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# MANUALE STAZIONE DI SERVIZIO

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667270 - 667275 (IT-EN-FR-DE-ES-EL)

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**APE TM Benzina**

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# MANUALE STAZIONE DI SERVIZIO

## APE TM Benzina

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# MANUALE STAZIONE DI SERVIZIO APE TM Benzina

## WORKSHOP MANUAL

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

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

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

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



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**GENERAL GUIDELINES**

**GEN**

## Maintenance guidelines

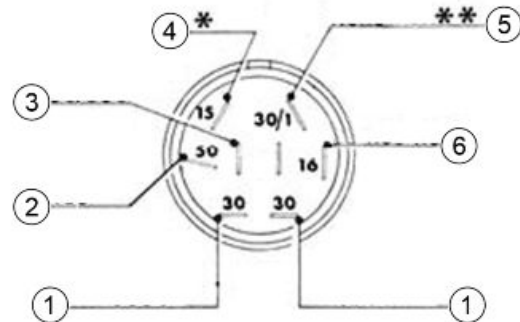
### RULES TO BE FOLLOWED IN THE EVENT OF INTERVENTION ON THE ELECTRIC SYSTEM - APE TM

#### A) ESSENTIAL WARNINGS

The check or in any case the intervention on the circuits of the devices for the electronic ignition can be done with relative ease by the electronic repairers of **Service Station Workshops**; it is essential, however, that they take observe the notices below, since, in case of failure to observe, they could irreparably damage the devices.

All inspection operations of the system involving disconnection of cables (verification of the connections and devices that are part of the ignition circuit, therefore including the main key switch) **must be made with the engine off**: otherwise the control unit could be irreparably damaged.

The ignition circuit works on AC, and obviously, must be definitely separated from that of DC  
 In fact the latter, powered by the battery and dynamotor, **serves only** for the service user groups (city lights, stop, horn, lights, headlight, etc.).



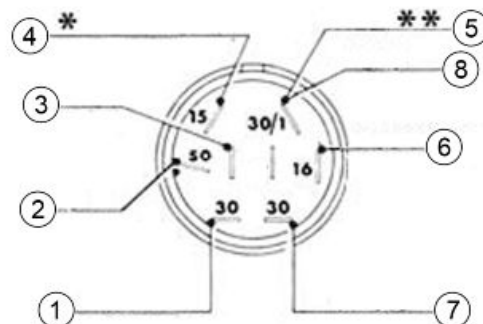
#### KEY:

- 1 = Red (direct current)
- 2 = White (direct current)
- 3 = Grey - Red (direct current)
- 4 = Purple (alternating current engine stop)
- 5 = Black (ground)
- 6 = White - Red (direct current)

\* = Connection connected to the red cable of the condenser charging coil.

\*\* = Connections with electronic ignition.

If there is a connection of two circuits, i.e., if the ignition one was routed by the DC, **there would be instantaneous deterioration of the control unit. It is therefore necessary and important that**, in case of removal or disconnection of cables, particularly of those which depend on the main key switch and the control unit, during reassembly pay attention to correctly reconnect each cable to the



corresponding terminal; **for this purpose it is always advisable to consult the electrical circuit diagrams.**

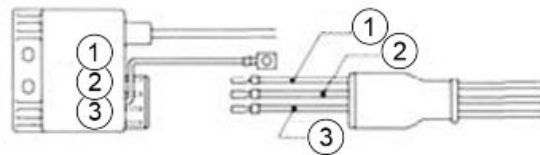
**KEY:**

- 1 = Red (direct current)
- 2 = White (direct current)
- 3 = Grey - Red (direct current)
- 4 = Purple (alternating current engine stop)
- 5 = Black (ground)
- 6 = White - Red (direct current)
- 7 = Grey (direct current)
- 8 = Black

\* = Connection connected to the red cable of the condenser charging coil.

\*\* = Connections with electronic ignition.

For obvious reasons it is essential that, in case of replacement of one or more devices in the system (main switch, stator unit of the flywheel, control unit) during reassembly, a device is used that is **similar** to the existing one: if in fact similar devices were used, but not specific to the same ignition system, they would not work, risking irreparable damage to the control unit.

**KEY:**

- 1 = White
- 2 = Red
- 3 = Green

**B) INSPECTIONS TO BE PERFORMED IN THE EVENT OF IGNITION IRREGULARITIES**

In the event of failure and abnormal operation of the ignition, whose causes are not detectable by a visual inspection, it is necessary first to replace the control unit with a corresponding, safely functional one. Remember that the disconnections and connections to replace the control unit **must be performed when the engine is off.**



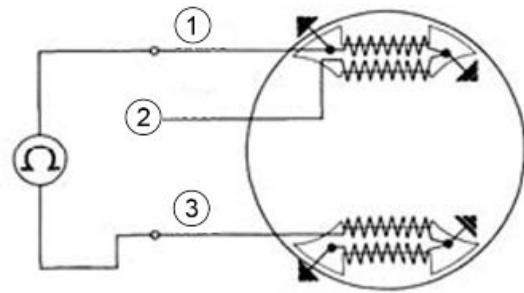
If replacing restores the ignition operation, the fault lies in the control unit, which obviously needs to be replaced. In the event that the failure persists, it is necessary to carry out checks on the alternator and on the stator components as follows:

After a visual inspection of the connections, stator and couplings, measurements are carried out on the charging coil and the ignition coil using an Ohm meter, capable of detecting resistance from 1 to 1000 ohm, as follows:

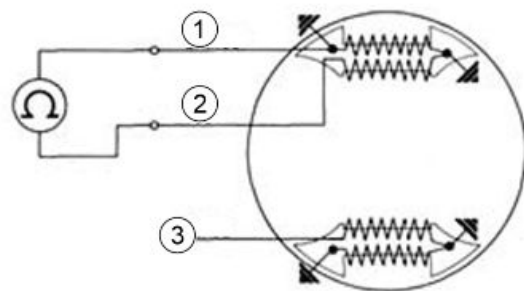
- Connect the instrument between the **WHITE** cable and the **RED** cable; there must be continuity and ohmic value (430 to 480 ohm);

**KEY:**

- 1) White
- 2) Red
- 3) Green



- Connect the + terminal of the instrument with the **WHITE** cable and the - terminal of the instrument with the **RED** cable there must be continuity and ohmic value (7 to 9 ohm).



**KEY:**

- 1) White
- 2) Red
- 3) Green

If failures are detected in the inspections of the charging coil and ignition coil, **proceed to replace the damaged parts.**

If there is no tool available to check the stator, when it is established that the ignition problem is not related to the power control unit nor to other visible causes (bad connections, damaged cables, damaged spark plug), proceed to replace the complete stator. In relation to what described in the preceding paragraphs we recommend, therefore, to include in the control tools an Ohm meter with the characteristics outlined above.

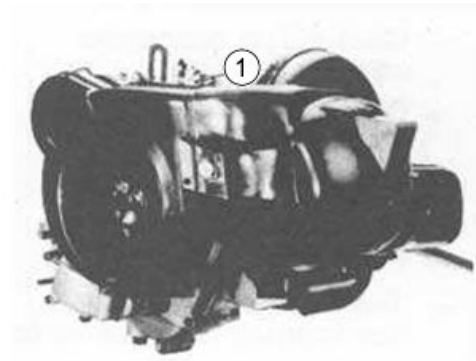
**C) IGNITION TIMING CHECK**

The timing check may be useful for example if the motor is not operating properly (start-up difficulties; decreased performance and power; difficult or irregular recovery speed etc.); if the failure does not depend on the carburetion, it may be caused by irregularities of the ignition timing.

This possibility is, however, considered quite rare since, due to the characteristics of the ignition system, the timing adjustment remains unchanged over time; since the problem arises in most cases from irregular operation of the control unit, to be sure please follow the steps outlined on the side for verification of the aforementioned device.

If however, after checking the carburetion and the control unit, the desired improvements are not obtained and there is doubt whether the anomalies are due to the ignition timing, proceed to check the latter, operating as follows:

**1)** Insert, into the hole (1) a rod of  $\varnothing$  5 mm.; run the engine manually until when the end of the rod, coming into correspondence with the other hole on the rotor, does not fit.



In this condition the engine is in ignition advance position.

**2)** Make a mark with white paint on the fan cover, in correspondence with the flap of the flywheel bearing the reference for the timing.

**3)** Connect a stroboscopic lamp (type TECNOTEST 130/P or other similar) at ignition; the connection will be made directly on the spark plug or on the H.V. cable, etc. depending on the type of stroboscopic lamp available and the specific operating instructions. Then start the engine and bring it to about 4000-5000 rpm.

**4)** The engine will be properly timed to the lamp when the two marks are aligned, or at most, moved to within a tolerance range of  $4^\circ$  (i.e., within  $2^\circ$  to the right and  $2^\circ$  to the left of alignment position).

**5)** If the mark of the flywheel rotor is shifted compared to the crankcase more than the allowed tolerance (or other major irregularities appear during the check), replace the stator or the control unit.

**N.B.**

**FOR VEHICLES OF NEXT PRODUCTION, THE FAN COVER WILL BE FITTED WITH A REFERENCE FOR TIMING, SO THE OPERATIONS DESCRIBED IN POINTS 1 AND 2 WILL NOT BE NECESSARY.**

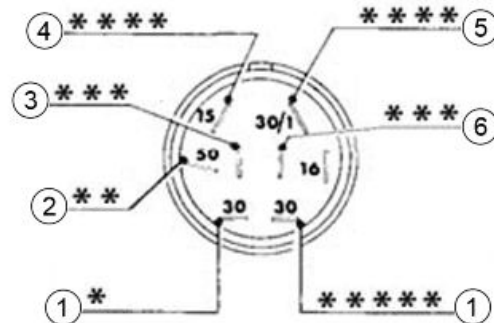
**RULES TO BE FOLLOWED IN THE EVENT OF INTERVENTION ON THE ELECTRIC SYSTEM - APE TM P703 FL2**

#### **A) ESSENTIAL WARNINGS**

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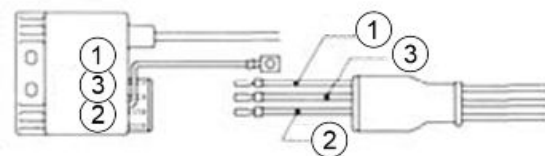
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**KEY:**

- 1 = Red (direct current)
- 2 = White (direct current)
- 3 = Red (direct current)
- 4 = Purple (alternating current engine stop)
- 5 = Black (ground)
- \* = Connection connected to the fuses.
- \*\* = Connection connected to the starter relays.
- \*\*\* = Connection connected to the white-red cable of the light switch.
- \*\*\*\* = Connections with electronic ignition.
- \*\*\*\*\* = Connection connected to the voltage regulator.

If there is a connection of two circuits, i.e., if the ignition one was routed by the DC, **there would be instantaneous deterioration of the control unit. It is therefore necessary and important that**, in case of removal or disconnection of cables, particularly of those which depend on the main key switch and the control unit, during reassembly pay attention to correctly reconnect each cable to the corresponding terminal; **for this purpose it is always advisable to consult the electrical circuit diagrams.**



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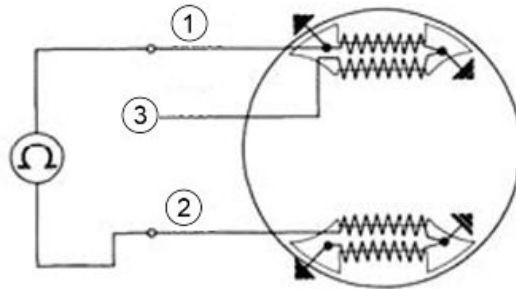
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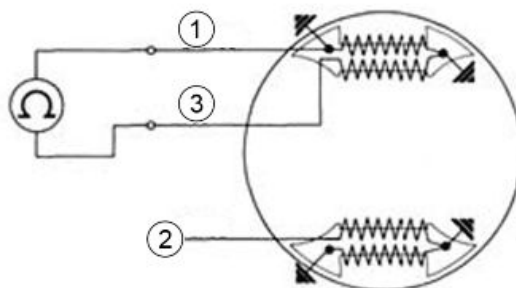
**1** = White

**2** = Red

**3** = Green



- Connect the + terminal of the instrument with the **WHITE** cable and the - terminal of the instrument with the **GREEN** cable there must be continuity and ohmic value (7 to 9 ohm).



**KEY:**

**1** = White

**2** = Red

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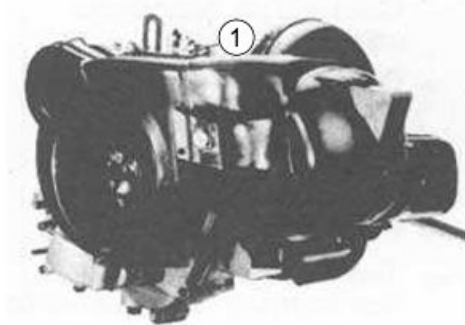
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## INDEX OF TOPICS

CHARACTERISTICS

CH

**Characteristics**

**SIZES**

millimetres	Deck	Long Deck	Van	Tipper
(1) Length	3175	3375	3175	3230
(2) Width	1480	-	-	1510
(3) Height	1630	-	1750	1630
(4) Wheelbase	2170	2170	2170	2170
(5) Track	1300	1300	1300	1300
(6) Turning spokes	3300	3300	3300	3300

**WEIGHTS**

(\*) = without the driver  
 (\*) = including the driver

Kilograms (kg)	Deck	Long Deck	Van	Tipper
Dry weight (*)	445	450	465	465
Vehicle weight in running order (with refuelling, tools and accessories)	1160	1160	1160	1160
Load capacity (**)	715	710	695	695

**TECHNICAL DATA - CHASSIS**

Specification	Desc./Quantity
Chassis	Sheet steel body and a single central longitudinal arm (integrated structure). Removable deck integrated into the structure.
Driver's cab	Welded to the chassis.
Seats in driving cab	Two.

**TECHNICAL DATA - ENGINE**

Specification	Desc./Quantity
Matriculation data	The identification codes consist of a prefix (ATM2T on the chassis, ATM2M on the engine) and a number.
Engine	Single-cylinder, 2-stroke engine, with "rotating" timing and with three transfer ducts, with transmission and differential grouped on the axis of the rear wheels.
Engine capacity	217.9 cm <sup>3</sup>
Bore X Stroke	68 x 60
Compression ratio	8.6 : 1
Ignition advance	14° ± 1°30' before T.D.C.:
Carburettor	Dell'Orto SHB 22/22.
Fuel	Pure petrol with separate engine lubrication, "LS" device.
Spark plug	Marelli CW7N, or Bosch W4AC; Lodge 3HN; Champion L82; AC430Z; NGK B7HS.
Maximum speed (CUNA STANDARDS)	60÷65 km/h.
Air filter	At the intake of the type with paper cartridge filter.
Cartridge	AC AIRAC FLAT PACK.
Consumption (CUNA)	~4.3 litres per 100 km.
Km range	Around 330 Km.

**TRANSMISSION**

Specification	Desc./Quantity
Gear ratio First	1/48.47
Gear ratio Second	1/26.54
Gear ratio Third	1/15.56
Gear ratio Fourth	1/9.16
Gear ratio Reverse	1/80.78

**STEERING**

Specification	Desc./Quantity
Steering	Built with tube pivoted on the arm with front wheel-holder oscillating hub.

**SUSPENSION**

Specification	Desc./Quantity
Front suspension	Built using helical spring.
Rear suspension	Built with flexible rubber components in progressive rate. Suspensions consist of hydraulic shock absorbers.

**TYRES**

Specification	Desc./Quantity
Wheel rim	From 3.50".
Front wheel and spare wheel	"Normal" type 4.00-12 C- PR6.
Rear wheels	"Radial" type 4.00-12 C- PR6. (for example Michelin C-XZX PR.6. for deck, van, tipper, Urban Cleansing van and cabriolet versions). "Radial" type 4.00-R12 C- PR8. (for example Michelin C-XZX PR.8. for versions with external fixed elaborations and those with hydraulic tipping).
Front tyre pressure	2.8 bar
Rear tyres - inflation pressure	4.5 bar

**N.B.:**

When installing the spare wheel in place of one of the rear wheels (for example due to a puncture) it is recommended to replace it as soon as possible by reinstalling the "radial" tyre which is more suitable for use.  
It is not advisable to install the radial tyre on the front wheel as there would be excessive sensitivity, especially when driving on twisting or bumpy roads.

**REFILLING**

(\*)= specific for versions with tipper deck.

Litres (l)	Deck	Long Deck	Van	Tipper
Fuel tank (reserve)	15 (3.5)	15 (3.5)	15 (3.5)	15 (3.5)
Engine oil (reserve)	3.0 (0.75)	3.0 (0.75)	3.0 (0.75)	3.0 (0.75)
Hydraulic oil (*)	3.0	3.0	3.0	3.0

**DIMENSIONS - APE TM KAT - APE TM P703 FL2**

millimetres	Deck	Long Deck	Van	Tipper	Motor chassis
(1) Length	3175	3390	3210	3225	3150
(2) Width	1480	-	-	1500	
(3) Height	1630	1630	1780	1630	
(4) Wheelbase	2170	2170	2170	2170	
(5) Track	1300	1300	1300	1300	
(6) Turning spokes	3300	3300	3300	3300	

**WEIGHTS - APE TM KAT - APE TM P703 FL2**

(\* ) = without the driver

(\* ) = including the driver

Kilograms (kg)	Deck	Long Deck	Van	Tipper
Dry weight (*)	465	465	505	505
Vehicle weight in running order (with refuelling, tools and accessories)	1270	1270	1270	1270
Load capacity (**)	805	805	765	765



**TECHNICAL DATA - CHASSIS - APE TM KAT - APE TM P703 FL2**

Specification	Desc./Quantity
Chassis	Sheet steel body and a single central longitudinal arm (integrated structure).
Versions	<b>Sheet</b> metal deck, integrated into the structure. <b>Long</b> deck. <b>Aluminium</b> alloy deck, hydraulic tipper for engine inspection.
Driver's cab	Welded to the chassis.
Seats in driving cab	Two.

**TECHNICAL DATA - ENGINE - APE TM KAT**

Specification	Desc./Quantity
Matriculation data	The identification codes consist of a prefix (ATM2T on the chassis, ATM2M on the engine) and a number.
Engine	Single-cylinder, 2-stroke engine, with "rotating" timing and with three transfer ducts, with transmission and differential grouped on the axis of the rear wheels.
Engine capacity	217.9 cm <sup>3</sup>
Bore X Stroke	68 x 60
Compression ratio	8.6 : 1
Ignition advance	14° ± 1°30' before T.D.C.:
Carburettor	Dell'Orto SHB 22/22.
Fuel	Pure petrol with separate engine lubrication, "LS" device.
Spark plug	Champion RL78C; NGK BR8HS.
Maximum speed (CUNA STANDARDS)	60÷65 km/h.
Air filter	At the intake of the type with paper cartridge filter.
Consumption (CUNA)	~4.1 litres per 100 km.
Km range	Around 330 Km.

**TECHNICAL DATA - ENGINE - APE TM P703 FL2**

Specification	Desc./Quantity
Matriculation data	The identification codes consist of a prefix (ATM2T on the chassis, ATM2M on the engine) and a number.
Engine	Single-cylinder, 2-stroke engine, with "rotating" timing and with three transfer ducts, with transmission and differential grouped on the axis of the rear wheels.
Engine capacity	217.9 cm <sup>3</sup>
Bore X Stroke	68 x 60
Compression ratio	8.6 : 1
Ignition advance	14° ± 1°30' before T.D.C.:
Carburettor	Dell'Orto SHB 22/22.
Fuel	Pure petrol with separate engine lubrication, "LS" device.
Spark plug	Bosch W4AC; Lodge 3HN; Champion L78C AC430Z.
Maximum speed (CUNA STANDARDS)	60÷65 km/h.
Air filter	At the intake of the type with paper cartridge filter.
Consumption (CUNA)	~4.1 litres per 100 km.
Km range	Around 330 Km.

**TRANSMISSION - APE TM KAT - APE TM P703 FL2**

Specification	Desc./Quantity
Gear ratio First	1/48.47
Gear ratio Second	1/26.54
Gear ratio Third	1/15.56
Gear ratio Fourth	1/9.16
Gear ratio Reverse	1/80.78

**STEERING - APE TM KAT - APE TM P703 FL2**

Specification	Desc./Quantity
Steering	Built with tube pivoted on the arm with front wheel-holder oscillating hub.

**SUSPENSION - APE TM KAT - APE TM P703 FL2**

Specification	Desc./Quantity
Front suspension	Built using helical spring.
Rear suspension	Built with flexible rubber components in progressive rate. Suspensions consist of hydraulic shock absorbers.

**TYRES - APE TM KAT - APE TM P703 FL2**

Specification	Desc./Quantity
Wheel rim	From 3.50".
Front tyre (handlebar version)	4.00-12CNTL
Rear tyre (handlebar version)	125R12C XZX TL
Front tyre (steering wheel version)	125R12C XZX TL
Rear tyre (steering wheel version)	125R12C XZX TL
Front tyre pressure	2.5 bar
Rear tyres - inflation pressure	4.5 bar

**REFILLING - APE TM KAT - APE TM P703 FL2**

(\*)= specific for versions with tipper deck.

Litres (l)	Deck	Long Deck	Van	Tipper
Fuel tank (reserve)	15 (3.5)	15 (3.5)	15 (3.5)	15 (3.5)
Engine oil (reserve)	3.2 (0.75)	3.2 (0.75)	3.2 (0.75)	3.2 (0.75)
Hydraulic oil (reserve) (*)	15 (3.2)	15 (3.2)	15 (3.2)	15 (3.2)

**Tightening torques****ENGINE UNIT**

Name	Torque in Nm
Transmission cross control stem	35 to 40 Nm (a)
3rd and 4th speed cross control stem	19 to 21 Nm (b)
1st and 2nd speed cross control stem	25 to 30 Nm (b)
Spark plug	18 to 24 Nm
Bolts locking dynamotor to differential crankcase	30 to 35 Nm
Bolts locking dynamotor to engine crankcase	20 to 25 Nm
Clutch assembly locking nut	180 to 220 Nm
Multi-gear pin nut	35 to 40 Nm
Fan flywheel locking nut	60 to 65 Nm
Silencer manifold fixing nut	19 to 21 Nm
Silencer to crankcase fixing bolts	18 to 22 Nm
Clutch cover fixing bolt	13 to 17 Nm
Cylinder head fixing bolt	20 to 23 Nm
Engine to deck fixing bolt	20 - 25 Nm
Spring line to frame fixing bolt	20 - 25 Nm
Spring line to frame anchor bolt	20 to 25 Nm
Oil drain plug	22 to 25 Nm
Bolt connecting the crankcase halves	13 to 15 Nm
Dynamotor pulley lock nut	35 to 40 Nm
Crankcase admission joint lock bolts	14 to 18 Nm
Change control support lock bolts	14 to 18 Nm

(a)= Specific for version with handlebar

(b)= Specific for version with steering wheel

**DIFFERENTIAL UNIT**

Name	Torque in Nm
Differential box toothed sprocket lock bolts	54 to 64 Nm
Differential cover fixing bolt	30 to 40 Nm

**FRONT SUSPENSION UNIT**

Name	Torque in Nm
Shock absorber upper anchoring nut	30-40
Shock absorber lower anchoring nut	100-120
Steering upper bearing lock gear	50 to 70
Wheel rim to drum locking	60-70
Wheel locking centre nut	100-120
Shoes self-centring plate lock nuts	20 - 25

**REAR SUSPENSION UNIT**

Name	Torque in Nm
Wheel to drum lock nut	60-70
Drum centre lock nut	200 to 240
Shock absorber lower lock nut	100 to 140 Nm
Shock absorber upper lock nut	30-40
Swinging arm lock nut	40-50 Nm
Flexible coupling lock nut	40 - 50
Hub to axle shaft lock nut	50-70
Hub to wheel axle lock nut	140-180
Hub to swinging arm lock nut	40 - 50
Shoes self-centring plate lock nut	18 to 20 Nm

**FRAME ASSEMBLY**

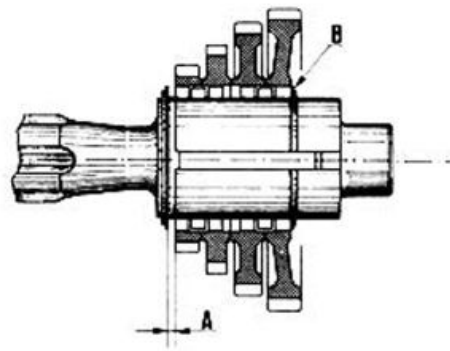
Name	Torque in Nm
Handle bar to steering tube lock bolts	42 to 52 (a)
Steering control lever to steering tube lock bolts	30 to 35
Steering housing lock nuts	20 to 25 (b)
Steering wheel lock nut	30 to 35 (b)
Rack pressure roller lid lock nuts	8 to 12 (b)
Pressure roller adjustment screw lock nut	40 to 60 (b)
Lever holder locking screw	7 to 8.5
Brake oil pump piston end stroke screw	6 to 10 Nm
Pedal assembly bolt lock nut	15 to 25
Stop switch	1.5 to 3
Cab doors lock bolt	23 to 30
Windshield wiper motor lock	8 to 9
Brake pump body lock bolts	12 to 20 (a)
Brake pump body lock bolts	8 to 12
Floor to cab panel lock bolts	20 - 25
Floor to centre cross member lock nuts	20 - 25

(a) Specific for versions with handlebar

(a) Specific for versions with steering wheel

**Vehicle overhaul data****Assembly clearances****SHOULDER RINGS**

Specification	Desc./Quantity
Shoulder ring (Nominal sizes)	B= 1 +0 -0.06 (mm)



**SHOULDER RING - CLEARANCE "A" UPON FITTING**

Name	Description	Dimensions	Initials	Quantity
Shoulder ring	1st Oversize	1.1 +0 -0.06		0.15 to 0.50
Shoulder ring	2nd Oversize	1.2 +0 -0.06		0.15 to 0.50
Shoulder ring	3rd Oversize	1.3 +0 -0.06		0.15 to 0.50
Shoulder ring	4th Oversize	1.5 +0 -0.06		0.15 to 0.50

For the clearance check, use the specific equipment.

**N.B.**

**IF YOU DO NOT GET THE CLEARANCE "A" WITH SHOULDER RING "B", REPLACE THE LATTER WITH A RING LARGE ENOUGH TO GET THE REQUIRED CLEARANCE.**

**Specific tooling**

T.0060824 Control probe axle clearance gear change

**Cylinder-piston oversizes**

**FITTING CLEARANCES**

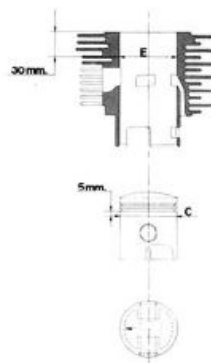
Pistons and cylinders supplied as spare parts by the Manufacturer are marked with the letters of the alphabet. When both pistons and cylinders are replaced, the pieces with the same letter must be matched.

**NORMAL CYLINDER- PISTON NOMINAL SIZES**

Specification	Desc./Quantity
Normal cylinder nominal sizes	E=68 +0.025 - -0.005
Normal piston nominal sizes	C=67.76 +0.025 -0.005

**CYLINDER COUPLING - PISTON**

Name	Initials	Cylinder	Piston	Play on fitting
Coupling:	1st Oversize	68.20 to 68.22	67.96 to 67.98	0.24
Coupling:	2nd Oversize	68.40 to 68.42	68.16 to 68.18	0.24
Coupling:	3rd Oversize	68.60 to 68.62	68.36 to 68.38	0.24



If, however, the cylinder should be increased, the size "E" (see figure) must exceed the size "C" of the piston to be installed (marked on the piston itself) of the indicated value, "Cylinder clearance - piston".

**Fitting clearance**

**Cylinder - piston clearance 0.24**

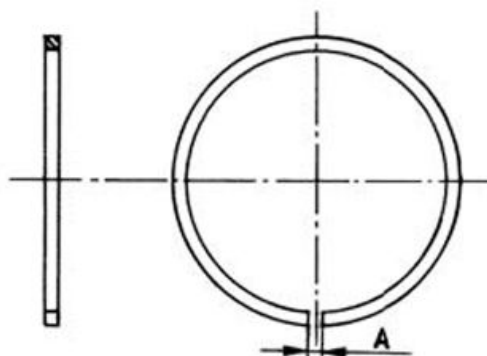
**CAUTION**

**AT REPLACEMENT OF PISTON IN THE CYLINDER, MAKE SURE THAT THE ARROW STAMPED ON THE PISTON SPROCKET IS FACING THE EXHAUST PORT OF THE CYLINDER.**

**Piston ring oversizes**

**SEALING RINGS**

Specification	Desc./Quantity
Seal ring (Nominal sizes)	Diameter = 68 (mm)



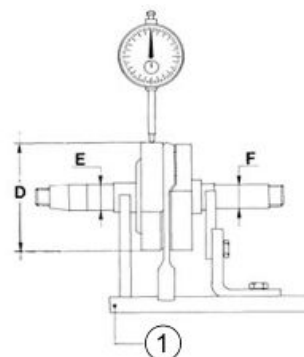
**CLEARANCE "A" UPON FITTING**

Name	Description	Dimensions	Initials	Quantity
Sealing ring	1st Oversize	68.20		0.25 to 0.40
Sealing ring	2nd Oversize	68.40		0.25 to 0.40
Sealing ring	3rd Oversize	68.60		0.25 to 0.40

**Crankshaft alignment check**

With the proper equipment (1), check that the eccentricity of the surface of Ø "E" and "F" are contained within 0.03 mm. (the maximum reading limit on the dial gauge clock); also check the eccentricity of the diameter "D", for which there shall be a maximum reading of 0.02 mm.

In the case of eccentricities not much greater than that prescribed, perform the straightening of the shaft by means of counterweights with a wedge, or tightening it in a vice (equipped with aluminium bushings) as needed.



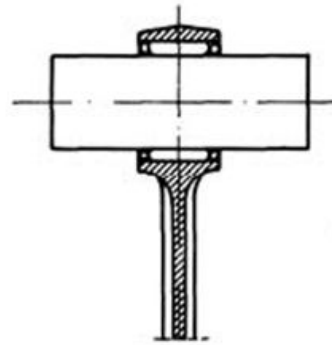
**Specific tooling**

19.1.20074 Crankshaft checking tool

**Rod small end bushing - Pin**

**CONNECTING ROD SMALL END - PIN - ROLLER CAGE**

The connecting rods and cages are divided into 4 categories (marked with incisions at the foot of the same connecting rod and on the cage frames).



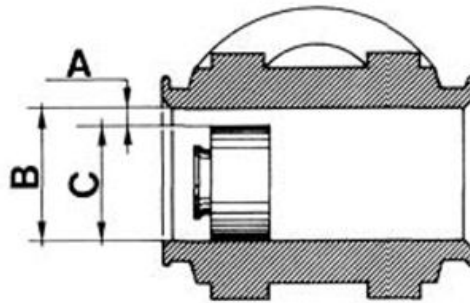
**CONNECTING ROD - ROLLER CAGE**

Connecting rod	Roller cage
1st category	4th category
2nd category	3rd category
3rd category	2nd category
4th category	1st category

**CAUTION**

**IN CASE OF NOISE, USE CAGE OF LOWER CATEGORY.**

**Oil pump**



**FRONT BRAKE CYLINDER - CLEARANCE "A" FOR FITTING**

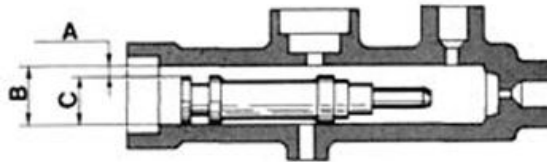
Name	Description	Dimensions	Initials	Quantity
Cylinder		B=22.225 -0 +0.033		0.040 to 0.106
Piston		C=22.225 -0.040 -0.073		0.040 to 0.106

**REAR BRAKE CYLINDERS - CLEARANCE "A" FOR FITTING**

Name	Description	Dimensions	Initials	Quantity
Cylinder		B=25.40 -0 +0.033		0.150 to 0.125
Piston		C=25.40 -0.040 -0.092		0.150 to 0.125

**FRONT AND REAR BRAKE CYLINDERS - CLEARANCE "A" FOR FITTING - APE TM P703  
FL2**

Name	Description	Dimensions	Initials	Quantity
Cylinder		B=25.40 -0 +0.033		0.040 to 0.125
Piston		C=25.40 -0.040 -0.092		0.040 to 0.125



**CLEARANCE "A" UPON FITTING**

Name	Description	Dimensions	Initials	Quantity
Cylinder		B=19 +0.033 -0		0.040 to 0.106
Piston		C=19 +0.040 -0.073		0.040 to 0.106

## INDEX OF TOPICS


**SPECIAL TOOLS**


**ST**





Tooling


**SPECIAL TOOLS**

Stores code	Description	
T.0014499	Bearing extractor	







T.0021467	Bearing extractor	
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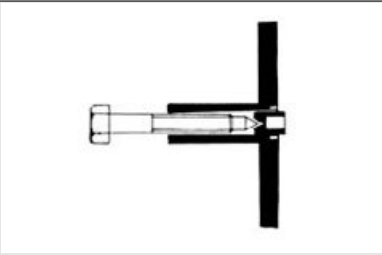





T.0017104	Pliers for circlips	
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T.0022465	Pliers for circlips	
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0023638	Pliers for circlips	
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T.0018119	Tool for fitting shafts	
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Stores code	Description	
19.1.20000	Tool for front suspension overhaul	
19.1.20004	Tool for disassembling steering bearing from the frame	
19.1.20024	Crankshaft removal tool	
19.1.20041	Steering upper bearing ring nut gear wrench	
19.1.20042	Extract the bottom seat of the steering bottom bearing	
19.1.20043	Rear wheel hub roller bearing fitting punch	
19.1.20044	Front wheel hub roller bearing fitting punch	

Stores code	Description	
19.1.20045	Tool for fitting steering lower bearing lower seat	
19.1.20046	Clutch puller	
19.1.20047	Pliers for chamfering nuts	
19.1.20049	Window positioning tool	
19.1.20050	Lower retainer clamp for strip	
19.1.20051	Upper retainer clamp for strip	
19.1.20074	Crankshaft checking tool	

Stores code	Description	
0019978	Oven	
T.0020322	Clutch removal and refitting tool	
T.0020781	Bearings Fitting Punch	
T.0021071	Punch to fit bearings and seal rings	
T.0021330	Steering seats fitting tool	
T.0023589	Punch for bearings and sealing rings	
T.0025095	Engine support plane	

Stores code	Description	
T.0025127	Wedge	
T.0027338	Punch to fit sealing rings	
T.0030632	Wrench for helical gear nut	
T.0031729	Clutch stop key	
T.0033970	Punch for fitting roller bearings	
T.0035731	Flywheel extractor and differential housing	
T.0039152	Punch for roller bearing	

Stores code	Description	
T.0039153	Punch for roller bearing	
T.0043062	Stop key of flywheel and dynamotor pulley	
T.0060824	Control probe axle clearance gear change	

# INDEX OF TOPICS

**MAINTENANCE**

**MA**

## Scheduled maintenance chart

### MAINTENANCE OPERATIONS - APE TM

In the event of prolonged vehicle inactivity, adhere to the following standards:

- 1) Clean the vehicle
  - 2) Remove the fuel from the vehicle
  - 3) Remove the air filter, and with the engine running at low speed and put 30 cc. of specific oil through the diffuser of the carburettor.
  - 4) Apply antirust grease to the unpainted metal parts
  - 5) Lift the wheels off the ground.
- A) Operation to be performed with the engine warm. Amount of new oil: approximately 885 gr., keeping in mind that in the controls of the oil level it must always be between the "min." and "max" positions marked on the rod of the cover.
- B) Operation to be performed with bent iron wire or also with compressed air fed into the nozzle fastening to the cylinder, after heating of the external exhaust pipe.
- C) Use the specific oil to restore the oil level in the tank and for replacement.
- \*) Mainly use of the vehicle on dusty roads; clean the filter housing and replace the filter cartridge more frequently.

