
WORKSHOP MANUAL

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Vespa GTS 250 I.E.



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

V.le Rinaldo Piaggio, 23 - 56025 PONTEDERA (Pi)

WORKSHOP MANUAL

Vespa GTS 250 I.E.

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

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

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

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



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



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



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



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CHARACTERISTICS

CHAR

This section describes the general specifications of the vehicle.

Rules

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

Safety rules

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

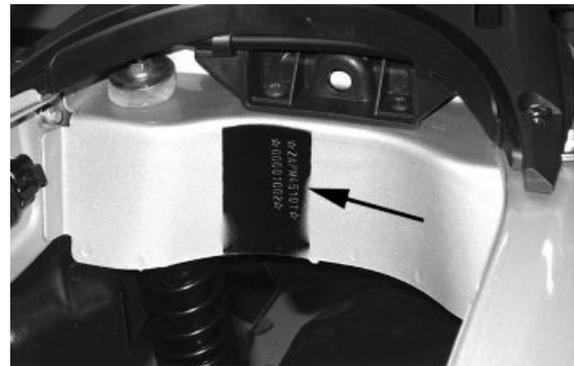
Maintenance rules

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

Vehicle identification

Chassis prefix: ZAPM45100000 ÷ 1001

Engine prefix: M451M ÷ 1001



Dimensions and mass

DIMENSIONS AND MASS

| Specification | Desc./Quantity |
|-----------------------|----------------|
| Total loadless weight | 151 ± 5 kg |
| Width (to hand grips) | 755 mm |
| Length | 1930 mm |
| Wheel base | 1370 mm |
| Saddle height | 800 mm |



Engine

DATA

| Specification | Desc./Quantity |
|-------------------|--|
| Type | single-cylinder, four-stroke and four liquid-cooled valves |
| Timing system | single overhead camshaft chain driven on the left-hand side, three-arm rocking levers set up with threaded set screw |
| Bore | 72 mm |
| Stroke | 60 mm |
| Cubic capacity | 249.29 mm |
| Compression ratio | 10.5 ÷ 11.5 |
| Idle speed | 1650 ± 50 rpm |
| Air filter | sponge, impregnated with mixture (50% petrol and 50% oil) |
| Starting system | electric starter motor with freewheel |
| Lubrication | with lobe pump (inside the crankcase) chain-driven and double filter: mesh and paper |
| Fuel supply | by electronic injection with electric fuel pump |
| Max. speed | 120 km/h |
| valve clearance | intake: 0.10 mm - discharge: 0.15 mm |

Transmission

TRANSMISSION

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

Capacities

CAPACITY

| Specification | Desc./Quantity |
|---------------------------------------|---|
| Engine oil | approx. 1300 cc (recommended oil Selenia HI Scooter 4 Tech) |
| Fuel tank (including a ~ 2 l reserve) | ~ 9.2 l |
| Rear hub | 250 cc (recommended oil TUTELA MATRIX) |
| Cooling system fluid | approx. 2.100 ÷ 2.150 l PARAFU 11FE (Diluted) |

Electrical system

ELECTRICAL COMPONENTS

| Specification | Desc./Quantity |
|------------------|--|
| Ignition/advance | Electronic, with inductive discharge and variable advance with three-dimensional mapping |
| Spark plug | CHAMPION RG 4 PHP |
| Battery | 12V-12Ah |

| Specification | Desc./Quantity |
|---------------|--|
| Fuses | 1: 30A - 1: 15A - 3: 10A - 4: 7,5A - 1: 3A |
| Generator | alternating current |

Frame and suspensions

FRAME AND SUSPENSIONS

| Specification | Desc./Quantity |
|-----------------------------------|---|
| Type | Unitised body made of stamped plate |
| Front suspension | Single arm suspension (cantilever wheel) fitted with a double-acting hydraulic shock absorber with coaxial spring |
| Front shock absorber axial travel | 86.5 mm |
| Rear suspension | Engine with swinging fork attached to frame by means of an arm with 2 degrees of freedom Pair of double-acting hydraulic shock absorbers and coaxial springs with preloading adjustment in 4 positions. |
| Rear shock absorber axial travel | 89.5 mm |

