel pump fault	Check the pump control device

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 adding the recommended oil type

Engine tends to cut-off at full throttle

ENGINE STOP FULL THROTTLE

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

Engine tends to cut-off at idle

ENGINE STOP IDLING

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

Excessive exhaust noise

EXCESSIVE EXHAUST NOISE

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

High fuel consumption

HIGH FUEL CONSUMPTION

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

SAS malfunctions

ANOMALIES IN THE SECONDARY AIR DEVICE

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

Transmission and brakes

Clutch grabbing or performing inadequately

IRREGULAR CLUTCH PERFORMANCE OR SLIPPAGE

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

Insufficient braking

INSUFFICIENT BRAKING

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

Brakes overheating

BRAKES OVERHEATING

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

Battery

BATTERY

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

Turn signal lights malfunction

TURN INDICATOR NOT WORKING

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

Steering and suspensions

Rear wheel

REAR WHEEL ROTATES WITH ENGINE AT IDLE

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

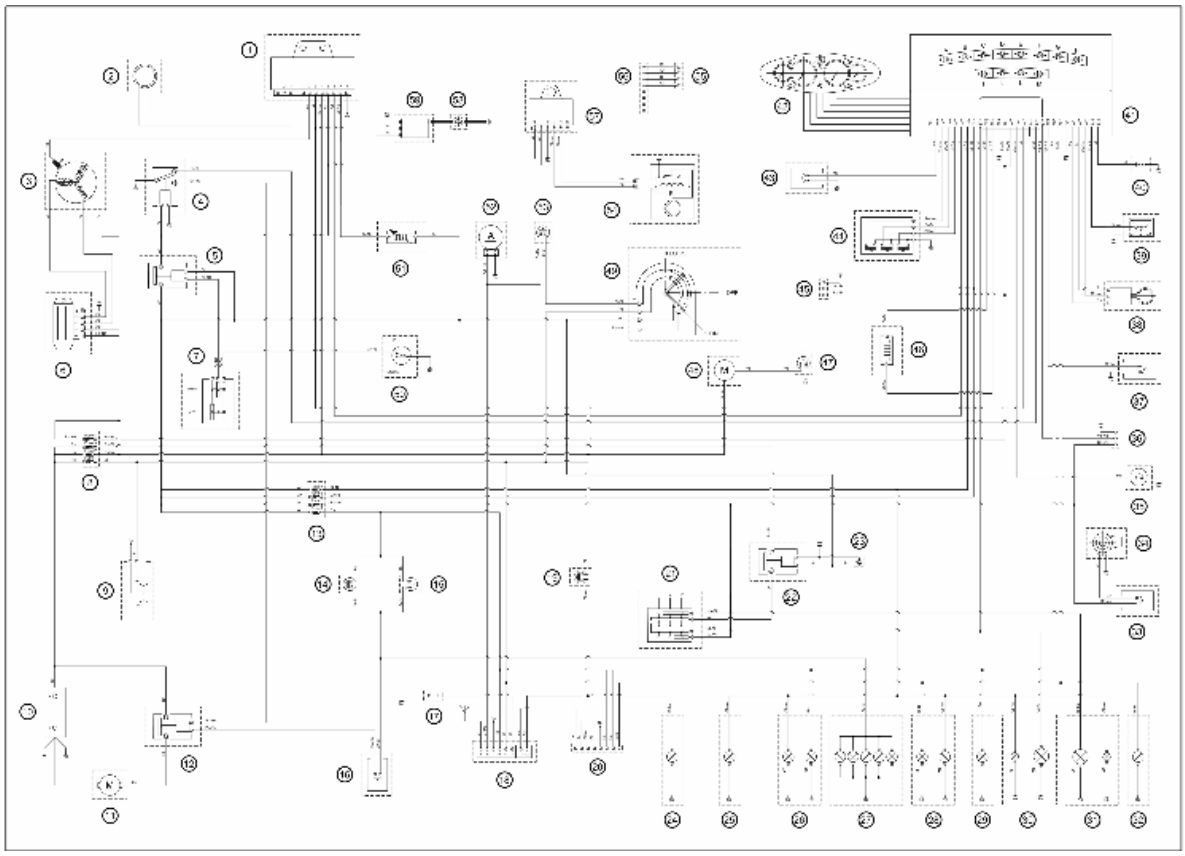
Controls

STEERING CONTROLS AND SUSPENSIONS

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

INDEX OF TOPICS

This section is devoted to the description of the electrical system components.



KEY

1. Electronic ignition device

2. Immobilizer aerial

3. Magneto flywheel Pick-up

4. Relay for disabling start-up

5.Relay engine stop

6. Voltage regulator

7. Engine stop switch

8. Main fuses

9. 12V-180W socket

10. Battery

11. Starter motor
12. Relay for start-up
13. Secondary fuses
14. Stop button on rear brake
15. Stop button on front brake
16. Start-up button
17. Reset
18. Saddle opening control unit wiring
19. Helmet compartment light switch
20. Wiring for antitheft device
21. Light switch
22. Relay for headlight
23. Diode
24. Helmet compartment internal light
25. License plate light
26. Rear left light
A. Tail light
B. Rear left turn indicator
27. Rear stop light
28. Rear right light
A. Rear right turn indicator
B. Tail light
29. Front left turn indicator
30. Left headlight
A. Tail light
B. High-beam light
31. Right headlight
A. Low-beam light
B. Tail light
32. Front right turn indicator
33. Horn button
34. Horn
35. Oil pressure sensor
36. Accessories wiring
37. Reset button
38. Wheel turning sensor
39. Fuel level transmitter
40. Thermistor

41. Digital instrument panel

A. Preset warning light

B. ABS wiring warning light

C. Stop light bulb burned warning light

D. Disabled engine warning light

E. Oil warning light

F. Low fuel warning light

G. Headlight warning light

H. High-beam warning light

I. Left turn indicator warning light

L. Emergency flashing warning light

M. Right turn indicator warning light

42. Analogue instrument panel

A. Immobilizer warning light

B. Instrument panel bulb

43. Emergency flashing button

44. Turn indicator switch

45. Wiring for control unit power

46. External temperature sensor

47. Thermoswitch

48. Electric fan

49. Key switch

50. Side stand button

51. Automatic starter

52. Saddle opening actuator

53. Saddle opening switch

54. Fuel pump

55. Wiring for radio display

56. Control unit display wiring

57. Electric pump control device

58. Spark plug

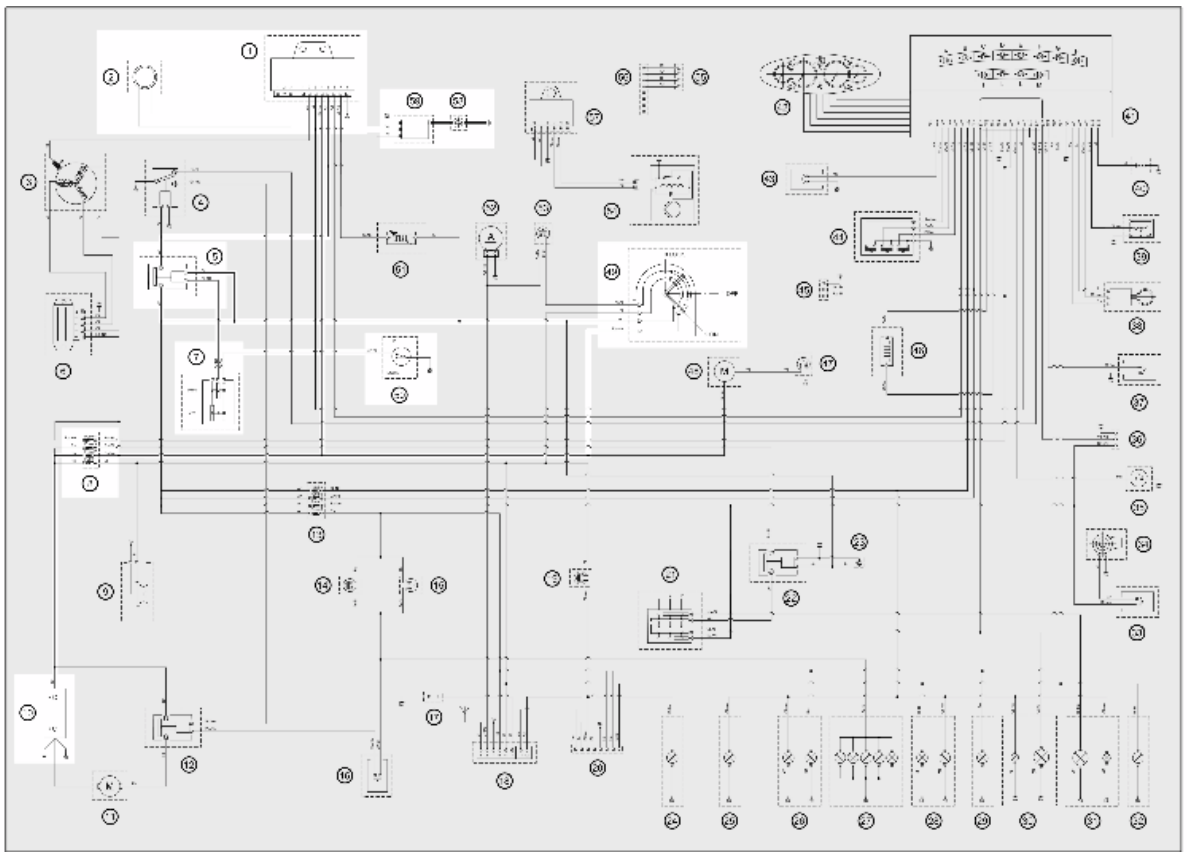
59. HV coil

KEY

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

Conceptual diagrams

Ignition



KEY

1. Electronic ignition device

2. Immobilizer aerial

5.Relay engine stop

7. Engine stop switch

8. Main fuses

10. Battery

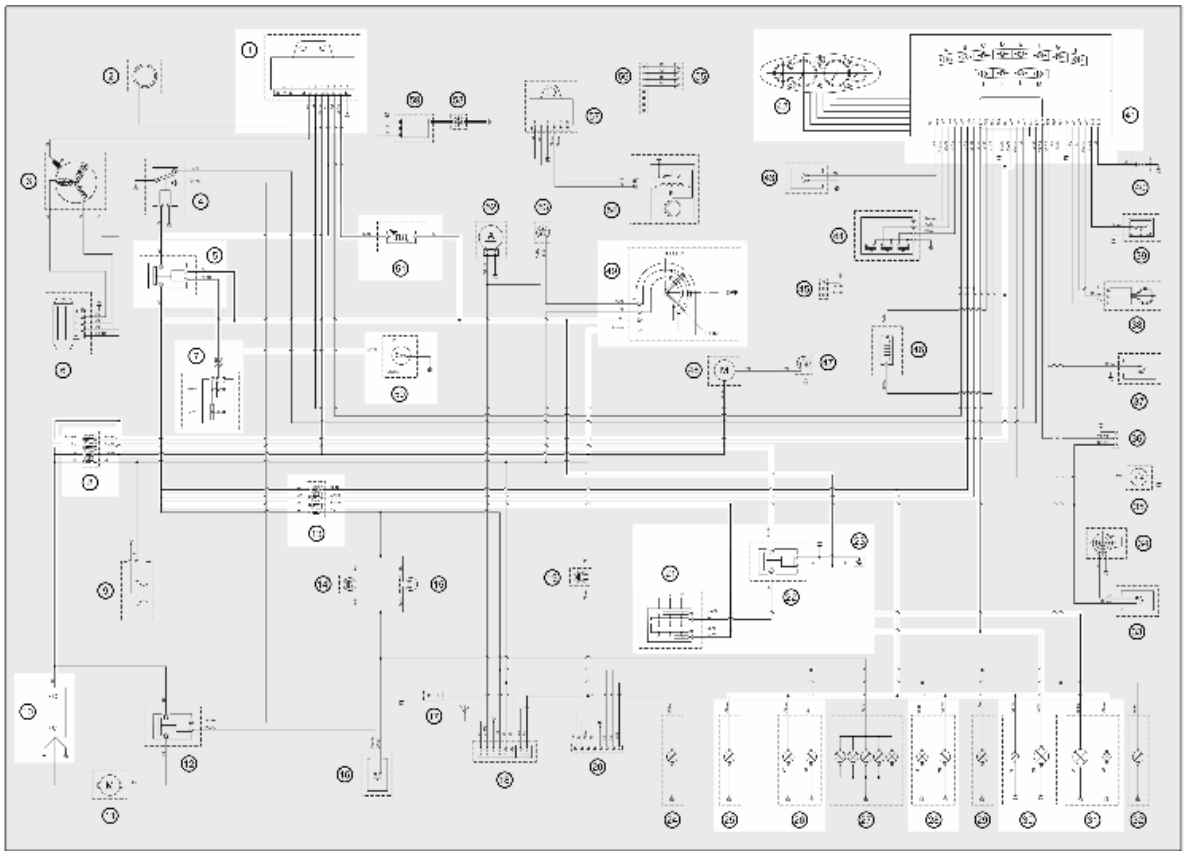
49. Key switch

50. Side stand button

58. Spark plug

59. HV coil

Headlights and automatic starter section



KEY

1. Electronic ignition device

5.Relay engine stop

7. Engine stop switch

8. Main fuses

10. Battery

13. Secondary fuses

21. Light switch

22. Relay for headlight

23. Diode

25. License plate light

26. Rear left light

A. Tail light

28. Rear right light

B. Tail light

30. Left headlight

A. Tail light

B. High-beam light

31. Right headlight

A. Low-beam light

B. Tail light

41. Digital instrument panel

G. Headlight warning light

H. High-beam warning light

42. Analogue instrument panel

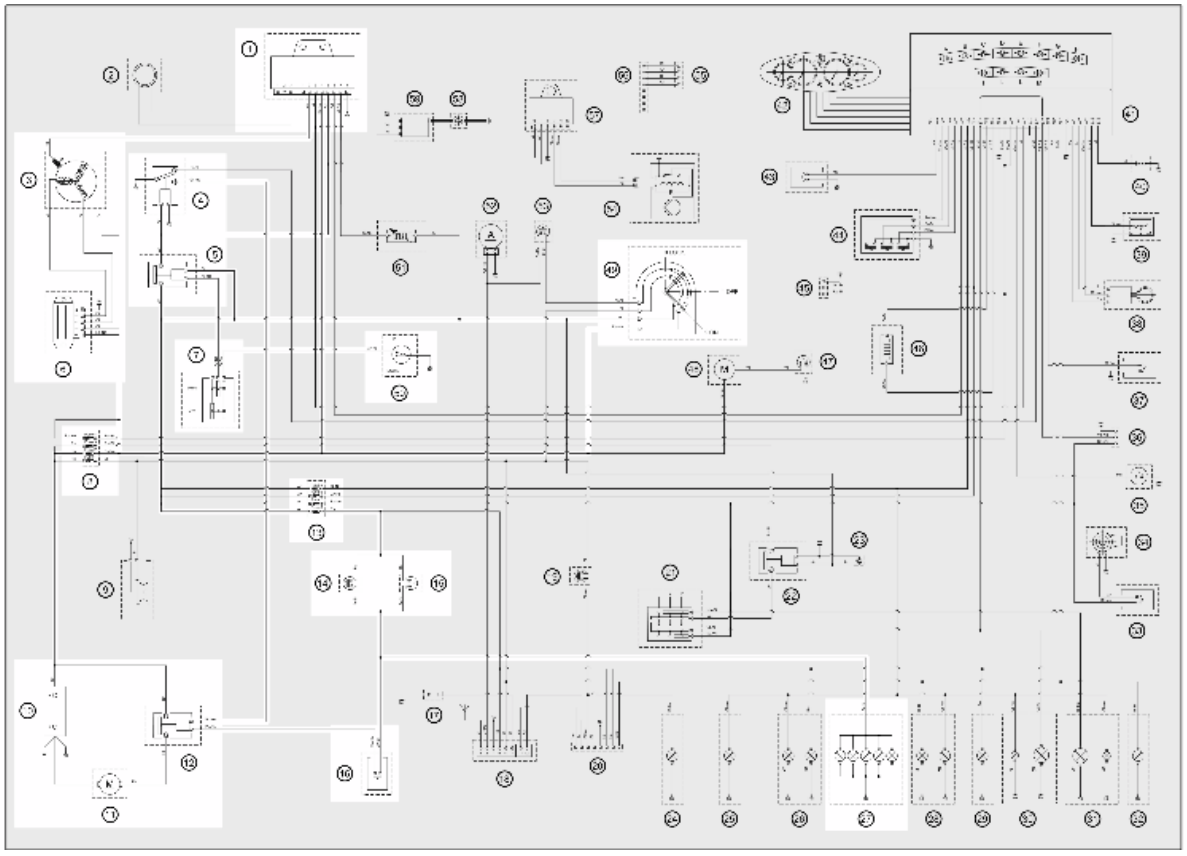
B. Instrument panel bulb

49. Key switch

50. Side stand button

51. Automatic starter

Battery recharge and starting



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13. Secondary fuses

14. Stop button on rear brake

15. Stop button on front brake

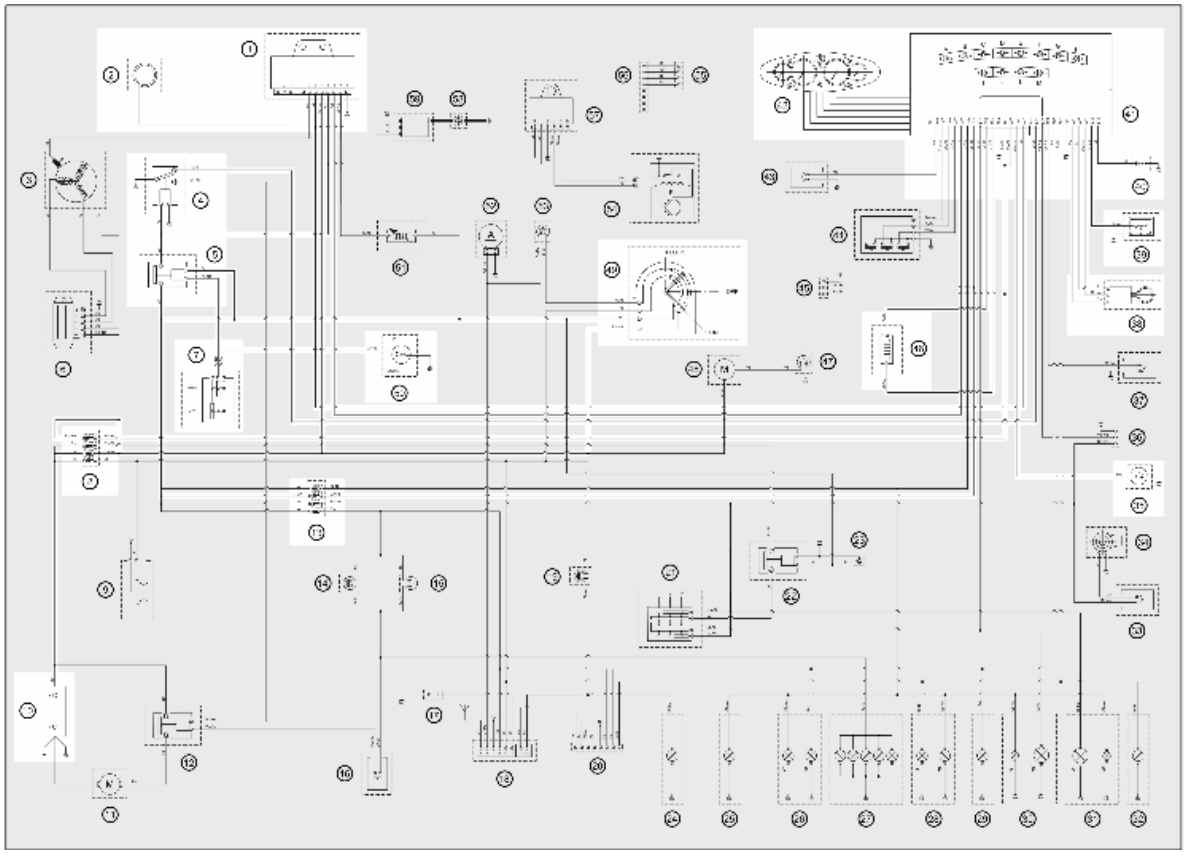
16. Start-up button

27. Rear stop light

49. Key switch

50. Side stand button

Level indicators and enable signals section



KEY

1. Electronic ignition device

2. Immobilizer aerial

4. Relay for disabling start-up

5.Relay engine stop

7. Engine stop switch

8. Main fuses

10. Battery

13. Secondary fuses

35. Oil pressure sensor

38. Wheel turning sensor

39. Fuel level transmitter

40. Thermistor

41. Digital instrument panel

A. Preset warning light

B. ABS wiring warning light

C. Stop light bulb burned warning light

D. Disabled engine warning light

E. Oil warning light

F. Low fuel warning light

G. Headlight warning light

H. High-beam warning light

I. Left turn indicator warning light

L. Emergency flashing warning light

M. Right turn indicator warning light

42. Analogue instrument panel

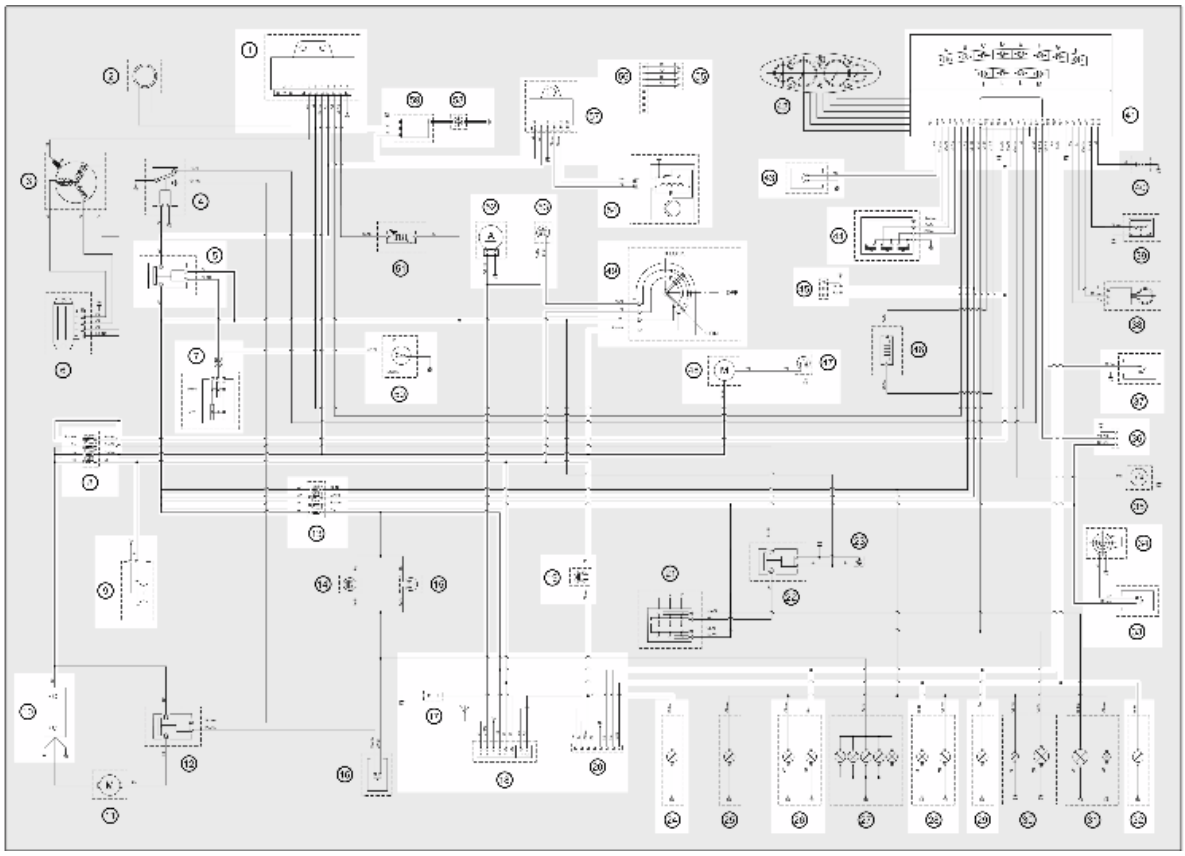
A. Immobilizer warning light

46. External temperature sensor

49. Key switch

50. Side stand button

Devices and accessories



KEY

1. Electronic ignition device

5.Relay engine stop

7. Engine stop switch

8. Main fuses

9. 12V-180W socket

10. Battery

13. Secondary fuses

17. Reset

18. Saddle opening control unit wiring

19. Helmet compartment light switch

20. Wiring for antitheft device

24. Helmet compartment internal light

26. Rear left light

B. Rear left turn indicator

28. Rear right light

A. Rear right turn indicator

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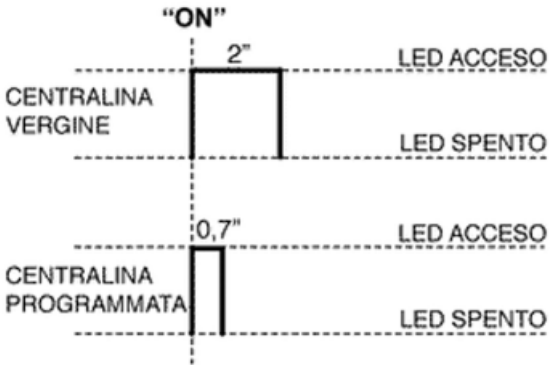
53. Saddle opening switch
54. Fuel pump
55. Wiring for radio display
56. Control unit display wiring
57. Electric pump control device
58. Spark plug
59. HV coil

Checks and inspections

Immobiliser

The electric ignition system is fed with direct current and is protected by an antitheft immobilizer integrated to the control unit.
The ignition system consists of:
- electronic control unit
- immobilizer aerial
- master and service keys with built-in transponder
- HV coil
- diagnosis LED



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

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

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

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

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

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

- Disconnect the control unit connector and check if:

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

- There is battery voltage between the terminal No. 4 (Red/Black) and terminal No. 8 (Negative) as shown in the figure.

If no voltage is detected, check the wiring to the battery positive lead and see if the 15A fuse is in good conditions (see the start-up diagram)

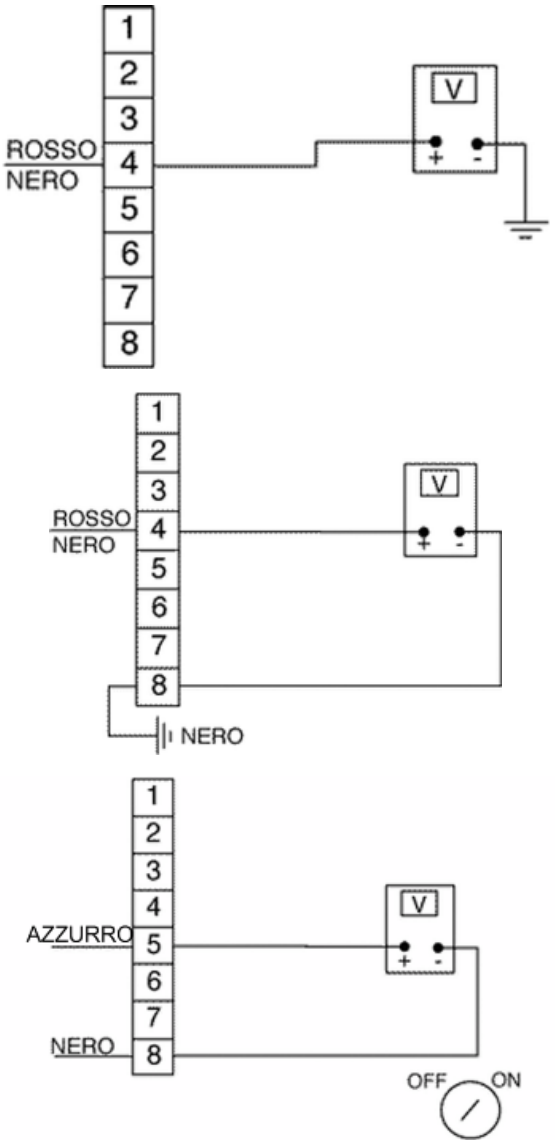
- There is battery voltage between terminals No. 5 and No. 8 with the key switch set to "ON", the side stand retracted and the emergency switch set to "RUN".

If no faults are found, replace the control unit; otherwise check the wiring and the following components:

- Engine stop remote control;

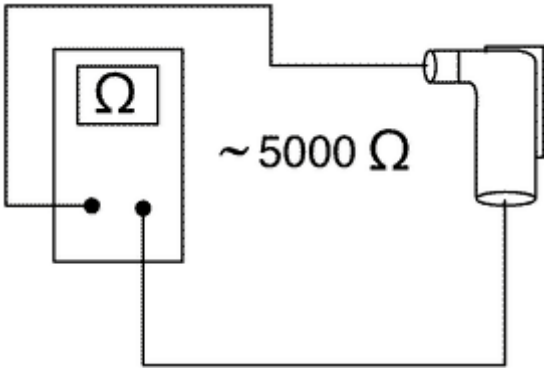
- Emergency cut-off switch;

- Side stand contacts;



- Key switch contacts.

Virgin circuit



If the ignition system has not been programmed, the engine can be started but it will run limited to 2000 rpm. When trying to accelerate, some evident loss of power may be felt.
Program the system with the MASTER (Brown) and SERVICE (Black) keys as follows:
- Insert the MASTER key, turn it to "ON" and keep it in that position for 2 seconds (limit values: 1 ÷ 3 seconds).
- Alternately insert all the available black keys and turn each one of them to "ON" for 2 seconds.
- Insert the MASTER key again and turn it to "ON" for 2 seconds.
The maximum time to change keys is 10 seconds.
A maximum of 7 (Black) service keys can be programmed at one time.
Sequence and times must be strictly observed or it will be necessary to repeat the procedure from the start.
Once the control unit has been programmed, the control unit is inseparably matched with the MASTER key transponder.
This matching allows programming further service keys in case of loss, replacement, etc. Each new time new data is programmed the previously stored one is deleted.
If a service key setting is lost, it is essential to carefully check the efficiency of the high voltage system:
Shielded cap resistance ~ 5000 Ω.
In any case it is advisable to use resistive spark plugs.

Diagnostic codes

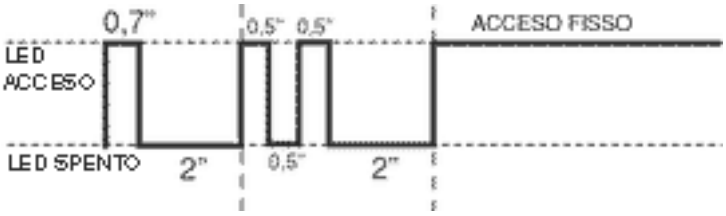
The flash indicating the switching to "ON" can be followed by a phase of programmed failure warnings.

That is, the led is off for 2 seconds, and then diagnosis codes are transmitted with 0.5-second flashes.

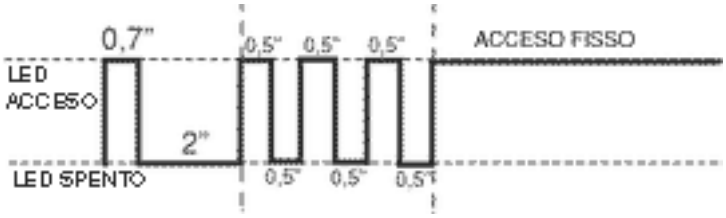
After the failure code indication, a steadily on LED signals that ignition is disabled; see the table:

2-FLASH CODE - Example with programmed control unit, no transponder and/or malfunctioning aerial.

Ignition disabled-Vehicle immobilised



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



Diagnostic code - 2 flashes

Diagnosis code: 2-flashes

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

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

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

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

CAUTION

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

Electric characteristic

immobilizer aerial

~ 7 ÷ 9 Ohm

Diagnostic code - 3 flashes

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

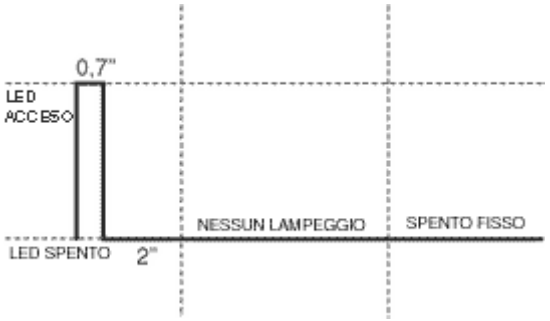
- If the failure disappears when the MASTER key is used, encode the service keys (Blue) again.
- If the failure persists, it means that the MASTER key and the control unit are not linked; in this case, replace the control unit and then encode the keys.

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

In this case, the engine can be started.

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

Ignition is enabled (regular conditions of use)



Ignition circuit

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

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

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

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

No spark plug

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

- Pick-Up check.

Disconnect the control unit connector and check that the cable between terminal No. 2 (Green) and terminal No. 8 (Black) is not interrupted. Check the Pick-Up and its power line:

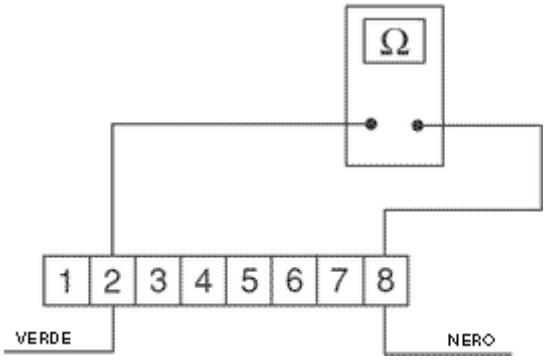
Electric characteristic

Pick-up resistance value

Pick-up resistance value: 105 ÷ 124 Ohm

If a break in the circuit is found, check again the flywheel and the engine ground connectors (see engine manual). If non-conforming values are measured, replace the Pick-Up; otherwise, repair the cable harness.

In case conforming values are measured, try replacing the control unit (without programming) and make sure the failure has been solved by checking sparks are produced in the spark plug; only then program the control unit.



- HV coil primary check

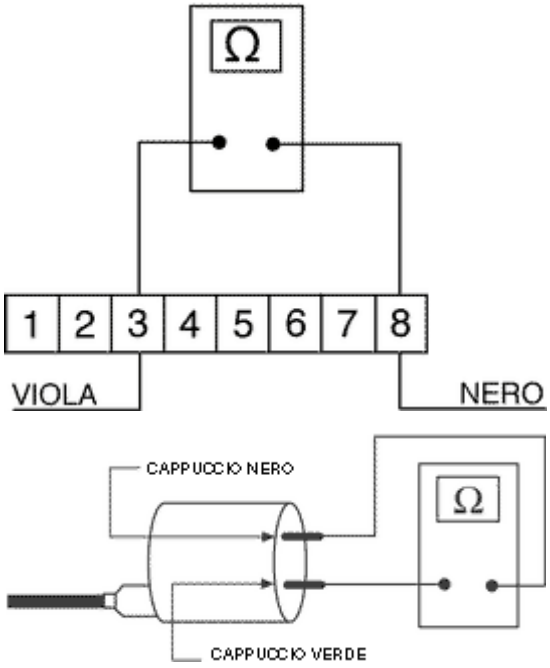
Disconnect the control unit connector and check that the cable between terminal No. 3 and terminal No. 8 is not interrupted (see figure).

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

If non-conforming values are measured, repair the cables or replace the HV coil.

N.B.

THE MULTIMETER MUST BE SELECTED TO DETECT CONTINUOUS VOLTAGE.



Electric characteristic

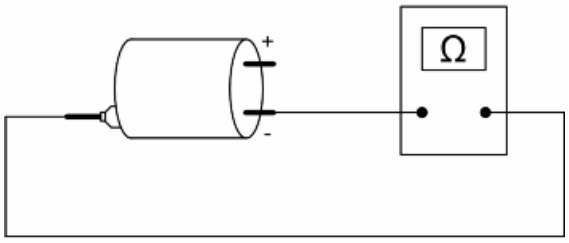
Resistance value:

0.4 ÷ 0.5 Ohm

- HV coil secondary check

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

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



Specific tooling

020409Y Multimeter adaptor - Peak voltage detection

Electric characteristic

Resistance value:

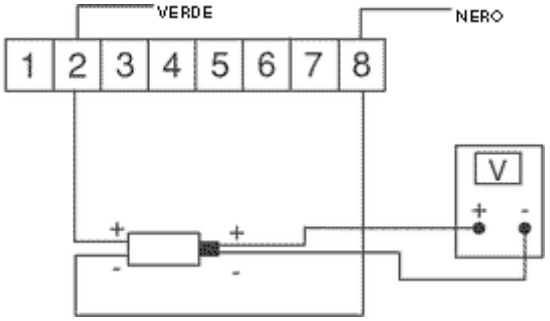
~ 3000 ± 300 Ohm

- Pick-Up

Disconnect the control unit connector and connect the positive wire to connector No. 2 and the negative wire to connector No. 8 (see figure).

Use the start-up system to run the engine and measure the voltage produced by the Pick-Up.

Replace Pick-Up if non-conforming values are measured.



N.B.

THE MULTIMETER MUST BE SELECTED TO DETECT CONTINUOUS VOLTAGE.

Electric characteristic

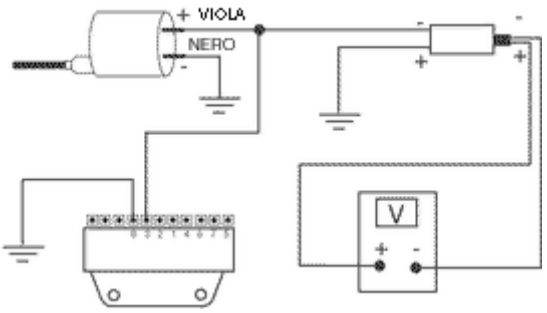
Resistance value:

> 2 Volt

- HV coil

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

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



N.B.

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

Electric characteristic

Resistance 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.

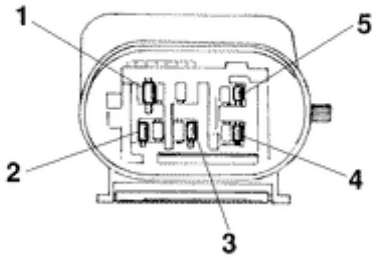
Stage indicative resistance: 0.7 - 0.9 Ω

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 ÷ 124 Ω 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.

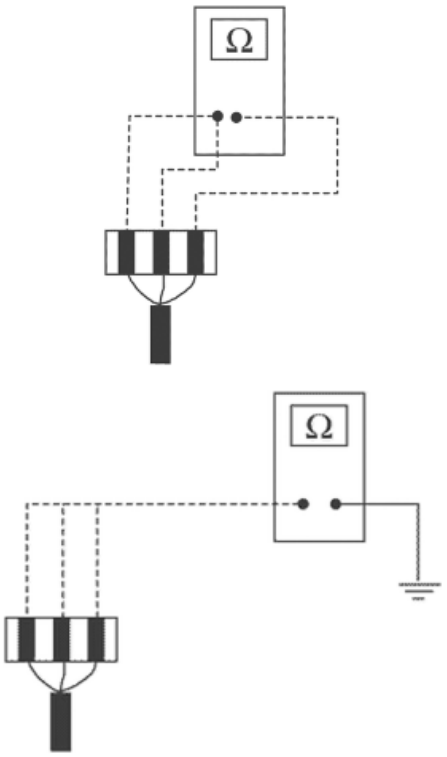
Disconnect the connector from the voltage regulator and check there is continuity between any yellow cable and the other two cables.

Electric characteristic

Ohm value:

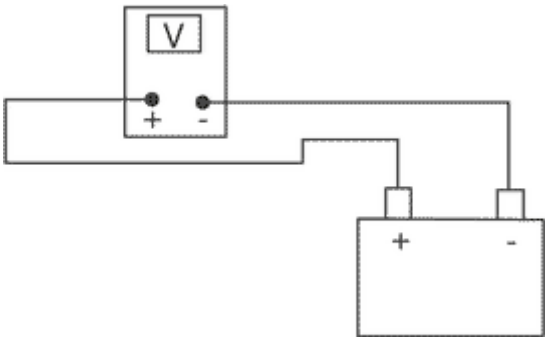
0.7 ÷ 0.9 Ohm

Also check that all yellow cables are insulated from the ground connection.
If non-conforming values are detected, repeat the checks directly to the stator. In case of further repetitions of incorrect values replace the stator or repair the wiring.



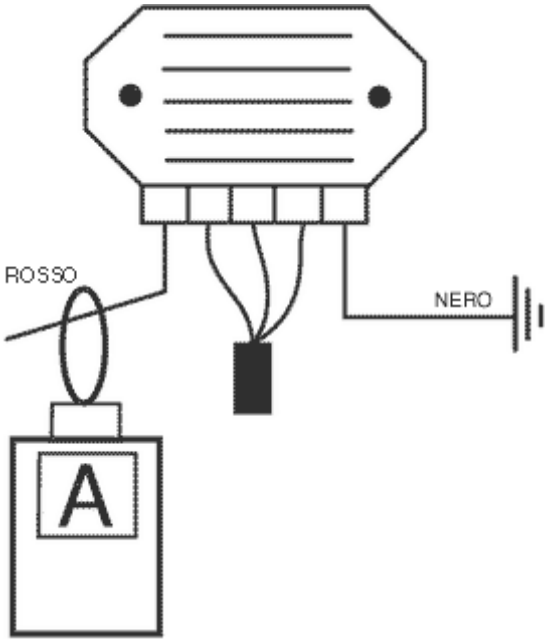
Voltage regulator check

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.



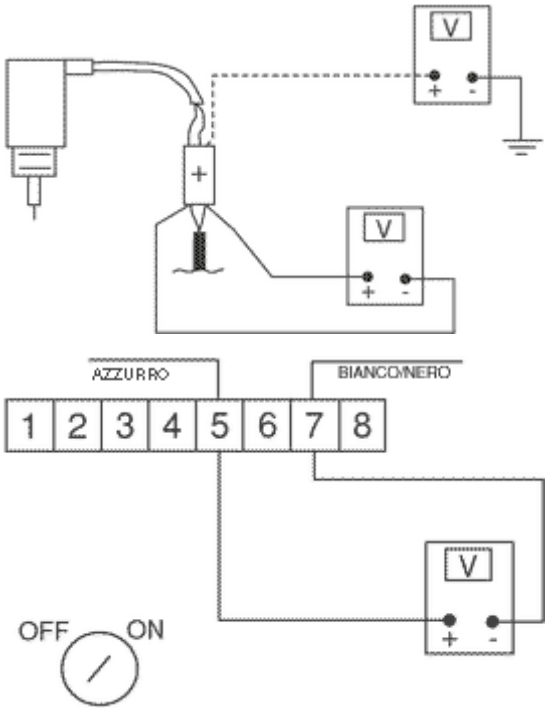
Recharge system voltage check

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

Refer to the engine section to check the resistance and operating conditions of the component. As regards voltage supply, keep the connector connected to the system and check that the two terminals receive battery voltage when the engine is on (see figure).
If no voltage is detected, connect the multimeter negative probe to the ground lead and the positive probe to the automatic starter Orange cable; with the key switch set to "ON" check whether there is battery voltage; if there is no voltage, check the wiring connections to the key switch and that the 15A fuse (No. 7) 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; then check whether there is voltage connecting the multimeter with the positive probe to terminal No. 5 (Blue), and the nega-



tive one to terminal No. 7 (White/Black) (see figure).

If there is no voltage, replace the control unit after making sure that the fuses are not blown; otherwise, check the cable harness between the starter and the control unit and, as a last resource, replace the starter.

Lights list

LIGHT BULBS TABLE

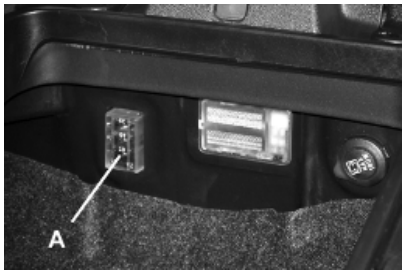
	Specification	Desc./Quantity
1	High-beam light bulb	**Type:** HALOGEN (H7) **Power:** 12V - 55W **Quantity:** 1
2	Low-beam bulb	**Type:** HALOGEN (H1) **Power:** 12V - 55W **Quantity:** 1
3	Front tail light bulb	**Type:** ALL GLASS **Power:** 12V - 5W **Quantity:** 2
4	Instrument panel bulb	**Type:** ALL GLASS **Power:** 12V - 2W **Quantity:** 5
5	Front turn indicator bulb	**Type:** Spherical **Power:** 12V - 10W **Quantity:** 1 RHS + 1 LHS
6	Helmet compartment light bulb	**Type:** CYLINDRIC **Power:** 12V - 5W **Quantity:** 1
7	Rear turn indicator light bulb	**Type:** Spherical **Power:** 12V - 10W **Quantity:** 1 RHS + 1 LHS
8	Stop light bulb	**Type:** ALL GLASS **Power:** 12V - 2.3W **Quantity:** 5
9	Rear tail light bulb	**Type:** SPHERICAL **Power:** 12V - 5W **Quantity:** 2
10	License plate light bulb	**Type:** ALL GLASS **Power:** 12V - 5W **Quantity:** 1

Fuses

The electrical system is equipped with:

1. Four protection fuses «**A**» inside the helmet compartment.

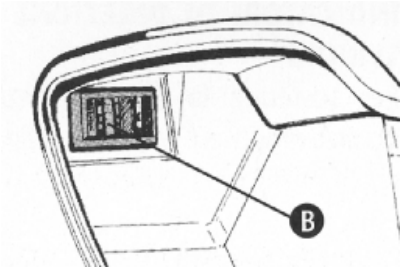
2. Four protection fuses «**B**» for the various circuits of the electrical system, located inside the front glove-box to the left.



The tables show the position and characteristics of the fuses on the scooter.

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).



FUSE TABLE

	Specification	Desc./Quantity
1	Fuse No. 1	**Position on fuse holder:**1 **Capacity:** 15A **Protected circuits:** 12V-180W Socket for electrical equipment - Helmet compartment light - Electrical saddle opening - Antitheft device pre-installation **Location:**helmet compartment
2	Fuse No. 2	**Position on fuse holder: 2** **Capacity:** 15A **Protected circuits:** Radiator electrical fan - Battery recharge - Vehicle lights - Power for antitheft device wiring - Electric fuel pump - Lines protected by fuses 4; 5; 6; 7 and 8 **Location:**helmet compartment
3	Fuse No. 3	**Position on fuse holder: 3** **Capacity:** 10 A **Protected circuits:** High- and low-beam lights - Front and rear tail lights - License plate bulb **Location:**helmet compartment
4	Fuse No. 4	**Position on fuse holder: 4** **Capacity:** 7.5 A **Protected circuits:** Power for radio/intercom control unit pre-installation - Analogue indicator **Location:**helmet compartment
5	Fuse No. 5	**Position on fuse holder: 5** **Capacity:** 7.5 A **Protected circuits:** Headlight warning light - Front and rear tail lights - License plate light **Location:** front case
6	Fuse No. 6	**Position on fuse holder: 6** **Capacity:** 10 A **Protected circuits:** Digital instrument panel - Immobilizer LED **Location:** front case
7	Fuse No. 7	**Position on fuse holder: 7** **Capacity:** 10 A **Protected circuits:** High-beam bulb and warning light in "passing" - Horn - Power for accessories pre-installation **Location:** front case
8	Fuse No. 8	**Position on fuse holder: 8** **Capacity:** 7.5 A **Protected circuits:** Stop lights - Vehicle start-up enabling button - Power for radio/intercom control unit pre-installation and antitheft device installation **Location:** front case

Dashboard

instrument panel

The X9 model has an instrument panel subdivided into 2 sections: the analogue section fastened to the windshield, and the digital section integral to the handlebar.

The analogue section comprises:

- A speedometer with double scale (MPH/KMH) controlled by the tone wheel;
- An rpm indicator controlled by the signal coming from the HV coil.
- A fuel gauge controlled by a resistive sensor (inside the tank)
- A coolant temperature gauge controlled by a resistive sensor (on the head)

These instruments are electrically controlled by stepper motors.

The digital section provides the displays of:

A: Preset warning light *

B: Preset warning light *

C: Preset warning light *

D: Engine disabled

E: Oil pressure

F: Fuel reserve

G: Tail lights and low-beam lights: green

H: High-beam lights on

I: Left turn indicator

L: Emergency lights (four arrows)

M: Right turn indicator

* The DGT instrument does not have the preset warning light LED

Low fuel indicators, turn indicators and emergency flashing light are activated by the instrument electronic components. For instance, the fuel reserve warning light bulb lights up only when the reserve signal coming from the tank persists for over 13.5 seconds. This prevents the reserve warning light from flickering.

- This flashing function has been incorporated to the instrument electronic components: that is, the emergency lights can work with the switch set to "OFF" and the control switch deactivated. The control switch is active only when the instrument panel is on.

To guarantee safety while riding, the "turn indicator control" function is connected to the odometer. In case you forget the signal ON, it will turn off automatically after riding 1 kilometre.

- The "engine disabled" warning light is activated through the side stand switch and the emergency switch located on the handlebar right side.
- The LCD display provides a 5-digit indication for the total distance covered by the vehicle. This can be expressed in kilometres or miles: naturally such indication cannot be reset. **To select the indication it is necessary to push simultaneously the "Trip" and "M" buttons and then turn the key switch to "ON"; by holding these 2 buttons for another 3 seconds, the word "SET" is displayed, and then the distance covered shifts from miles to kilometres or vice versa.**

The instrument panel digital section has a liquid crystal display and 4 control buttons.

The display provides 3 icons with the words:

- **Oil**

- **Service**

- **Belt**

- The **"Oil"** icon flashes when a distance of 1000 km has been covered, and then every 3000 km.

- The **"Service"** icon flashes for the first time at 1000 km or after 1 year. After that, every 6000 km or after 1 year.

- The **"Belt"** icon warns the rider about the need to replace the driving belt. It lights up every 12000 km

After the maintenance operations at the authorised workshop, it is necessary to cancel the indication by the icon/s with the "Reset" button located on the front of the vehicle under the fairing.

The "Reset" button resets the distance covered, and, in the case of the "Service" icon, also the year count. This count remains active even if the battery is disconnected for short periods of time.

To reset an icon, press the "Reset" key for less than a second to select the icon preceding the one to be reset and then hold the "Reset" key for at least 3 seconds so that the following is displayed:

- The desired icon selected lights up.

- The flashing of that icon confirms the reset.

For instance, to reset "Service" icon, select "Oil" and keep the "Reset" key pressed for at least 3 seconds. To reset "Oil", repeat the procedure described selecting "Belt".

Care must be taken with this procedure since icon selection and reset are simultaneous operations (for this operation it is not possible to view the desired function and reset in two different key strokes because, if you do so, the following icon could be reset).

Data check function

Date and check function

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

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

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

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

Sealed battery

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

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

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

INSTRUCTIONS FOR THE BATTERY REFRESH AFTER OPEN-CIRCUIT STORAGE

1) Voltage check

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

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

2) Constant voltage battery charge mode

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

10 to 12 h recommended

Minimum 6 h

Maximum 24 h

3) Constant current battery charge mode

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

CAUTION

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

WARNING

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

Dry-charge battery

- Remove the battery air pipe cap and each single cell caps.
- Fill the battery with electrolyte of 1.270+/-0.01 kg/l density (corresponding to 31+/-1 Bé) with an ambient temperature not below 15°C, until it reaches the upper level indicated on the block.
- Incline the battery slightly to remove any air bubbles formed during filling.
- Place the caps on each single element filling holes without screwing them and leave the battery to rest. During this stage, the battery is subjected to a gasification phenomenon and temperature increases.
- Let it rest until it reaches ambient temperature (this stage can take up to 60 minutes).
- Tilt the battery slightly to facilitate the elimination of any gas bubbles present inside; restore the level using the same filling electrolyte

N.B.

THIS IS THE LAST TIME THAT ELECTROLYTE CAN BE ADDED. FUTURE TOP-UPS SHOULD BE DONE ONLY WITH DISTILLED WATER.

Within 24 hours recharge the battery following these steps:

- Connect the battery charger terminals observing the correct polarity;
- Wit the battery charger drw. 020333Y and/or drw. 020334Y operate the battery charger control by selecting the position corresponding to that capacity;
- Otherwise, charge the battery with direct current equal to 1/10 of rated capacity (e.g. for a battery with a 9Ah rated capacity, the charging current should be 0.9-1.0A) for approximately a 4-6 hour charge.

N.B.

BATTERIES THAT HAVE BEEN STORED FOR A LONG TIME CAN TAKE A LONGER CHARGING TIME. BATTERY CHARGERS DRW. 020333Y AND DRW. 020334Y HAVE AN AUTOMATIC PROTECTION WHICH INTERRUPTS THE RECHARGE AFTER 12 HOURS TO AVOID BATTERY HARMFUL HEATING. IN THIS CASE, THE ACTIVATION OF THE SAFETY SYSTEM AND NOT A GREEN LED ON INDICATES THE END OF THE CHARGE.

Let the open circuit battery rest for approximately 4-6 hours; then check the off-load voltage using a standard tester.

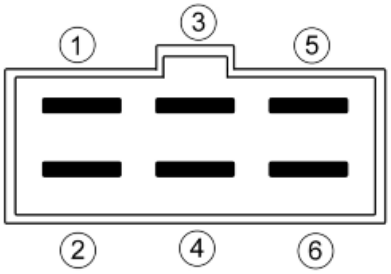
- If the open-circuit voltage is higher or equal to **12.6V**, the battery is charged adequately. Slightly shake or tilt the battery to eliminate any air bubbles created during recharging.
- Check the electrolyte levels again, fill them with distilled water up to the upper level line if necessary, clean battery properly, close each single cell cap tightly and install it on the vehicle.
- If the voltage indicated is low, charge the battery another 4-6 hours in the way described above.

N.B.

WITH BATTERY CHARGER DRW. 020334Y, THE BATTERY CHARGE LEVEL CAN BE CHECKED WITH THE "CHECK" FUNCTION. THE VALUE INDICATED ON THE DISPLAY MUST BE HIGHER THAN THE VALUE INDICATED IN THE TABLE; OTHERWISE RECHARGE THE BATTERY AGAIN IN THE SAME WAY INDICATED ABOVE.

Pump electrics check

Connect the tester positive probe to pin 4 of the connector of the fuel pump control device, and the negative probe to pin 3, making sure there is battery voltage as indicated in the table.



PUMP SUPPLY

Specification	Desc./Quantity
Key set to «KEY ON»	Supply to the pump for 13 seconds
Engine revs from 0 to 200 rpm	Always «OFF»
Engine revs from 200 to 1200 rpm	Always «ON»
Engine revs from 1200 to 2000 rpm	0.2 seconds «ON» 9 seconds «OFF»
Engine rpm] 2000 r.p.m.	Always «ON»

INDEX OF TOPICS

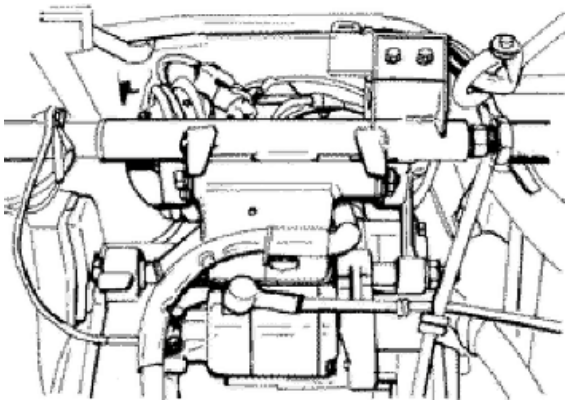
Removal of the engine from the vehicle

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

Locking torques (N*m)

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

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



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

WARNING

Wear safety goggles when using hitting tools.

WARNING

BE VERY CAREFUL WHEN HANDLING FUEL.

CAUTION

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

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

INDEX OF TOPICS

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

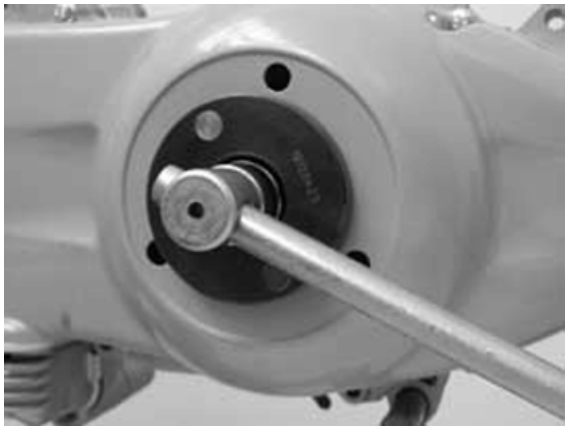
Automatic transmission

Transmission cover

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

Specific tooling

020423Y Driven pulley lock wrench



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

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

Air duct

- Remove the 4 screws and the housing.

Air duct filter

To remove the intake throat on the transmission cover, remove the 2 fixing screws indicated in the figure.

Removing the driven pulley shaft bearing

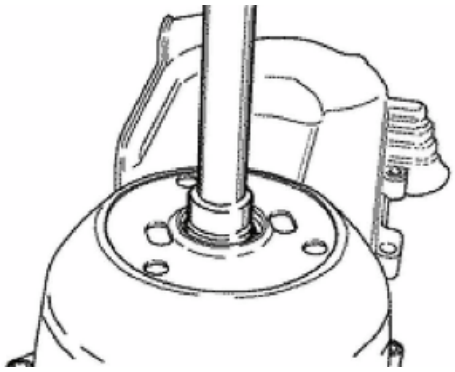
- Remove the clip from the inside of the cover.
- Remove the bearing from the crankcase by means of:

Specific tooling

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm

020412Y 15 mm guide



Refitting the driven pulley shaft bearing

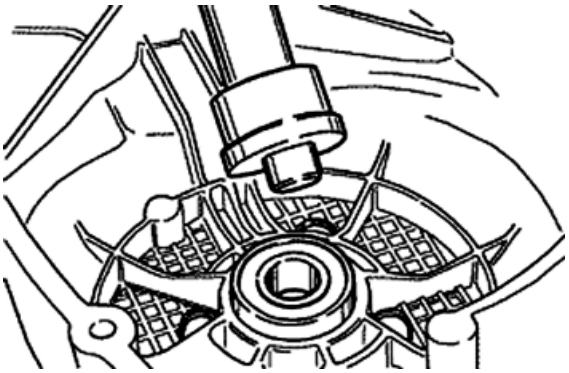
- Slightly heat the crankcase from the inside so as not to damage the painted surface.
- Insert the bearing in its seat.
- Refit the Seeger ring.

CAUTION

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

N.B.