Unit	After the first 1000 km	Every 4000 km	Every 8000 km *) = every 16000 km	In the event of a review	Notes
<b>ENGINE</b>					
Carburettor locking	•				See the table of locking torque
Piston - big end - cylinder lights descaling		•			See the table of locking torque
Cleaning and descaling of the still usable engine parts				•	See the table of locking torque
<b>TRANSMISSION - DIFFERENTIAL</b>					
Oil replacement	• (▲ - A)		• (▲ - A)	• (▲)	Specific (▲) oil
Check and restore oil level		• (▲)			IP DUE T (▲) oil
air filter					
Replace			*)•		
<b>SPARK PLUG</b>					
Electrode gap and descaling check	•	•			Marelli CW 7N; Bosch W 4AC-Lodge 3HN; Champion L82-AC430Z; NGK B7HS
Replacement				•	Marelli CW 7N; Bosch W 4AC-Lodge 3HN; Champion L82-AC430Z; NGK B7HS
<b>SILENCER</b>					
Cleaning of the exhaust pipe		•(B)			
<b>BEARINGS</b>					
Grease		•(■)		•(■)	(■) IP Athesia Grease 3 or FIAT Jota 3 Grease
<b>ARTICULATIONS AND CONTROL LEVERS (ENGINE SIDE)</b>					
Grease		•(+)		•(+)	(+) IP Autogrease LZ or FIAT Zeta 2 Grease
<b>HYDRAULIC BRAKE</b>					
Check and restore oil level		•(x-C)		•(+)	(+) IP Autofluid FR Oil or FIAT Blue label DOT 3 Liquid
<b>FLEXIBLE TRANSMISSIONS</b>					
Adjust	•				
Lubricate			•(■)	•(■)	
<b>MAIN NUTS AND BOLTS OF THE VEHICLE</b>					
Locking check	•			•	See the table of locking torque

### MAINTENANCE OPERATIONS - APE TM KAT

\* = check.

• = replacement.

(\*) = every two years.

(\*\*) = every 12000 km / 36 months.



x 1000 Km - (Months)	1 (4)	5 (12)	10 (24)	15 (36)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	
Battery - check/top-up		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Safety blocks - Check	*		*		*		*		*		*		*		*		*		*	
Carburetion - Inspection/Adjustment	*		*		*		*		*		*		*		*		*		*	
Ignition spark plug - Replacement		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Door hinges - Lubrication			*		*		*		*		*		*		*		*		*	
Dynamotor belt - Inspection/Adjustment	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Transmissions (gas, clutch, drive) - Inspection/Adjustment	*		*		*		*		*		*		*		*		*		*	
Tyre wear and inflation pressure - Inspection	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Air filter - Replacement			•		•		•		•		•		•		•		•		•	
Parking brake - Adjustment	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Electrical system - Inspection	*		*		*		*		*		*		*		*		*		*	
Cylinder and fan system - Inspection					*				*				*				*			
Light transmission on the engine - Lubrication		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Brake fluid level - Inspection	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Brake fluid - Replacement	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)
Engine oil and differential - Replacement	•		•		•		•		•		•		•		•		•		•	
Headlight - Inspection/Adjustment	*		*		*		*		*		*		*		*		*		*	
Vehicle and brake test - Inspection	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Suspension - Inspection			*		*		*		*		*		*		*		*		*	
Piston cylinder head exhaust port - Cleaning			•		•		•		•		•		•		•		•		•	
Flexible transmissions - Lubrication		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Exhaust pipe - Cleaning			•		•		•		•		•		•		•		•		•	
Pressure flexible brake pipes - Replacement							•						•						•	
Cleaning air filter and SAS box (sponge) - Inspection/Replacement		*	•	*	•	*	•	*	•	*	•	*	•	*	•	*	•	*	•	*
SAS reed support - replacement	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)	(**)
Labour time	90'	65'	20 0'	65'	22 5'	65'	24 0'	65'	22 5'	65'	11 0'	65'	26 0'	65'	20 0'	65'	22 5'	65'	24 0'	65'

**MAINTENANCE OPERATIONS - APE TM P703 FL2**

\* = check.  
 • = replacement.  
 (\*) = every two years.

x 1000 Km - (Months)	1 (4)	5 (12)	10 (24)	15 (36)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	
Battery - check/top-up		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Safety blocks - Check	*		*		*		*		*		*		*		*		*		*	
Carburetion - Inspection/Adjustment	*		*		*		*		*		*		*		*		*		*	
Ignition spark plug - Replacement		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Door hinges - Lubrication			*		*		*		*		*		*		*		*		*	
Dynamotor belt - Inspection/Adjustment	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Transmissions (gas, clutch, drive) - Inspection/Adjustment	*		*		*		*		*		*		*		*		*		*	

x 1000 Km - (Months)	1	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	
	(4)	(12)	(24)	(36)																
Tyre wear and inflation pressure - Inspection	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Air filter - Replacement			•		•		•		•		•		•		•		•		•	
Parking brake - Adjustment	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Electrical system - Inspection	*		*		*		*		*		*		*		*		*		*	
Cylinder and fan system - Inspection					*				*				*				*			
Light transmission on the engine - Lubrication		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Brake fluid level - Inspection	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Brake fluid - Replacement	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)	
Engine oil and differential - Replacement	•		•		•		•		•		•		•		•		•		•	
Headlight - Inspection/Adjustment	*		*		*		*		*		*		*		*		*		*	
Vehicle and brake test - Inspection	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Suspension - Inspection			*		*		*		*		*		*		*		*		*	
Piston cylinder head exhaust port - Cleaning			•		•		•		•		•		•		•		•		•	
Flexible transmissions - Lubrication		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Exhaust pipe - Cleaning			•		•		•		•		•		•		•		•		•	
Pressure flexible brake pipes - Replacement							•						•						•	
Labour time	90'	55'	19 0'	55'	21 5'	55'	23 0'	55'	21 5'	55'	19 0'	55'	25 0'	55'	19 0'	55'	21 5'	55'	23 0'	

## Suggested products chart

### RECOMMENDED PRODUCTS

Product	Description	Specifications
AGIP CITY TEC 2T	Oil for 2-stroke petrol engines	JASO FC, ISO-L-EGD Specifications
AGIP ROTRA MP 80W-90	Oil with specifications SAE 80W-90, API GL-5	Gearbox oil
AGIP BRAKE 4	Brake fluid	Specifications - FMVSS DOT 4
AGIP GREASE PV 2	Multipurpose grease	NLGI 2 specifications; ISO-LXBIB2
AGIP ARNICA 46	Oil for hydraulic tilting system pump	Oil for hydraulic circuits corresponding to specific ISO VG 46, DIN 51524 HVLP
AGIP SUPERDIESEL MULTIGRADE 15W-40	Engine oil (recommended for warm climates)	SAE 15W-40, API CF-4/SG

## Carburettor

Disassemble the carburettor in its parts, wash all of them with pure petrol, dry all body grooves with compressed air to ensure adequate cleaning.

Check carefully that the parts are in good condition.

### THROTTLE VALVE

The throttle valve should slide freely in the mixing chamber. Replace it in case of excessive clearance due to wear.

If there are wear marks in the mixing chamber causing inadequate tightness or a free valve slide (even if it is new), replace the carburettor.

It is advisable to replace the gasket at every refit

**CARBURETTOR CHARACTERISTICS**

Specification	Desc./Quantity
Dell'Orto type	SHB 22/22
Diffuser	mm. 22
Maximum jet	73/100 long
Minimum jet	55/100 long
Minimum fixed air	100/100
Maximum fixed air	170/100
Starter jet	70/100

**CAUTION**

**CHECK THAT THE CARBURETTOR IS WELL LOCKED, THAT THE VALVE COVER AND THE FITTINGS OF THE ADMISSION DUCT ARE NOT LOOSE, IN ORDER TO AVOID HARMFUL AIR LEAKAGE AFFECTING THEIR CARBURETION.**

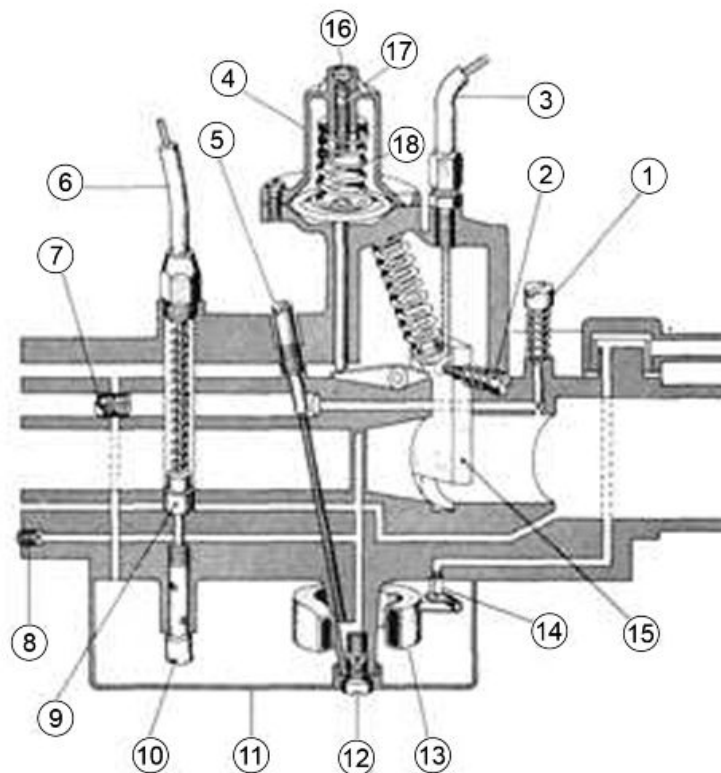
**IDLE ADJUSTMENT**

The operations for adjusting the idle speed must be carried out when the engine is warm, as follows:

1. Acting on the throttle valve travel end adjustment screw (2) until approaching the corresponding limit at spontaneous stop of the engine;

In these conditions, act on the mixture flow adjustment screw (1) to reach a higher rpm number.

If with this adjustment the RPM number reached is excessive, reduce it, using the screw (2) lowering further throttle valve, reaching a minimum regular regime (1250 - 1450 rpm).



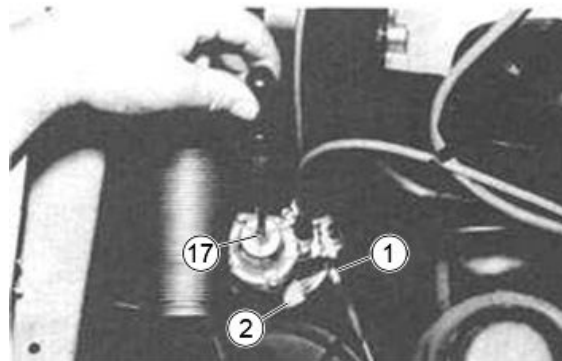
**KEY:**

- 1. Idle adjustment screw
- 2. Throttle valve travel end adjustment screw
- 3. Transmission and throttle control
- 4. RPM limiter device

5. Minimum jet
6. Starter transmission
7. Minimum air calibrator
8. Maximum air calibrator
9. Starter valve
10. Starter jet
11. Tank
12. Maximum jet
13. Float
14. Needle
15. Throttle valve
16. Inviolability cap
17. Preloading spring screw
18. Spring

**WARNING**

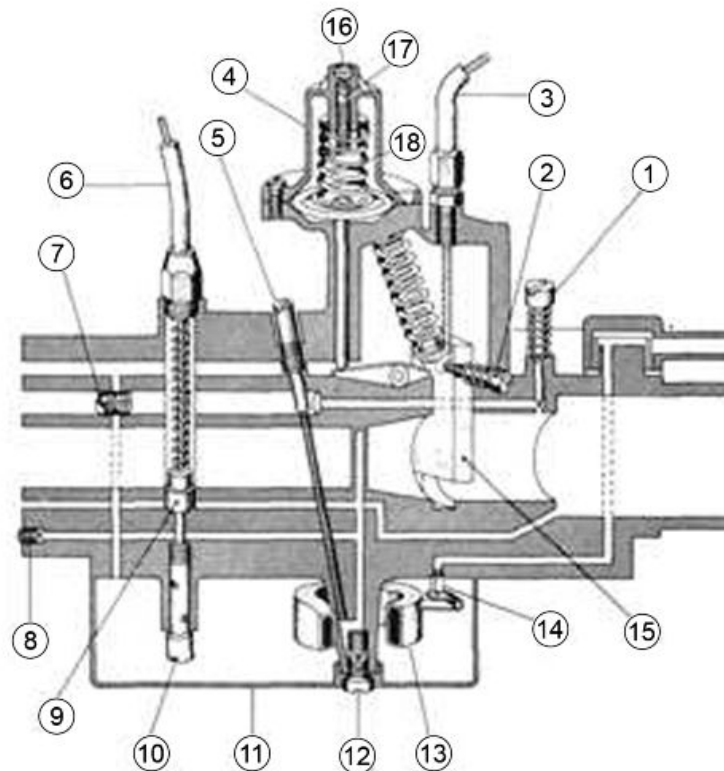
THE PLASTIC KNOB (2), FITTED ON THE THROTTLE VALVE TRAVEL END ADJUSTMENT SCREW, MUST NOT BE REMOVED UNDER ANY CIRCUMSTANCES.



2. If in spite of the adjustments previously described, engine idling remains irregular remove the inviolability cap (16) and proceed as follows:

2.1 If when releasing the throttle control the engine tends to remain slightly accelerated: gradually loosen the preloading spring screw (17) until obtaining, at the release of the throttle, an excellent idle condition.

2.2 If when releasing the throttle the engine tends to turn off: gradually tighten the screw (17) in order to further preload the spring (18).



**N.B.**

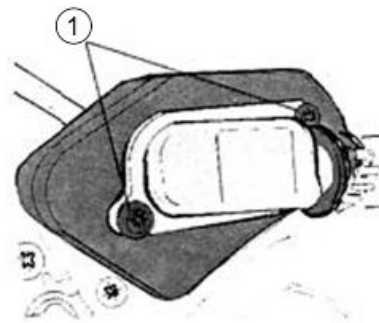
**THE INTERVENTIONS DESCRIBED AT POINT 2. - 2.1 - 2.2, SHOULD BE MADE ONLY IF ACTUALLY NECESSARY, SINCE THE CARBURETTORS ARE ALREADY CALIBRATED WHEN PROVIDED BY THE MANUFACTURER, SO IN MOST CASES A CORRECT IDLE IS OBTAINED ONLY BY PROCEEDING AS INDICATED IN SECTION 1.**

## Secondary air system

### FILTER CLEANING AND AIR INTEGRITY CHECK

To clean the sponge filters of the secondary air system, proceed as follows:

- 1)** Unscrew the two fixing screws (1) from the aluminium lid of the secondary air box to access the polyurethane sponge contained inside the same box;
- 2)** Clean the polyurethane sponge by washing with soap and water, then dry everything with compressed air and reposition everything back in the corresponding seats, after checking at the same time that the blade is not warped and/or does not guarantee its seal on its contact surface; replace if necessary.



**N.B.**

WHEN REASSEMBLING, TAKE CARE TO PROPERLY POSITION THE BLADE IN ITS SEAT ON THE PLASTIC AND ALUMINIUM COVERS.

**CAUTION**

DURING THE OPERATION 1) ALWAYS CHECK THE INTEGRITY AND THE SEAL OF TWO RUBBER SLEEVES LOCATED ON THE END OF THE SECONDARY AIR TUBE; IF NECESSARY REPLACE USING NEW CLAMPS TO FIX THEM.

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## Settings and Adjustments

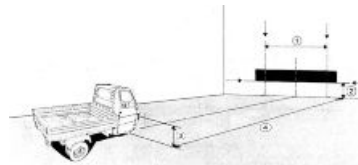
**HEADLIGHT AIMING**

(1) = Distance between the centres of the headlights

(2) = (3) x 0.9

(3) = Height from the ground of the centre of the headlights

(2) = (3) x 0.95 if the aiming of the headlights is carried out with the vehicle at a distance of 5 metres from the screen.

**HEADLIGHTS AIMING INSPECTION**

Position the unloaded vehicle on a flat surface and at 10 m (4) away from a white screen located in the dark (see the figure) and make sure that the vehicle axis is perpendicular to the screen. Draw two vertical lines "↓-↓", on the screen, at a distance "(1)" corresponding to the distance between headlight axes. Draw a horizontal line "→ - ←" whose height "(2)" from the ground corresponds to 0.9 x (3); with the low-beam headlight on, the horizontal borderline between the dark and the light zones should not be above the horizontal line "→-←". Now switch on the high-beam lights and check that the centre of the depth light beam for each headlight is on the corresponding vertical line "↓-↓", or slightly outside that line.

**N.B.**

THE TWO HEADLIGHTS ARE FITTED WITH TWO ADJUSTMENT SCREWS THAT ALLOW TO CORRECT ANY CHANGES IN INCLINATION (SCREW LOCATED ON THE UPPER PART) OF THE LIGHT BEAMS. TO ACCESS THESE SCREWS, REMOVE THE EXTERNAL FINISH FRAME OF THE HEADLIGHT ASSEMBLY. BEFORE CARRYING OUT THIS CONTROL, MAKE SURE THAT THE FRONT AND REAR TYRES ARE INFLATED TO THE PRESSURES SPECIFIED IN THE CHARACTERISTICS.

**HEADLIGHTS AIMING - APE TM P703 FL2**

(1) = Distance between the centres of the headlights

(2) = (3) x 0.9

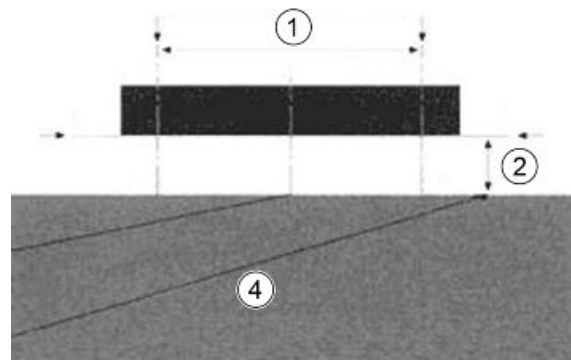
(3) = Height from the ground of the centre of the headlights

(2) = (3) x 0.95 if the aiming of the headlights is carried out with the vehicle at a distance of 5 metres from the screen.

**HEADLIGHTS AIMING CHECK - APE TM P703****FL2**

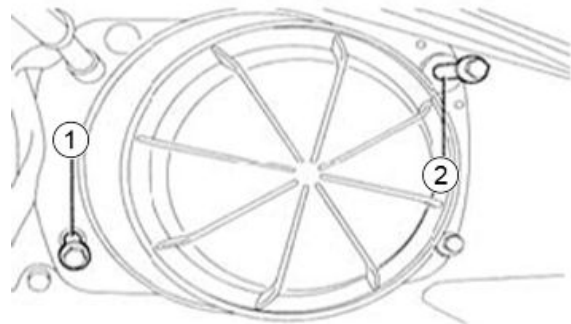
Position the unloaded vehicle on a flat surface and at 10 m (4) away from a white screen located in the dark (see the figure) and make sure that the vehicle axis is perpendicular to the screen. Draw two vertical lines "↓-↓", on the screen, at a distance "(1)" corresponding to the distance between headlight axes. Draw a horizontal line "→ - ←" whose height "(2)" from the ground corresponds to  $0.9 \times (3)$ ; with the low-beam headlight on, the horizontal borderline between the dark and the light zones should not be above the horizontal line "→-←".

Now switch on the high-beam lights and check that the centre of the depth light beam for each headlight is on the corresponding vertical line "↓-↓", or slightly outside that line.

**N.B.**

**BEFORE CARRYING OUT THIS CONTROL, MAKE SURE THAT THE FRONT AND REAR TYRES ARE INFLATED TO THE PRESSURES SPECIFIED IN THE CHARACTERISTICS.**

Both headlights have 2 adjustment screws, "(1)" and "(2)", located at the back of the headlight used to correct any misalignment of the light beam: screw "(1)" to adjust divergence; screw "(2)" to adjust angle.



## INDEX OF TOPICS

EMISSION CONTROL SYSTEM

CO EM



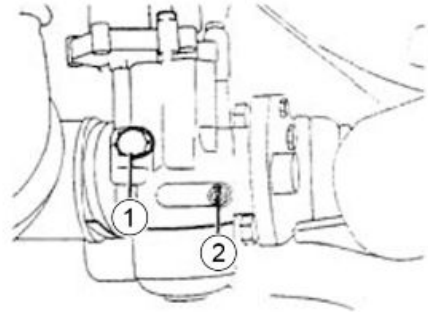
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## CO check

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The test must be done after a thorough cleaning of all parts of the carburettor, with the air filter clean and spark plug in good condition.

- 1) Heat the vehicle for the time necessary to activate the catalytic converter.
- 2) Turn off the vehicle for the time necessary to perform the operations of 3) and 4).
- 3) Insert an extension pipe of ~ 50 cm at the exhaust fumes socket on the silencer.
- 4) With the utmost care, check the seal between silencer and tube. Insert the probe of the exhaust fumes analyser into the tube.
- 5) Start the engine.
- 6) Wait for a minute for the idle to stabilise.
- 7) Without ever operating the accelerator and using the appropriate screw (1), bring the engine speed to  $1350 \pm 100$ rpm.
- 8) Record the flow screw (2) in order to have a value of "CO" equal to 1.5% - 3.0%.
- 9) Operate the throttle grip by slowly speeding up the engine to a speed of 4000 rpm. and return to the closed position; check that the idle speed remains at the previously established value, otherwise repeat the procedure starting from point 3).



### Specific tooling

020332Y Digital rev counter

494929 Exhaust fumes analyser

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## INDEX OF TOPICS

TROUBLESHOOTING

TROUBL

## Probable cause and troubleshooting

### CLUTCH SLIPPAGE

Possible Cause	Operation
Insufficient idle stroke	Adjust the stroke.
Weak return spring	Replace.
Worn or burned driven disc gasket	Replace the disc.
Insufficient oil in the differential transmission or unsuitable oil	Restore the oil level or replace.

### SPONTANEOUS GEARS DISENGAGEMENT

Possible Cause	Operation
Gearbox housing worn	Verify and replace if necessary.
Badly adjusted control cable	Record.
Transmission gears or spiders not properly assembled or worn	Review.

### NOISE

Possible Cause	Operation
Worn or leaking shock absorbers	Replace.
Flexible buffers of the swinging arms worn	Replace.
Insufficient lubrication of the hubs	Remove the hubs and fill the appropriate chamber with special grease.

### Recommended products

#### AGIP GREASE PV 2 Multipurpose grease

NLGI 2 specifications; ISO-LXBIB2

### SECONDARY AIR TUBE JOINT FAILURE ON THE SILENCER - APE TM KAT

Possible Cause	Operation
Secondary air blade locking	Replace.
Secondary air filter clogging	Clean the filter and the box.
Clogging of the secondary air joint on the silencer	Descale the joint taking care to not let the residues fall into the silencer.

## Engine

### THE ENGINE STOPS

Possible Cause	Operation
Idle speed too low	Work on the appropriate adjuster screw del of the carburettor.
Dirt or water in the mixture or in the ducts	Clean thoroughly.
Inefficient spark plug	Clean and adjust the gap between the electrodes or replace.
Cock obstruction	Clean.
H.V. cable or spark plug hood damaged	Check or replace.
Fuel tank cap breather obstruction (defective fuel system)	Clean properly.

### CRANKSHAFT KNOCKS

Possible Cause	Operation
Excessive clearance of the main bearings	Replace.
Big end failure	Replace the crankshaft.
Crankshaft unbalanced	Check the alignment
Piston pin worn	Replace.

### RINGING OF THE PISTON

Possible Cause	Operation
Excessive clearance between the piston and cylinder	Replace the piston and correct the cylinder.
Excessive clearance of the roller pin-connecting rod small end or piston pin	Inspect (for any replacement of the rollers of the connecting rod small end, see the section <b>Fitting clearances</b> ).

## Poor performance

### **POOR PERFORMANCE - POOR COMPRESSION - GAS LEAKS**

Possible Cause	Operation
Loosening of screws and nuts	Relock nuts and bolts of the specific elements of the engine (carburettor, cylinder head, silencer attachment), observing the values of related torques.

### **LOW POWER**

Possible Cause	Operation
Timing incorrect	Carry out the checks required for the <b>Ignition Timing Control</b> .
Head, cylinder or spark plug not fitted correctly	Correct the fitting and the locking.
Current leakage of the ignition system.	Locate the leakage and act accordingly.
Excessive incrustation on the lights of the cylinder.	Descale.
Silencer blocked	Descale with iron wire bent into a hook or with compressed air introduced into the cylinder nozzle fixed to the cylinder prior external exhaust pipe heating.

## Starting difficulties

### **STARTING PROBLEMS**

Possible Cause	Operation
Clogged jets, carburettor body or cock	Remove and clean in petrol; Dry with a compressed air jet.
Air filter clogged or dirty	Replace.
Inefficient spark plug	Clean and adjust the electrodes or replace.
Discharged battery	The battery is the electrical device in the system that requires the most frequent inspections and thorough maintenance. Frequently check that the fluid level fully covers the plates; if not, restore the level by adding distilled water (never use natural water, even if it is drinking water) and check fluid density at the same time, as described in the "Battery" section. If the vehicle is not used for some time (1 month or longer) the battery needs to be recharged periodically. The battery runs down completely in the course of three months. When the battery is being placed on the vehicle, make sure that the connections are not misplaced, keeping in mind that the black ground cable with the silencer attached to the frame is to be connected to the negative terminal whereas, the other cable, must be connected to the terminal marked +.
Inefficient dynamotor	Identify defects and make any revisions as stated in the section "Disassembly and reassembly of dynamo motor".
Rapid inefficiency of the regulator and battery	Check that the connections to the battery have not been reversed.

## Gearbox

### **TRANSMISSION NOISE**

Possible Cause	Operation
Excessive clearance between the gears of the transmission	Review and replace the worn components.
Insufficient oil in the differential transmission	Restore the oil level or replace.
Bearings of the gear shaft are noisy	Replace.

### **OIL LOSS FROM THE DIFFERENTIAL UNIT**

Possible Cause	Operation
Overfilling of the differential gear oil	Bring back to level.

Possible Cause	Operation
Loosening of the crankcase halves and the differential cover locking nuts	Check the locks, replace the gaskets if necessary.
Axle shaft oil seal hood worn or broken	Replace.
Cracked crankcase	Replace.
Loose oil drain plug	Lock and replace if damaged.

## Brakes

### BRAKES BLOCKED

Possible Cause	Operation
Return springs stretched	Replace.
Compensation hole on the pump clogged	Clean and bleed the air out of the system.
Rubber gaskets swollen or sized	Inspect the system, replace all rubber parts and the liquid (see <b>Rules to check the hydraulic brake</b> ) purge air from the system: use the oil specified in <b>General maintenance and lubrication regulations and in Priming the oil pump</b> .

### ELASTIC ACTION OF THE BRAKE PEDAL

Possible Cause	Operation
Air in the system	Purge.
The flexible pipe inflates under pressure due to wear	Replace.
Air leak in the pump due to poor tightness of rubber rings	Replace the rings.

### BRAKE PEDAL VERY YIELDING

Possible Cause	Operation
Deteriorated valve ring	Replace the valve.
The oil used is not suitable	Replace the oil with that prescribed.
The bleed hole on the pump cap causes loss of pressure in the pump and allows air to enter the sealing gasket	Clean the tank cap and bleed the system.
Fluid leak from fittings, cylinders and hoses	Review and replace the worn components.

### BRAKES OVERHEATING

Possible Cause	Operation
Insufficient clearance between shoes and drums	Self-adjusting device locked.
Shoe return spring weak or damaged	Replace.
Piston locked	Inspect the unit.
Drums and shoes worn or scored	Replace.

## Suspensions and steering

### FRONT WHEEL NOISE

Possible Cause	Operation
Hub bearings worn or with excessive clearance	Replace.
The wheel hub chamber needs to be greased	Disassemble or apply grease.
Hydraulic absorber inefficient or discharged	Replace.
Roller bearings of swinging arm worn	Replace.

### FAILURE ON ONE WHEEL

Possible Cause	Operation
Inefficient or leaking shock absorbers	Replace.
Worn rubber buffers	Replace.
Excessive tyre wear due to incorrect inflation pressure or excessive loads	Check and restore the tyre to the prescribed pressure or replace it (if necessary) and recall the user's attention. <b>N.B.:</b> In case of replacement of wheels or tyres, at replacement, lock the nuts while respecting the table of tightening torques.

**THE VEHICLE PULLS TO ONE SIDE**

<b>Possible Cause</b>	<b>Operation</b>
The pressure of one of the tyres is not right	Check and ensure that the inflation pressure is the one prescribed (see <b>Characteristics</b> ).
Rear swinging arms deformed	Straighten out if possible, or replace.
Worn rubber buffers	Replace.
The vehicle "pulls" to one side due to deformation of the steering tube	Check the steering tube and replace if necessary.
Steering is hard or knocks	Check the steering fifth wheels: if they are loose they must be properly tightened; if marked with pricks, they must be replaced.
Irregularities in road holding	Check the tyre pressure, the efficiency of the suspension and the locking of the wheel nuts. Pay attention that the load is not badly distributed on the deck.

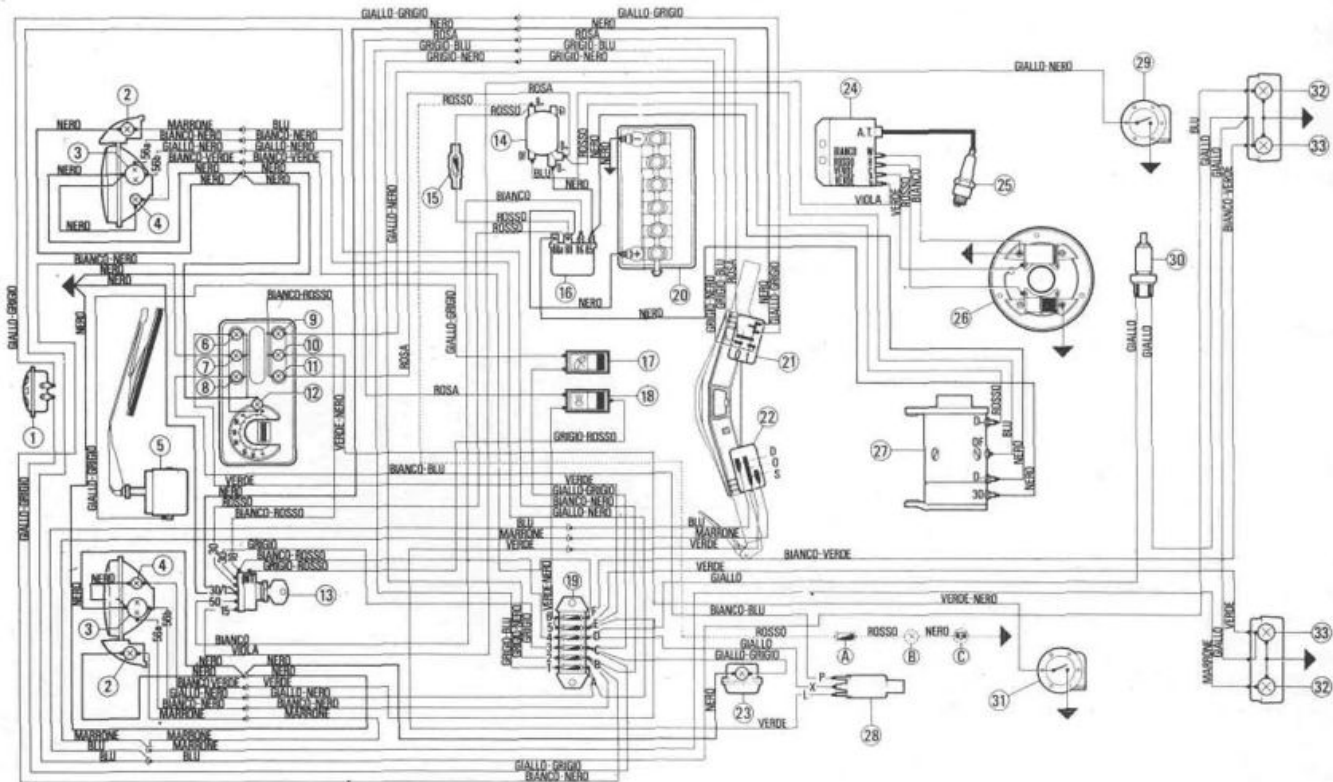
# INDEX OF TOPICS

**ELECTRICAL SYSTEM**

**ES**

**Electric circuit diagram**

**Electrical System Diagram (version with handlebar)**



**KEY:**

1. Horn
2. Front turn indicators, 12V-21W bulbs
3. High beam and low beam headlight, 12V-25/25W twin-filament lamp
4. Front position indicators, 12V-4W bulbs
5. Windscreen wiper
6. Warning light, daylight running lights on (green light), "All Glass" lamp 12 V - 1.2 W
7. Warning light, high beam lights on (blue light), "All Glass" lamp 12 V - 1.2 W
8. Warning light of turn indicators operation (green light), "All Glass" lamp 12 V - 1.2 W
9. Oil reserve warning light (red light), "All Glass" lamp 12 V - 1.2 W
10. Fuel reserve warning light (amber light), "All Glass" lamp 12 V - 1.2 W
11. Warning light indicating dynamo battery charger low voltage (red light), "All Glass" lamp 12 V - 1.2 W
12. "All Glass" lamp for lighting odometer 12 V - 1.2 W
13. Engine start-up switch
14. Voltage regulator
15. Protection fuse 25A
16. Remote control



17. Windscreen wiper switch
18. Switch for external lighting
19. Protection 8A fuse valves to electrical system
20. 12V - 24Ah battery
21. Switch for external lighting with horn button
22. Turn indicator switch
23. Ceiling lighting bulb inside the cab 12V - 4W
24. Electronic control unit
25. Spark plug
26. Flywheel fan
27. Dynamotor
28. Heated switch
29. Oil tank level indicator
30. Rear stop lights switch
31. Fuel tank level indicator
32. Rear turn indicators, 12V - 21W bulbs
33. Rear position lights and stop lamps 12V - 5/21W.

**WARNING**

**THE MARKS --- INDICATE THE ELECTRICAL INSTALLATION VARIANTS FOR THE VAN BODY-WORK.**

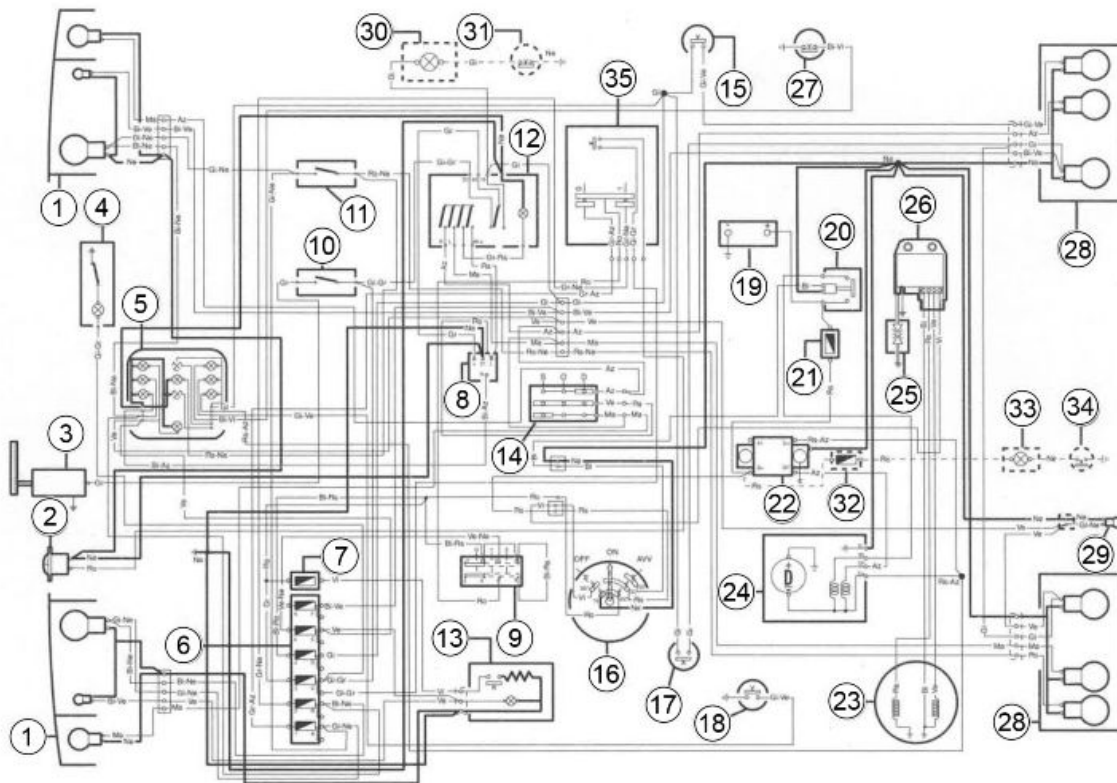
**KEY:**

- A. 8A Protective fuse valve.
- B. Lamp for lighting inside the van.
- C. Push-button light switch, controlled by the back door.

