# WORKSHOP MANUAL

## 633572

# LX 150 4T USA

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# WORKSHOP MANUAL
# LX 150 4T USA

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.

# INDEX OF TOPICS

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## Rules

This section describes general safety rules for any interventions to be performed on the vehicle.

## Safety rules

- Should it be necessary to keep the engine running while servicing, make sure that the area or room is well ventilated, and use special exhaust fans, if required. Never let the engine running in closed rooms. In fact, exhaust gases are toxic.
- The battery electrolyte contains sulphuric acid. Protect your eyes, cloths and skin. Sulphuric acid is highly corrosive; in the event of contact with your eyes or clothes, rinse thoroughly with water and consult a doctor immediately.
- The battery produces hydrogen, a gas that can be highly explosive. Do not smoke and avoid sparks and flames when close to the battery, especially during recharge.
- Fuel is highly flammable, and in some conditions it can be explosive. Do not smoke in the working area, and avoid free flames or sparks.
- Clean the brake pads in a well ventilated environment, directing the compressed air jet so as to not intake the dust produced by the wear of the friction material. Even though the latter contains no asbestos, dust inhalation 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 specific 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 fire-point solvent. Lubricate all working surfaces before reassembly, except for conical couplings.
- After reassembly, check that all components have been installed properly and that they are in good working order.
- For removal, overhaul and reassembly operations use only tools provided with metric measures. Metric bolts, nuts and screws are not interchangeable with coupling members with English measurement. Using improper coupling members and tools may impair the vehicle.
- Should any interventions to the vehicle electric system be required, check that the electrical connections - especially earth and battery connections - have been implemented properly.

## Vehicle identification

**VEHICLE IDENTIFICATION**

| Specification | Desc./Quantity |
|---|---|
| Chassis prefix | ZAPM 428 F5 |
| engine prefix | M442M÷1001 |


## Dimensions and mass

**DIMENSIONS AND WEIGHT**

| Specification | Desc./Quantity |
|---|---|
| Curbside weight | 110 ± 5 kg |
| Maximum height | 1140 mm |
| Width | 740 mm |
| Wheelbase | 1280 mm |
| Length | 1800 mm |

## Engine

**ENGINE**

| Specification | Desc./Quantity |
|---|---|
| Engine | Single cylinder 4-stroke Piaggio LEADER |
| Timing system | Single Over-Head Cam shaft (SOHC), 2 valves |
| Valve play | suction 0,10 exhaust: 0,15 |
| Bore per stroke | 62,6 x 48,6 mm |
| Dry weight | 150,46 cm³ |
| Compression ratio | 10.5 : 1 |
| Carburettor | KEIHIN CVEK26 |
| Idling | ~ 1600 ÷ 1800 r.p.m. |
| Starter system | Electric |
| Max power | 11,6 CV at 7750 rpm |
| Cooling | Forced air. |

## Transmission

**TRANSMISSION**

| Specification | Desc./Quantity |
|---|---|
| Trasmission | With automatic expandable pulley variator, trapezoidal belt, automatic clutch, gear reducer and transmission compartment with forced circulation. |

## Capacities

**CAPACITY**

| Specification | Desc./Quantity |
|---|---|
| Engine oil | ~ 1000 cc |
| Rear oil hub | ~ 100 cc |
| Fuel tank capacity | ˜ 8.5 litres (including 2 l reserve) |

## Electrical system

**ELECTRICAL SYSTEM**

| Specification | Desc./Quantity |
|---|---|
| Starter system | Electric |
| Spark | Champion RG6YC- NGK CR7EB |

## Frame and suspensions

**CHASSIS AND SUSPENSION**

| Specification | Desc./Quantity |
|---|---|
| Frame | Structural frame in pressed sheet steel |
| Steering and suspensions | Steering column tube pivoted on front wheel hub; helical spring suspension and hydraulic double-effect shock absorbers; rear with hydraulic double-effect shock absorber and adjustable coaxial spring in the preloading on 4 positions. |

## Brakes

**BRAKES**

| Specification | Desc./Quantity |
|---|---|
| Front brake | Ø 200 mm disc (hydraulically controlled via a lever on RHS of handlebars) with fixed calliper. |