ALWAYS REPLACE THE BEARING WITH A NEW ONE UPON REFITTING.



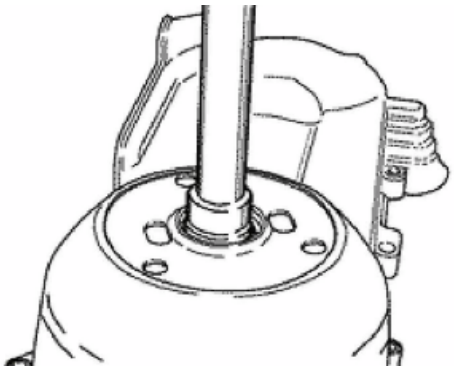
Specific tooling

020376Y Adaptor handle

020357Y 32x35-mm Adaptor

020412Y 15 mm guide

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



CAUTION

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

N.B.

ALWAYS REPLACE THE BEARING WITH A NEW ONE UPON REFITTING.

Specific tooling

020376Y Adaptor handle

020357Y 32x35-mm Adaptor

020412Y 15 mm guide

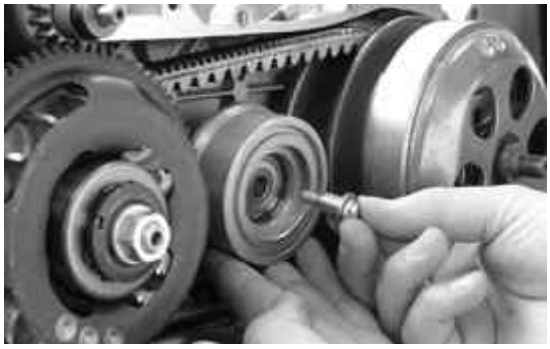
Baffle roller

Metallic roller

Removal

Belt support roller (200 cm³ models only)

- Check that the roller does not show signs of wear and that it turns freely.
- Remove the special fixing screw and the roller together with the bearing.



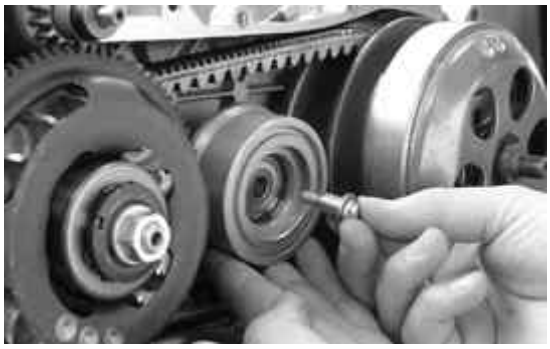
Refitting

- Heat the roller and insert the bearing using the specific punch:

Specific tools:

Specific tooling

020455Y 10-mm guide



- Refit the roller with the special screw.
- Tighten to the specified torque.
- Refit the intake throat with the O-ring, the sump sealing gasket and a the fan housing.

Locking torques (N*m)

Anti-flapping roller 12 - 16

- Heat the roller and insert the bearing using the specific punch:

Specific tools:

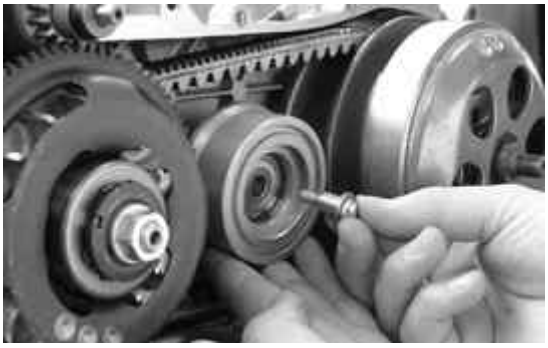
Specific tooling

020455Y 10-mm guide

- Refit the roller with the special screw.
- Tighten to the specified torque.
- Refit the intake throat with the O-ring, the sump sealing gasket and a the fan housing.

Locking torques (N*m)

Anti-flapping roller 12 - 16

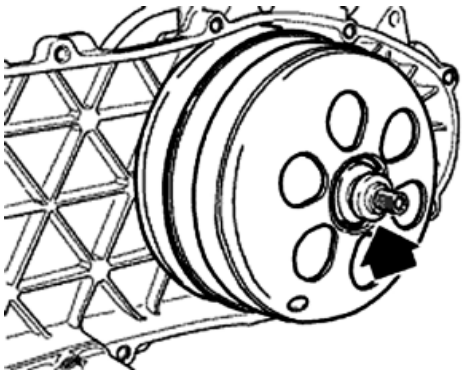


Removing the driven pulley

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

N.B.

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



Inspecting the clutch drum

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

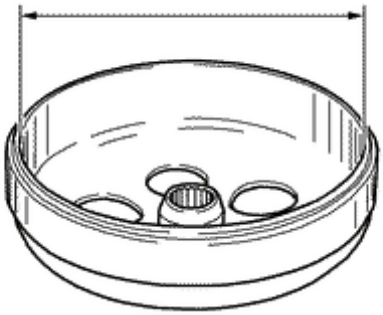
Characteristic

Max. value clutch bell

Max. value: Ø 134.5 mm

Clutch bell standard value

Standard value: Ø 134 - 134.2 mm



- 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

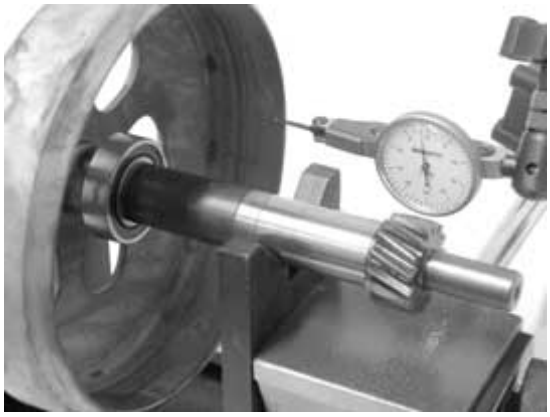
020074Y Support base for checking crankshaft alignment

020335Y Magnetic support for dial gauge

Characteristic

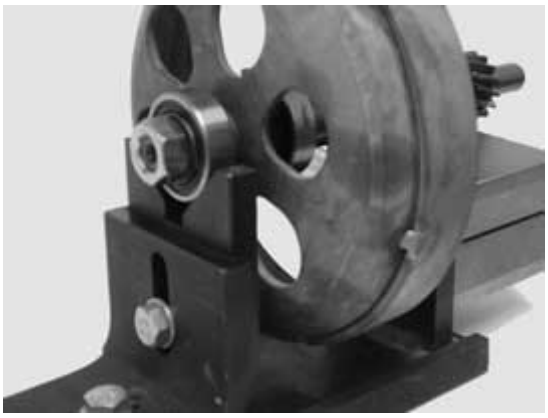
clutch bell inspection: Limit eccentricity.

Admissible limit eccentricity: 0.15 mm



Checking the bell working surface eccentricity

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



Removing the clutch

Removing the clutch

Fit the driven pulley spring compressor specific tool with medium length pins screwed in position **F** from the tool internal side.

- Insert the adapter ring 8 in the pins.
- Assemble the driven pulley unit on the tool introducing the rivets heads in the adapter ring.
- Make sure that the clutch is perfectly inserted into the adapter ring before proceeding to loosen/tighten the clutch nut.
- Use the special 46x55 wrench component n°9 to remove the nut fixing the clutch in place.
- Separate the driven pulley components (Clutch, fan and spring with plastic fitting).

CAUTION

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

Specific tooling

020444Y009 wrench 46 x 55

020444Y010 adapter ring

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 FAYING SURFACE AND MUST NOT BE DIFFERENT FROM ONE ANOTHER.
VARIOUS CONDITIONS CAN CAUSE THE CLUTCH TO TEAR.

CAUTION

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

Characteristic

Check minimum thickness

1 mm

Pin retaining collar

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

N.B.

USE TWO SCREWDRIVERS IF YOU HAVE ANY DIFFICULTY.

N.B.

BE CAREFUL NOT TO PUSH THE SCREWDRIVERS IN TOO FAR TO AVOID DAMAGE THAT COULD COMPROMISE THE O-RING SEAL.

Removing the driven half-pulley bearing

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

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

Specific tooling

001467Y035 Belle for OD 47-mm bearings

- Remove the roller bearing using the modular punch.

Specific tooling

020376Y Adaptor handle

020456Y Ø 24 mm adaptor

020363Y 20 mm guide

Inspecting the driven fixed half-pulley

- Measure the outer diameter of the pulley bushing.
- Check the contact surface with the belt to make sure there are no flaws.

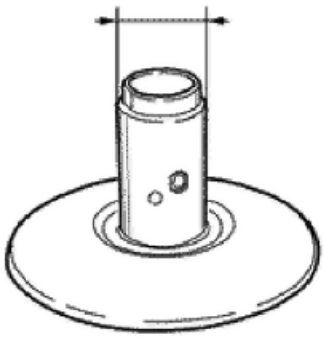
Characteristic

Half-pulley standard diameter

Standard diameter: Ø 40.985 mm

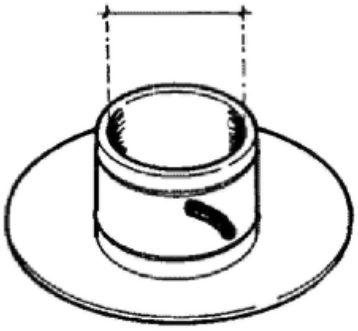
Half-pulley minimum diameter

Minimum admissible diameter: Ø 40.96 mm



Inspecting the driven sliding half-pulley

- Remove the two internal grommets and the two O-rings.
- Measure the movable half-pulley bushing inside diameter.



Characteristic

Movable driven half-pulley max. diameter

Max. diameter admitted: Ø 41.08 mm

Movable driven half-pulley standard diameter

Standard diameter: Ø 41.000 ÷ 41.035 mm

Refitting the driven half-pulley bearing

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

Fit the snap ring

WARNING

N.B.

FIT THE BALL BEARING WITH THE VISIBLE SHIELD

Specific tooling

020376Y Adaptor handle

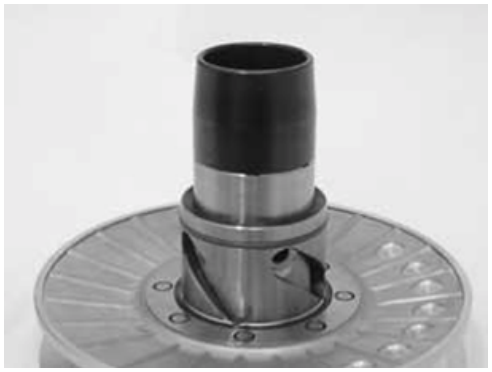
020375Y Adaptor 28 x 30 mm

020424Y Driven pulley roller casing fitting punch

Refitting the driven pulley

- Insert the new oil guards and O-rings on the movable half-pulley.
- Lightly grease the O-rings (A) shown in the figure.

- Fit the half-pulley over the bushing using the appropriate tool
- Check that the pins are not worn and proceed to refitting them in their slots.
- Refit the torque server closure collar.



Using a curved-spout grease gun, lubricate the driven pulley assembly with approximately 6 g of grease. Apply the grease through one of the holes in the bushing until it comes out through the hole on the opposite side. This operation is necessary to avoid the presence of grease beyond the O-rings.

N.B.

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

Specific tooling

020263Y Driven pulley assembly sheath

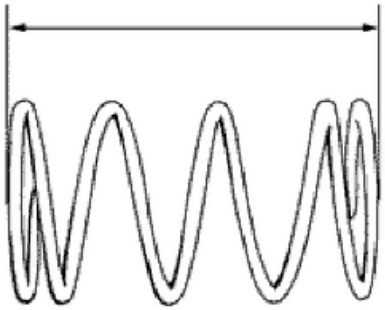
Recommended products

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 length of the spring, while it is relaxed.



Characteristic

Standard length

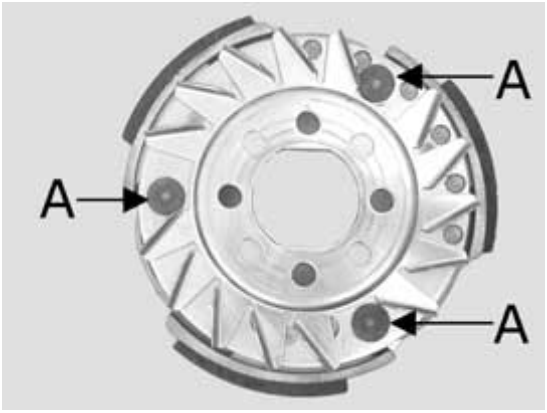
106 mm

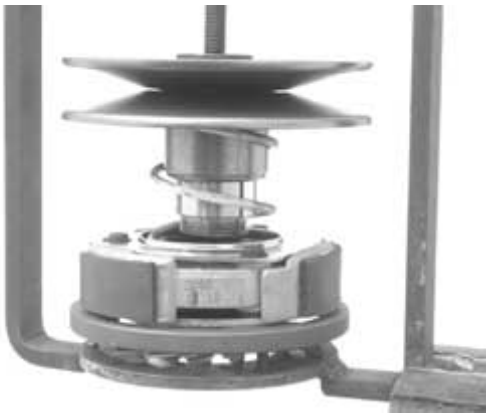
acceptable limit after use:

101 mm

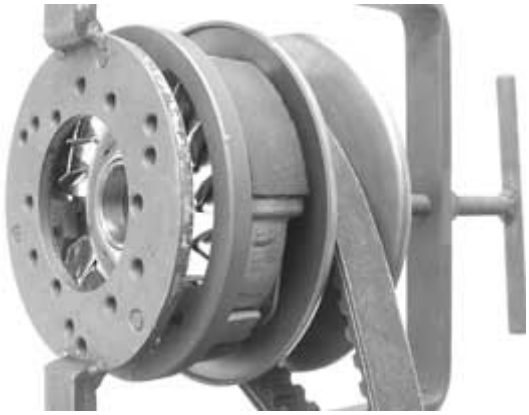
Refitting the clutch

- Support the driven pulley spring compressor appropriate tool with the control screw in vertical axis.
- Arrange the tool with the medium length pins screwed in position «**F**» on the inside.
- Insert the adapter ring 8 in the pins.
- Preassemble the cooling fan to the clutch in such a way that the keying facets are aligned and the 3 pin heads (A) of the mass axis can be seen in full.
- 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 lock nut and tighten it to the specified torque using the specific 46x55 spanner.





- 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 until it reaches the pulleys maximum opening and place the belt on the minimum rolling diameter.
- Remove the driven pulley /belt unit from the tool.



N.B.

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

N.B.

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

N.B.

AN EXCESSIVE QUANTITY CAN DAMAGE THE CLUTCH OPERATION.

Specific tooling

020444Y011 adapter ring

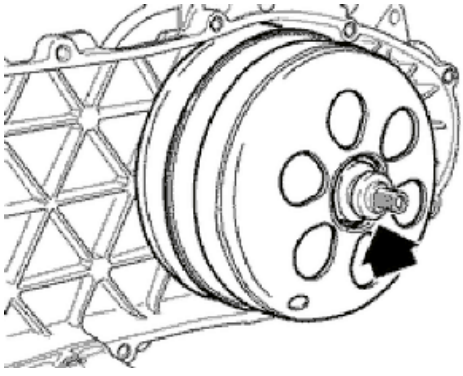
020444Y009 wrench 46 x 55

Locking torques (N*m)

Clutch unit nut on driven pulley **55 ÷ 60**

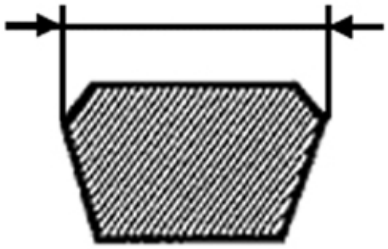
Refitting the driven pulley

- Reassemble the clutch bell and spacer.



Drive-belt

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



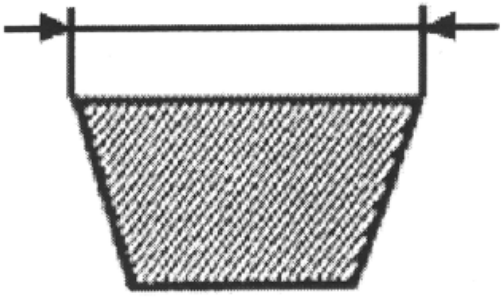
Characteristic

Driving belt - minimum width:

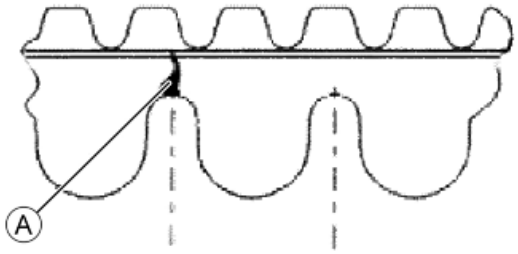
21.5 mm

Driving belt - standard width:

22.5 ± 0.2 mm



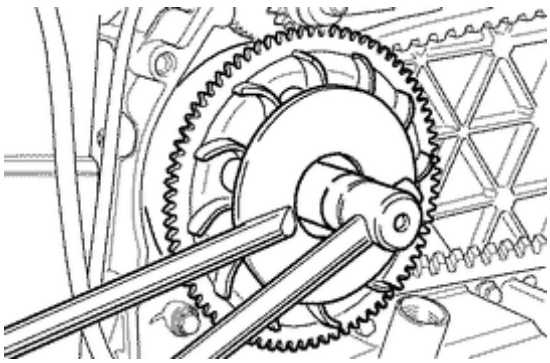
During the wear checks foreseen in the scheduled maintenance services at 6,000 km; 18,000 km; etc., check that the rim bottom of the toothing does not show signs of incisions or cracking (see figure): The rim bottom of the tooth must not have incisions or cracking; if it does, change the belt.



Removing the driving pulley

- With the appropriate tool, remove the nut with the built-in Belleville washer, the drive common to the kick-starter version, and the steel washer.
- Remove the fixed driving half-pulley.
- Remove the steel washer separating from the bushing.

Specific tools:

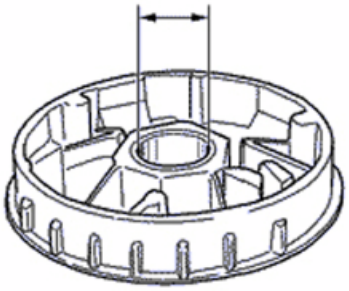


Specific tooling

020368Y driving pulley lock wrench

Inspecting the rollers case

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



CAUTION

DO NOT LUBRICATE OR CLEAN SINTERED BUSHINGS

Characteristic

movable driving half-pulley bushing: Standard Diameter

26.000 - 26.021 mm

movable driving half-pulley bushing: Maximum allowable diameter

Ø 26.12 mm

Sliding bushing: Standard Diameter

Ø 25.959 ÷ 25.98 mm

Sliding bushing: Minimum admissible diameter

Ø 25.95 mm

Roller: Standard Diameter

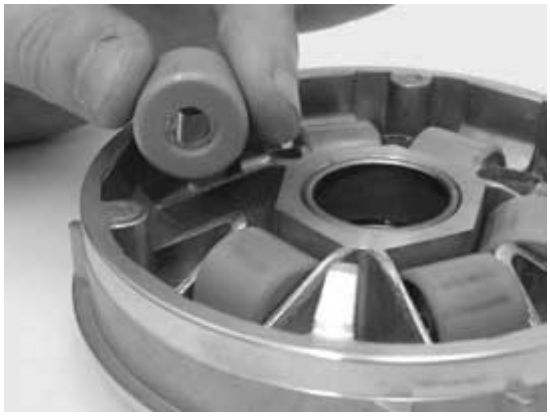
Ø 18.9 ÷ 19.1 mm

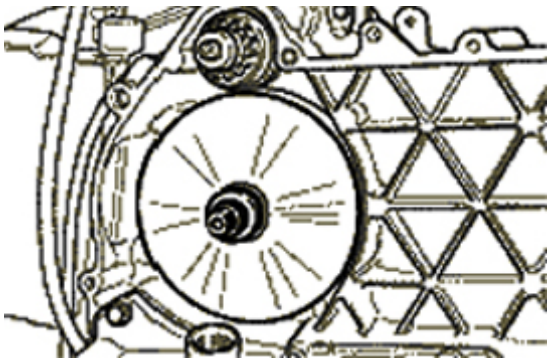
Roller: Minimum diameter permitted

Ø 18.5 mm

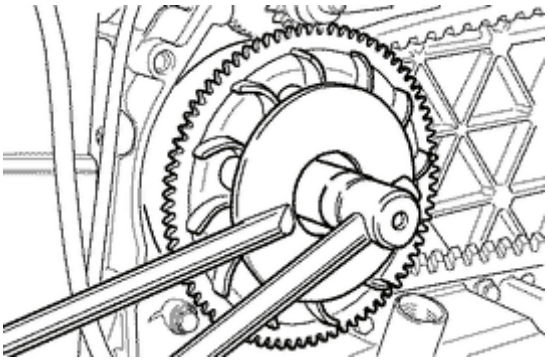
Refitting the driving pulley

- Preassemble the movable half-pulley with the roller contrast plate by putting the rollers in their housings with the larger support surface touching the pulley according to the direction of rotation.
- Check that the roller contact plate does not have flaws and is not damaged on the grooved edge.
- Mount the complete bushing unit on the driving shaft.
- Fit the driven pulley/Clutch/belt unit on the engine.





- Correctly refit the previously removed Bendix back to its position.
- Reassemble the parts of the unit (internal lining, fixed half-pulley, external lining, drive and nut), spread Loctite 243 Quick Set threadlock on the thread and tighten the nut to the prescribed torque.
- Avoid the half-pulley rotation with the appropriate stop key tool..
- Rotate the engine manually until the belt is slightly taut.



CAUTION

IT IS EXTREMELY IMPORTANT THAT THE BELT IS PERFECTLY FREE WHEN THE FIXED DRIVING HALF-PULLEY IS ASSEMBLED. THIS IS TO AVOID CARRYING OUT A WRONG TIGHTENING OF THE DRIVING HALF-PULLEY.

Specific tooling

020368Y driving pulley lock wrench

Locking torques (N*m)

Drive pulley nut 75 ÷ 83

Refitting the transmission cover

- Check that there are 2 centring dowels and that the sealing gasket for the oil sump on the transmission cover is adequately fitted.
- Replace the cover and tighten the 10 screws to 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.
- Refit the plastic cover.

Specific tooling

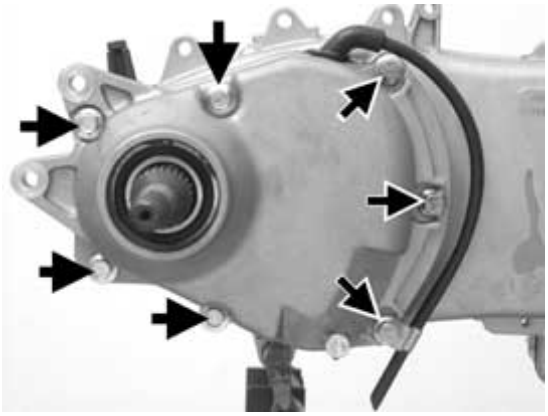
020423Y Driven pulley lock wrench

Locking torques (N*m)

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

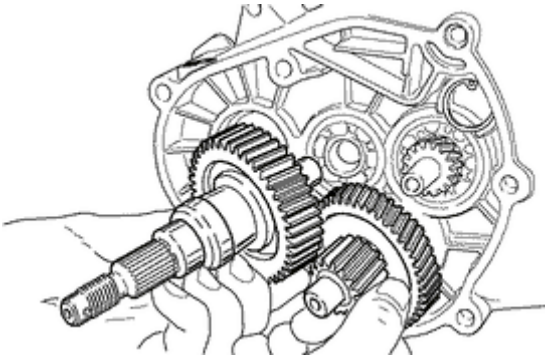
Removing the hub cover

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



Removing the wheel axle

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

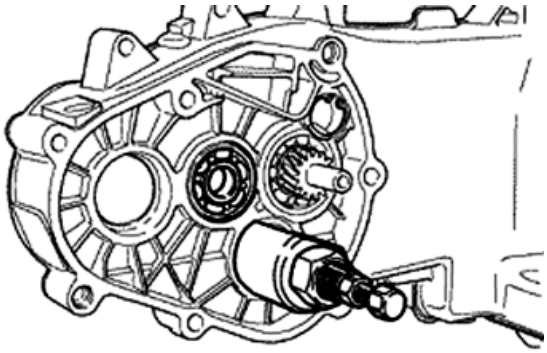


Removing the hub bearings

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

Specific tooling

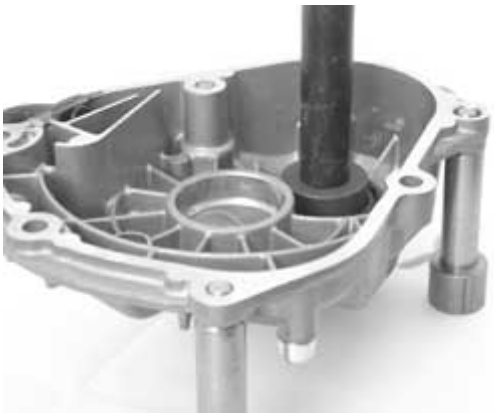
001467Y013 Pliers to extract ø 15-mm bearings



Removing the wheel axle bearings

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

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



Specific tooling

020376Y Adaptor handle

020477Y Adaptor 37 mm

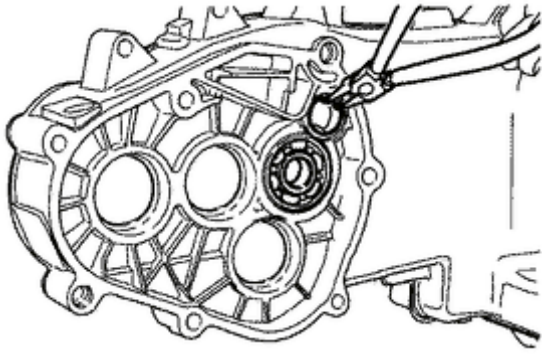
020483Y 30 mm guide

020359Y 42x47-mm Adaptor

020489Y Hub cover support stud bolt set

Removing the driven pulley shaft bearing

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



Specific tooling

020376Y Adaptor handle

020375Y Adaptor 28 x 30 mm

020363Y 20 mm guide

Inspecting the hub shaft

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

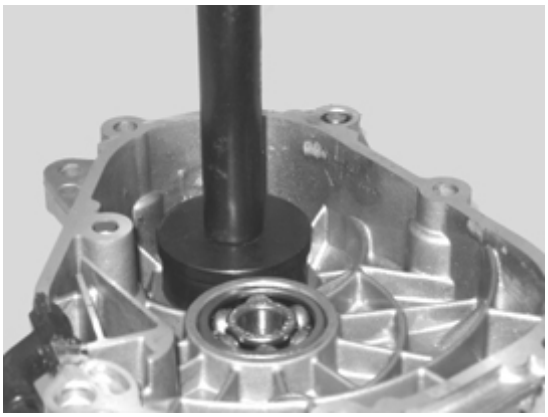
Inspecting the hub cover

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

Refitting the wheel axle bearing

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

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



Specific tooling

020376Y Adaptor handle

020360Y 52x55-mm Adaptor

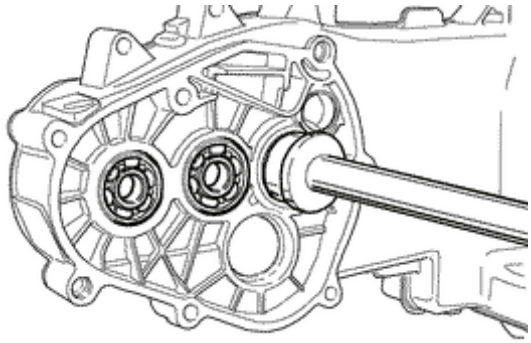
020483Y 30 mm guide

Refitting the hub cover bearings

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

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

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



N.B.

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

N.B.

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

N.B.

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

Specific tooling

020150Y Air heater support

020151Y Air heater

020412Y 15 mm guide

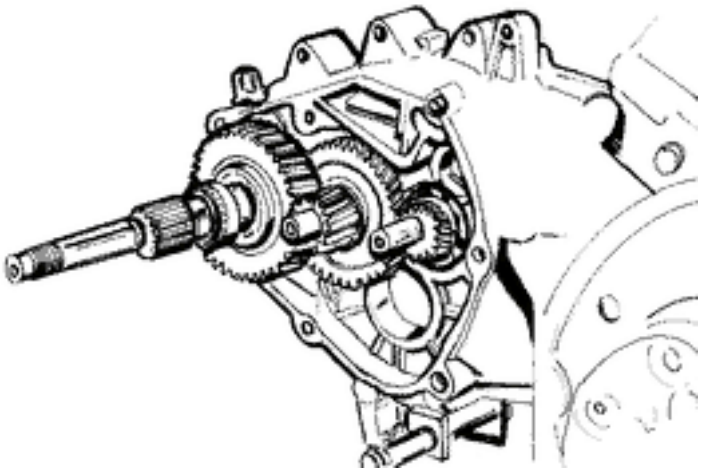
020376Y Adaptor handle

020359Y 42x47-mm Adaptor

020363Y 20 mm guide

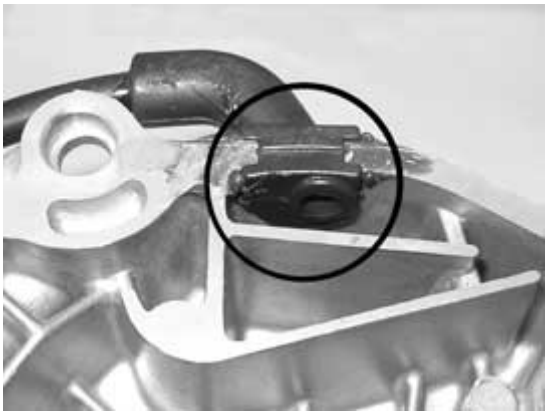
Refitting the hub bearings

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



Refitting the ub cover

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

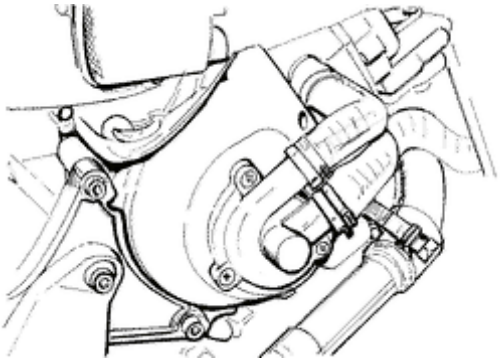


Locking torques (N*m)

Rear hub cover screws **24 ÷ 27**

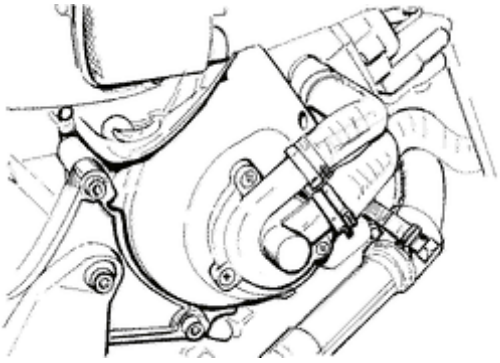
Flywheel cover

- Remove the two clamps, the two couplings and empty the cooling system.
- Remove the 4 retainers and the flywheel cover.



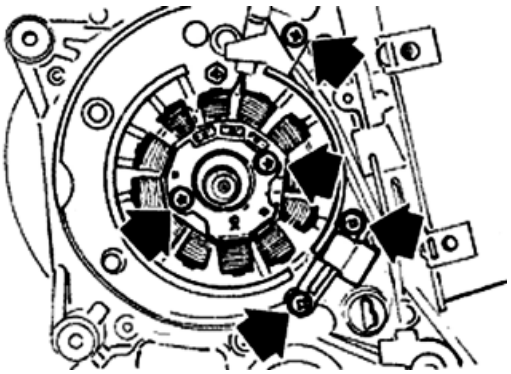
Removing the hub cover

- Remove the two clamps, the two couplings and empty the cooling system.
- Remove the 4 retainers and the flywheel cover



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.

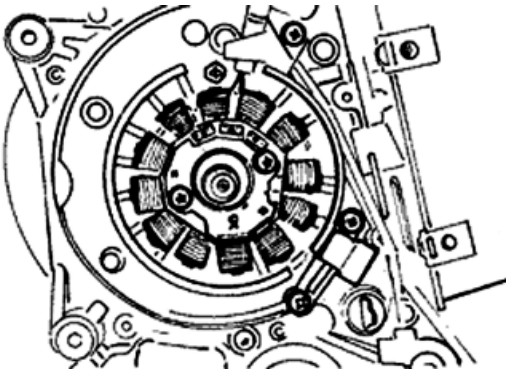


Refitting the stator

- 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.
- Stator screws and Pick-Up

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)

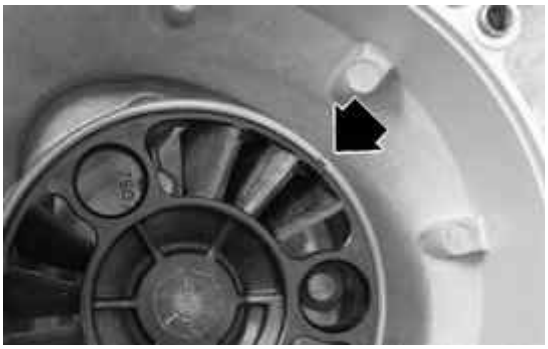
Stator assembly screws (°) 3 ÷ 4

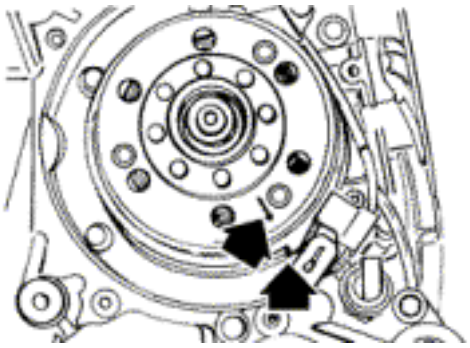
Refitting the flywheel cover

- Place the flywheel with the top dead centre mark aligned with the crankcase.
- Place the flywheel cover by aligning the reference marks of the drive and the crankcase cover.
- Reassemble the cover on the engine, placing the three connectors in the drive for the water pump.
- Carry out the steps in the reverse order from the dismantling procedure.

CAUTION

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





- Place the flywheel with the top dead centre mark aligned with the crankcase.
- Place the flywheel cover by aligning the reference marks of the drive and the crankcase cover.
- Reassemble the cover on the engine, placing the three connectors in the drive for the water pump.
- Carry out the steps in the reverse order from the dismantling procedure.

CAUTION

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

Flywheel and starting

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

Removing the flywheel magneto

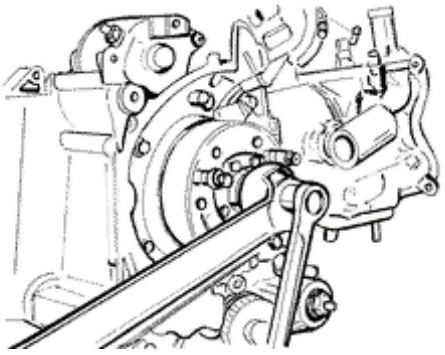
- Lock the rotation of the Flywheel with the calliper spanner tool.
- Remove the nut.
- Take out the flywheel.

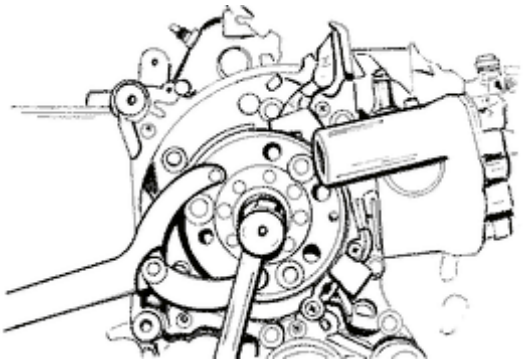
CAUTION

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

N.B.

THE FLYWHEEL OF THE 200 CM³ MODELS FEATURES ENHANCED INERTIAL MASS.





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 ÷ 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.

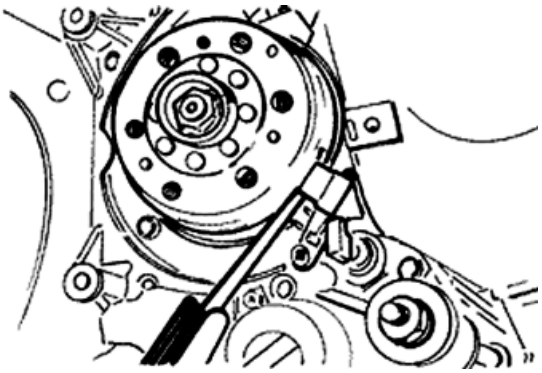
A VARIATION IN THE AIR GAP DISTANCE MODIFIES THE IGNITION SYSTEM IDLE SPEED

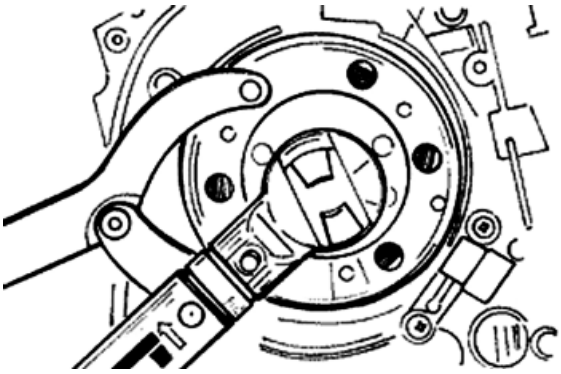
Specific tooling

020565Y Flywheel lock calliper spanner

Locking torques (N*m)

Flywheel nut **54 ÷ 60**



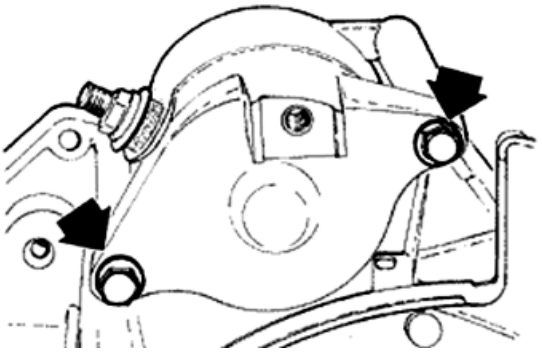


Refitting the starter motor

- Fit a new O-ring on the starter motor and lubricate it.
- Fit the starter on the crankcase and lock the 2 screws to the prescribed torque.

Locking torques (N*m)

Starter motor screws **11 ÷ 13**



Cylinder assy. and timing system

Removing the intake manifold

- Remove the flywheel cover completely as described in the flywheel cover section.
- Loosen the 3 crews and remove the intake manifold.

N.B.

TAMPERPROOF SCREWS ARE SUPPLIED WITH 125 CC MODELS.

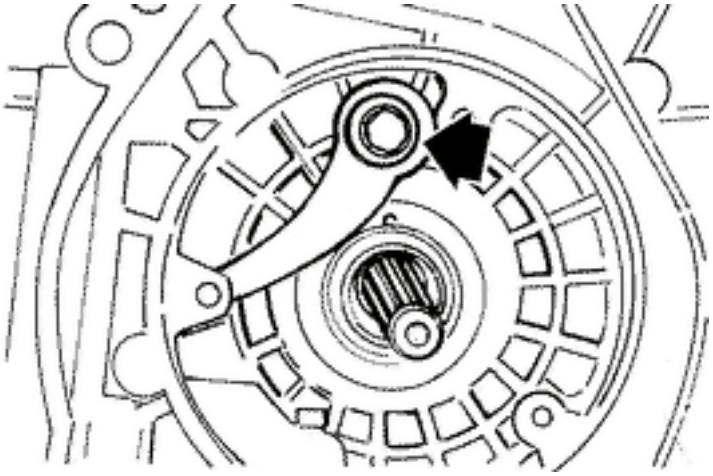
Removing the timing system drive

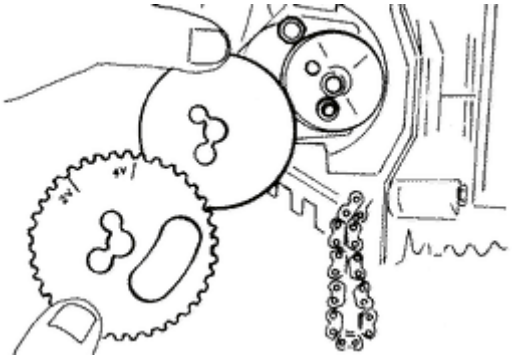
- Remove the parts listed below first: transmission cover, driving pulley with belt, start-up piston, oil sump with spring and by-pass piston, oil pump pulley cover, the O-ring on the crankshaft and the pinion separation washer.
- Remove the tappet cover.
- Remove the central screw fastener and the automatic valve-lifter retaining cover, as shown in the figure.
- Remove the return spring of the automatic valve lifter unit and the automatic valve lifter unit and its end of stroke washer.
- Loosen the central screw on the tensioner first.
- Remove the two fixings shown in the figure.
- Remove the tensioner with its gasket.
- Remove the internal hex screw and the counterweight shown in the figure.
- Remove the camshaft command pulley and its washer.
- Remove the command sprocket wheel and the timing chain.
- Remove the screw indicated in the figure, the spacer and the tensioner slider.

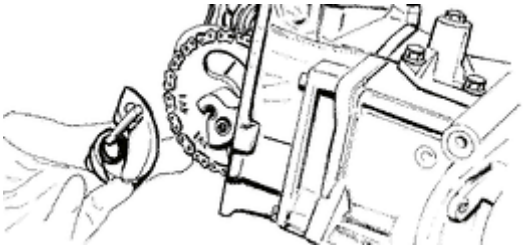
The chain tensioning pad must be removed from the transmission side. As regards the lower chain guide pad, it may only be removed after the head has been removed.

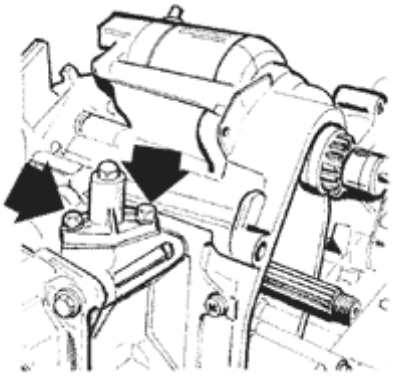
N.B.

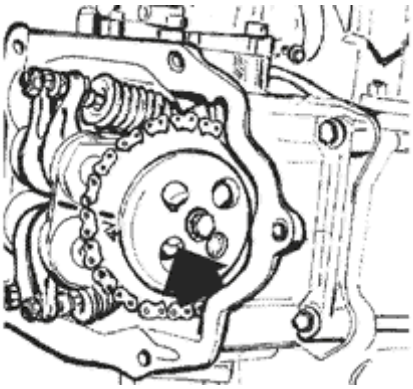
It is advisable to mark the chain in order to guarantee that the initial direction of rotation is maintained.





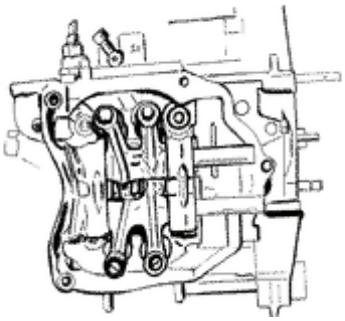






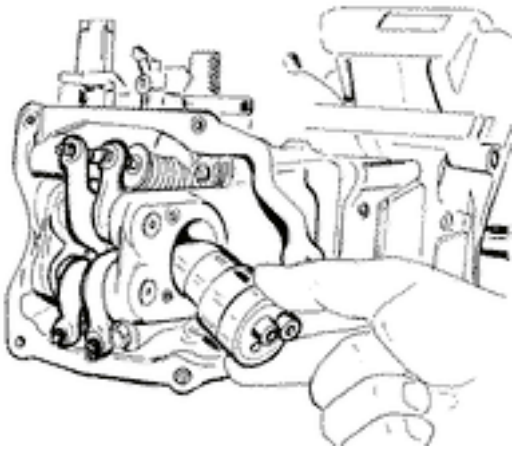
Removing the cam shaft

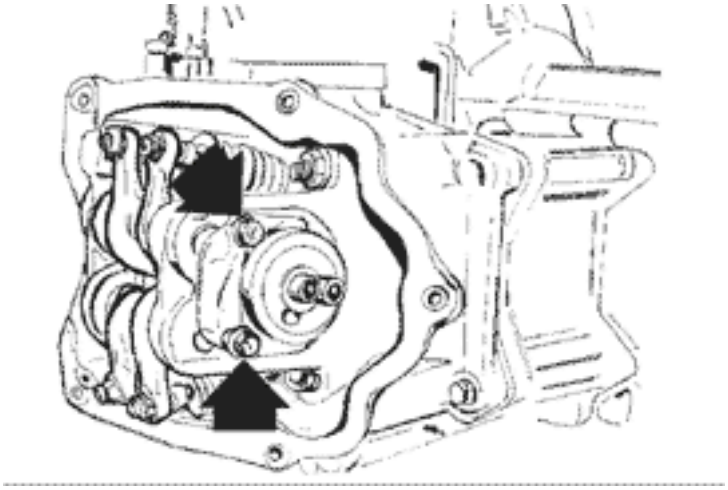
- Remove the 2 screws and the camshaft retainer shown in the diagram.
- Remove the camshaft.
- Remove the pins and the rocking levers from the flywheel side holes.



N.B.

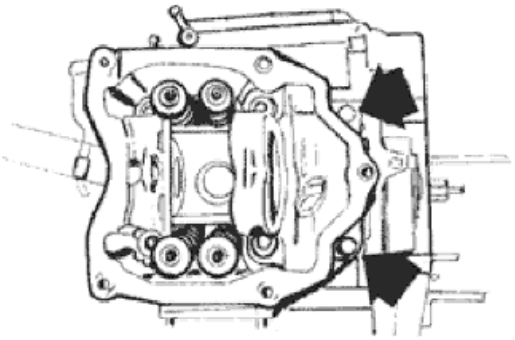
IN NEEDED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, ROCKING LEVER PINS AND FIXING BRACKET. THE HEAD CAN ALSO BE REMOVED WITHOUT REMOVING THE CHAIN AND THE DRIVING SHAFT CHAIN TIGHTENER.





Removing the cylinder head

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



N.B.

IN NEEDED, THE HEAD MAY BE REMOVED WITH THE CAMSHAFT, ROCKING LEVER PINS AND FIXING BRACKET. THE HEAD CAN ALSO BE REMOVED WITHOUT REMOVING THE CHAIN AND THE DRIVING SHAFT CHAIN TIGHTENER.

Removing the valves

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

CAUTION

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

Specific tooling

020382Y011 adapter for valve removal tool

020382Y Valve cotters equipped with part 012 removal tool

020306Y Punch for assembling valve sealing rings

Removing the cylinder - piston assy.

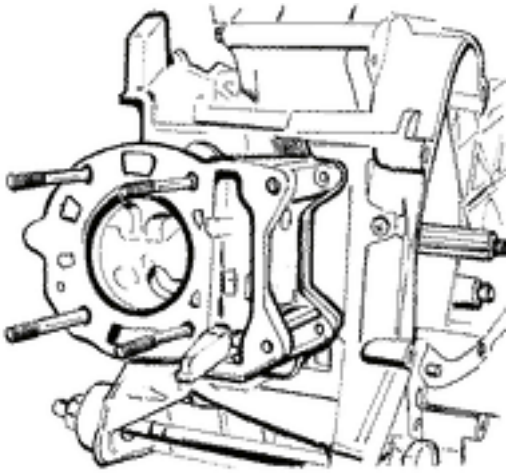
- Remove the chain guide pad.
- Pull out the cylinder.
- Remove the cylinder base gasket.
- Remove the two stop rings, the wrist pin and the piston.
- Remove the piston seals.

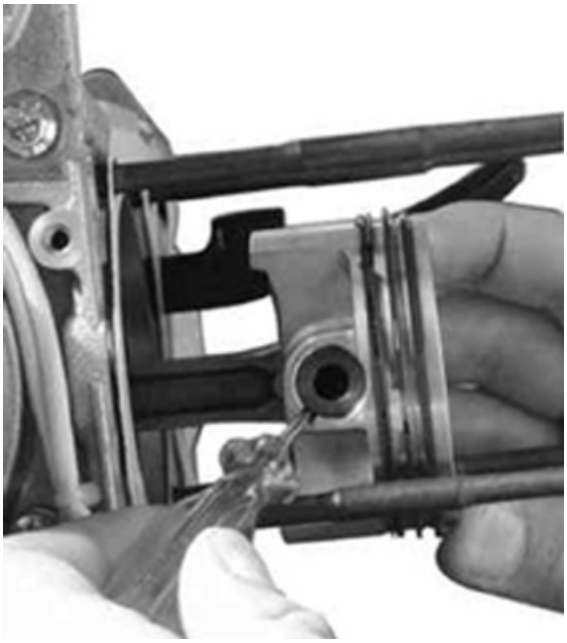
CAUTION

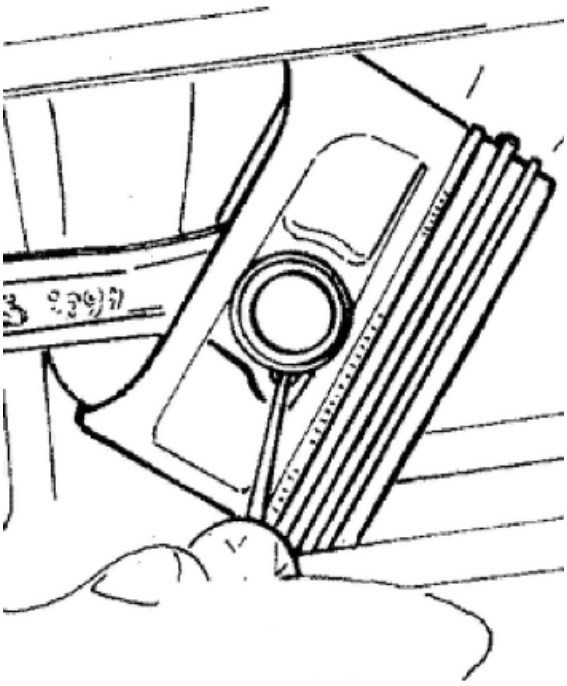
TO AVOID DAMAGING THE PISTON, SUPPORT IT WHILE REMOVING THE CYLINDER.

N.B.

BE CAREFUL NOT TO DAMAGE THE SEALING RINGS DURING REMOVAL.





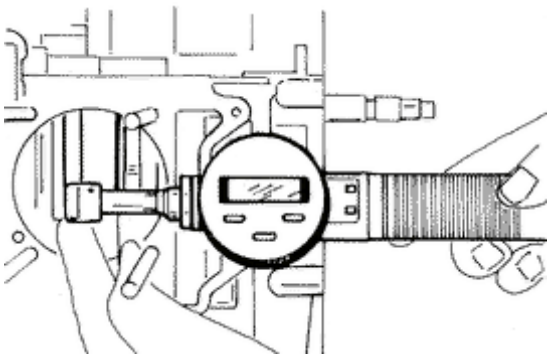


Inspecting the small end

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

N.B.

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



Characteristic

Rod small end check-up: Maximum diameter

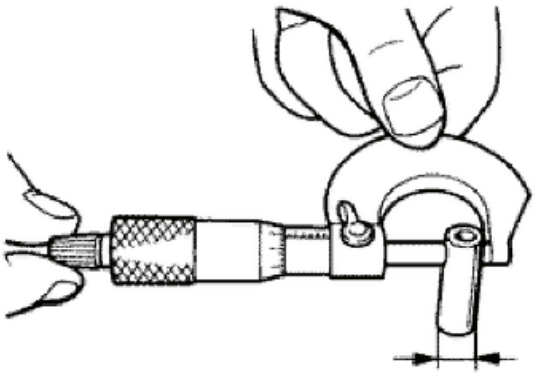
15.030 mm

Rod small end check-up: Standard diameter

15+0.015+0.025 mm

Inspecting the wrist pin

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



Characteristic

Pin diameter: Standard clearance

0.015 ÷ 0.029 mm

Pin diameter Standard diameter

14.996 - 15.000 mm

Inspecting the piston

- Measure the diameter of the wrist pin seat on the piston.
- Calculate the piston pin coupling clearance.
- Measure the outside diameter of the piston, perpendicular to the gudgeon pin axis.
- Measure at 41.1 mm from the piston crown in the position shown in the figure.
- 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.

N.B.

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

Characteristic

Wrist pin seat on the piston: Standard diameter

15.001 ÷ 15.006 mm

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

0.001 ÷ 0.010 mm

piston diameter

56.945 ÷ 56.973 mm

Fitting clearance

Top piston ring - standard coupling clearance 0.025 ÷ 0.07 mm **Top piston ring - maximum clearance allowed after use** 0.08 mm **Middle piston ring - standard coupling clearance** 0.015 - 0.06 mm **Middle piston ring - maximum clearance allowed after use** 0.07 mm **oil scraper ring - standard coupling clearance** 0.015 - 0.06 mm **oil scraper ring - maximum clearance allowed after use** 0.07 mm

Inspecting the piston rings

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

N.B.

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

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.
- With opening in the position indicated on the tool

S = left

D = right

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

CAUTION

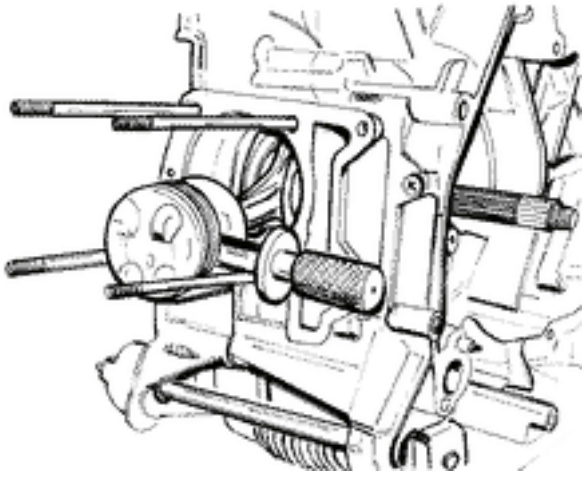
USING A HAMMER MIGHT DAMAGE THE STOPS' HOUSING.

N.B.

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

Specific tooling

020430Y Pin lock fitting tool



Choosing the gasket

- Provisionally fit the piston into the cylinder, without any base gasket.
- Assemble a dial gauge on the specific tool

Support to check piston position 020428Y

- Set the dial gauge to zero placing the tool on a contrasting surface. Keeping the zero position, assemble the tool on the cylinder and lock it with 2 supplied nuts as shown in the figure.
- Rotate the crankshaft until TDC (the inverted point of the dial gauge rotation)
- Position the dial gauge on the piston as shown in the figure and measure how much the piston protrudes.
- By means of the table shown in the specifications chapter identify the cylinder base gasket thickness to be used for refitting. Correctly identify the cylinder base gasket thickness to keep the correct compression ratio.
- Remove the specific tool and the cylinder.

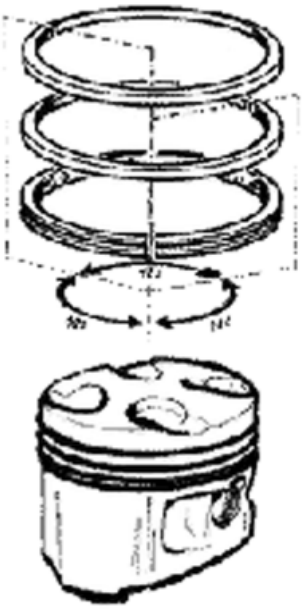
N.B.

PISTON PROTRUSION IS MEASURED IN 125 ENGINES WHILE INTRODUCTION IS MEASURED IN 200 ENGINES.

Refitting the piston rings

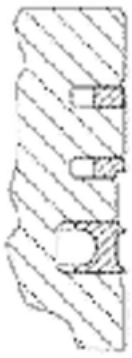
Fitting the sealing rings

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



N.B.

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



Refitting the cylinder

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

N.B.

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

Specific tooling

020393Y Piston assembly band

020287Y Clamp to assemble piston on cylinder

Inspecting the cylinder head

- Using a trued bar and a feeler thickness gauge check that the cylinder head surface is not worn or distorted.

Maximum allowable run-out: 0.05 mm

- Check that the camshaft and the rocking lever pin capacities exhibit no wear.
- Check that the cylinder head cover surface, the intake manifold and the exhaust manifold are not worn.

Characteristic

bearing «A»

Diameter 12.000 - 12.018 mm

bearing «B»

Ø 20.000 ÷ 20.021 mm

bearing «C»

Ø 37.000 - 37.025 mm

Head check

- Using a trued bar and feeler gauge check that the cylinder head surface is not worn or distorted.

Maximum allowable run-out: 0.05 mm

- Check that the camshaft and the rocker pin capacities exhibit no wear.

- Check that the cylinder head cover surface, the intake manifold and the exhaust manifold are not worn.

Standard diameter

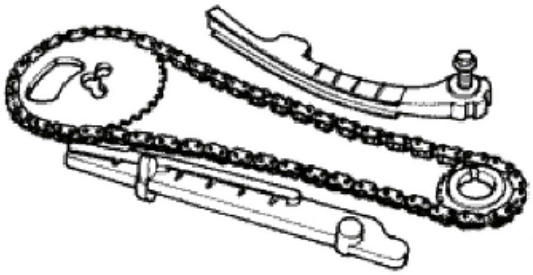
A Ø 12.000 ÷ 12.018 mm

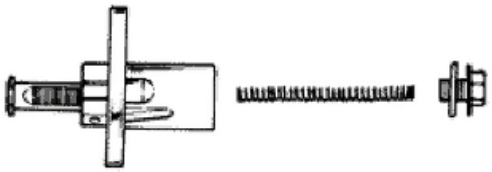
B Ø 20.000 ÷ 20.021 mm

C Ø 37.000 ÷ 37.025 mm

Inspecting the timing system components

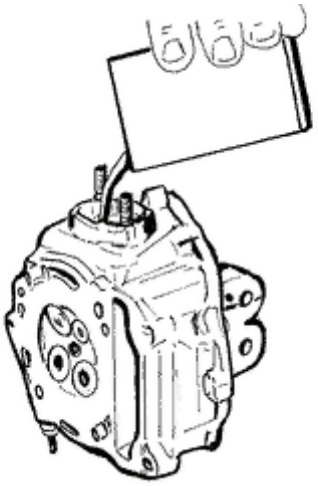
- Check that the guide slider and the tensioner slider are not worn out.
- Ensure that the camshaft control pulley chain assembly and the sprocket wheel are not worn.
- If you detect wear, replace the parts or, if the chain, sprocket wheel and pulley are worn, replace the whole unit.
- Remove the centre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





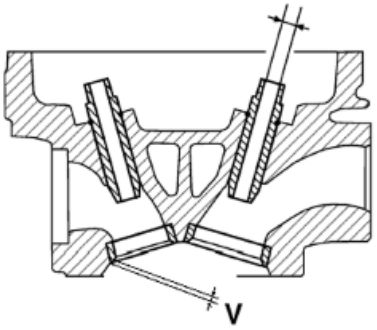
Inspecting the valve sealings

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



Inspecting the valve housings

- Check the width of the imprint on the valve seat«**V**» wear limit max. 1.6 mm.
- Remove any carbon formation from the valve guides.
- Measure the inside diameter of each valve guide.
- Take the measurement at three different heights in the rocker arm push direction.
- If the width of the impression on the valve seat or the diameter of the valve guide exceed the specified limits, replace the cylinder head.