**N.B.**

**THE ELECTRICAL SYSTEM DIAGRAM FOR THE TIPPER VERSION DIFFERS DUE TO THE ADDITION OF A SENSOR (OPERATED BY THE DECK POSITION AT TIME OF DETACHMENT) LINKED BY A GREY CABLE TO A RED WARNING LIGHT (LAMP 12V - 1.2 W) MOUNTED ON THE CENTRE OF THE DASHBOARD.**

**Electrical system diagram (version with handlebar) - APE TM P703 FL2**

**KEY:**

1. Front headlight fitting with twin-filament high-/low-beam bulb (12V-25W/25W), daylight running light bulb (12V-5W), turn indicator bulb (12V-21W).
2. Horn.
3. Windscreen wiper.
4. Internal light (12V-5W).
5. Light indicator unit (12V-1.2W bulbs).
6. Fuse terminal block (six 8A fuses).
7. Cigarette lighter fuse (15A).
8. Turn indicator control device.
9. External light control switch.
10. Windscreen wiper control switch.
11. Rear fog light switch.
12. Emergency lights switch (12V-1.2W).
13. Cigarette lighter (12V-1.2W).
14. Turn indicator selector.
15. Reverse button.
16. Key switch.
17. Stop button on rear brake.
18. Low fuel warning light control.
19. 12V-32Ah battery.

- 20. Start-up relay.
- 21. Main fuse (25A).
- 22. Voltage regulator.
- 23. Magneto flywheel.
- 24. Dynamotor.
- 25. Spark plug.
- 26. Electronic control unit.
- 27. Oil warning light control.
- 28. Rear light with twin-filament daylight running light/stop bulb (12V-5W/21W), reverse bulb (12V-21W for rear right light), rear fog light bulb (12V-21W for left rear light), turn indicator bulb (12V-21W).
- 29. License plate light (12V-5W bulb).
- 30. Load box tilting device warning light (12V-3W).
- 31. Load box tilting button.
- 32. Van lighting fuse (8A).
- 33. Van lighting bulb (12V-5W).
- 34. Van lighting switch.
- 35. Headlight switch and horn button.

**COLOUR CODE:**

**Ar:** Orange

**Az:** Blue

**Bi:** White

**Gi:** Yellow

**Gr:** Grey

**Ne:** Black

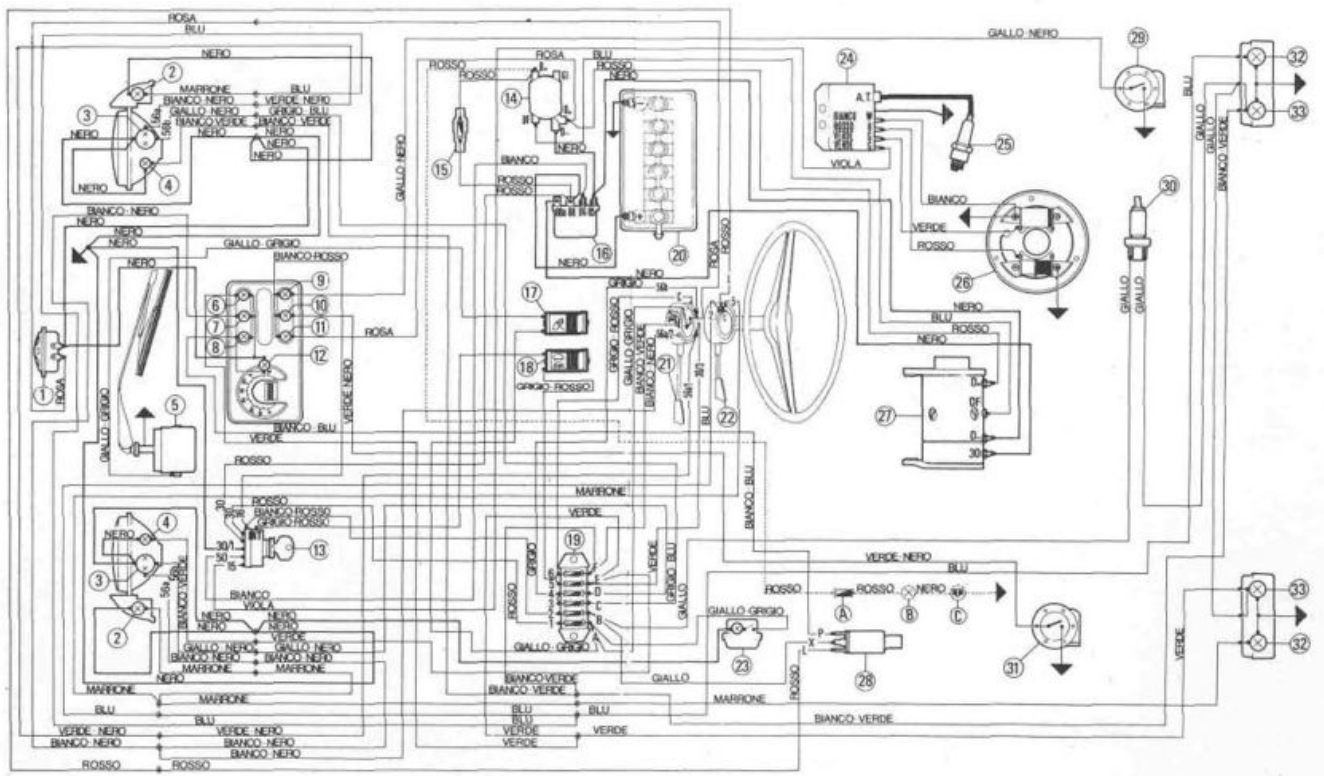
**Ro:** Pink

**Rs:** Red

**Ve:** Green

**Vi:** Purple

**Electrical System Diagram (version with steering wheel)**

**KEY:**

1. Horn
2. Front turn indicators, 12V-21W bulbs
3. High beam and low beam headlight, 12V-25/25W twin-filament lamp
4. Front position indicators, 12V-4W bulbs
5. Windscreen wiper
6. Warning light, daylight running lights on (green light), "All Glass" lamp 12 V - 1.2 W
7. Warning light, high beam lights on (blue light), "All Glass" lamp 12 V - 1.2 W
8. Warning light of turn indicators operation (green light), "All Glass" lamp 12 V - 1.2 W
9. Oil reserve warning light (red light), "All Glass" lamp 12 V - 1.2 W
10. Fuel reserve warning light (amber light), "All Glass" lamp 12 V - 1.2 W
11. Warning light indicating dynamo battery charger low voltage (red light), "All Glass" lamp 12 V - 1.2 W
12. "All Glass" lamp for lighting odometer 12 V - 1.2 W
13. Engine start-up switch
14. Voltage regulator
15. Protection fuse 25A
16. Remote control
17. Windscreen wiper switch
18. Switch for external lighting
19. Protection 8A fuse valves to electrical system

- 20. 12V - 24Ah battery
- 21. Switch lever for external lighting with horn button
- 22. Turn indicator switch lever
- 23. Ceiling lighting bulb inside the cab 12V - 4W
- 24. Electronic control unit
- 25. Spark plug
- 26. Flywheel fan
- 27. Dynamotor
- 28. Heated switch
- 29. Oil tank level indicator
- 30. Rear stop lights switch
- 31. Fuel tank level indicator
- 32. Rear turn indicators, 12V - 21W bulbs
- 33. Rear position lights and stop lamps 12V - 5/21W.

**WARNING**

**THE MARKS --- INDICATE THE ELECTRICAL INSTALLATION VARIANTS FOR THE VAN BODY-WORK.**

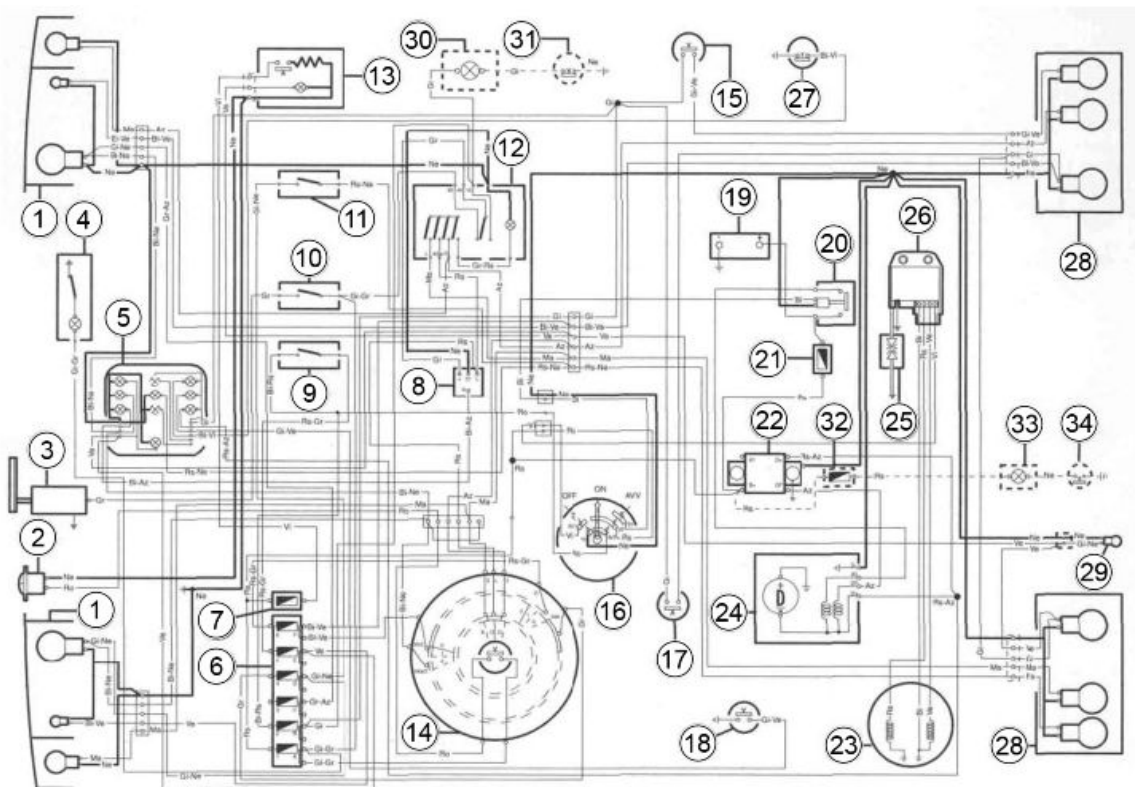
**KEY:**

- A. 8A Protective fuse valve.
- B. Lamp for lighting inside the van.
- C. Push-button light switch, controlled by the back door.

**N.B.**

**THE ELECTRICAL SYSTEM DIAGRAM FOR THE TIPPER VERSION DIFFERS DUE TO THE ADDITION OF A SENSOR (OPERATED BY THE DECK POSITION AT TIME OF DETACHMENT) LINKED BY A GREY CABLE TO A RED WARNING LIGHT (LAMP 12V - 1.2 W) MOUNTED ON THE CENTRE OF THE DASHBOARD.**

**Electrical system diagram (version with steering wheel) - APE TM P703 FL2**

**KEY:**

1. Front headlight fitting with twin-filament high-/low-beam bulb (12V-25W/25W), daylight running light bulb (12V-5W), turn indicator bulb (12V-21W).
2. Horn.
3. Windscreen wiper.
4. Internal light (12V-5W).
5. Light indicator unit (12V-1.2W bulbs).
6. Fuse terminal block (six 8A fuses).
7. Cigarette lighter fuse (15A).
8. Turn indicator control device.
9. External light control switch.
10. Windscreen wiper control switch.
11. Rear fog light switch.
12. Emergency lights switch (12V-1.2W).
13. Cigarette lighter (12V-1.2W).
14. Light switch lever, turn indicators switch, and horn.
15. Reverse button.
16. Key switch.
17. Stop button on rear brake.
18. Low fuel warning light control.
19. 12V-32Ah battery.

- 20. Start-up relay.
- 21. Main fuse (25A).
- 22. Voltage regulator.
- 23. Magneto flywheel.
- 24. Dynamotor.
- 25. Spark plug.
- 26. Electronic control unit.
- 27. Oil warning light control.
- 28. Rear light with twin-filament daylight running light/stop bulb (12V-5W/21W), reverse bulb (12V-21W for rear right light), rear fog light bulb (12V-21W for left rear light), turn indicator bulb (12V-21W).
- 29. License plate light (12V-5W bulb).
- 30. Load box tilting device warning light (12V-3W).
- 31. Load box tilting button.
- 32. Van lighting fuse (8A).
- 33. Van lighting bulb (12V-5W).
- 34. Van lighting switch.

**COLOUR CODE:**

**Ar:** Orange

**Az:** Light Blue

**Bi:** White

**Gi:** Yellow

**Ma :** Brown

**Gr:** Grey

**Ne:** Black

**Ro:** Pink

**Rs:** Red

**Ve:** Green

**Vi:** Purple

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## Key-switch

### APE P703 (VERSION WITH HANDLEBAR)

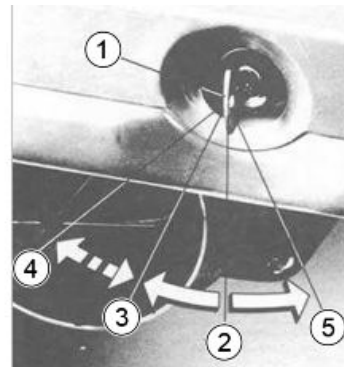
Positions of the switch "1".

**2:** Everything turned off - Extractable key - Contacts 30/1-15 coil feeder grounded electronic device - Current to audible warning device, windscreen wipers and internal light.

**3:** Running position - Arrangement of utilities and external lights - Contacts 30 - 16 and 30 - INT. Current to audible warning device, windscreen wipers and internal light.

**4:** Engine starter - Non-extractable key with return to position "3" - Contacts 30 - 16, 30 -INT. and 30 - 50.

**5:** Arrangement of utilities and external lights (Night parking) - Extractable key - Contacts 30 - INT. and 30/1 - 15. Current to audible warning device, windscreen wiper and internal light.



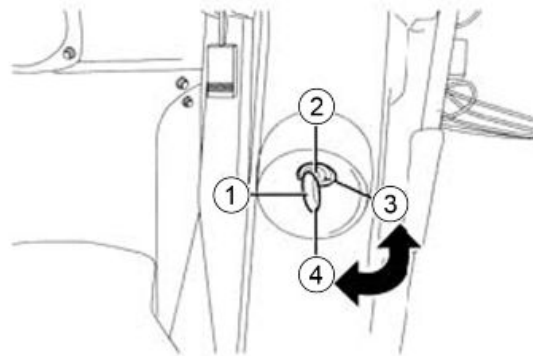
### APE TM P703 FL2 (VERSION WITH HANDLEBAR)

Positions of the switch "1".

**2 =** Ignition off, key can be removed, steering locked. Contacts 15- 30/1

**3 =** Running position arrangement of utilities and external lights - contacts 30 - INT.

**4 =** Engine start-up The position is marked with the "START" logo. Once the engine starts, the key moves back to the running position "3" - contacts 30 - INT and 30 - 50.





**APE P703V (VERSION WITH STEERING WHEEL)**

Positions of the switch "1".

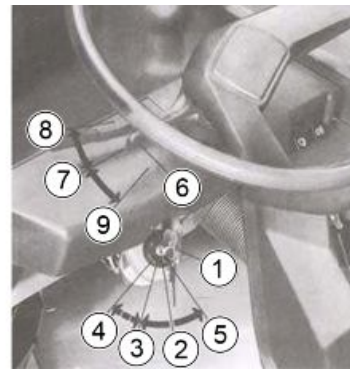
**2:** Everything turned off - Extractable key - Contacts 30/1-15 coil feeder grounded electronic device - Current to audible warning device, windscreen wipers and internal light.

**3:** Engine starter - arrangement of utilities and external lights - Contacts 30 - INT. - 30 - 16. Current to audible warning device, windscreen wipers and internal light.

**4:** Engine starter - Non-extractable key with return to position "3" - Contacts 30 - 16, 30 -INT. and 30 - 50.

**5:** Arrangement of utilities and external lights (Night parking) - Extractable key - Contacts 30 - INT. and 30/1 - 15.

Current to audible warning device, windscreen wiper and internal light.



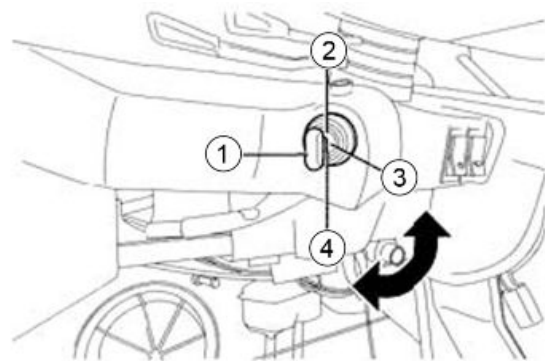
**APE TM P703 FL2 (VERSION WITH STEERING WHEEL)**

Positions of the switch "1".

**2 =** Ignition off, key can be removed, steering locked. Contacts 15- 30/1.

**3 =** Running position arrangement of utilities and external lights - contacts 30 - INT.

**4 =** Engine start-up The position is marked with the "START" logo. Once the engine starts, the key moves back to the running position "3" - contacts 30 - INT and 30 - 50.



## Turn signal switch

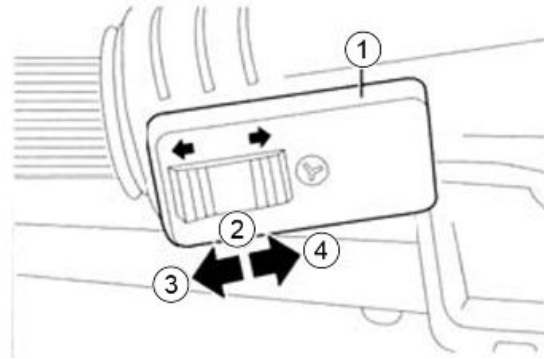
### APE TM P703 FL2 (VERSION WITH HANDLE-BAR)

Positions of the switch "1".

2= Lights off - no contacts.

3 = Left turn indicator blinking - contact between green and brown cables.

4 = Right turn indicator blinking - contact between green and blue cables.



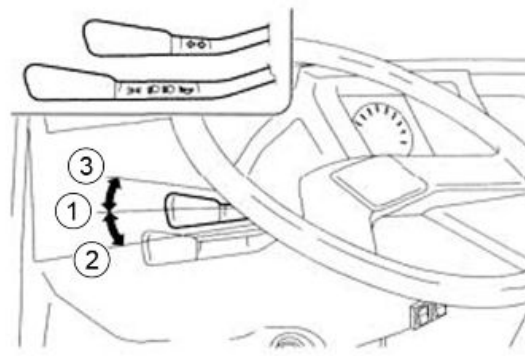
### APE TM P703 FL2 (VERSION WITH STEERING WHEEL)

Positions of the turn indicators control lever:

1 = Lights off - no contacts.

2 = Left turn indicator blinking - contacts L - 2.

3 = Right turn indicator blinking - contacts L - 5.



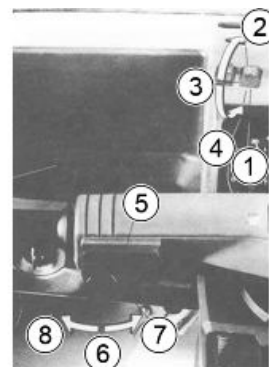
### APE P703 (VERSION WITH HANDLEBAR)

Positions of the switch "5".

6: Turn indicators off - No contact.

7: Right indicators - Contact between green and blue cables.

8: Left indicators - Contact between green and brown cables

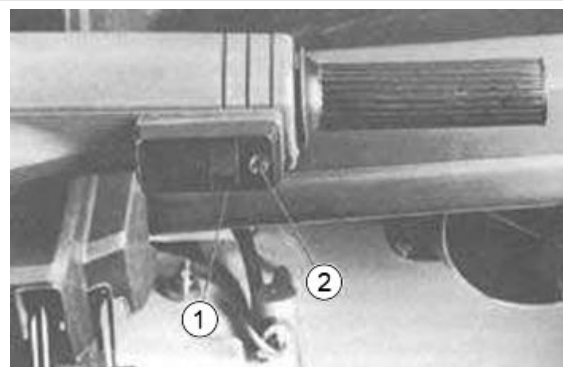


## Horn button

### APE P703 (VERSION WITH HANDLEBAR)

Button for audible warning device "2".

Audible warning device activated contact between black and yellow/grey cables.

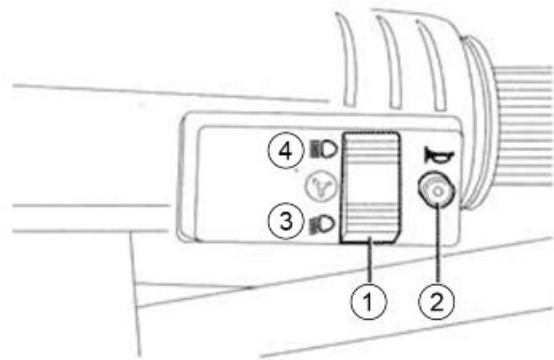


**APE TM P703 FL2 (VERSION WITH HANDLEBAR)**

Horn button "2".

**N.B.**

**WHEN THE HORN BUTTON IS PRESSED, THERE MUST BE CONTINUITY BETWEEN THE YELLOW-GREY AND BLACK CABLES.**

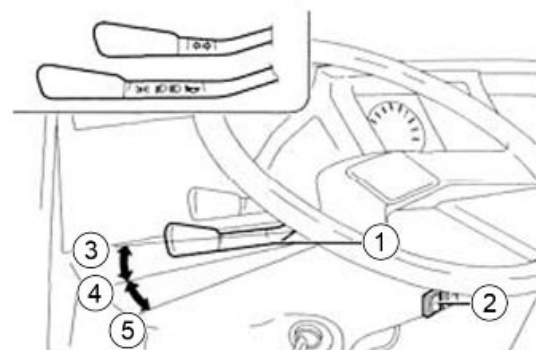


**APE TM P703 FL2 (VERSION WITH STEERING WHEEL)**

To activate the horn, press lever (1) upwards.

**N.B.**

**WHEN THE LIGHT SWITCH AND HORN LEVER IS MOVED UP, THERE SHOULD BE CONTINUITY BETWEEN THE RED AND THE YELLOW-GREY CABLES.**

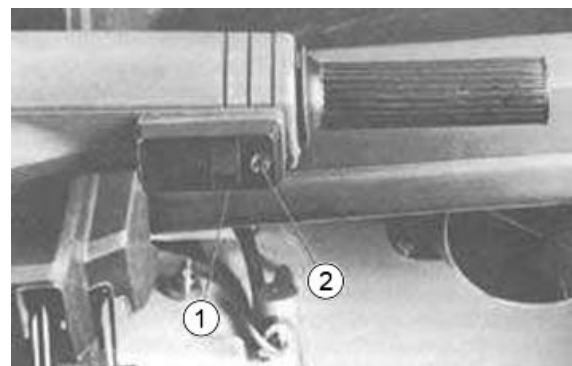


**Headlight switch**

**APE P703 (VERSION WITH HANDLEBAR)**

Positions of the light switch "1".

High beam on, contact between pink and grey/black cables. Low beam on, contact between pink and grey/blue cables.



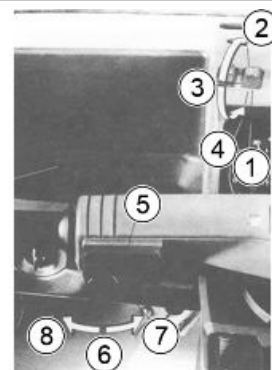
**APE P703 (VERSION WITH HANDLEBAR)**

Positions of switch "1".

**2:** External lights off - No contact

**3:** Daylight running lights activated - Contacts L-I

**4:** Daylight running lights, high or low beam, activated - contacts L-I-U



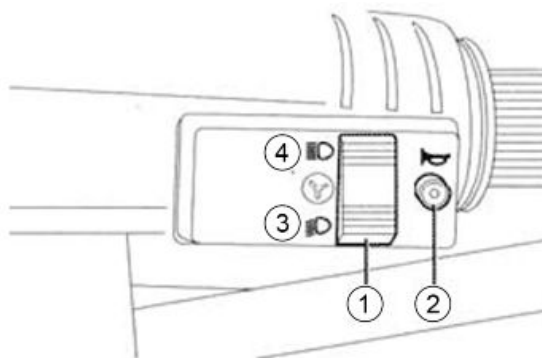
**APE TM P703 FL2 (VERSION WITH HANDLE-BAR)**

Positions of the switch "1".

The centre position of the switch corresponds to lights off.

**3** = High beams, front and rear daylight running lights, panel lights on - contact between pink and blue-grey cables.

**4** = High beams on, front and rear daylight running lights, panel lights on - contact between pink and black-grey cables.



**N.B.**

**THE SWITCH POSITIONS ARE SUBJECT TO THE POSITION OF THE EXTERNAL LIGHTS CONTROL SWITCH.**

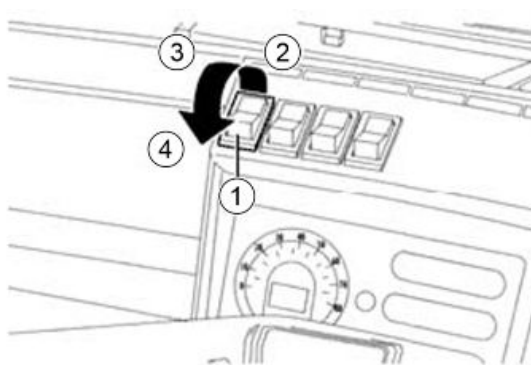
**APE TM P703 FL2 (VERSION WITH HANDLE-BAR)**

Positions of switch "1".

**2**= Lights off - no contacts.

**3** = Daylight running lights on - contacts 2-3 and 6-7.

**4** = High and low beams on (if the head lights switch is in position 3 or 4) - contacts 3-4 and 7-8.



**APE P703V (VERSION WITH STEERING WHEEL)**

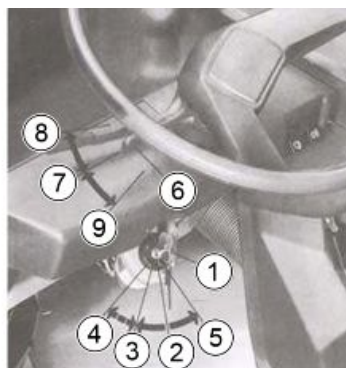
**TURN INDICATORS CONTROL LEVER**

Positions of lever "6":

**7**: Turn indicators off - No contact.

**8**: Right indicators - Contacts L - 5.

**9**: Left indicators - Contacts L - 2.



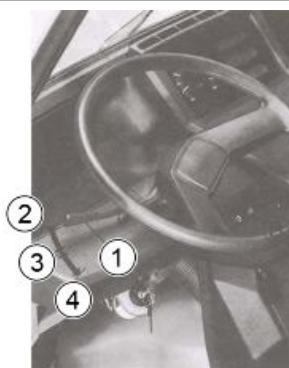
**APE P703V (VERSION WITH STEERING WHEEL)**

**LIGHT DEFLECTORS AND EXTERNAL LIGHT SWITCH COMMAND LEVER**

Position of lever "1" with switch "2" activated.

**3**: Tail lights on - No contact.

**4**: Low beams and tail lights on Contacts C - 56 B.



5: High beams and tail lights on - Contacts 30/2 - 56 a/2 - 30/3 - 56 a/1.

**APE TM P703 FL2 (VERSION WITH STEERING WHEEL)**

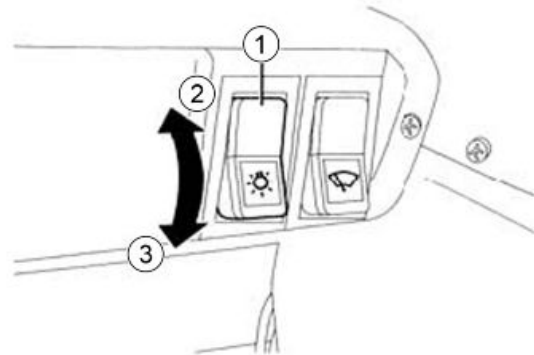
Positions of the external lights switch "1":

2 = Lights off.

3 = Lights on.

**N.B.**

**WHEN THE SWITCH IS SET TO POSITION "3", THERE MUST BE CONTINUITY BETWEEN THE WHITE-RED AND RED-GREY CABLES.**



**APE TM P703 FL2 (VERSION WITH STEERING WHEEL)**

Positions of the light switch and horn lever "1" with the external light switch "2" set to the ON position:

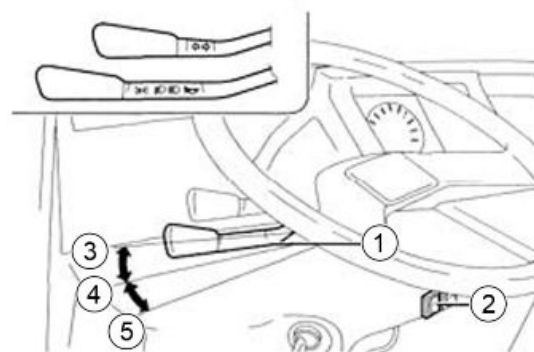
3 = Tail lights on - no contact.

4 = Low-beam lights and daylight running lights on - contacts C - 56b.

5 = High-beam lights and daylight running lights on - contacts 30/2 - 56a/2.

**N.B.**

**THE SWITCH POSITIONS ARE SUBJECT TO THE POSITION OF THE EXTERNAL LIGHTS CONTROL SWITCH.**



**Voltage regulator**

The controller is basically composed of two groups:

- a) Minimal switch, consisting of a nucleus, on which are mounted two coils (voltmeters, and ammeter).
- b) Three-contact voltage regulator ("soft" voltage) also consists of a nucleus on which other two coils are mounted, ammeter and voltmeters.

The minimal switch has the task of inserting the dynamo in the battery circuit when the dynamo reaches a certain speed (coupling rpm) and switch it off as soon as a reverse current occurs, as well as verifying, when the vehicle is stationary, that the tension of battery exceeds that of the dynamo.

The voltage regulator has the task of maintaining the voltage within limits that ensure a rapid charging of the battery when it is low, and to prevent overloading, regardless of the speed variations and the electrical charges activated.

**Starter motor**

**OPERATION OF DYNAMOTOR**

The dynamotor acts as a generator and as a starter motor. The creation of this device is a direct consequence of the principle of reversibility of the dynamo and in particular of the dynamo excited in parallel,

which passes easily from one mode of operation to another, without changing the direction of rotation. The combination of the two functions is facilitated by the fact that, structurally, dynamo and starter motor are similar enough that the various components be confused, even constructively.

Upon start-up, the dynamotor absorbs current from the battery and operates as an electric motor; after starting the APE engine and reaching a certain speed, the dynamotor acts as a normal dynamo, charging the battery and powering the vehicle electrical system.

To get more torque at start up, the starter motors have the excitation field in series; the dynamos, though, require excitation field in parallel: the dynamotor is therefore equipped with both a series and a parallel field. When the machine is at rest, the contacts of the minimum switch are open, while those of the voltage regulator are closed and short-circuit the adjustment resistance, turning the ignition key, the current from the battery runs the field in the series and the rotor of the dynamotor; the parallel field also makes its contribution and the APE engine is ultimately driven at a rate sufficient to start the thermal cycle. Once the engine is started and leaving the key in the ON position, the field in series is excluded and the dynamotor finds itself in identical conditions with a normal dynamo with field in parallel.

### **MAIN CHARACTERISTICS OF THE DYNAMOTOR**

<b>Specification</b>	<b>Desc./Quantity</b>
Dynamotor	Type Bosch G 14V 11 A 39. 12V 0.9 PS. and type EFEL 12V. 0.9 PS. 11 A.
Rated voltage	12V.
rated power	starter motor section 0.9 CV. dynamo section 90 W.
Weight	7.6 kg.
Rotation	Right.
Connection to the engine	By belt transmission.
Control	Key switch and relays.

### **DYNAMOTOR MAINTENANCE**

As you have to remove the dynamotor before any maintenance operation, disconnect the cable connected to its positive terminal (1).

During the operation copper and carbon powder is often deposited between the slats of the manifold: so it is necessary to clean the manifold after every 200 hours of operation of the dynamotor.

For this purpose, use a clean rag soaked in petrol and blow the manifold with compressed air.

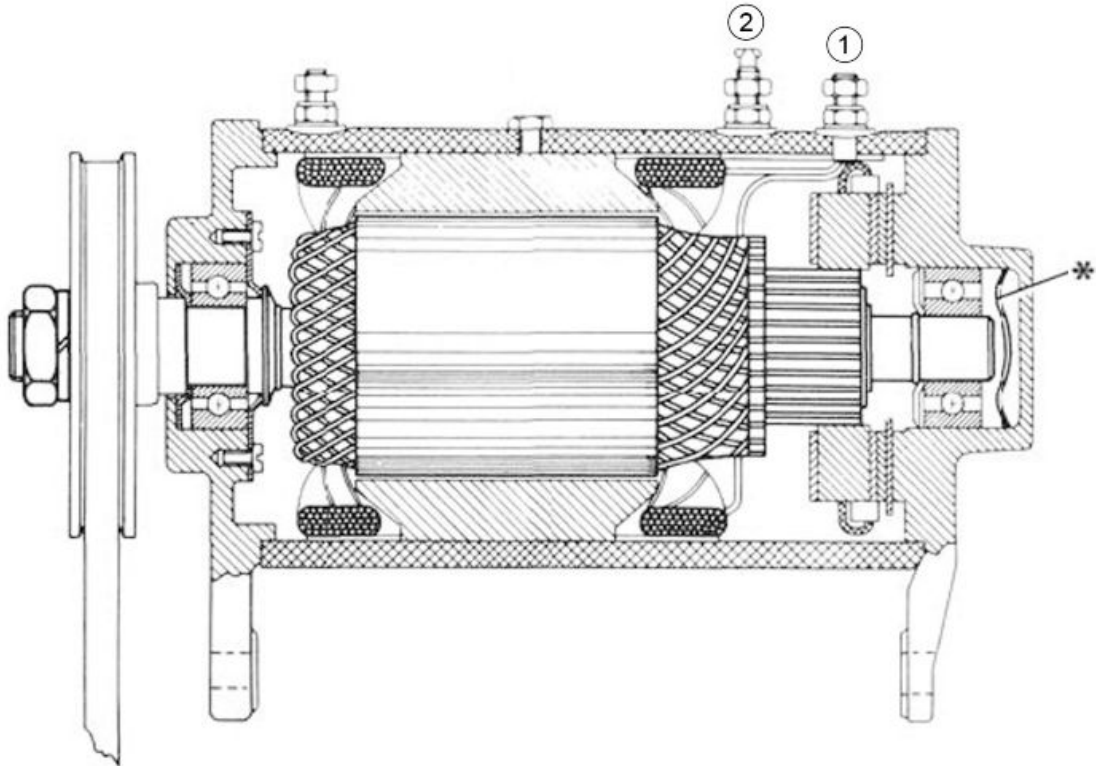
If the manifold is damaged by burns or is oval, lathe it again, bearing in mind that the reduction on the diameter must not exceed 0.5 mm; after lathing, remove the mica to a depth of 1 mm and thoroughly clean.