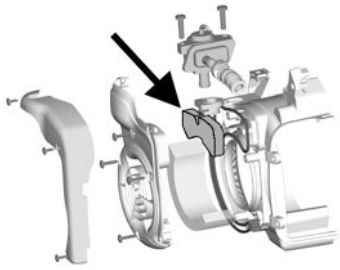
| Specification | Desc./Quantity |
|---|---|
| Rear brake | Ø110 mm drum |

## Wheels and tyres

**WHEELS AND TYRES**

| Specification | Desc./Quantity |
|---|---|
| Front wheel rim | Die-cast aluminium alloy 2.50x11" |
| Front tyre | Tubeless 110/70-11" |
| Rear wheel rim | Die-cast aluminium alloy 3.00x10" |
| Rear tyre | Tubeless 120/70-10" |
| Tyre pressure (front wheel) | 1,6 bar |
| Tyre pressure rear wheel | 2 bar |
| Tyre pressure (rear wheel driver and passenger) | 2,3 bar |

## Secondary air



To reduce the amount of polluting emissions, this vehicle is equipped with a catalytic converter.
In order to facilitate the catalysis process, extra oxygen is supplied via a Secondary Air System (SAS).
Such system allows to add oxygen to the unburnt gases before the catalytic converter, thus improving the efficiency of the catalyser and hence the reaction process.
Air is added through an intake duct on the cylinder head, after being depurated by black filter.
The system is equipped with a shut-off valve which engages during deceleration, so to avoid undesired noise.
To ensure the SAS is always working correctly, it is necessary to have it checked by an **Authorised Piaggio Service** Station every 12,000 Km (see the Maintenance Operations section), so that the filters may be thoroughly cleaned.

The operation consists of cleaning the filtering elements with water and neutral detergent and then drying them with a clean cloth and light jets of compressed air.

**SHOULD YOU REQUIRE ANY ASSISTANCE, CONTACT YOUR NEAREST AUTHORISED PIAGGIO DEALER.**

## Carburettor

## 150cc Version

## Kehin

**CALIBRATION CARBURETOR**

| Specification | Desc./Quantity |
|---|---|
| Type | CVEK 26 |
| Throttle valve diameter | Ø 26,5 |
| Choke diameter | Ø 26,4 |
| Adjustment marking | 265A |
| Maximum thrust | 82 |
| Maximum air thrust (on body) | 85 |
| Tapered pin stamping | NELA |
| Gas valve spring | 130 ÷ 180 gr. |
| Minimum jet | 35 |
| Minimum air thrust (on body) | 150 |
| Initial minimum mixture screw opening | 1 ¾ |
| Starter jet | 42 |
| Starter air thrust (on body) | Ø 1,5 |
| Starter pin stroke | 10 mm (a 24°) |
| Choke resistor | 20 Ohm (a 24°) |

## Tightening Torques

**LUBRICATION**

| Name | Torque in Nm |
|---|---|
| Hub oil drainage cap | 15 ÷ 17 |
| Oil filter | 4 ÷ 6 |
| Oil pump cover screws | 5 ÷ 6 |
| Oil pump screw tightening torque | 5 ÷ 6 Nm |
| Pump drive pulley screw | 10 ÷ 14 |
| Chain cover screws | 4 ÷ 6 |
| Oil pan screws | 10 ÷ 14 |
| Minimum oil pressure sensor | 12 ÷ 14 |
| Blow-by recovery duct fastening screws: | 3 - 4 |

**CYLINDER HEAD**

| Name | Torque in Nm |
|---|---|
| Ignition spark plug | 12 ÷ 14 |
| Head cover screw | 11 ÷ 13 |
| Head to cylinder set nuts (*) | 28 ÷ 30 |
| Head set screws (external) | 11 ÷ 13 |
| Start up mass screws | 7 ÷ 8,5 |
| Magneto housing screw | 1 ÷ 2 |
| Magneto side air duct screw | 3 ÷ 4 |
| De-compressor balance weight fixing | 7 ÷ 8,5 |
| Camshaft pulley screw: | 12 ÷ 14 Nm |
| Timing chain tightener sliding block screws | 10 ÷ 14 |
| Start up mass bell screws | 11 ÷ 15 |
| Tightener screws | 11÷13 Nm |
| Timing chain tensioner central screw: | 5 ÷ 6 Nm |
| Camshaft retain plate screw | 5 ÷ 6 |
| Exhaust pipe/cylinder head fixing nut. | 16 ÷ 18 |
| Suction manifold screw on head | 11 ÷ 13 |