Brakes

BRAKES

| Specification | Desc./Quantity |
|---------------|--|
| Front | Ø 220 disc brake and floating calliper with Ø 25 mm twin plungers and hydraulic control (lever on the far right end of the handlebar) |
| Rear | Ø 220 disc brake and calliper with two Ø 30 mm counteracting plungers and hydraulic control (lever on the far left end of the handlebar) |

Wheels and tyres

WHEELS AND TYRES

| Specification | Desc./Quantity |
|---------------------------------|---------------------|
| Front wheels - light alloy rims | 3.00x12 |
| Rear wheels - light alloy rims | 3.00x12 |
| Front tyres | 120/70-12" Tubeless |
| Rear tyres | 130/70-12" Tubeless |

TYRE PRESSURE

| Specification | Desc./Quantity |
|--|----------------|
| Front tyre pressure (when cold) | 1.8 bar |
| Rear tyre pressure (when cold) | 2 bar |
| Tyre pressure (when cold) with passenger | 2.2 bar |

N.B.

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

Tightening Torques

GRUPPO STERZO

| Name | Torque in Nm |
|--|---|
| Upper steering ring nut | 35 ÷ 40 |
| Lower steering ring nut | 12 - 14 |
| Handlebar fixing screw | 45 ÷ 50 (The two screws must be tightened to the prescribed torque after having done so with the rear wheel axle nut. Safety locks: see «Pre-delivery Operations») |
| Fixing screws for handlebar control assembly U-bolts | 7 ÷ 10 |

FRAME ASSEMBLY

| Name | Torque in Nm |
|--|--------------|
| Engine-swinging arm bolt | 64 - 72 |
| swinging arm bolt - body shell | 76 ÷ 83 |
| Engine and vehicle side swinging arm junction bolt | 33 ÷ 41 |
| Bolt of the Silent block support plate | 42 ÷ 52 |
| Centre stand bolt | 32 ÷ 40 |
| Side stand fixing bolt | 35 ÷ 40 |

SOSPENSIONE ANTERIORE

| Name | Torque in Nm |
|---|--------------|
| Screw fixing the shock absorber to the shock absorber - calliper attachment plate | 20 ÷ 27 |
| Wheel axle nut | 74 ÷ 88 |
| Wheel screw | 20 ÷ 25 |
| Screw fixing rear mudguard to steering shock absorber upper clamp | 5 ÷ 6.5 |
| | 20 ÷ 30 |

FRENO ANTERIORE

| Name | Torque in Nm |
|--|---|
| Brake fluid pump - hose fitting | 20 ÷ 25 |
| Brake fluid tube- calliper fitting | 19 ÷ 24 |
| Vite serraggio pinza alla piastra attacco ammortizzatore - pinza freno | 24 ÷ 27 |
| Disc tightening screw | 6 (Apply LOCTITE 242 threadlock, medium strength) |
| Oil bleed screw | 12 - 16 |
| Pad fastening pin | 19.6 ÷ 24.5 |
| Viti vaschetta pompa freno | 1,5 ÷ 2 |

REAR SUSPENSION

| Name | Torque in Nm |
|---|--|
| Retainer for left shock absorber to crankcase support plate | 20 ÷ 25 |
| Shock absorber upper fitting | 20 ÷ 25 |
| Shock absorber lower fitting | 33 ÷ 41 |
| Rear wheel shaft | 104 ÷ 126 |
| Screw fixing wheel to hub | 20 ÷ 25 |
| Screws for muffler - shock absorber support arm on engine | 20 ÷ 25 (The two screws must be tightened to the prescribed torque after having done so with the |

| Name | Torque in Nm |
|------|--|
| | rear wheel axle nut. Safety locks: see «Pre-delivery Operations») |

FRENO POSTERIORE

| Name | Torque in Nm |
|-------------------------------------|--------------|
| Brake fluid pump - hose fitting | 20 ÷ 25 |
| Brake fluid pipe-calliper fitting | 20 ÷ 25 |
| Rear disc tightening bolt | 11 ÷ 13 |
| Oil bleed screw | 12÷16 |
| Calliper to engine tightening screw | 20 ÷ 25 |
| Viti vaschetta pompa freno | 1,5 ÷ 2 |
| Vite accoppiamento pinza | 30 ÷ 33 Nm |