The maximum eccentricity of the manifold, on the sliding surface shall not exceed 0.03 mm.

Also check the condition of the brushes and their working conditions: for this purpose, raise, without distorting, the wiper pressure springs and make sure that the brushes slide freely in their tracks; if they were blocked or slide with difficulty, clean the brushes and tracks with a rag soaked in petrol.

If the brushes are worn, replace them with originals of the same type. If just one brush is worn, it is advisable to replace the pair of brushes. After replacement, run the Dynamotor lightly loaded until the brushes balance, i.e. until their contact surface perfectly adheres to that of the manifold.

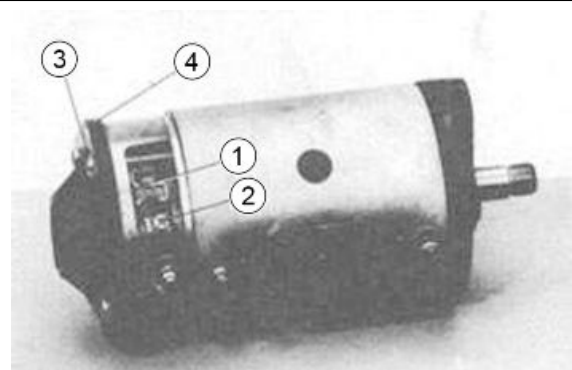
If the dynamotor is de-energized (inability to generate power for lack of residual magnetism) reenergize as follows: rotate the Dynamotor 2000 - 3000g /1 ', disconnect the regulator and connect for 3 to 4 sec. (2 to 3 times) the terminal (1) to the positive battery and the ground terminal (2).



**DYNAMOTOR - REMOVAL**

**BRUSHES**

Remove the protective strip, lift the spring (1) taking care not to exhaust it, slip off the brush and remove it by removing the screw (2). Repeat the operation for the rest of the brushes.



**ROTOR**

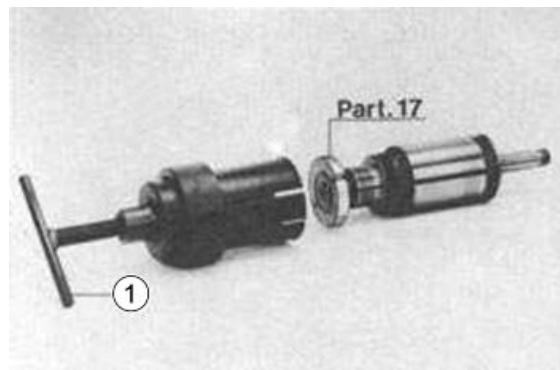
Remove the four screws (3) and remove the brush holding flange (4) paying attention to the flexible washer (\*) which must be repositioned at the time of replacement, then, if necessary, with light mallet blows, remove the rotor.

**BALL BEARING**

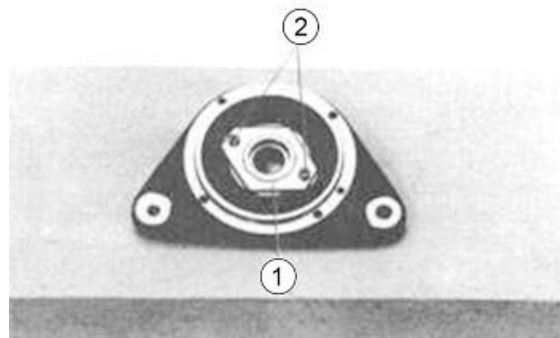
Fit the specific tool fitted with comp. 17, act on the central screw (1) and remove the bearing and the washer.

**Specific tooling**

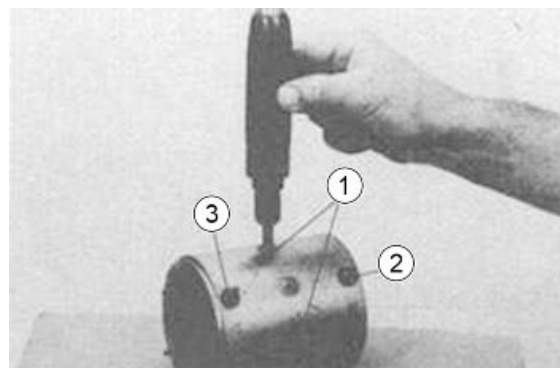
**T.0014499 Bearing extractor**

**PULLEY SIDE BALL BEARINGS**

Remove the flange using the four screws, unscrew the two screws (2), remove the plate (1) and from the part opposite to that shown in the figure, with a punch of external Ø 22 mm eject the bearing.

**FIELD WINDINGS**

With the help of a strike screwdriver, as shown in the figure, remove the four anchor screws (1) of the windings, unscrew the two nuts (3) and (2) and remove the windings themselves.

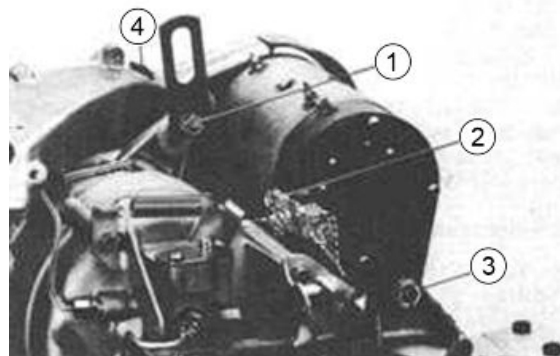


**N.B.**

**THE UNIT IS ASSEMBLED PROCEEDING IN THE OPPOSITE ORDER AS FOR REMOVAL AS DESCRIBED ABOVE.**

**DYNAMOTOR - FITTING**

The Dynamotor is assembled on the engine unit as described above: position the dynamotor, anchoring it to the crankcase with the relative bolts without locking them, adjust the belt by moving the dynamotor toward the rear of the engine and lock the bolt (1), then the other two in the order shown in the figure.



Remove the cap from the track (4) on the scroll putting a pencil in contact with the belt, push the pencil to the bottom and check its course; the belt



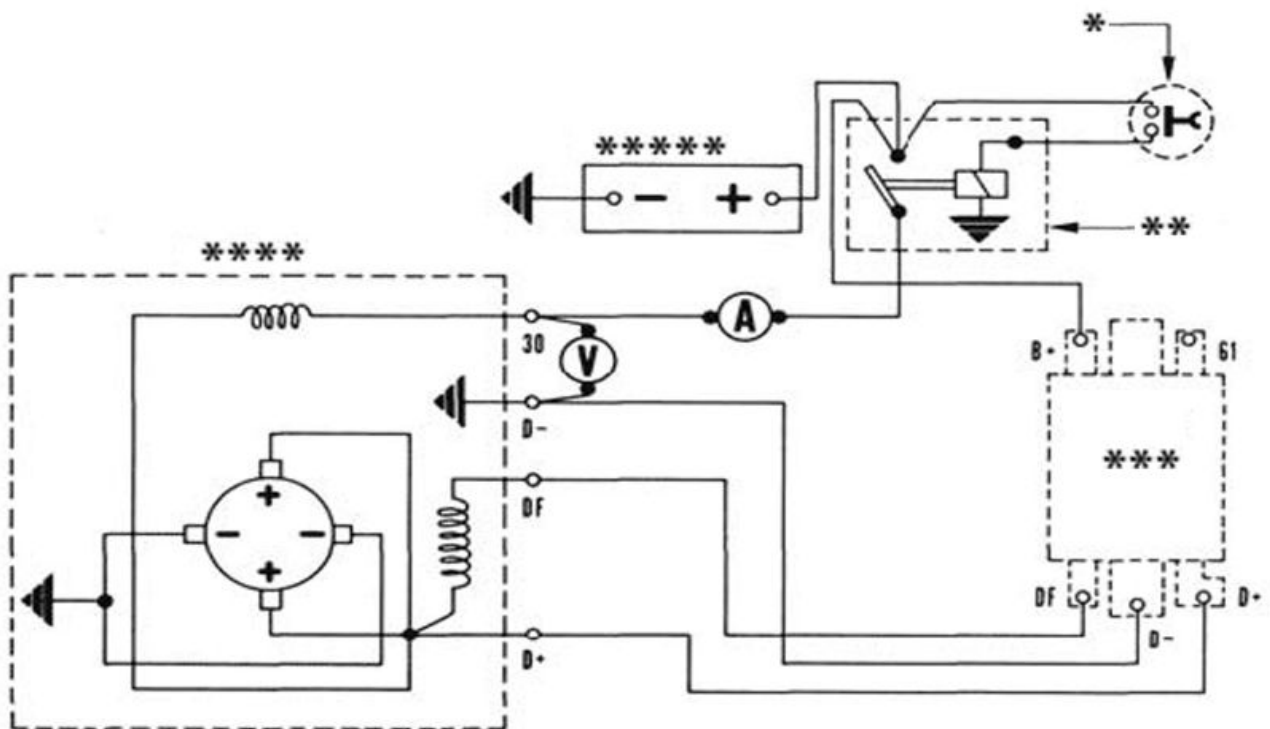
tension is correct if the stroke of the pencil is 7 to 8 mm.

**Bench tests**

**DYNAMOTOR STARTER MOTOR BOSCH TYPE AND EFEL TYPE**

**CARAT ELECTROMAGNETIC CHECK**

- 1) No-load test: the starter motor, under no-load, must draw a maximum of 15 Amp. with a supply voltage of 11.5 to 12V and must rotate at rpm  $1' \geq 2500$ .
- 2) Load test: braking the starter motor so that it draws 120 Amp, and with a supply voltage of 9.2 to 9.4 V a torque  $\geq 520$  kgm must be obtained, for no lower than 1000 at 1'.
- 3) Pickup test: with rotor locked and a supply voltage 7.5 to 7.8V the current drawn must not be higher than 260 Amp and the torque must be no lower than 1200 kgm.



**KEY:**

- \*= Starter button
- \*\*= Solenoid
- \*\*\*= Voltage regulator
- \*\*\*\*= Dynamotor
- \*\*\*\*\*= 12V battery - 24 Ah

**N.B.**

**THESE CHARACTERISTICS ARE TO BE OBSERVED ONCE YOU HAVE FOR TURNED THE DYNAMOTOR FOR 30" IN THE CONDITIONS DESCRIBED IN POINT 1).**

N.B.

**THE DETECTION SHALL BE MADE WITH REGULATOR ACTIVATED.**

**ALTERNATOR BOSCH TYPE AND EFEL TYPE**

**EXTERNAL CHARACTERISTICS CONTROL**

Make the electrical circuit diagram, proceeding as follows:

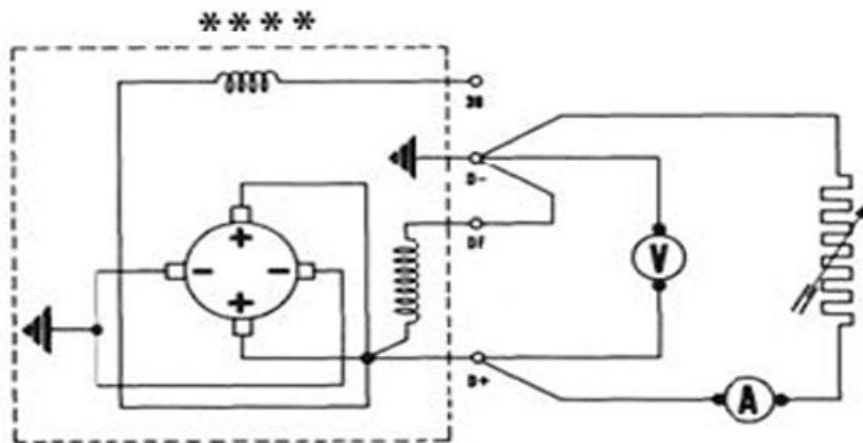
maintain, on variable resistive load, a constant voltage of 13.5 V at full excitation and after thermal stabilisation, which can be achieved through the operation of the alternator to the supply of 90W for 15', proceed to detect the characteristic values of the external alternator, which must be those indicated in the respective tables:

**BOSCH TYPE ALTERNATOR**

Specification	Desc./Quantity
Number of revolutions - Power	3850 revolutions ~ 10 W.
Number of revolutions - Power	3900 revolutions ~ 50 W.
Number of revolutions - Power	4000 revolutions ~ 90 W.
Number of revolutions - Power	4100 revolutions ~ 130 W.

**EFEL TYPE ALTERNATOR**

Specification	Desc./Quantity
Number of revolutions - Power	3350 revolutions ~ 10 W.
Number of revolutions - Power	3400 revolutions ~ 50 W.
Number of revolutions - Power	3500 revolutions ~ 90 W.
Number of revolutions - Power	3600 revolutions ~ 130 W.



**KEY:**

\*\*\*\*= Dynamotor

**BOSCH TYPE AND EFEL TYPE VOLTAGE REGULATOR**

**ADJUSTMENT CHARACTERISTICS CONTROL**

Make an electrical circuit diagram and run the dynamotor at 6000 revolutions/1' constant, perform thermal stabilisation, through empty operation of the regulator for 15' and then connect it to a battery charger for 5'.

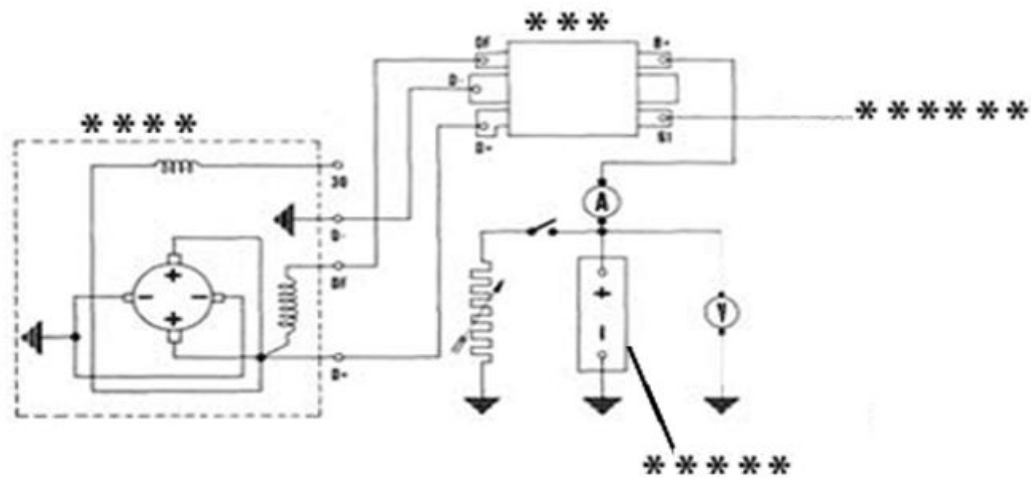
Stop the dynamotor and restart it until you reach 6000 revolutions/1' required for the voltage control on loads that must match the values reported in the following tables:

**BOSCH TYPE REGULATOR**

Specification	Desc./Quantity
Load	0 Amp. 14.3-15.4 V.
Load	6 Amp. 13.8-15.2 V.
Load	11 Amp. 13.2-14.5 V.

**EFEL TYPE REGULATOR**

Specification	Desc./Quantity
Load	0 Amp. 14.3-15.8 V.
Load	6 Amp. 14-14.9 V.
Load	13 Amp. 13.6-14.6 V.



**KEY:**

- \*\*\*= Voltage regulator
- \*\*\*\*= Dynamotor
- \*\*\*\*\*= 12V battery - 24 Ah
- \*\*\*\*\*= Warning lamp

**TOOLS USED FOR THE CONTROLS**

Specification	Desc./Quantity
Ammeter	Ammeter in DC. (minimum full scale 20 Amp.).

Specification	Desc./Quantity
Voltmeter	Voltmeter in DC. (minimum full scale 20 V class 1).
Rheostat	Rheostat 70 ohm 17 Amp.
Battery	12V Battery - 24 to 24 Ah

### **REGULATION CHARACTERISTICS**

Specification	Desc./Quantity
Minimum voltage closing switch	12.4 to 13.1 V.
Return current	2 to 7.5 Amp.

**N.B.**

**THE VOLTAGE REGULATOR MUST BE FIXED ON A VIBRATION FREE AND HEAT-CONDUCTING BENCH.**

## **Verifiche e controlli**

### **STARTER FAILURES DUE TO ALTERNATOR UNIT**

Possible Cause	Operation
Failure of motor rotation	Check that: <ul style="list-style-type: none"> <li>- the battery is not drained</li> <li>- the terminals of the ignition switch or the battery are not oxidised or loose</li> <li>- the brushes are not worn and the springs are pressing on them sufficiently (minimum load 0.850 kg)</li> <li>- the rotor or the inductor are not grounded.</li> </ul>
Very slow engine rotation	In addition to performing the checks in case of rotation failure of the motor, check that the coils of the inductor winding or rotor are not shorted.
Excessive noise	Check that the bearings of the supports are not worn.

**WARNING**

**THE AXIAL CLEARANCE OF THE ROTOR MUST NOT BE MORE THAN 1 MM.**

**WARNING**

**THE NARROWING OF THE INSULATION BETWEEN THE MANIFOLD BLADES MUST HAVE A DEPTH OF NOT LESS THAN 0.4 MM.**

### **THE BATTERY DOES NOT CHARGE WHILE RUNNING**

Possible Cause	Operation
Break of the charging circuit	Locate and repair the break (in most cases they are oxidised or loose terminals).
Fuse blown	Defective regulator: Replace Damaged battery: Replace. Fuse holder with oxidised contacts.
Defective contact of brushes with the manifold	Restore the sliding between brushes and guides.
Lack of residual magnetism	Reenergise the Dynamotor.
Interrupted or ground rotor	Replace the rotor.
Rotor in short circuit	Clean the threads of the manifold; if not getting good results, replace the rotor.
Broken belt	Replace.
Defective regulator	Replace.

### **THE BATTERY CHARGES ONLY PARTIALLY**

Possible Cause	Operation
Defective regulator	Replace.
Belt slide	Register or replace.

### **THE BATTERY RUNS DOWN WITH THE DYNAMOTOR OFF**

Possible Cause	Operation
Defective regulator	Replace.

**THE VOLTAGE OSCILLATES, IS NOT CONSTANT**

Possible Cause	Operation
Defective regulator	Replace.

**THE VOLTAGE REACHES EXCESSIVE VALUES**

Possible Cause	Operation
Defective regulator	Replace.

**THE DYNAMOTOR OVERHEATS**

Possible Cause	Operation
Rotor in short circuit	Clean the threads of the manifold; if not getting good results, replace the rotor.

**RAPID CONSUMPTION OF THE BRUSHES**

Possible Cause	Operation
Eccentric manifold	Lathe the manifold again and remove the mica.

**EXCESSIVE SPARKS AT MANIFOLD**

Possible Cause	Operation
Rotor interrupted	Replace the rotor.
Rotor unsoldered to the manifold	Remake the welds when the rotor is well preserved.
Wiper presser springs loose	Replace the springs.
Brushes consumed	Replace the brushes.
Projection of mica on the manifold	Remove the mica from the manifold.
Short circuit in charge indicator bulb	Replace the lamp.

**Battery charge - charging curve****BATTERY 12V 24 to 27 Ah**

Use of dry-charge batteries:

- 1) Having removed the adhesive tape and the caps, put sulphuric acid inside the elements of the type for accumulators with specific weight 1.26 corresponding to 30° Bé at a temperature not lower than 15° C, until the level does not pass the separators by 5 mm.
- 2) Let it rest for two hours.
- 3) Charge at a rate of approx. 1/10 of capacity until the voltage reaches a value of about V 2.7 for each element, with an acid density around 1.27, corresponding to 31° Bé with stable values. The operation must last approx. 15-20 hours.

**WARNING**

**IF NECESSARY, THE CHARGING TIME MAY BE REDUCED TO 5-6 HOURS.**

- 4) When charging is over, bring the acid to level (by adding distilled water or, if in excess, remove the acid), plug and carefully clean.
- 5) After carrying out the operations above, install the battery on the vehicle, correctly observing the connections described previously.

**BATTERY GAS DISCHARGE OUTSIDE THE CAB.****CAUTION**

**IN ORDER TO ENSURE A REGULAR DISCHARGE, OUTSIDE THE CAB, OF THE GASES THAT FORM IN THE BATTERY, CONNECT TO THE BATTERY THE SPECIAL EXHAUST TUBE KEEPING IN MIND THAT THE END OPPOSITE THE ONE CONNECTED TO THE BATTERY MUST FIT INTO THE HOLE ON THE FLOOR OF THE CAB TO ALLOW FOR THE ESCAPE OF THE GASES.**

## BATTERY MAINTENANCE

The battery is an electrical device which requires careful monitoring and a very diligent maintenance.

The main maintenance rules are:

### 1) Check the level of the electrolyte

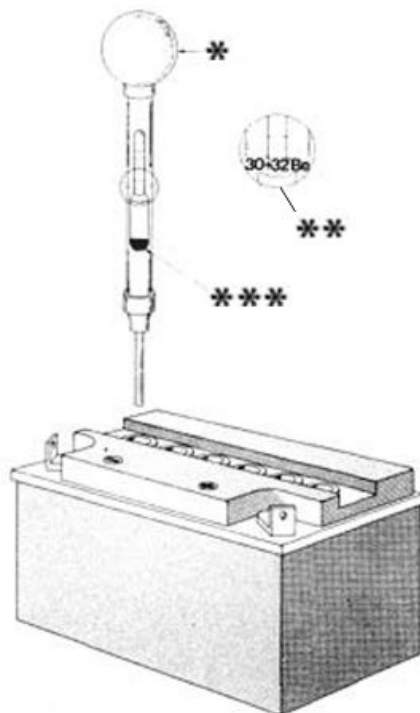
The level of the electrolyte, to be controlled frequently, must reach the top level. Only use distilled water, to restore this level. If it becomes necessary to add water too frequently, check the vehicle's electrical system: the battery works overcharged and is subject to quick wear.

### 2) Load status check

After topping-up the electrolyte level, check its density using special density gauge. When the battery is charged the density should be of 30°-32° Bé corresponding to a specific weight of 1.26-1.28 for a temperature not lower than 15° C.

When the density drops below 20° Bé the battery is completely discharged and it must be recharged.

In addition with the battery under charge the voltage of each element must be of 2.6-2.8V. The discharge limit for each element is 1.8V. These voltage checks must be performed fitting into the outside circuit of the battery a lighthouse lamp.



\*=Hold the tube vertically

\*\*= Detect the level by eye

\*\*\*= The float must be freed

### 3) Recharging the battery

Normal recharging on the bench must be carried out with a current of 2.4 A for approx. 6 to 8 hours. Connections to the power supply must be made by connecting the corresponding poles (+ to+ and - to -).

During the charge the caps of the battery must be removed.

At the end of the charge, the level and the density of the electrolyte as well as the voltage of each element must be checked. If the vehicle is not used for a period of time (1 month or more) it will be necessary to periodically recharge the battery. The battery runs down completely in the course of three months. When the battery must be placed back on the vehicle make sure that + (positive) and - (negative) terminals are well connected with their respective cables; in particular the negative terminal must be reconnected with the cable grounded to the frame.

#### **4) Cleaning the battery**

The battery must be kept clean and dry especially the top part; for cleaning use a hard bristle brush. To prevent corrosion of the cable terminals they must be kept clean and covered with a layer of pure petroleum jelly: do not use lubricating grease since, reacting with the acid of the battery or with its vapour produces conducting salts with the subsequent leakage of current that favours corrosions.

Connections to the terminals must be well tightened to prevent contact resistance.

Anchoring and disanchoring the positive (+) cable of the battery must always be done after the negative cable has been disanchored (grounded to the frame)

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# INDEX OF TOPICS

ENGINE FROM VEHICLE

EV



**REMOVAL OF ENGINE FROM THE FRAME**

Disconnect the (-) cable from the battery, the electrical cables of the dynamotor and the electronic control unit; remove the covers, the carburettor bellows and hot air of the cab, the oil and petrol adduction tubes, throttle grips, gearbox, starter, reverse, clutch, etc.

After carrying out the above steps:

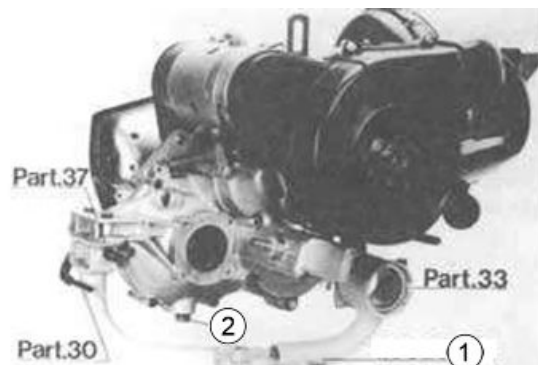
remove, using the 3 anchor bolts, the axle shaft hubs (left and right) from the elastic coupling; then hold the engine differential unit using a lifting device, remove three anchor bolts (two in front of the cross member and one at the rear of the load box) and remove the engine differential unit.



**DRAIN OIL FROM ENGINE**

Install the engine-differential unit in the support (1) included in components 30, 33, 37 and proceed to empty, in a special clean from engine oil bowl through the drain hole "2".

**N.B.**  
**TO FACILITATE THE EMPTYING, UNSCREW THE OIL FILLER CAP.**



**Specific tooling**

**T.0025095 Engine support plane**

**NOTES RELATING TO REASSEMBLY**

To reassemble the vehicle, we illustrate those operations that require special tools or expedients. Those operations that are easy to perform, that can be easily carried out with screwdrivers, wrenches, normal pliers, etc. and which can be easily perceived by the operator are not included: similarly, the operations which are already described for the disassembly phase, for which it is necessary to simply follow the procedures in reverse order are not described.

Upon refitting, all components that have been disassembled must be subjected to accurate cleaning and to an inspection of the wear condition.

To be remembered in particular that:

**-The half crankcases** of the engine must not show cracks or deformations; the seats of the bearings must be free of abrasions.

**- Ball bearings:** make sure they are in perfect conditions, without excessive axial and radial clearances; make sure they run freely turning them by hand: if after they have been cleaned (washing with petrol), surface roughness is felt, replace them.

Upon refitting, lubricate the bearings with the recommended grease.

- **Roller bearings:** use new casings at each refitting: observe the following rules: Wash the new case with pure petrol or neutral petroleum to eliminate the rust preventer; after having applied the grease, fit them with the face where the initials are marked facing outward. For their positioning, operate as indicated in the respective figures of this chapter, using the specific equipment.

- **Shafts and axles:** sliding and rolling surfaces must not show notches and abrasions such as to impair the proper operation and must be properly lubricated.

- **Clutch:** check the wear of the disks, the efficiency of the spring and all the components included in the clutch assembly; if necessary replace damaged components.

- **Gears:** inspect the wear conditions of the teeth, if they are chipped or badly worn replace them with new components.

- **Front wheel axle chamfered nut.:** at every reassembly a new nut must be applied, to be chamfered on the corresponding shaft according to the instructions given in specific section "Locking the front wheel brake drum."

- Always use **new gaskets, split pins and brake washers.**

### **Recommended products**

#### **AGIP GREASE PV 2 Multipurpose grease**

NLGI 2 specifications; ISO-LXBIB2

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## INDEX OF TOPICS

ENGINE

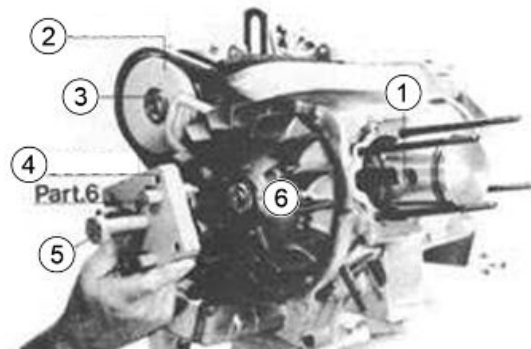
EN

## Flywheel

### FLYWHEEL - PULLEY - REMOVAL

Anchor the flywheel and the pulley dynamotor using the specific equipment (2), unscrew the nut (3) of the pulley and the nut (6) of the flywheel.

Apply, through the 3 screws provided with the relevant spacers interposed between the extractor and flywheel in order not to interfere with the stator coils, the specific equipment (4), and unscrew the central screw (5) until the extraction has taken place.



#### WARNING

TO CARRY OUT THE EXTRACTION OF THE DYNAMOTOR PULLEY, IT IS NOT REQUIRED TO USE ANY TOOL, AS THE DISASSEMBLY IS CARRIED OUT MANUALLY.

#### Specific tooling

**T.0043062 Stop key of flywheel and dynamotor pulley**

**T.0035731 Flywheel extractor and differential housing**

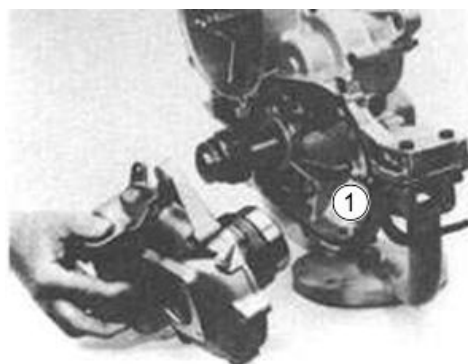
## Crankcase splitting

### DIFFERENTIAL HOUSING COVER AND SEPARATION OF HALF CRANKCASES

Remove the connecting nuts and bolts and, acting with a few mallet blows, remove the cover.

#### SEPARATION OF HALF CRANKCASES

Proceed as described above for the differential cover, remember in particular that you can not decouple the engine crankcases before dismounting the differential cover, which is necessary to loosen the inner nut (1) connecting the half crankcases.



**HALF CRANKCASES COUPLING**

Both the crankshaft and the multiple gear must be fitted on the clutch side crankcase half and the change gear shaft on the flywheel side crankcase half.



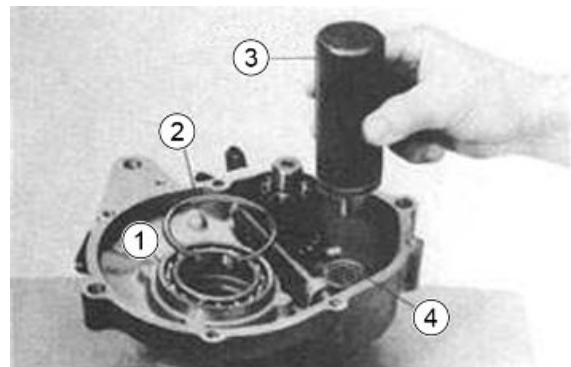
To couple the half crankcases proceed as follows:

- Clean the mating surfaces thoroughly; spread with mastic the gasket to be interposed with putty (on both sides) and fit on the flywheel side crankcase half.
- To successfully fit the half crankcases together, act if necessary with a wooden mallet on the flywheel side crankcase half: never act on the end of the crankshaft.

**DIFFERENTIAL COVER - FITTING**

**DIFFERENTIAL HOUSING BALL BEARING -  
ROLLER BEARING CHANGE GEAR SHAFT**

Heat, with the specific tool, the bearing housing area and fit in its place the ball bearing (1) and with the tip of a screwdriver insert the retainer circlip (2).



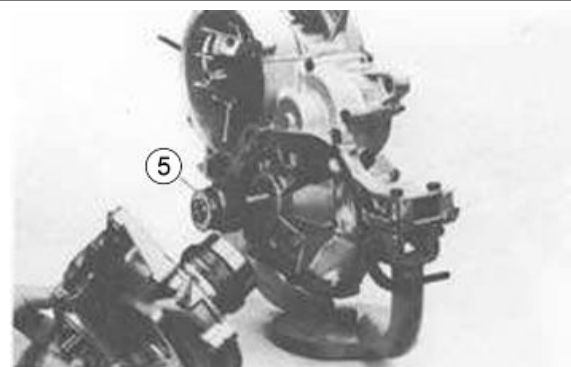
Wait until the cover is cooled and with the specific punch (3) position the roller bearing (4). Insert the inverter gear in its housing, install the reverse gear command lever and, with light mallet blows, insert the differential housing, anchoring it with the retainer circlip.

**Specific tooling**

**0019978 Oven**

**T.0039153 Punch for roller bearing**

After cleaning the mating surfaces and fitting the gasket (spreading the mastic) on the crankcase, apply the thrust washer (5) on the differential cover, holding it in position with a layer of grease, shift into sliding gear the slider of the reverse gear control lever so you can pair with ensuring that the two parts fit together perfectly and lock with the relative



bolts and nuts to the torque specified in the table "Tightening torques".

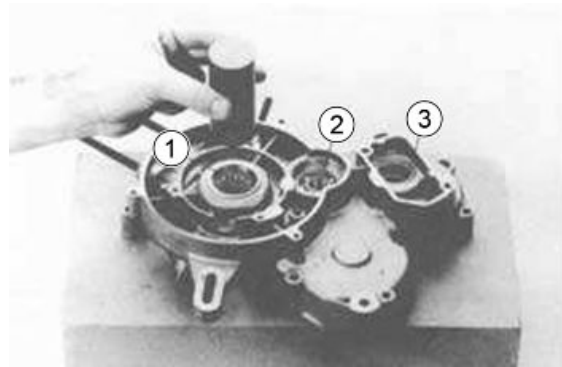
## Fly-wheel side half-crankcase

### FLYWHEEL SIDE CRANKCASE HALF - REMOVAL

#### BENCH ROLLER BEARING - MULTI-GEAR BALL BEARING - ROLLER BEARING CHANGE GEAR SHAFT

Position the crankcase half on a support base and after removing the crankshaft seal ring with the end of a screwdriver expel, with a punch of external  $\varnothing$  of 39 mm., the outer ring of the bench roller bearings (1).

With a punch of external  $\varnothing$  of 37 mm., eject the roller bearing gear shaft (3) and, acting on the side opposite to that shown in the figure, with a flat head punch of  $\varnothing$  28 mm., remove the ball bearing of the multi-gear pin (2).



### FLYWHEEL-SIDE CRANKCASE HALF - FITTING

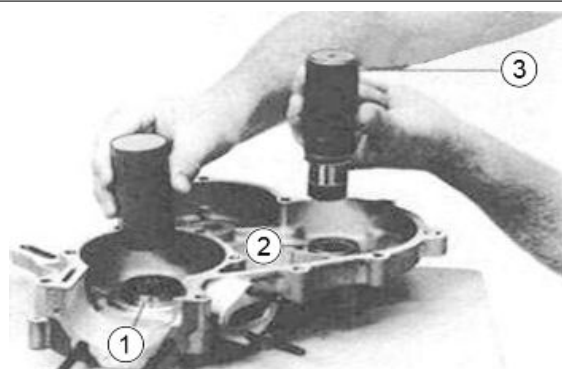
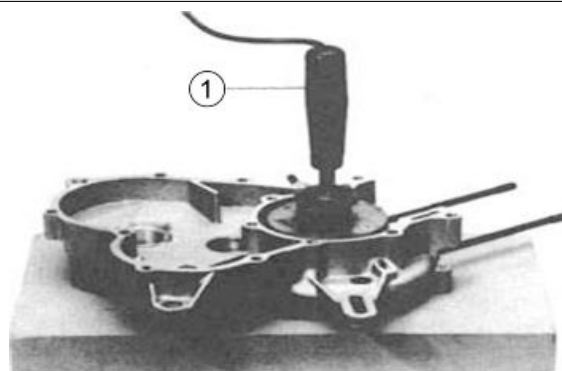
Place the crankcase half on a supporting base and using a heat gun warm up the crankcase half to approx. 80 °C in the area of the bearing seat with the appropriate tool (1).