**TRANSMISSION**

| Name | Torque in Nm |
|---|---|
| Driving pulley screw | 75 ÷ 83 |
| Transmission cover screw | 11 ÷ 13 |
| Driven pulley axis (°) | 54 ÷ 60 |
| Rear hub cover screw | 24 ÷ 27 |
| Clutch assembly nut on driven pulley | 45 ÷ 50 |

**FLYWHEEL**

| Name | Torque in Nm |
|---|---|
| Flywheel fan screws | 3 ÷4 N.m |
| Stator cover screws (°) | 3 ÷ 4 |
| Flywheel nut | 52 ÷ 58 |
| Pick-up screw | 3÷ 4 |

**CRANKCASE AND DRIVING SHAFT**

| Name | Torque in Nm |
|---|---|
| Engine crankcase inside head screws (transmission side half shaft) | 4 ÷ 6 |
| Oil filter union on crankcase | 27 ÷ 33 |
| Rear brake shaft set screw | 11 ÷ 13 |
| Engine crankcase coupling screws | 11 ÷ 13 |
| Prefilter cap | 24 ÷ 30 |
| Starter motor fixing screw: | 11 ÷ 13 Nm |
| Muffler to crankcase set screws | 24 ÷ 27 |
| Engine oil drainage cap | 24 ÷ 30 |

**STEERING UNIT**

| Name | Torque in Nm |
|---|---|
| Steering upper ring nut | 35 ÷ 40 |
| Steering lower ring nut | 12 ÷ 14 |
| Handlebar fastening screw | 50 ÷ 55 |

**CHASSIS UNIT**

| Name | Torque in Nm |
|---|---|
| Frame - swing arm bolt | 44 ÷ 52 |
| rocker arm pin - engine | 33 ÷ 41 |
| Centre stand pin | 32 ÷ 40 |
| Bolt mounting rocker arm silent-block | 33 ÷ 41 |

**FRONT SUSPENSION**

| Name | Torque in Nm |
|---|---|
| Shock absorber upper nut | 20 ÷ 30 |
| Front wheel spindle nut | 75 ÷ 90 |
| Shock absorber upper bracket bolt | 20 ÷ 25 |
| Wheel rim screw | 20 ÷ 25 |
| Shock absorber lower bolts (°) | 20 ÷ 27 |

**FRONT BRAKE**

| Name | Torque in Nm |
|---|---|
| Pump-tube oil connection | 8 ÷ 12 |
| Tube-caliper oil connection | 20 ÷ 25 |
| Screw fixing the caliper to the support | 20 ÷ 25 |
| Brake disc screw | 5 ÷ 6,5 |
| Oil bleeder valve (on caliper) | 10 ÷ 12 |
| Handlebar to pump | 7 ÷ 10 |

**REAR SUSPENSION**

| Name | Torque in Nm |
|---|---|
| Rear wheel axle | 104 ÷ 126 |
| Shock absorber bottom fixing | 33 ÷ 41 |
| Shock absorber/chassis nut: | 20 - 25 N.m |

## Overhaul data

## Assembly clearances

## Cylinder - piston assy.

**COUPLING BETWEEN PISTON (ASSO-WERKE) AND CYLINDER**

| Name | Play | Initials | Cylinder | Piston | Play on fitting |
|---|---|---|---|---|---|
| Coupling | </> | A | 62,580 ÷ 62,587 | 62,533 ÷ 62,540 | 0,040 ÷ 0,054 |
| Coupling | </> | B | 62,587 ÷ 62,594 | 62,540 ÷ 62,547 | 0,040 ÷ 0,054 |
| Coupling | </> | C | 62,594 ÷ 62,601 | 62,547 ÷ 62,554 | 0,040 ÷ 0,054 |
| Coupling | </> | D | 62,601 ÷ 62,608 | 62,554 ÷ 62,561 | 0,040 ÷ 0,054 |
| Compression segment 1st increase | </> | A1 | 62,780 ÷ 62,787 | 62,733 ÷ 62,740 | 0,040 ÷ 0,054 |
| Compression segment 1st increase | </> | B1 | 62,787 ÷ 62,794 | 62,740 ÷ 62,747 | 0,040 ÷ 0,054 |
| Compression segment 1st increase | </> | C1 | 62,794 ÷ 62,801 | 62,747 ÷ 62,754 | 0,040 ÷ 0,054 |