Characteristic

Valve seat wear Intake guide

limit accepted: 5,022

Valve seat wear Intake guide

Standard diameter: 5.000 ÷ 5.012 mm

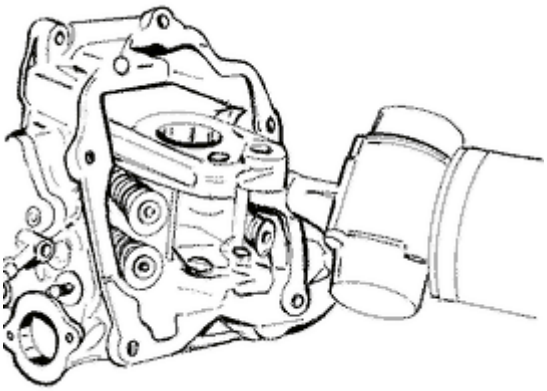
Valve seat wear Exhaust guide

Accepted limit 5.022

Valve seat wear Exhaust guide

Standard diameter: 5.000 ÷ 5.012 mm

Inspecting the valves



- Measure the diameter of the valve stems in the three positions indicated in the diagram.
- Calculate the clearance between valve and valve guide.
- Check that there are no signs of wear on the faying surface with the articulated set screw terminal.
- If no anomalies are found during the above checks, 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. Upon grinding, keep the cylinder head with the valve axes in a horizontal position. This will prevent the lapping compound residues from penetrating between the valve stem and the guide (see figure).

CAUTION

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

N.B.

DO NOT CHANGE THE POSITIONS THE VALVES ARE FITTED IN

Characteristic

Valve check Standard length

Exhaust: 94.4 mm

Valve check Standard length

Inlet: 94.6 mm

Valve check Maximum admissible clearance

Exhaust: 0.072 mm

Valve check Maximum admissible clearance

Inlet: 0.062 mm

Valve check standard clearance

Exhaust: 0.025 ÷ 0.052 mm

Valve check standard clearance

Inlet: 0.013 ÷ 0.040 mm

Valve check Minimum admissible diameter:

Exhaust: 4.95 mm

Valve check Minimum admissible diameter:

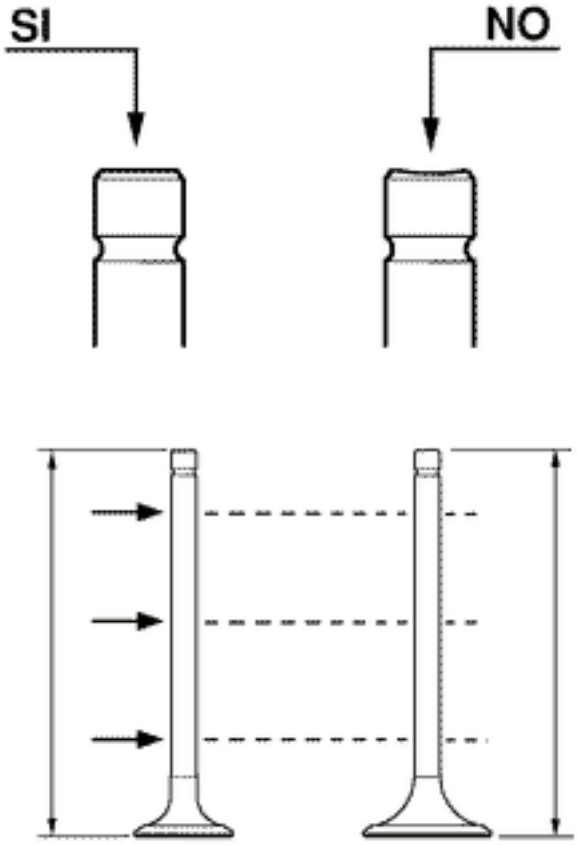
Inlet: 4.96 mm

Valve check Standard diameter:

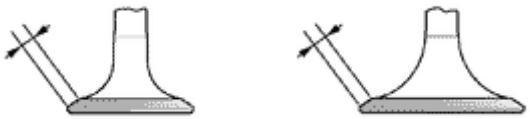
Inlet: 4.972 ÷ 4.987 mm

Valve check Standard diameter:

Exhaust: 4.96 ÷ 4.975 mm



- Measure the diameter of the valve stems in the three positions indicated in the diagram.
- Calculate the clearance between valve and valve guide.
- Check that there are no signs of wear on the faying surface with the articulated set screw terminal.
- If no anomalies are found during the above checks, 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. Upon grinding, keep the cylinder head with the valve axes in a horizontal position. This



will prevent the lapping compound residues from penetrating between the valve stem and the guide (see figure).

CAUTION

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

N.B.

DO NOT CHANGE THE POSITIONS THE VALVES ARE FITTED IN

Characteristic

Valve check Standard length

Exhaust: 94.4 mm

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Inlet: 94.6 mm

Valve check Maximum admissible clearance

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Valve check standard clearance

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Valve check Minimum admissible diameter:

Exhaust: 4.95 mm

Valve check Minimum admissible diameter:

Inlet: 4.96 mm

Valve check Standard diameter:

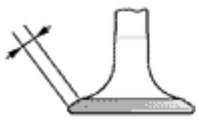
Inlet: 4.972 ÷ 4.987 mm

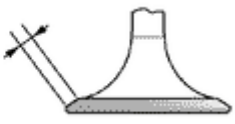
Valve check Standard diameter:

Exhaust: 4.96 ÷ 4.975 mm

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

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





- If any of the sealing surfaces on the valves is wider than the specified limit or is damaged in one

or more points, or curved, replace the valve with a new one.

CAUTION

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

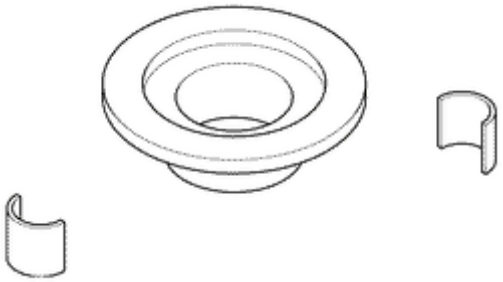
Characteristic

Valve wear check Standard: Intake and discharge:

0.99 - 1.27 mm

Inspecting the springs and half-cones

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



Refitting the valves

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

N.B.

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

Specific tooling

020306Y Punch for assembling valve sealing rings

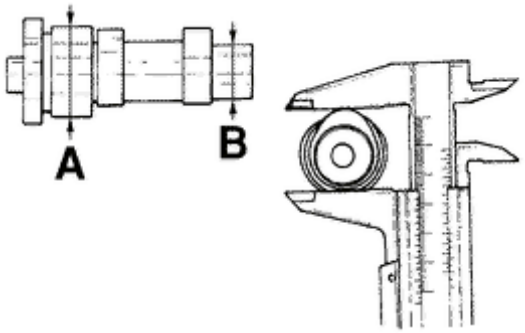
020382Y Valve cotters equipped with part 012 removal tool

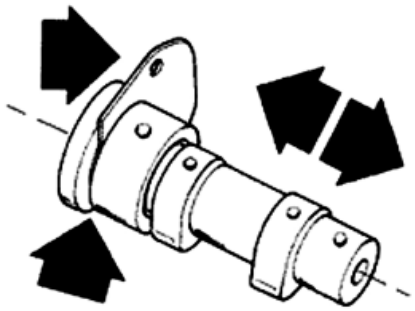
020382Y011 adapter for valve removal tool

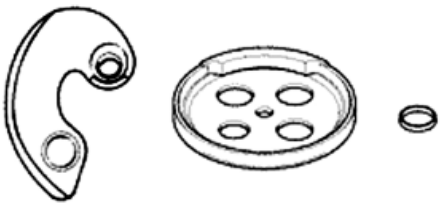
Inspecting the cam shaft

- Inspect the camshaft for signs of abnormal wear on the cams.
- Check the cam height.
- Check there is no wear on the camshaft retaining plate and its associated groove on the camshaft.
- If any of the above dimensions are outside the specified limits, or there are signs of excessive wear, replace the defective components with new ones.
- Check there are no signs of wear on the automatic valve-lifter cam, or the end-of stroke roller, or the rubber buffer on the automatic valve-lifter retaining cover.
- Check that the valve lifting spring has not yielded.
- Replace any defective or worn components.
- Check the rocking lever pins do not show signs of wear or scoring.
- Measure the internal diameter of each rocking lever.

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







Characteristic

Rocking lever inside diameter: Standard diameter

Diameter 12.000 - 12.011 mm

Rocking lever pin diameter: Standard diameter

Diameter 11.977 - 11.985 mm

Camshaft check: Maximum admissible axial clearance

0.42 mm

Camshaft check: Standard axial clearance:

0.11 - 0.41 mm

Camshaft check: Standard height

Exhaust: 29.209 mm

Camshaft check: Standard height

Inlet: 30.285 mm

Camshaft check: Minimum admissible diameter

Bearing B diameter: 19.950 mm

Camshaft check: Minimum admissible diameter

Bearing A Ø: 36.94 mm

Camshaft check: Standard diameter

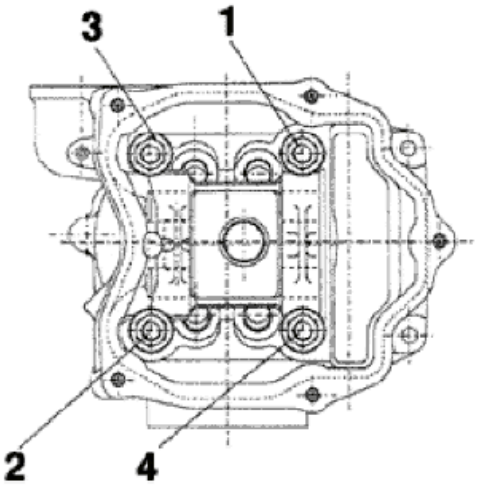
Bearing B diameter: 19.959 ÷ 19.98 mm

Camshaft check: Standard diameter

Bearing A Ø: 36.95 ÷ 36.975 mm

Refitting the head and timing system components

- Fit the timing chain guide pad.
- Insert the centring dowel between the cylinder head to the cylinder, fit the cylinder head gasket and the cylinder head.
- Lubricate the stud bolt threading.
- Tighten up the nuts to a pre-torque of 7±1 N·m
- Rotate by a 180° angle (2 rotations of 90° each)
- To carry out the operations described above, follow the tightening sequence in the figure.
- Fit the two screws on the outside of the timing chain side and tighten them to the specified torque.

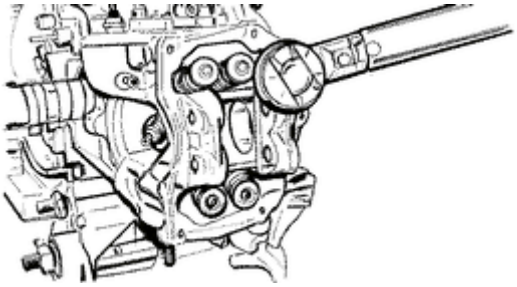


N.B.

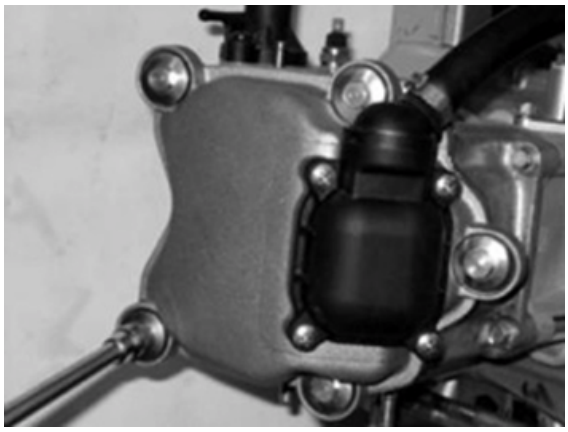
BEFORE INSTALLING THE HEAD, MAKE SURE THAT THE LUBRICATION CHANNEL IS CLEAN USING A COMPRESSED AIR JET.

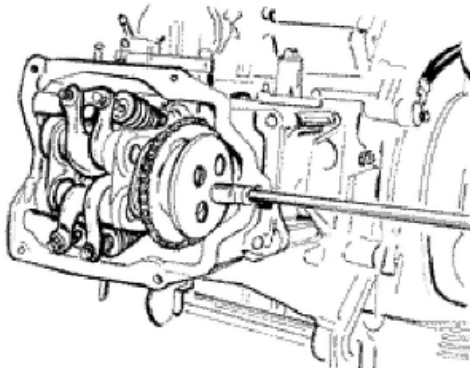
Locking torques (N*m)

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



- Refit the lower timing chain sprocket wheel on the crankshaft, with the chamfer facing the insertion side.
- Loop the timing chain around the sprocket on the crankshaft.
- Fit the chain tensioner slider from the cylinder head side.
- Fit the spacer and the screw fastener.
- Tighten the screws to the prescribed torque.
- Fit the pins and rocking levers.
- Lubricate the two rocking levers through the holes at the top.
- Lubricate the 2 bearings and insert the camshaft in the cylinder head with the cams corresponding to the rocking levers.
- Insert the retention plate and tighten the two screws shown in the figure to the prescribed torque.
- Refit the spacer on the camshaft.
- Rotate the engine so that the piston is at top dead centre, using the reference marks on the flywheel and the crankcase.
- Holding this position insert the chain on the camshaft control pulley.
- Insert the pulley on the camshaft while keeping the reference **4V** in correspondence with the reference mark on the head.
- Fit the counterweight and tighten the clamping screw to the prescribed torque.
-Fit the end-stop ring on the automatic valve-lifter cam and fit the automatic valve-lifter cam to the camshaft.
- Fit the automatic valve-lifter return spring.
- During this operation the spring must be loaded by approximately 180°.
- Fit the automatic valve-lifter retaining dish, using the counterweight screw fastener as a reference.





- Tighten the clamping screw to the prescribed torque.
- Set the tensioner cursor in the rest position.
- Fit the chain tensioner on the cylinder, using a new gasket, and tight the two screws to the prescribed torque.
- Insert the chain tensioning screw, together with the spring and washer, tightening it to the prescribed torque.
- Adjust the valve clearance.
- Fit the spark plug.

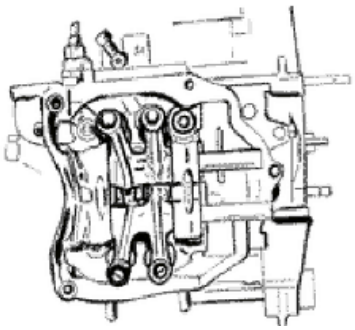
Electrode distance 0.8 mm

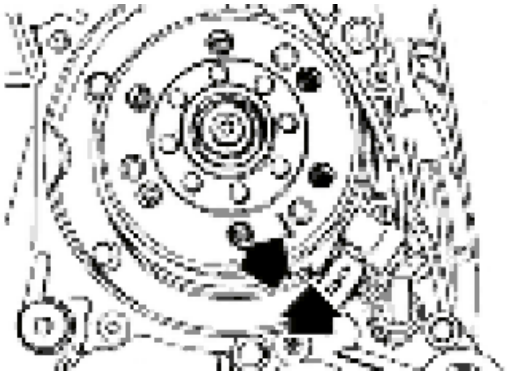
N.B.

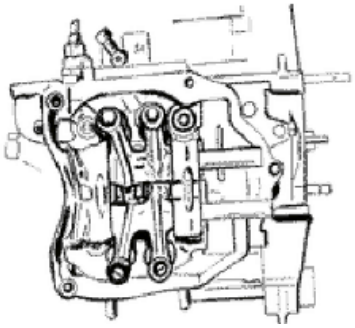
GREASE THE END STOP RING TO PREVENT IT COMING OUT AND FALLING INTO THE ENGINE.

Locking torques (N*m)

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





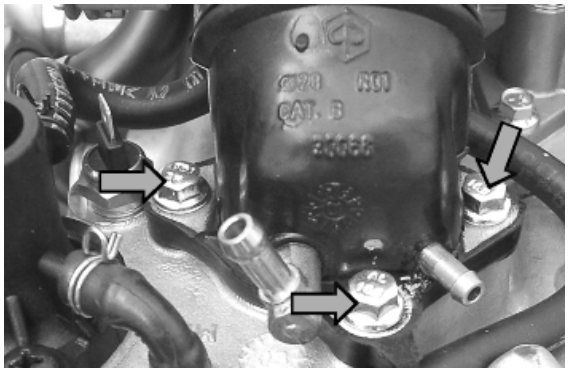


Refitting the intake manifold

Fit the intake manifold and do up the three screws.

N.B.

USE COMMERCIALLY AVAILABLE INSERTS AND INSERT HOLDERS FOR THE SPECIAL SCREWS FOR 125 CM³ MODELS.



Crankcase - crankshaft

Splitting the crankcase halves

First remove the following units:

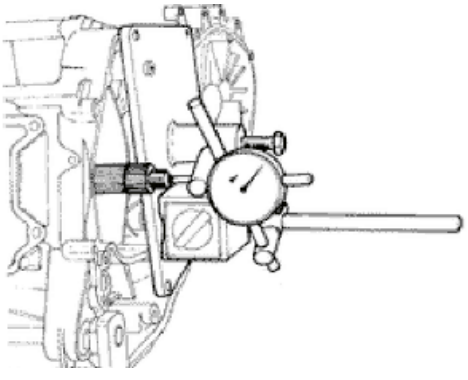
transmission cover, driving pulley, driven pulley and belt, rear hub cover, gears, bearings and oil seals as described in the **transmission** chapter.

- Remove the oil sump, the by-pass, the chain compartment cover and the oil pump as in the **lubrication** chapter.
- Remove the flywheel cover together with the water pump, the flywheel and the stator as described in the **magneto flywheel** chapter.
- Remove the oil filter and the oil pressure switch.
- Remove the cylinder/piston/head unit as described in the **cylinder head timing system** chapter.
- Remove the two retainers indicated in the figure and the starter motor.

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

Higher clearances are signs of wear on the supporting surfaces of the crankshaft casing.

Standard clearance: 0.15 ÷ 0.40 mm



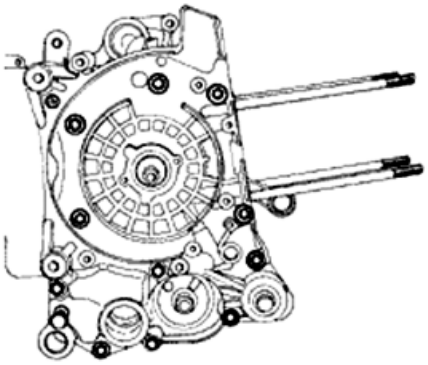
Remove the 11 coupling screws to the crankcase.

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

Remove the crankshaft.

CAUTION

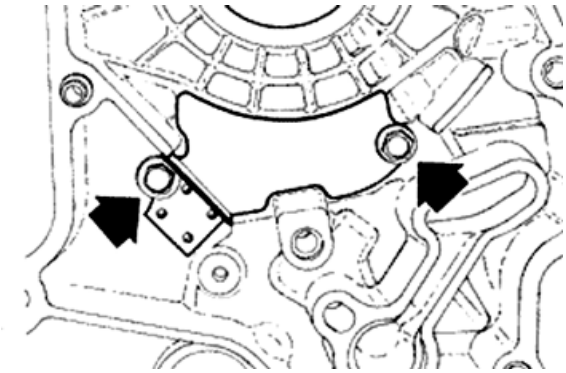
KEEP THE CRANKSHAFT IN ONE OF THE TWO HALVES OF THE CRANKCASE WHEN SEPARATING IT. IF YOU FAIL TO DO THIS, THE CRANKSHAFT MIGHT ACCIDENTALLY FALL.



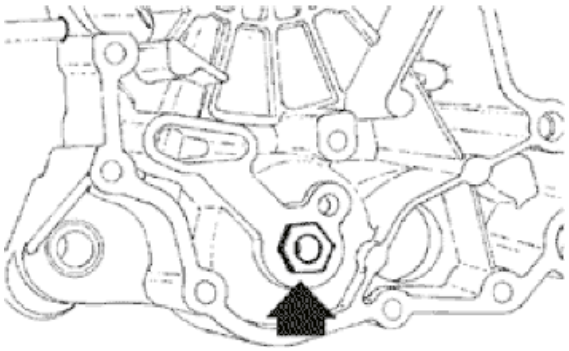
- Remove the coupling gasket of the crankcase halves.
- Remove the two screws and the internal cover shown in the diagram.

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.

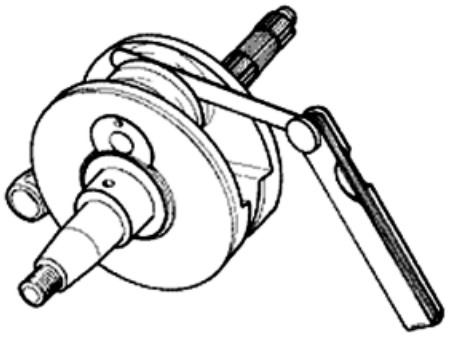


- Remove the oil guard on the flywheel side.
- Remove the oil filter fitting shown in the diagram



Fitting clearance

Connecting rod axial clearance **0.20 - 0.50**



Check the radial clearance on the connecting rod.

Standard clearance: 0.036 ÷ 0.054 mm

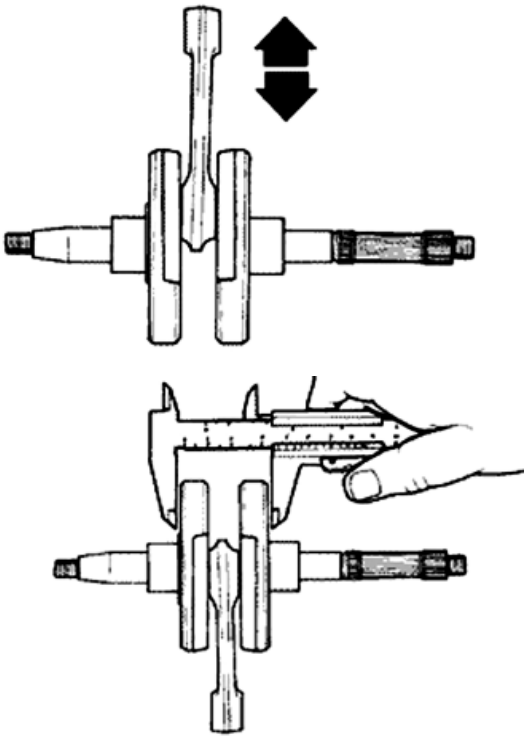
-Check the surfaces that limit the axial free-play are not scored and measure the width of the crankshaft between these surfaces, as shown in the diagram.

Standard dimensions:

55.75 ÷ 55.90 mm

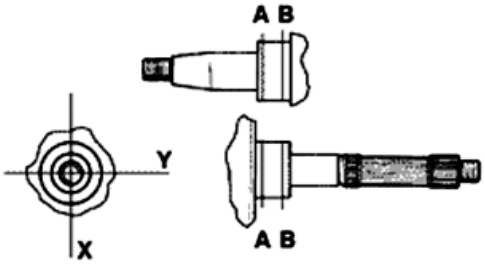
N.B.

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



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

Check the diameters of both bearings of the crankshaft according to 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.



Characteristic

Standard diameter - Category 2

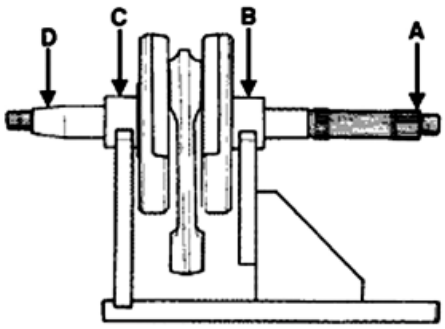
29.004 ÷ 29.010

Standard diameter - Category 1

28.994 ÷ 29.000

The crankshaft can be reused when the width is within the standard values and the surfaces show no signs of scoring.

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

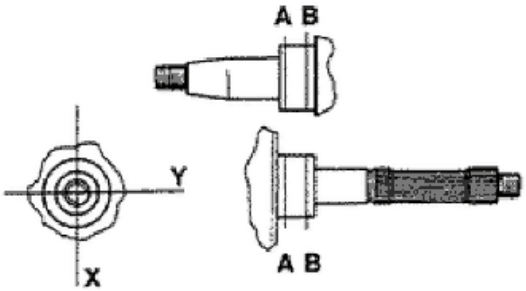
Measure the capacity of both axes X-Y

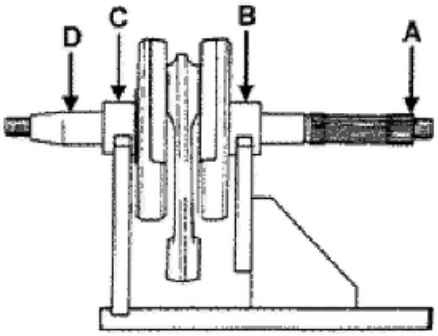
Specific tooling

020074Y Support base for checking crankshaft alignment

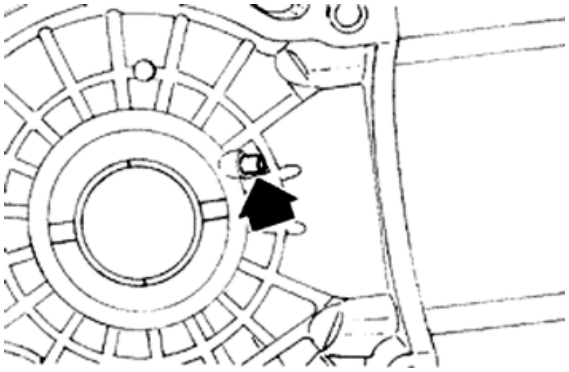
CRANKSHAFT ALIGNMENT

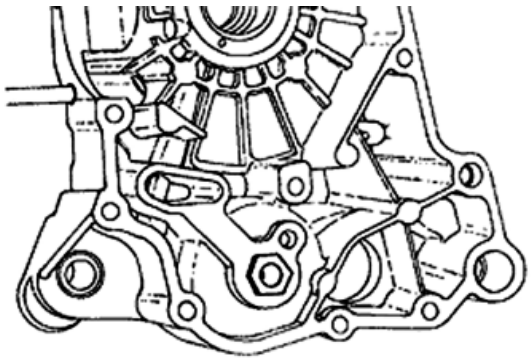
Titolo	Durata/Valore	Testo Breve (< 4000 car.)	Indirizzo Immagine
Crankshaft alignment			





Inspecting the crankcase halves



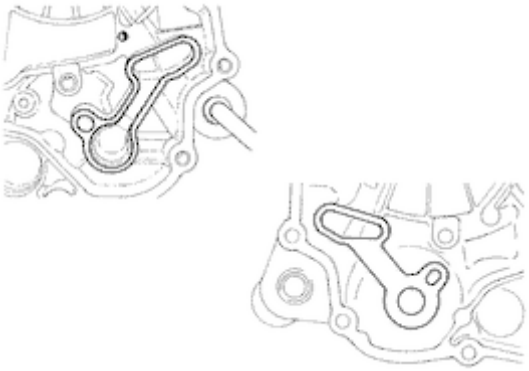


- Before proceeding to check the crankcase halves, thoroughly clean all surfaces and oil ducts.
- On the transmission-side crankcase half, take particular care when handling the oil pump compartment and the oil ducts, the by-pass duct, the main bushings and the cooling jet on the transmission side (see diagram).
- Take particular care, also, that there are no signs wear in the oil by-pass valve housing (see Chapter Lubrication), as this could prevent a good seal in the valve, which regulates the oil pressure.
- On the flywheel side crankcase half, take particular care cleaning the oil ducts for the main bushings, the oil duct for the jet that lubricates the cylinder head and the oil drainage duct at the flywheel side oil seal.
- Inspect the coupling surfaces on the crankcase halves for scratches or deformation, taking partic-

ular care with the cylinder/crankcase surfaces and the crankcase halves surfaces.

- Defects in the crankcase coupling gasket between the crankcase halves or the mating surfaces shown in the diagram, could cause a drop in the oil pressure lubricating the main bearings and connection rod.

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



N.B.

THE JET IS FED THROUGH THE MAIN BUSHINGS. PROPER OPERATION OF THIS COMPONENT IMPROVES PISTON CROWN COOLING. CLOGGING HAS EFFECTS THAT ARE DIFFICULT TO DETECT (PISTON TEMPERATURE INCREASE). FAILURE OR LEAKS CAN CAUSE A CONSIDERABLE DROP IN THE LUBRICATION PRESSURE FOR MAIN BUSHINGS AND CONNECTING ROD .

N.B.

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

Inspecting the crankshaft plain bearings

Refitting the crankcase halves

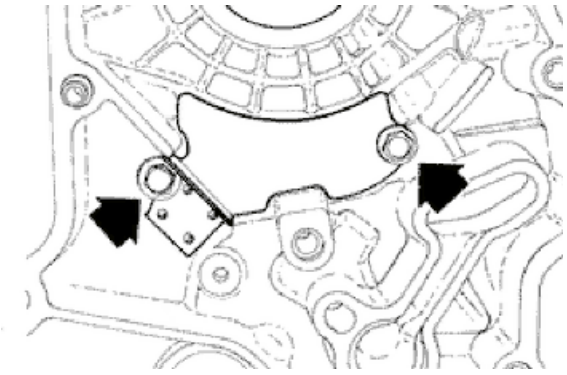
- Fit the internal bulkhead by locking the two screws to the prescribed torque.

- Fit the oil filter fitting and tighten it to the specified torque.

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

- Lubricate the main bushings and insert the crankshaft in the transmission side crankcase half.

- Reassemble the two crankcase halves.



For the 200 models reposition the shim washers as in the original fitting.

- Fit the 11 screws and tighten them to the prescribed torque.
- Lubricate the flywheel oil seal.
- Using the appropriate tool, assemble the oil seal.
- Fit a new O-ring on the pre-filter and lubricate it.
- Insert the filter on the engine with the relative cap. Tighten to the specified torque.

N.B.

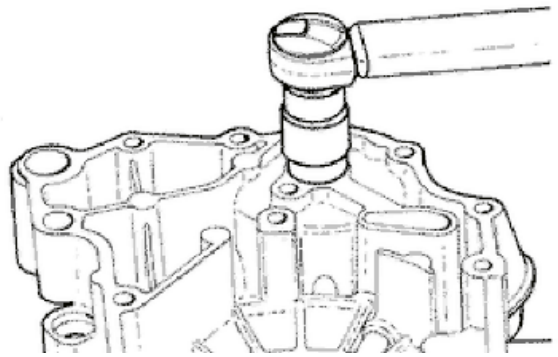
FAILURE TO USE THE SPECIFIC TOOL CAN RESULT IN AN INCORRECT DEPTH POSITION AND AS A CONSEQUENCE IN INADEQUATE OIL SEALING.

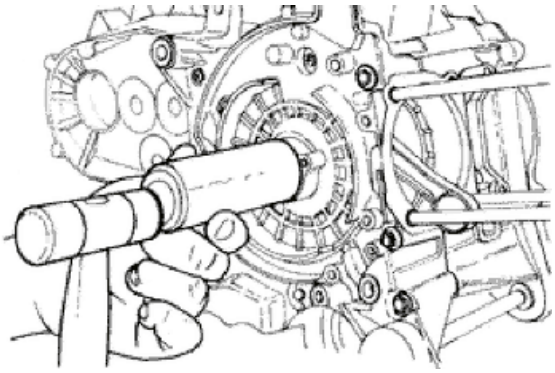
Specific tooling

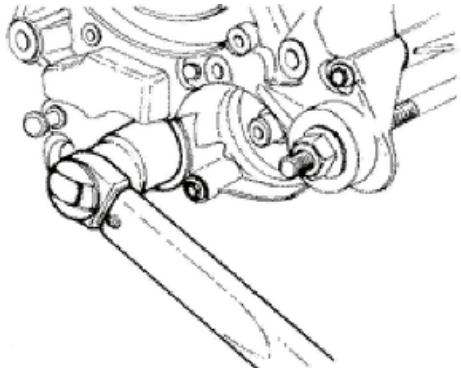
020425Y Punch for flywheel-side oil seal

Locking torques (N*m)

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



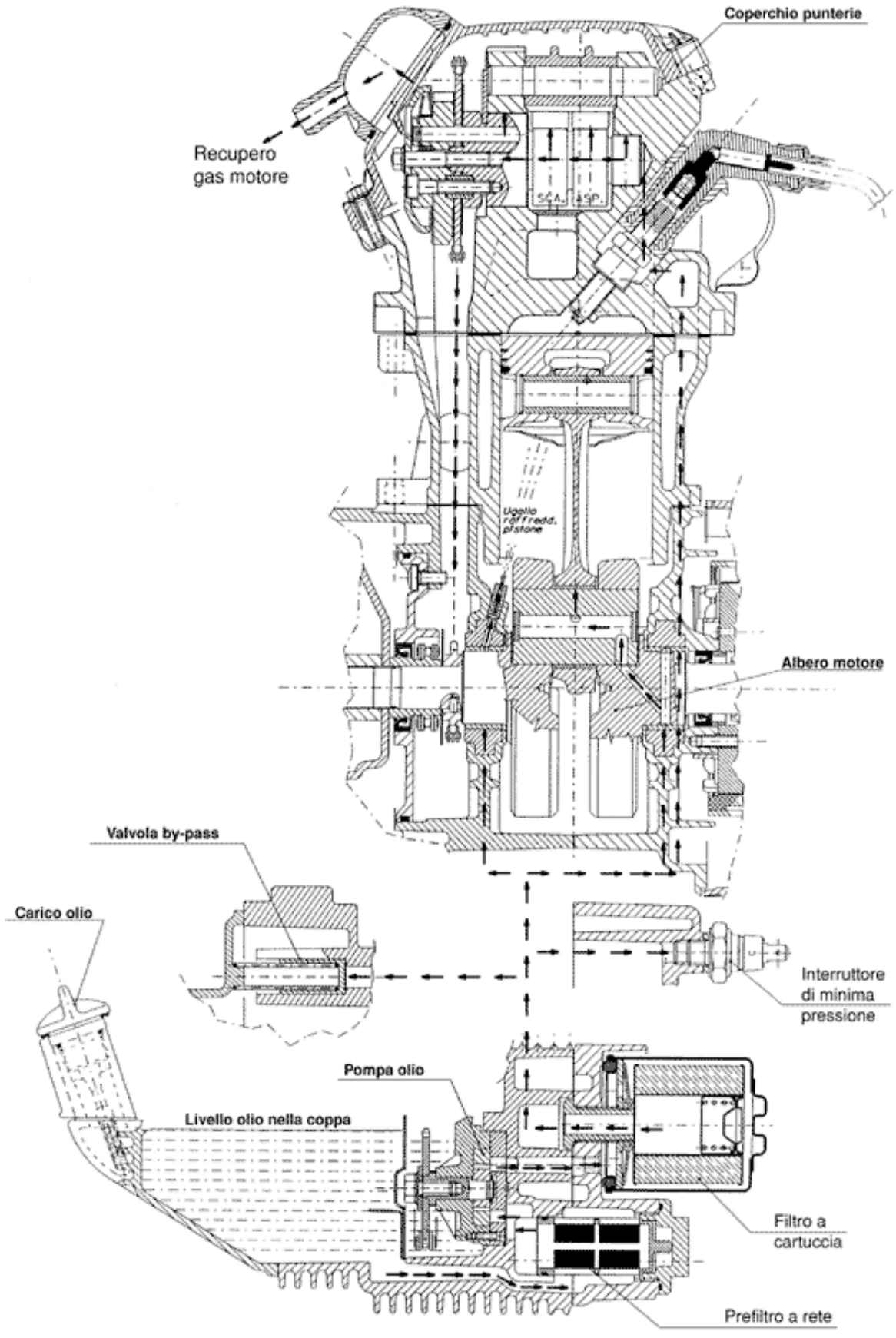




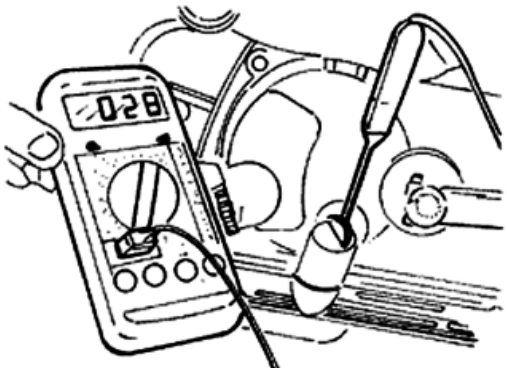
Lubrication

Conceptual diagrams

LUBRICATION CIRCUIT


Coperchio punterie
Recupero
gas motore
Albero motore
Valvola by-pass
Carico olio
Interruttore
di minima
pressione
Pompa olio
Livello olio nella coppa
Filtro a
cartuccia
Prefiltro a rete

Oil pressure check



- After removing the flywheel cover as described in the "Flywheel" chapter, remove the electric connexion of the minimum oil pressure switch and then remove the switch.
- With the engine idling at 1650 rpm and the oil temperature at ~90°C, check that the oil pressure is between 0.5 ÷ 1.2 atm.
- With the engine idling at 6000 rpm and the oil temperature at ~90°C, check that the oil pressure is between 3.2 ÷ 4.2 atm.
- Remove the appropriate tools once the measurement is complete, refit the oil pressure switch and washer, tightening it to the specified torque and fit the fan cover.
- If the oil pressure is not within 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 PROPER CONDITION.

Characteristic

Oil pressure

Minimum pressure admitted at 6000 rpm: 3.2 atm.

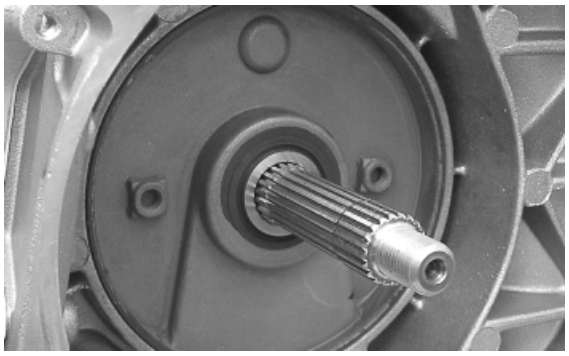
Locking torques (N*m)

Minimum oil pressure sensor **12 ÷ 14**

Crankshaft oil seals

Removal

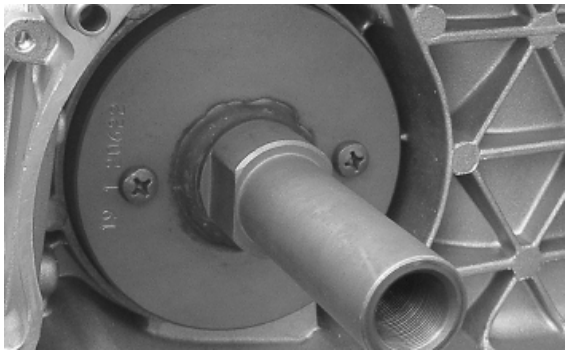
- Remove the transmission cover and the complete drive pulley beforehand



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

Specific tooling

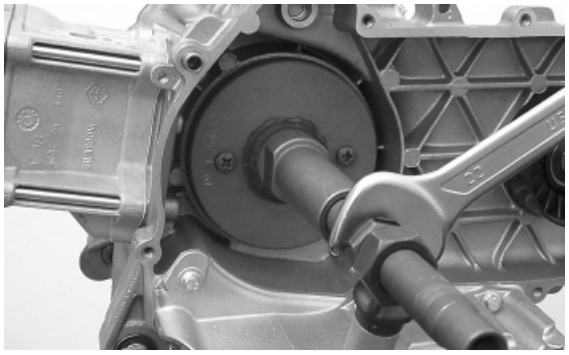
020622Y Transmission-side oil guard punch



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

Specific tooling

020622Y Transmission-side oil guard punch



Refitting

- Use a new oil seal upon refitting.
- Prepare the new oil seal, lubricating the sealing lip.
- Preassemble the oil seal with the specific tool, positioning the screws.
- Place the sheath over the crankshaft.
- Insert the tool with the oil seal on the crankshaft until it comes into contact with the crankcase.

- Orientate the oil seal by inserting the bracket which is part of the specific tool.
- Tighten the threaded bar onto the crankshaft as far as it will go.
- Use the nut to move the base of the tool until you can feel the end of the oil seal driving stroke.
- Remove all of the tool components following the inverse procedure

CAUTION

DO NOT LUBRICATE THE KEYING SURFACE ONTO THE ENGINE CRANKCASE.

CAUTION

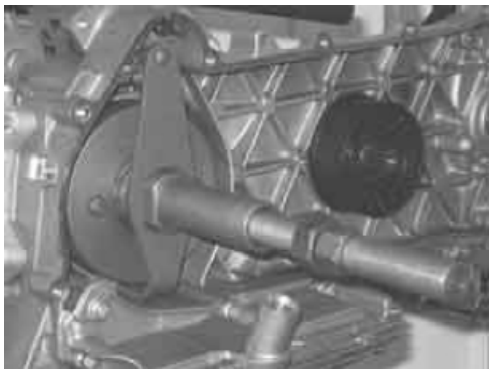
ORIENT THE OIL GUARD BY POSITIONING THE CHAIN HOUSING CHANNEL FACING DOWNWARDS. WHEN THE POSITION IS REACHED, DO NOT RETRACT THE OIL GUARD. FAILURE TO COMPLY WITH THIS RULE CAN CAUSE A WRONG POSITIONING OF THE OIL GUARD SHEATH.

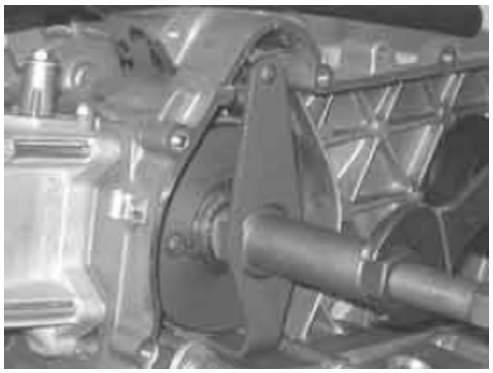
CAUTION

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

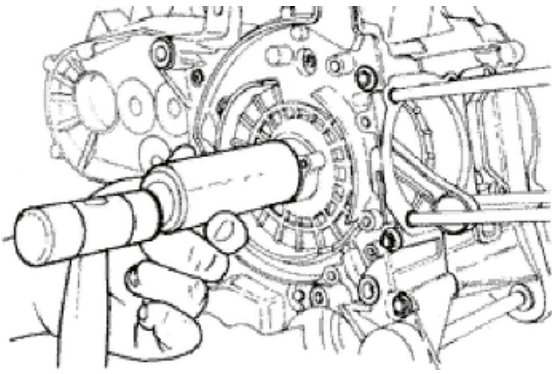
Specific tooling

020622Y Transmission-side oil guard punch





For 125 models, fit 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.

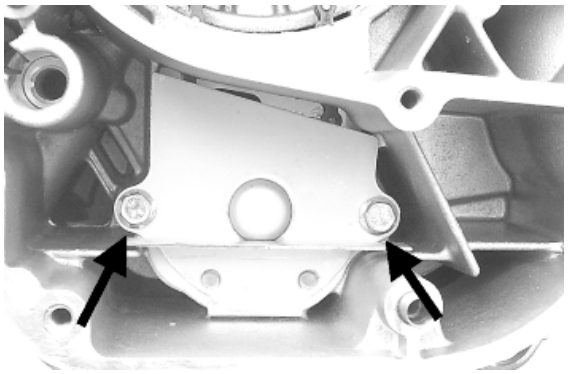
Specific tooling

020425Y Punch for flywheel-side oil seal

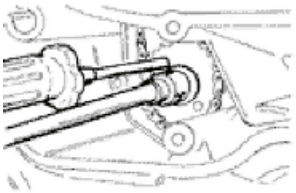
Oil pump

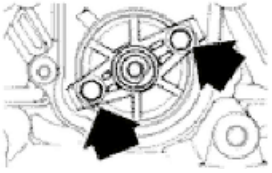
Removal

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



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





- Remove the oil pump by undoing the two screws in the figure.
- Remove the oil pump seal.

N.B.

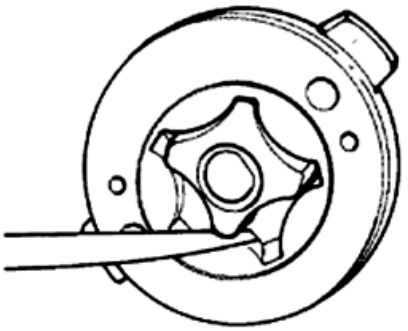
IT IS ADVISABLE TO MARK THE CHAIN IN ORDER TO ENSURE THAT THE INITIAL DIRECTION OF ROTATION IS MAINTAINED.

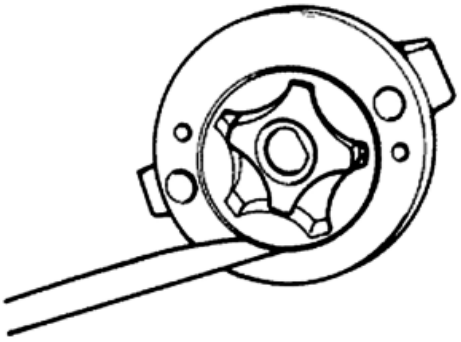
Inspection

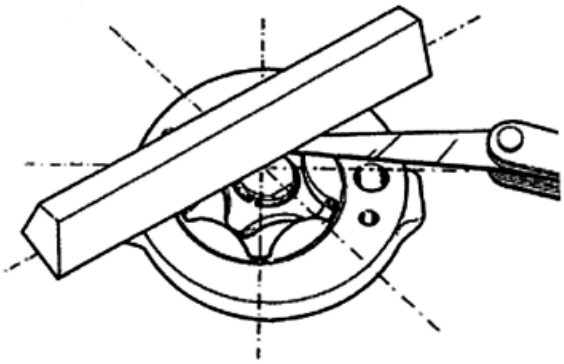
- Remove the two screws and the oil pump cover.
- Remove the clip retaining the innermost rotor.
- Remove and wash the rotors thoroughly with petrol and compressed air.
- Reassemble the rotors in the pump body, keeping the two reference marks visible Replace the snap ring.
- Check the clearance between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

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

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







Characteristic

Axial rotor clearance

Limit values admitted: 0.09 mm

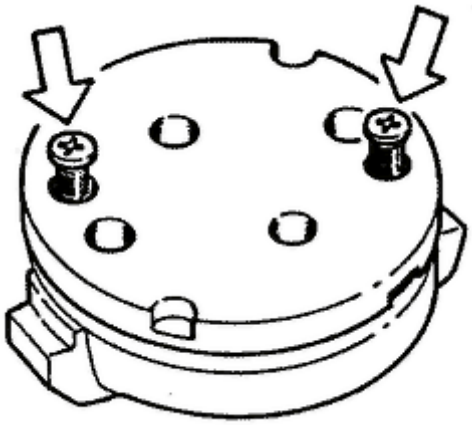
Distance between the outer rotor and the pump body

Admissible limit clearance: 0.20 mm

Distance between the rotors

Admissible limit clearance: 0.12 mm

Refitting



- Check there are no signs of wear on the oil pump shaft or body.
- Check there are no signs of scoring or wear on the oil pump cover.
- If you detect non-conforming measurements or scoring, replace the faulty parts or the unit.
- Fit the pump cover in the position that permits the crankcase clamping screws to be aligned.
- Make sure the gasket is positioned properly and refit the pump on the engine crankcase. The pump can only be fitted in one position. - Tighten the screws to the prescribed torque.
- Fit the sprocket wheel with a new O-ring.
- Fit the chain.
- Fit the central screw and the belleville washer. Tighten to the prescribed torque.
-Fit the oil pump cover, by tightening the two screws to the prescribed torque.

N.B.

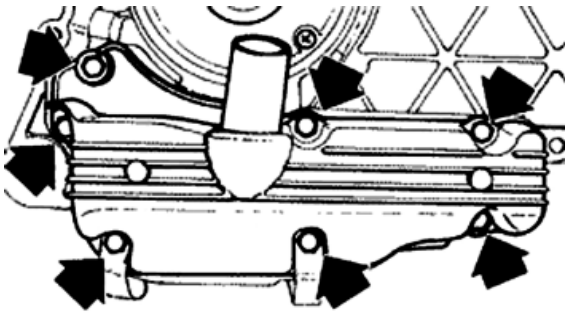
FIT THE BELLEVILLE WASHER SO THAT ITS OUTER RIM TOUCHES THE PULLEY. MAKE SURE THAT THE PUMP TURNS FREELY.

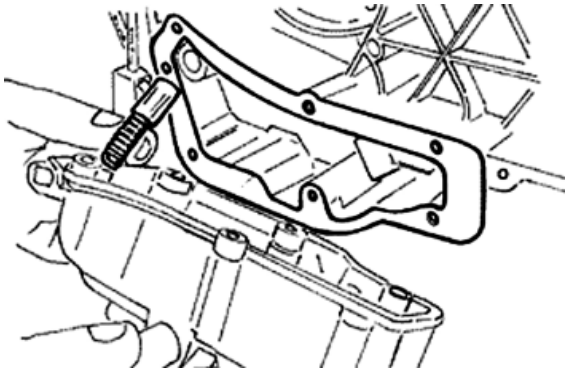
Locking torques (N*m)

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

Removing the oil sump

- Remove the oil filler plug, the transmission cover, the complete driving pulley assembly with belt and the sprocket wheel, as described in the "Transmission" chapter.
- Drain the oil as described above.
- Remove the 7 screws, shown in the diagram, and the 2 rear brake fluid pipe fixing brackets.
- Remove the screw, the by-pass piston, the gasket and the centring dowels shown in the figure.





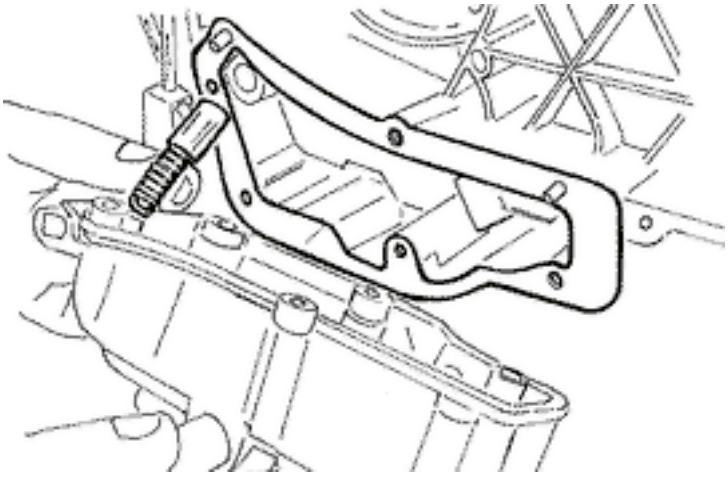
Inspecting the by-pass valve

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

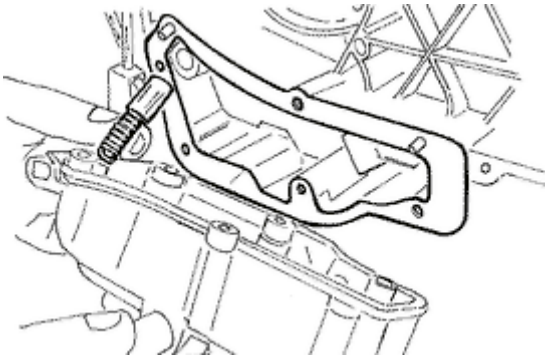
Characteristic

By-pass check up: Standard length

54.2 mm



Refitting the oil sump



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

Locking torques (N*m)

Oil sump screws **10 ÷ 14**

SAS valve

Inspecting the one-way valve

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

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

If anomalies are detected, replace the pump.

N.B.

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

N.B.

ABSENCE OF VIBRATION INDICATES INEFFICIENT SEALING

Specific tooling

020329Y MityVac vacuum-operated pump

Inspecting the cut-off

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

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

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

N.B.

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

N.B.

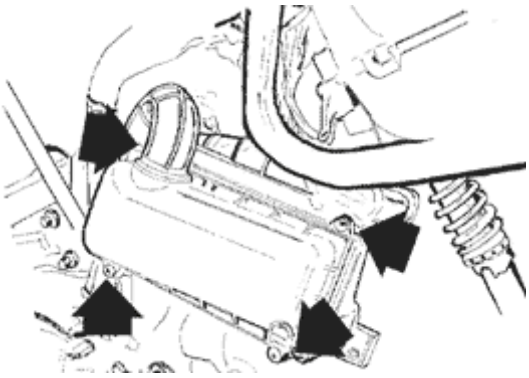
A FAULTY CUT-OFF VALVE DIAPHRAGM, BESIDES JEOPARDISING THE CORRECT OPERATION OF THE CUT-OFF VALVE, ALSO DAMAGES IDLE FUNCTIONING

Specific tooling

020329Y MityVac vacuum-operated pump

Fuel supply

- To clean the filtering element proceed as follows: remove the 4 filter cover fixing screws indicated in the figure; remove the cover and take out the paper filtering element, clean with compressed air and refit.
- Make sure the filtering element is in the correct position.
- Check that the air passage sections are not damaged or deformed.
- Check the correct sealing of the coupling between the filter housing and the cover.



N.B.

FAILURE TO OBSERVE THESE INSTRUCTIONS MAY RESULT IN WRONG VACUUM INSIDE THE FILTER HOUSING, WHICH IN TURN MAY PRODUCE VARIATIONS IN CARBURETION.

Removing the carburettor

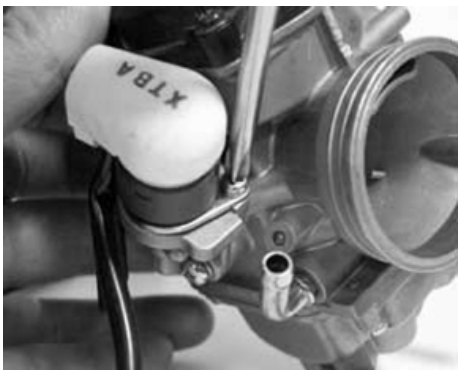
Kehin

- To detach the carburettor from the engine, it is necessary to move the air filter and remove the transmission throttle control, the automatic starter connection, the clamps anchoring the carburettor to the filter housing and to the inlet manifold, the air delivery pipe to the diaphragm, and the intake fitting.
- Take out the carburettor and rotate it so as to remove the screw with the water joint and the pipes.

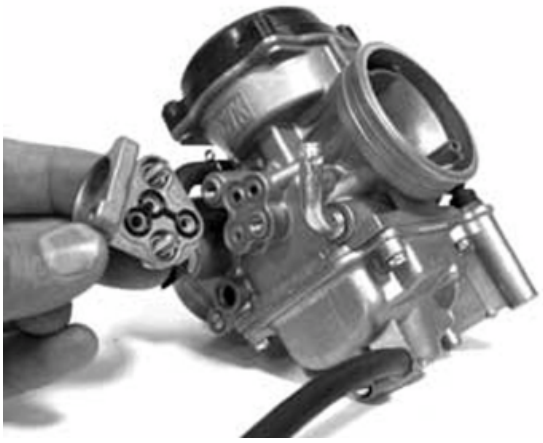
N.B.

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

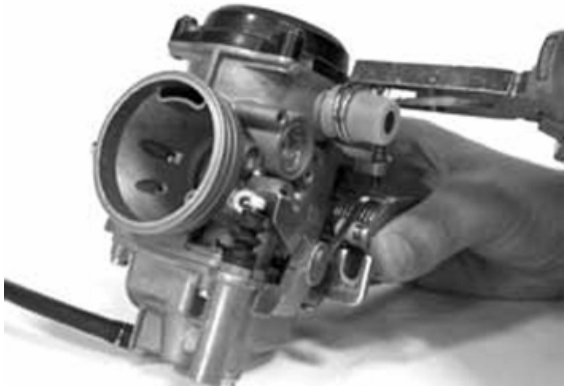
- Remove the protection, the bracket and the starter acting on the screw shown in the figure.



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



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



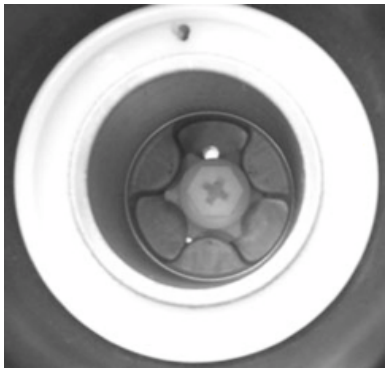
- Remove the 4 fixing screws shown in the figure and the vacuum chamber cover.

WARNING

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

- Remove the vacuum valve together with the diaphragm.

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



- Remove the 4 screws indicated in the figure.

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

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

N.B.

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

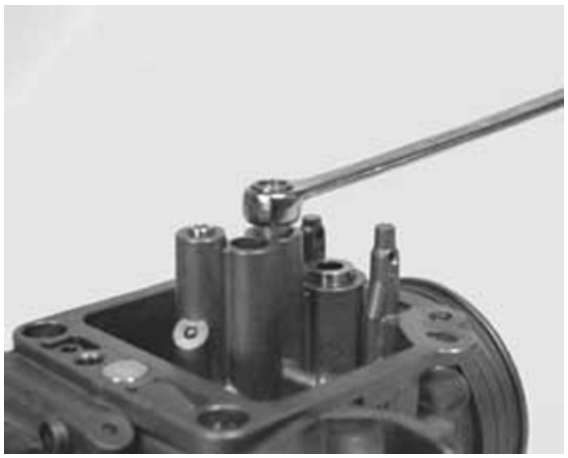
N.B.

AVOID REMOVING THE PISTON OF THE PUMP AND ITS CONTROL.