#### Specific tooling

0019978 Oven

#### BENCH ROLLER BEARINGS - MULTI-GEAR BALL BEARING - ROLLER BEARING GEAR SHAFT

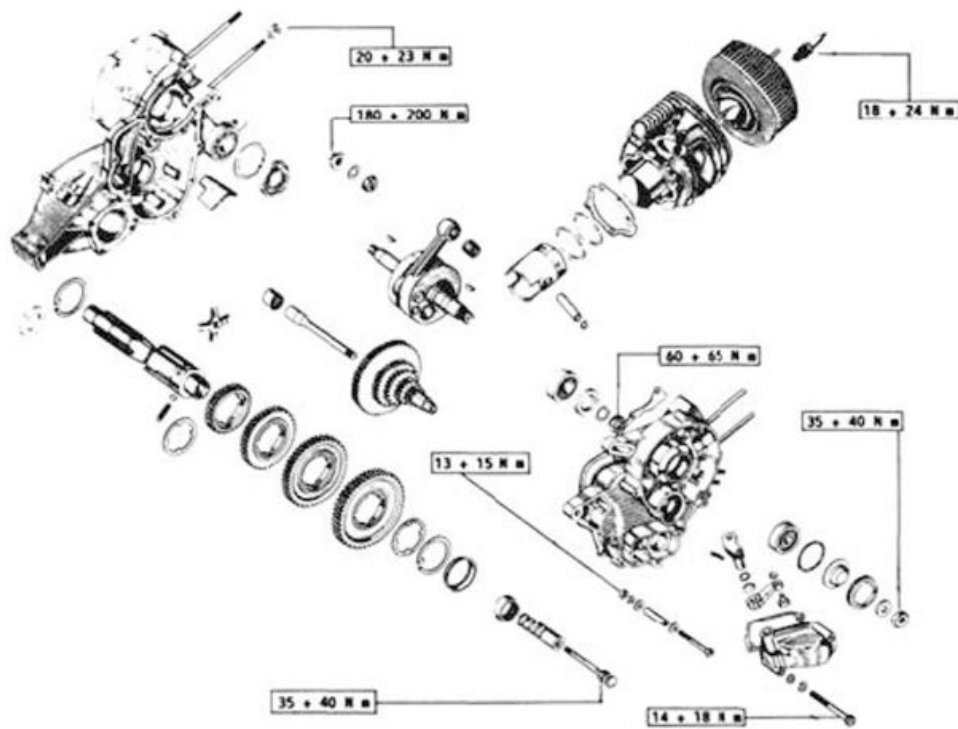
Assemble, with the help of a flat head punch of  $\varnothing$  44 mm. if necessary, the bench roller bearing (1) and operating from the side opposite that represented in the figure, with a section of tube with external  $\varnothing$  40 mm. the ball bearing of the multi-gear pin.



Allow the crankcase to cool and with the specific punch (3), position the needle bearing of gear shaft (2).

**Specific tooling**

T.0039152 Punch for roller bearing

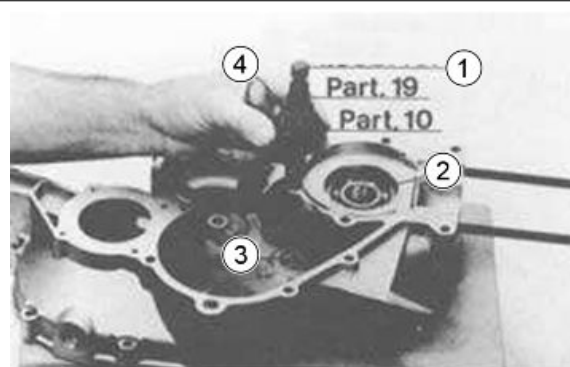


**Bearings on half-crankcase clutch-side**

**CLUTCH-SIDE CRANKCASE HALF - REMOVAL**

**SEAL RING - CIRCLIP - BENCH BALL BEARING**

Remove, using a screwdriver, the seal ring, the retaining circlip, with specific pliers and then, with a section of tube with outer Ø of 54 mm., remove, by acting on the side opposite to that shown in the figure, the ball bearing (2).



**Specific tooling**

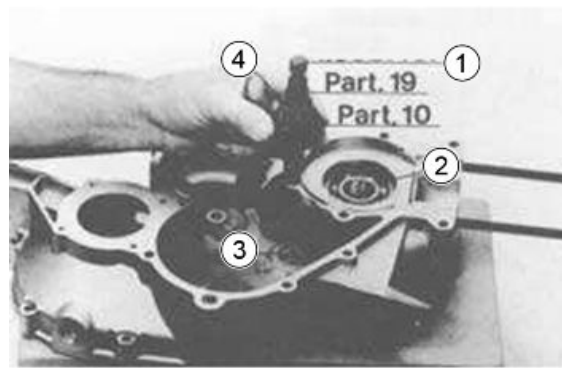
T.0022465 Pliers for circlips

**MULTI-GEAR PIN ROLLER BEARING**

Use the special tool (1) provided in items 10 and 19, and pull the roller bearing (3), acting on the central nut (4).

**Specific tooling**

**T.0021467 Bearing extractor**

**CLUTCH-SIDE CRANKCASE HALF - FITTING**

Similarly to the procedure for installing the flywheel side crankcase, heat the special tool, the area housing the bench ball bearing.

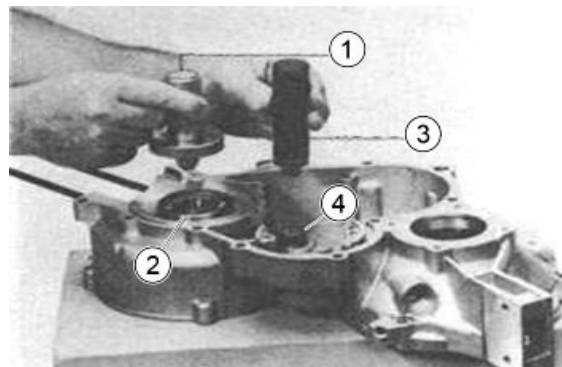
**BENCH BALL BEARING - MULTI-GEAR ROLLER BEARING**

Insert, using the special tool (1), the bench ball bearing (2) in its housing, wait until the crankcase has cooled, and fit, with the appropriate tool, the roller bearing (4) of the multi-gear pin.

**Specific tooling**

**T.0023589 Punch for bearings and sealing rings**

**T.0033970 Punch for fitting roller bearings**

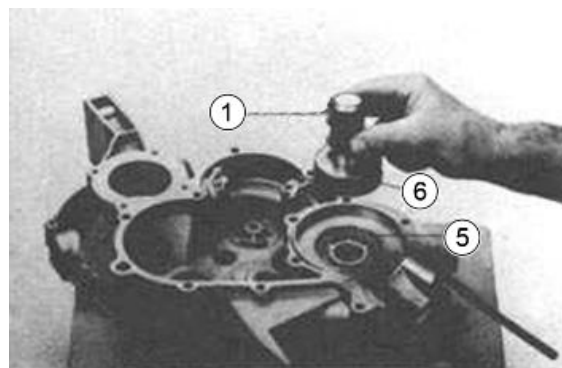
**CIRCLIP - SEAL RING**

Assemble, with the help of specific pliers, the circlip (1) and, redeploing the specific tool (2), the seal ring (3).

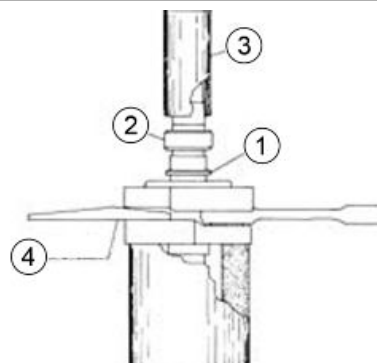
**Specific tooling**

**T.0022465 Pliers for circlips**

**T.0023589 Punch for bearings and sealing rings**

**SPACER - BENCH ROLLER BEARING INTERNAL RING**

Insert the clutch side crankshaft on a support base with internal  $\varnothing$  of 36 mm. and, after mounting the spacer (1), mount the inner ring (2), heated in an oil bath at 100°C, of the bench roller bearing on the crankshaft (flywheel side) using as a punch (3) a section of pipe with internal diameter of 29 mm.





**WARNING**

TO AVOID POSSIBLE DEFORMATION ON THE CRANK-SHAFT IT IS NECESSARY THAT THE FITTING OF THE RING (2) BE CARRIED OUT AFTER THE APPROPRIATE SPECIAL EQUIPMENT (4) HAS BEEN INTERPOSED BETWEEN THE TWO HALF SHAFTS.

**Specific tooling**

**T.0025127 Wedge**

**CRANKSHAFT ON CLUTCH SIDE CRANK-CASE HALF**

Insert crankshaft on clutch side crankcase half as represented in the figure; apply specific tool (1) equipped with components 24 and 25 and act on the nut until pulling the stop crankshaft on the ball bearing of the crankcase half.



**Specific tooling**

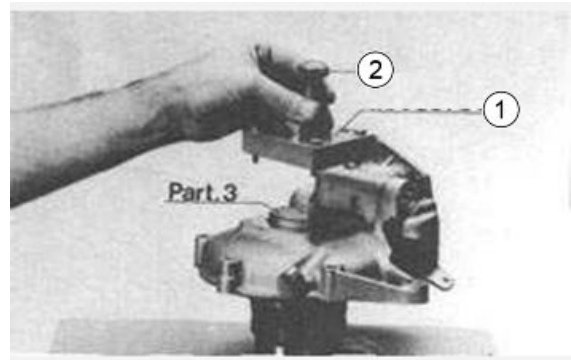
**T.0018119 Tool for fitting shafts**

**Differential assembly**

**DIFFERENTIAL BOX - REMOVAL**

Using specific pliers, remove the differential box retainer circlip.

Fasten, with the 4 special screws, the extractor (1) equipped with component 3 and act on the central screw (2) until the removal of the box.



**Specific tooling**

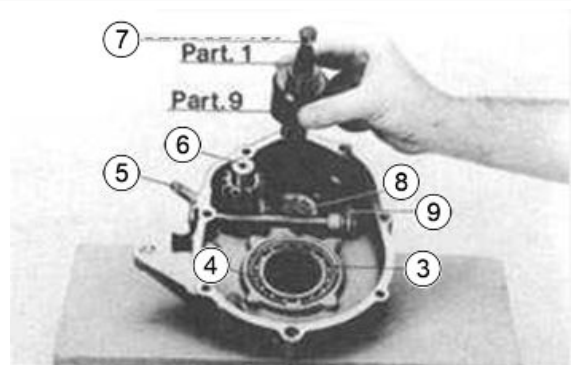
**0023638 Pliers for circlips**

**T.0035731 Flywheel extractor and differential housing**

**DIFFERENTIAL BOX BALL BEARING - INVERTER GEAR - ROLLER BEARING CHANGE GEAR SHAFT**

With the help of a screwdriver remove the circlip (3) and, re-using the special extractor equipped with component 5, from the part opposite to that shown in the figure, eject the ball bearing (4).

With a plug of Ø of 4.5 mm. remove the spring pin (9), remove the reverse gear command lever (5) and the reversing gear (6).



After performing the above operations, extract the roller bearing (8) using the specific extractor (7) equipped with component 1 and 9.

### Specific tooling

**T.0021467 Bearing extractor**

**T.0035731 Flywheel extractor and differential housing**

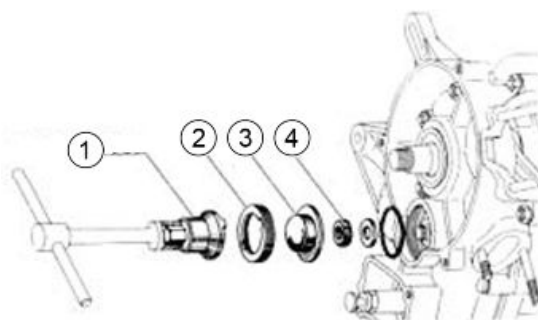
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## Clutch assembly

### CAP LOCK RING AND MULTI-GEAR AXLE NUT

Using the specific key (1) unlock the nut (2) and remove the cap (3).

Remove the clutch cover and with the specific key, lock the unit; then with a T-shaped wrench of 19 mm. unscrew the nut (4) of the multi-gear pin.



### Specific tooling

**T.0030632 Wrench for helical gear nut**

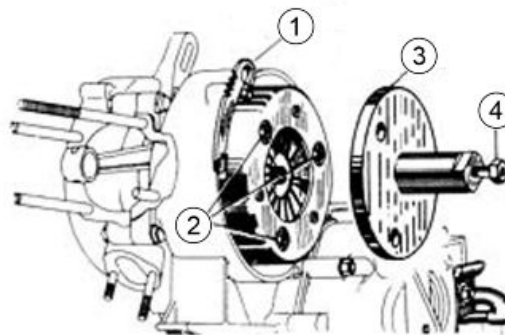
**T.0031729 Clutch stop key**

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### CLUTCH ASSEMBLY - REMOVAL

Lock the assembly with the appropriate key (1) and unscrew the lock nut.

Apply the extractor (3) using the 3 screws (2) fixing the plates, and act on the central screw (4) until the assembly is extracted; if it does not occur it is necessary to act by means of mallet blows on the periphery of the clutch housing to loosen up the cone and thus cause the extraction of said clutch.

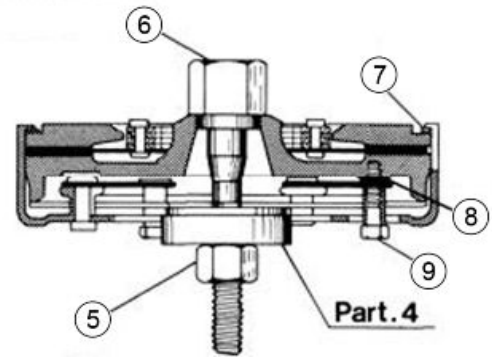


### Specific tooling

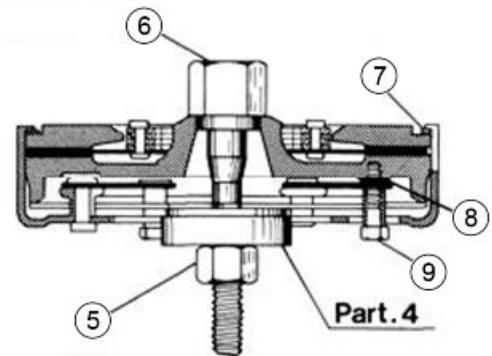
**19.1.20046 Clutch puller**

**CAUTION**

IN THE REMOVAL OPERATIONS DESCRIBED ABOVE, THE EXTRACTION OF 3 SCREWS (2), NECESSARY FOR THE APPLICATION OF THE EXTRACTOR, AUTOMATICALLY CAUSES THE FALL OF CORRESPONDING WASHERS (8) IN THE CLUTCH ASSEMBLY. AS A RESULT OF THIS, IT IS ABSOLUTELY NECESSARY, BEFORE REFITTING, TO RECOVER, FROM INSIDE THE CLUTCH ASSEMBLY, THE THREE WASHERS (8) AND CORRECTLY REPOSITION THEM.



With the assembly fixed in the specific tool (provided with the new component 4) compress the spring, by operating the nut (5), until making possible the extraction of the elastic retainer ring (7); unscrew the three anchor bolts (9) of the plates, and after removing the nut (5) of the tool, remove the different components.

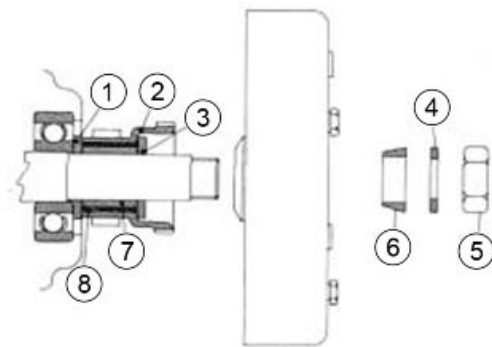


**Specific tooling**

**T.0020322 Clutch removal and refitting tool**

**CLUTCH ASSEMBLY - FITTING**

Apply the thrust washer (1), bushing (8), (7), engine gear (2) and thrust washer (3) on the crank shaft, then install the clutch assembly, making sure that the crankshaft stick correctly engages on the drive disc track.



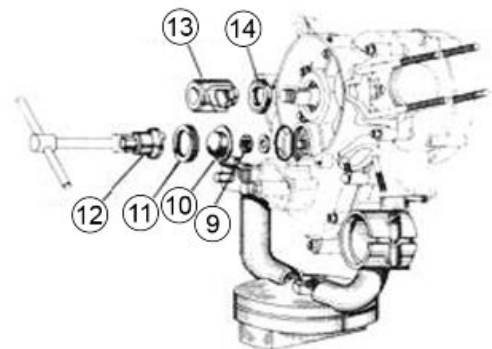
With the specific key, hold the assembly firmly and, after fitting the cone (6) and washer (4), lock the nut (5) at 180 to 220 Nm (18 to 22 kgm).

**Specific tooling**

**T.0031729 Clutch stop key**

**SEAL RING - MULTIPLE PIN NUT - CAP AND RING**

Hold the clutch assembly locked, leaving the specific key fitted and tighten the multi-gear nut (9), install the gasket, the cap (10) and, with the help of specific key (12), lock the ring nut (11).



Then fit the sealing ring (14) with the specific tool (13).

**Specific tooling**

T.0030632 Wrench for helical gear nut

T.0027338 Punch to fit sealing rings

**Cylinder/piston assy - carburettor****BIG END - CYLINDER - REMOVAL**

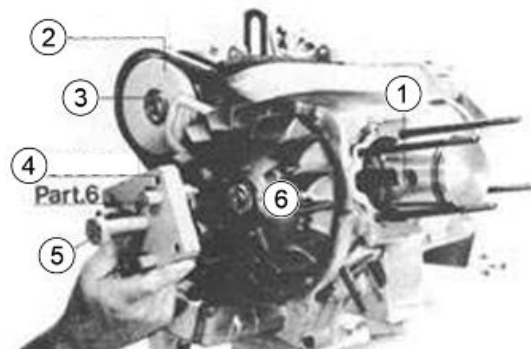
After removing the cooling cover, the fan cover and the silencer, unscrew the four fixing nuts and remove the big end and the cylinder.

**PISTON PIN - REMOVAL**

With the help of specific pliers, remove the circlips (1) and expel the pin with a punch of  $\varnothing$  16 mm.

**Specific tooling**

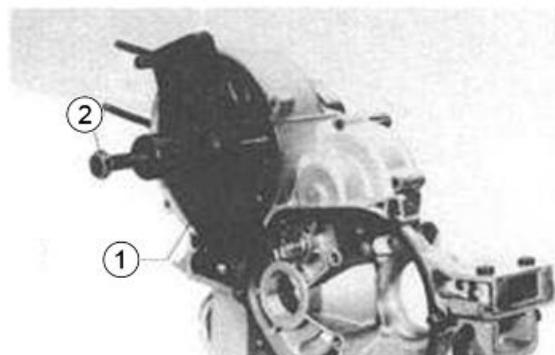
T.0017104 Pliers for circlips

**Crankshaft****Crankshaft**

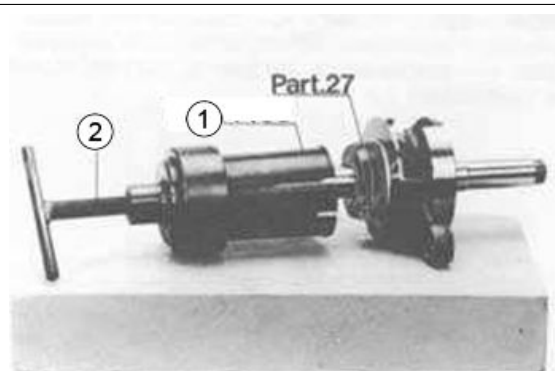
Position the special tool (1), using the appropriate screws, then act on the central screw (2) until completely loosening the crankshaft from its housing.

**Specific tooling**

19.1.20024 Crankshaft removal tool

**BENCH ROLLER BEARING INTERNAL RING**

Apply the specific extractor (1) equipped with the specific reduction rings of component 27, and act on the handle (2) until extracting the bearing track.

**Lubrication****"L.S." DEVICE**

The vehicles have two separate tanks for petrol and oil.

The refilling of the fuel tank must not be carried out with petrol-oil mixture, but only with pure petrol of the normal type for motor vehicles. The oil tank must be filled with specific oil.

The petrol is sent to the carburettor with the normal gravity system; the oil is sent to the crankshaft (and sprayed by it inside the cylinder) by means of an "LS" device, consisting of a variable stroke piston pump, operated by the crankshaft through a gear drive (1) and (2).

Similar to the fuel tank, the oil tank also is equipped with a reserve detector connected to a red light signal lamp (12V-1.2W) with a symbol of recognition; this lamp is installed inside the cab in the middle of the instrument panel dashboard.

**Recommended products**

**AGIP CITY TEC 2T Oil for 2-stroke petrol engines**

JASO FC, ISO-L-EGD Specifications

**"L.S." DEVICE CHARACTERISTICS**

Oil quantity	Time it takes for the oil consumption with maximum throttle control of lever	Time it takes for the oil consumption with minimum throttle control of lever
1 cm <sup>3</sup>	24" to 27"	1'.45" to 2'.35"

**THE ABOVE TIMES MUST BE DETECTED BY ROTATING THE GEAR CONTROL OF THE MIXER TO 5000 RPM.**

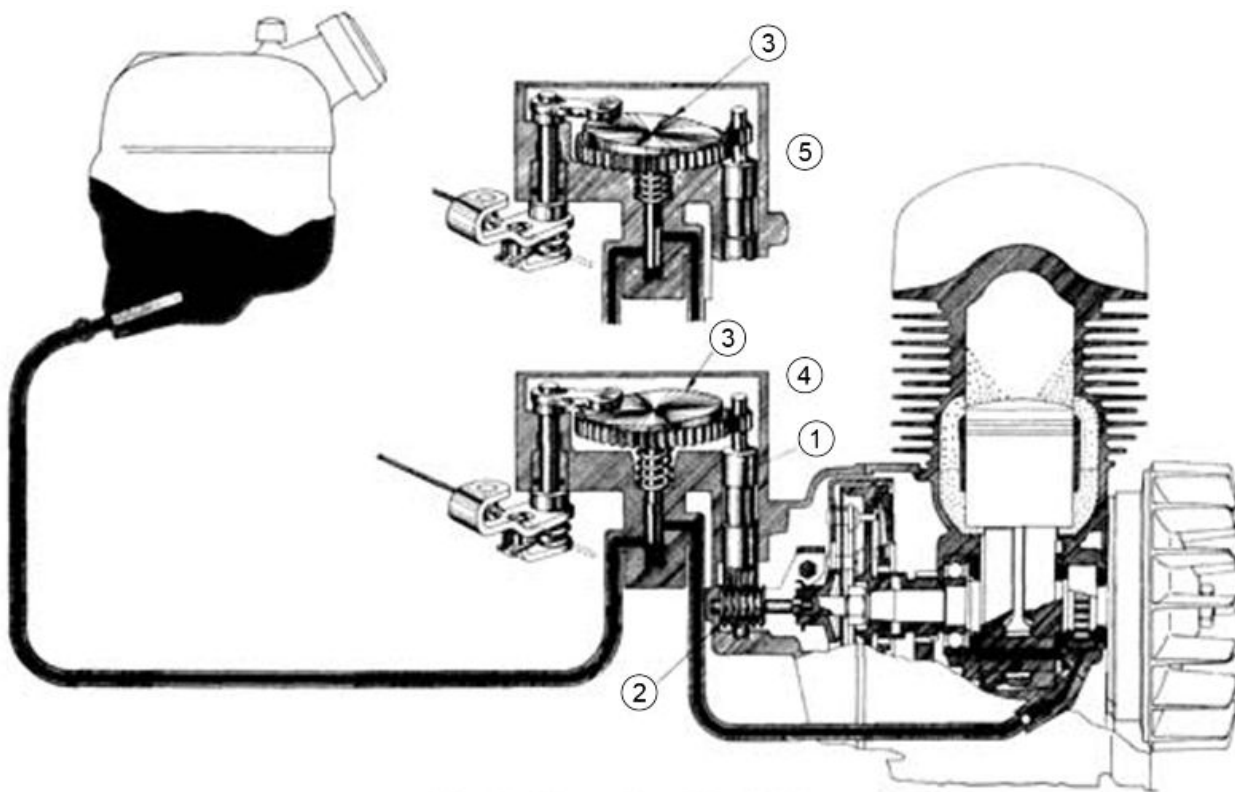
**CAUTION**

**IN CASE OF REMOVAL, REVIEW AND REINSTALLATION OF THE "LS" DEVICE, THE DUCTS MAY STAY FREE OF OIL. TO ALLOW THE "L.S." DEVICE TO PROGRESSIVELY AND SAFELY REFILL THESE, YOU ARE ADVISED THEREFORE - AFTER THESE OPERATIONS - TO SUPPLY THE FUEL TANK WITH APPROXIMATELY 3 (L) OF 2% MIXTURE OF SPECIFIC OIL. WITH THIS SUPPLY EXHAUSTED, SUBSEQUENT REFUELS MUST OBVIOUSLY BE CARRIED OUT WITH PETROL ONLY.**

**Recommended products**

**AGIP CITY TEC 2T Oil for 2-stroke petrol engines**

JASO FC, ISO-L-EGD Specifications

**KEY:**

**3** = Oil piston.

**4** = Piston (3) in position to sample oil from the tank.

**5** = Piston (3) in position to deliver oil to the engine.

**"L.S." DEVICE - APE TM KAT**

For the "L.S." device of the version APE TM KAT, the same treatment applies that is given for the APE TM version unless specific type of oil used.

**Recommended products**

**AGIP CITY TEC 2T Oil for 2-stroke petrol engines**

JASO FC, ISO-L-EGD Specifications

## INDEX OF TOPICS

**G**EAR-BOX

**GE**

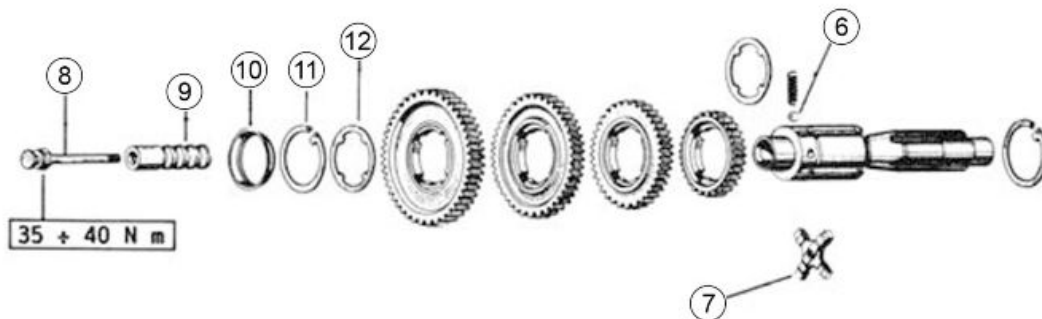
**CHANGE GEARS AND GEARBOX STEM CONTROL - APE TM P703 - REMOVAL**

After removing the container ring (10), the springs and the 2 balls (6), remove the retaining circlip (11), pull off the shoulder ring (12) and the four gears.

Unscrew the stem (8) (left-hand thread), remove the bushing (9) and the cross (7).

**Specific tooling**

T.0022465 Pliers for circlips

**CHANGE GEARS AND GEARBOX STEM CONTROL - APE TM P703 - FITTING**

Insert the cross (7) in the transmission gear shaft, then place the bushing (9), coat the threads of the stem (8) with the specific product, and screw it (left-hand thread) on the cruise (7) with torque of 35 to 40 Nm (3.5 to 4 kgm).

Reassemble the remaining components in reverse order of disassembly, taking care to orient the gears of the fourth, third and second speed with the collar facing outwards and the first gear speed with the collar turned inward.

**N.B.**

**AFTER REASSEMBLING THE GEAR UNIT PROCEED TO CHECK THE AXIAL CLEARANCE AS INDICATED IN THE SPECIFIC SECTION "FITTING CLEARANCES"**

**CHANGE GEARS - STEM - GEAR CONTROL BUSHING - APE TM P703V - REMOVAL**

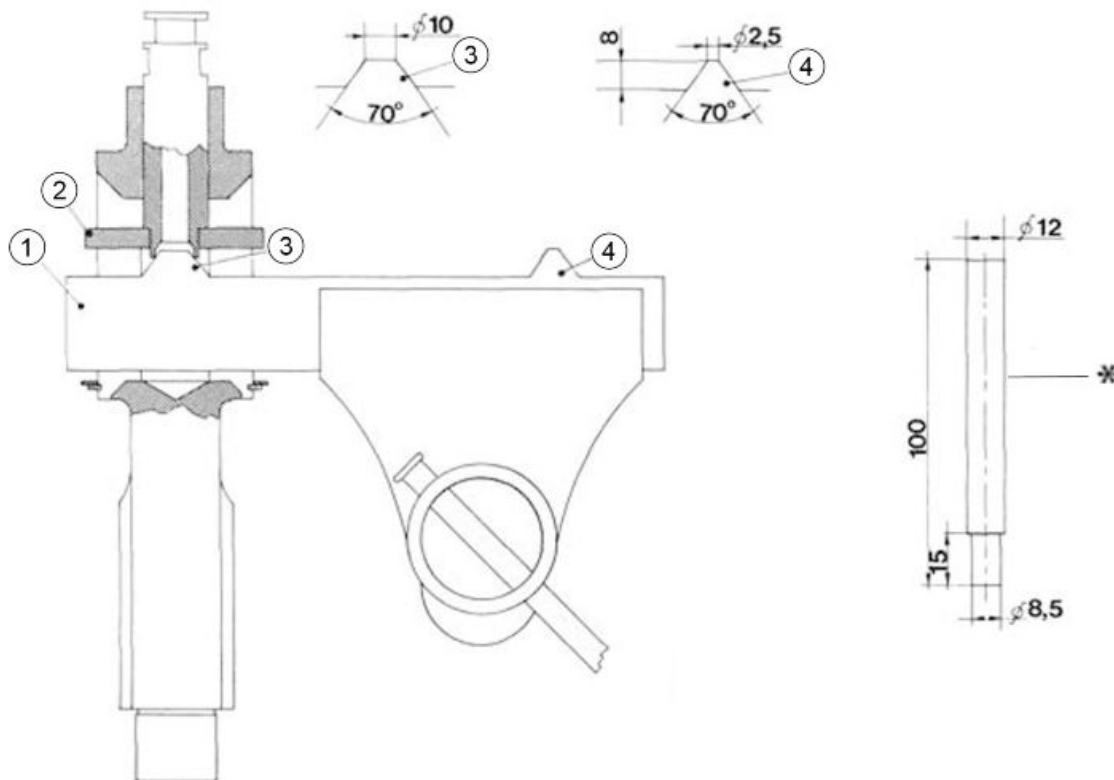
Remove the snap ring, the thrust washer and the gears.

Unscrew the control stem of the 3rd and 4th speed and the 1st and 2nd speed bushing (left-hand thread), then pull out the two crosses.

**N.B.**



**AFTER REASSEMBLING THE GEAR UNIT PROCEED TO CHECK THE AXIAL CLEARANCE AS INDICATED IN THE SPECIFIC SECTION "FITTING CLEARANCES"**



**KEY:**

\*= Punch for chamfering 1st and 2nd speed cross

**CHANGE GEARS - STEM - GEAR CONTROL BUSHING- APE TM P703V - FITTING**

- 1) Install the cross (2) on the gearbox shaft, tighten the bushing (left-hand thread) and lock it at a torque of 25 to 30 Nm (2.5 - 3 Kgm)
  - 2) Obtain two conical appendages (3) and (4) on a metal sheet profile (1) (7 mm thick) and insert it into a groove on the gearbox shaft, until it matches up with the appendix (3) with the end of the stem to be chamfered.
  - 3) Lock in the clamp the protruding part of the profile and, acting with a punch of the dimensions shown in the figure, perform the chamfering of the threaded end of the bushing on the cross (2). Once the chamfering has been carried out as described above, insert the 3rd and 4th speed coupling cross in the transmission gears shaft, screw the control stem (left thread and tightening torque 19 - 21 Nm-1.9 - 2.1 Kgm) and chamfer using the appendix (4) of the profile, operating as described above.
- Reassemble the gears, the shoulder ring and the circlip.

**N.B.**

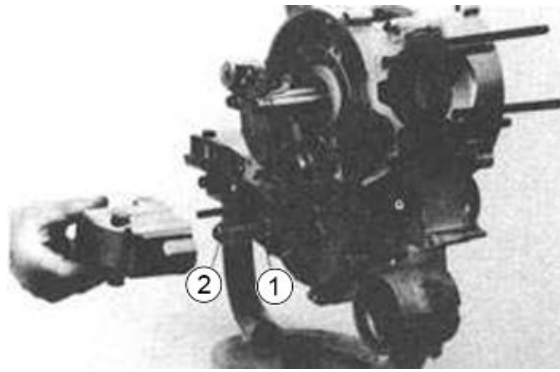
**AFTER REASSEMBLING THE GEAR UNIT PROCEED TO CHECK THE AXIAL CLEARANCE AS INDICATED IN THE SPECIFIC SECTION "FITTING CLEARANCES"**

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**CHANGE CONTROL SUPPORT****VEHICLES VERSION WITH STEERING WHEEL**

Rotate the crankshaft and bring the gears to such a position to allow the stem (2) and the bushing (1) to reach their maximum range, bring the two control levers to neutral position, fit a new gasket on the transmission support joining surface, engage the shoe of the upper lever on the groove of the stanchion of the y and [4]3 speed and the slider of the lower lever on the groove of the control bushing ^ and [2]8 speed then lock the gear change support with the two bolts and their washers.

Once the locking is done, check the regular operation of the transmission.

**CHANGE CONTROL SUPPORT****VEHICLES VERSION WITH HANDLEBAR**

The assembly of units such as the stator, flywheel, cylinder-piston unit, cylinder head, silencer, etc., requires no special precautions; it is sufficient to operate in reverse order of disassembly.

**WARNING**

**FOR THE LOCKING OF NUTS, BOLTS AND SCREWS, SEE THE TABLE "TIGHTENING TORQUE".**

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DIFFERENTIAL

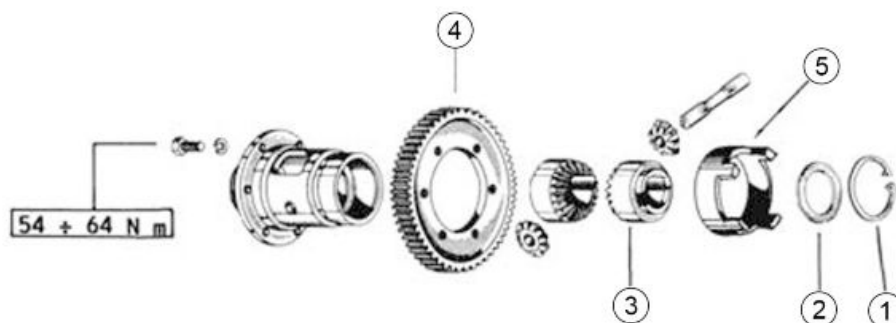
DI

### DIFFERENTIAL BOX - REMOVAL

Remove, using the specific pliers, the circlip (1), the washer (2) and the planetarium (3), then straighten the tabs of the retaining ring (5) of the satellites pin remove the ring itself, the pin, the satellites and the remaining sprocket. By removing the six bolts, remove the differential sprocket (4).

#### Specific tooling

T.0022465 Pliers for circlips



### DIFFERENTIAL BOX - FITTING

The replacement of the differential box is done in the reverse order of disassembly, taking care in reassembly to carefully fold the tabs of the retaining ring (5) of the satellite pin.

### CHANGE GEARS AND GEARBOX STEM CONTROL - APE TM P703 - REMOVAL

After removing the container ring (10), the springs and the 2 balls (6), remove the retaining circlip (11), pull off the shoulder ring (12) and the four gears.

Unscrew the stem (8) (left-hand thread), remove the bushing (9) and the cross (7).