| Name | Play | Initials | Cylinder | Piston | Play on fitting |
|---|---|---|---|---|---|
| Compression segment 1st increase | </> | D1 | 62,801 ÷ 62,808 | 62,754 ÷ 62,761 | 0,040 ÷ 0,054 |
| Compression segment 2st increase | </> | A2 | 62,980 ÷ 62,987 | 62,933 ÷ 62,940 | 0,040 ÷ 0,054 |
| Compression segment 2st increase | </> | B2 | 62,987 ÷ 62,994 | 62,940 ÷ 62,947 | 0,040 ÷ 0,054 |
| Compression segment 2st increase | </> | C2 | 62,994 ÷ 63,001 | 62,947 ÷ 62,954 | 0,040 ÷ 0,054 |
| Compression segment 2st increase | </> | D2 | 63,001 ÷ 63,008 | 62,954 ÷ 62,961 | 0,040 ÷ 0,054 |
| Compression segment 3st increase | </> | A3 | 63,180 ÷ 63,187 | 63,133 ÷ 63,140 | 0,040 ÷ 0,054 |
| Compression segment 3st increase | </> | B3 | 63,187 ÷ 63,194 | 63,140 ÷ 63,147 | 0,040 ÷ 0,054 |
| Compression segment 3st increase | </> | C3 | 63,194 ÷ 63,201 | 63,147 ÷ 63,154 | 0,040 ÷ 0,054 |
| Compression segment 3st increase | </> | D3 | 63,201 ÷ 63,208 | 63,154 ÷ 63,161 | 0,040 ÷ 0,054 |

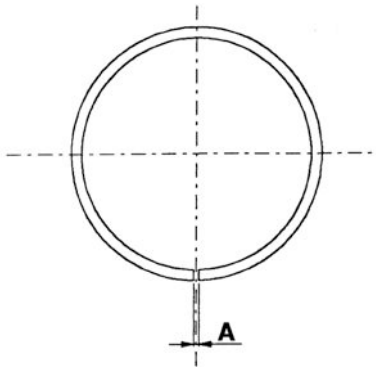
**COUPLING BETWEEN PISTON (RIGHT WAY) AND CYLINDER**

| Name | Play | Initials | Cylinder | Piston | Play on fitting |
|---|---|---|---|---|---|
| Coupling | </> | A | 62,580 ÷ 62,587 | 62,541 ÷ 62,548 | 0,032 ÷ 0,046 |
| Coupling | </> | B | 62,587 ÷ 62,594 | 62,548 ÷ 62,555 | 0,032 ÷ 0,046 |
| Coupling | </> | C | 62,594 ÷ 62,601 | 62,555 ÷ 62,562 | 0,032 ÷ 0,046 |
| Coupling | </> | D | 62,601 ÷ 62,608 | 62,562 ÷ 62,569 | 0,032 ÷ 0,046 |

## Piston rings

**PISTON RINGS**

| Name | Description | Dimensions | Initials | Quantity |
|---|---|---|---|---|
| Compression lining | | 62.6x1 | A | 0.15 ÷ 0.30 |
| Scraper ring lining | | 62.6x1 | A | 0.20 ÷ 0.40 |
| Scraper ring lining | | 62.6x2.5 | A | 0.20 ÷ 0.40 |
| Compression lining 1° greater | | 62.8x1 | A | 0.15 ÷ 0.30 |
| Scraper ring lining 1° greater | | 62.8x1 | A | 0.20 ÷ 0.40 |
| Scraper ring lining 1° greater | | 62.8x2.5 | A | 0.20 ÷ 0.40 |
| Compression lining 2° greater | | 63.0 x 1 | A | 0.15 ÷ 0.30 |
| Scraper ring lining 2° greater | | 63.0 x 1 | A | 0.20 ÷ 0.40 |
| Compression lining 2° greater | | 63.0 x 2.5 | A | 0.20 ÷ 0.40 |
| Compression lining 3° greater | | 63.2 x 1 | A | 0.15 ÷ 0.30 |
| Compression lining 3° greater | | 63.2 x 1 | A | 0.20 ÷ 0.40 |
| Compression lining 3° greater | | 63.2 x 2.5 | A | 0.20 ÷ 0.40 |