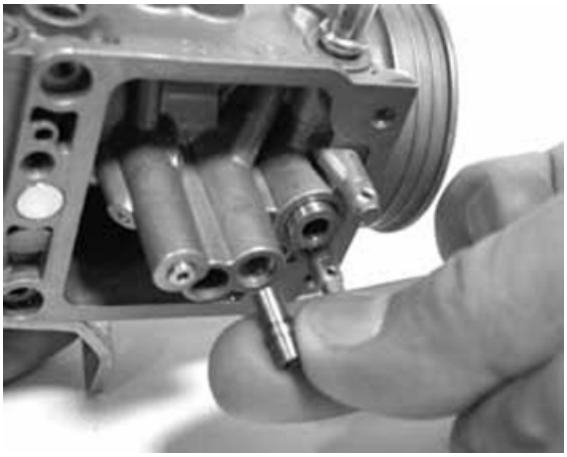
Adequately support the carburettor and using a rod and hammer remove the float pin acting from the throttle control side.

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

-Remove the maximum nozzle.



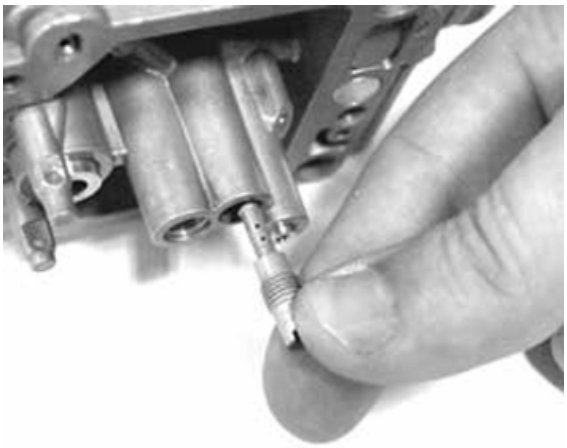
-Remove diffuser.



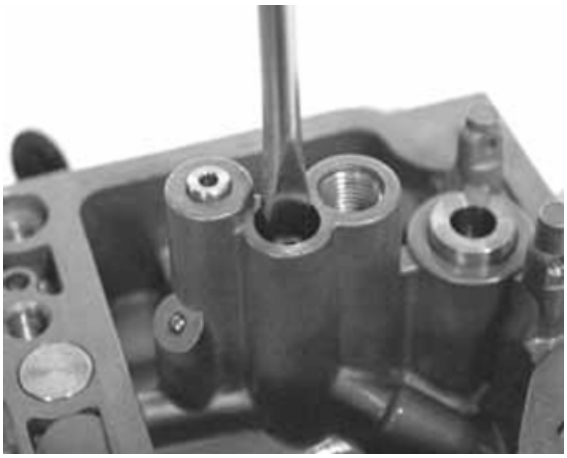
- Remove the sprayer.

N.B.

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



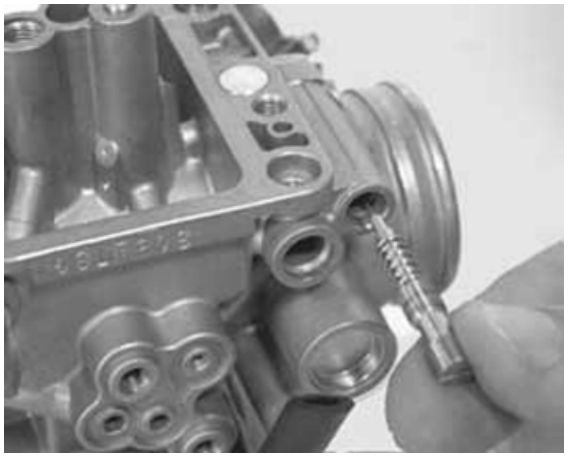
-Remove the minimum nozzle.



- Remove the minimum flow set screw and the spring.

CAUTION

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

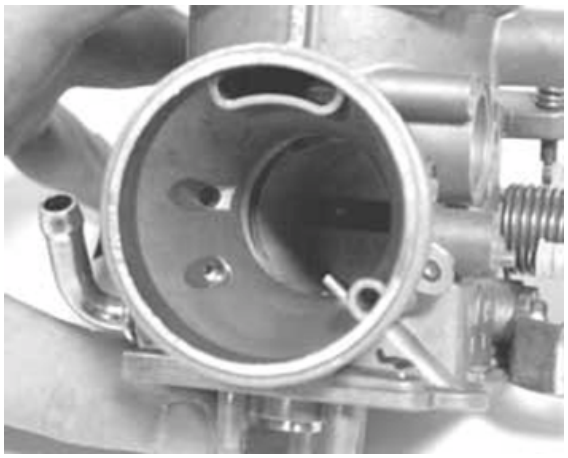


Refitting the carburettor

Kehin

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

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



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

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

- Blow the intake nozzle properly.

N.B.

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

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

- Check that the coupling surfaces, the tank and the diaphragm are not dented.

-Check that the depression valve housing pipe is not scratched.

- Check that the throttle valve and the shaft do not show abnormal wear.

- Check that the plunger seat does not show abnormal wear.

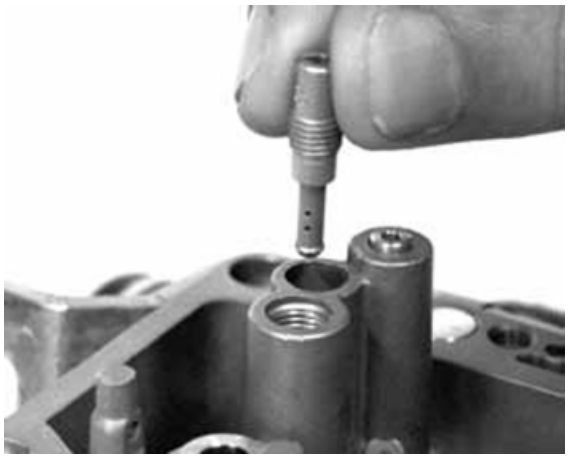
- Replace the carburettor in case of irregularities.

- Check that the return spring of the accelerating pump rocking lever is not deformed by over-stretching.

N.B.

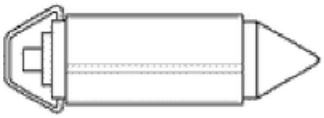
TO AVOID DAMAGES, DO NOT INTRODUCE METAL OBJECTS IN THE ADJUSTED SECTIONS.

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



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

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



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

N.B.

INTRODUCE THE RETURN SPRING ON THE FLOAT PLATE ADEQUATELY

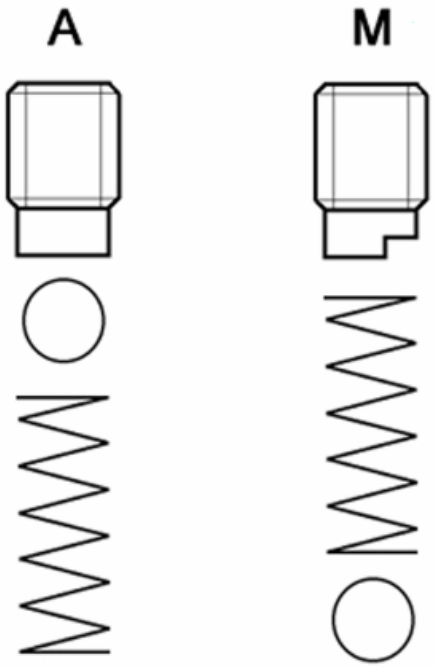
- Remove the drainage screw from the tank, wash and blow it properly and make sure the acceleration pump pipes are clean.
- Operate the acceleration pump piston repeatedly and blow with compressed air.
- Reassemble the acceleration pump valves following this order:

INTAKE VALVE (A)

- Spring
- Ball
- Nozzle

IN VALVE (M)

- Ball
- Spring
- Nozzle

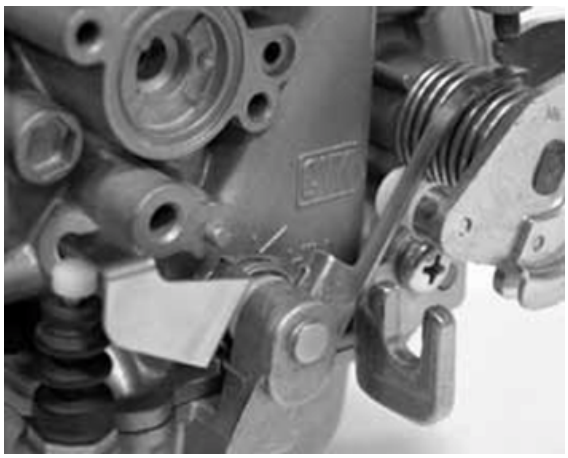


N.B.

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

-Check the screw tightness introducing a small amount of fuel in the tank.

- Assemble a new gasket on the tank.
- Assemble the tank on the carburettor body fastening the 4 screws.
- Check that the control roller is free to rotate in its own seat.



N.B.

MAKE SURE THE TANK GASKET IS CORRECTLY INTRODUCED

N.B.

AVOID DEFORMING THE ACCELERATION PUMP CONTROL ROCKING LEVER.

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

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

Inspecting the valve and needle

Kehin

- Check that the tapered pin of the vacuum valve does not show wear.
- Check that the depression valve does not show threads on the external surfaces.
- Check that the vacuum intake hole is not clogged.
- Check that the diaphragm is not damaged or has hardened, otherwise replacement the whole valve.
- Insert the tapered pin into the vacuum valve housing.
- Reassemble the vacuum valve on the carburettor body taking care that the tapered pin is inserted into the sprayer.
- 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 to the prescribed torque
- Wash and blow dry the filter sponge of the ambient pressure intake.
- Reassemble the filter with its clamp.
- Wash and blow dry the starter support.

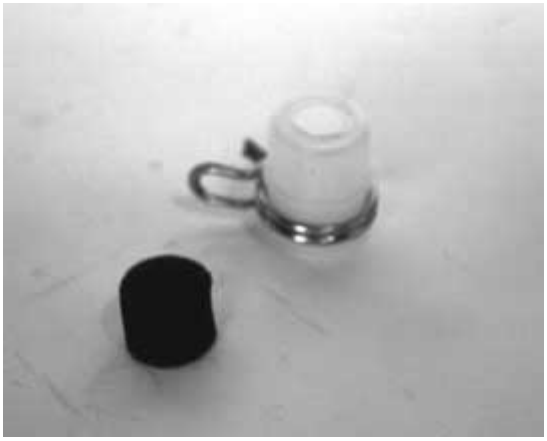
Assemble a new gasket on the carburettor body and tighten the 2 fixing screws.

N.B.

THE VALVE CAN BE INSERTED IN ONLY ONE POSSIBLE POSITION.

Locking torques (N*m)

Vacuum chamber cover screws: XX Nm



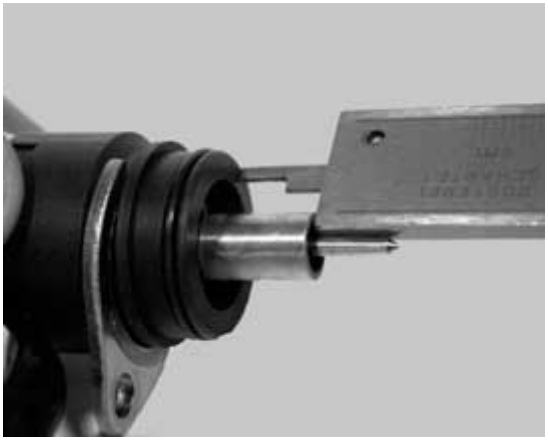
Inspecting the automatic choke device

Kehin

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

Protrusion value

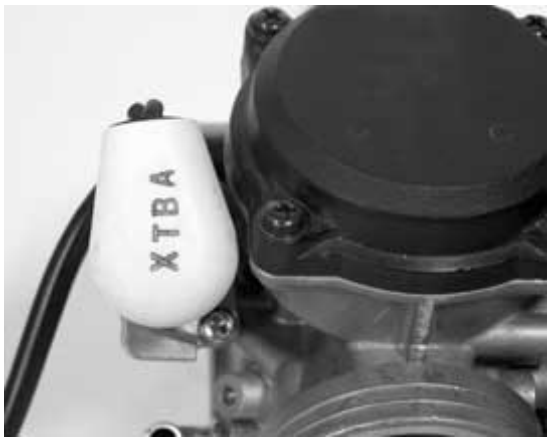
10 mm at about 24°

Starter resistance

20 Ω

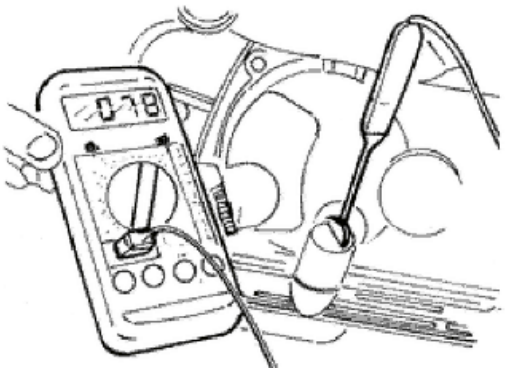
Check the automatic starter: Keihin maximum time

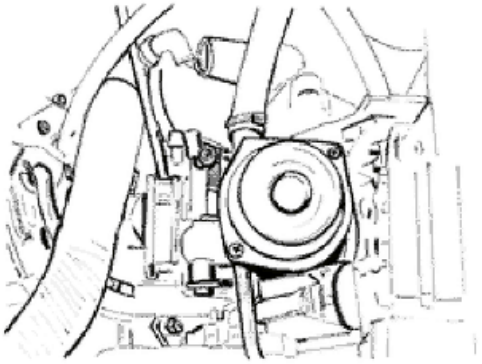
5 min



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

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

Front

Removing the front wheel

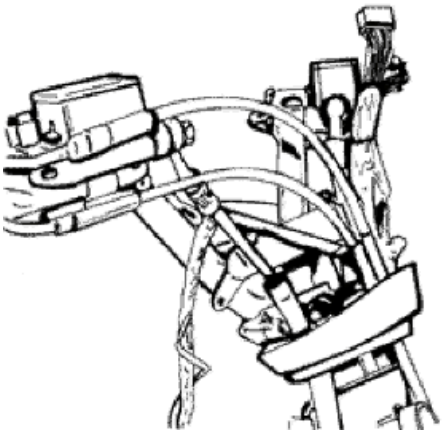
Remove the two callipers according to what is described in the "Braking system" chapter.

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

Handlebar

Removal

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



N.B.

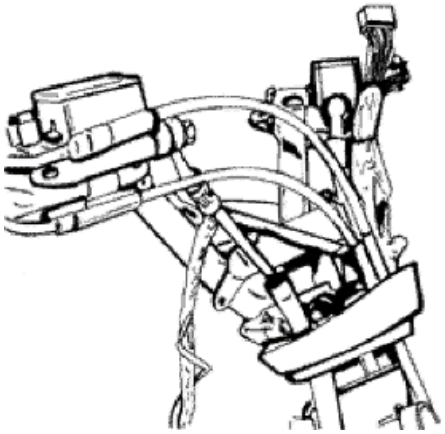
IF THE HANDLEBAR IS BEING REMOVED TO REMOVE THE STEERING, IT IS ONLY NECESSARY TO TILT THE HANDLEBAR FORWARD ONTO THE FRONT PART OF THE VEHICLE WITHOUT REMOVING THE PARTS FITTED SO AS TO AVOID DAMAGING THE SHAFTS.

Refitting

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

Locking torques (N*m)

Handlebar fixing screw (*) 43 ÷ 47

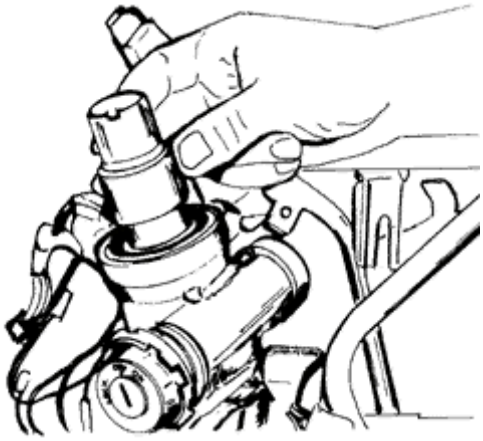


Removal

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

Specific tooling

020055Y Wrench for steering tube ring nut



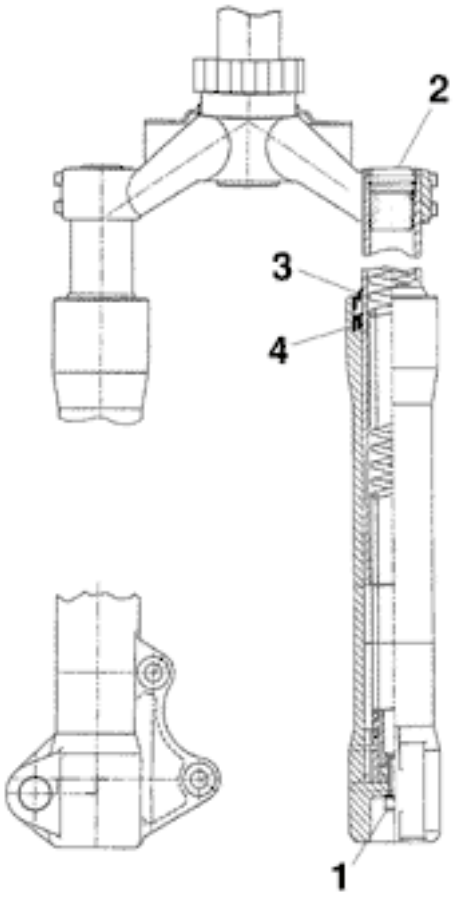
Overhaul

- Remove the lower screw (1);
- Drain oil from suspension;
- Slide off the stem;
- Replace the sealing rings (3-4) with new ones;
- Fit the new sealing rings only after lubricating their seats;
- Refit the stem and the lower screw (1);
- Unscrew the cap (2);
- Pour 133±2.5 cm³ of Selenia Fork 10W oil per stem on the KAYABA fork, recognisable by the mark stamped on the sleeves inner side (wheel side)
- Pour 145 cm³ of Selenia Fork 10W oil per stem on the MVP fork, recognisable by the label with the "**S**" on the sleeve external side near the wheel axle.
- Refit all parts following the removal steps but in reverse order.

Recommended products

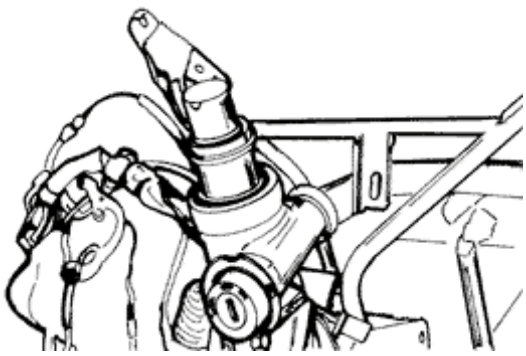
SELENIA FORK 10W Oil for front fork

SAE 10 W hydraulic oil



Refitting

Insert the two ring nuts and the special washer indicated in the figure



Specific tooling

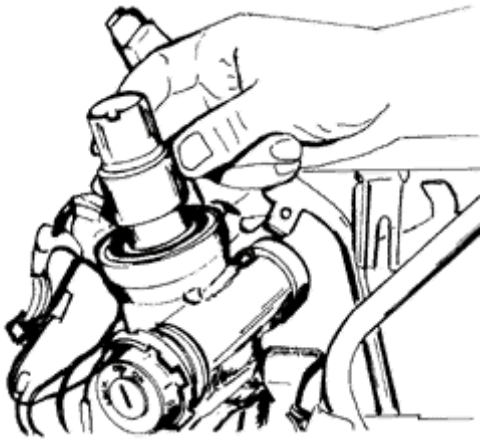
020055Y Wrench for steering tube ring nut

Locking torques (N*m)

Upper steering ring nut 30 ÷ 33

Lubricate the seats and the balls.

Lock in place and turn the wrench anticlockwise



Specific tooling

020055Y Wrench for steering tube ring nut

Recommended products

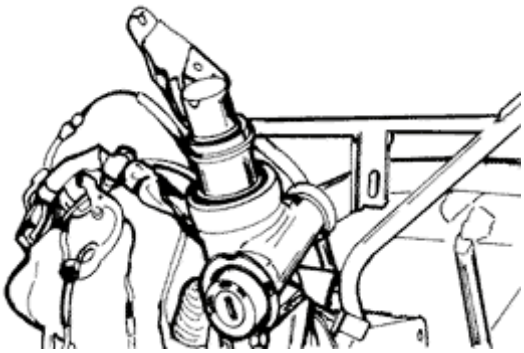
AGIP GREASE PV2 Grease for steering bearings, bolt seatings for swinging arms and faying surface of driven pulley spring (only pulley side)

Soap-based lithium and zinc oxide grease containing NLGI 2; ISO-L-XBCIB2

Locking torques (N*m)

Steering bearing upper seat 1) 80 ÷ 90°. Steering bearing upper seat 50 ÷ 60 N.m

- Tighten the lower ring nut to the prescribed torque.
- Loosen the lower ring nut by 90°
- Insert the spacer
- Lock the upper ring nut to the prescribed torque.



Specific tooling

020055Y Wrench for steering tube ring nut

Locking torques (N*m)

Upper steering ring nut 30 ÷ 33 Lower steering ring nut 12 ÷ 15

Removal

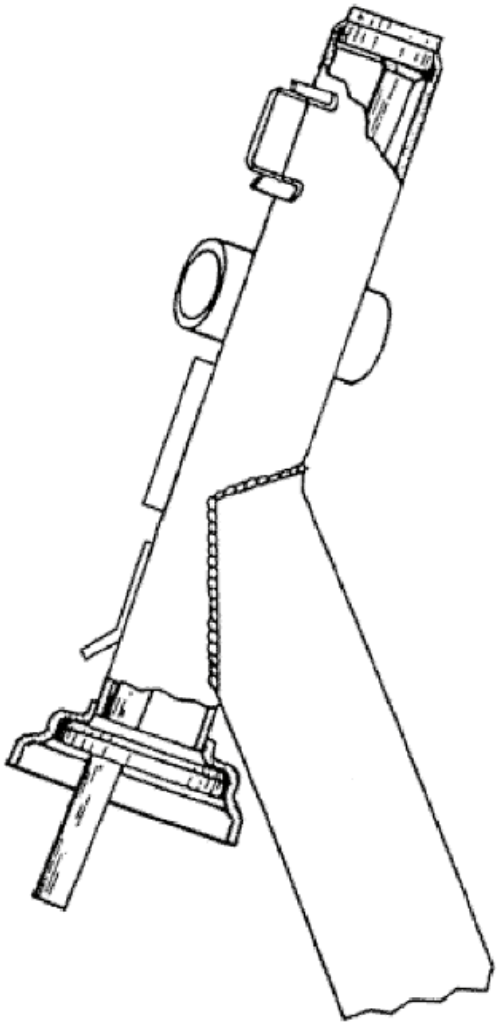
Remove upper bearing with an appropriate tool.

N.B.

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

Specific tooling

020004Y Punch for removing fifth wheels from headstock



Refitting

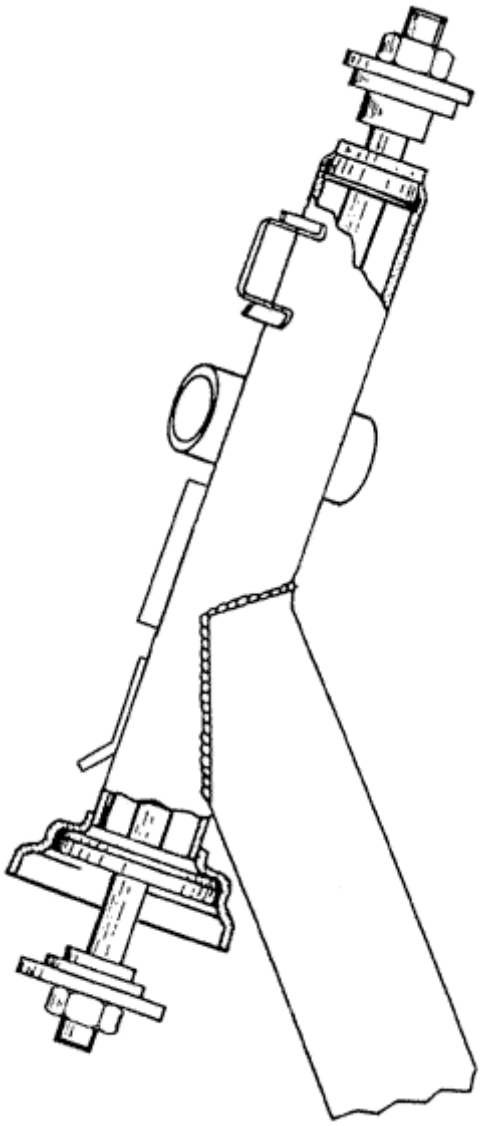
Insert the lower and upper bearing on the chassis using an appropriate tool.

N.B.

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

Specific tooling

001330Y Tool for fitting steering seats



Rear

Removing the rear wheel

Removal

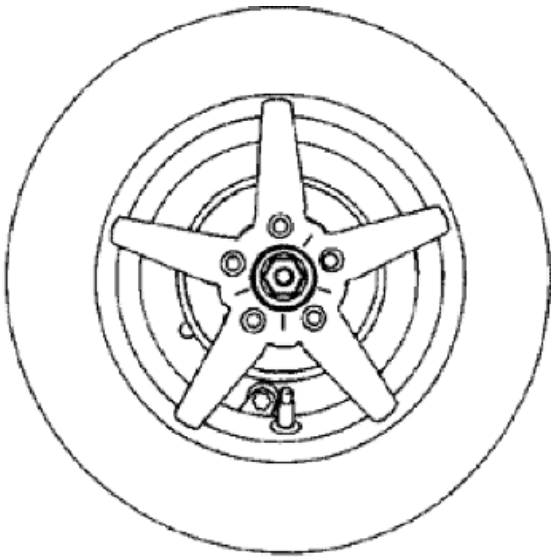
- Unscrew the four fixing screws and remove the muffler and the relevant bracket;
- Unscrew the central retaining nut.

Reassembly

Carry out the previous operations in reverse order.

Locking torques (N*m)

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



Removal

Removal

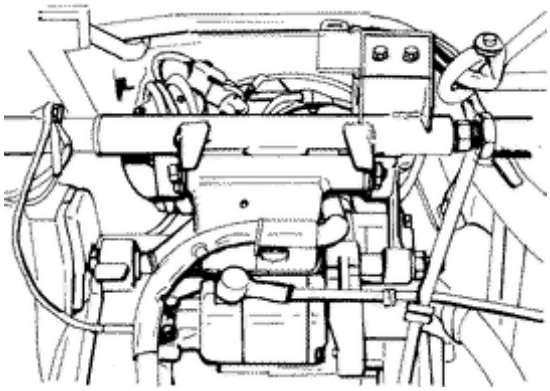
- Remove the chassis external nut on the left side.
- Loosen the two nuts shown in the figure.
- Slide off the bolt and remove the swinging arm.

Reassembly

Carry out the previous operations in reverse order.

Locking torques (N*m)

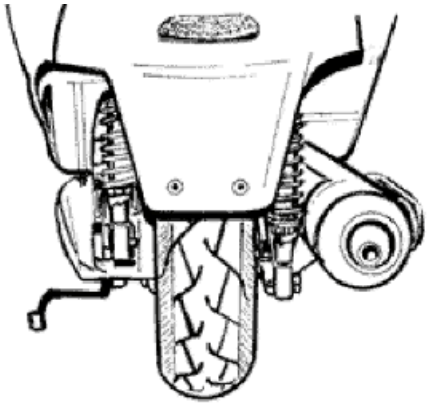
swinging arm 8 ÷ 12 Nm



Removal

Proceed as follows:

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



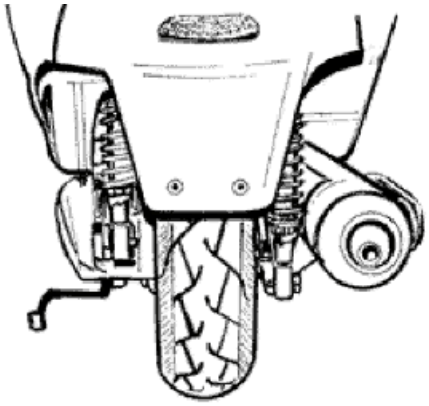
Proceed as follows:

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

Carry out the previous operations but in reverse order.

Locking torques (N*m)

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



Refitting

Carry out the previous operations but in reverse order.

Locking torques (N*m)

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

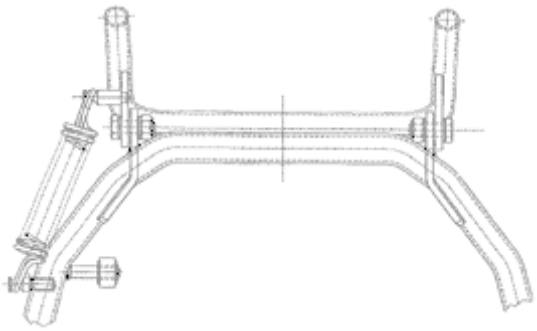
Centre-stand

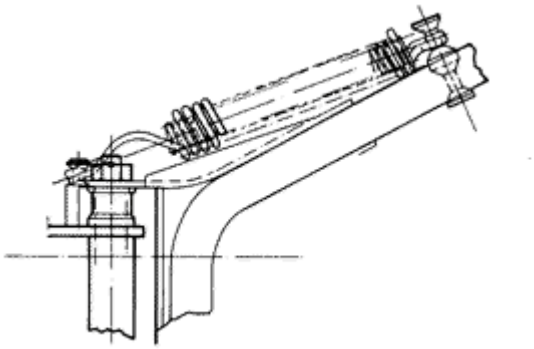
Removal

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

Reassembly

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





CAUTION

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

Recommended products

AGIP GREASE PV2 Grease for control levers on the engine

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

Locking torques (N*m)

stand retaining bolt 20 ÷ 25

INDEX OF TOPICS

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

Interventions rules

General rules for maintenance operations on the hydraulic braking system.

WARNING

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

N.B.

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

N.B.

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

N.B.

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

WARNING

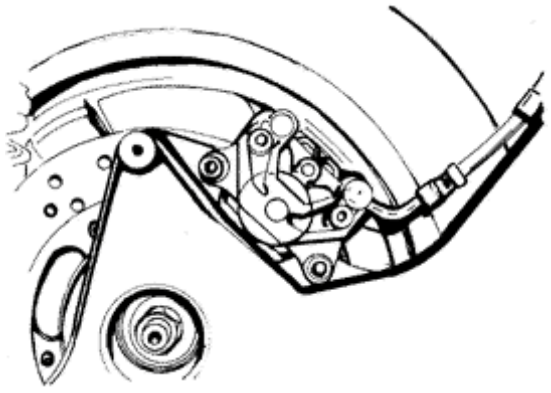
THE PRESENCE OF BRAKE FLUID ON THE DISC OR BRAKE PADS REDUCES BRAKING EFFICIENCY.
IN THIS CASE, REPLACE THE PADS AND CLEAN THE DISC WITH A HIGH-QUALITY SOLVENT.

Removal

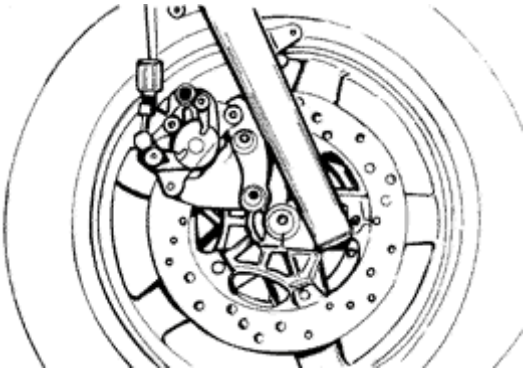
Proceed as follows:

- remove the muffler,

- repeat the operations above regarding front caliper removal.



Front brake calliper



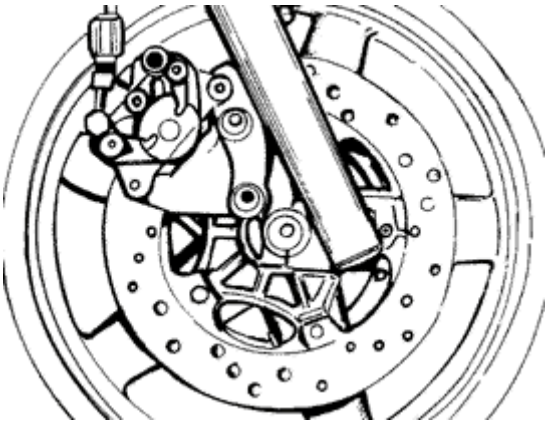
N.B. Minimise difficulty for this operation by removing the callipers from their supports without removing the oil pipe.

Front brake pad removal:

Proceed as follows:

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

Removal



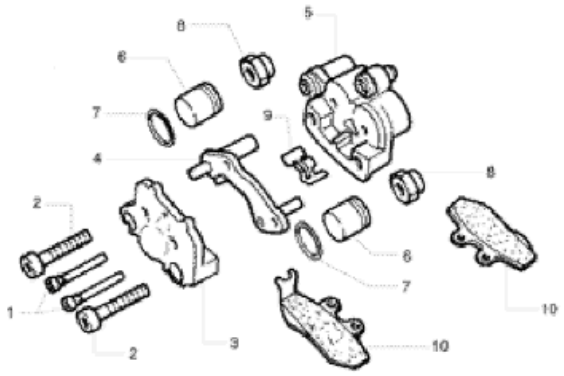
Proceed as follows:

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

Locking torques (N*m)

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

Overhaul



Proceed as follows:

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

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

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

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

5) Check:

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

Refitting

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

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

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

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

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

Functioning

This is a floating type calliper.

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

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

The brake pad lock spring

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

CAUTION

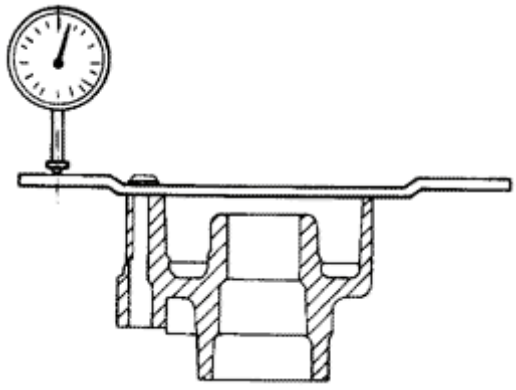
ALL THE SEALS AND GASKETS MUST BE REPLACED EVERY TIME THE CALLIPER IS SERVICED.

Locking torques (N*m)

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

Removal

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



Front/rear disc replacement

1) disassemble the front/rear wheel;
2) loosen the two fixing screws and remove the disc.
When refitting, position the disc correctly, respecting the direction of rotation, and apply medium threadlock.

N.B.

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

Recommended products

(°) Loctite 243 Medium-strength threadlock

Apply LOCTITE 243 medium-strength threadlock

Characteristic

Brake discs check: Max. axial deviat.

0.1 mm

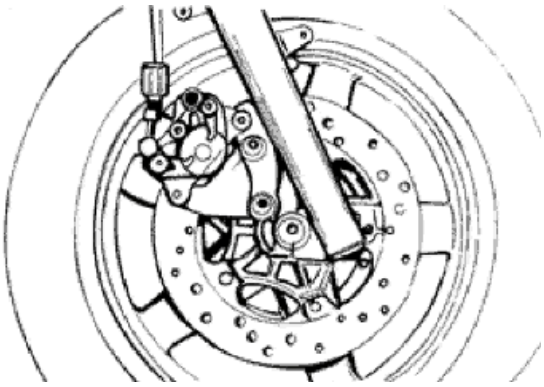
Locking torques (N*m)

Disc tightening screw (°) **5 ÷ 6.5**

Removal

Proceed as follows:

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



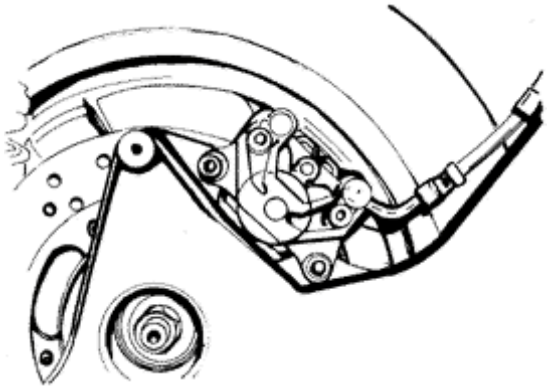
N.B.

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

Removal

Proceed as follows:

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

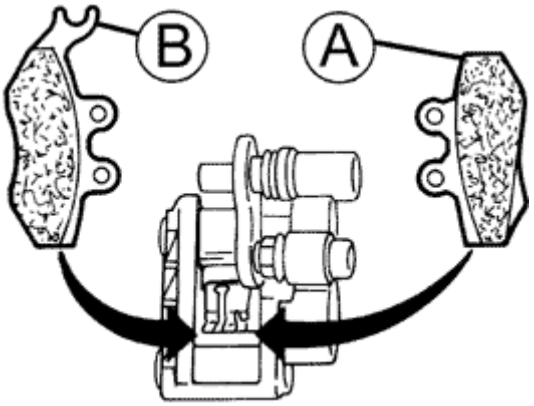


CAUTION

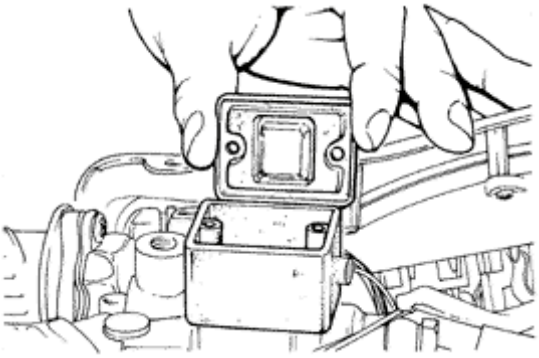
The brake pads are asymmetrical and cannot be interchanged
A = shock absorber side
B = wheel side

CAUTION

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



Front



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

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

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

N.B.

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

CAUTION

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

Specific tooling

020329Y MityVac vacuum-operated pump

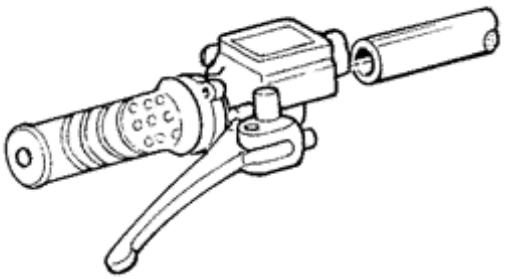
Locking torques (N*m)

Oil bleed screw **8 ÷ 12**

Front brake pump

Removal

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



Locking torques (N*m)

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

Overhaul

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

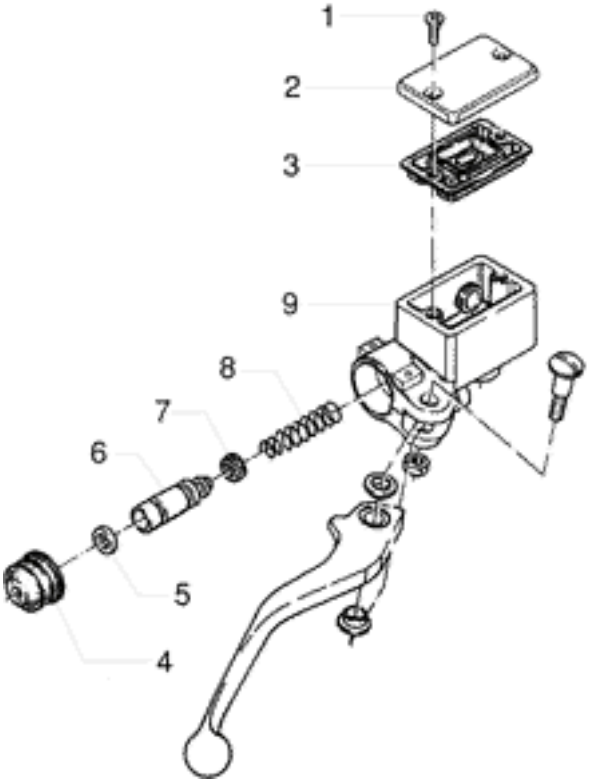
Refitting

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

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

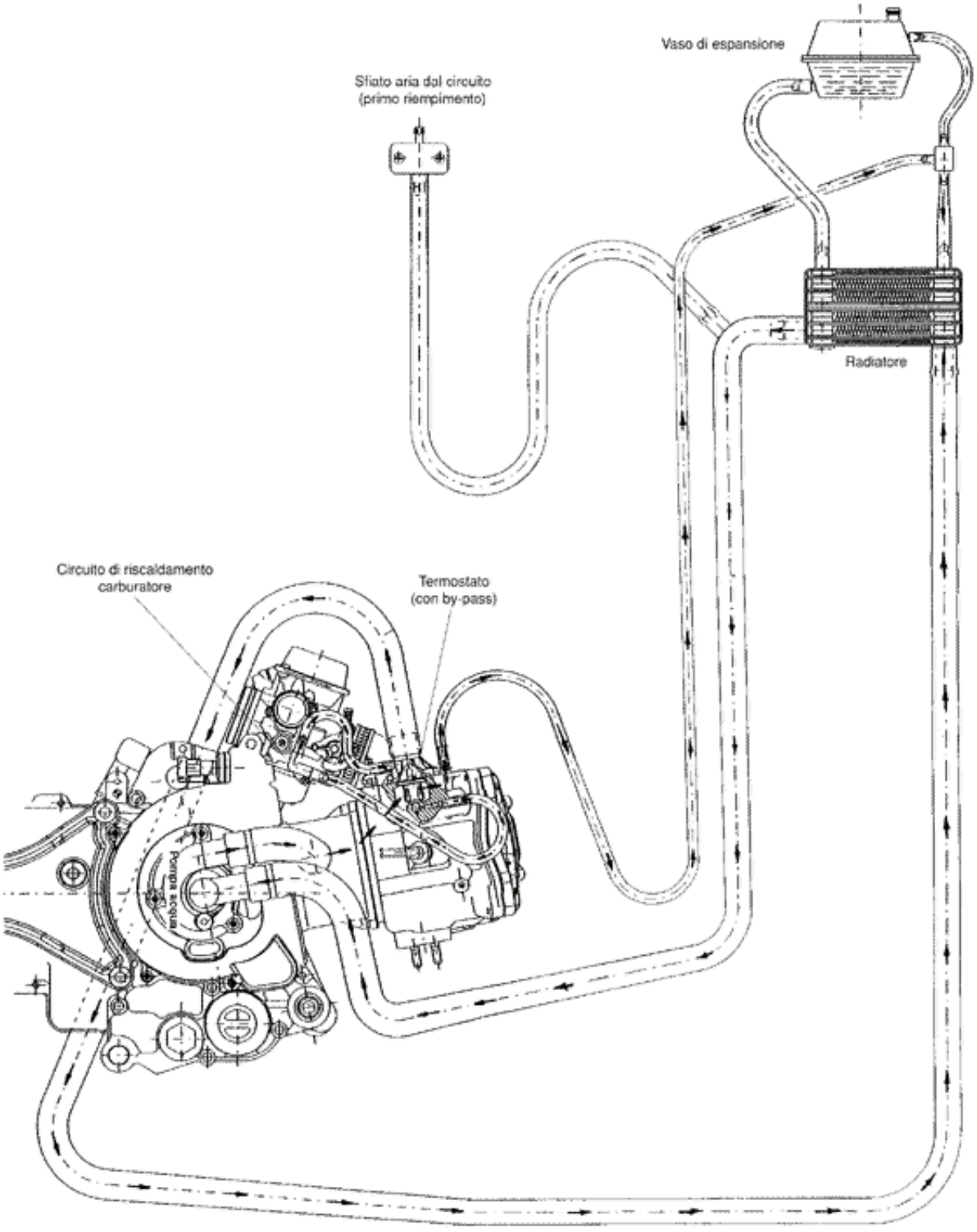
CAUTION

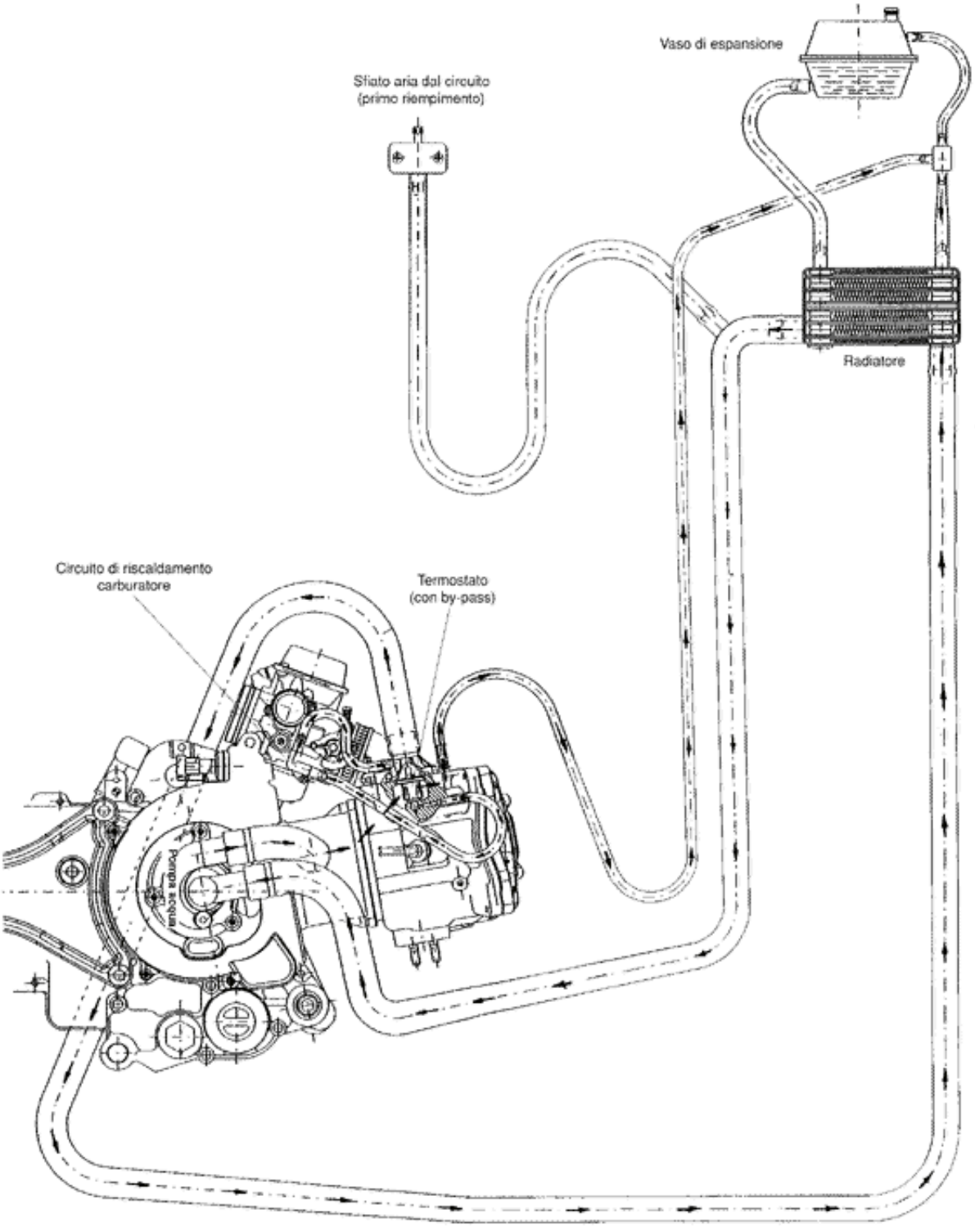
ALL THE SEALS AND GASKETS MUST BE REPLACED EVERY TIME THE PUMP IS SERVICED.



INDEX OF TOPICS

Circuit diagram




Vaso di espansione
Sfiato aria dal circuito
(primo riempimento)
Radiatore
Circuito di riscaldamento
carburatore
Termostato
(con by-pass)

Water pump - overhaul

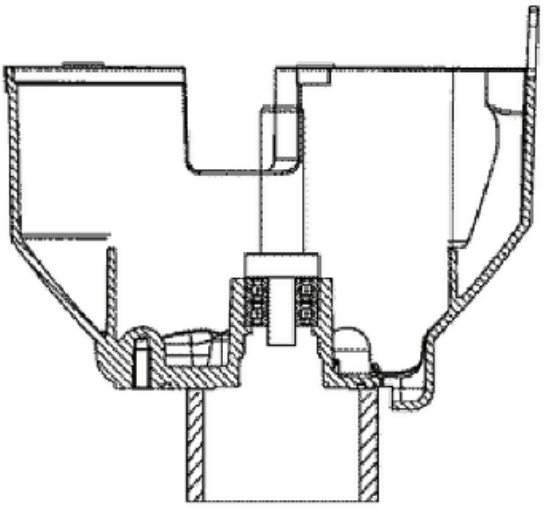
With a hot air gun heat the flywheel cover on the inner side.

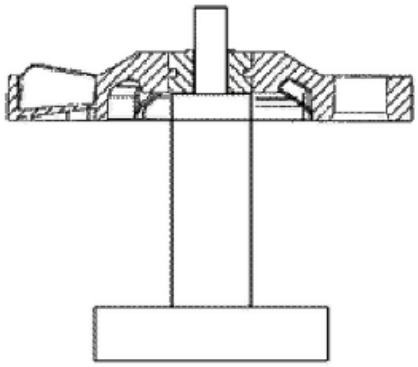
- Place the flywheel cover on the ring base following the same procedure as for removal.
- Place the two bearings on the specific punch.
- Use grease to keep the bearings on the appropriate tool.
- Use a plastic mallet to insert the bearings on the housing up to the stop.
- Assembly the ceramic ring and the corresponding rubber gasket. The ceramic ring chamfering should always face towards the gasket.
- Lubricate the rubber gasket and insert the unit on the flywheel cover.

Use the punch of the appropriate tool manually if necessary.

Insert the drive on the guide on the support base facing part of the appropriate tool, being careful to check that the convex part faces upwards.

- Insert the flywheel cover with bearings on the appropriate tool.
- Insert the shaft together with the mechanical gaskets on the bearings.
- With the appropriate punch and socket, insert the shaft in the bearings and the drive until the end of stroke of the appropriate tool cannot be seen.
- Reassemble the rotor cover with a new O-Ring.
- Tighten the 3 fixing screws to the torque below.





N.B.

AVOID OVERHEATING AS THIS MAY ALTER THE PAINTED SURFACE.

N.B.

ALWAYS USE NEW BEARINGS.

N.B.

ALWAYS USE NEW CERAMIC RING AND GASKETS. ASSEMBLING THE CERAMIC SEALING RING IN A MANNER OTHER THAN MANUALLY MAY DAMAGE THE RING.

N.B.

Centre the punch well on the rotor. Push the shaft in and check that the wheel flywheel cover is level. Failure to respect this procedure damages the drive.

N.B.

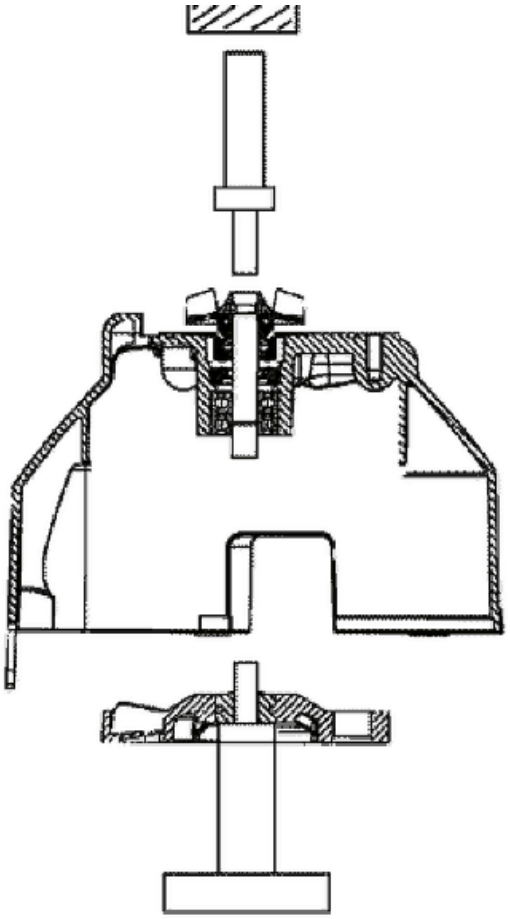
DO NOT LUBRICATE THE O-RING. FAILURE TO RESPECT THIS RULE RESULTS IN RING DISTORTION.

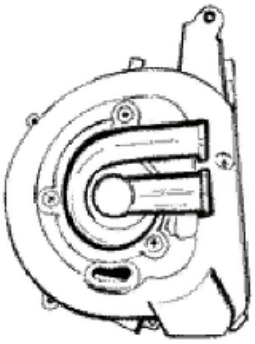
Specific tooling

020440Y Water pump service tool

Locking torques (N*m)

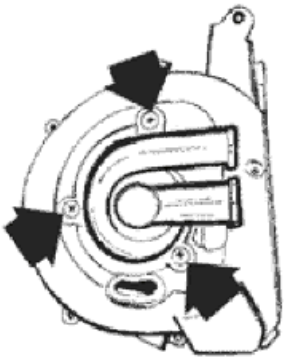
Water pump rotor cover 3 ÷ 4





- Check that the rotor does not show abnormal wear or dents;
- Check that the rotor shaft is not rusty;
- Check that there is no rust on the bearing seats or the ceramic seal;
- Check that the drive does not show dents and that it is perfectly integral with the steel hub.

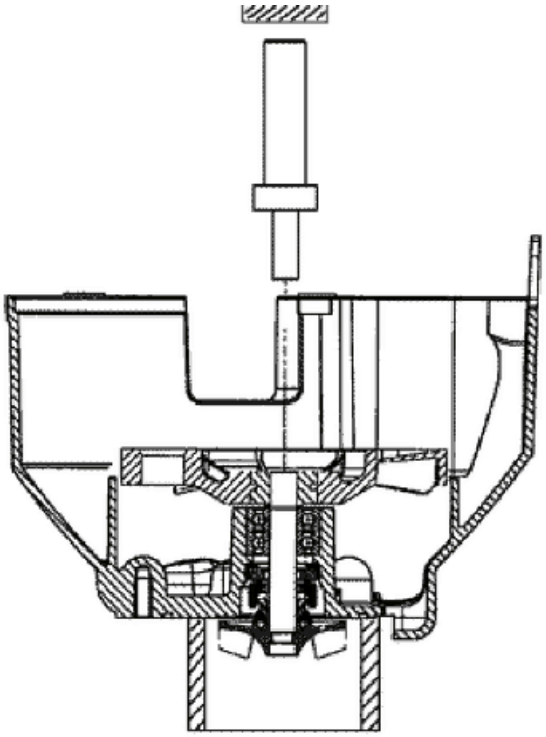
- Check the water pump if noise in the bearings or liquid leaking from the drainage hole inside the cover is detected.
- Remove the flywheel cover together with the water pump from the engine (see chapter 4).
- Remove the rotor cover by unscrewing the 3 retainers indicated in the figure.



- Place the flywheel cover on the ring base forming part of the tool drawing No 020440Y

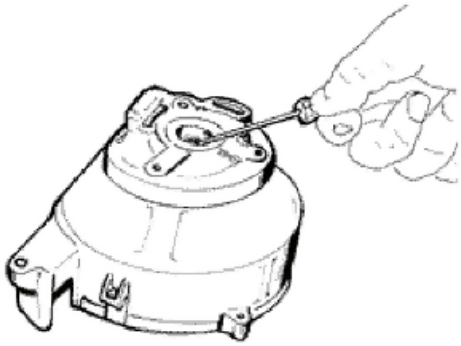
With an appropriate socket and punch, forming part of the specific tool 020440y, extract the shaft together with the rotor from the drive and the bearings.

- Use a screwdriver to remove the static part of the ceramic seal from the flywheel cover.
- Place the flywheel cover below the socket making sure it is perfectly levelled.
- Use the punch in the inverted position to extract the two ball bearings.



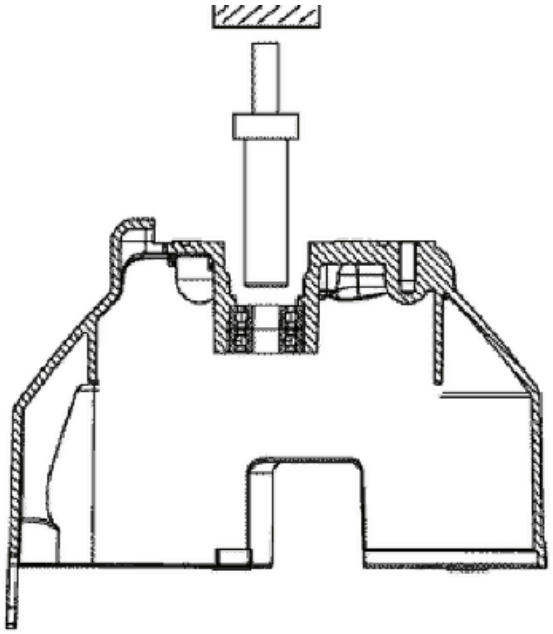
N.B.

To avoid damaging the cover surface that retains the coolant, use de ring base with the accurately machined surface facing the flywheel cover.



Specific tooling

020440Y Water pump service tool



With the hot air gun, drw. No. 20151y, heat the inner side of the flywheel cover .

N.B.: Avoid overheating as this may alter the painted surface.

- Place the flywheel cover on the ring base following the same procedure as for removal.
- Place the two bearings on the specific punch.

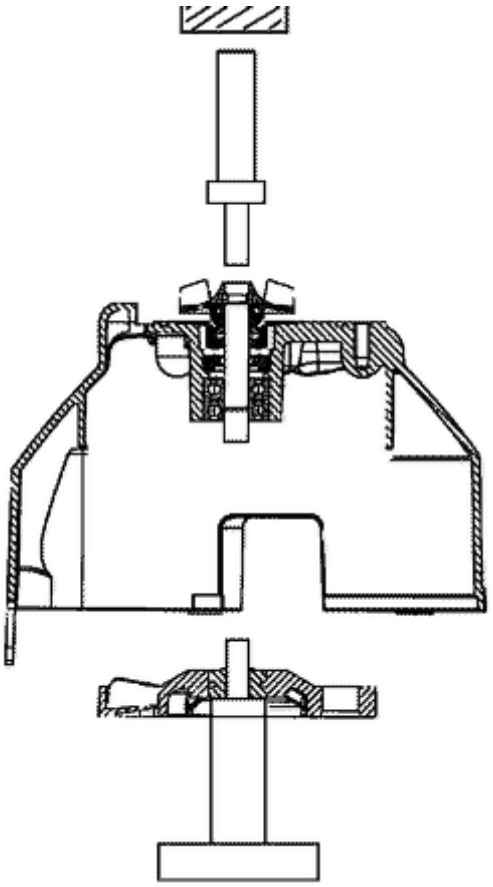
N.B. Always use new bearings.