#### Specific tooling

T.0022465 Pliers for circlips



#### **CHANGE GEARS AND GEARBOX STEM CONTROL - APE TM P703 - FITTING**

Insert the cross (7) in the transmission gear shaft, then place the bushing (9), coat the threads of the stem (8) with the specific product, and screw it (left-hand thread) on the cruise (7) with torque of 35 to 40 Nm (3.5 to 4 kgm).

Reassemble the remaining components in reverse order of disassembly, taking care to orient the gears of the fourth, third and second speed with the collar facing outwards and the first gear speed with the collar turned inward.

**N.B.**

**AFTER REASSEMBLING THE GEAR UNIT PROCEED TO CHECK THE AXIAL CLEARANCE AS INDICATED IN THE SPECIFIC SECTION "FITTING CLEARANCES"**

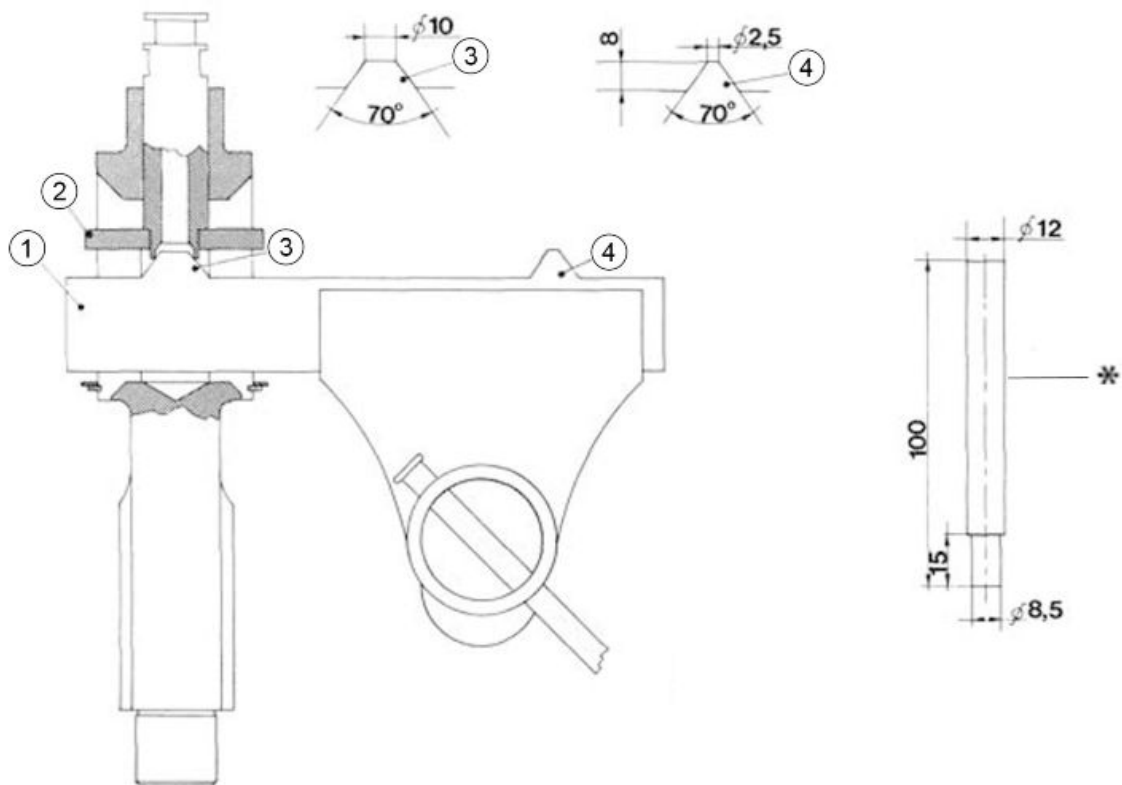
#### **CHANGE GEARS - STEM - GEAR CONTROL BUSHING - APE TM P703V - REMOVAL**

Remove the snap ring, the thrust washer and the gears.

Unscrew the control stem of the 3rd and 4th speed and the 1st and 2nd speed bushing (left-hand thread), then pull out the two crosses.

**N.B.**

**AFTER REASSEMBLING THE GEAR UNIT PROCEED TO CHECK THE AXIAL CLEARANCE AS INDICATED IN THE SPECIFIC SECTION "FITTING CLEARANCES"**

**KEY:**

\*= Punch for chamfering 1st and 2nd speed cross

**CHANGE GEARS - STEM - GEAR CONTROL BUSHING- APE TM P703V - FITTING**

**1)** Install the cross (2) on the gearbox shaft, tighten the bushing (left-hand thread) and lock it at a torque of 25 to 30 Nm (2.5 - 3 Kgm)

**2)** Obtain two conical appendages (3) and (4) on a metal sheet profile (1) (7 mm thick) and insert it into a groove on the gearbox shaft, until it matches up with the appendix (3) with the end of the stem to be chamfered.

**3)** Lock in the clamp the protruding part of the profile and, acting with a punch of the dimensions shown in the figure, perform the chamfering of the threaded end of the bushing on the cross (2). Once the chamfering has been carried out as described above, insert the 3rd and 4th speed coupling cross in the transmission gears shaft, screw the control stem (left thread and tightening torque 19 - 21 Nm-1.9 - 2.1 Kgm) and chamfer using the appendix (4) of the profile, operating as described above.

Reassemble the gears, the shoulder ring and the circlip.

**N.B.**

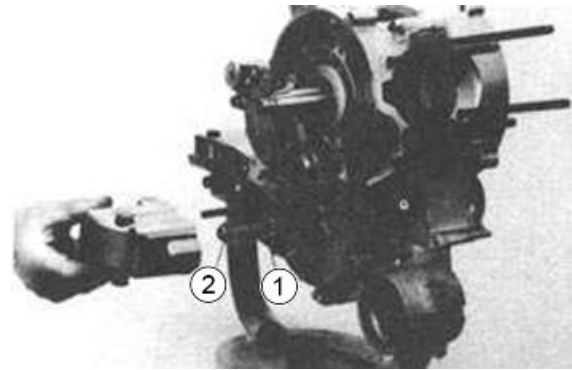
**AFTER REASSEMBLING THE GEAR UNIT PROCEED TO CHECK THE AXIAL CLEARANCE AS INDICATED IN THE SPECIFIC SECTION "FITTING CLEARANCES"**

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**CHANGE CONTROL SUPPORT****VEHICLES VERSION WITH STEERING WHEEL**

Rotate the crankshaft and bring the gears to such a position to allow the stem (2) and the bushing (1) to reach their maximum range, bring the two control levers to neutral position, fit a new gasket on the transmission support joining surface, engage the shoe of the upper lever on the groove of the stanchion of the y and [4]3 speed and the slider of the lower lever on the groove of the control bushing ^ and [2]8 speed then lock the gear change support with the two bolts and their washers.

Once the locking is done, check the regular operation of the transmission.

**CHANGE CONTROL SUPPORT****VEHICLES VERSION WITH HANDLEBAR**

The assembly of units such as the stator, flywheel, cylinder-piston unit, cylinder head, silencer, etc., requires no special precautions; it is sufficient to operate in reverse order of disassembly.

**WARNING**

**FOR THE LOCKING OF NUTS, BOLTS AND SCREWS, SEE THE TABLE "TIGHTENING TORQUE".**

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## INDEX OF TOPICS

**B**RAKING SYSTEM

**BS**



**RULES TO CHECK THE HYDRAULIC BRAKE**

If the braking system is malfunctioning and this requires a general inspection, make sure that:

- a) The metal pipes are in perfect working conditions and are adequately fitted so that they do not interfere with the chassis and may get damaged or flattened.
- b) The cloth or rubber flexible pipes do not show swellings or are soaked with oil or mineral grease: as these substances can dissolve rubber.
- c) All pipe clamps are adequately secured to the supporting brackets and plates: inadequate fixing would lead to pipe vibration and oscillation, and in turn, to pipe breaking.
- d) There are no fluid leaking from the different couplings; if there are, tighten well being careful not to damage the pipes.

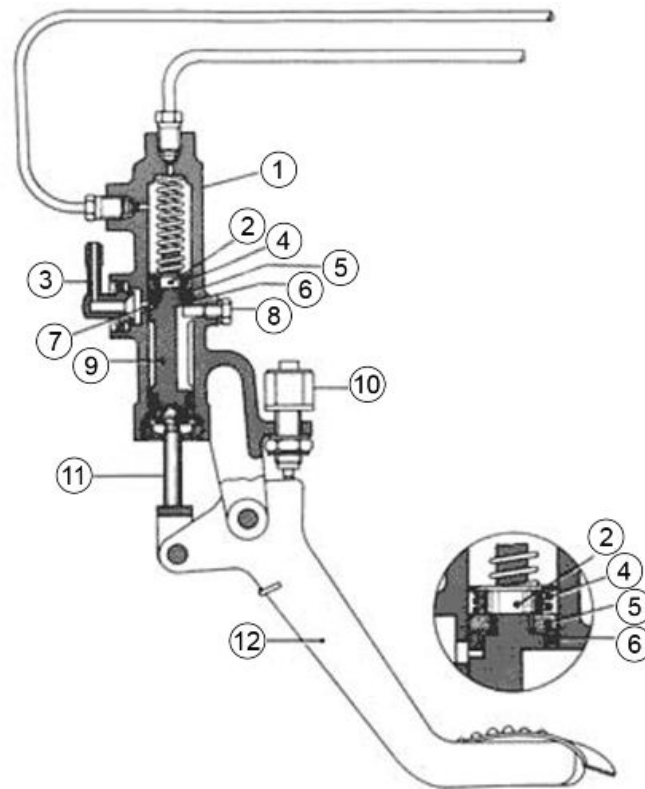
**BRAKES OVERHAUL**

- Separate from the pump the brake pedal and fix the pump body on the vice, taking care to interpose the aluminium bushings between the shoes of the vice in order not to damage it.
- Remove the piston and the springs from the body; to do this remove the end travel screw (8), the protective ring and push on the rod of the control piston (11) so that you can remove the retaining circlip with the specific pliers; gradually loosen until the pressure on the control rod to allow, through the action of the spring, the leakage of the piston from the cylinder of the pump body.
- If while acting as above, the piston does not go out, it is advisable to blow air at slight pressure from the end of the threaded oil delivery joints.

Clean the different components with alcohol: do not use petroleum or petrol as they can adhere to rubber parts and damage them.

**Specific tooling**

**T.0022465 Pliers for circlips**



### BRAKE CONTROL PUMP UNIT

#### KEY:

1. Pump body
2. Cap
3. Tank hose fitting
4. Spring
5. Sealing ring
6. Ring
7. Recovery and compensation hole
8. Piston end stroke screw
9. Piston
10. Stop switch
11. Piston control rod
12. Pedal

Once washed, the parts must be dried with jets of compressed air; afterwards, make sure that:

- That the pump body does not show signs of internal damage or corrosion as this may result in sealing ring or piston failure; the latter must also be replaced if worn or scratched or if mating with the cylinder has a clearance higher than that prescribed in the specific section "Fitting clearances."
- That the rubber parts in the piston and the valve are not dilated or damaged as this most likely leads to poor braking.
- That the piston return spring is in good condition.

- That the hole of recovery and compensation (7) (visible in the section of the pump in the figure) that communicates with the tank of the pump body, is not clogged or dirty.

It is advisable to carry out the cleaning of this hole with a jet of compressed air to apply, at reassembly, the special pump components 2-4-5 and 6 positioning them as shown in detail in the figure.

To facilitate the operation, lubricate the surfaces of the rubber elements with grease; this must also be done for the piston when fitting in the cylinder.

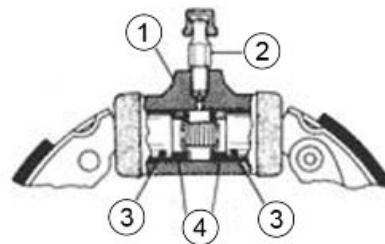
Once these parts are fitted, check that the pump works properly by pushing and quickly releasing the piston into the cylinder: the piston should quickly go back to its rest position.

---

### SHOW CONTROL CYLINDER

Once the shoe assembly has been removed from the frame and the cylinder disassembled in all its components, inspect following the same procedure as per the brake pump, always bearing in mind the warnings mentioned before regarding rubber gaskets, the central spring, the wear level of all parts as well as the cleaning procedure for the different parts.

For this specific assembly, it is also important to make sure that the air bleed opening (screw "2") and the oil intake hole are not clogged (blow in compressed air through the holes). The max. clearance between the metal pistons and the cylinder must not exceed that specified in the special section "Assembly clearances".



### BRAKE CYLINDERS UNIT

#### KEY:

1. Brake cylinder body
2. Air bleeding screw
3. Pistons
4. Sealing ring

---

## Brake pump

### LOADING PUMP OIL

Once all the above checks have been completed, the pump (always on the vice) must be filled with specific oil, as follows:

- Completely fill the reservoir (it must be kept in the same position as when it is mounted on the vehicle).
- Acting on the control rod, push two or three times the piston for a short stroke, to let the oil fill the pump body.

- Bring the piston to the end of their stroke so that any remaining air and a little oil are expelled.
  - Plug (by hand) the exit hole of the oil from the threaded shank.
  - Gradually release the pressure on the piston, making sure that it returns to the end of the stroke so that the oil may flow out of the reservoir into the pump body;
  - Repeat the above steps until, pushing the piston to the end of its stroke, a jet of air-free oil comes out of the oil discharge hole on the threaded shank; then plug the hole and return the piston to rest position.
- When the operations as described above are carried out, add oil in the pump reservoir to keep it always filled.

Once ascertained that the fluid intake conduit is not damaged especially where the connections are, the complete braking assembly is ready to be refitted on the frame, and the pump, full of oil, may be connected to the hydraulic circuit.

### **Recommended products**

#### **AGIP BRAKE 4 Brake fluid**

Specifications - FMVSS DOT 4

### **OIL REFILL IN THE HYDRAULIC CIRCUIT**

- A) - Push down the pedal to the end of its travel and slowly let it return to its starting position, repeating the operation until the pedal feels a back pressure. As this operation is carried out add oil to the tank to prevent the pump from discharging.
- B) - Lower the pedal, loosen the bleed screws on the front wheel, let the air out, after this bleed point has been connected through a small rubber pipe to a tray full of brake oil.
- C) - Repeat the operation as from point A) until all air bubbles have come out of through the pipe: at this point fit back the bleed screw, while keeping the pedal pushed down.
- D) - Repeat the above procedures for the other tires.

---

## **Shoes and drums**

### **CHECKING THE BRAKE SHOES AND DRUMS**

Check the thickness of the gaskets: if they are deteriorated or worn, replace the entire shoe assembly. Check the efficiency of the return springs: if these are deformed, replace them. Inspect the brake drums: replace them if they are scored or oval-shaped or, whenever possible, turn and lap the inside diameter. In the filling operations, a maximum oversize of 0.6 mm on the regular drum  $\varnothing$  is allowed.

**N.B.**

**THE BRAKE DRUMS ARE FITTED WITH AN INSPECTION HOLE (WITH A SCREW CAP) WHICH ALLOWS THE WEAR CHECK OF THE BRAKE GASKETS WITHOUT REMOVING THE DRUM.**

**CAUTION**

**BRAKING CIRCUIT FLUID IS HYGROSCOPIC, IT ABSORBS HUMIDITY FROM THE SURROUNDING AIR.**

**IF THE HUMIDITY IN THE BRAKE FLUID EXCEEDS A CERTAIN VALUE, THE RESULT IS AN INEFFICIENT BRAKE. UNDER NORMAL DRIVING AND CLIMATIC CONDITIONS THE FLUID SHOULD BE REPLACED EVERY TWO YEARS.**

**IF THE BRAKES UNDERGO SEVERE OPERATING CONDITIONS THE LIQUID SHOULD BE REPLACED MORE FREQUENTLY.**

**CAUTION**

**WHEN REFILLING TO LEVEL USE ONLY THE TYPE OF OIL THAT HAD BEEN USED PREVIOUSLY.**

**SHOE CLEARANCE ADJUSTMENT**

Once the shoes and their self-regulating device on the hub have been assembled, it is necessary, before installing the brake drum on the wheel axle, to proceed, with the device just mentioned, to the pre-adjustment of the shoes with respect to the brake drum.

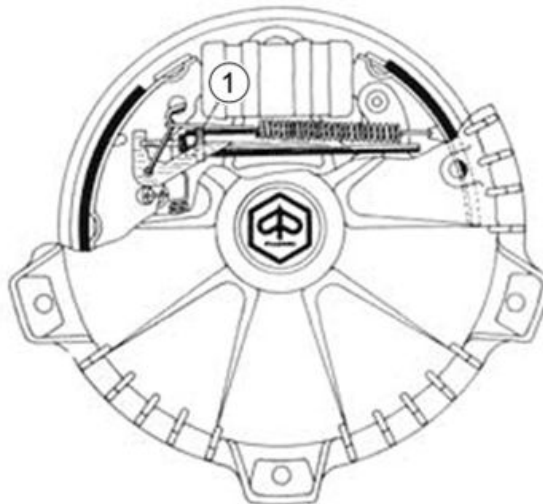
**PRE-ADJUSTMENT**

Turn the register (1) of the device (from top to bottom or vice versa as the case may be) until the outside diameter of the shoes is moved as close as possible to the corresponding inside diameter of the brake drum.

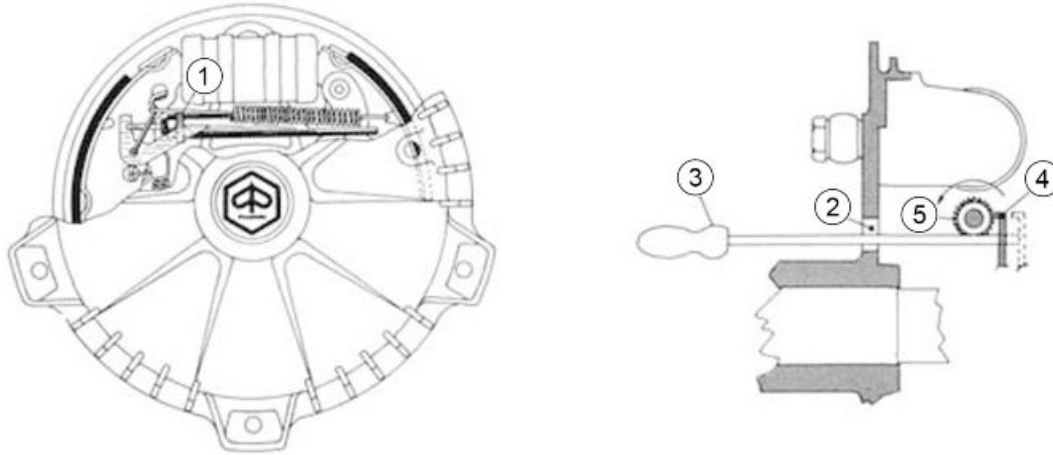
Once these pre-adjustment operations have been completed, assemble the drum and proceed to the final adjustment which is done (while the vehicle is not running) acting on the break pedal until the braking action occurs in correspondence with the average travel of the pedal.

**WARNING**

**THIS ADJUSTMENT BETWEEN SHOES AND DRUM (ON THE 3 WHEELS), AS THE VEHICLE IS BEING USED, IS ALWAYS KEPT CONSTANT BY THE AUTOMATIC ACTION OF THE ADJUSTING DEVICE THROUGH THE USE OF THE BREAK PEDAL.**

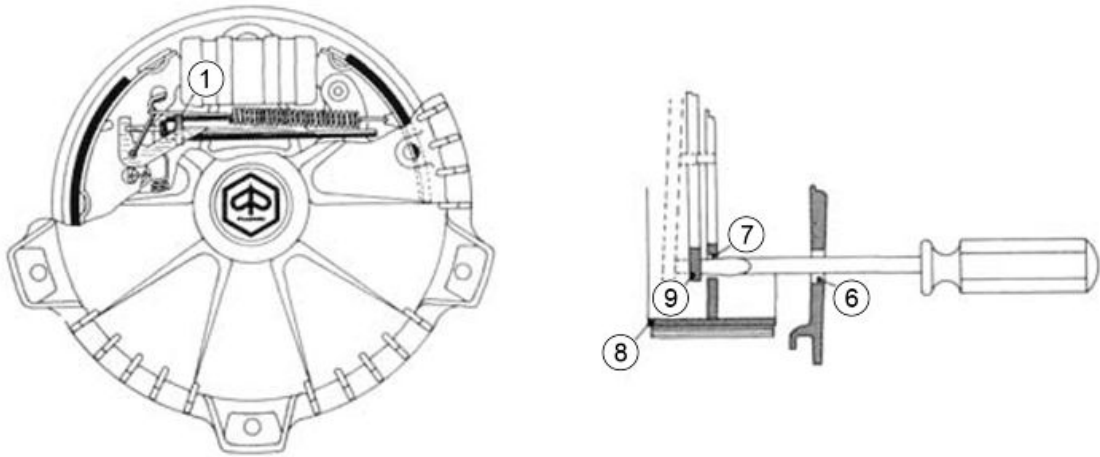
**FRONT DRUM BRAKE**

Once the cap has been removed from hub hole (2), insert an adjustment tab (3) in the hole and push lever (4) in while causing the sprocket wheel (5) to turn in the sense specified in the figure until the clearance between the shoe and the drum facilitates removing the drum. This operation is easier if the brake pedal is pressed at the same time.



### Rear brake drum

Remove the cap from the hub hole (6), insert a screwdriver until reaching the corresponding hole (7) on the brake shoe (8). Push the parking brake control lever (9) and release the supporting tab of the lever. When the lever is released and under the action of the return spring, the shoes will get detached from the drum and can be removed.



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## Parking brake

### MECHANICAL BRAKE ADJUSTMENT

In order to adjust the travel of the control hand lever, proceed as follows:

- Bring the lever to its rest position and move it upward by two teeth on the sector.
- Act on the tensioner so as to prevent the rotation by hand of the wheels.
- Lock the tensioner in position with its check nut.

**N.B.**

**REMEMBER THAT A NORMAL TENSION OF THE CABLE AFFECTS THE OPERATION OF THE BRAKE ON THE REAR WHEELS.**

**CAUTION**

**IF THE DRUM BRAKE IS EXCESSIVELY WORN RESULTING IN THE "CASING" OF SHOES IN THE DRUMS AND THERE IS DIFFICULTY IN THE DRUM REMOVAL, PROCEED AS INDICATED IN THE SECTION "FRONT BRAKE DRUM" - "REAR BRAKE DRUM".**

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# INDEX OF TOPICS

**S**TEERING COLUMN

**SC**



## Steering box assembly

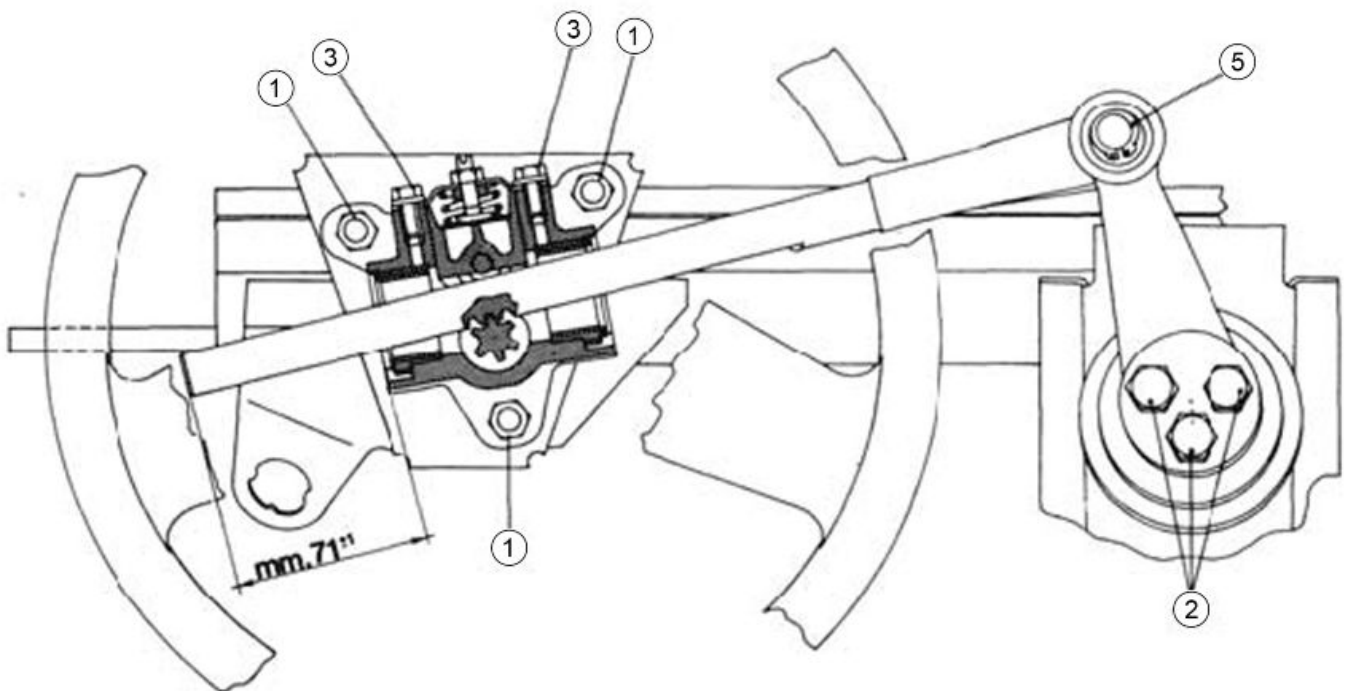
### HANDLEBAR - REMOVAL

Once the ash tray has been removed, take out the three anchor bolts using a 17-mm T-shaped wrench and tilt the steering wheel backwards.

### STEERING CONTROL ASSEMBLY (STEERING WHEEL VERSION) - REMOVAL

Disconnect the negative cable (-) from the battery to prevent short circuits.

Remove the instrument port dashboard and after removing the 3 nuts (1) and the 3 bolts (2), remove the complete steering gear box.

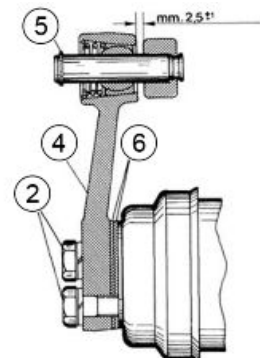


### RACK PRESSING ROLLER (STEERING WHEEL VERSION) - REMOVAL

Unscrew the two bolts (3) fixing the cover and remove the presser unit and the rack.

### STEERING CONTROL LEVER (STEERING WHEEL VERSION) - REMOVAL

For removal of the lever (4) it is sufficient to remove the 3 bolts (2), the retainer circlip (5); any shim washer (6) between the lever and the steering tube, released at removal and that should be adequately repositioned at their places at refitting.



### STEERING WHEEL AND SUPPORTING BALL BEARING (STEERING WHEEL VERSION) - REMOVAL

Undo the lower locking nut and slide off the steering wheel. First remove the retaining circlip with the specific pliers and then push out the ball bearing with a 28 mm inside diameter punch.

#### Specific tooling

T.0022465 Pliers for circlips

### STEERING WHEEL - BALL BEARING - FITTING

For the fitting, operate inversely to that described for the removal; replace the ball bearing on the steering gear box, the bearing retaining circlip with the specific pliers, and insert the steering wheel, locking it with the corresponding nut (tightening torque 30 to 35 N m. 3 to 3.5 kgm.).

#### Specific tooling

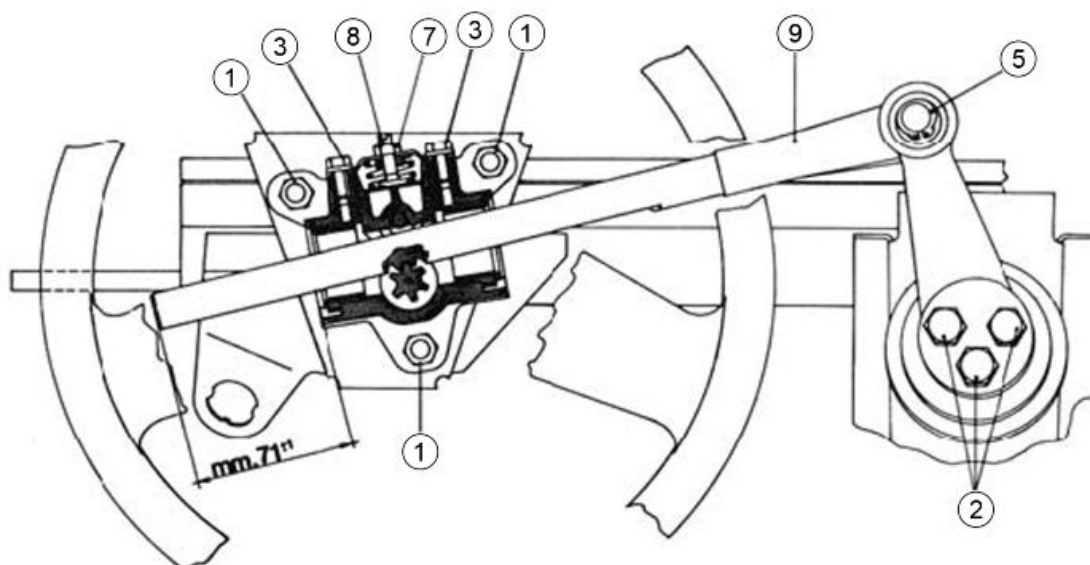
0023638 Pliers for circlips

### STEERING HOUSING - RACK - STEERING CONTROL LEVER - STEERING WHEEL VERSION - FITTING

Fit the presser unit consisting of roller, roller support, washer, spring, etc., and fasten the cover with the two screws (3) tightened to the prescribed torque. Unlock the locknut (7) and take the adjustment screw (8) to the end of stroke (by unscrewing it), then place the steering housing on the dashboard and lock it with 3 nuts (1) to the specified torque.

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

Steering housing lock nuts 20 - 25



Insert the rack (9) (complete with steering control lever (4) and retaining circlip (5) until it protrudes from the opposite side by 70 - 72 mm., keeping in mind that with this positioning the steering wheel must be oriented for a straight motion course for the vehicle as shown in the figure; if this does not occur, slide off the rack again, act on the steering wheel (rotate one or more teeth) and refit the rack again until the steering wheel is oriented as explained above.

Align the front wheel in a straight line motion direction, in a similar manner as for the steering wheel; place the steering control lever (4) interposing (between steering tube and control lever) the washers (6) that were removed at disassembly, and lock the lever (4) with 3 bolts (2) to the prescribed torque.

**N.B.**

**APPLY SPECIFIC GREASE ON ALL THE COMPONENTS OF THE ASSEMBLY (BALL BEARING, AXIS, STEERING WHEEL, RACK, ROLLER, ETC.) BEFORE REFITTING THEM.**

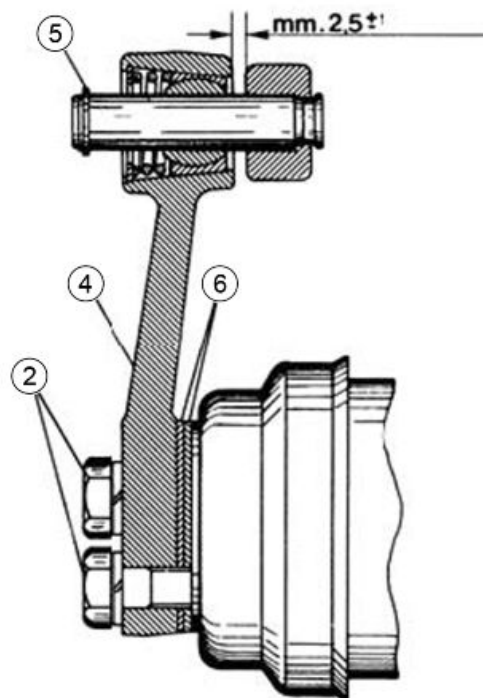
### Recommended products

**AGIP GREASE PV 2 Multipurpose grease**

NLGI 2 specifications; ISO-LXBIB2

### Locking torques (N\*m)

**Steering control lever to steering tube lock bolts 30 to 35**



### RACK CLEARANCE ADJUSTMENT

Tighten the screw (8) that has been previously unscrewed until it comes into contact with the roller support (do not undo beyond this limit). Now, turn back the screw (8) (undoing it) by 1/10 of a turn (max. 36°). Lifting the vehicle, also lift the front wheel and, by turning the steering wheel, cause the rack to slide all the way along its working travel; if when doing so, any kind of resistance is found, stop the steering wheel rotation and repeat from the start the adjustment described above exactly at the position

where the resistance was detected with the screw (8). With the above adjustment carried out correctly, lock, holding firmly the screw (8), the locknut (7).

Make sure that the steering wheel is now aligned (with its spokes) to the wheel ready to move on a straight line. If it is not aligned, unlock the 3 nuts (1) and move the steering housing along the fixing slots until the steering wheel is correctly aligned and lock the housing with the 3 nuts (1), observing the locking torque.

**WARNING**

**ONCE THE STEERING HOUSING IS LOCKED, ALWAYS CHECK THAT THE DISTANCE BETWEEN THE RACK AND THE CONTROL LEVER IS 2.4 - -2.6 MM AS INDICATED IN THE FIGURE AND THAT ALL PARTS HAVE BEEN REPLACED (FRAME, STEERING TUBE, STEERING HOUSING, ETC.) OR IF SOME REPAIR HAS BEEN CARRIED OUT IN THE CAB. IF THE VALUE IS NOT AS SPECIFIED, REMOVE OR ADD (AS REQUIRED) ONE OF THE WASHERS (6) TO OBTAIN THE RECOMMENDED DISTANCE.**

**APE TM P703 FL2 (VERSION WITH STEERING WHEEL)****N.B.**

**APPLY SPECIFIC GREASE ON ALL THE COMPONENTS OF THE ASSEMBLY (BALL BEARING, AXIS, STEERING WHEEL, RACK, ROLLER, ETC.) BEFORE REFITTING THEM.**

**Recommended products**

**AGIP GREASE PV 2 Multipurpose grease**

NLGI 2 specifications; ISO-LXBIB2

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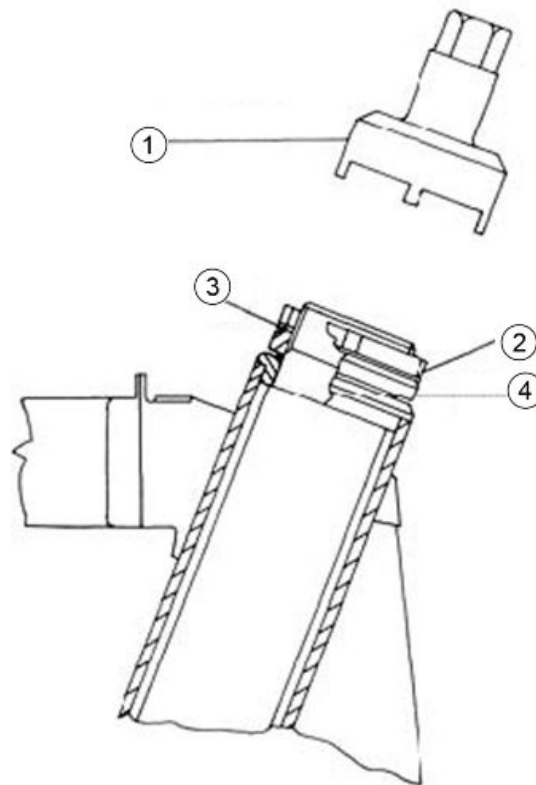
## Upper housing

**STEERING UPPER BEARING RING NUT**

Remove the oil supply pipe from the front brake cylinder (close the hole to avoid unnecessary loss of oil) and with the specific key (1) remove the ring nut (2) and the brake washer (3) of the steering upper bearing; lift the vehicle with a lifting device and pull out the steering tube.