MUFFLER

| Name | Torque in Nm |
|---|--------------|
| Muffler heat guard fixing screw | 4 ÷ 5 |
| Screw for fixing muffler to the support arm | 20 ÷ 25 |
| Lambda probe clamp on exhaust manifold | 40 ÷ 50 |
| Exhaust manifold-muffler joint clamp | 12 ÷ 13 |
| Manifold - muffler diaphragm tightening clamp | 16 ÷ 18 |

LUBRICATION

| Name | Torque in Nm |
|---|--------------|
| Hub oil drainage plug | 15 ÷ 17 |
| Oil filter on crankcase fitting | 27 ÷ 33 |
| Engine oil drainage plug/mesh filter | 24 ÷ 30 |
| Oil filter | 4 ÷ 6 |
| Oil pump cover screws | 7 ÷ 9 |
| Screws fixing oil pump to the crankcase | 5 - 6 |
| Oil pump control crown screw | 10 ÷ 14 |
| Oil pump cover plate screws | 4 ÷ 6 |
| Oil sump screws | 10 ÷ 14 |
| Minimum oil pressure sensor | 12 ÷ 14 |

CYLINDER HEAD

| Name | Torque in Nm |
|--------------------------------------|-------------------|
| Spark plug | 12 ÷ 14 |
| Head cover screws | 6 ÷ 7 |
| Nuts fixing head to cylinder | 7±1 + 10±1 + 270° |
| Head fixing side screws | 11 ÷ 12 Nm |
| Starter ground screw | 7 ÷ 8.5 |
| Tappet set screw lock nut | 6 ÷ 8 |
| Inlet manifold screws | 11 ÷ 13 |
| Timing chain tensioner slider screw | 10 ÷ 14 |
| Start-up counterweight support screw | 11 ÷ 15 |
| Timing chain tensioner support screw | 11 ÷ 13 |
| Timing chain tensioner central screw | 5 - 6 |
| Camshaft retention plate screw | 4 ÷ 6 |

TRANSMISSION

| Name | Torque in Nm |
|---------------------------|--------------|
| Belt support roller screw | 11 ÷ 13 |

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

FLYWHEEL

| Name | Torque in Nm |
|------------------------------------|--|
| Flywheel cover screw | 11 ÷ 13 |
| Stator assembly screws | 3 - 4 (Apply LOCTITE 242 medium-strength threadlock) |
| Flywheel nut | 94 - 102 Nm |
| Pick-Up clamping screws | 3 ÷ 4 |
| Screw fixing freewheel to flywheel | 13 - 15 |

CRANKCASE AND CRANKSHAFT

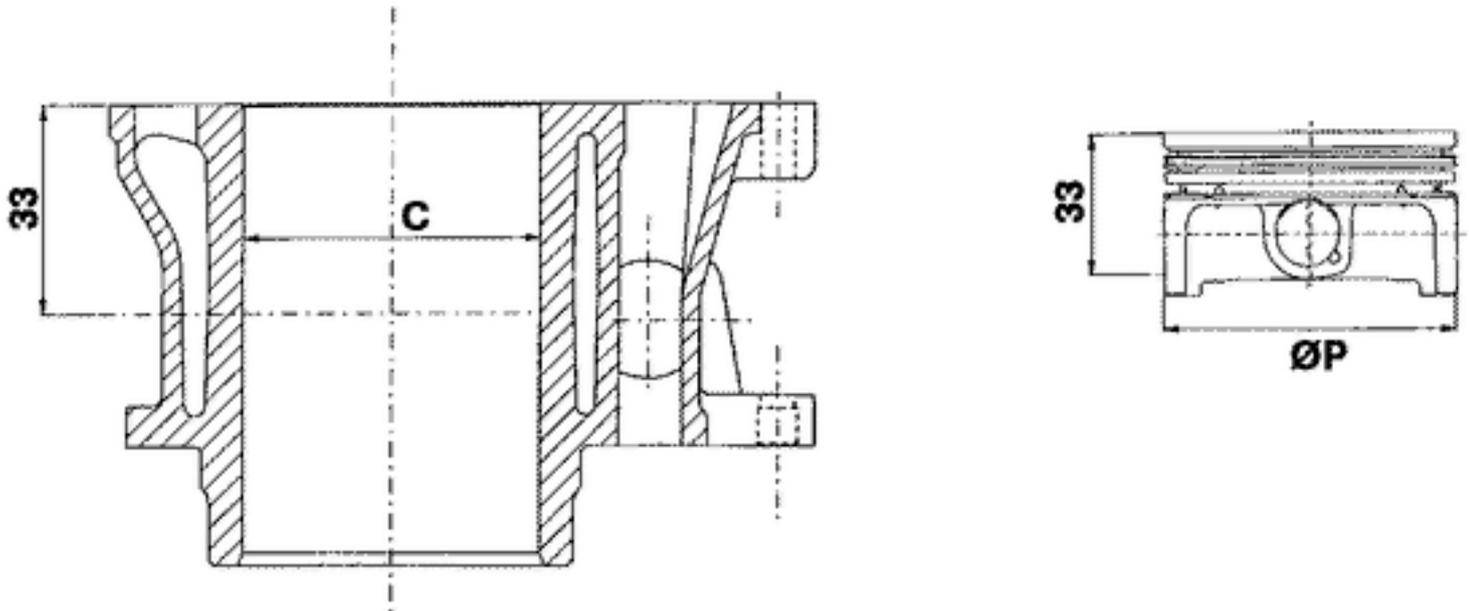
| Name | Torque in Nm |
|--|--|
| Internal engine crankcase bulkhead (transmission-side half shaft) screws | 4 ÷ 6 |
| Engine-crankcase coupling screws | 11 ÷ 13 |
| Starter screws | 11 ÷ 13 |
| Crankcase timing cover screws | 3.5 - 4.5 (Apply LOCTITE 242 medium-strength threadlock) |