- Use grease to keep the bearings on the appropriate tool.
- Use a plastic mallet to insert the bearings on the housing up to the stop.
- Assembly the ceramic ring and the corresponding rubber gasket. The ceramic ring chamfering should always face towards the gasket.
- Lubricate the rubber gasket and insert the unit on the flywheel cover.

Use the punch of the specific tool 020440Y manually if necessary.

N.B. Always use new ceramic ring and gaskets.

Fitting the ceramic sealing ring other than manually may damage the ring.



Insert the drive on the guide plug on the support base which forms part of the specific tool drw. No. 020440Y, being careful to check that the convex part faces upwards.

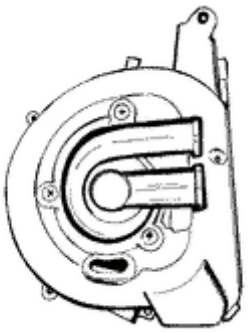
- Insert the flywheel cover with bearings on the appropriate tool.
- Insert the shaft together with the mechanical gaskets on the bearings.
- With the appropriate punch and socket, insert the shaft in the bearings and the drive until the end of stroke of the appropriate tool cannot be seen.

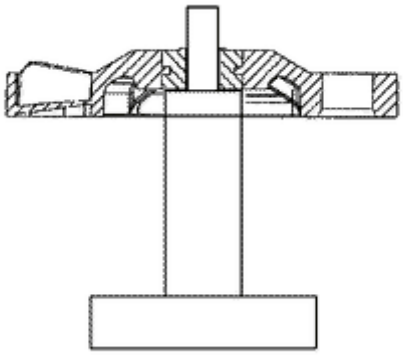
N.B. Centre the punch well on the rotor. Push the shaft in and check that the wheel flywheel cover is level. Failure to respect this procedure damages the drive.

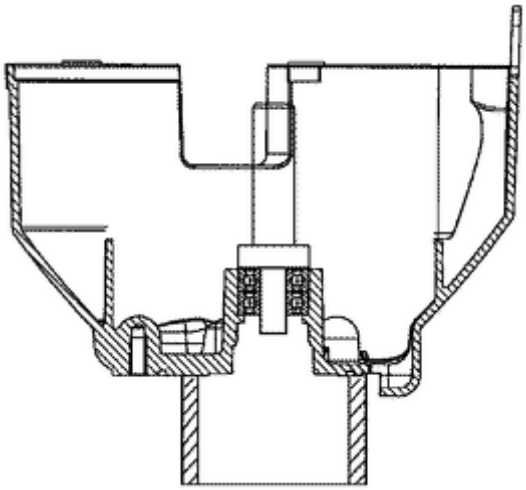
- Reassemble the rotor cover with a new O-Ring.
-Tighten the 3 fixing screws to the prescribed torque:

Locking torque: 3 ÷ 4 Nm·

N.B. Do not lubricate the O-ring. Otherwise, this will result in ring deformation.







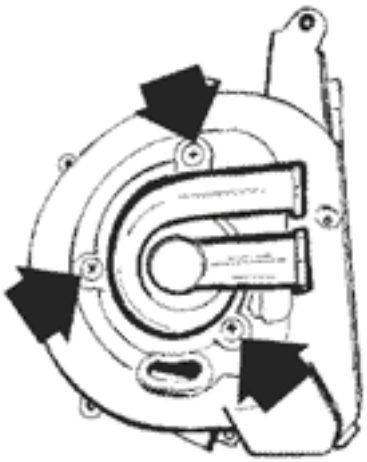
- Check the water pump if noise in the bearings or liquid leaking from the drainage hole inside the cover is detected.

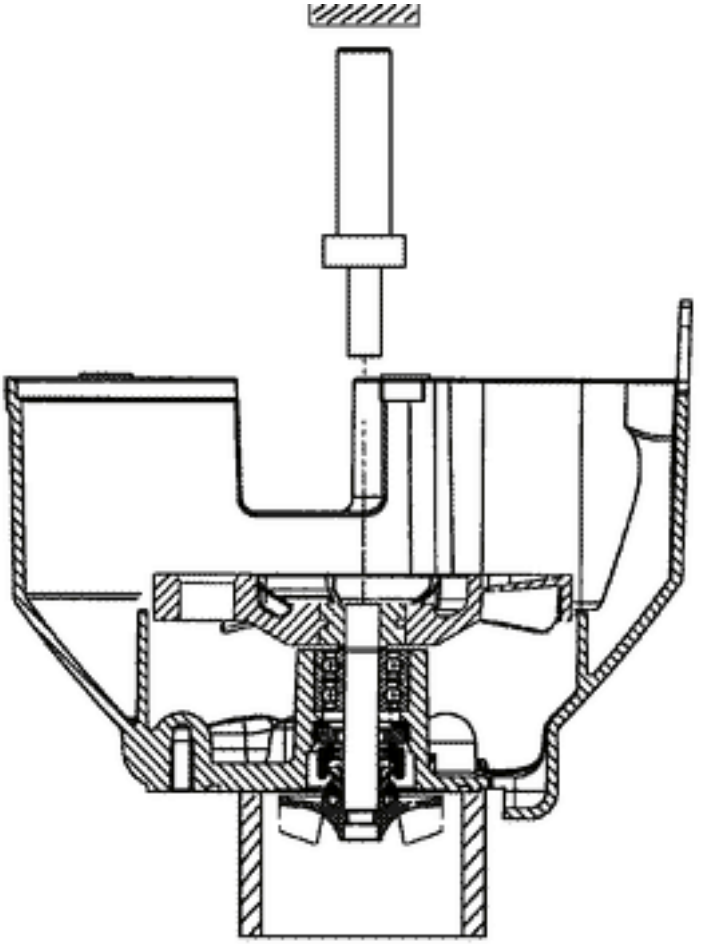
- Remove the flywheel cover together with the water pump from the engine (see chapter 4).
- Remove the rotor cover by unscrewing the 3 retainers indicated in the figure.
- Place the flywheel cover on the ring base forming part of the drw. No. 020440Y tool.

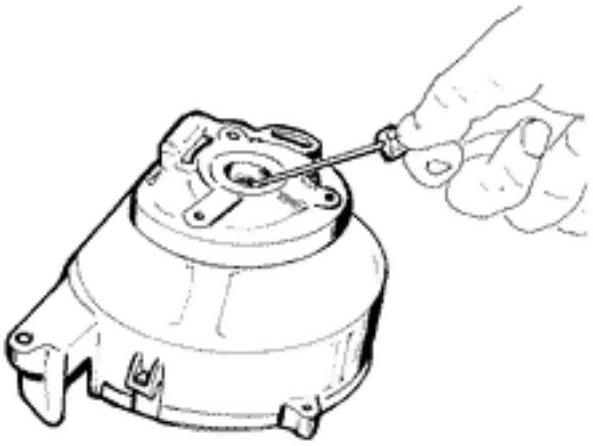
N.B.: To avoid damaging the cover surface that retains the coolant, use de ring base with the accurately machined surface facing the flywheel cover.

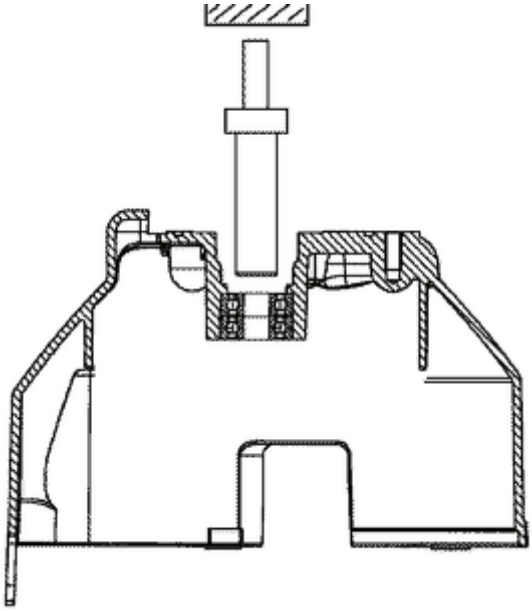
With an appropriate socket and punch, forming part of the specific tool 020440y, extract the shaft together with the rotor from the drive and the bearings.

- Use a screwdriver to remove the static part of the ceramic seal from the flywheel cover.
- Place the flywheel cover below the socket making sure it is perfectly levelled.
- Use the punch in the inverted position to extract the two ball bearings.







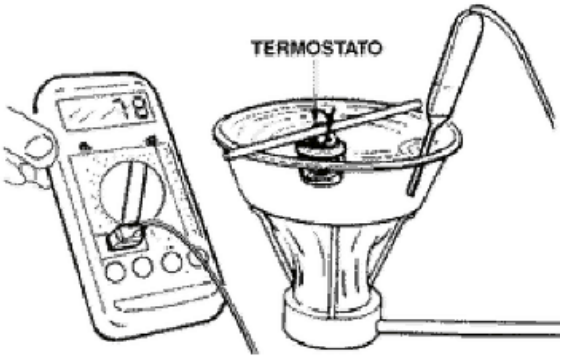


Removal

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

Check

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



- Replace the thermostat if it does not work properly.

CAUTION

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

Specific tooling

020331Y Digital multimeter

020151Y Air heater

Characteristic

Thermostat check: opening travel

3.5 mm at 80°C

Thermostat check: Opening start temperature

69.5 ÷ 72.5°C

1) Look to see that the thermostat is not damaged.

2) Fill a metal container with approx. 1 litre of water.

Immerse the thermostat, and keep it in the centre of the container.

Immerse the multimeter temperature probe drawing No° 020331Y closeà to the thermostat.

Heat the container with a hot air gun drawing No° 020151Y.

Check the temperature when the thermostat starts to open:

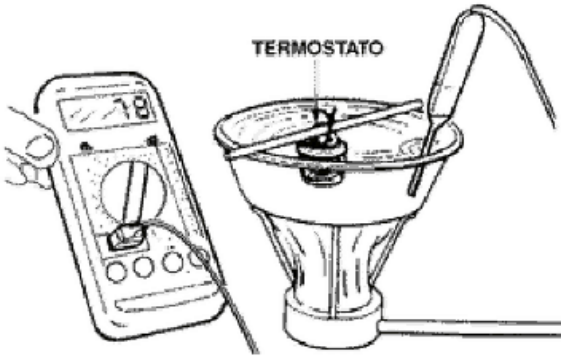
Opening start temperature: 69.5 ÷72.5°C

Heat up until the thermostat is completely open.

Opening travel: 3.5 mm at 80°C

CAUTION - To execute the test correctly, make sure neither the thermostat nor the thermometer touches the container.

3) Replace the thermostat if it is not working properly.



Refitting

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

Locking torques (N*m)

Thermostat cover screws **3 ÷ 4**

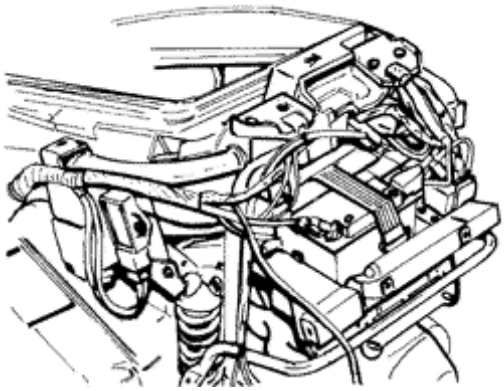
INDEX OF TOPICS

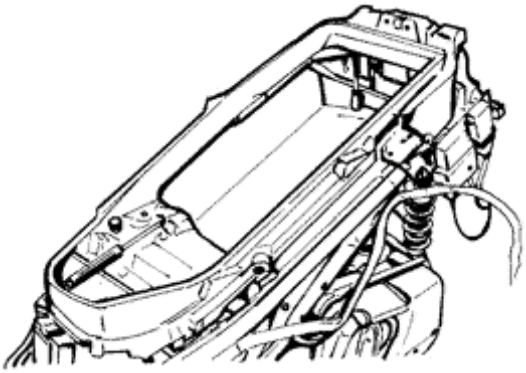
This section è is devoted to the operations that can be carried out on the vehicle's bodywork.

Seat

Helmet bay

- Remove all electrical devices, the fuse box and release the wires fixed to the chassis with the relative clamps;
- Remove the battery after removing the elastic belt;
- Undo the screws fixing the rear frame to the chassis and to the helmet compartment and remove compartment by lifting the front part and sliding it backwards;
- Remove the saddle;
- Unscrew the remaining fixing screws, remove the rubber cover and the helmet compartment light switch and then slide the helmet compartment off and upwards



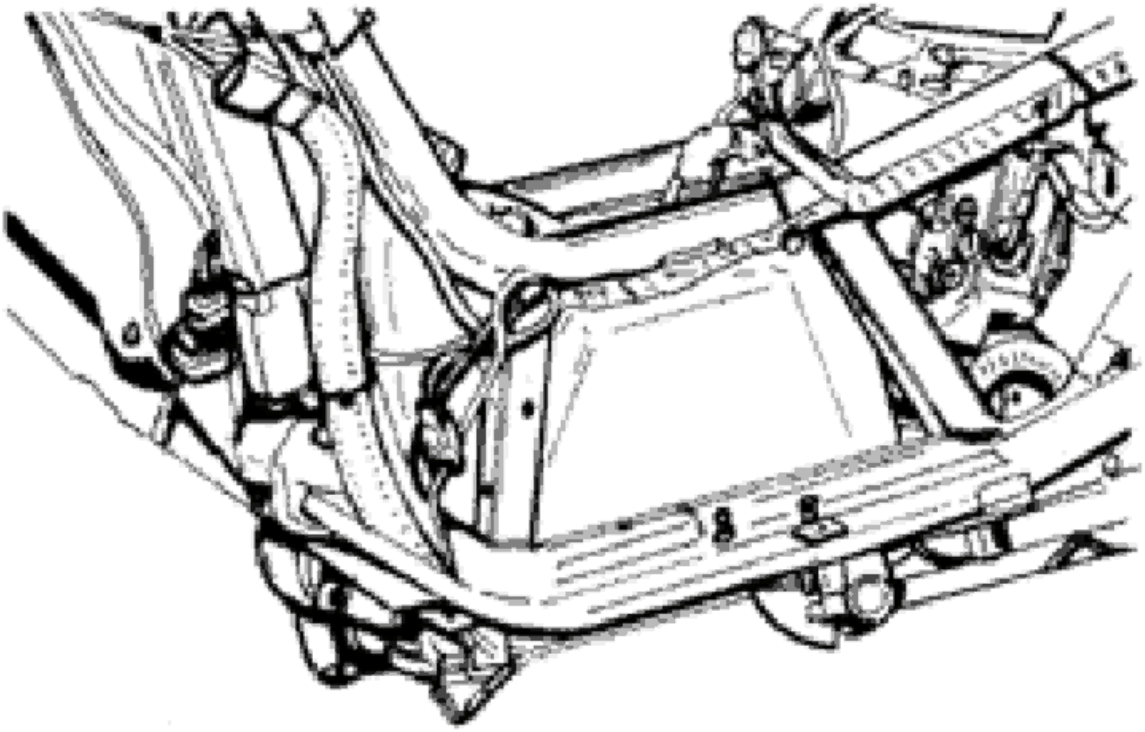


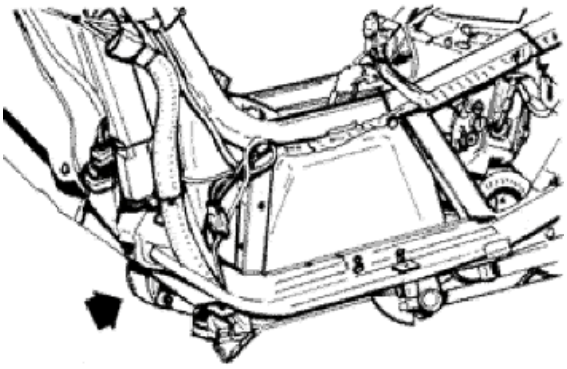
Fuel tank

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

N.B.

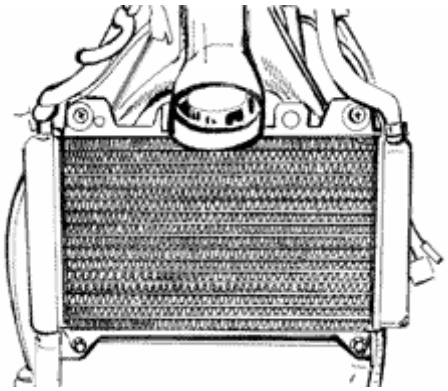
this operation should be preferably be carried out with the tank empty.





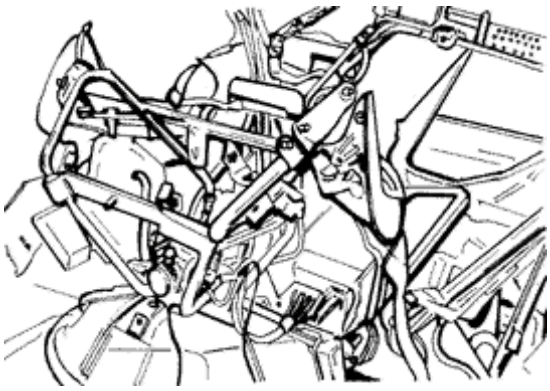
Radiator fan

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



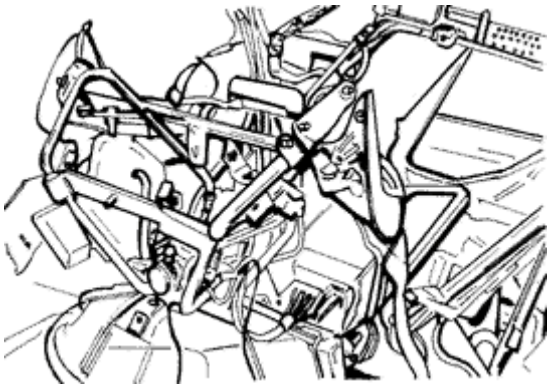
Expansion tank

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



Top-case

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



INDEX OF TOPICS

Carry out the listed tests before delivering the vehicle.

Warning - Be very careful when handling fuel.

Aesthetic inspection

Appearance check:

- Paintwork
- Fitting plastic parts
- Scratches
- Dirt

Tightening torques inspection

Lock check

- Safety locks
- clamping screws

Safety locks

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

Electrical system

Electrical system:

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

- Horn

- Starter

CAUTION

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

WARNING

BEFORE RECHARGING THE BATTERY, REMOVE THE CAPS OF EACH CELL.
KEEP THE BATTERY AWAY FROM NAKED FLAMES OR SPARKS WHILE IT IS CHARGED.
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 ONE.

WARNING

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

CAUTION

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

Levels check

Level check:

- Hydraulic braking system fluid level.

- Rear hub oil level

- Engine coolant level.

Road test

Test ride

- Cold start

- Instrument operations

- Response to the throttle control

- Stability on acceleration and braking

- Rear and front brake efficiency

- Rear and front suspension efficiency

- Abnormal noise

Static test

Static control after the test ride:

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

CAUTION

CHECK AND ADJUST TYRE PRESSURE WITH TYRES AT AMBIENT TEMPERATURE.

CAUTION

NEVER EXCEED THE RECOMMENDED INFLATION PRESSURES OR TYRES MAY BURST.

Functional inspection

Functional check up:

Braking system (hydraulic)

- Lever travel

Braking system (mechanical)

- Lever travel

Clutch

- Proper functioning check

Engine

- Throttle travel check

Others

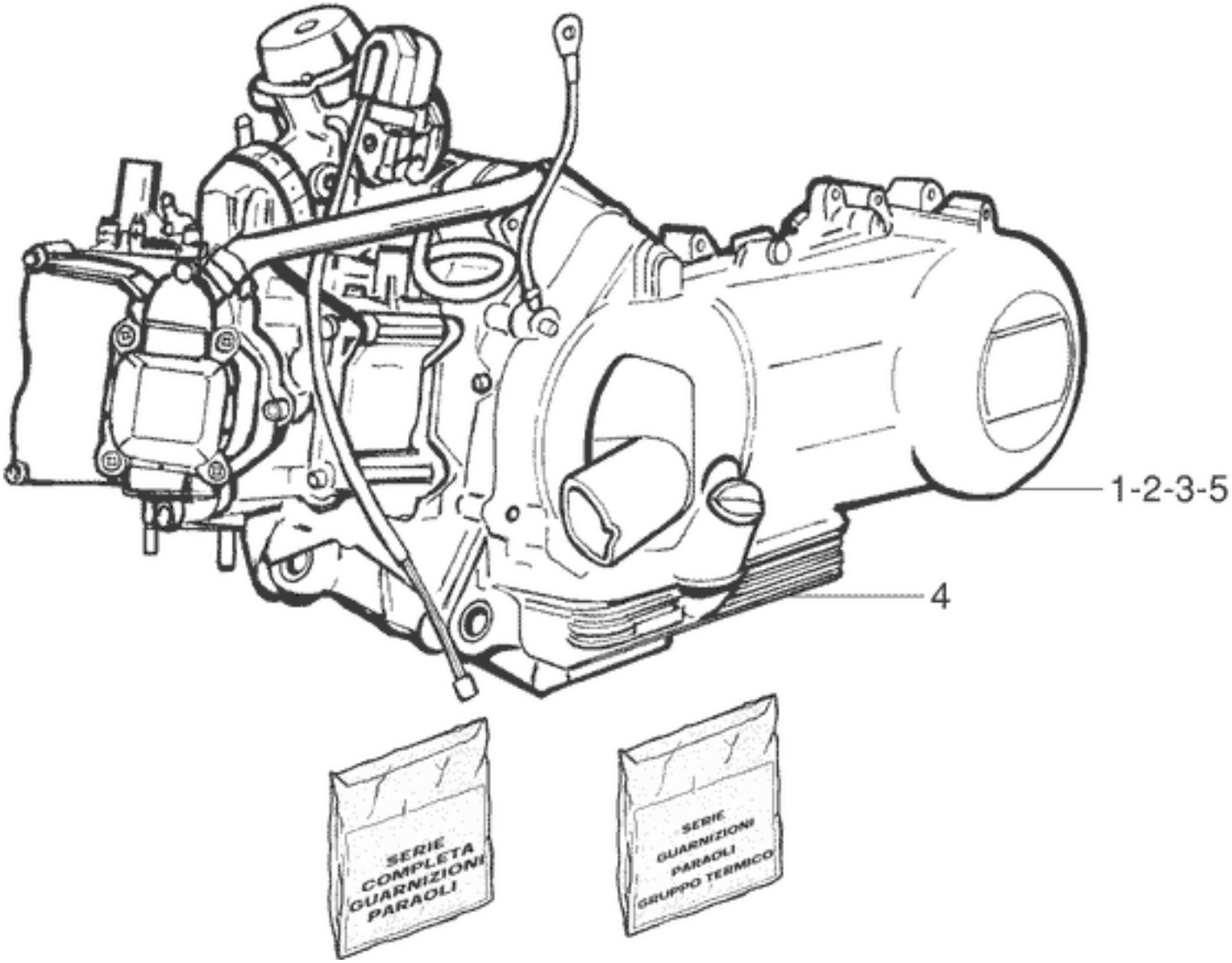
- Check documentation
- Check the frame and engine numbers
- Tool kit
- License plate fitting
- Check locks
- Check tyre pressures
- Installation of mirrors and any accessories

INDEX OF TOPICS

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

The description, code and predetermined time for each operation are specified.

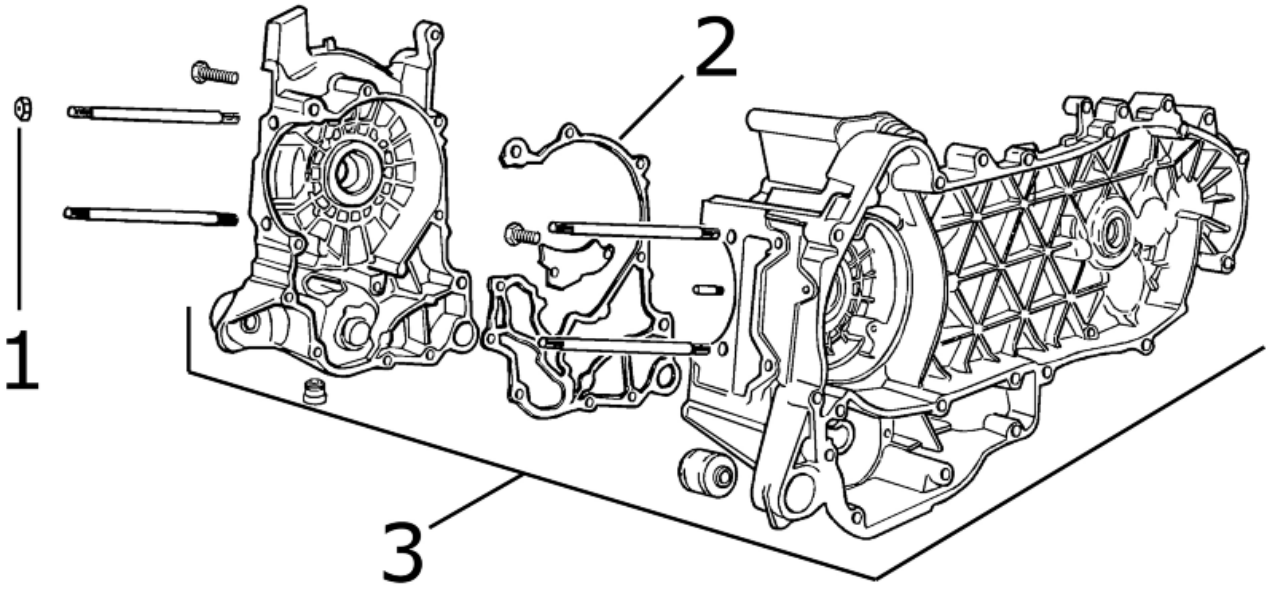
Engine



Crankcase

CRANKCASE REPAIR TIME

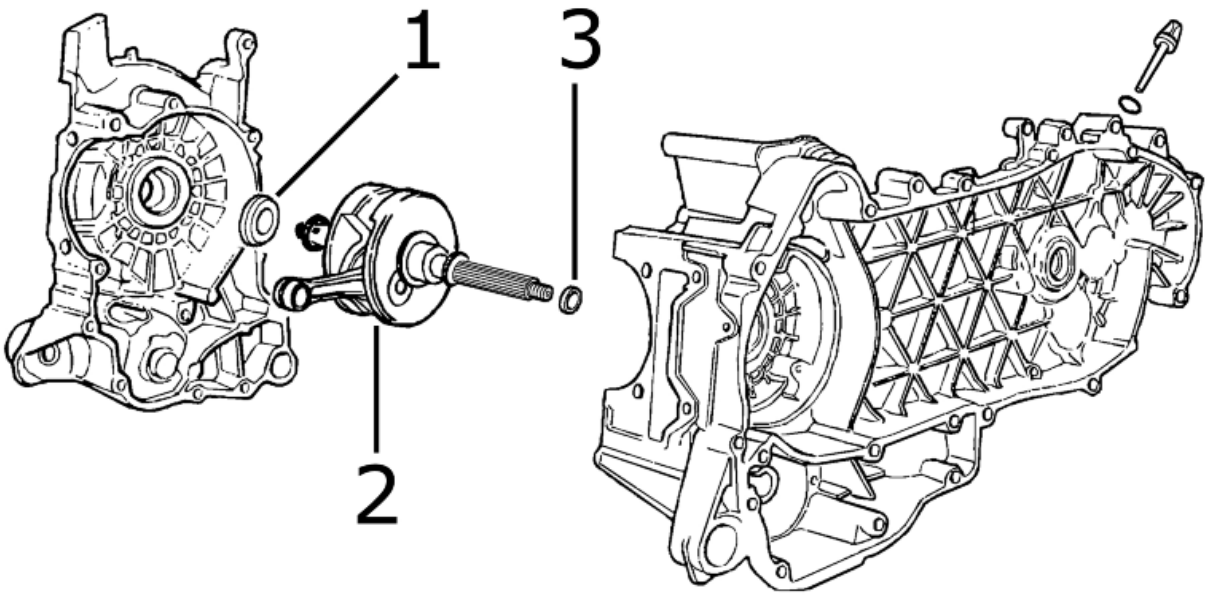
	Code	Action	Duration
1	003056	Head/Cylinder - Nut tightening	
2	001153	Crankcase halves gasket - Replacement	
3	001133	Engine crankcase - replace	



Crankshaft

CRANKSHAFT REPAIR TIME

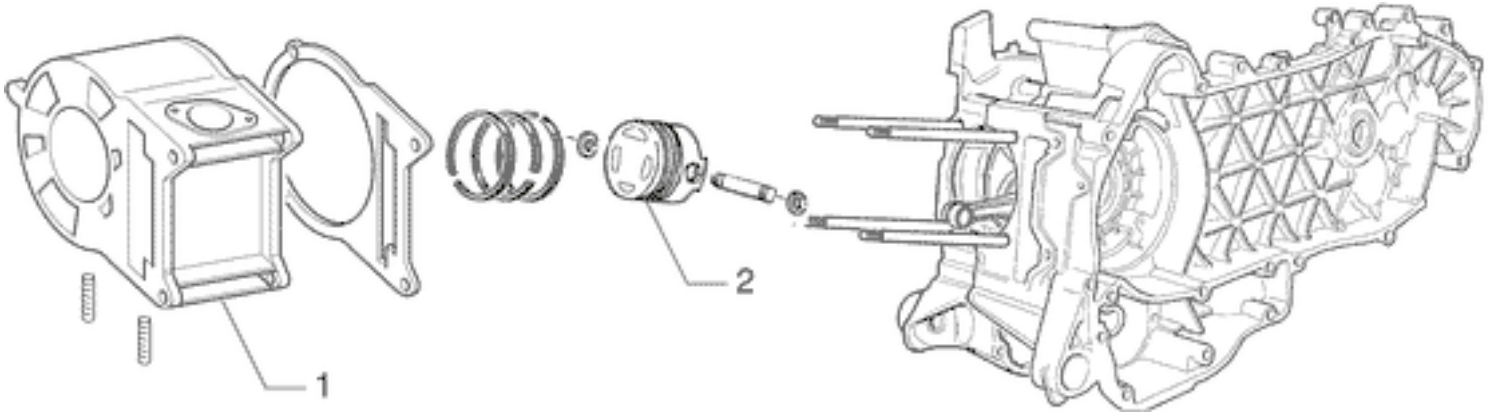
	Code	Action	Duration
1	001099	Oil seal, flywheel side - Replacement	
2	001117	Crankshaft - Replacement	
3	001100	Oil seal, clutch side - Replacement	



Cylinder assy.

PIN PISTON CYLINDER ASSEMBLY REPAIR TIME

	Code	Action	Duration
1	001002	Cylinder / Piston - Replacement	

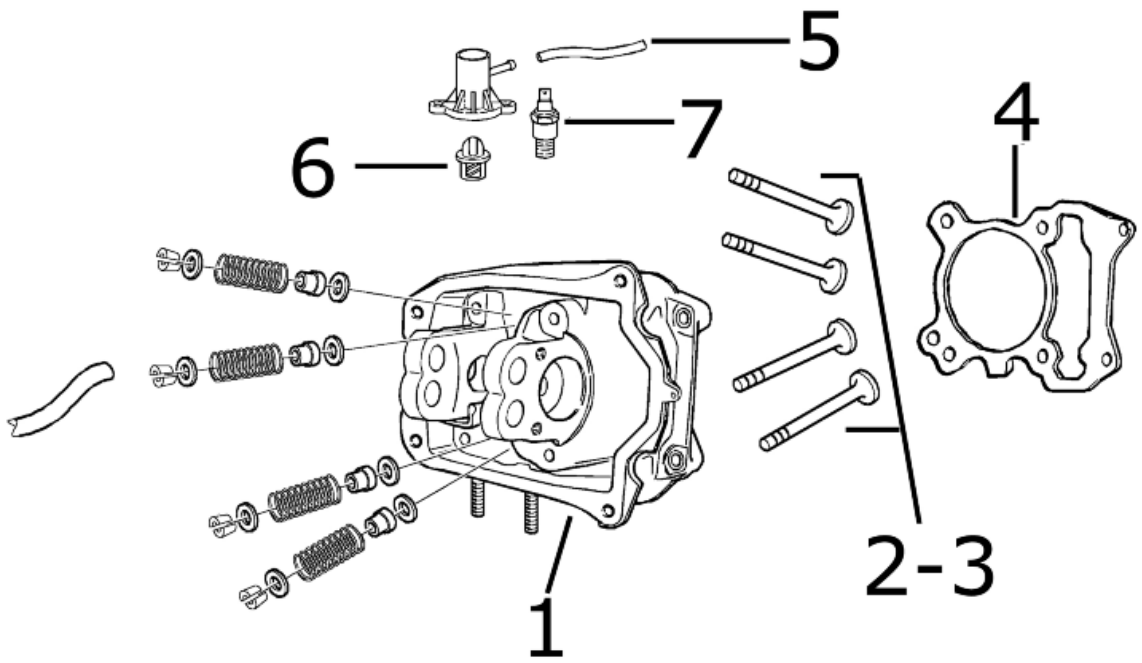


Cylinder head assy.

CYLINDER HEAD ASSEMBLY REPAIR TIME

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

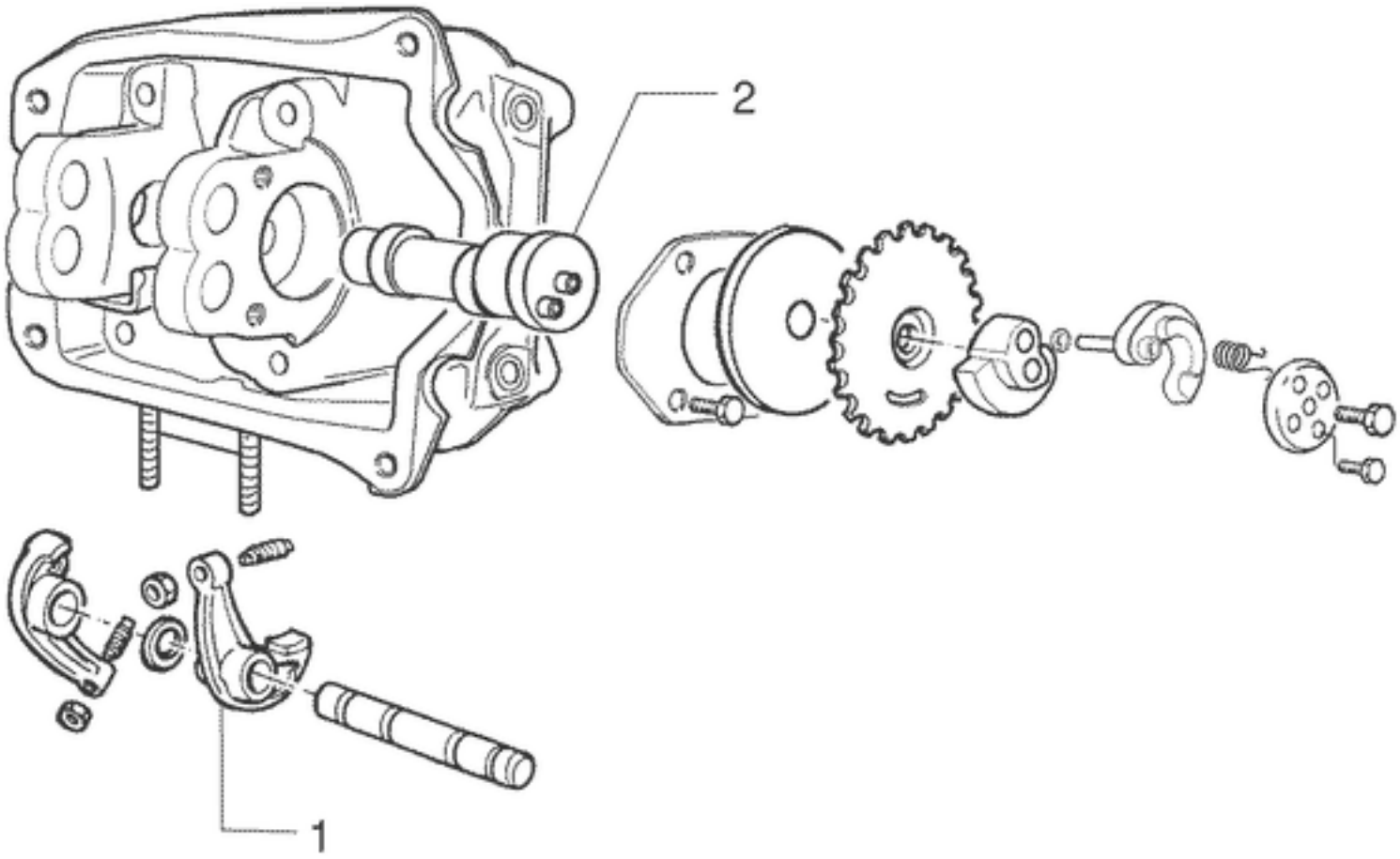
	Code	Action	Duration
6	001057	Thermostat - Replacement	
7	001083	Thermistor - Replacement	



Rocker arms support assy.

ROCKING LEVER SUPPORT ASSEMBLY REPAIR TIME

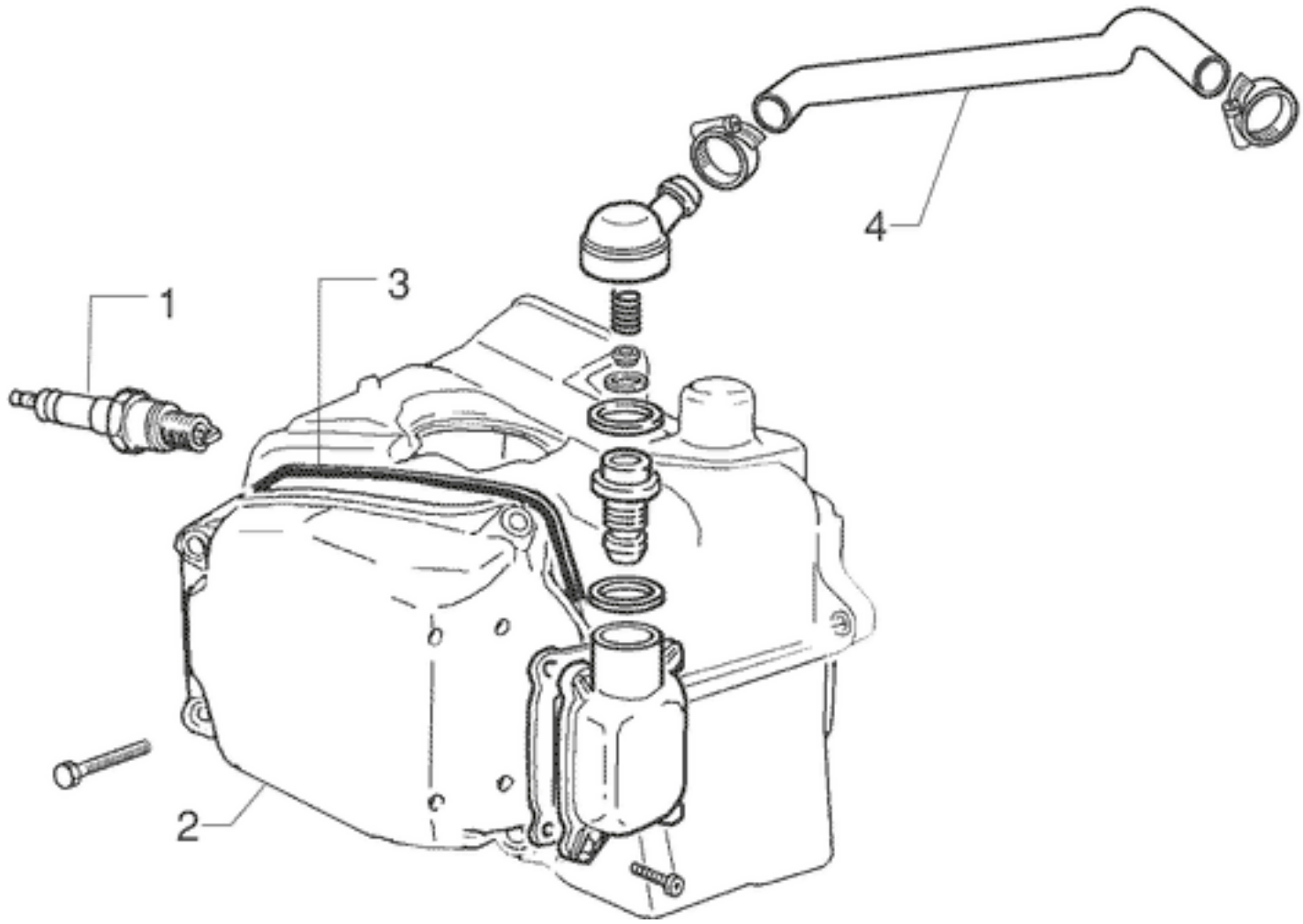
	Code	Action	Duration
1	001148	Valve rocking levers - Replacement	
2	001044	Camshaft - Replacement	



Cylinder head cover

CYLINER HEAD COVER REPAIR TIME

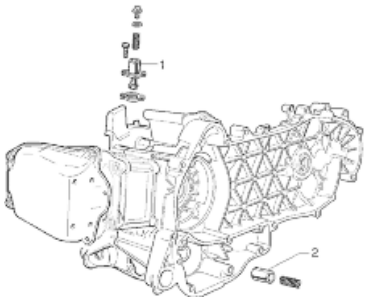
	Code	Action	Duration
1	001093	Spark plug - Replacement	
2	001089	Head cover - Replacement	
3	001088	Head cover gasket - Replacement	
4	001074	Oil vapour recovery pipe - Replacement	



Chain tensioner

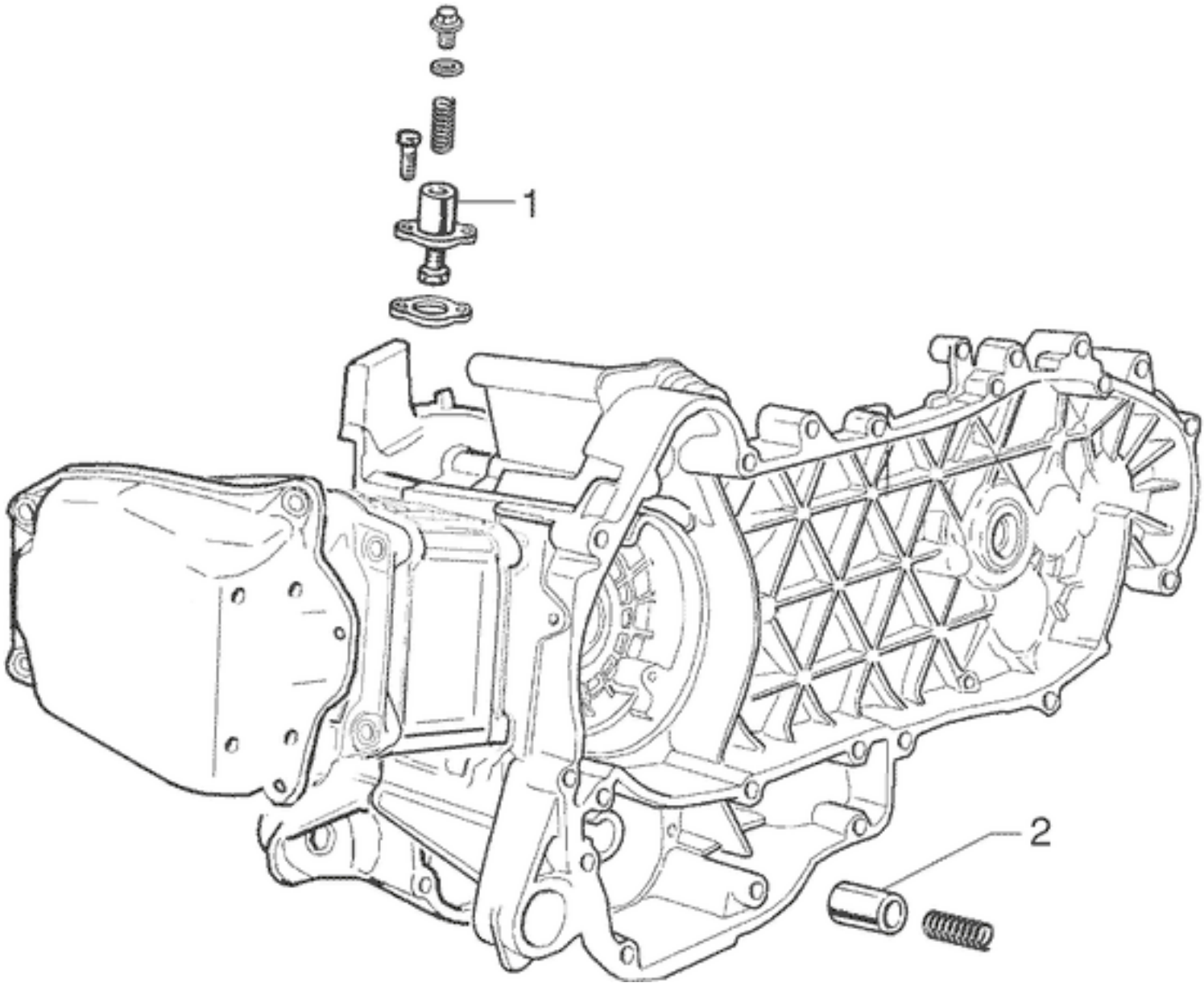
CHAIN TENSIONER REPAIR TIME

	Code	Action	Duration
1	001124	By pass lubrication - Replacement	
2	001129	Chain tightener - Service and replacement	



CHAIN TENSIONER REPAIR TIME

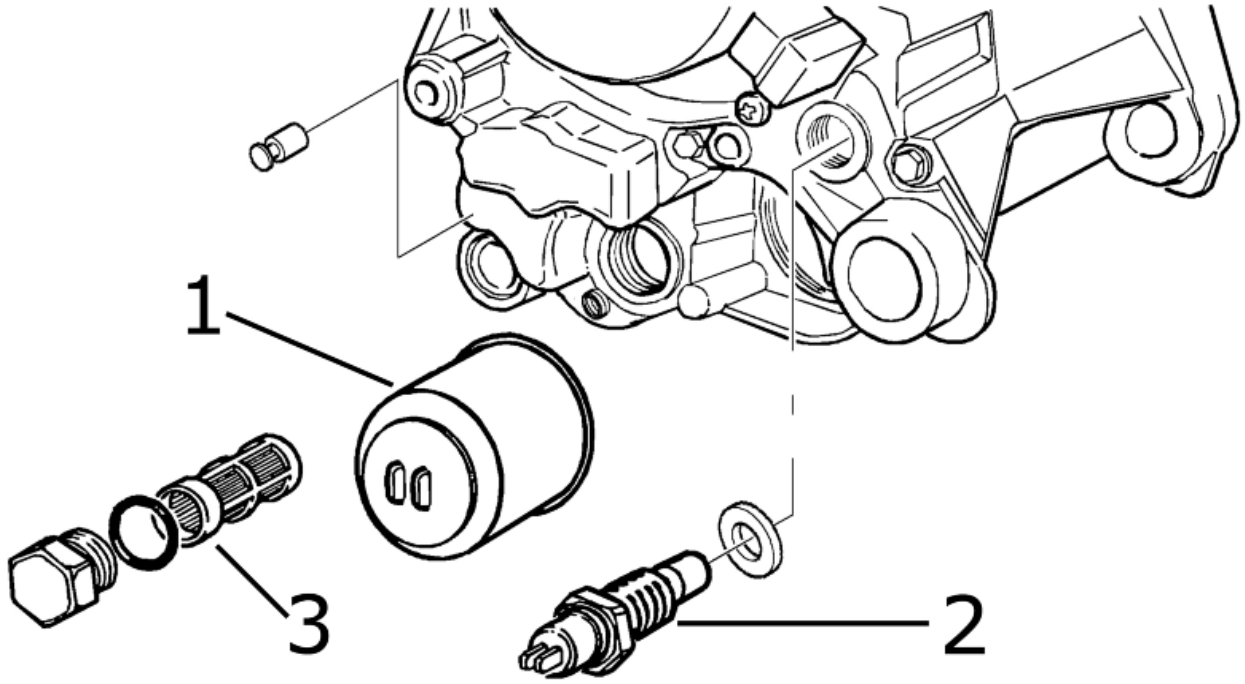
	Code	Action	Duration
1	001129	Chain tightener - Overhaul and replacement	
2	001124	By pass lubrication - Replacement	



Oil filter

OIL FILTER REPAIR TIME

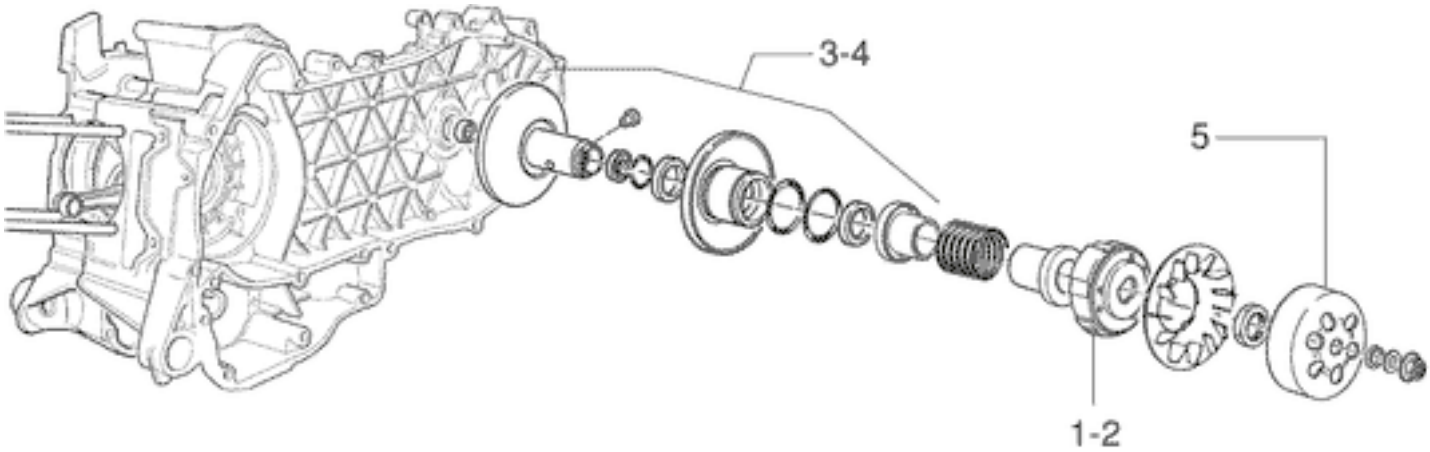
	Code	Action	Duration
1	001123	Oil filter - Replacement	
2	001160	Oil pressure sensor - Replacement	



Driven pulley

DRIVEN PULLEY REPAIR TIME

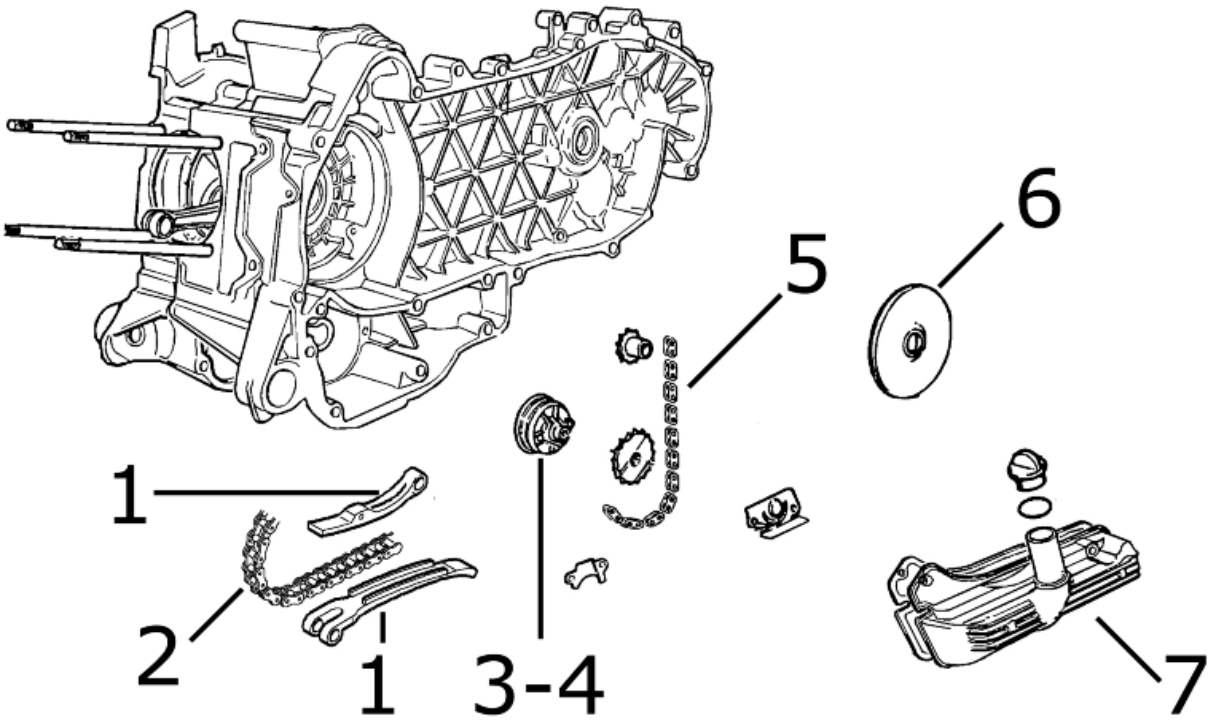
	Code	Action	Duration
1	001022	Clutch - Replacement	
2	003072	Clutch - replacement Clutch assembly - Wear check	
3	001012	Driven pulley - Service	
4	001110	Driven pulley - Replacement	
5	001155	Clutch bell housing - Replacement	



Oil pump

OIL PUMP UNIT REPAIR TIME

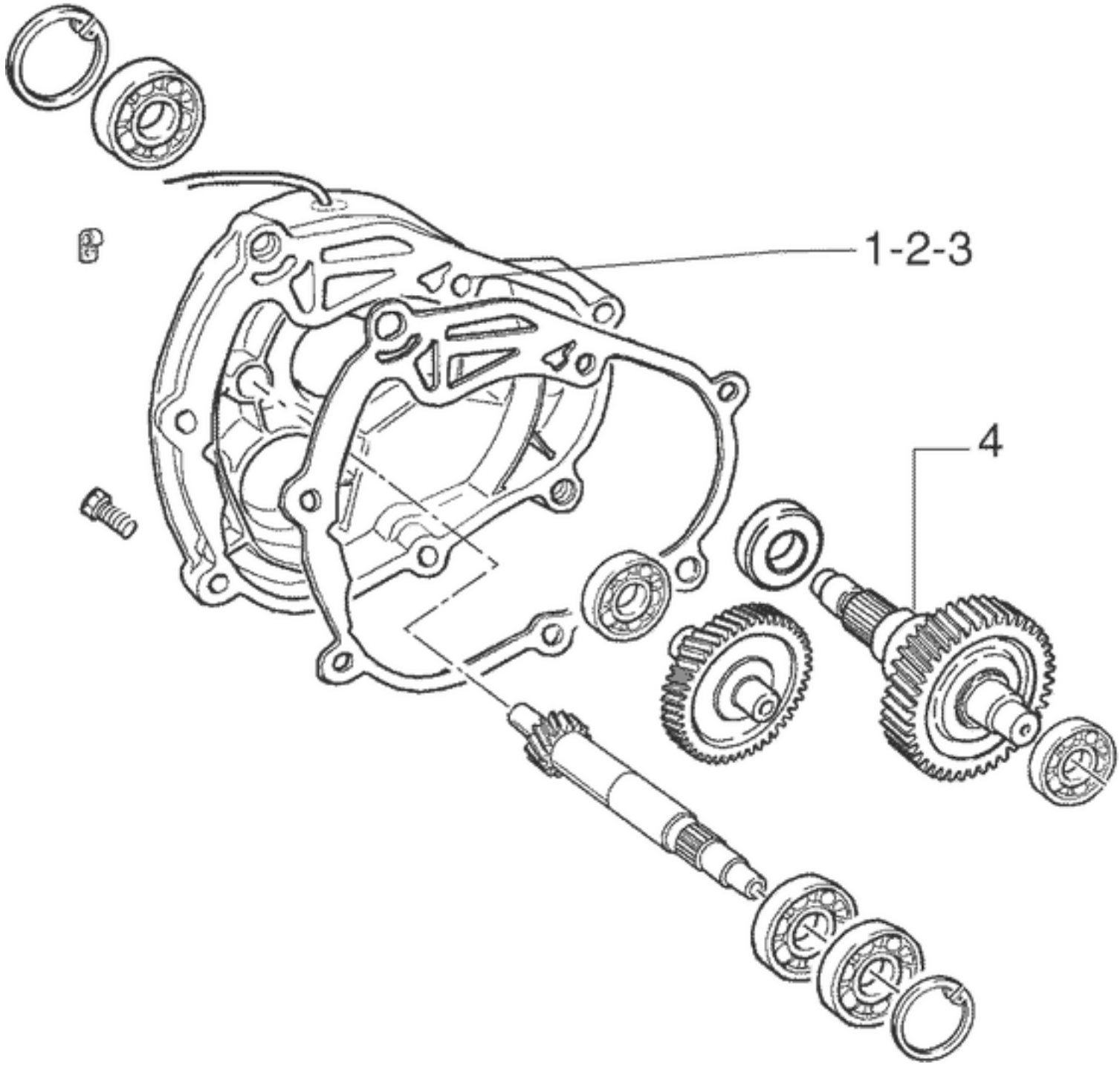
	Code	Action	Duration
1	001125	Chain guide pads - Replacement	
2	001051	Belt/ Timing chain - Replacement	
3	001042	Oil pump - Service	
4	001112	Oil pump - change	
5	001122	Oil pump chain - Replacement	
6	001121	Chain cover oil seal - Replacement	
7	001130	Oil sump - Replacement	



Final gear assy.