## Crankcase - crankshaft - connecting rod

**AXIAL PLAY BETWEEN CRANKSHAFT AND ROD**

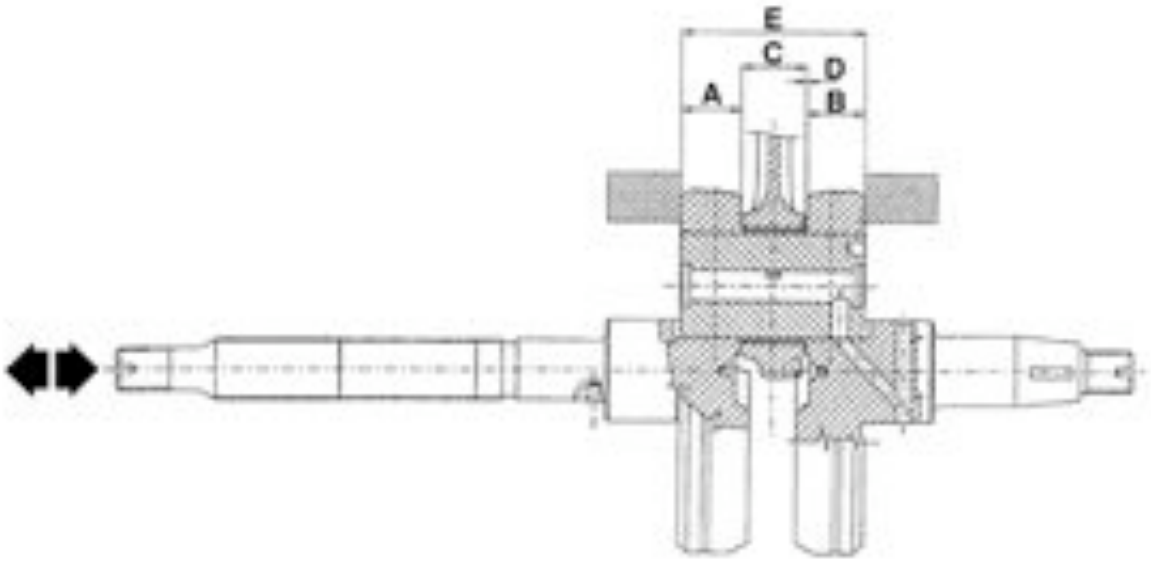
| Name | Description | Dimensions | Initials | Quantity |
|---|---|---|---|---|
| Half shaft trans-mission side | | 16,6 +0 -0,05 | A | D = 0,20 ÷ 0,50 |
| Half shaft flywheel side | | 16,6 +0 -0,05 | B | D = 0,20 ÷ 0,50 |
| Connecting rod | | 18 -0,10 -0,15 | C | 0,20 ÷ 0,50 |

| Name | Description | Dimensions | Initials | Quantity |
|---|---|---|---|---|
| Crank pin length | | 51,400 | E | |

**AXIAL PLAY BETWEEN CRANKSHAFT AND BENCH SEMIBEARINGS**

| Name | Description | Dimensions | Initials | Quantity |
|---|---|---|---|---|
| Crankshaft | | | category 1 | 28,998 ÷ 29,004 |
| Crankshaft | | | category 2 | 29,004 ÷ 29,010 |
| Carter | | | Class 1 | 32,953 ÷ 32,959 |
| Carter | | | Class 2 | 32,959 ÷ 32.965 |
| Half crankshaft bearing | | | Type B - blue | 1,973 ÷ 1,976 |
| Half crankshaft bearing | | | Type C - yellow | 1,976 ÷ 1,979 |
| Half crankshaft bearing | | | Type E - green | 1,979 ÷ 1,982 |
| Crankshaft 1 category 1 | | | E - E | |
| Crankshaft 1 category 2 | | | C - C | |
| Crankshaft 2 category 1 | | | C - C | |
| Crankshaft 2 category 2 | | | B - B | |

*Crankshaft/crankcase axial play: 0,15 ÷ 0,40*



## Slot packing system

- Temporarily fit the cylinder on the piston, without the base gasket.
- Fit a comparator on the specific device
- Reset the comparator on an inspection surface with an average preload of 5 mm for example Keeping the reset position, fit the device on the cylinder and lock it with 2 nuts as shown in the figure.
- Turn the crankshaft until the upper dead centre point (inversion point of the comparator rotation).
- Calculate the difference between the two measurements: using the table below find the thickness of the cylinder base gasket to be used for reassembly. Correct identification of the thickness of the cylinder base gasket helps keep the correct compression ratio.
- Remove the specific device and cylinder.