COOLING

| Name | Torque in Nm |
|-------------------------|--------------|
| Water pump rotor cover | 3 ÷ 4 |
| Thermostat cover screws | 3 ÷ 4 |
| Bleed screw: | 3 |

Overhaul data**Assembly clearances**

Cylinder - piston assy.



ENGINE COUPLING CATEGORY

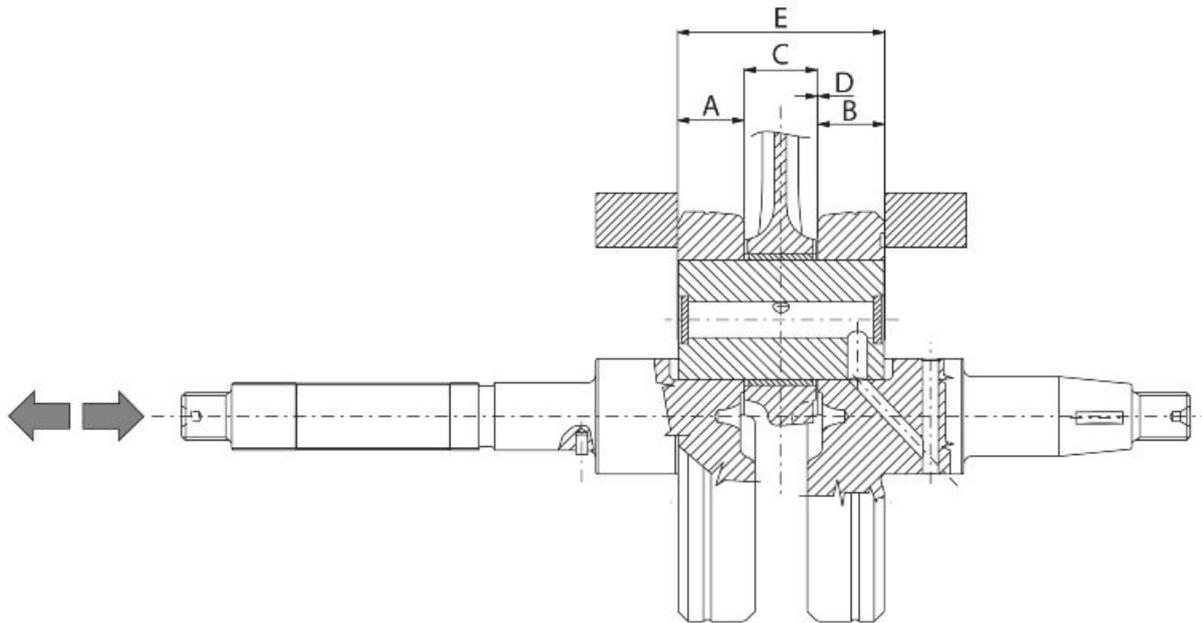
| Name | Initials | Cylinder | Piston | Play on fitting |
|----------|----------|-----------------|-----------------|-----------------|
| Cylinder | M | 72.01 ÷ 72.017 | 71.953 ÷ 71.960 | 0.050 - 0.064 |
| Cylinder | N | 72.017 ÷ 72.024 | 71.960 ÷ 71.967 | 0.050 - 0.064 |
| Piston | O | 72.024 ÷ 72.031 | 71.967 ÷ 71.974 | 0.050 - 0.064 |
| Piston | P | 72.031 ÷ 72.038 | 71.974 ÷ 71.981 | 0.050 - 0.064 |