12 REAR WHEEL AXLE

Description	Code	Op.	Minutes
Gear reduction unit - Service	001010	1	65'
Gear reduction unit cover - Replacement	001156	2	60'
Gearbox oil - Replacement	003065	3	20'
Rear wheel axle - Replacement	004125	4	60'

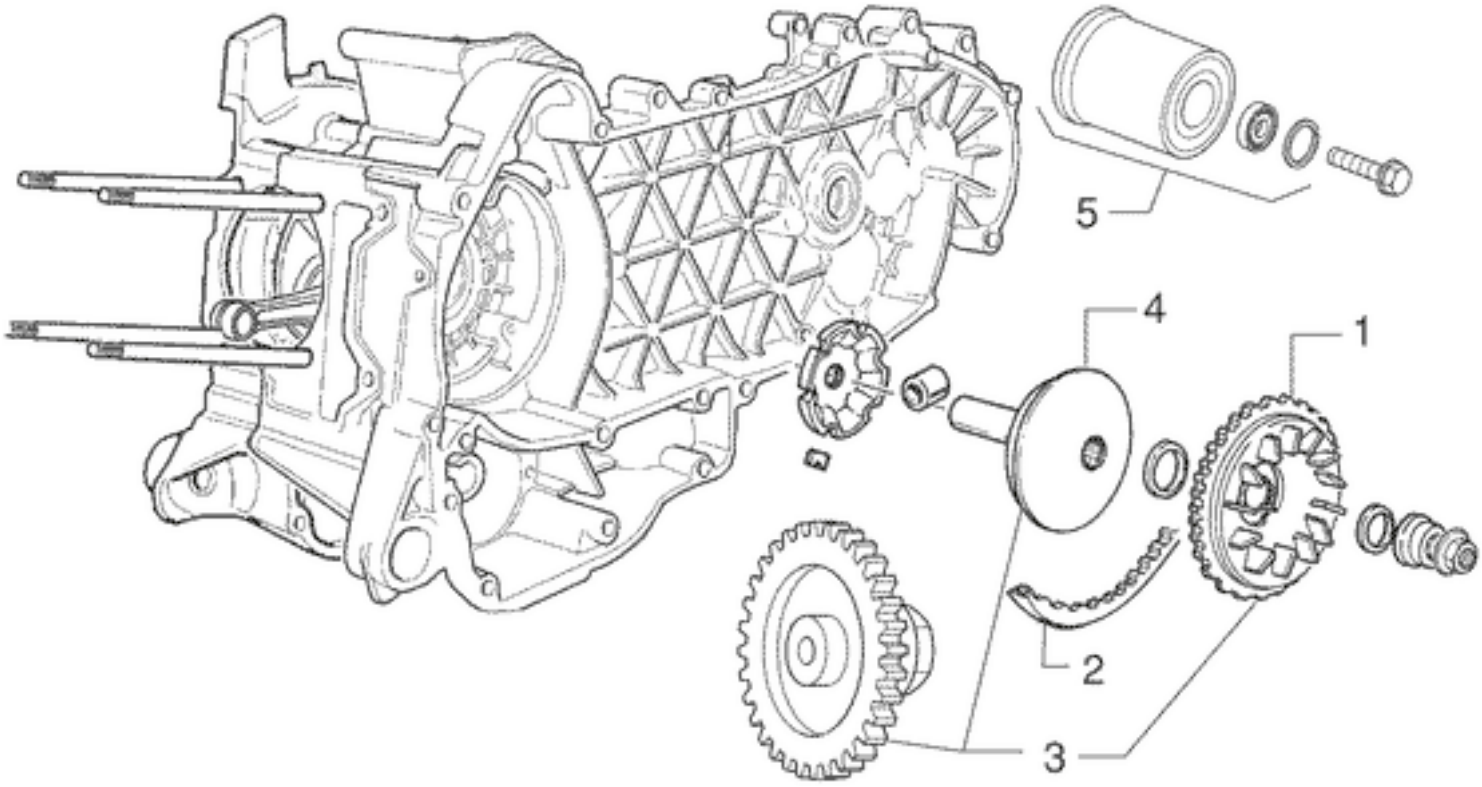


Driving pulley

DRIVING PULLEY REPAIR TIME

	Code	Action	Duration
1	001086	Driving half-pulley - Replacement	
2	001011	rear-view belt - Replacement	
3	001006	rear-view pulley - Service	
4	001066	driving pulley - Replacement	
5	001141	Belt anti-vibration roller - Replacement	

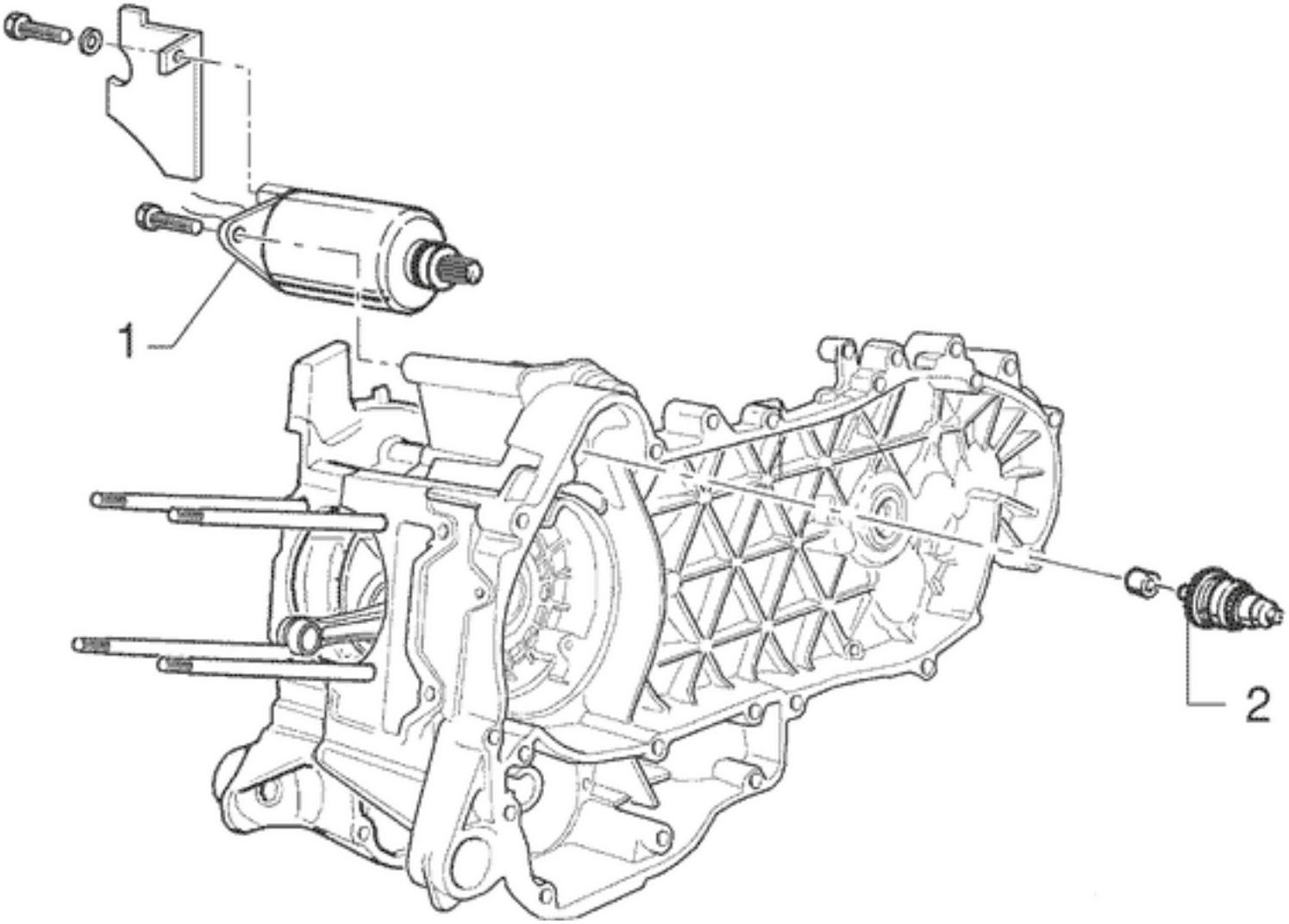
	Code	Action	Duration
6	001175	Anti-vibration roller - Service	



Starter motor

ELECTRIC START-UP REPAIR TIME

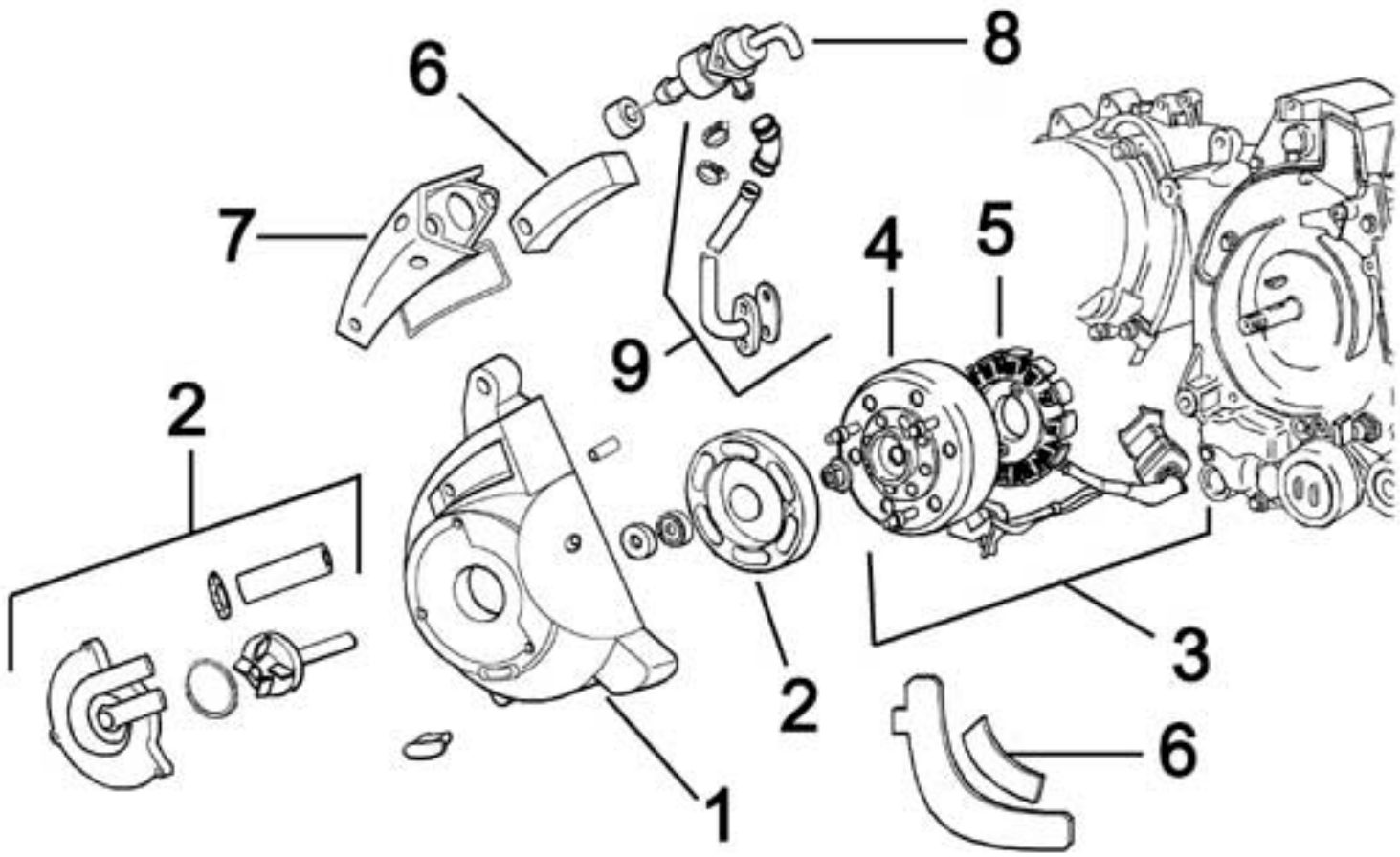
	Code	Action	Duration
1	001020	Starter motor - Replacement	
2	001017	Starter sprocket wheel - Replacement	



Flywheel magneto

MAGNETO FLYWHEEL REPAIR TIME

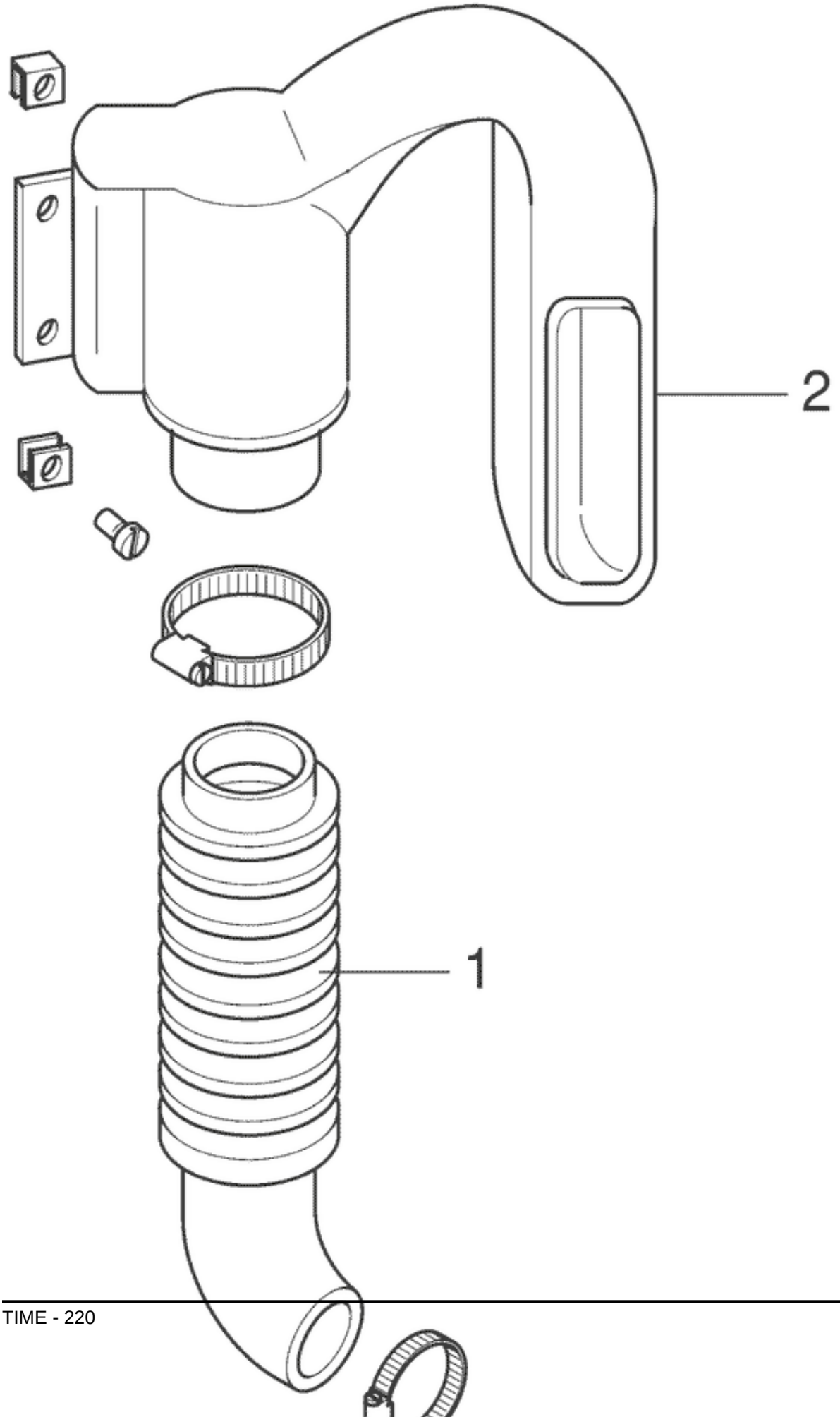
	Code	Action	Duration
1	001087	Flywheel cover - replace	
2	001113	Water pump - Replacement	
3	001058	Flywheel - Replacement	
4	001067	Stator - Replacement	
5	001173	Rotor - Replacement	
6	001161	Secondary air filters - Replacement / Cleaning	
7	001162	Secondary air housing - Replacement	
8	001174	SAS valve - Replacement	
9	001163	SAS valve / Head connection - Replacement	



Belt cooling duct

BELT COOLING PIPE REPAIR TIME

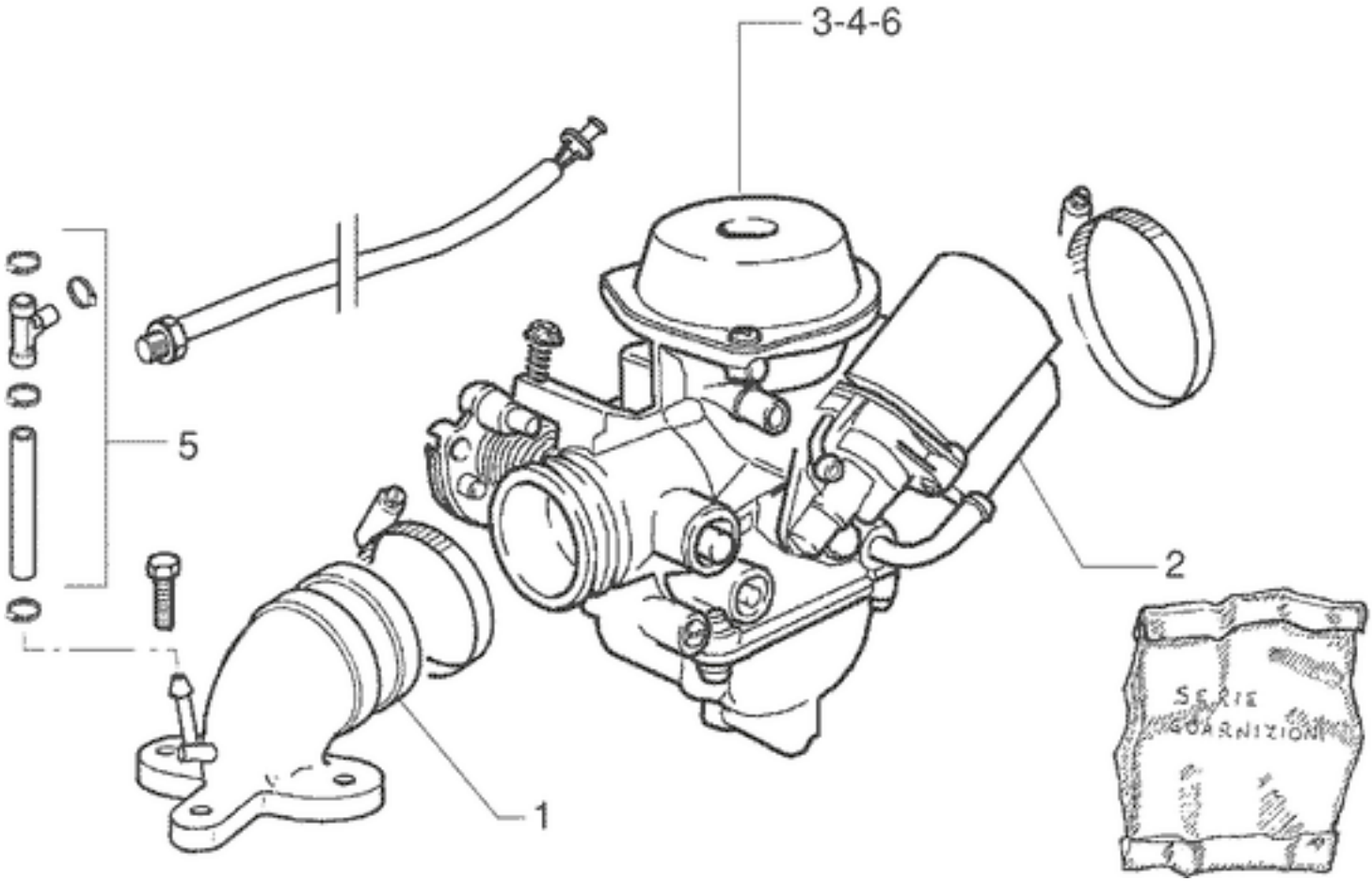
	Code	Action	Duration
1	001132	Transmission air inlet pipe - Replacement	
2	001131	Transmission air intake - Replacement	


2
1

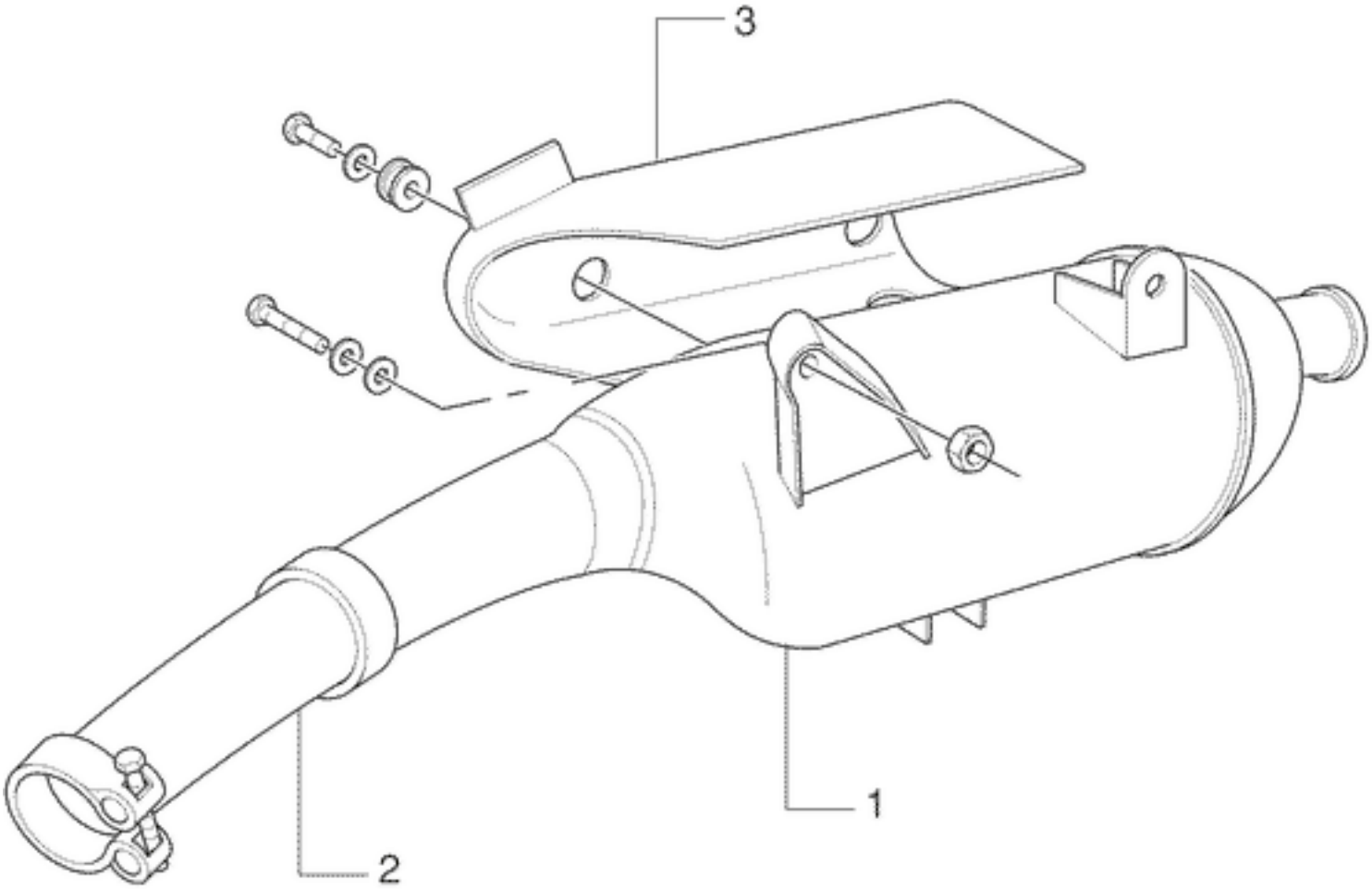
Carburettor

CARBURETTOR REPAIR TIME

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



Exhaust pipe



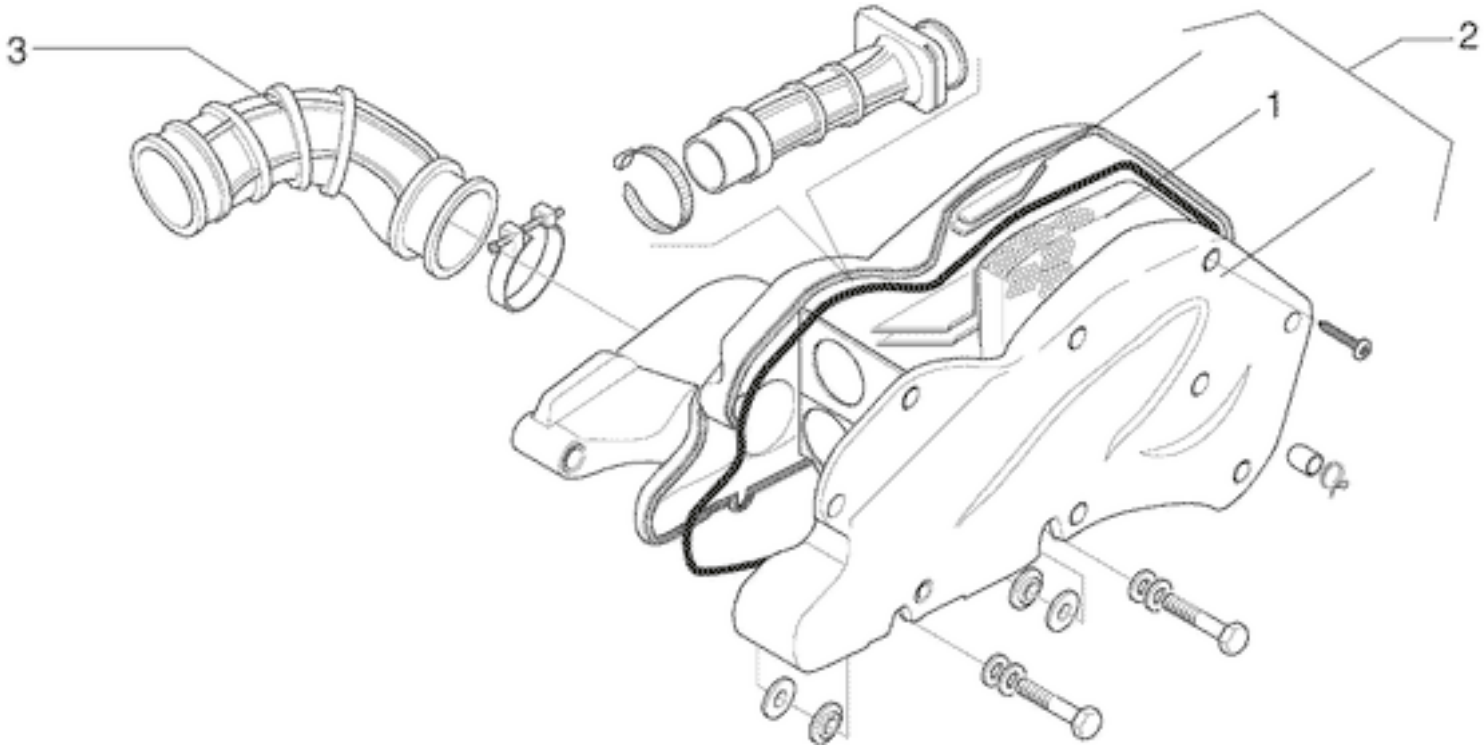
MUFFLER REPAIR TIME

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

Air cleaner

AIR CLEANER REPAIR TIME

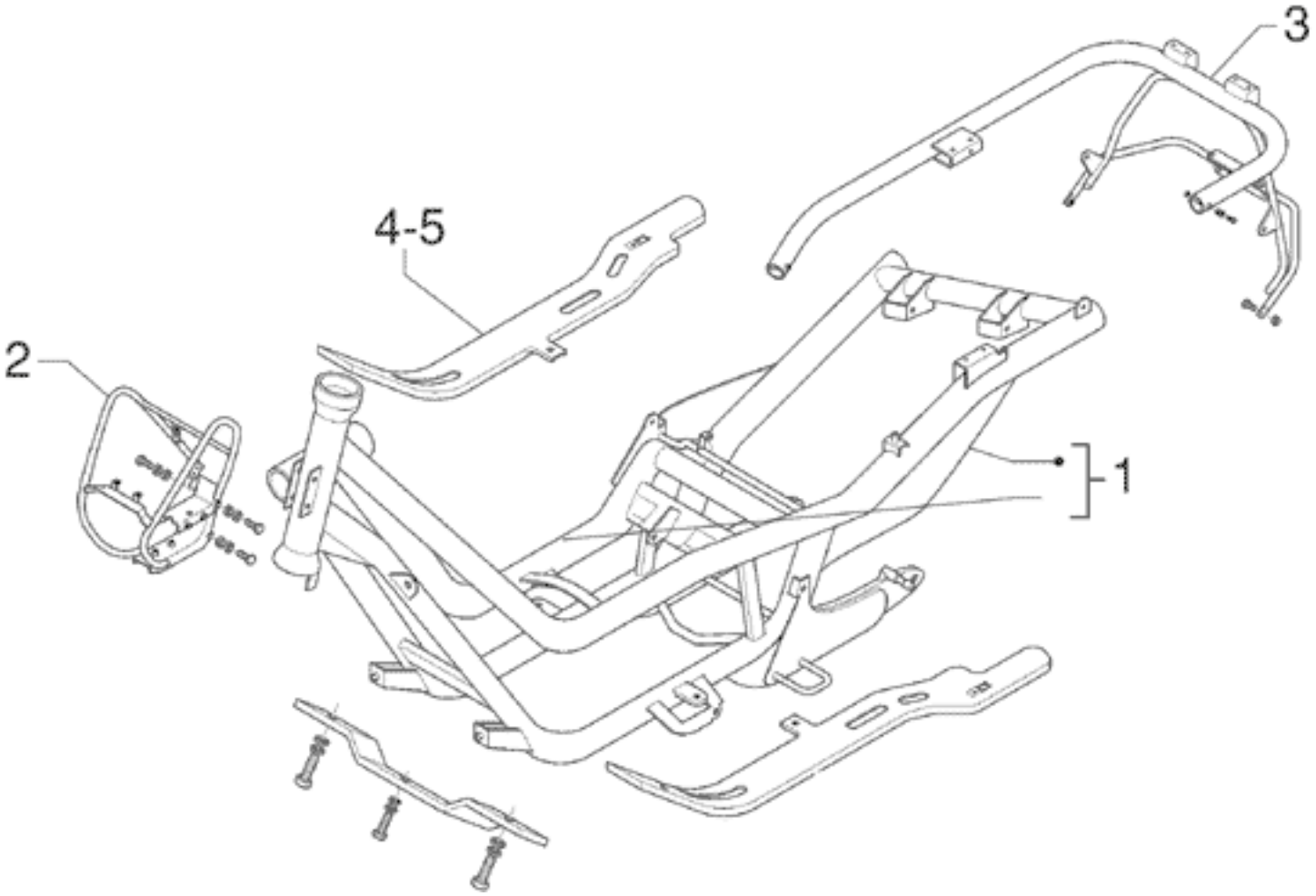
	Code	Action	Duration
1	001014	Air filter - Replacement/Cleaning	
2	001015	Air filter box - Replacement	
3	004122	Air cleaner carburettor fitting - Replacement	



Frame

CHASSIS REPAIR TIME

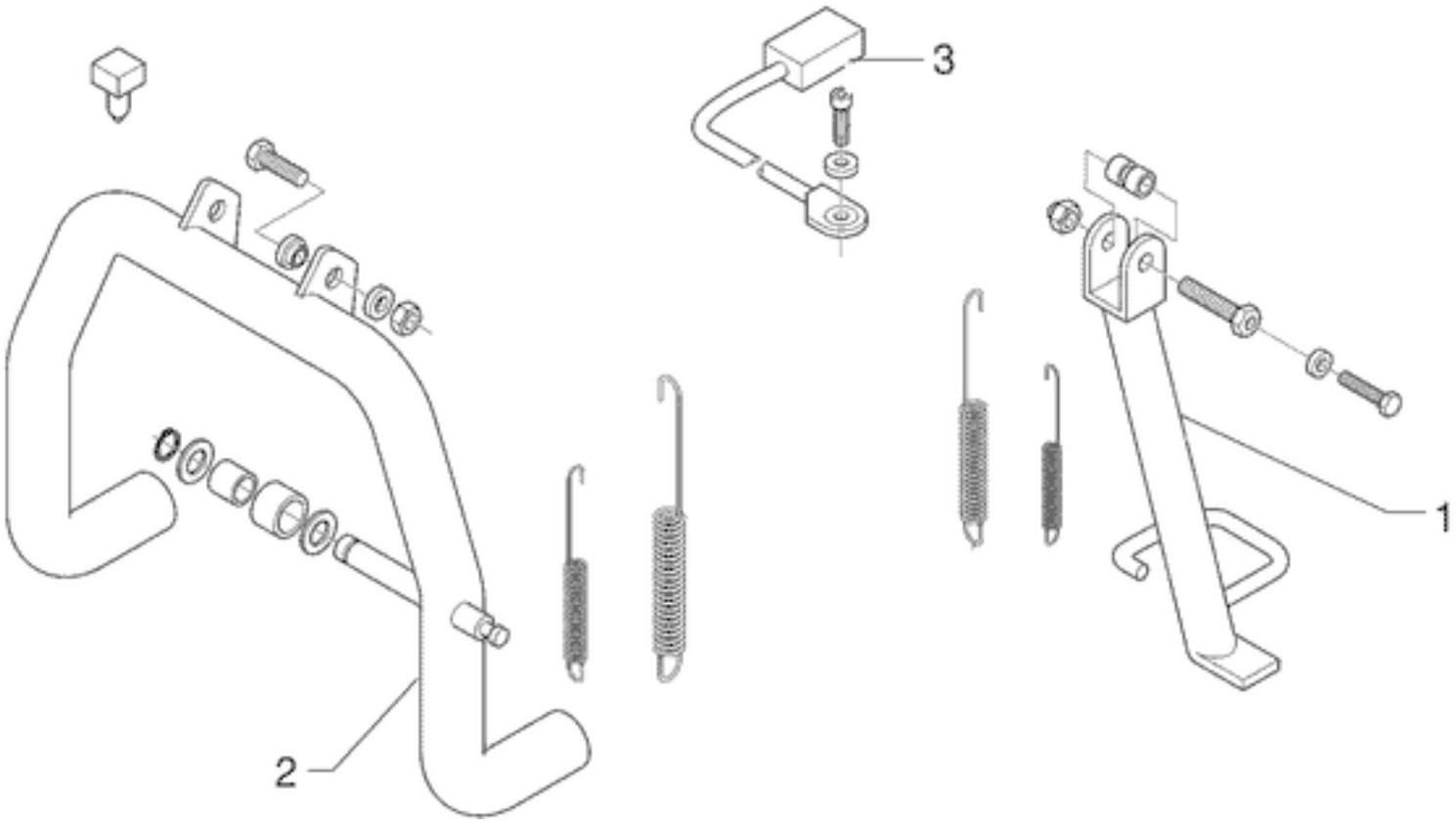
	Code	Action	Duration
1	004148	footboard support bracket two sides - Replacement	
2	004147	Footrest support bracket, one side - Replacement	
3	004116	Rear frame - Replacement	
4	004146	Front frame - Replacement	
5	004001	Frame - replace	



Centre-stand

STAND REPAIR TIME

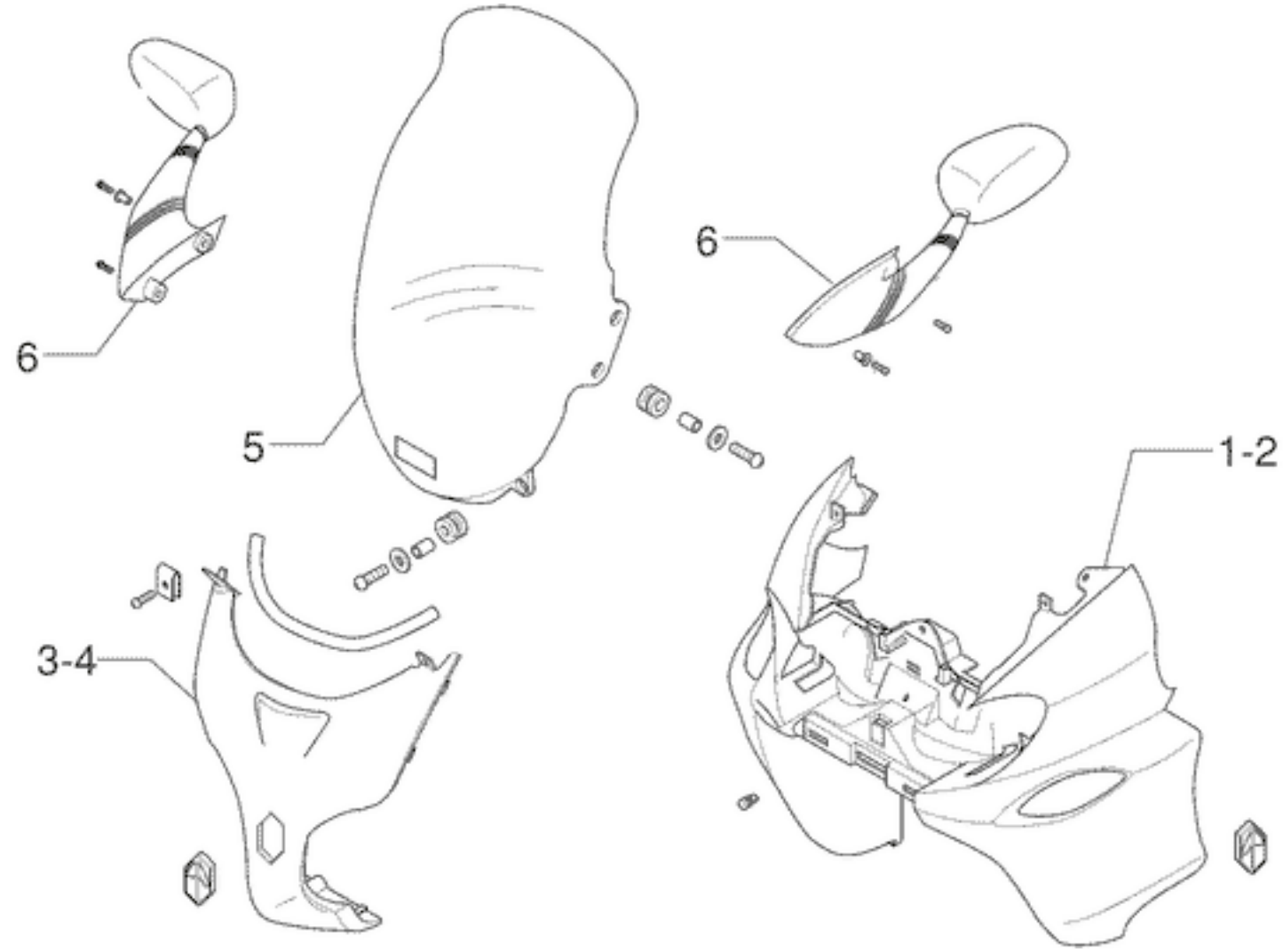
	Code	Action	Duration
1	004004	Stand - Replacement	
2	004102	Side stand - Replacement	
3	005079	Stand switch - Replacement	



Legshield spoiler

SPOILER FRONT SHIELD REPAIR TIME

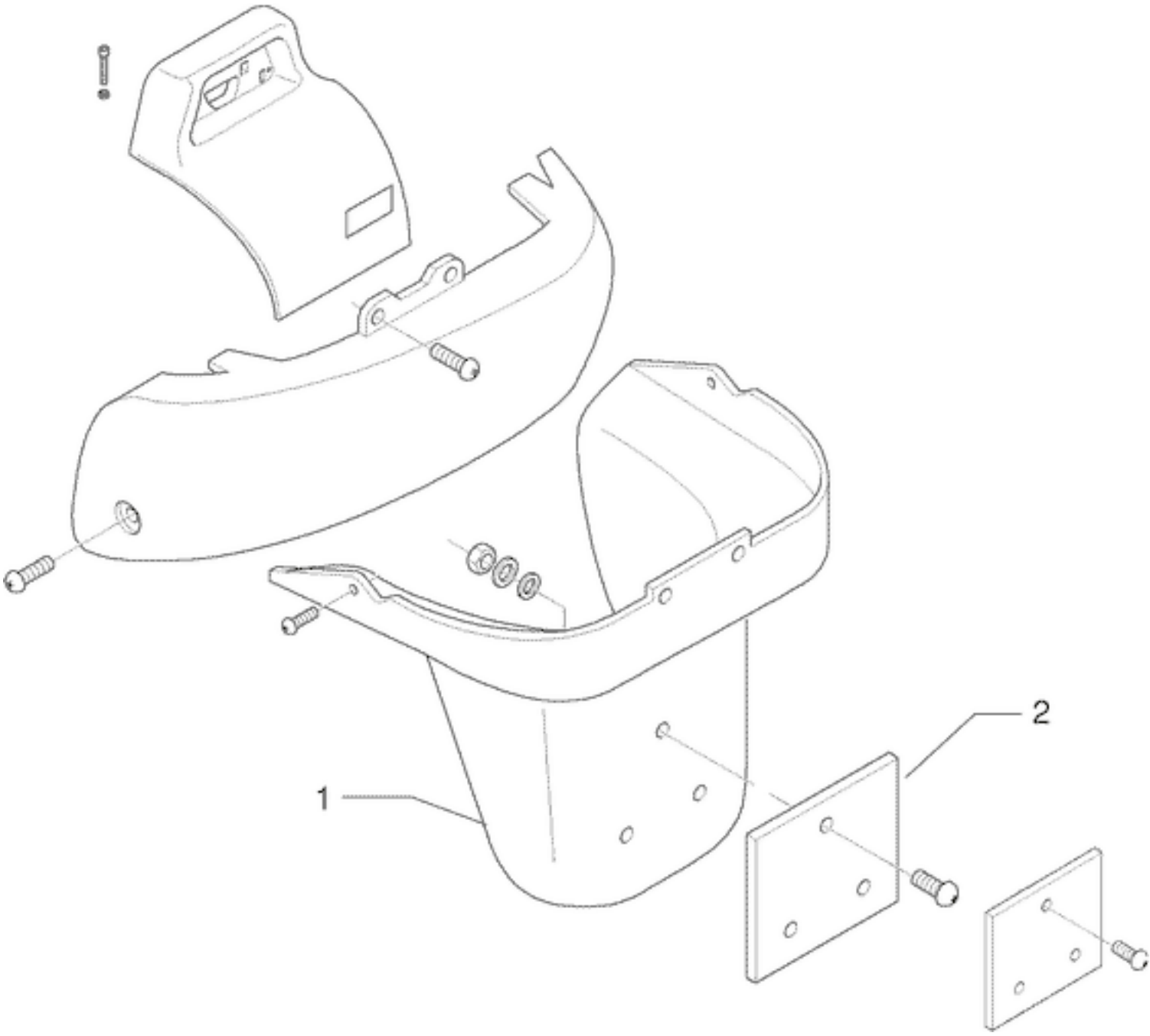
	Code	Action	Duration
1	004066	Rear view mirrors - Replacement	
2	004028	Windshield glass - Replacement	
3	006012	Front shield - Paintwork	
4	006006	Headstock cover - Paintwork	
5	004149	Shield central cover - Replacement	
6	004064	Front shield - front section - Replacement	



Side fairings

43 REAR COVERS

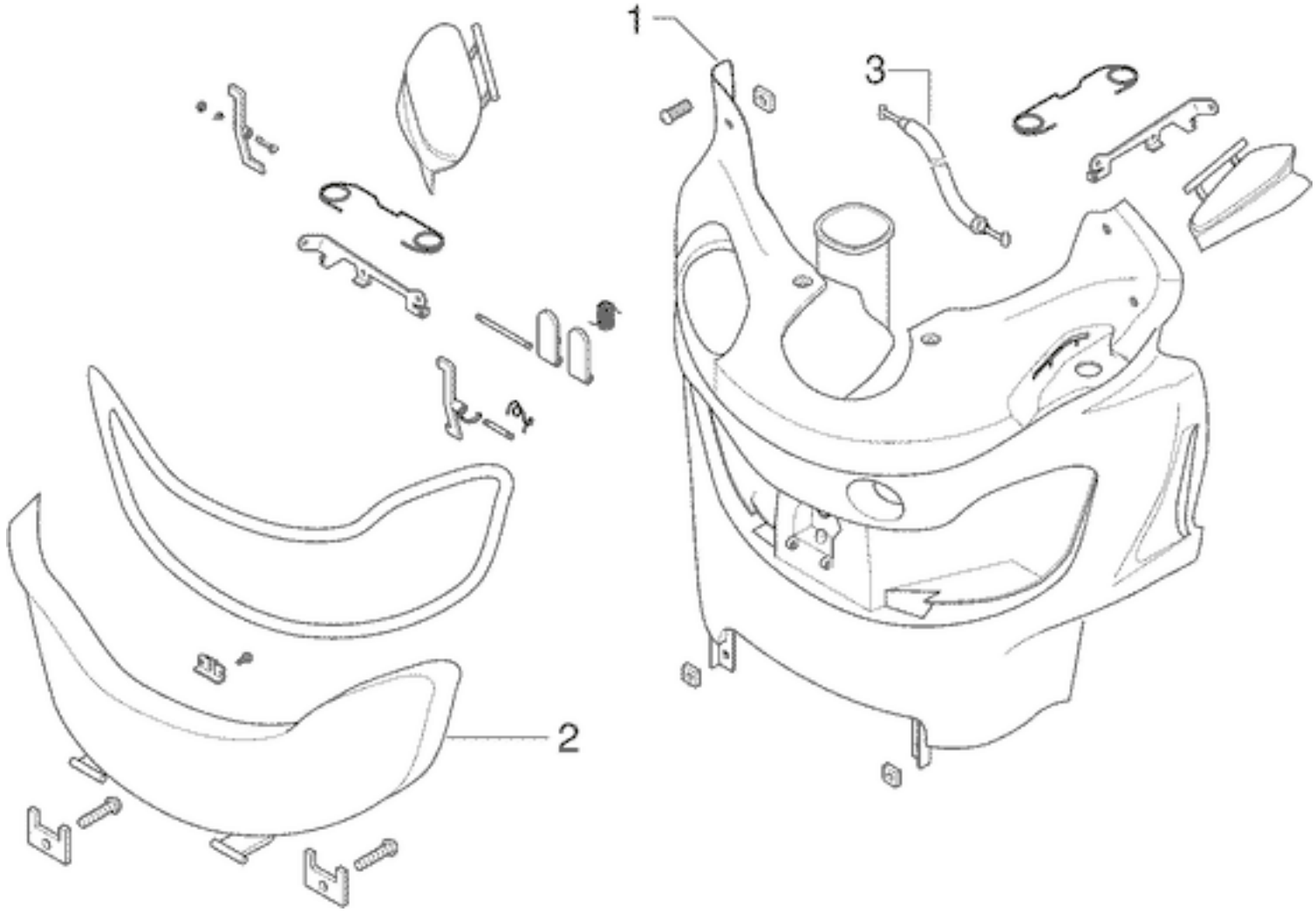
Description	Code	Op.	Minutes
Rear mudguard - Replacement	004009	1	10'
Licence plate holder - Replacement	005048	2	15'



Rear cover

REAR SHIELD REPAIR TIME

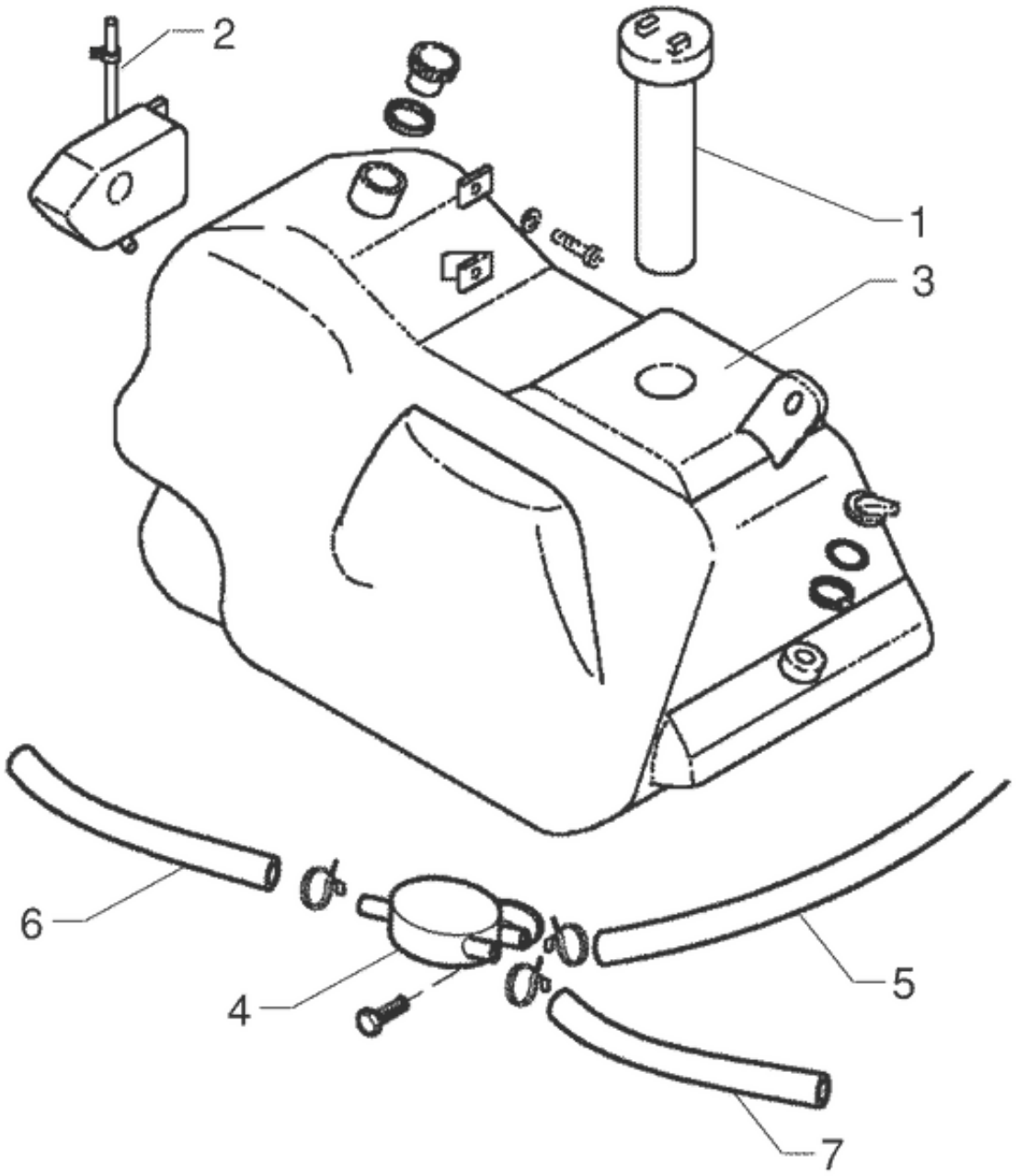
	Code	Action	Duration
1	002082	Fuel tank door opening drive - Replacement	
2	004081	Glove box door - Replacement	
3	004065	Front shield, rear part - Removal and refitting	



Fuel tank

TANK REPAIR TIME

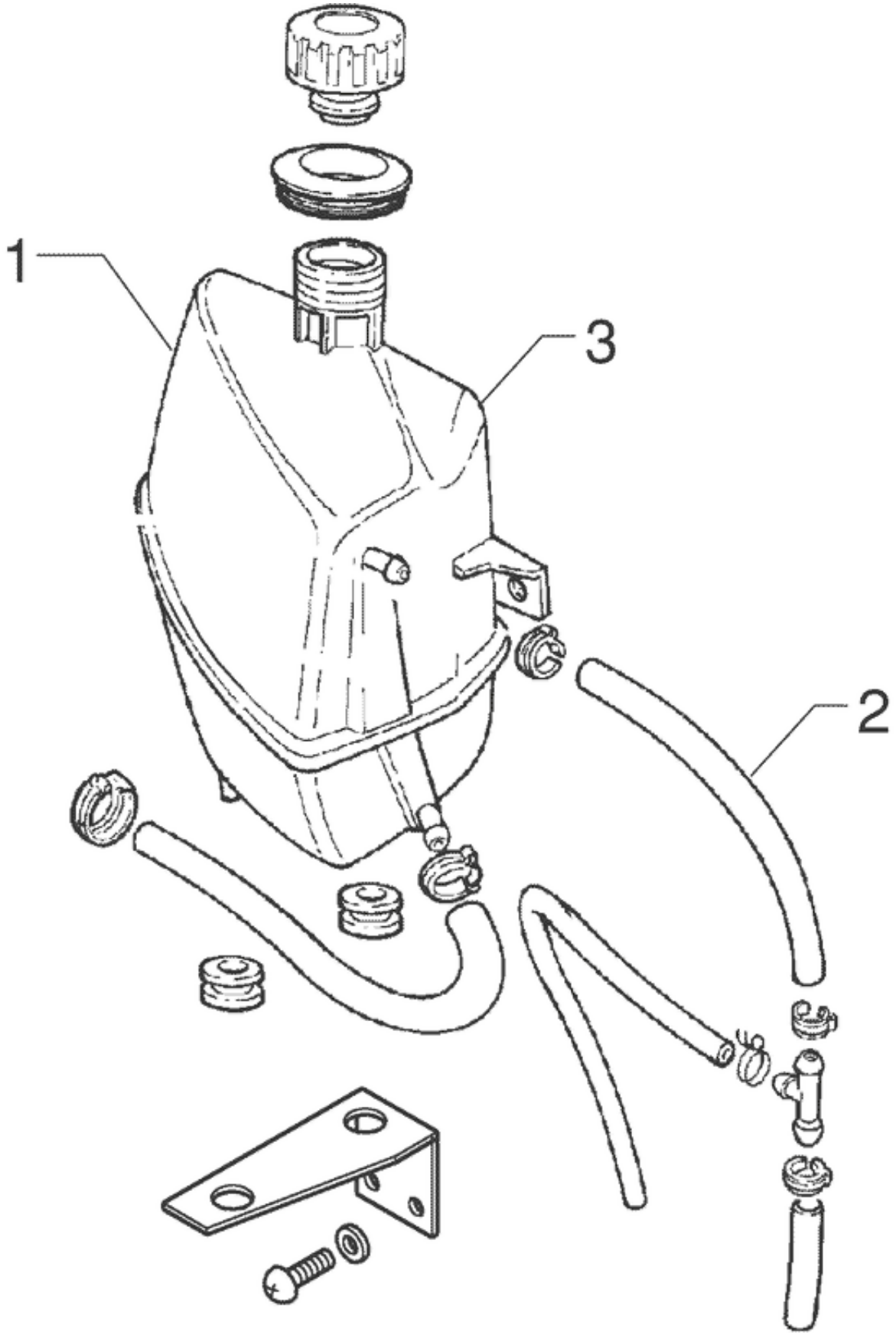
	Code	Action	Duration
1	004089	Tank-pump hose - Replacement	
2	004086	Petrol pump depression tube - Replacement	
3	004137	Carburettor - pump hose - Replacement	
4	004073	Fuel pump - Replacement	
5	004005	Fuel tank - replace	
6	004109	Fuel tank breather - change	
7	005010	Tank float - Replacement	



Expansion tank

EXPANSION TANK REPAIR TIME

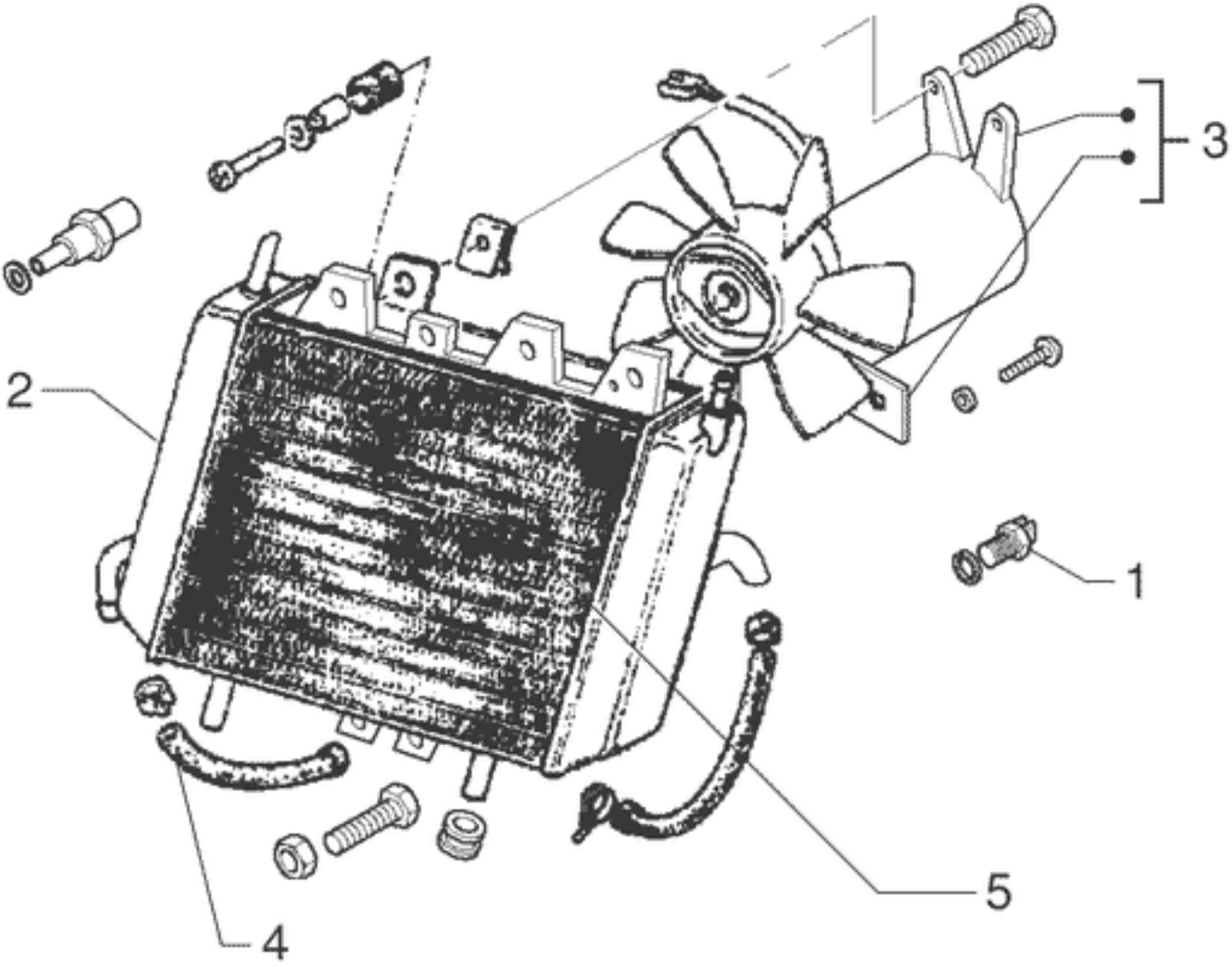
	Code	Action	Duration
1	001052	Coolant and air bleed - Replacement	
2	007013	Expansion tank connection pipe - Replacement	
3	007001	Expansion tank - Replacement	