**CAUTION**

**TO REMOVE THE UPPER SEAT (4) THE SPECIFIC WRENCH (1) IS NOT NEEDED SINCE THE REMOVAL, AS THE SEAT HAS NO THREADS BUT HAS BEEN FORCED ON THE STEERING TUBE, IS CARRIED OUT SIMULTANEOUSLY WITH THE PULLING OUT OF THE STEERING TUBE.**

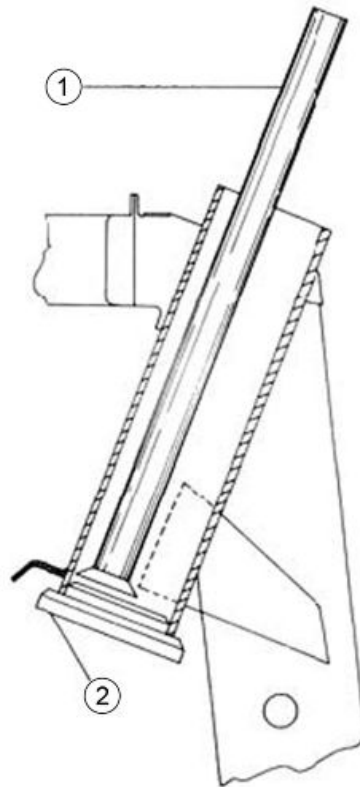


#### **UPPER SEAT OF THE LOWER STEERING BEARING**

Operate the same way as described in the section "**Lower seat of the upper steering bearing**" for the expulsion of the lower seat; reusing the specific tool (1) introduced from the upper side of the steering headstock, with the aid of a mallet, remove the upper seat (2) of the lower steering bearing.

#### **Specific tooling**

**19.1.20004 Tool for disassembling steering bearing from the frame**



### STEERING UPPER BEARING RING - FITTING

After the vehicle has been lifted, insert the steering tube into its sleeve, then lower the vehicle until the front wheel touches the ground, apply the specific grease on the lower seat of the upper steering bearing and fit the balls (n. 44) on the seat.

Insert the upper seat (2), the brake washer (3) and the ring nut (1) locking it with the specific key (4) to the specified torque. Again lift the wheel from the ground, make sure that the steering wheel is free to rotate and chamfer the brake washer (3) on one of the four grooves of the lock ring nut (1).

After the brake washer has been chamfered, assemble the remaining components of the group following the fitting operations but in reverse order and proceed to purge air on the front brake.

### Specific tooling

19.1.20041 Steering upper bearing ring nut gear wrench

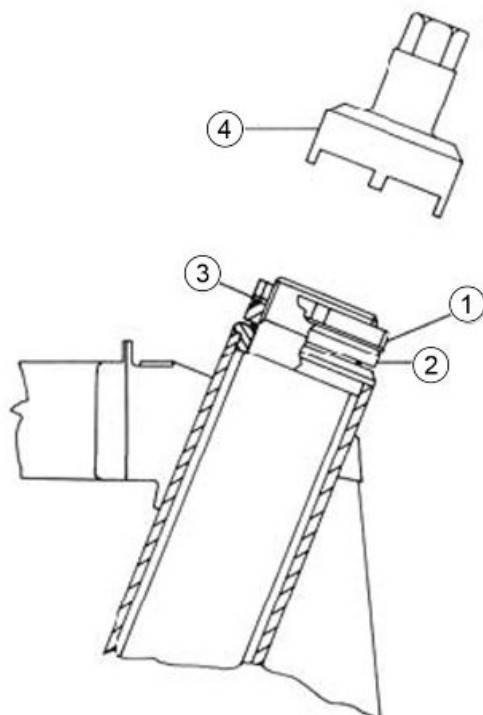
### Recommended products

**AGIP GREASE PV 2 Multipurpose grease**

NLGI 2 specifications; ISO-LXBIB2

### Locking torques (N\*m)

**Steering upper bearing lock gear 50 to 70**



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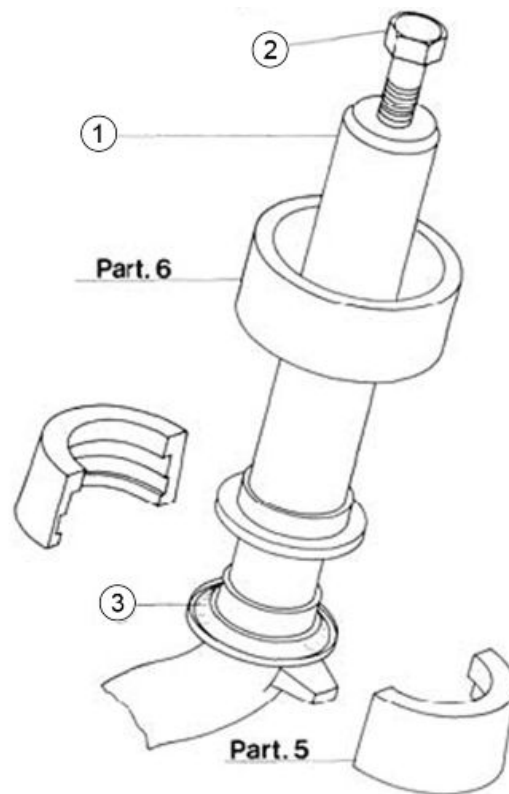
## Lower housing

### LOWER SEAT OF THE LOWER STEERING BEARING

On the steering tube fit the special tool (1), apply the two half rings (component 5) and lock them with the ring (component 6); then act on the centre screw (2) and pull out the lower seat (3).

### Specific tooling

**19.1.20042 Extract the bottom seat of the steering bottom bearing**



### FRONT WHEEL BRAKE DRUM

With the tip of a screwdriver remove the dust gaiter; unscrew the lock nut with collar on the wheel axis and, using a mallet, remove the brake drum from its axis.

#### CAUTION

**WHEN THE BRAKE DRUM IS REASSEMBLED, THE NUT WITH COLLAR THAT HAD BEEN PULLED OUT DURING REMOVAL MUST NOT BE USED AGAIN BUT REPLACED WITH A NEW ONE.**

### BOTTOM SEAT OF THE STEERING BOTTOM BEARING - FITTING

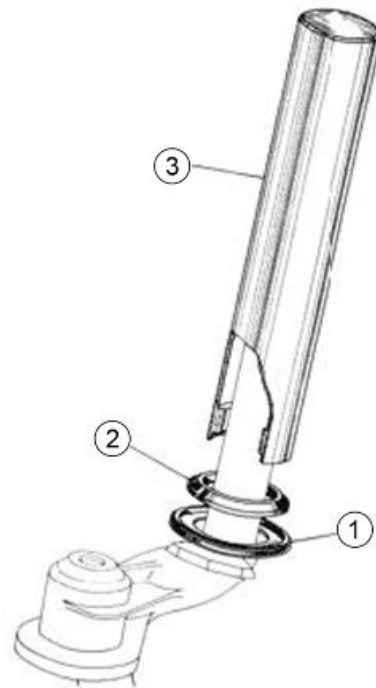
On the steering tube fit the dust gaiter (1) and seat (2) then, using the special tool (1) push (using a mallet) until the seat-dust gaiter unit stops; at this point remove the tool and mount the balls (n. 27) on the seat which had been previously greased with the specific product.

### Recommended products

#### AGIP GREASE PV 2 Multipurpose grease

NLGI 2 specifications; ISO-LXBIB2



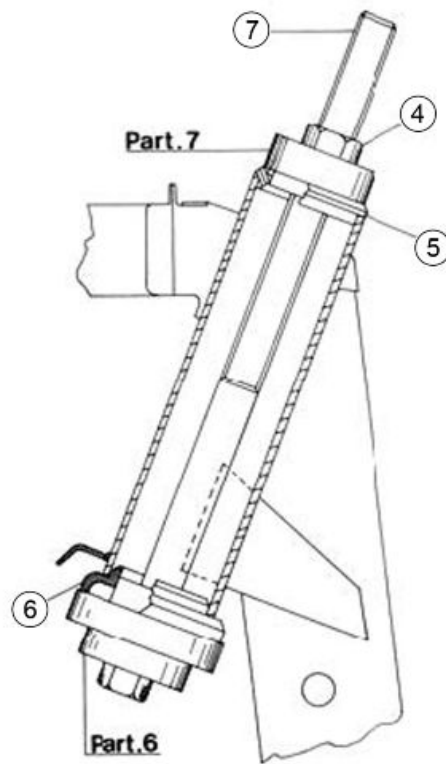


#### **LOWER SEAT OF THE UPPER BEARING AND UPPER SEAT OF THE STEERING LOWER BEARING - FITTING**

Fit on the sleeve the relative seats (1) and (2), introduce from the lower side of the sleeve the special tool (3) (provided with comp. 6 and 7) and, using the nut (4), definitively position the seats in place.

#### **Specific tooling**

**T.0021330 Steering seats fitting tool**



# INDEX OF TOPICS

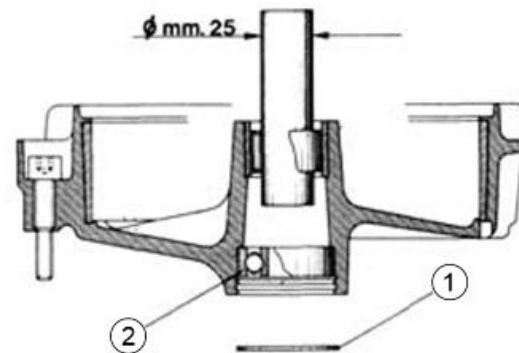
**SUSPENSIONS**

**SS**

## Front

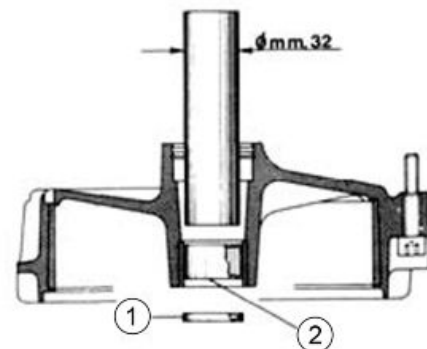
### BALL BEARING- REMOVAL

Take out the circlip (1), rest the drum on a suitable base, and expel the ball bearing (2) with the aid of a section of tube, OD 25 mm.



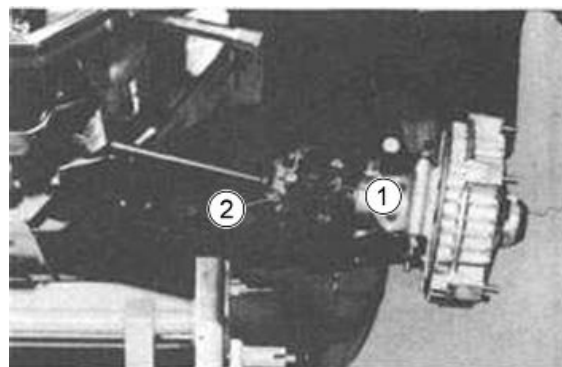
### ROLLER BEARING - REMOVAL

With the tip of a screwdriver, take out the sealing ring (1), turn the drum over on the supporting base and expel the roller bearing (2) with the aid of a section of tube, OD 32 mm, and a few taps with a mallet.



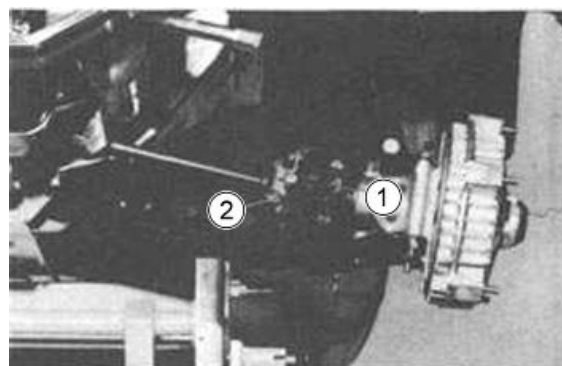
### FLEXIBLE JOINT - REMOVAL

Hoist the vehicle, secure the axle shafts to the engine with flexible straps so as to avoid that the end with the joint pin slides off the differential sprocket wheel; take out the 6 bolts (1) connecting the flexible joint to the terminals and remove the flexible joint.



### OIL SEALING AXLE SHAFT AND COVER

Drain off the oil of the gearbox-differential assembly through the oil drainage hole; remove the 3 bolts (1) fixing the hub; remove the oil sealing cover from the differential and once the bolt (2) has been removed after having remove the bolt, slide off the oil sealing cover.



#### N.B.

NO SPECIFIC TOOLS ARE REQUIRED TO REPLACE THE BUSHING SEAL RING; ONCE THE BUSHING HAS BEEN REMOVED FROM THE COVER, JUST USE A SCREWDRIVER TO TAKE OUT THE SEALING RING AND A FLAT HEAD PUNCH OF SUITABLE DIAMETER TO REFIT IT.

### ROLLER BEARING - SEALING RING ON FRONT DRUM - FITTING

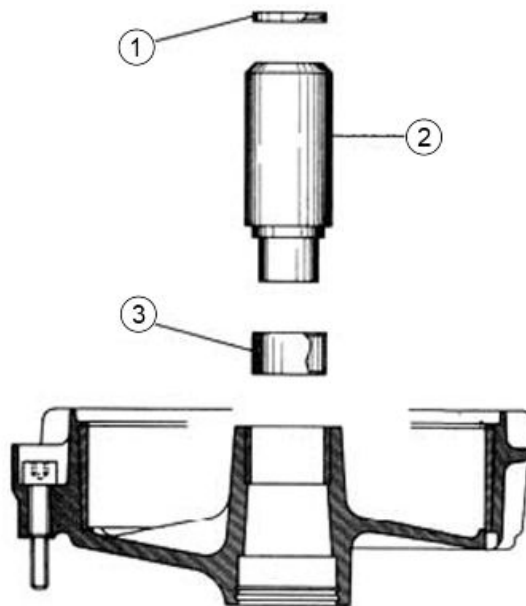
Proceed to fit the specific roller bearing (3) using the specific punch (2). Once this operation is completed, fit the sealing ring (1).

**N.B.**

**BEFORE FITTING THE ROLLER BEARINGS, ALWAYS REFER TO THE STANDARDS LISTED IN THE TABLE "TIGHTENING TORQUE".**

### Specific tooling

#### 19.1.20044 Front wheel hub roller bearing fitting punch



### BALL BEARING - CIRCLIPS ON THE FRONT BRAKE DRUM - FITTING

Heat, with the specific tool, the bearing housing area and fit with the specific punch (5), the relative ball bearing (6).

Complete the fitting with the insertion, using the special tool, of the circlip (4).

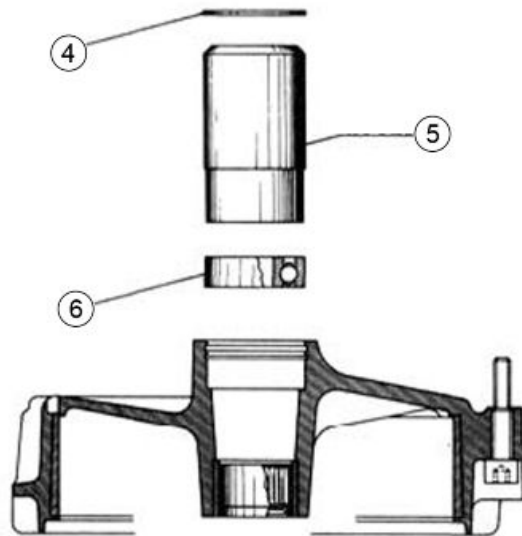
**WARNING**

**BEFORE REFITTING THE DRUM, FILL THE INTERNAL CHAMBER WITH THE SPECIFIC GREASE.**

### Recommended products

**AGIP GREASE PV 2 Multipurpose grease**

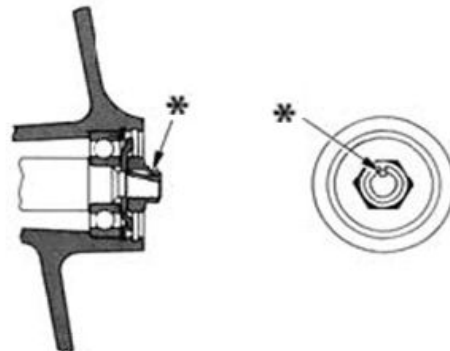
NLGI 2 specifications; ISO-LXBIB2



### FRONT WHEEL BRAKE DRUM LOCKING

When refitting the drum brake on the front wheel axle, do not reuse the previously removed chamfered nut, but replace it with a new one; the locking must be carried out chamfering carefully, as in the figure, the collar in the existing groove on the wheel-holder shaft, then fit the cover after filling it with specific grease.

For the chamfering operation appropriate pliers must be used.



### Specific tooling

19.1.20047 Pliers for chamfering nuts

### Recommended products

**AGIP GREASE PV 2 Multipurpose grease**

NLGI 2 specifications; ISO-LXBIB2

### KEY:

\*= chamfer.

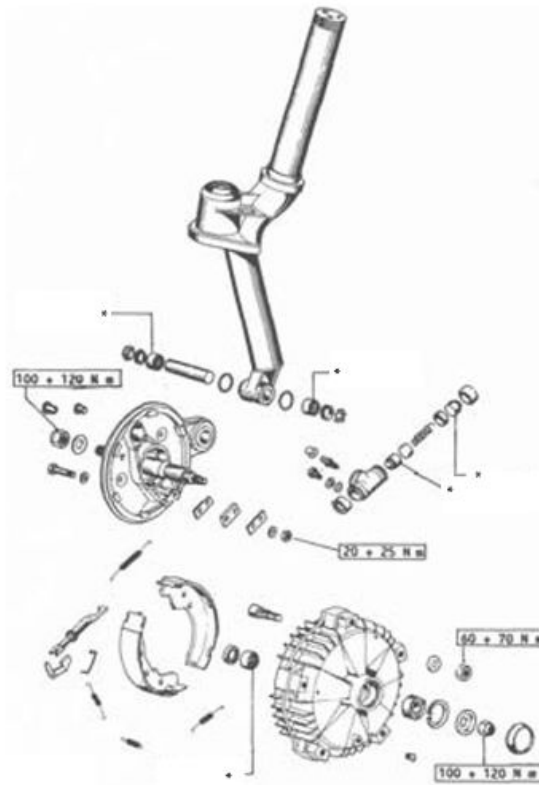
## Verifiche e regolazioni

FRONT SUSPENSION UNIT OVERHAUL - APE TM - APE P703 - APE P703V

For the overhaul of the front suspension, it is essential to proceed to some changes to the specific tool of the particular components, with the addition of the new specific components 20-21-22.

### Specific tooling

#### 19.1.20000 Tool for front suspension overhaul



#### KEY:

\* = Grease.

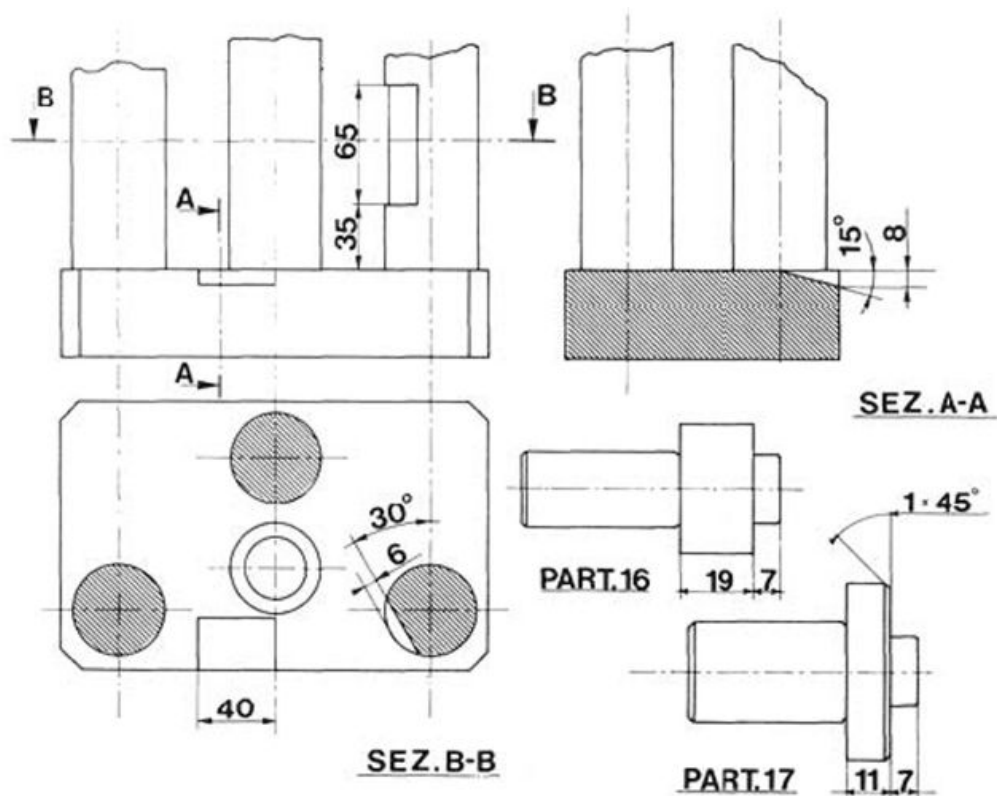
The overhaul operation of the steering-front suspension unit is essentially needed to replace parts (pin - roller bushing - sealing rings and dust guard assembly) that connect the steering tube and the swinging arm of the front wheel holder. It is carried out using a special tool to be operated with the necessary use of a hydraulic press with minimum power of 10 t.

#### N.B.

**BEFORE CARRYING OUT THE OVERHAUL AS MENTIONED ABOVE, MAKE SURE THAT THE STEERING TUBE AND THE SWINGING ARM, WITH SPECIAL ATTENTION TO THE AREA WHERE THE NEEDLE BEARING WORKS ON THE WHEEL SHAFT, ARE IN TOP CONDITION; IN FACT, ONLY THEN THE SERVICE IS JUSTIFIABLE  
MORE OVER, KEEP IN MIND THAT, WHEN THE STEERING TUBE IS DEFORMED, IT MUST ALWAYS BE REPLACED WITH A NEW ONE.**

### Specific tooling

#### 19.1.20000 Tool for front suspension overhaul

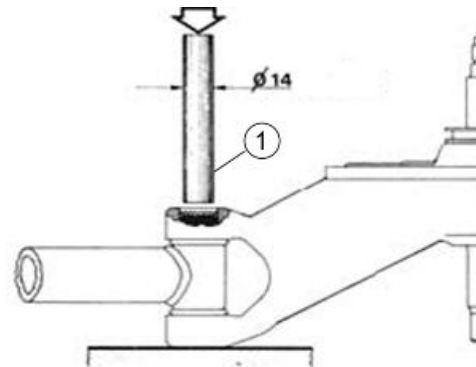


### THE TWO WEDGE WASHERS - REMOVAL

(Manual operation that does not require the use of the press).

- With the help of a punch (1) with diameter 14, flatten with a mallet the wedge washer and pull it out with a pointed screwdriver.

For the second washer, repeat the operation using the punch on the side opposite the one shown in the figure.



### PIN AND ROLLER BUSHINGS - REMOVAL

- On the specific tool (1), fitted with components 1-6-18 and 21, place the suspension assembly as shown in the figure and operate with the press until the pin and the roller bushing are simultaneously expelled in the direction opposite to the press thrusting force.

When the pin and the first roller bushing are expelled, the swinging arm is completely disanchored from the steering tube.

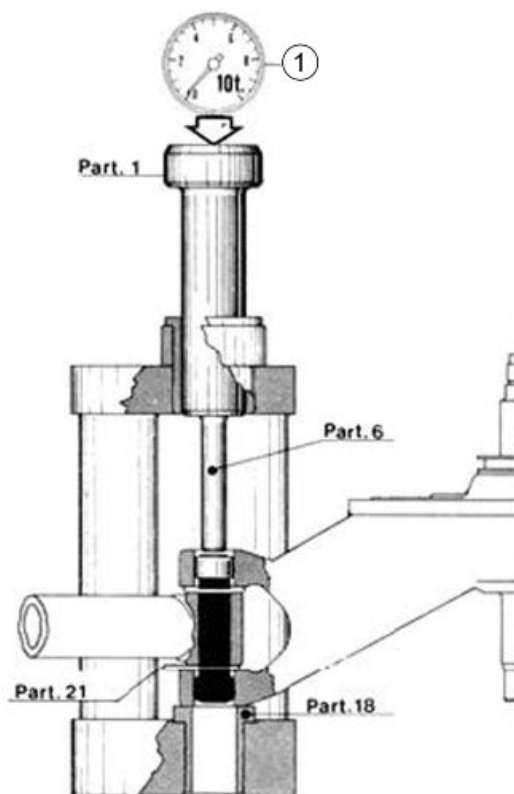
#### WARNING

**THE SPECIAL TOOL MUST ALWAYS BE PROVIDED WITH ACCESSORIES 1 (ON THE TOP SIDE) AND 18 (ON THE BOTTOM CRANKCASE).**

### Specific tooling

#### 19.1.20000 Tool for front suspension overhaul

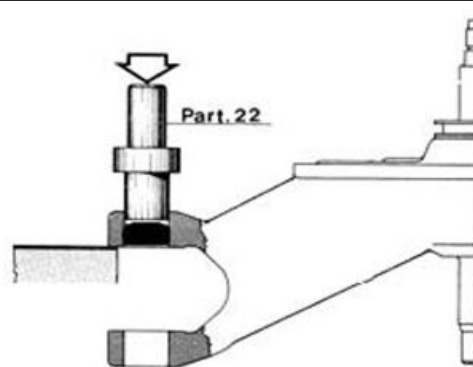




**ROLLER BUSHING 2ND EXPULSION - REMOVAL**

(Manual operation that does not require the use of the press).

To expel the second roller, use the component 22 and hit with the mallet.



**INSTALLING**

**CAUTION**

**DURING THE REMOVAL OPERATIONS DESCRIBED ABOVE, THE ROLLER BUSHINGS ARE DESTROYED WHEN THE PRESS IS USED. THEREFORE, UPON FITTING, NEW BUSHINGS MUST BE USED, AS IT IS ALWAYS NECESSARY TO USE NEW PIN, SEALING RINGS AND DUST GUARD.**

**WARNING**

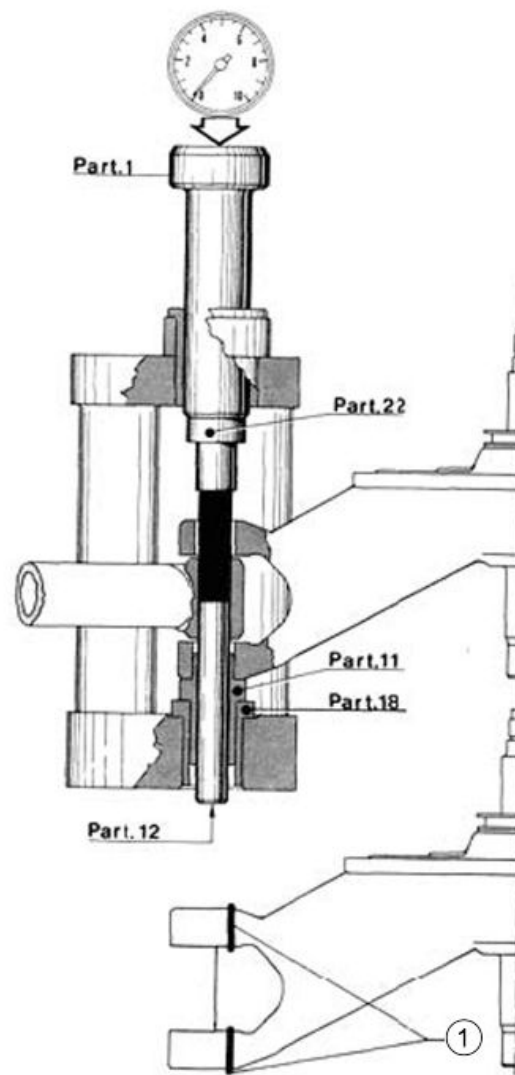
**IF AT THE END OF THE REMOVAL OPERATIONS OF THE WEDGE WASHERS AND IN PARTICULAR OF THE PIN, SIGNS OF DETERIORATION SHOULD BE NOTICED IN THE AREA WHERE THE ROLLER BEARINGS ARE HOUSED, IT IS ALWAYS ESSENTIAL TO PROCEED TO THE REPLACEMENT OF THE ARM.**

**PIN - INSTALLATION**

- Connect by hand the swinging arm to the steering tube by means of the guide pin comp. 12.

**N.B.**

**BEFORE PROCEEDING TO MAKE THIS CONNECTION, INSTALL THE TWO DUST GUARD RINGS (1) ON THE SWINGING ARM.**



- Provide the specific tool connecting to component 1, bottom end, the comp. 22 and the lower crankcase the component 11.

### Specific tooling

#### 19.1.20000 Tool for front suspension overhaul

Position the swing arm - steering tube unit, provided with guide pin, on the specific tool previously prepared; insert the pin, previously greased with lubricant on component 22 and push it through the action of the press to until bringing the component 22 to a stop on the steering tube.

### Recommended products

**AGIP GREASE PV 2 Multipurpose grease**

NLGI 2 specifications; ISO-LXBIB2

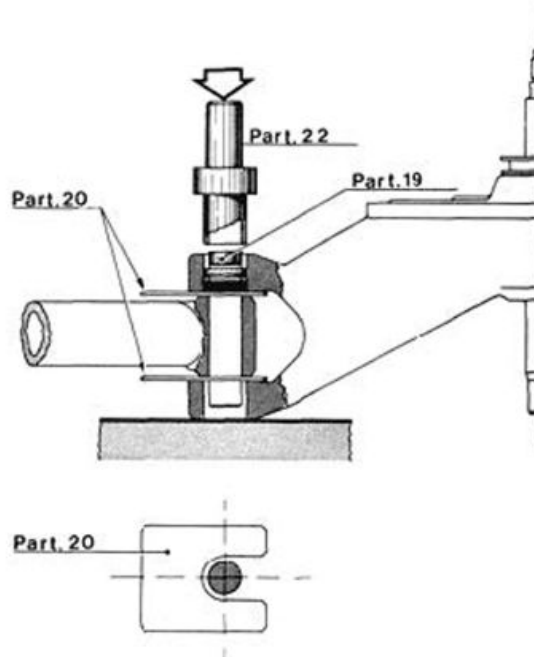
### SEALING RINGS - FITTING

(Manual operation that does not require the use of the press).

- Once the pin has been assembled, remove the unit from the tool and, with light use of the mallet, fit the two spacers component 20.

#### WARNING

**THE ASSEMBLY OF THE SPACERS MUST BE CARRIED OUT WHILE MAKING SURE TO KEEP THE CONCENTRICITY AND DISTANCE WITH RESPECT TO THE PIN; INDEED AN INCORRECT POSITIONING OF THEM (INDENT OF COMPONENT 20 IN CONTACT WITH THE PIN) WOULD NOT PERMIT THE PASSAGE OF THE SEAL RINGS IN THE ASSEMBLY PHASE.**



Manually fit the two sealing rings that have been dipped in lube oil to the pin, until the top end of the pin, on which component 19 will be positioned, is left free; then through the use of comp. 22 push the seal rings with light mallet blows, until reaching the stop of the comp. 22 on comp. 19.

### 2nd SEAL RING - FITTING

- Repeat the above procedure working on the side opposite the one shown in the figure, in order to fit the other seal ring.

### ROLLER BUSHINGS COMPLETE WITH WEDGE WASHERS - FITTING

Fit on the pin, by hand, the roller bushing complete with the wedge washer.

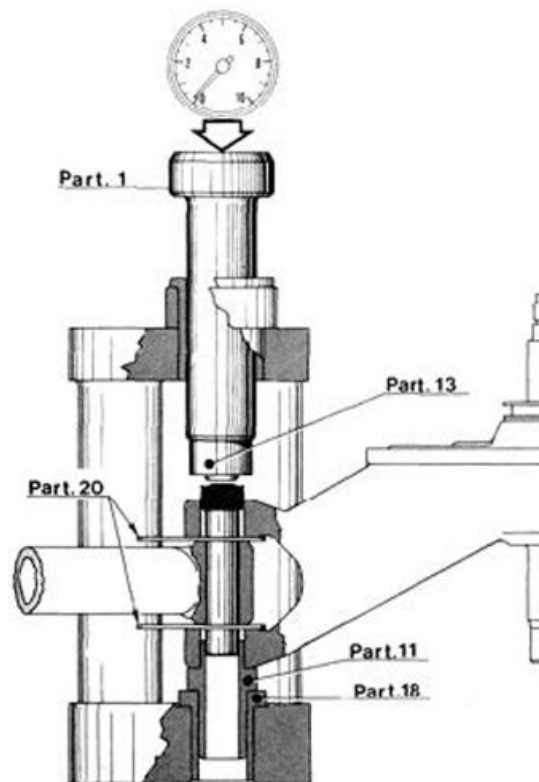
#### WARNING

**BEFORE PROCEEDING TO THIS PRE-FITTING, THE ROLLER BUSHINGS (AFTER HAVING BEEN WASHED IN PURE PETROL OR NEUTRAL PETROLEUM TO REMOVE THE RUST PREVENTER) MUST BE HALF FILLED WITH THE SPECIFIC GREASE.**

### Recommended products

**AGIP GREASE PV 2 Multipurpose grease**

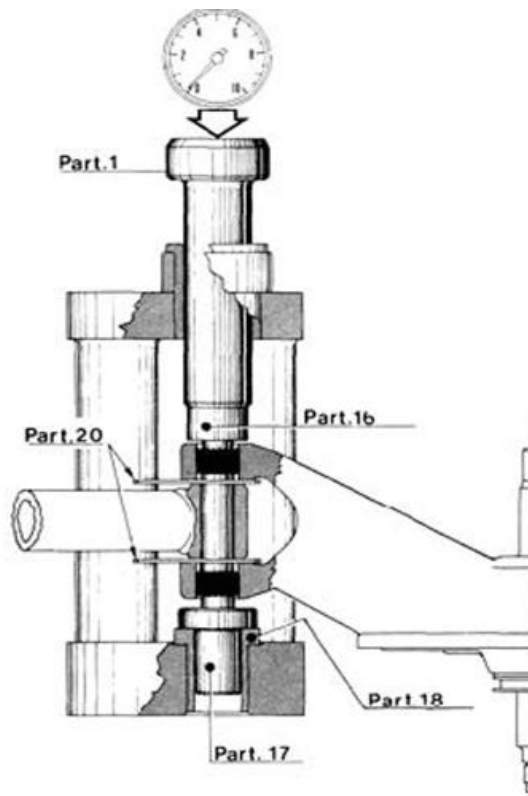
NLGI 2 specifications; ISO-LXBIB2



- Remove from the crankcase of the tool specific the comp 12 (driving) partially ejected during the assembly of the pin (see figure in the specific section "Mounting the pin", always leaving the fitted the comp. 11).
- Apply comp. 13 on comp. 1, in place of the existing comp. 22 (see figure in the specific section "Mounting seal rings").
- Place the suspension unit back on the tool and, using the press, push the wedging washer-roller bushing assembly until bringing the comp. 13 to a stop on the oscillating hub. This completes the fitting operation for the first roller bushing.
- To install the second roller bushing, apply on the tool - always equipped with comp. 13 - the comp. 15 replacing comp. 11: with the suspension unit overturned, in position corresponding to that indicated in the next figure, repeat the operation as described in the preceding point, so as to assemble the second unit wedge washer - needle bushing.

**FINAL POSITIONING OF THE ROLLER BUSHINGS ON THE PIN (END OF THE PIN MAKING CONTACT WITH THE INSIDE BOTTOM OF THE ROLLER BUSHING)**

- Remove from comp. 1 of the tool, comp. 13 and in its place insert comp. 16; apply on the lower crankcase comp. 17; act on the press until the roller bushings are definitively positioned.



**WASHERS WEDGING**

Use the tool supplied in comp. 22 and 11, as already represented in the specific section "Mounting the pin", and push, using the press loaded to approx. 1.8 t., until the washer is wedged on the swinging arm. At this point remove the two spacers (comp. 20 of the figure in the section "Mounting the pin"), and, after having completely filled with specific grease the space between the steering tube and the oscillating arm, move the dust guard rings (1) until they are made to fit in the space provided.