Crankcase - crankshaft - connecting rod

CRANKSHAFT

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

Crankshaft to crankcase axial clearance



CRANKSHAFT/ CRANKCASE AXIAL CLEARANCE

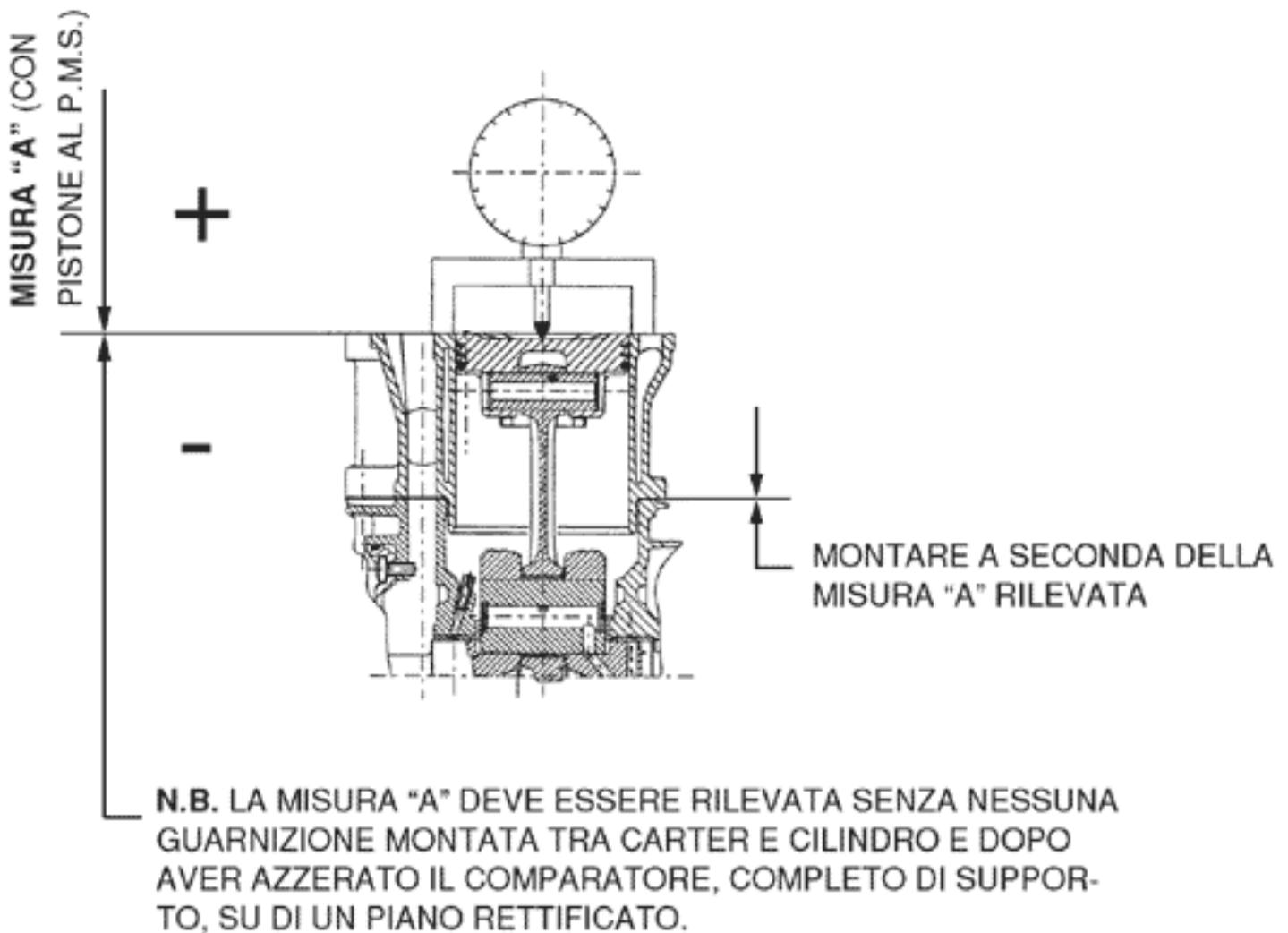
| Name | Description | Dimensions | Initials | Quantity |
|-------------------------------|-------------|----------------|----------|-----------------|
| Half-shaft, transmission side | | 16.6 +0-0.05 | A | D = 0.20 - 0.50 |
| Flywheel side half-shaft | | 16.6 +0-0.05 | B | D = 0.20 - 0.50 |
| Connecting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