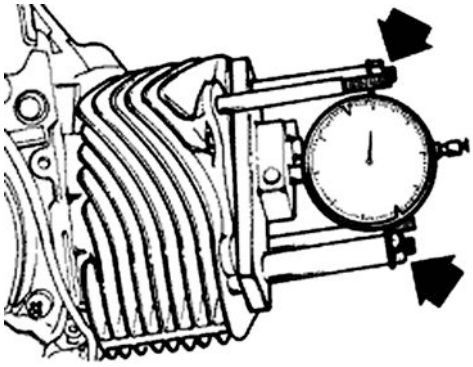
### Characteristic

**Compression ratio**

10.5 : 1

**PACKING SYSTEM**

| Specification | Desc./Quantity |
|---|---|
| Measured dimension | 1 ÷ 1,1 |
| Base gasket thickness | 0,8 ± 0,05 |
| Measured dimension | 1,1 ÷ 1,3 |
| Base gasket thickness | 0,6 ± 0,05 |
| Measured dimension | 1,3 ÷ 1,4 |
| Base gasket thickness | 0,4 ± 0,05 |



## Products

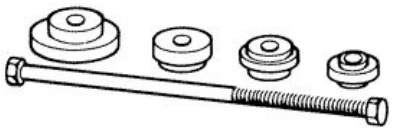
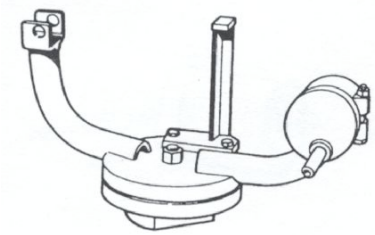
**TABLE OF RECOMMENDED PRODUCTS**

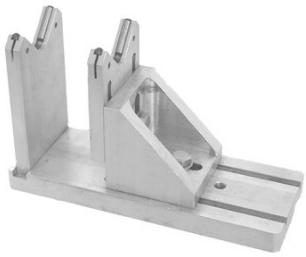
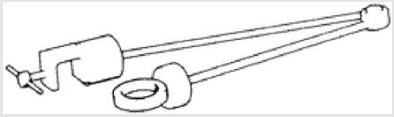
| Product | Description | Specifications |
|---|---|---|
| TUTELA MATRYX MOTO RIDER | Oil for rear hub | Oil synthetic multidegree SAE 75W/85 API GL4 |

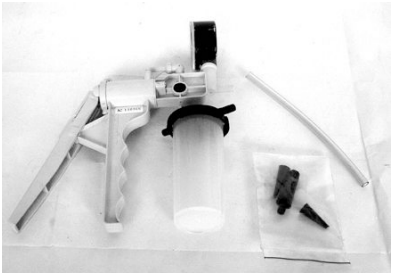
| Product | Description | Specifications |
|---|---|---|
| SELENIA HI Scooter 4 Tech | Oil for flexible transmission lubrication (brake, acceleration control, km counter) | Oil for four stroke motors |
| SELENIA Air Filter Oil | Oil for air filter sponge | Mineral oil with specific additive for ingreasing the ISO VG 150 |
| SELENIA HI Scooter 4 Tech | Engine oil | Synthetic oil SAE 5W/40 that passes the API SG specification. |
| JOTA 3 FS | Speedometer transmission | Lithium soap grease NLGI 33 |
| TUTELA TOP 4 | Brake fluid | Synthetic fluid SAE J1703, NHTSA 116 DOT 4, ISO 4925 |
| MONTBLANC MOLYBDENUM GREASE | Grease for driven pulley shaft compensating ring and mobile driven pulley sliding seat | Molybdenum bisulphide grease |
| TUTELA ZETA 2 | Grease for steering bearings and swing arm pin seats and driven pulley spring supporting surface (pulley side only) | Lithium soap and zinc oxide grease NLGI2 |
| TUTELA TP1 | Grease for brake control lever, gas | NLGI 1-2 calcium soap based white spray grease |