1
3
2

Radiator

RADIATOR REPAIR TIME

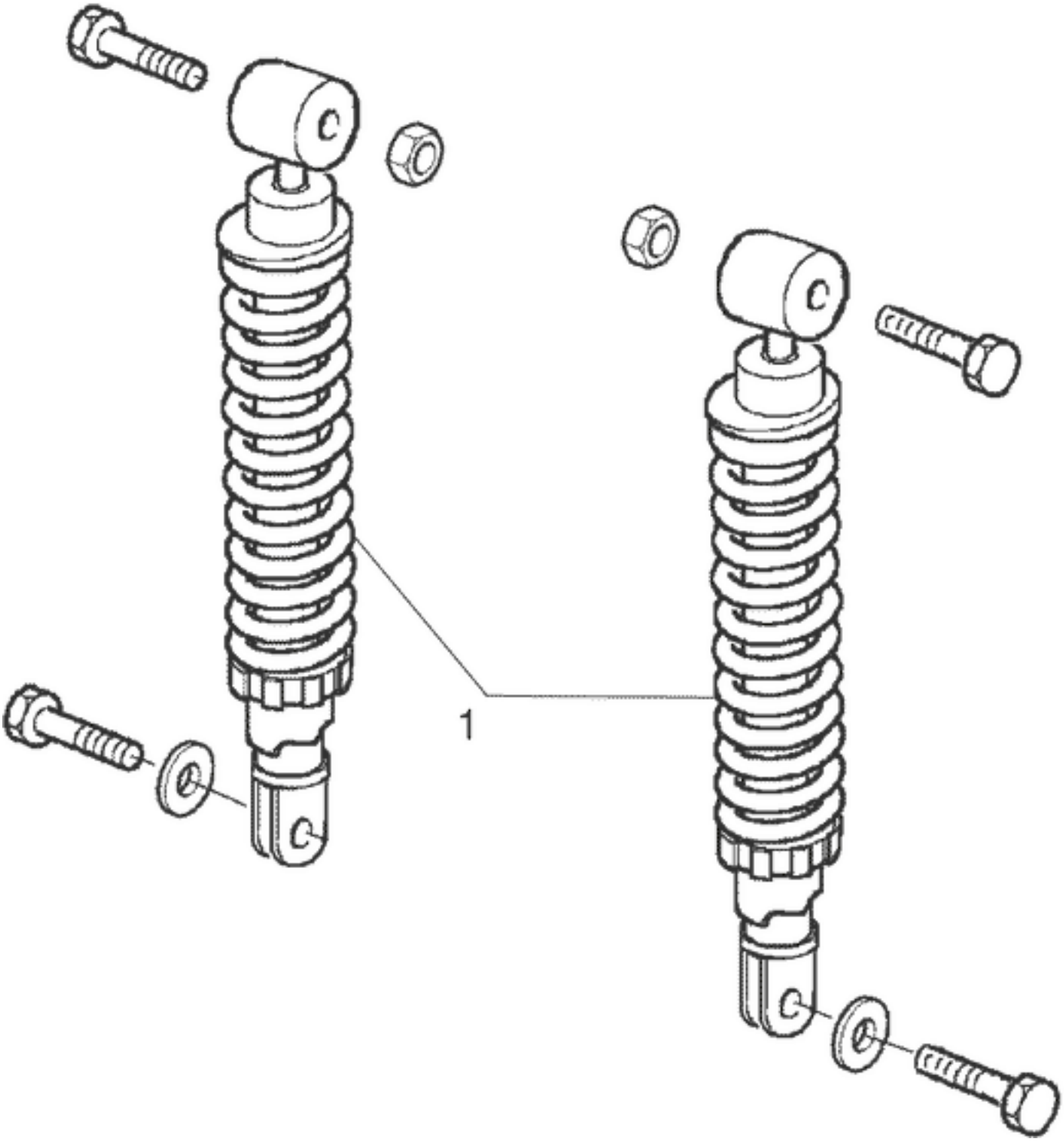
	Code	Action	Duration
1	007003	Coolant delivery and return pipe - Replacement	
2	007016	Fan with support - replace	
3	007002	Radiator - Replacement	
4	007014	Radiator thermal switch - Replacement	



Rear shock-absorber

REAR SHOCK ABSORBER

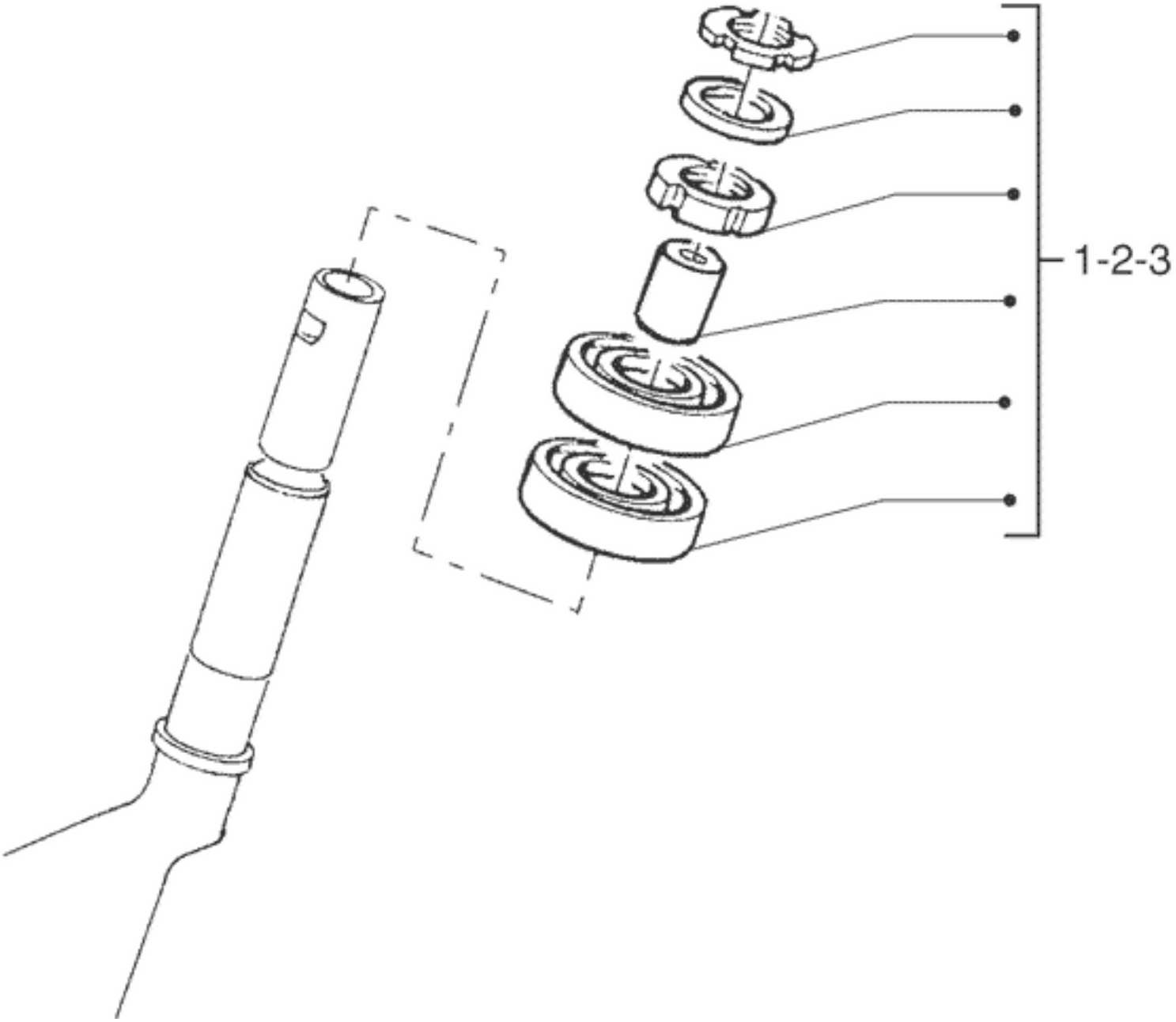
	Code	Action	Duration
1	003007	Rear shock absorber - Replacement	



Steering column bearings

STEERING FIFTH WHEEL REPAIR TIME

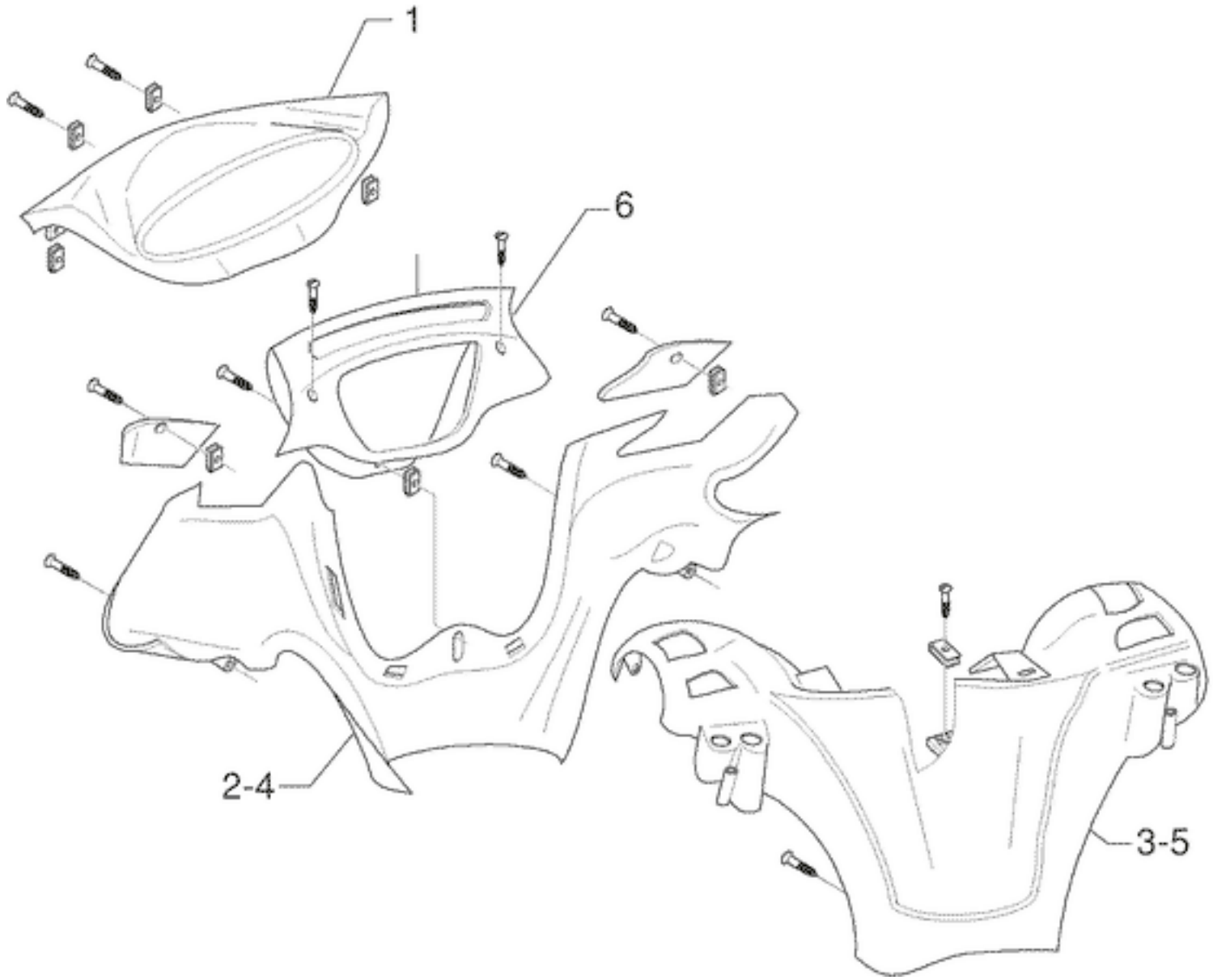
	Code	Action	Duration
1	003073	Steering clearance - Adjust	
2	003002	Steering fifth wheel - Replacement	
3	004119	Bearing / Steering support fifth wheel - Replacement	



Handlebar covers

HANDLEBAR COVER

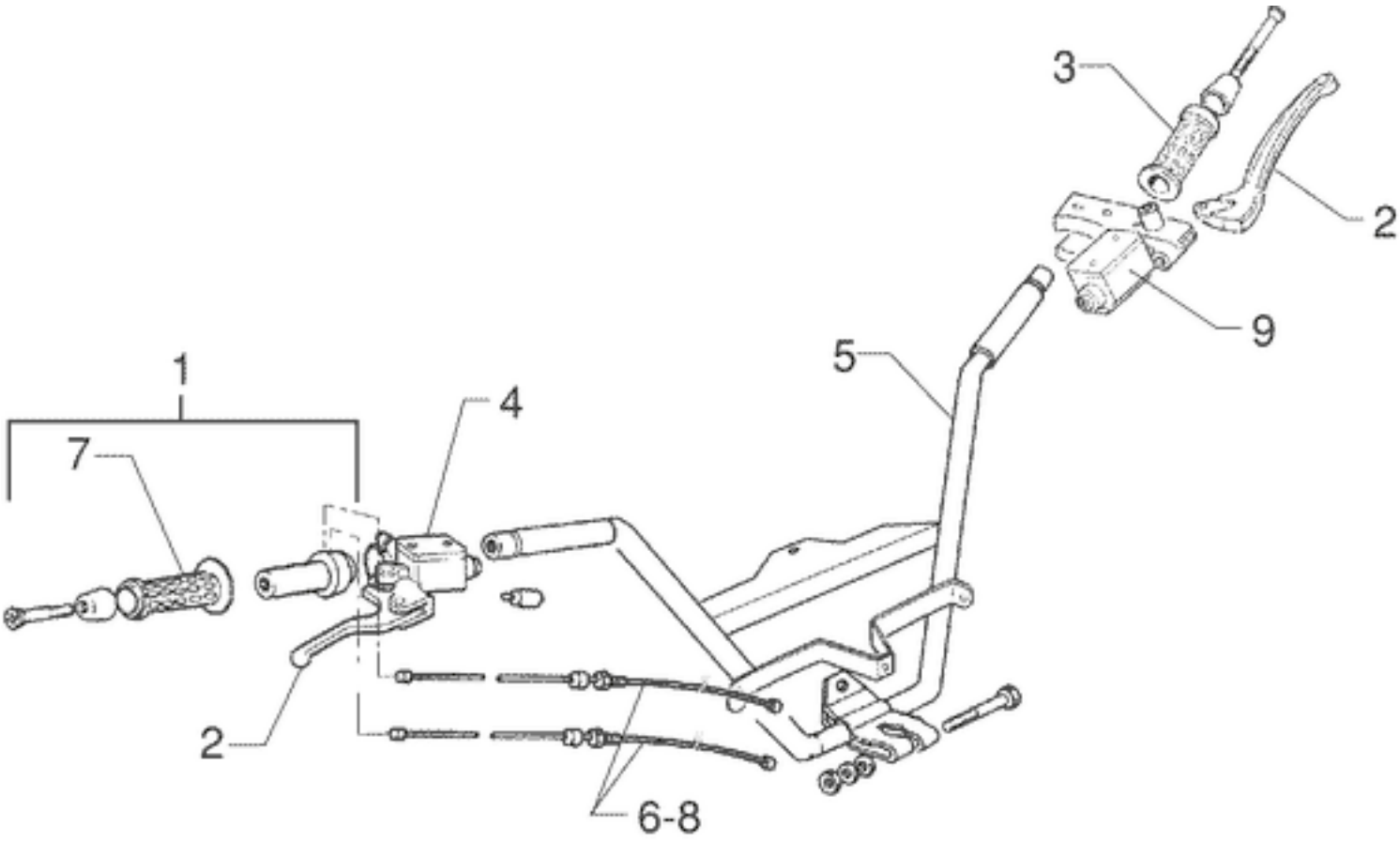
	Code	Action	Duration
1	004152	Board computer cover - Replacement	
2	006014	Handlebar rear part - Painting	
3	006013	Handlebar front part - Painting	
4	004019	Handlebar rear section - Replacement	
5	004018	Front handlebar cover - Replacement	
6	004151	Instrument panel support - Replacement	



Handlebar components

HANDLEBAR COMPONENTS

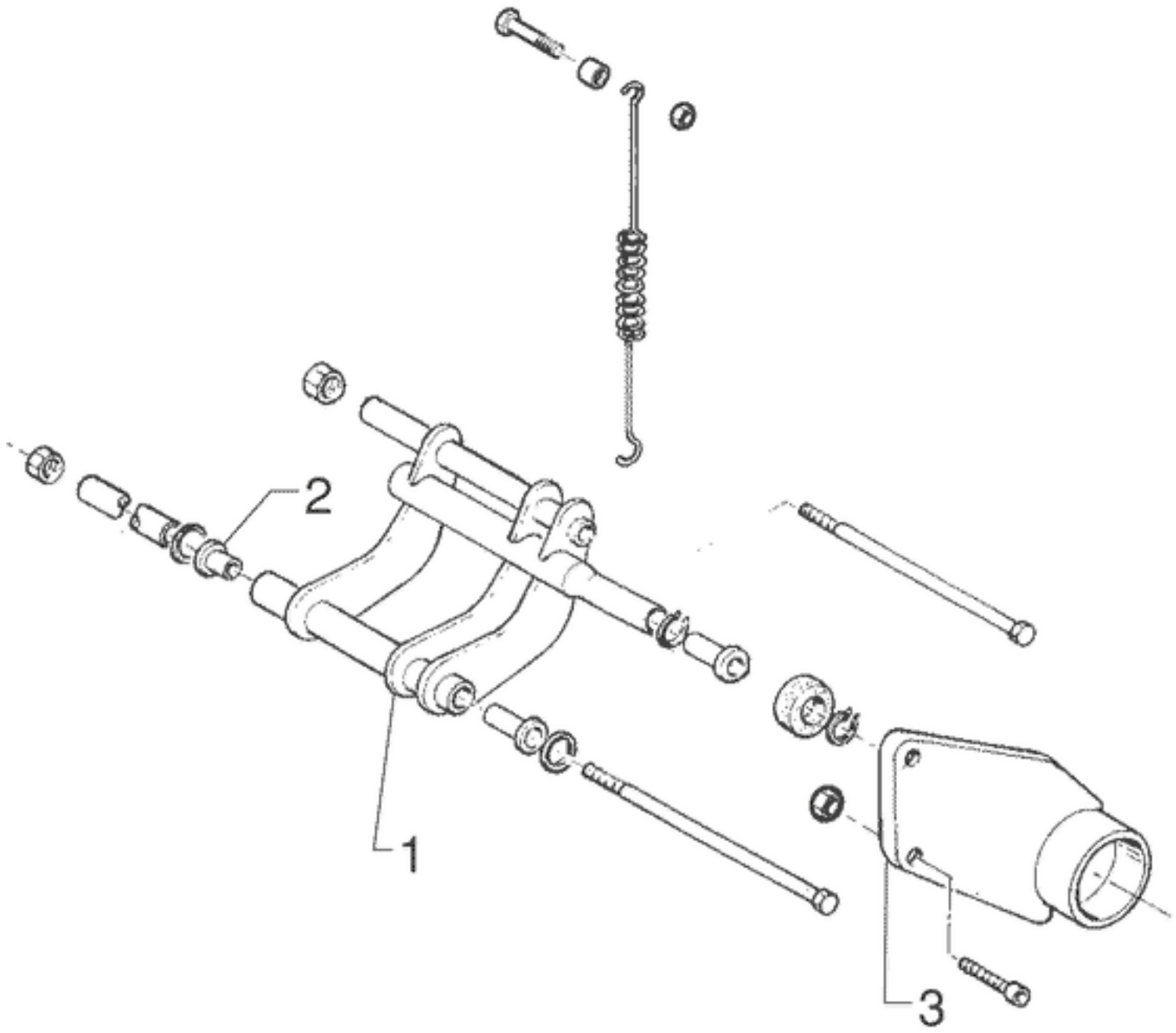
	Code	Action	Duration
1	002088	Integral brake pump - Replacement	
2	003061	Accelerator transmission - Adjustment	
3	002059	Right hand grip - Replacement	
4	002063	Throttle control transmission - Replacement	
5	003001	Handlebar - Removal and refitting	
6	002024	Front brake pump - replace	
7	002071	Left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



Swing-arm

SWINGING ARM REPAIR TIME

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

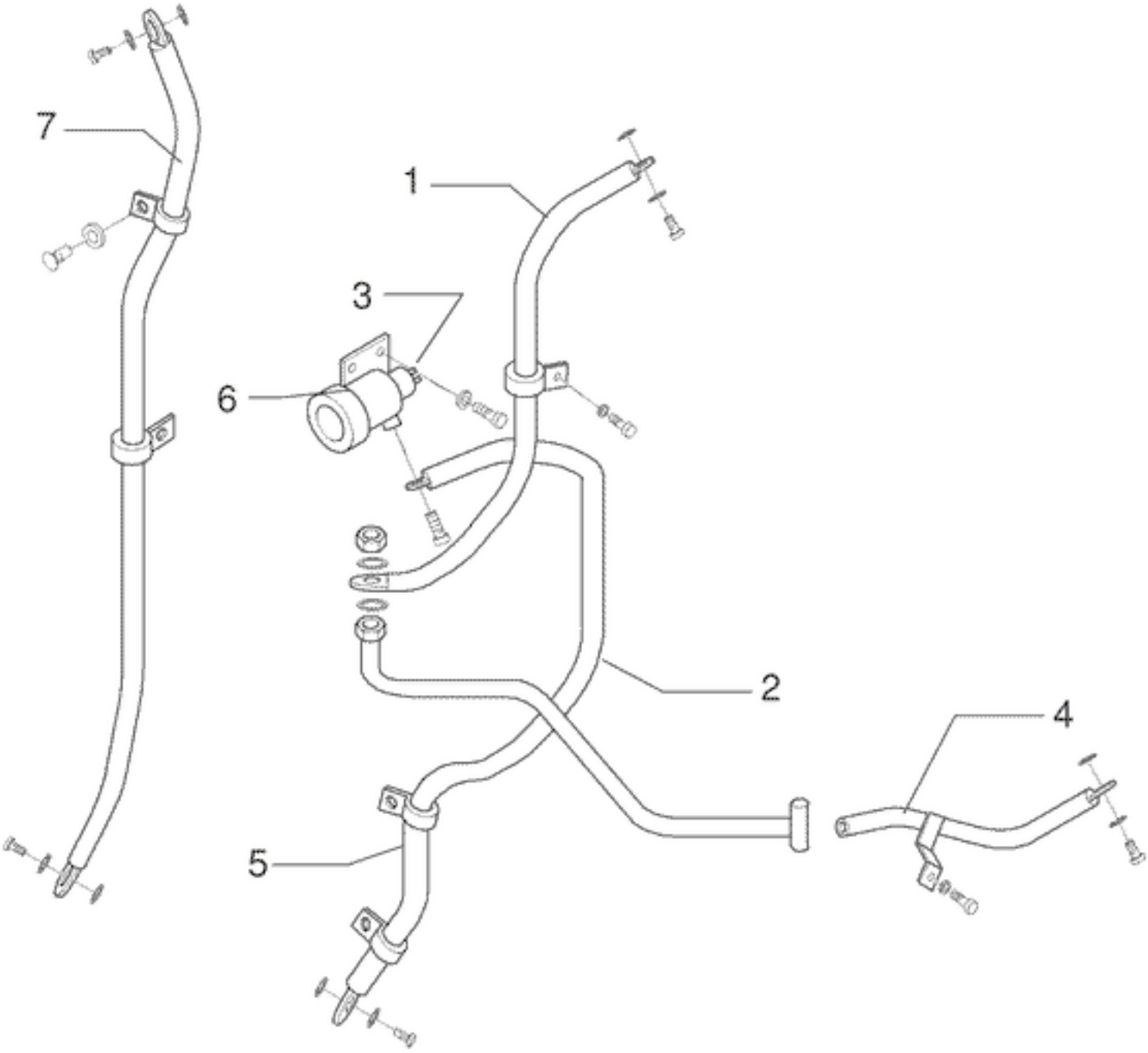


Brake hoses

BRAKE PIPING

	Code	Action	Duration
1	002021	Front brake piping - Replacement	
2	002090	Integral brake fluid and system bleeding - Change	
3	002086	Integral brake front rigid pipe- Replacement	
4	002087	Integral brake rear rigid pipe- Replacement	
5	002089	Integral braking device - Replacement	

	Code	Action	Duration
6	002085	Integral brake device pipe- front caliper - Replacement	
7	002084	Integral brake pump pipe, device - Replacement	

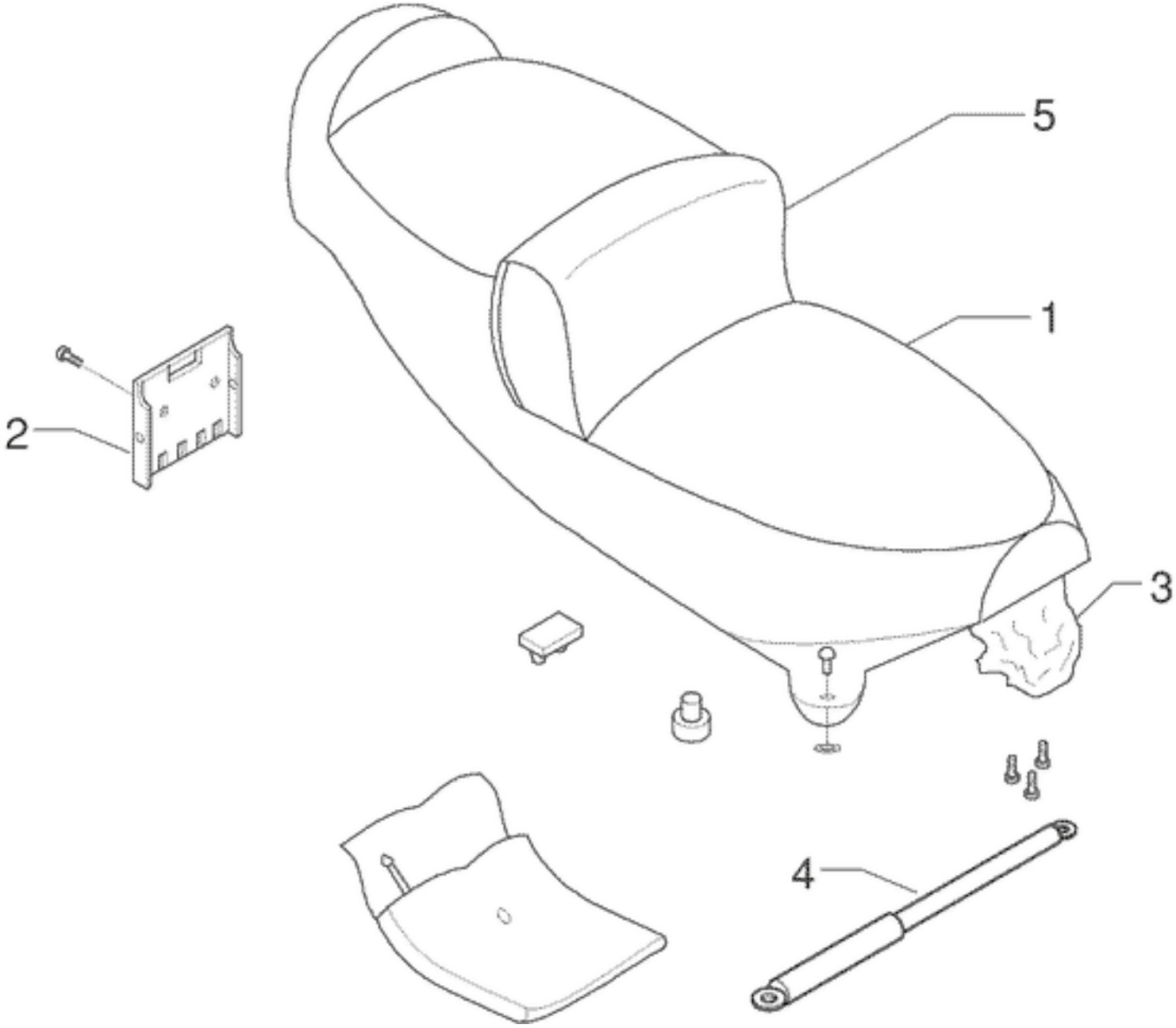


Seat

SADDLE REPAIR TIME

	Code	Action	Duration
1	004067	Rider backrest - Replacement	
2	004150	Saddle shock absorber - Replacement	

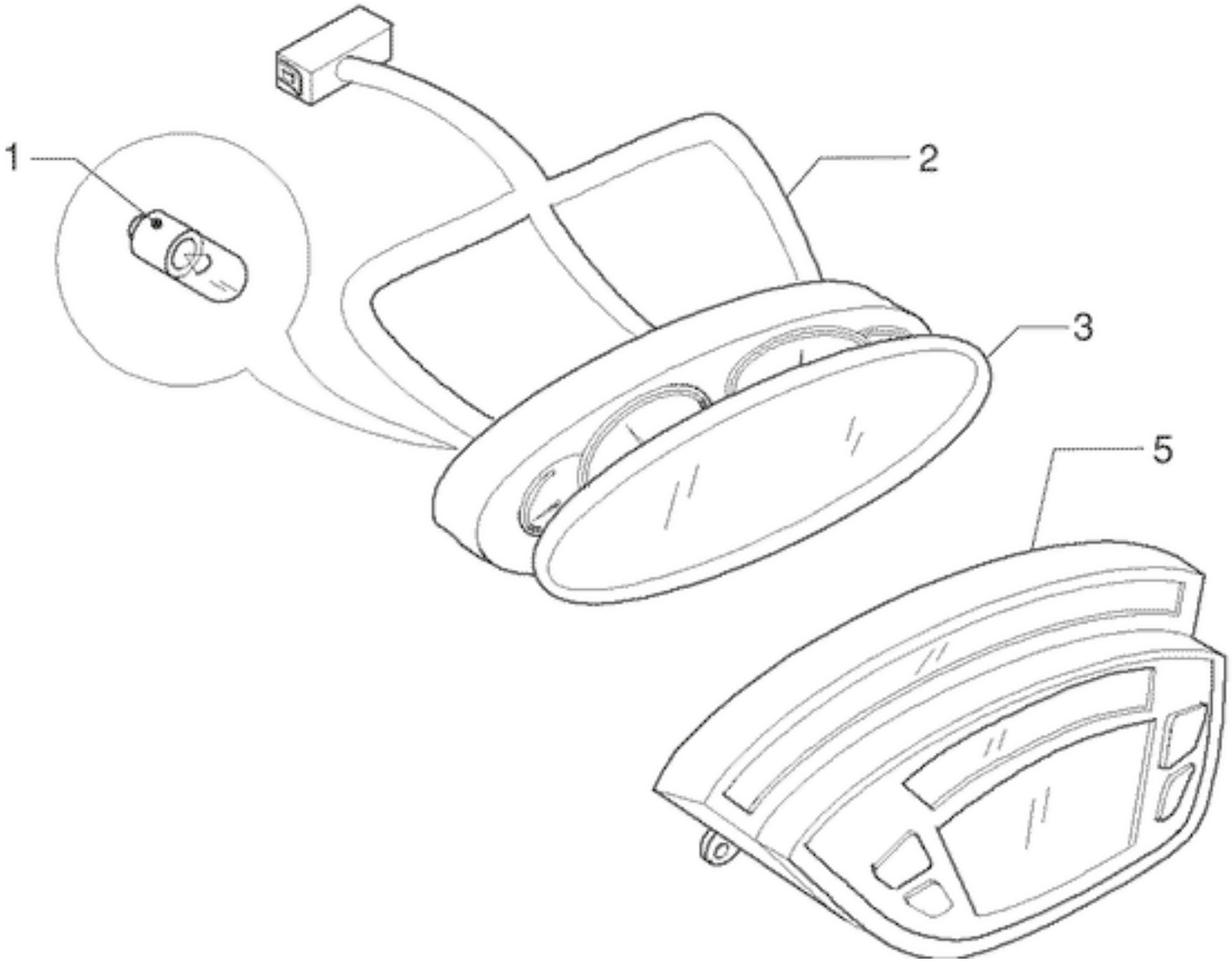
	Code	Action	Duration
3	004144	Port and/or saddle cover - Replacement	
4	004054	Saddle lock catch - Replacement	
5	004003	Saddle - Replacement	



Instrument panel

INSTRUMENT PANEL REPAIR TIME

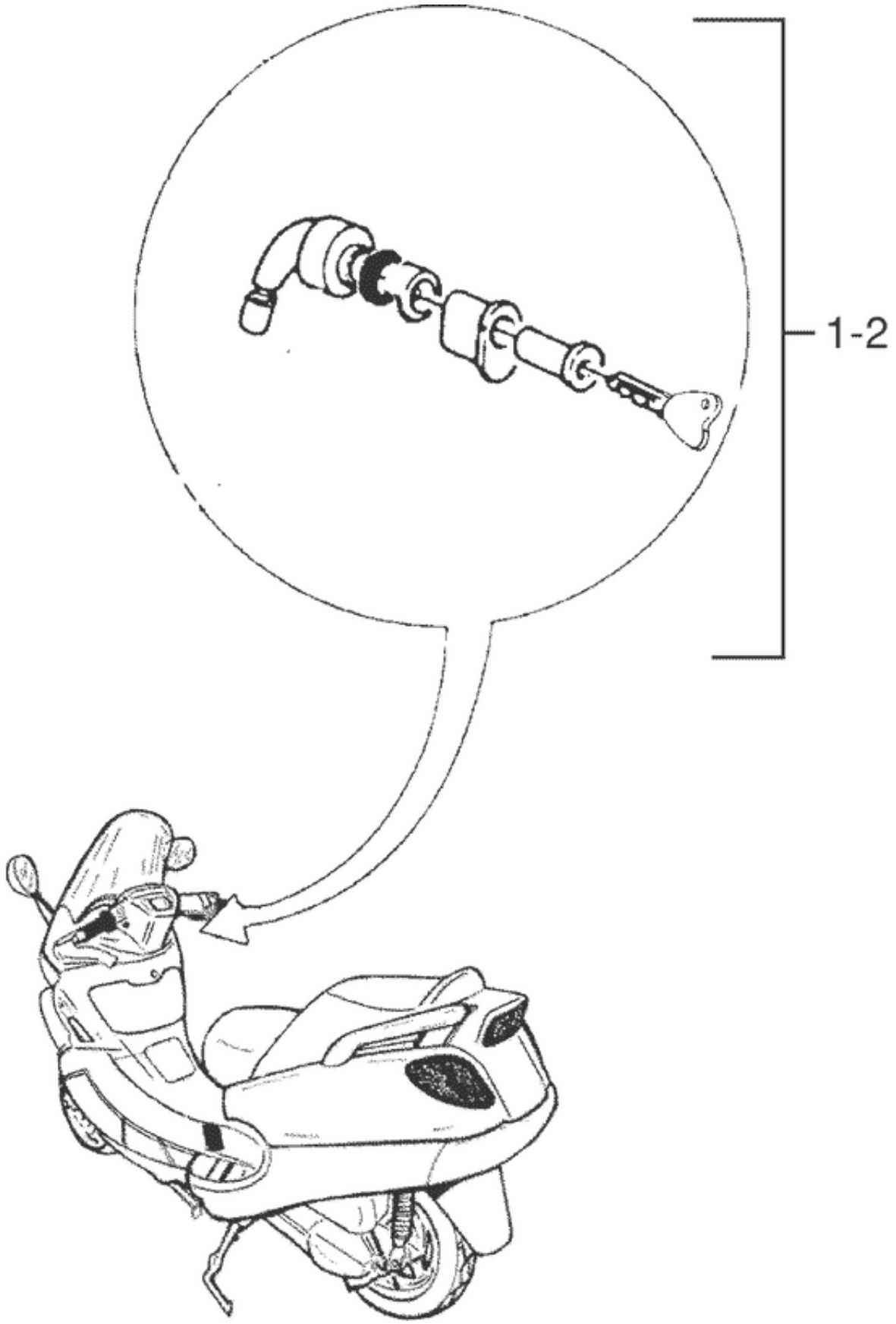
Titolo	Durata/Valore	Testo Breve (< 4000 car.)	Indirizzo Immagine
Instrument panel repair time			



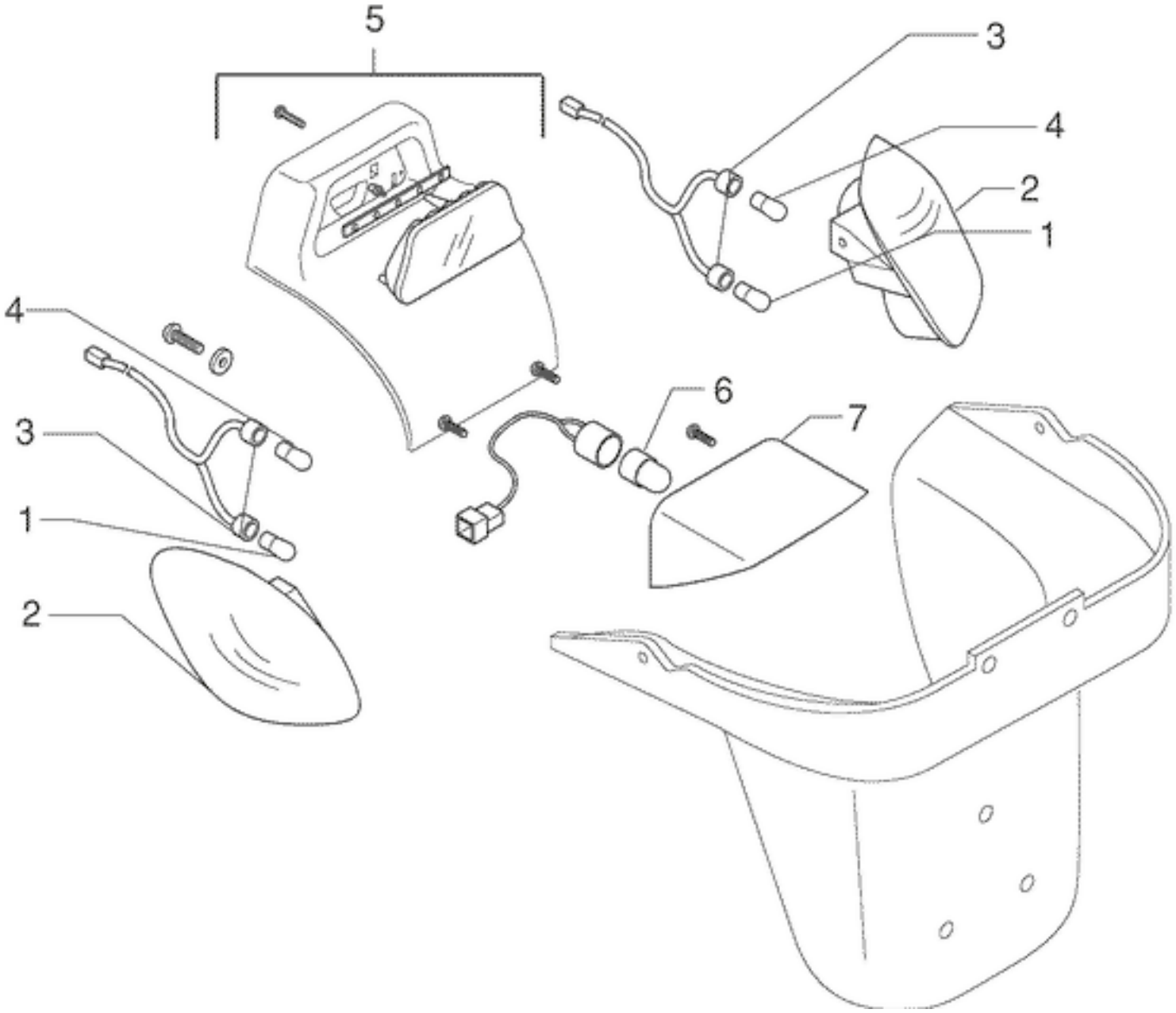
Locks

LOCKS

	Code	Action	Duration
1	004010	Antitheft lock - Replacement	
2	005016	Key switch - Replacement	


1-2

Turn signal lights



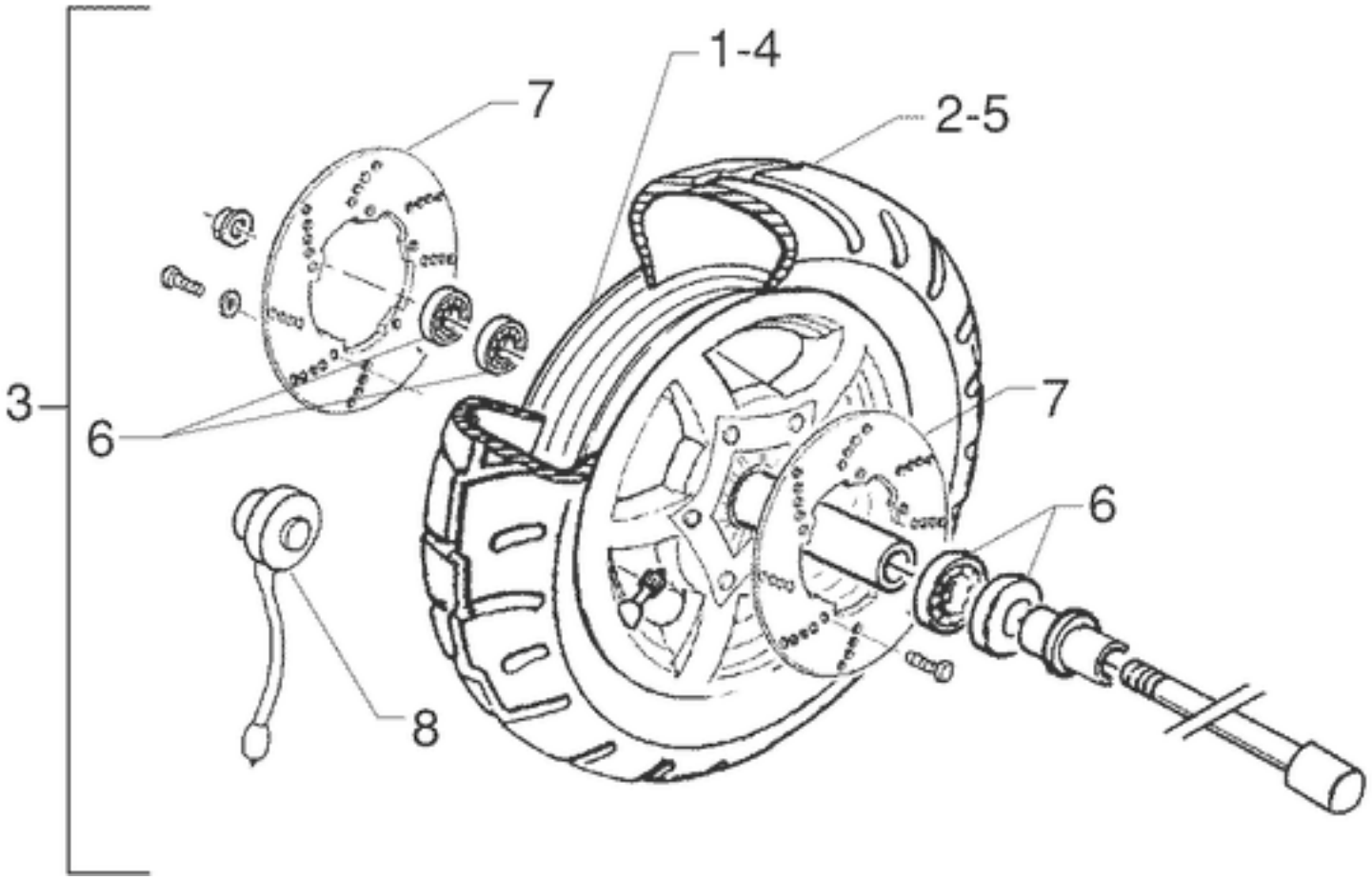
REAR LIGHTS

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

Front wheel

FRONT WHEEL

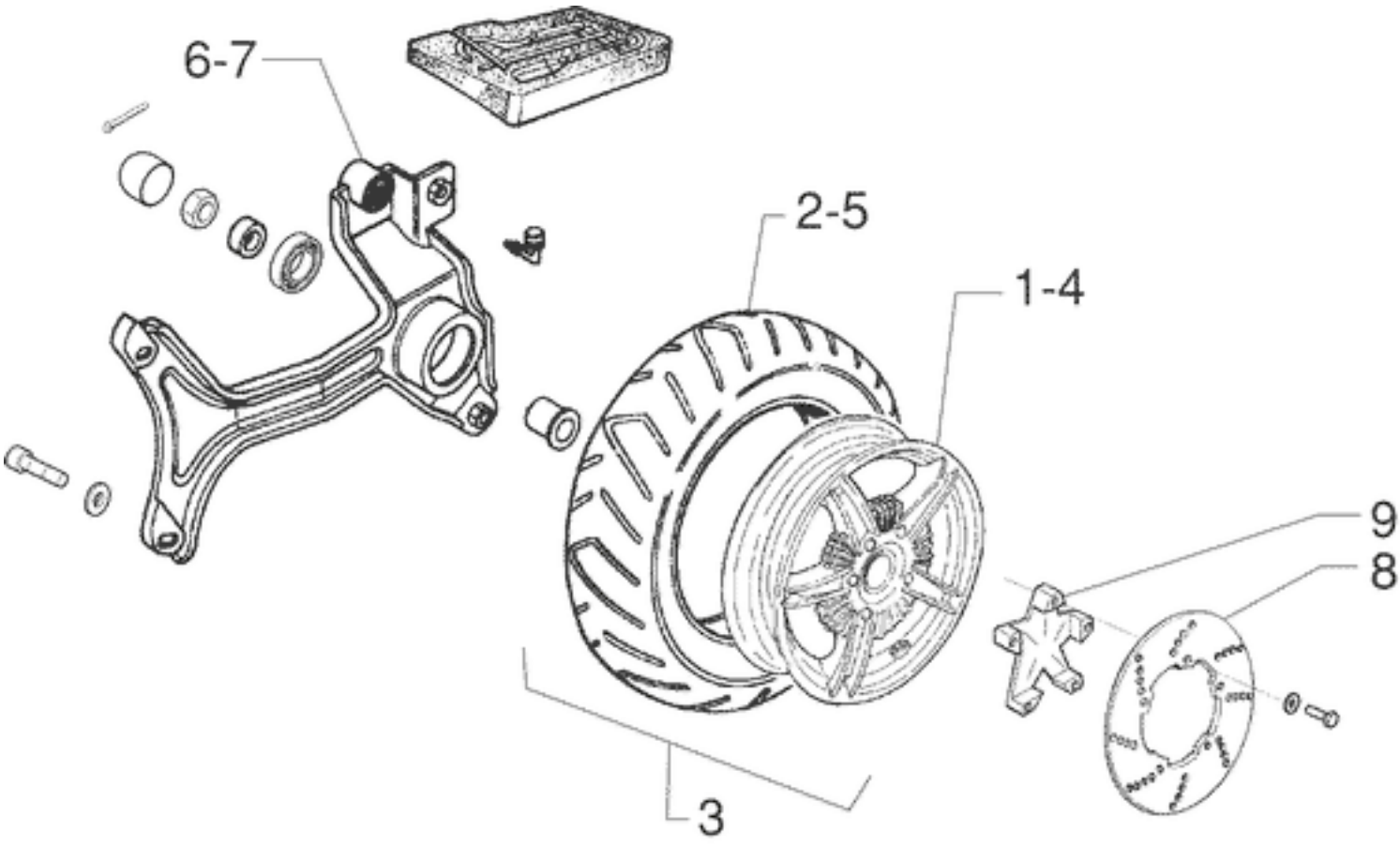
	Code	Action	Duration
1	005089	Tone wheel - Replacement	
2	002041	Front brake disc - Replacement	
3	003040	Tyre pressure - Check	
4	003063	Tyre pressure - Check	
5	006018	Wheel rim - Paintwork	
6	004123	Front wheel - Replacement	
7	003047	Front tyre - Replacement	
8	003037	Front wheel rim - Replacement	



Rear wheel

REAR WHEEL

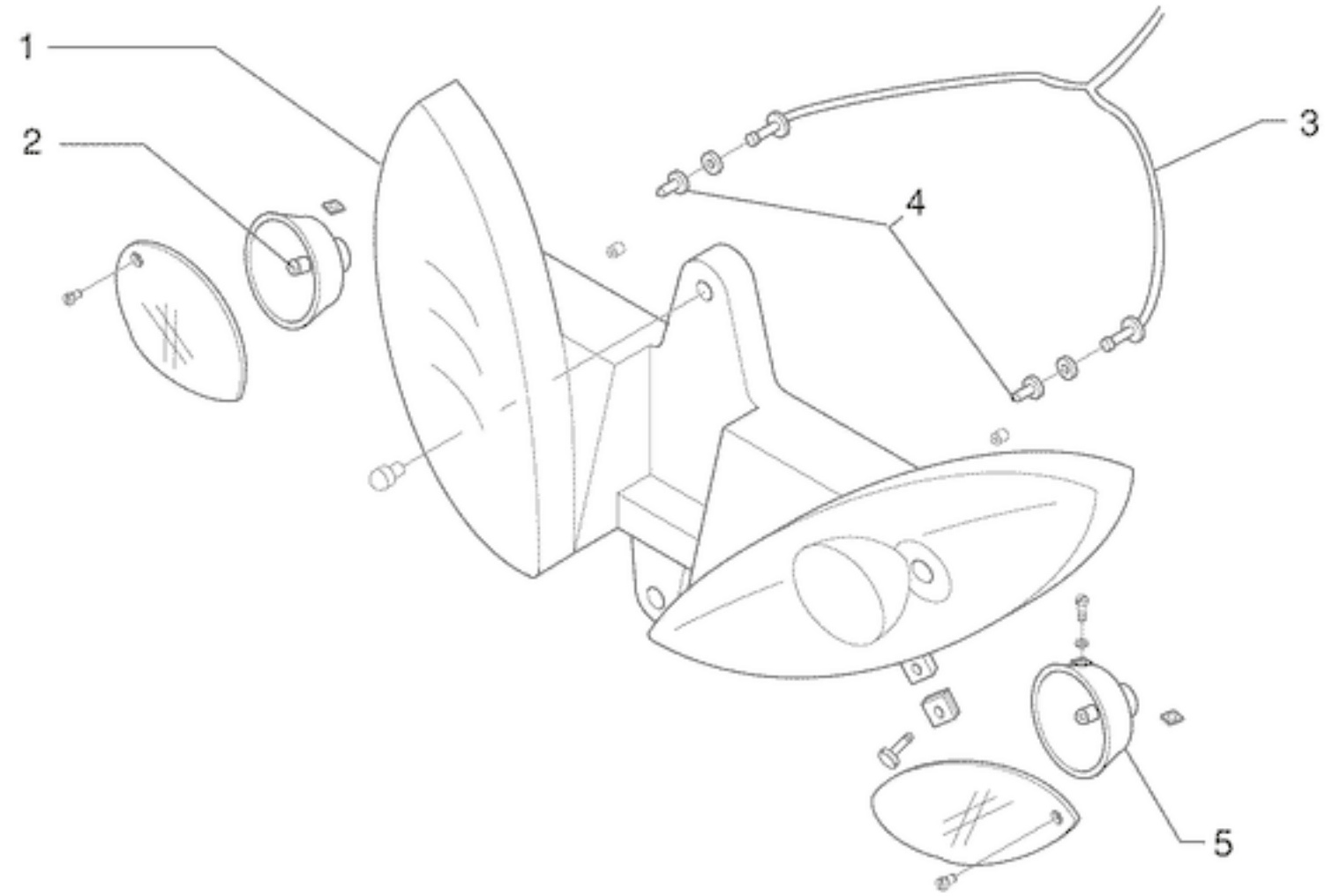
	Code	Action	Duration
1	002028	Rear wheel hub - Replacement	
2	002070	Rear brake disc - Replacement	
3	003077	muffler/rear shock absorber support arm - Service	
4	003014	Rear suspension arm - Replacement	
5	003063	Tyre pressure - check	
6	006018	Wheel rim - Paintwork	
7	001016	Rear wheel - Replacement	
8	004126	Rear wheel tyre - Replacement	
9	001071	Rear wheel rim - Replacement	



Electric devices

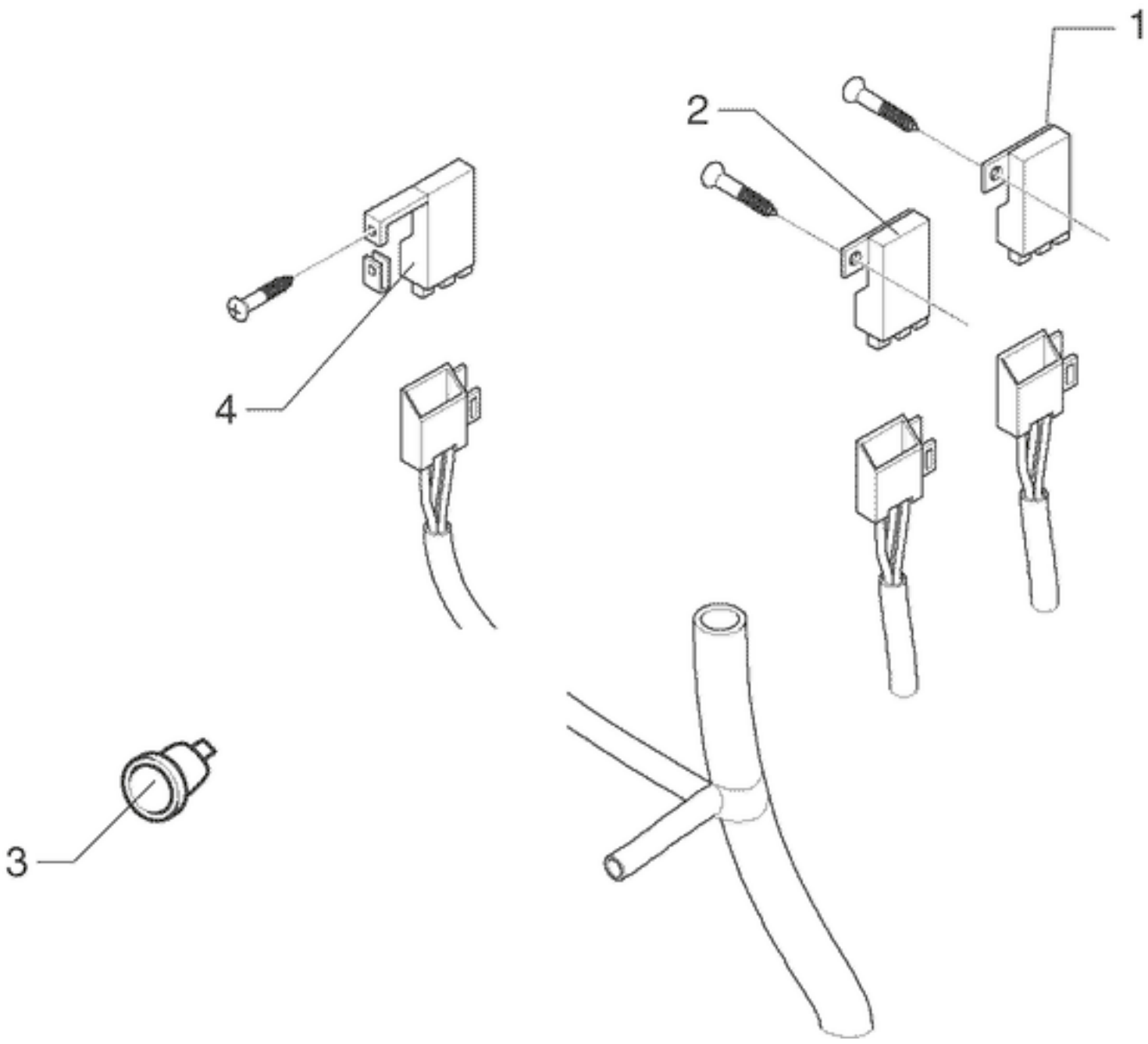
40 HEADLIGHT

Description	Code	Op.	Minutes
Front headlamp - replace	005002	1	15'
Front turn indicator bulb - Replacement	005067	2	10'
Front lights cable unit - replace	005044	3	15'
Headlight bulbs - Replacement	005008	4	15'
Front direction indicators - Replacement	005012	5	30'



