WORKSHOP MANUAL

50 cc ENGINE
HORIZONTAL CYLINDER
I.A.E
(Exhaust air injection)
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**CHARACTERISTICS**

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<tr>
<th>Engine</th>
<th>Single cylinder 2-stroke Exhaust air injection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling</td>
<td>Forced air</td>
</tr>
<tr>
<td>Bore x stroke</td>
<td>39.9 x 39.8 mm</td>
</tr>
<tr>
<td>Cubic capacity</td>
<td>49.9 cc</td>
</tr>
<tr>
<td>Max. power output</td>
<td>3.2 kW at 7100 rpm</td>
</tr>
<tr>
<td>Max. torque at</td>
<td>6800 rpm</td>
</tr>
<tr>
<td>Ignition</td>
<td>CDI</td>
</tr>
<tr>
<td>Spark plug</td>
<td>NGK BR7HS or EYQUEM R 850</td>
</tr>
<tr>
<td>Magneto</td>
<td>Kokusan 89 W</td>
</tr>
<tr>
<td>Starter motor</td>
<td>Mitsuba 150 W or Moric 160 W</td>
</tr>
<tr>
<td>Air pump</td>
<td>Dell’orto</td>
</tr>
<tr>
<td>Carburettor</td>
<td>Gurtner PY 12</td>
</tr>
<tr>
<td>Oil pump</td>
<td>Dell’orto</td>
</tr>
<tr>
<td>Oil pump control unit</td>
<td>Dell’orto</td>
</tr>
<tr>
<td>Exhaust</td>
<td>Catalytic</td>
</tr>
</tbody>
</table>

**TIGHTENING TORQUES**

| Spark plug | 2 m.daN |
| Engine speed sensor | 1 m.daN |
| Cylinder casings | 1 m.daN |
| Air pump | 0.7 m.daN |
| Covers | 1 m.daN |
| Cylinder head | 1.2 m.daN |
| Starter motor | 1 m.daN |
| Drive pulley | 4 m.daN |
| Driven pulley | 4.5 m.daN |
| Inlet manifold | 1 m.daN |
| Rotor | 4 m.daN |
| Stator | 1 m.daN |
| Fan | 0.7 m.daN |

**Capacities**

Transfer box | 0.12 L.

**Engine marking**

Engine type | HA1
SPECIAL IMPORTANT POINTS

Oil and fuel
This engine is designed to run on 95 or 98 unleaded fuel only

The oil used for the separate lubrication system is « Esso 2T Spécial » or « Esso 2T Spécial anti-fumée » approved by the manufacturer
The oil is injected directly into the carburettor via an electric pump which is controlled by a control unit

Note:
Petrol is highly inflammable, do not smoke in the working area and avoid proximity to flames or sparks. Work in a clear and well-ventilated area.
## SPECIAL TOOLS

<table>
<thead>
<tr>
<th>Tool N°</th>
<th>Designation</th>
<th>Used with</th>
<th>752127</th>
<th>Clutch compression tool</th>
<th>756725</th>
</tr>
</thead>
<tbody>
<tr>
<td>64706</td>
<td>Casing extractor and opening tool</td>
<td>casing opening plate + pin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64710</td>
<td>Shoulder locator</td>
<td>64706</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64765</td>
<td>Engine support</td>
<td>engine support bracket</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68007</td>
<td>Protective cap small model</td>
<td>755985</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68994</td>
<td>Torque wrench 8 Nm to 54 Nm extension</td>
<td>752235 adapter</td>
<td>755982</td>
<td>Engine support adapter</td>
<td>64765</td>
</tr>
<tr>
<td>69098</td>
<td>Protective cap large model</td>
<td>64706</td>
<td>755983</td>
<td>Casing opening tool</td>
<td>68007</td>
</tr>
<tr>
<td>69104</td>
<td>Pin nut</td>
<td>750069</td>
<td>755985</td>
<td>flywheel extractor</td>
<td>68007</td>
</tr>
<tr>
<td>750069</td>
<td>Stud Ø10 pitch 125</td>
<td>69104</td>
<td>756668</td>
<td>Crank assembly lip seal tool</td>
<td></td>
</tr>
<tr>
<td>750808</td>
<td>Thrust washer</td>
<td>64706</td>
<td>756725</td>
<td>38 mm box wrench</td>
<td>752127</td>
</tr>
<tr>
<td>752000</td>
<td>Piston circlip pliers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Gauge to adapt the casing opening plate for engine P/N 754006 for the HA1 engine