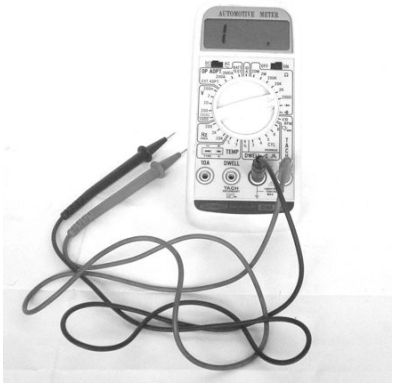
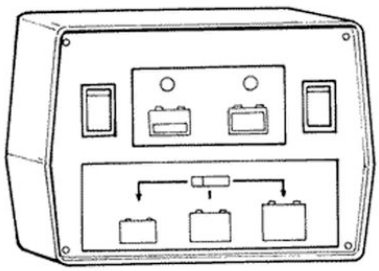
# INDEX OF TOPICS

## TOOLS

| Stores code | Description | |
|---|---|---|
| 001330Y | Steering seat installer, to be fitted with parts: 001330Y009-For lower seat, 001330Y013-For upper seat |  |
| 001467Y009 | Bell for bearings external Ø 50 mm |  |
| 001467Y013 | 15-mm pliers |  |
| 002465Y | Pliers for snap rings |  |
| 005095y | Engine support |  |
| 008564Y | Flywheel extractor |  |

| Stores code | Description | |
|---|---|---|
| 020004Y | Drift for removing thrust rings from steering head tube |  |
| 020055Y | Steering tube ring nut spanner |  |
| 020074Y | Crankshaft aligning tool |  |
| 020150Y | Support for air heater "METABO HG 1500/2" |  |
| 020151Y | Air heater "METABO HG 1500/2" |  |
| 020193Y | Oil pressure gauge |  |

| Stores code | Description | |
|---|---|---|
| 020262Y | Crankcase detachment plate |  |
| 020263Y | Protective sheath |  |
| 020287Y | Piston band clamps (Engine 125cc) |  |
| 020306Y | Valve sealing ring drift |  |
| 020329Y | Pump MITYVAC |  |

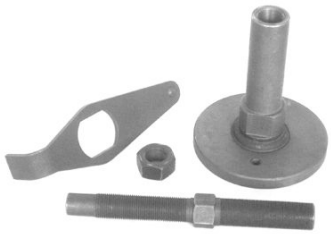
| Stores code | Description | |
|---|---|---|
| 020330Y | Timing light for two- and four-stroke engines |  |
| 020331Y | Digital multimeter |  |
| 020332Y | Digital rpm counter |  |
| 020333Y | Single battery charger |  |

| Stores code | Description | |
|---|---|---|
| 020334Y | Multiple battery charger |  |
| 020335Y | Magnetic stand and comparator |  |
| 020357Y | 32 x 35 mm adaptor | |
| 020359Y | 42 x 47 mm hub bearing fitting adaptor | |
| 020360Y | 52 x 55 mm adaptor | |
| 020363Y | 20mm guide |  |
| 020364Y | 25 mm guide |  |

| Stores code | Description | |
|---|---|---|
| 020368Y | driving pulley stop wrench |  |
| 020375Y | Adapter 28 x 30 mm | |
| 020376Y | Handle for punches |  |
| 020382Y011 | Bushing (valve remover) |  |
| 020409Y | Multimeter adapter (Peak voltage measurement) |   |
| 020412Y | 15 mm guide |  |

| Stores code | Description | |
|---|---|---|
| 020414Y | 28-mm guide - Hub bearing assembly |  |
| 020423Y | driven pulley stop key |  |
| 020424Y | Driven pulley roller casing drift |  |
| 020425Y | Flywheel-side oil guard punch |  |
| 020426Y | Piston fitting fork |  |

| Stores code | Description | |
|---|---|---|
| 020427y | Piston Fitting Tool (motor 150) |  |
| 020428Y | Piston position check support |  |
| 020430Y | Pin retainers installation tool |  |
| 020431Y | Valve oil seal extractor |  |
| 020434Y | Oil pressure gauge connection |  |

| Stores code | Description | |
|---|---|---|
| 020444Y | Driven half pulley spring compressor tool |  |
| 020565Y | Compass flywheel stop spanner |  |
| 020622Y | Transmission-side oil guard punch |  |
| 494929 | Exhaust gas analyser |  |