**Recommended products**

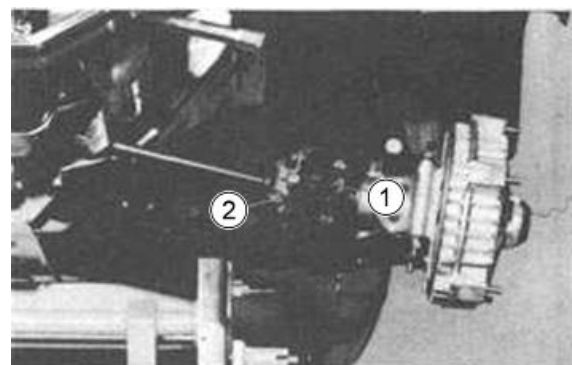
**AGIP GREASE PV 2 Multipurpose grease**

NLGI 2 specifications; ISO-LXBIB2

**Rear**

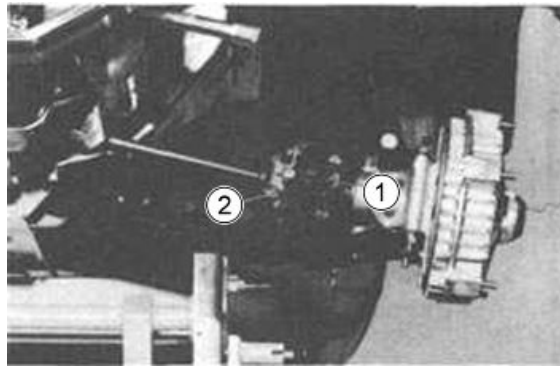
**FLEXIBLE JOINT - REMOVAL**

Hoist the vehicle, secure the axle shafts to the engine with flexible straps so as to avoid that the end with the joint pin slides off the differential sprocket wheel; take out the 6 bolts (1) connecting the flexible joint to the terminals and remove the flexible joint.



### OIL SEALING AXLE SHAFT AND COVER

Drain off the oil of the gearbox-differential assembly through the oil drainage hole; remove the 3 bolts (1) fixing the hub; remove the oil sealing cover from the differential and once the bolt (2) has been removed after having removed the bolt, slide off the oil sealing cover.



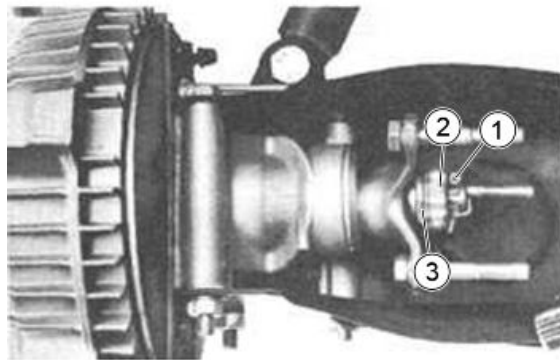
#### N.B.

NO SPECIFIC TOOLS ARE REQUIRED TO REPLACE THE BUSHING SEAL RING; ONCE THE BUSHING HAS BEEN REMOVED FROM THE COVER, JUST USE A SCREWDRIVER TO TAKE OUT THE SEALING RING AND A FLAT HEAD PUNCH OF SUITABLE DIAMETER TO REFIT IT.

### REAL WHEEL HUB

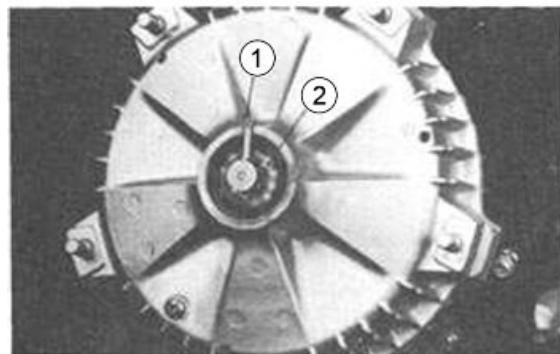
#### HUB LOCK-NUT

Remove, using the 3 lock-nuts, the flexible joint from the hub (as indicated in the section "Flexible joint"), remove the cotter pin (1) and the cap (2); lock, through the action of the parking brake, the wheel axle and with a socket wrench of 27 mm. loosen the nut (3).



#### BRAKE DRUM - REMOVAL

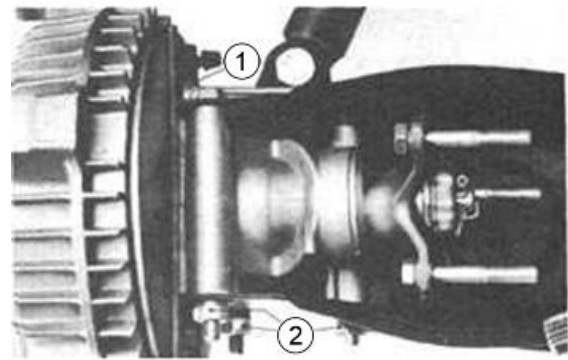
Take out the dust gaiter and, in the same manner as per the hub nut, remove the cotter pin (1), the cap (2) and, with a 30 mm box-spanner, the drum lock nut.



Release the parking brake and loosen the cone with a few taps with a mallet near the drum perimeter, thus facilitating extracting the brake drum.

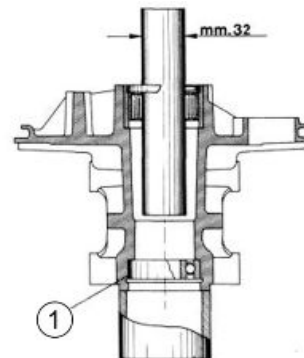
**WHEEL HUB FROM TRIANGLE - REMOVAL**

Release the parking brake cable; remove the brake oil suction pipe (1), the three anchor bolts (2) and remove the entire hub.



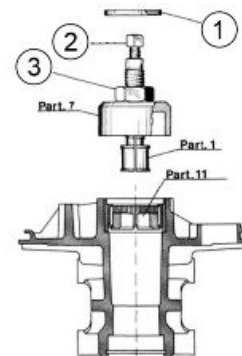
**BALL BEARING - REMOVAL**

In a similar manner as per the brake drum, place the hub on the supporting base and expel the ball bearing (1) using a section of tube, OD 32 mm.



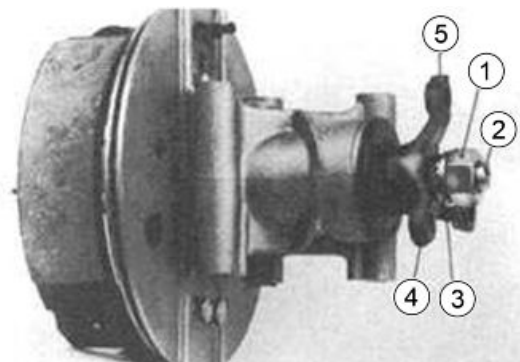
**SEAL RING AND ROLLER BEARING - REMOVAL**

With the tip of a screwdriver, remove the sealing ring (1) fit the specific tool (2) fitted with components 1-7-11 and act on the central nut (3) until the bearing is finally removed.



**WHEEL AXLE - REMOVAL**

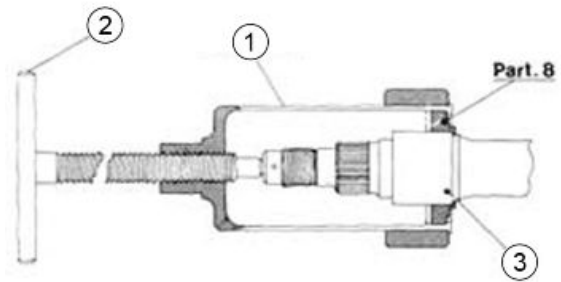
Loosen the hub lock nut (1) (**previously loosened in the operations described in the section "Hub lock nut"**). Remove the washer (3), the cone (4), the hub (5) and, by means of mallet blows, eject the wheel axle (2).



**INTERNAL BUSHING FROM REAR WHEEL**

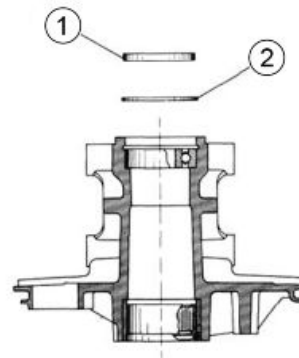
**AXLE ROLLER BEARING - REMOVAL**

Apply the specific tool (1), fitted with the reduction rings (comp. 8), as shown in the figure and move tool handle (2) until the bushing (3) can be removed from the roller bearing.



**SEALING RING AND CIRCLIP - REMOVAL**

Use a screwdriver to take out the sealing ring (1) and with the specific pliers remove the circlip (2) that holds the bearing.

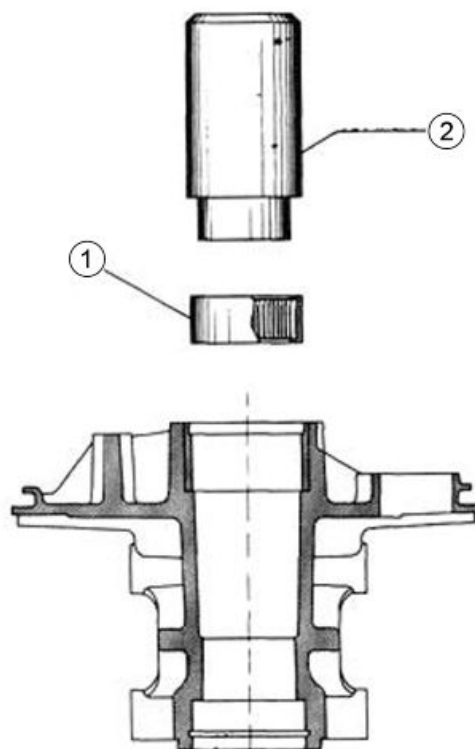


**ROLLER BEARING ON REAR HUB - FITTING**

Fit the roller bearing (1) using the special tool (2).

**Specific tooling**

**19.1.20043 Rear wheel hub roller bearing fitting punch**



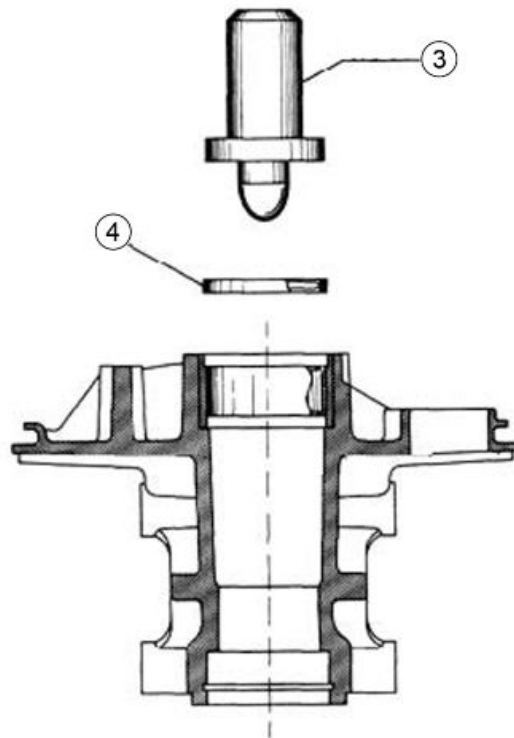


**SEALING RING ON REAR HUB - FITTING**

Position the seal ring (4) with the specific punch (3).

**Specific tooling**

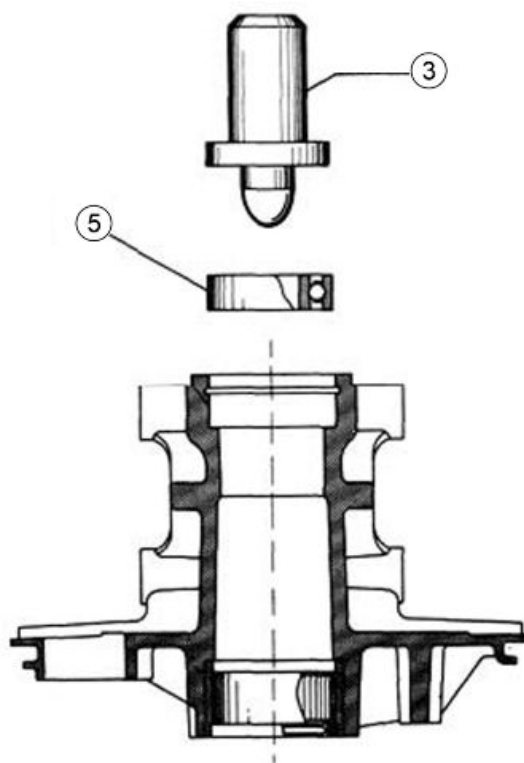
T.0021071 Punch to fit bearings and seal rings

**BALL BEARING ON REAR HUB - FITTING**

Operate with the stove as described in the specific section "Ball bearing and circlip on the front brake drum" and insert the ball bearing (5) in its housing using the specific punch (3).

**Specific tooling**

T.0021071 Punch to fit bearings and seal rings



#### **CIRCLIP AND SEALING RING ON REAR HUB - FITTING**

Assemble, using the proper equipment, the circlip (6) and, using the punch (3), position the seal ring (7).

#### **WARNING**

**BEFORE REFITTING THE WHEEL AXLE, FILL THE INTERNAL CHAMBER OF THE HUB WITH SPECIFIC GREASE.**

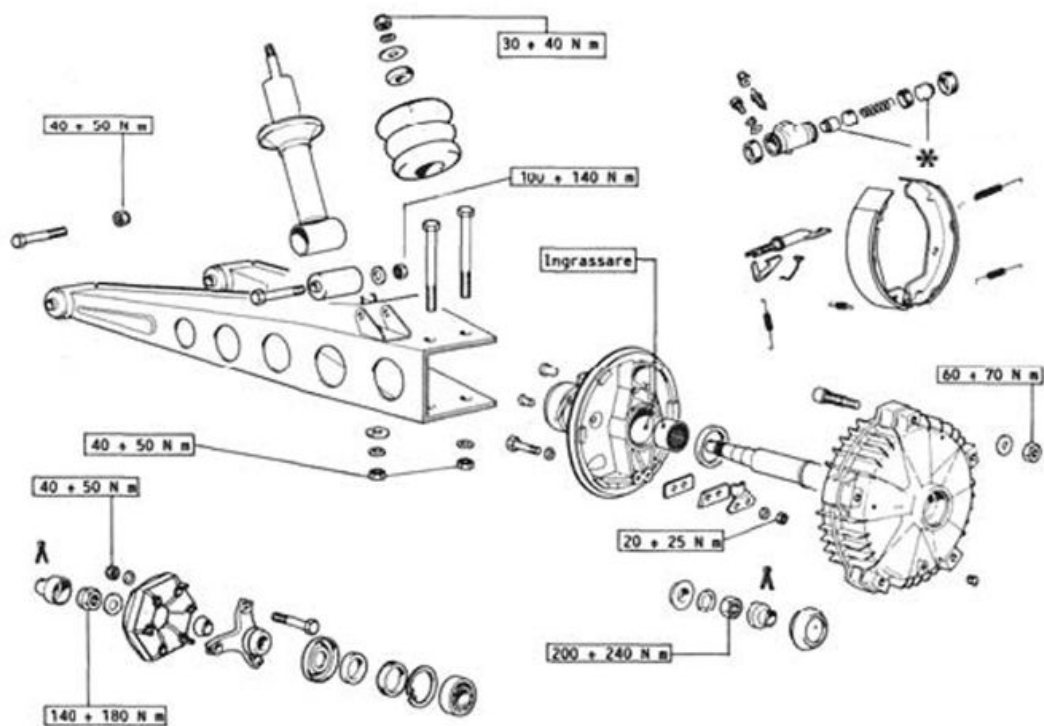
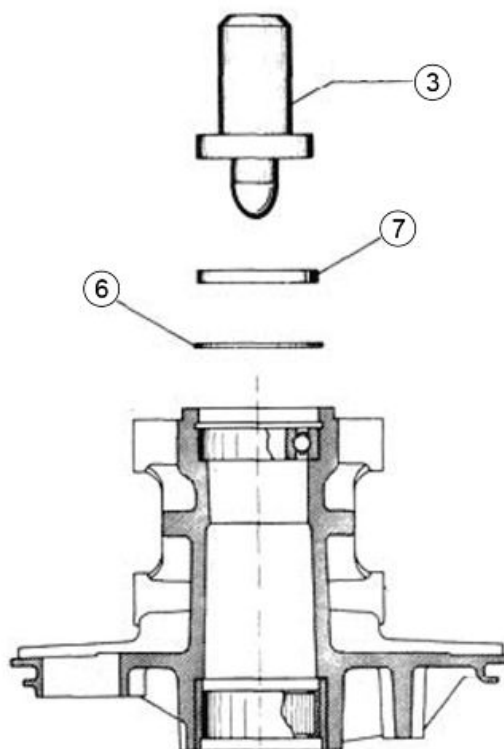
#### **Specific tooling**

**T.0021071 Punch to fit bearings and seal rings**

#### **Recommended products**

**AGIP GREASE PV 2 Multipurpose grease**

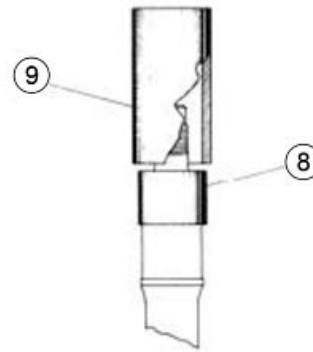
NLGI 2 specifications; ISO-LXBIB2



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**INTERNAL BUSHING, ROLLER GEARING ON  
WHEEL AXLE - WHEEL AXLE ON THE REAR  
HUB - FITTING**

Heat the oil-coated bushing (8) at approx. 100°. Afterwards, with a section of tube (9), ID 36 mm, fit the bushing in its seat. Once this operation is completed, fit the entire rear wheel axle in the hub, tap with a wood or plastic mallet if required.

**WHEEL HUB - BRAKE DRUM - FLEXIBLE JOINT - FITTING**

There are no special instructions to fit these components; it is sufficient to operate in reverse order of disassembly, carefully following the locking torques in the table "Tightening torques", always remembering to fill the dust guard lid with the required grease.

**Recommended products****AGIP GREASE PV 2 Multipurpose grease**

NLGI 2 specifications; ISO-LXBIB2

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# INDEX OF TOPICS

TIPPER VERSION

VR

## Circuito idraulico

### DISTRIBUTORE CONTROL POSITIONS

**Position "0"** (load box in running position): the oil sucked by the pump is sent into the duct (3) and through the distributor and its duct (4) falls into the tank.

**Position "1"** (load box in lifting stage): the oil is sucked by the pump and sent into the duct (3), reaches the lifting jack through the distributor and the tube (5).

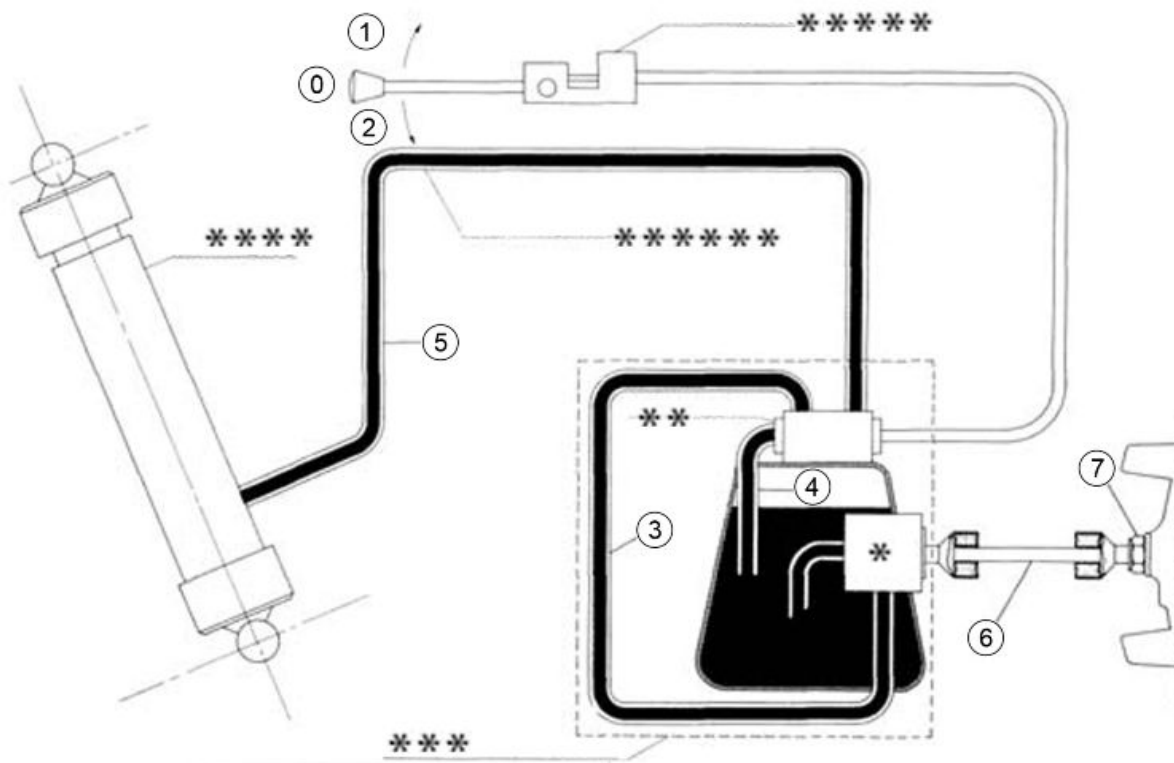
**Position "2"** (load box in lowering stage): repeats the same cycle of the "0" position, with the recovery of oil from the jack which, due to the lowering of the load box, is discharged into the tank through the passage from the tube (5), the distributor, and the duct (4).

As it is necessary to perform overhaul operations on the hydraulic circuit of the vehicle, always remember that once the overhaul is complete it is necessary to proceed, before delivery to the customer, to the following controls.

Alignment of the shaft with joints (6) with the engine axis: check that the shaft with joints (6) is aligned perfectly with the engine axis; failure to align as described above can be restored by operating on the distributor pump assembly by means of the appropriate movements.

**N.B.**

**WE REMIND THE OPERATOR OF THE NEED TO CARRY OUT THE ABOVE ALIGNMENT THOROUGHLY, SINCE A POSSIBLE FUNCTIONING OF THE PUMP IN NON-ALIGNED POSITION COULD CAUSE THE LOOSENING OF THE LOCK NUT (7) OF THE FAN, WITH CONSEQUENT DETERIORATION OF SAID FAN AND OF THE CRANKSHAFT.**



**KEY:**

\*= Pump.

\*\*= Distributor.

\*\*\*= Tank distributor pump unit.

\*\*\*\*= Jack.

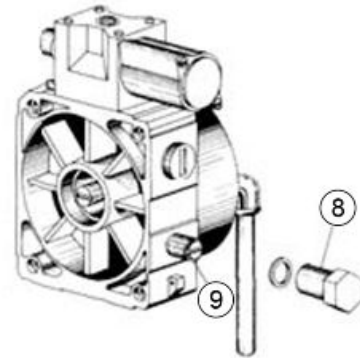
\*\*\*\*\*=Distributor control.

\*\*\*\*\*= Use duct.

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**DEFECTIVE LOAD BOX LIFTING**

- 1) Check and restore the oil level in the tank with specific oil.
- 2) If despite having operated as described in 1) the problem persists, operate as follows: interpose a pressure gauge between the tube (5) and the distributor, insert the command in position "1" and act, having previously removed the nut (8), on the set valve adjustment screw (9) until obtaining a pressure in the hydraulic circuit (detectable on the gauge) of 105 Kg/cm<sup>2</sup> with load box fully raised.

**Recommended products****AGIP ARNICA 46 Oil for hydraulic tilting system pump**

Oil for hydraulic circuits corresponding to specific ISO VG 46, DIN 51524 HVLP

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# INDEX OF TOPICS

**CHASSIS**

**CH**



## Windscreen

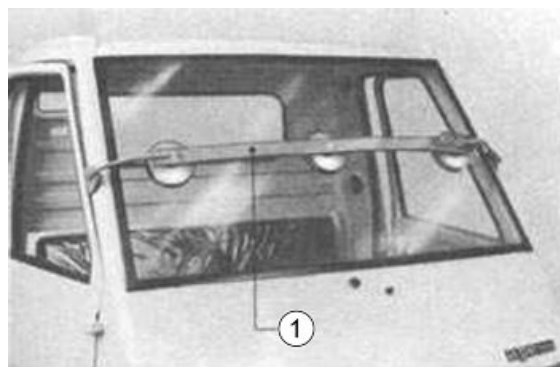
### PANE - FITTING

Thoroughly clean the area that houses the window pane, remove any adhesive or glass that may have been left (use any mechanical tool, blades, abrasive elements, etc.). Check that the frame profile is not deformed (straighten if required).

- If necessary, touch up the area that houses the pane using original varnish so as to ensure the sealant will adhere properly.

- Protect the external and internal edge of the frame using a special tape for bodywork; use a brush to apply a thin coat of primer on the whole adherence surface involved when the adhesive sealant is applied.

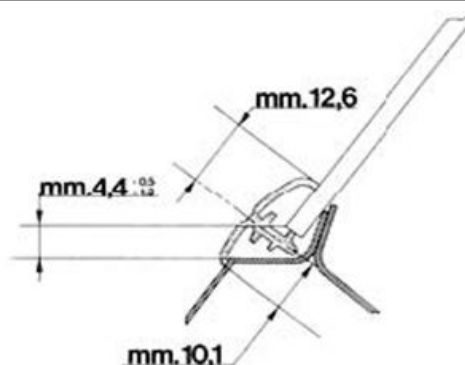
- Degrease the edge of the new window pane with ethyl alcohol. Using the specific tool (1), place it and centre it with respect to the upper and lower edges of the frame that houses the pane, observing proper distances (lower side and upper side). Also check that the distance of the pane from the edge of the housing frame is the same on both sides.



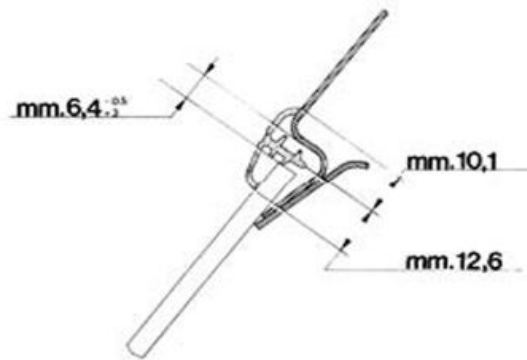
### Specific tooling

#### 19.1.20049 Window positioning tool

- Centre it with respect to the upper and lower edges of the frame that houses the pane, observing proper distances (lower side and upper side).



- Centre it with respect to the lower edge of the frame that houses the pane, observing proper distances (lower side and upper side). Also check that the distance of the pane from the edge of the housing frame is the same on both sides.



- The adhesive sealing compound cartridge has two components that should be come into contact inside that cartridge; they should be carefully mixed before being used. For this operation, use the whisk for the cartridge that must be attached to a drill (slow rotation) and inserted into the same cartridge. Proceed at this point the mixing operation for the duration of 3', slowly rotating the drill.

#### CAUTION

**IN ORDER TO ENSURE THE EFFECTIVENESS OF THE BONDING, AND THEN THE RESULTING GLASS SEAL, ALWAYS MAKE SURE THAT THE PRIMER AND THE ADHESIVE SEALING COMPOUND, BEFORE THEY ARE USED, HAVE NOT LOST THE REQUIRED PROPERTIES FOR THE FUTURE EXCEEDING OF THE STORAGE LIMITS.**

#### CAUTION

**THE EXPIRATION DATE OF THE RECOMMENDED PRODUCTS, IS 12 MONTHS FROM THE DATE OF PRODUCTION.**

#### Specific tooling

##### AC/UNI Whisk Whisk for "Thio Bostik 80" cartridge

Make sure that a period of 30' minimum and 4h maximum has elapsed from the moment the bottom primer was applied.

Then insert the cartridge in the appropriate gun, which should be connected to a compressed air unit. Be careful to apply the adhesive sealing compound as a uniform string between the frame and the pane.

#### N.B.

**BOTH THE PRIMER AND THE ADHESIVE SEALING COMPOUND ARE AVAILABLE AT THE PIAGGIO SPARE PARTS DISTRIBUTION CENTRE.**

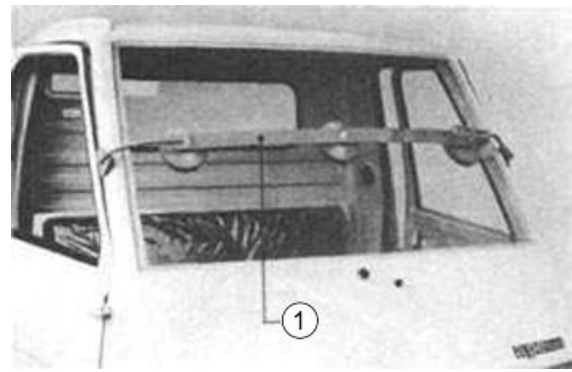
**FOR TOOLS, MIXING WHISK AND GUN, FOR CORRECT USE OF THE SEALANT, REFER TO DEALERS OF THE BOSTON COMPANY.**

#### Specific tooling

##### AC/UNI Gun Gun for "Thio Bostik 80" cartridge

##### AC/UNI Whisk Whisk for "Thio Bostik 80" cartridge

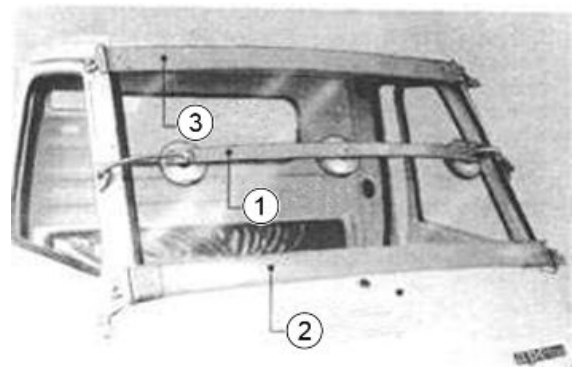
Once the adhesive sealing compound is applied, proceed to fit four finishing strips (trimmings) to the sides of the frame, at the positions previously shown in the figure (lower side and upper side), and four profiles until they adhere to the pane and the frame edge.



**WARNING**

**FIT THE 4 STRIPS WITH THE TOP EDGE FACING THE PANE.**

Then apply the band (2) on the lower trim, and the band (3) on the upper trim, to ensure a perfect adherence, in the drying phase. Once dried (needed time at 20°C: 4- 5 hours "dust out", that is for the initial stage; 6 hours for total hardening).



Remove the two bands and the tool, being careful to remove with a spatula any adhesive sealing compound that may have oozed when the trims were pressed.

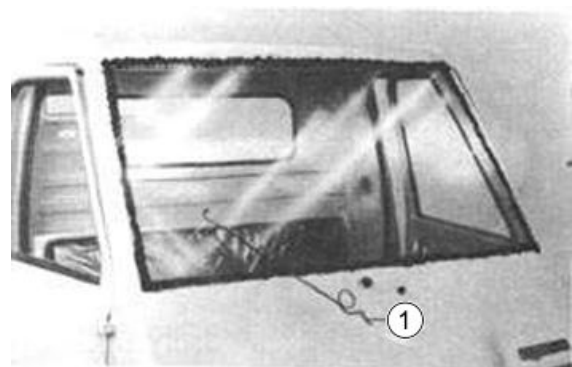
**Specific tooling**

**19.1.20050 Lower retainer clamp for strip**

**19.1.20051 Upper retainer clamp for strip**

**REMOVAL AND REUSE OF A WINDOW PANE THAT IS NOT DAMAGED**

- Should a repair operation in the cab require removing the already fitted window pane (not damaged) and afterwards refitting it, proceed as follows:



- remove the trims and the profiles; make a hole on the gasket made with specific sealant (between the frame and the window pane) and thread through a harmonic steel wire (1) (Ø 0.5 mm.), cut the sealing gasket by sliding the wire all along the window pane perimeter, until the window pane gets detached from the sealing gasket.

**WARNING**

**TWO PERSONS ARE REQUIRED TO CUT THE SEALING GASKET WITH THE STEEL WIRE (ONE WORKING FROM INSIDE THE CAB, AND THE OTHER, FROM OUTSIDE).**

- To reuse the window pane not broken, proceed as instructed in the specific section "Pane - Fitting" and before fitting make sure to wipe off any remaining sealant from the window pane edge.
- 

## Repairs

### PAINTWORK

We recall your attention on the importance that the following procedure be carried out with special care in order for the touch-ups to give good results:

- Prepare the required products.

**Cycle A** - Major touch-ups: the sheet metal has been cleared and shows signs of oxidation, or the painted surface does not adhere sufficiently.

- 1) Thoroughly sand and clean the sheet metal until the surface is bare. Dry and dust with a clean rag.
- 2) Spray the rust remover and dry.
- 3) Apply a filling compound and let dry out.
- 4) Use very fine sandpaper (min 320 grain).
- 5) Spray the enamel and let dry.

**Cycle B** - For minor touch-ups where a rust preventer is not required.

- Sand as per point (4).
  - If necessary, carry out operations 3 and 4 of cycle **A**.
  - Carry out procedure (5) of cycle **A**.
-

## INDEX OF TOPICS

PRE-DELIVERY

PD

**FUEL CONSUMPTION CONTROLS ON ROAD**

To properly carry out any on road consumption tests, referred to in points 1), 2) and 3) it is advisable to use an auxiliary tank of known capacity, with three-way valve, such as to be inserted at the beginning of the test and removed at the end. It is advisable to first test the following controls: tire pressure, calibration of the carburettor and that the wheels turn freely.

Then proceed according to the requirements listed below:

- 1)** - Perform the test at a constant speed of 40 km/h. in 4th speed at full load so as to achieve a total weight of 1160 Kg (including tare, load capacity and passengers on board).
- 2)** - Maximum allowed wind speed: 2 to 3 m/sec.: outside temperature of between 10° - 20°C.
- 3)** - Path to be made: approx. 30 Km. (including 15 km for the outward journey and the same for the return) on flat paved road, highway type, and dry.

**Results of tests**

Once the path referred to in point 3) is carried out, the fuel consumption can be considered acceptable - with the vehicle run in and in good general conditions of efficiency - if from 20 to 23 km/l.

**FOR VEHICLES OF LONG USE, DEPENDING ON TOTAL DISTANCE COUNTED AND STATE OF MAINTENANCE, INCREASES IN FUEL CONSUMPTION SHALL BE CONSIDERED APPROPRIATE.**

**SET UP OF THE VEHICLE PRIOR TO USE**

With the review of the engine complete, or of other vehicle assemblies, before making the delivery to the customer, make the following checks and adjustments:

- 1.** - Check tightness of nuts and bolts (with particular care to locking the wheels).
- 2.** - Effectiveness of the front and rear suspension.
- 3.** - Oil level in gearbox - differential, in the brake pump tank and the "LS" device oil tank, also make sure that there are no air bubbles in the oil supply pipe from the tank to the pump and from the pump to the crankcase.
- 4.** - Absence of leakage of petrol and oil.
- 5.** - Effectiveness of brakes.
- 6.** - Check tire pressure (see the guidelines in Characteristics).
- 7.** - Controls adjustments.
- 8.** - Carburetion check.
- 9.** - Effectiveness of electric system.
- 10.** - Checking battery electrolyte level.
- 11.** - Road holding.
- 12.** - Cleaning the vehicle: for the outside of the oil engine; for the painted parts water and suede leather to dry.
- 13.** - Proper adjustment of the headlights.
- 14.** - Check dynamotor belt tension.
- 15.** - Check the battery connections; the couplings + (positive) and - (negative) must be connected with their respective cables.

If the connections are inverted, the regulator will quickly be damaged beyond repair.

**WARNING**

**DEALERS ARE INVITED TO PERFORM THESE CHECKS ON NEW VEHICLES AS WELL, BEFORE DELIVERY TO THE CUSTOMER.**

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