Slot packing system

Characteristic

Compression ratio

10.5 ÷ 11.5 : 1



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

N.B.

MEASUREMENT "A" MUST BE TAKEN WITHOUT ANY GASKET FITTED BETWEEN THE CRANK-CASE AND CYLINDER AND AFTER RESETTING THE GAUGE, EQUIPPED WITH A SUPPORT, ON A GROUND PLANE

ENGINE 250 SHIMMING

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

Products
RECOMMENDED PRODUCTS TABLE

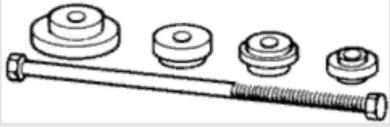
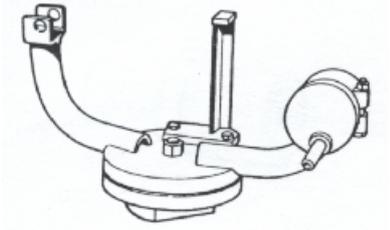
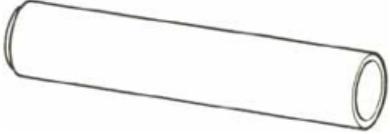
| Product | Description | Specifications |
|------------------------------|--|---|
| AGIP ROTRA 80W-90 | Rear hub oil | SAE 80W/90 Oil that exceeds the requirements of API GL3 specifications |
| AGIP CITY HI TEC 4T | Oil to lubricate flexible transmissions (throttle control) | Oil for 4-stroke engines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

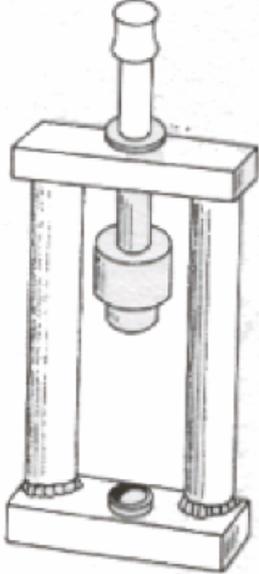
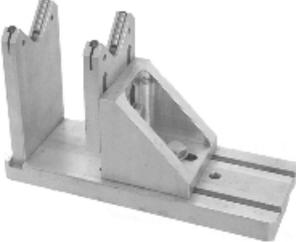
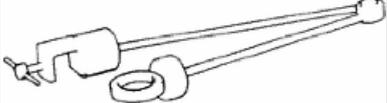
INDEX OF TOPICS

TOOLING

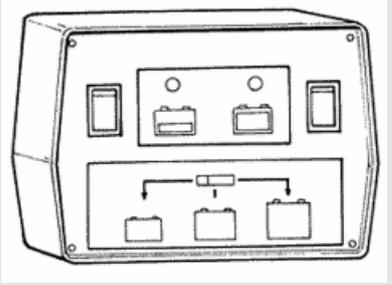
TOOL

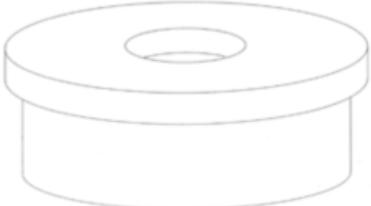
APPROPRIATE TOOL

| Stores code | Description | |
|--------------------|---|--|
| 001330Y | Tool for fitting steering seats |  |
| 001467Y017 | Bell for bearings, outside Ø 39 mm |  |
| 001467Y014 | Extraction pliers for ø 15 mm bearings |  |
| 005095Y | Engine support |  |
| 002465Y | Pliers for circlips |  |
| 006029Y | Punch for fitting fifth wheel seat on steering tube |  |
| 020004Y | Punch for removing fifth wheels from the headstock |  |