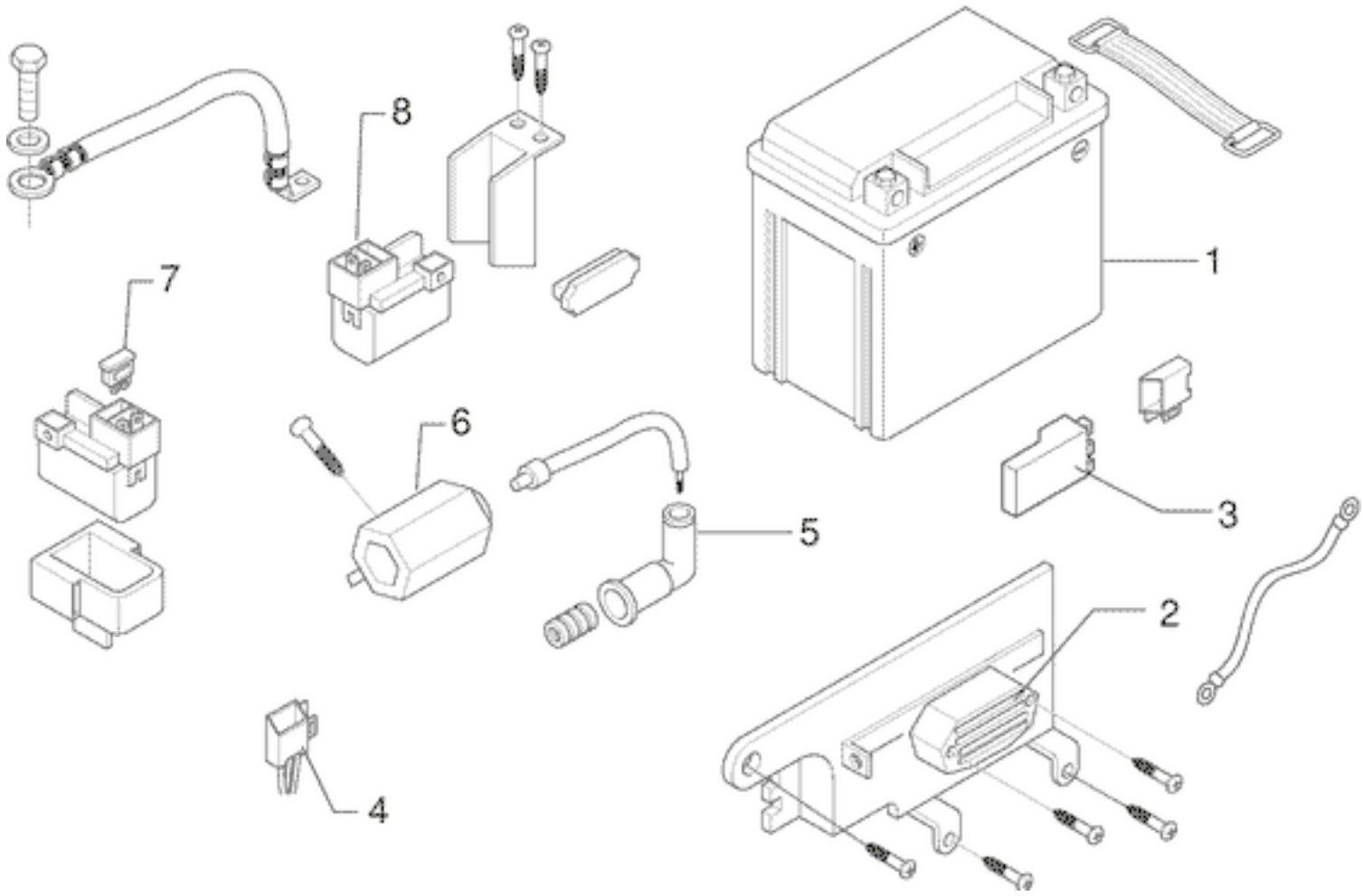
ELECTRICAL WIRING 1

	Code	Action	Duration
1	005087	Side stand remote control - Replacement	
2	005085	Reset button - Replacement	
3	005088	Emergency stop remote control - Replacement	
4	005011	Start-up remote control switch - change	



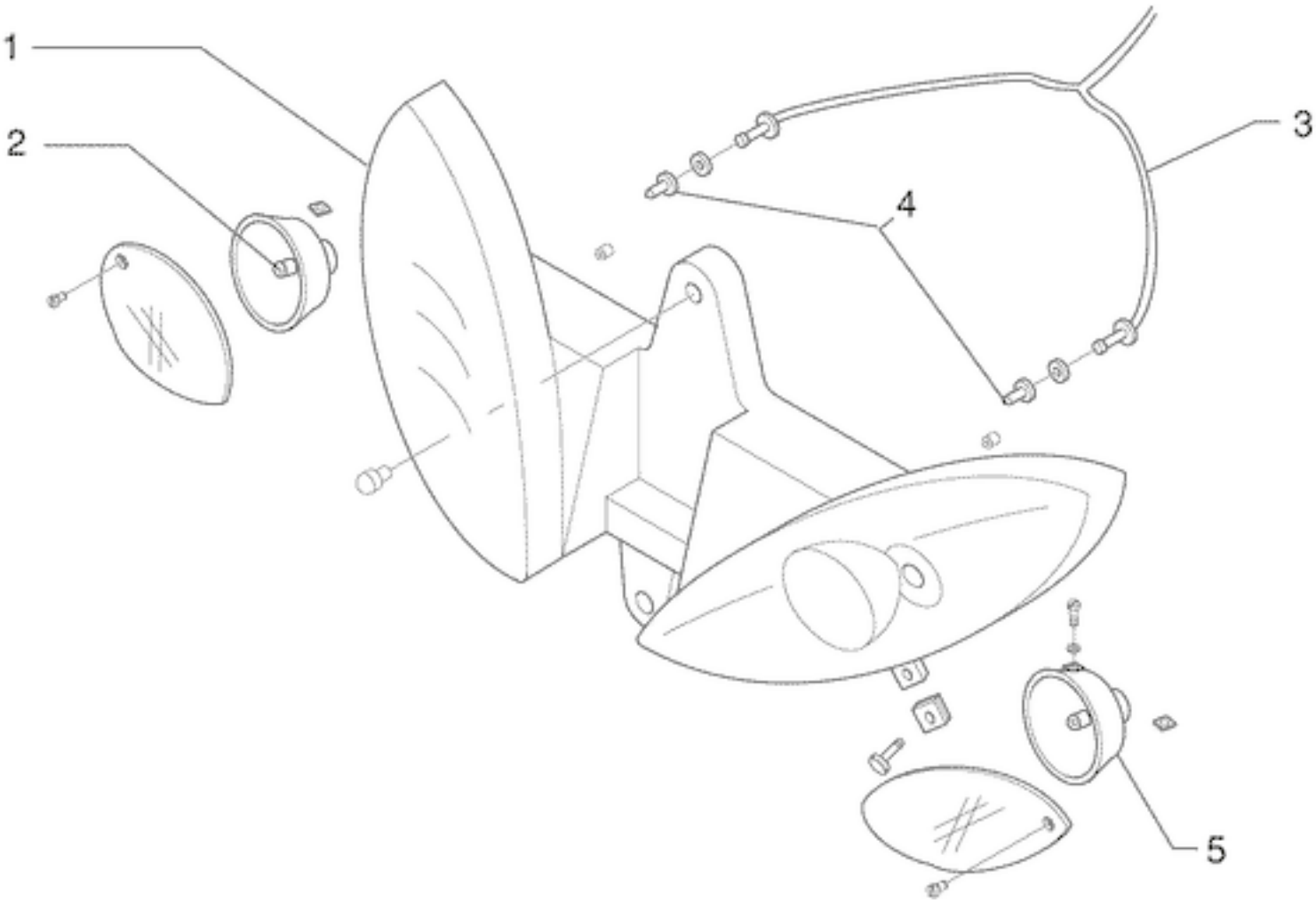
BATTERY

	Code	Action	Duration
1	005075	Stop remote control - Replacement	
2	005024	Battery fuse - Replacement	
3	001069	HV coil - Replacement	
4	001094	Spark plug cap - Replacement	
5	005035	Headlight remote control - Replacement	
6	001023	Control unit - Replacement	
7	005009	Voltage regulator - Replacement	
8	005007	Battery - Replacement	



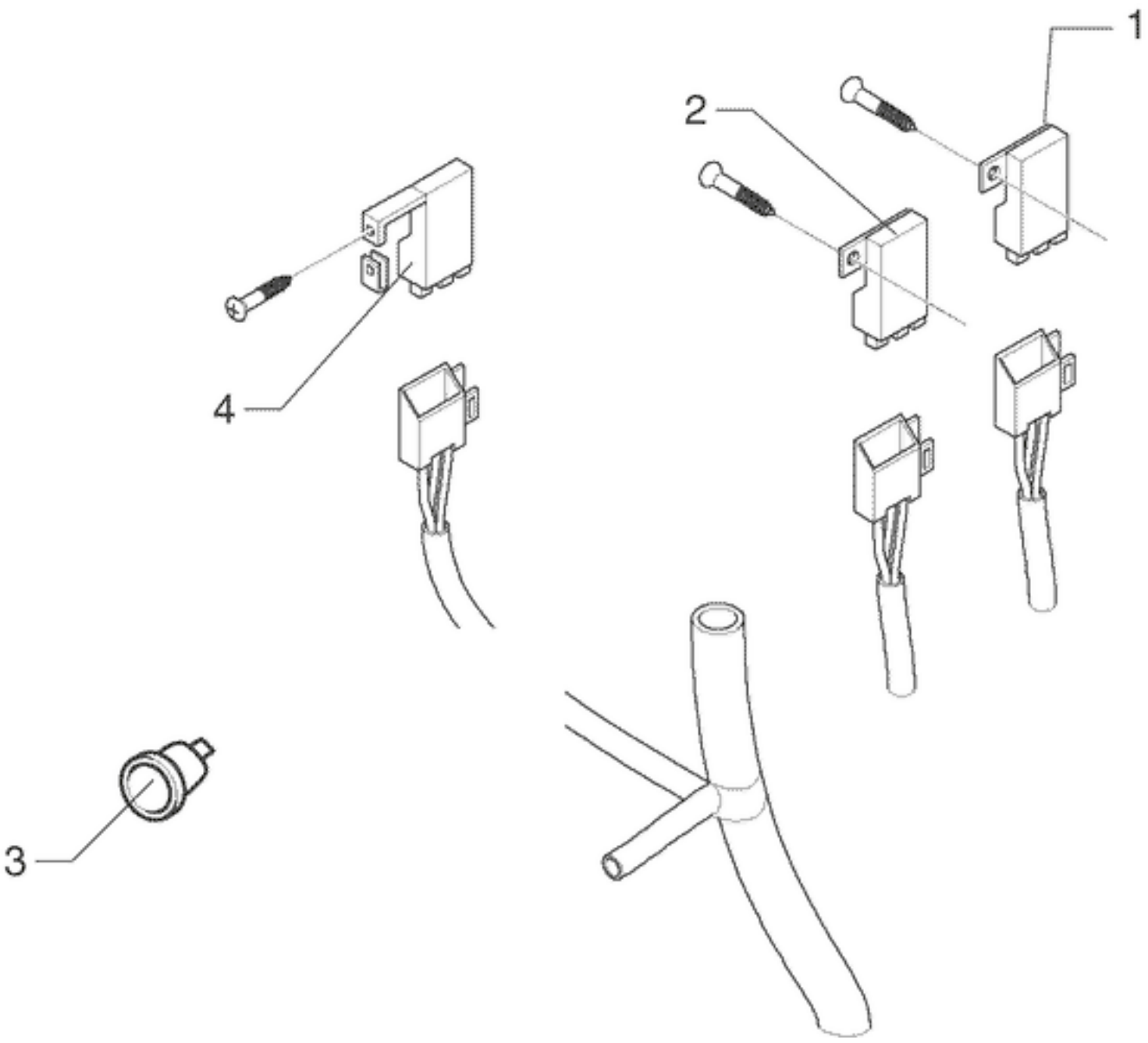
HEADLIGHT

	Code	Action	Duration
1	005067	Front turn indicator bulb - Replacement	
2	005044	Front lights cable unit- Replacement	
3	005008	Front headlamp bulbs - Replacement	
4	005012	Front direction indicators - Replacement	
5	005002	Front headlamp - replace	



49 ELECTRICAL DEVICES

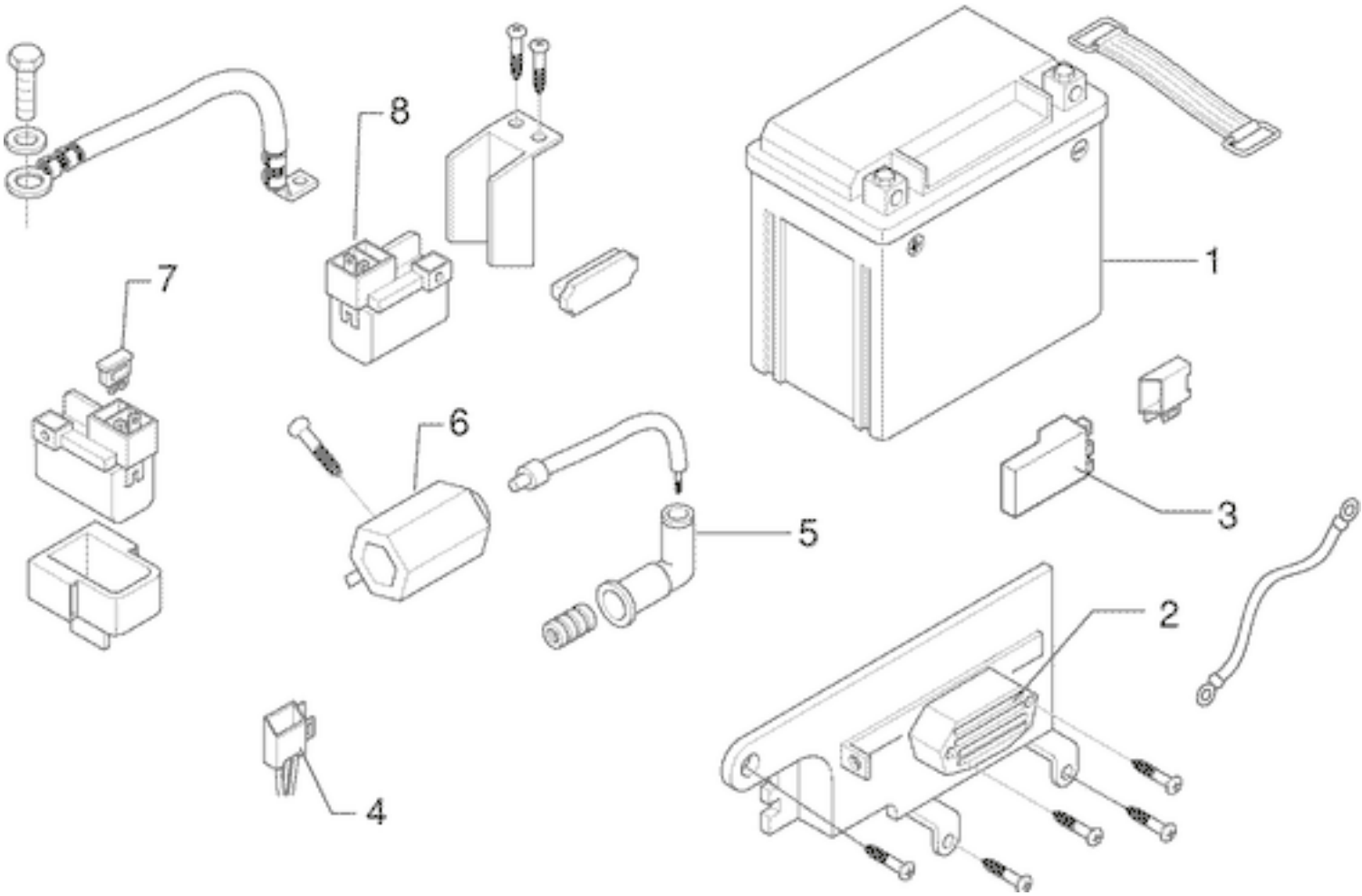
Description	Code	Op.	Minutes
Start-up remote control switch - Replacement	005011	1	20'
Emergency stop remote control - Replacement	005088	2	30'
Reset button - Replacement	005085	3	10'
Side stand remote control - Replacement	005087	4	15'



48 BATTERY

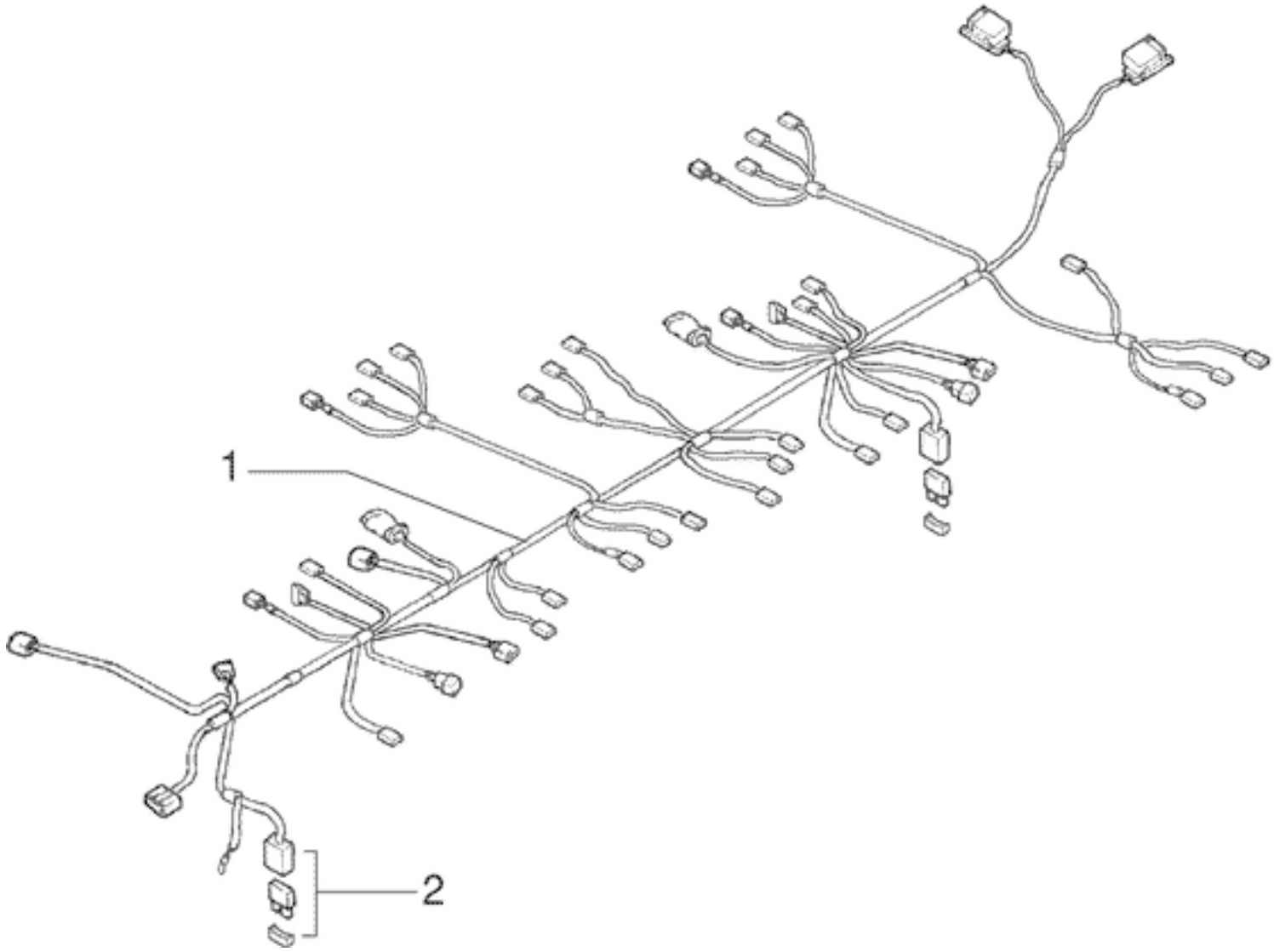
Description	Code	Op.	Minutes
Battery - change	005007	1	15'
Voltage regulator - replace	005009	2	30'
Control unit - Replacement	001023	3	30'
Headlight remote control - Replacement	005035	4	10'
Spark plug cap - Replacement	001094	5	10'

H.V. coil - replace	001069	6	30'
Battery fuse - Replacement	005024	7	10'
Stop remote control - Replacement	005075	8	40'



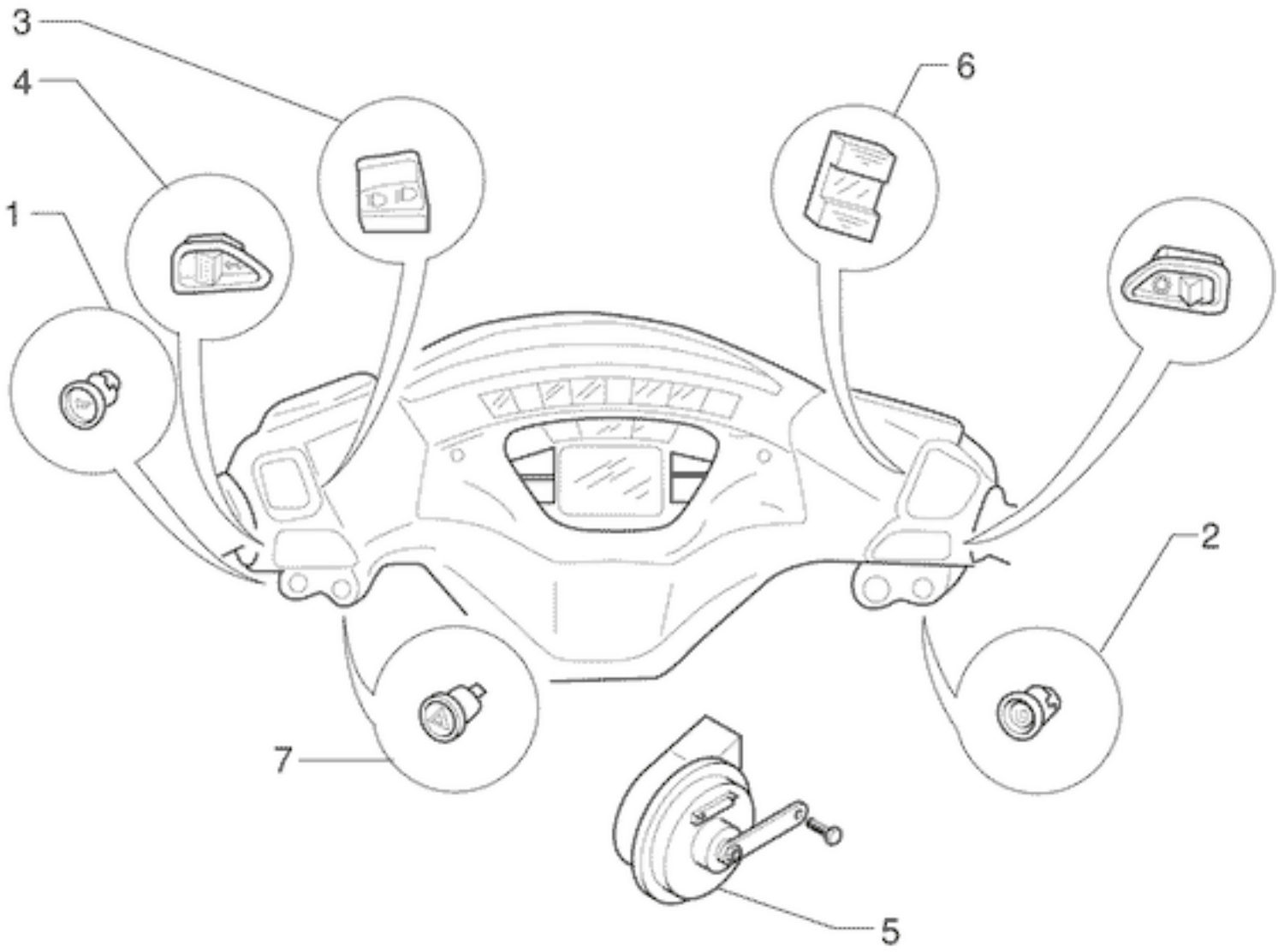
CABLE HARNESS

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



ELECTRICAL DEVICES

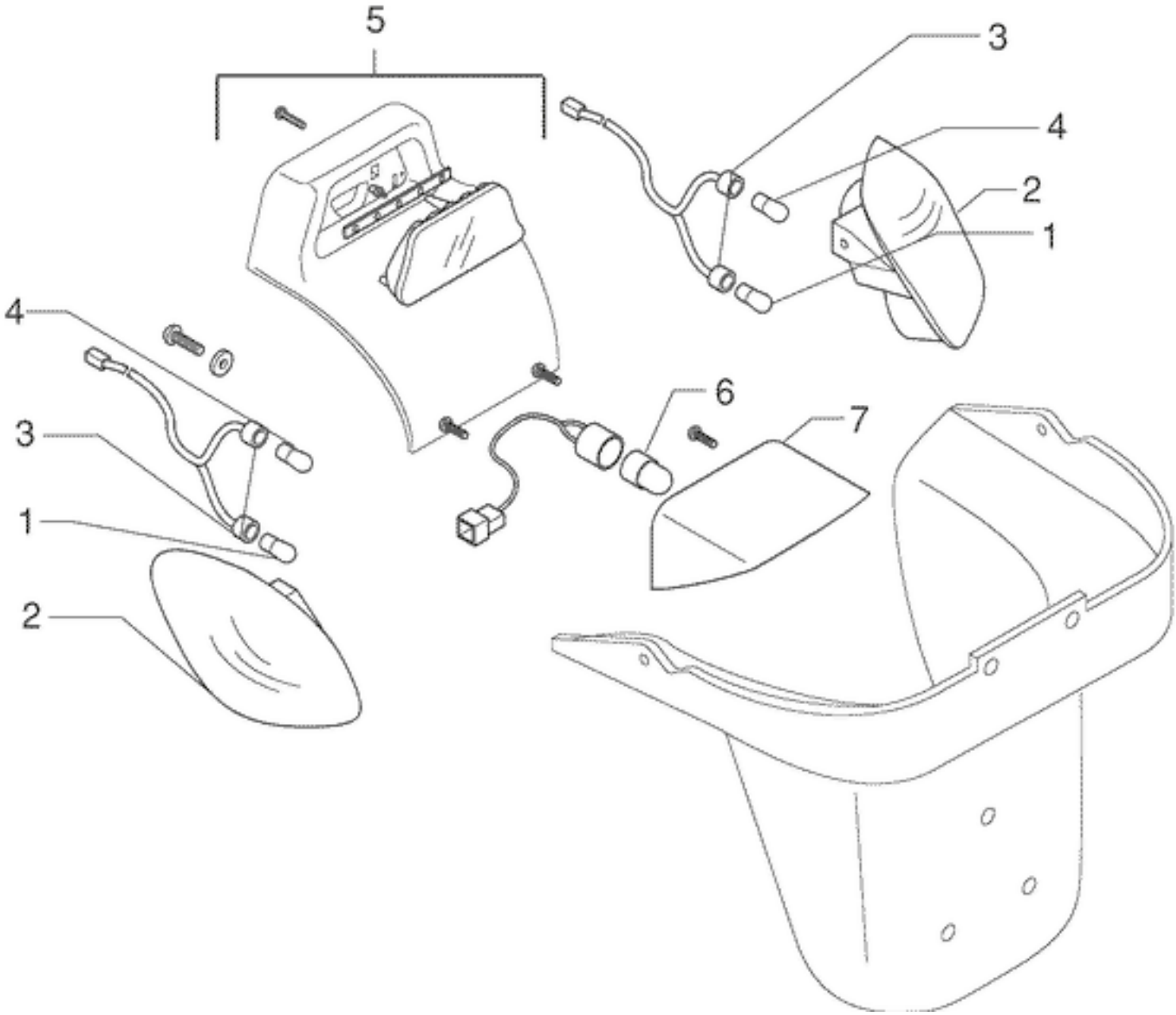
	Code	Action	Duration
1	005084	Emergency light switch - Replacement	
2	005077	Emergency stop switch - Replacement	
3	005003	Horn - Replacement	
4	005006	Light switch or turn indicators - replace	
5	005039	Lights switch - Replacement	
6	005041	Starter button - Replacement	
7	005040	Horn button - Replacement	



41 REAR LIGHT

Description	Code	Op.	Minutes
Rear turn indicator bulb - Replacement	005068	1	15'
Taillight - change	005005	2	15'
Rear telltale light and headlamp cable assembly - Replacement	005030	3	15'
Rear light bulbs - replace	005066	4	15'
Cat's eye - Replacement	004141	5	10'
Licence plate light bulb - Replacement	005031	6	5'

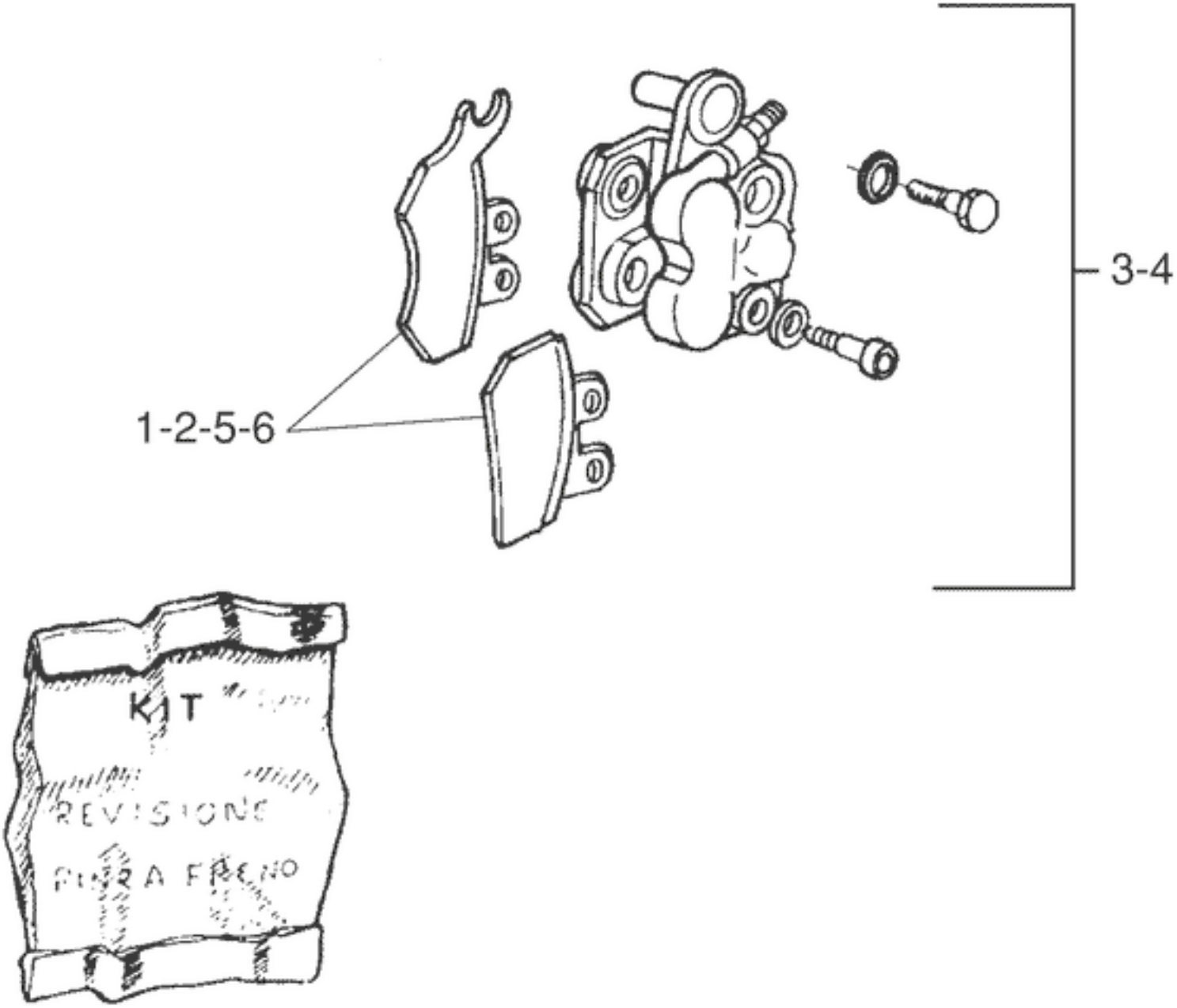
Transparent licence plate cov- er - replace	005032	7	20'



Brake callipers

CALLIPERS

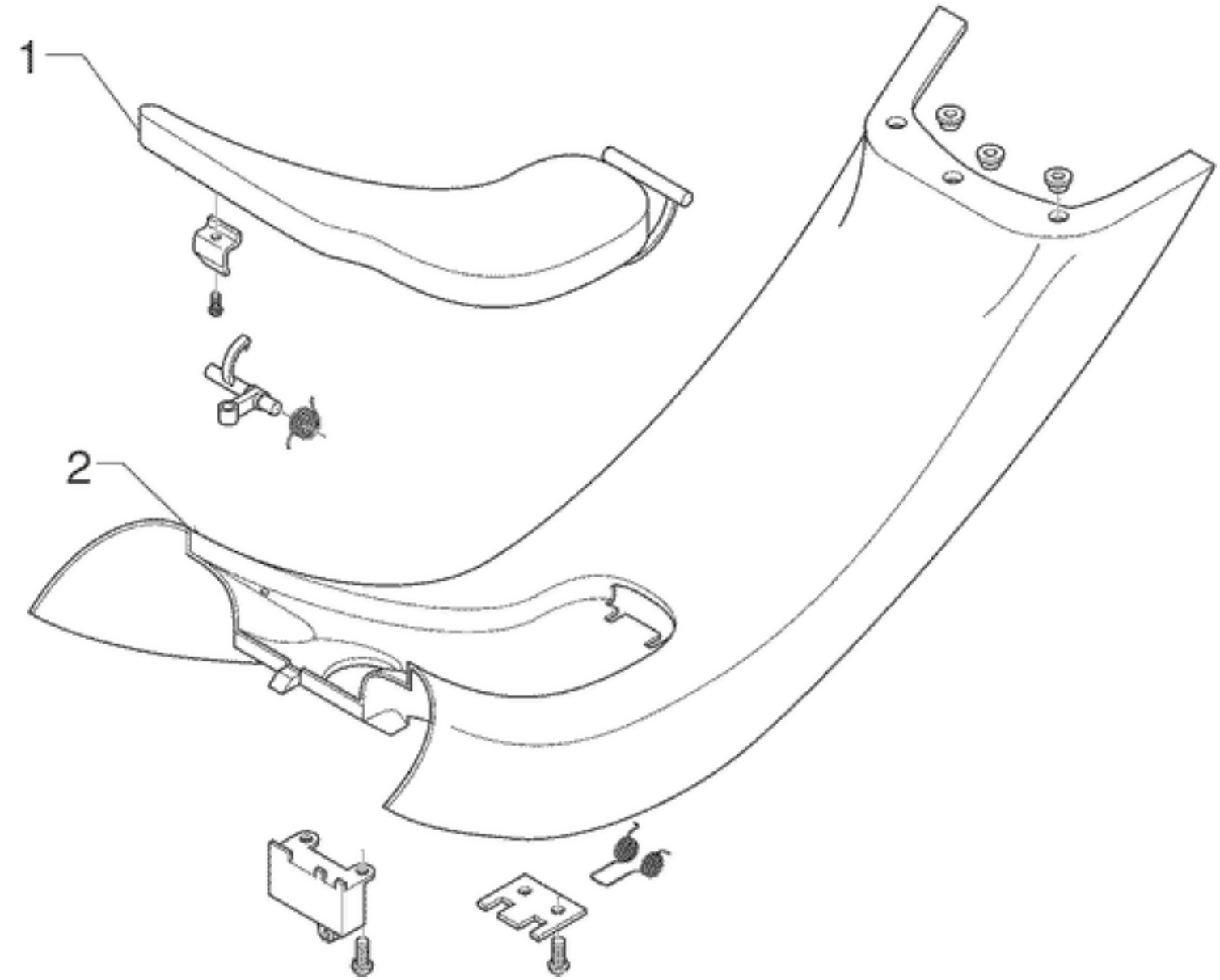
	Code	Action	Duration
1	003071	Rear brake pads - Wear check	
2	002002	Rear brake pads - Replacement	
3	002048	Rear brake calliper - Replacement	
4	002039	Front brake calliper - Replacement	
5	003070	Front brake pads - Wear check	
6	002007	Front brake pads - replace	



Fuel tank filler flap

FOOTREST, DOOR, TANK REPAIR TIME

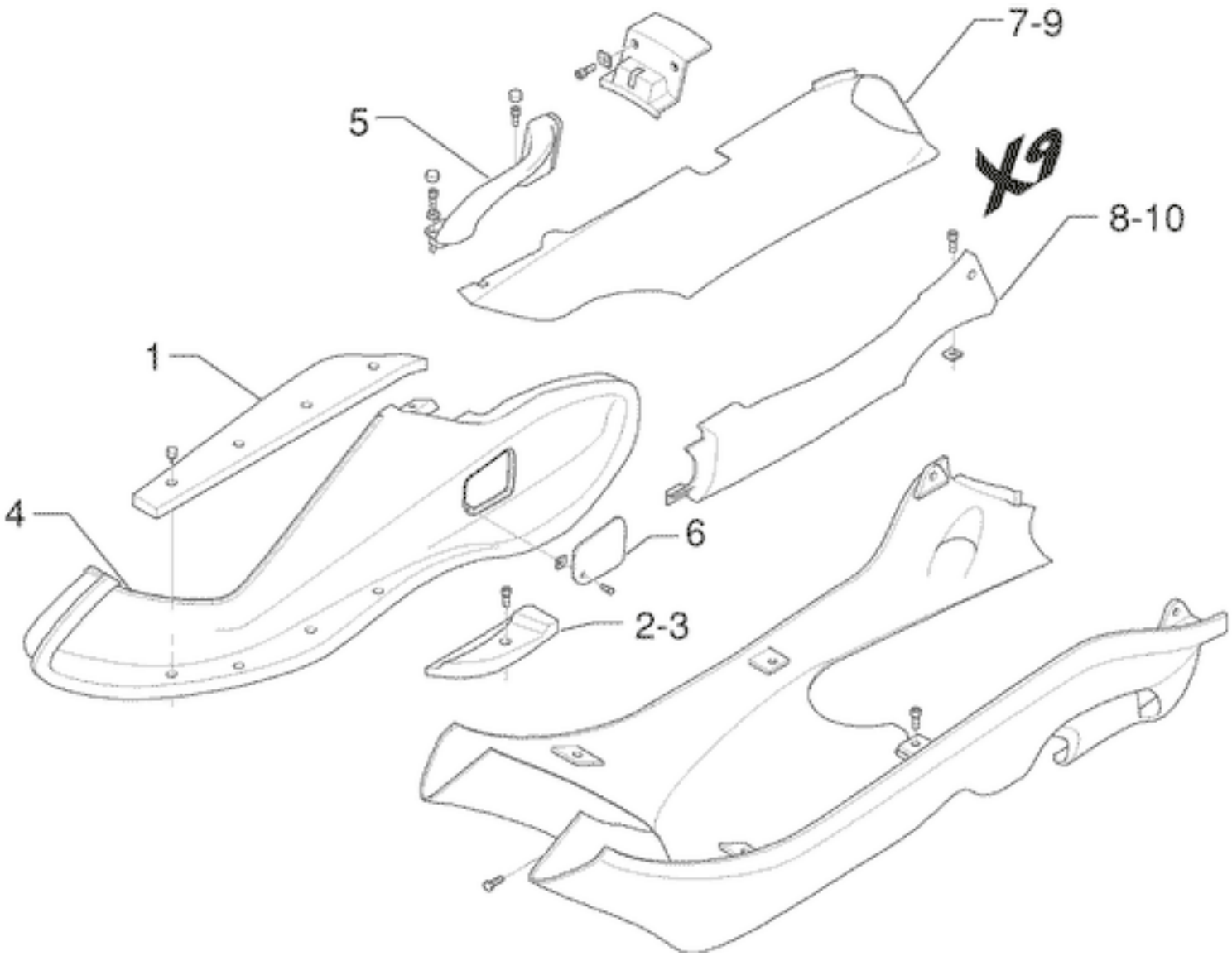
	Code	Action	Duration
1	004011	Central frame cover - replace	
2	004135	Fuel tank lid - Replacement	



Footrests

MATS REPAIR TIME

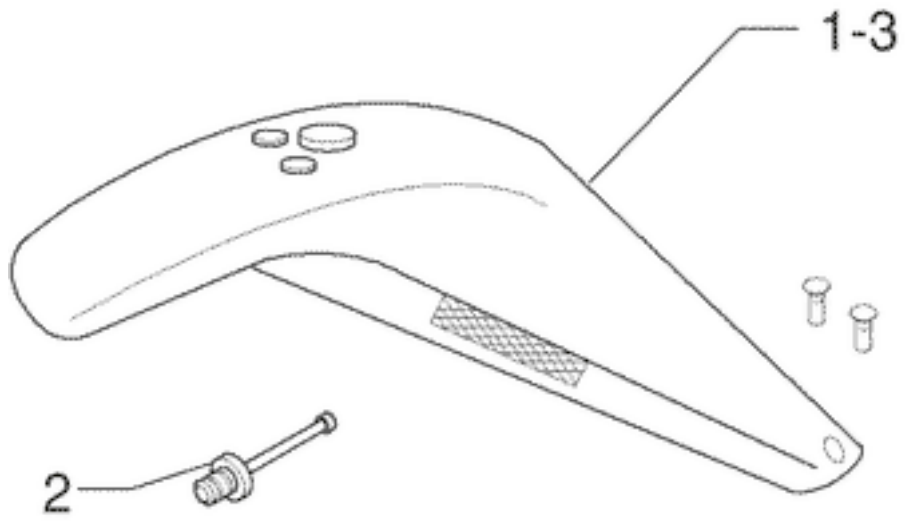
	Code	Action	Duration
1	006008	Rear fairing - Paintwork	
2	006005	Two side covers - Paintwork	
3	004129	Rear fairing - Replacement	
4	004012	Rear fairing - Replacement	
5	004059	Spark plug inspection flap - Replacement	
6	004068	One passenger grab handle - Replacement	
7	004015	Footrest - Replacement	
8	004143	Footrest support - Replacement	
9	004076	Single rear mat - Replacement	
10	004075	Front mat - Replacement	

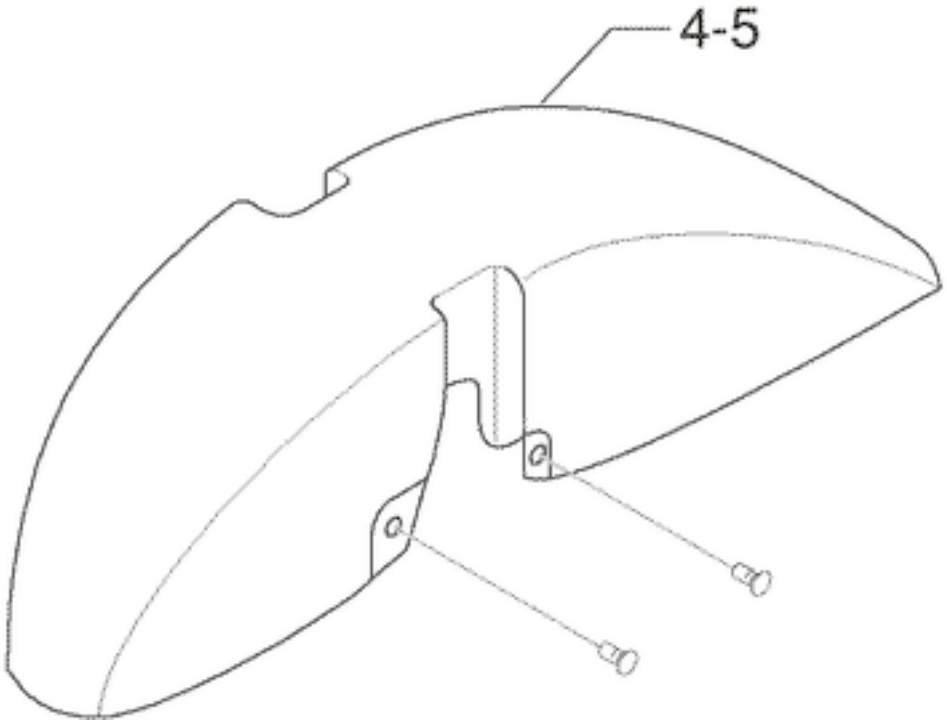


Front mudguard

FRONT MUDGUARD REPAIR TIME

	Code	Action	Duration
1	006003	Front mudguard - Paintwork	
2	004002	Front mudguard - change	
3	006027	Spoiler - Paintwork	
4	005081	Temperature sensor - Replacement	
5	004053	Spoiler - Replacement	

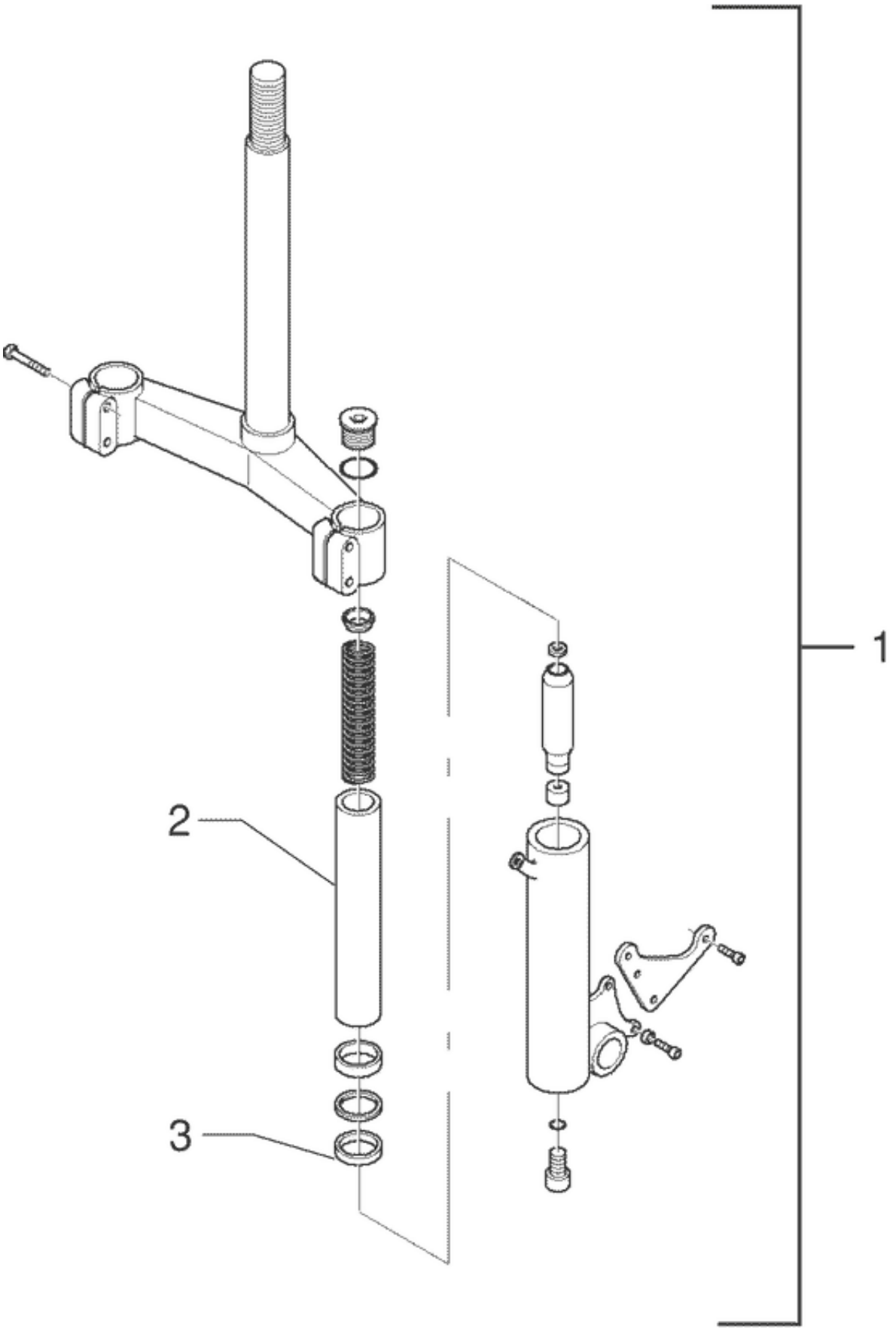




Steering column

STEERING REPAIR TIME

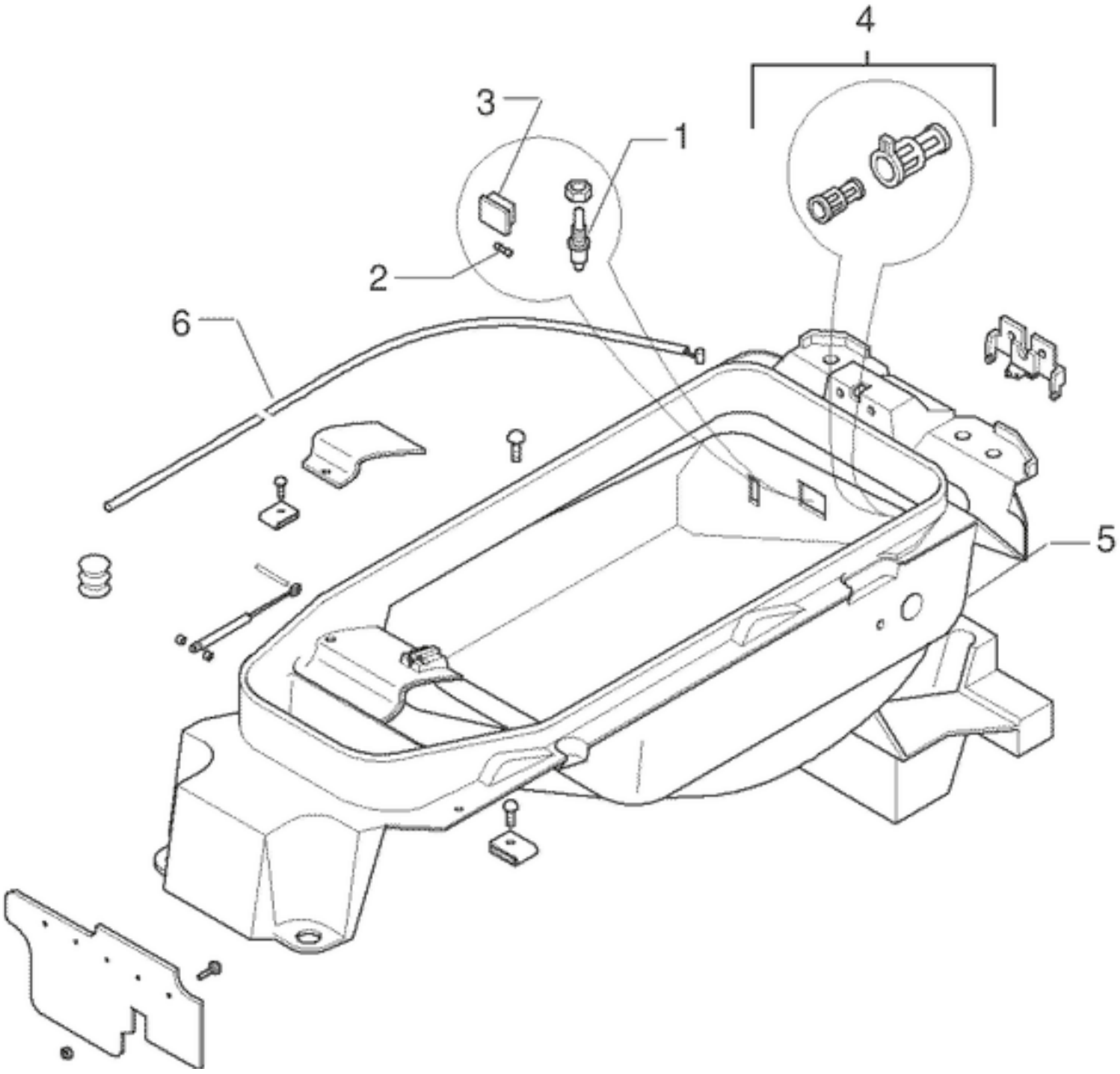
	Code	Action	Duration
1	003048	Fork oil seal - Replacement	
2	003079	Fork stem - Replacement	
3	003051	Fork assembly - Replacement	


1
2
3

Helmet bay

HELMET COMPARTMENT

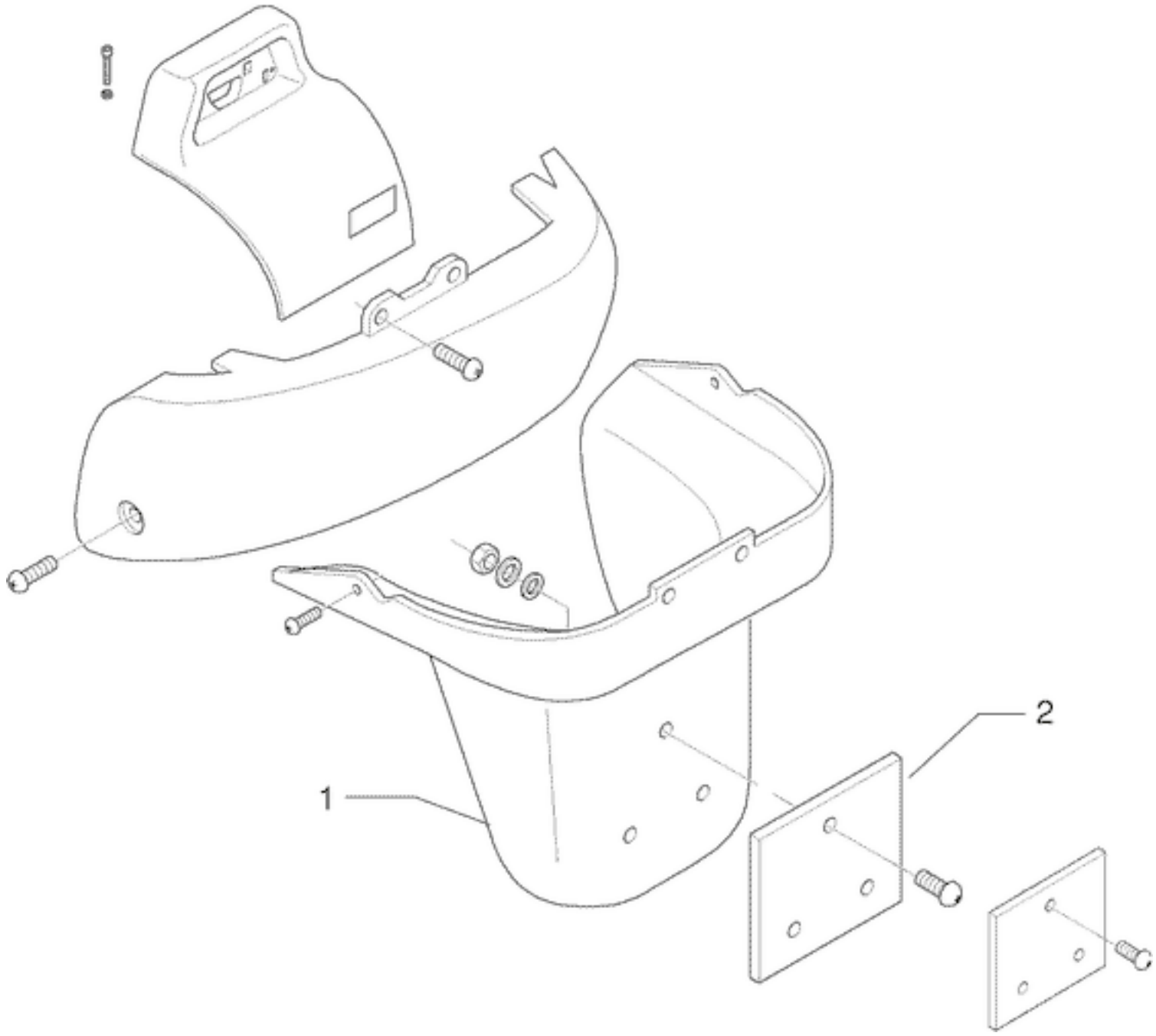
	Code	Action	Duration
1	004016	Helmet compartment - Replacement	
2	002083	Saddle opening transmission - Replacement	
3	004142	electric socket - Replacement	
4	005027	Helmet compartment bulb support - Replacement	
5	005026	Helmet compartment light - Replacement	
6	005033	Glove-box light switch - Replacement	



Rear side fairings

REAR COVERS

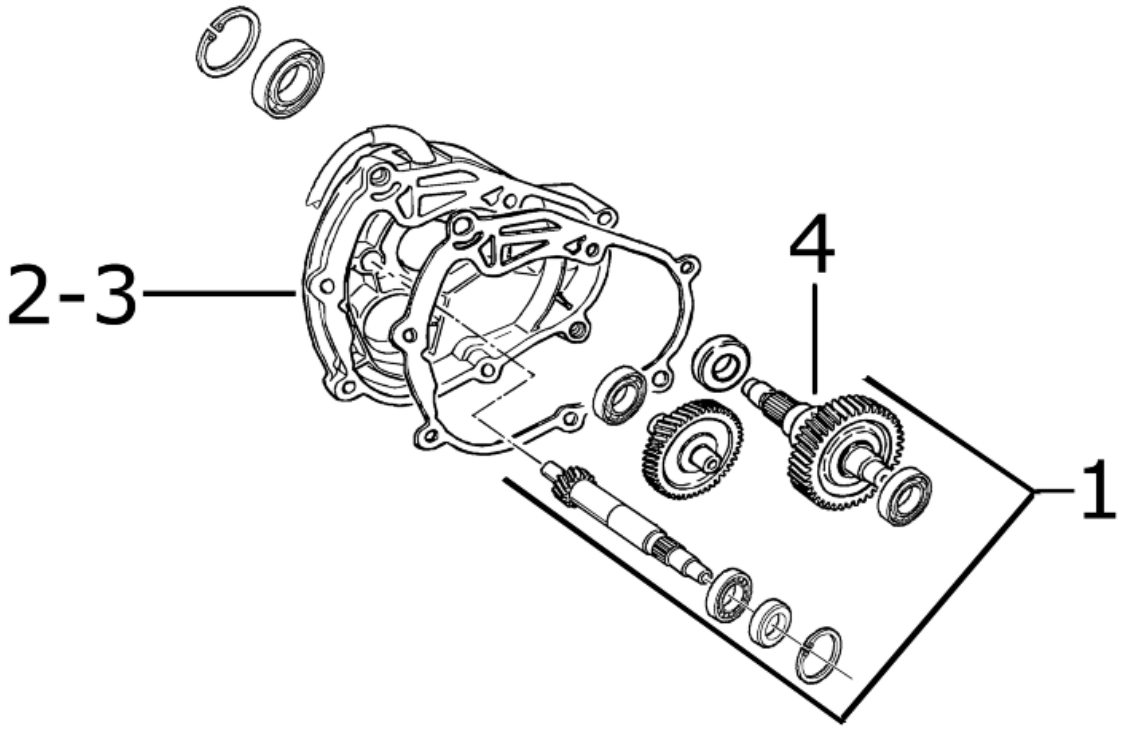
	Code	Action	Duration
1	005048	Licence plate holder - Replacement	
2	004009	Rear mudguard - Replacement	



Rear wheel axle

REAR WHEEL AXLE - REPAIR TIME

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


2-3
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