| Stores code | Description | |
|-------------|--|---|
| 020021Y | Front suspension service tool |  |
| 020036Y | Punch |  |
| 020038Y | Punch |  |
| 020055Y | Wrench for steering tube ring nut |  |
| 020074Y | Support base for checking crankshaft alignment |  |
| 020150Y | Air heater support |  |

| Stores code | Description | |
|-------------|---------------------------------------|---|
| 020151Y | Air heater |  |
| 020193Y | Oil pressure gauge |  |
| 020262Y | Crankcase splitting strip |  |
| 020263Y | Sheath for driven pulley fitting |  |
| 020306Y | Punch for assembling valve seal rings |  |
| 020329Y | Mity-Vac vacuum operated pump |  |

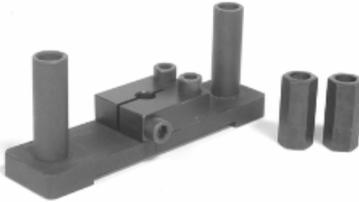
| Stores code | Description | |
|-------------|---------------------------------------|---|
| 020330Y | Stroboscopic light for timing control |  |
| 020331Y | Digital multimeter |  |
| 020332Y | Digital rev counter |  |
| 020333Y | Single battery charger |  |
| 020334Y | Multiple battery charger |  |

| Stores code | Description | |
|-------------|---------------------------------|---|
| 020335Y | Magnetic support for dial gauge |  |
| 020357Y | 32 x 35 mm adaptor |  |
| 020359Y | 42 x 47 mm adaptor | |
| 020360Y | 52 x 55 mm adaptor |  |
| 020363Y | 20 mm guide |  |
| 020364Y | 25 mm guide |  |

| Stores code | Description | |
|-------------|---|---|
| 020365Y | 22 mm guide |  |
| 020375Y | 28 x 30 mm adaptor |  |
| 020376Y | Adaptor handle |  |
| 020382Y | Valve cotters equipped with part 012 removal tool |  |
| 020382Y011 | adapter for valve removal tool |  |

| Stores code | Description | |
|-------------|---|---|
| 020393Y | Piston fitting band |  |
| 020412Y | 15 mm guide |  |
| 020423Y | driven pulley lock wrench |  |
| 020424Y | Driven pulley roller casing fitting punch |  |
| 020426Y | Piston fitting fork |  |

| Stores code | Description | |
|-------------|---|---|
| 020431Y | Valve oil seal extractor |  |
| 020434Y | Oil pressure control fitting |  |
| 020441Y | 26 x 28 mm adaptor |  |
| 020444Y | Tool for fitting/ removing the driven pulley clutch |  |
| 020456Y | Ø 24 mm adaptor |  |
| 020477Y | 37 mm adaptor | |

| Stores code | Description | |
|-------------|---------------------------------|---|
| 020483Y | 30 mm guide |  |
| 020489Y | Hub cover support stud bolt set |  |
| 494929Y | Exhaust fumes analyser |  |
| 020428Y | Piston position check support |  |
| 020460Y | Scooter diagnosis and tester |  |
| 020621Y | H.V. cable extraction adapter |  |

| Stores code | Description | |
|-------------|--|---|
| 020481Y | Control unit interface wiring |  |
| 001467Y035 | Bearing housing outside diameter 47 mm |  |
| 020626Y | Driving pulley lock wrench |  |
| 001467Y013 | Pliers to extract ø 15 mm bearings |  |
| 020627Y | Flywheel lock wrench |  |
| 020467Y | Flywheel extractor |  |

| Stores code | Description | |
|-------------|---|--|
| 020454Y | Tool for fitting piston pin stops (200 - 250) | |
| 020622Y | Transmission-side oil guard punch | |
| 020480Y | Petrol pressure check set | |
| 020244Y | 15 mm diameter punch | |
| 020115Y | Ø 18 punch | |
| 020271Y | Tool for removing-fitting silent bloc | |