- Dimensions in mm
- Holes with diameter of 7 mm

Scale: 1/2
DISASSEMBLY

Putting the engine on the stand
- Fit the engine to adapter P/N 755982
- Put the assembly on stand P/N 64765 clamped in the jaws of a vice

To remove the cooling system
- Remove the 4 fixing bolts (1) from the cooling volute and the cylinder cover
- Remove the cooling volute and the cylinder cover
  - Tightening torque when refitting: 1 m.daN

- Remove the fan 3 fixing bolts (2)
- Remove the fan
  - Tightening torque when refitting: 0.7 m.daN
**Removal of the air pump**
- Remove the 4 fixing bolts (1)
- Remove the air pump (2)
  - Tightening torque when refitting: 0.7 m.daN

**To remove the magneto flywheel**
- Hold the rotor (1) with the pin wrench P/N 752237
- Remove the nut
  - Tightening torque when refitting: 4 m.daN
- Fit protective cap P/N 68007 to the end of the crankshaft
- Tighten flywheel extractor P/N 755985 on the rotor
- Lock the flywheel extractor and turn the thrust bolt until the rotor is released
To remove the stator and engine speed sensor assembly
- Remove the engine speed sensor 2 fixing bolts (1) and the stator assembly 2 fixing bolts (2)
- Remove the stator and sensor assembly (3)
- Remove the key (4) from the crank
  - Tightening torque when refitting: 1 m.daN

To remove the primary transmission cover
- Remove the transmission cover 6 fixing bolts
- Remove the cover and the stand stop (1)
  - Tightening torque when refitting: 1 m.daN

To remove the drive pulley
- Lock the fixed flange (1) with tool P/N 752237
- Remove the fixed flange nut and washer
- Remove the fixed flange
DISASSEMBLY

- Remove the belt (2)
- Remove the drive pulley (3) with the guide hub (4)

- Remove the starter dog (7) bearing (6) fixing bolt (5) (depending on the model)
- Remove the bearing
- Remove the washer 12x22x1 (8)
- Remove the starter ring (9)
- Remove the starter dog (depending on the model)

  - Tightening torque when refitting the bearing: 1 m.daN
  - Tightening torque when refitting the pulley: 4 m.daN

To remove the driven pulley
- Lock the clutch drum (1) with the pin wrench P/N 752237
- Remove the nut
- Remove the clutch drum and the clutch / driven pulley assembly

  - Tightening torque when refitting: 4.5 m.daN
**To remove the secondary transmission cover**

**Note:** Supply a container to catch the transfer box oil when the cover is removed
Oil filling and level check of the transfer box are carried out through plug (3)

- Remove the cover (2) six fixing bolts (1)
- Remove the cover with the primary shaft (4)

  - Tightening torque when refitting: 1 m.daN

**Note:** the primary shaft may be removed from the cover by pushing it by means of a mallet

**To remove the secondary transmission**

- Remove the paper gasket (1) and the 2 locating pins (2)
- Remove the first thrust washer (3) (14 x 27 x 0.5) from the intermediate shaft (4)
- Remove the secondary shaft (5)

**Note:** take care not to damage the seal on the wheel side when removing the secondary shaft, as the oil could leak out through a drain hole in the casing located between the seal on the wheel side and the bearing

- Remove the intermediate shaft and its second thrust washer (6) (14 x 27 x 0.5) located behind it
DISASSEMBLY

**To remove the starter motor (depending on model)**
- Remove the starter motor (2) two fixing bolts and washers (1)
- Remove the starter motor and its O-ring

*Note:* the bottom bolt is used for the engine earth (green wire connected to – battery)

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**To remove the cylinder head/cylinder assembly**
- Slacken off the cylinder head/cylinder 4 mounting bolts in the order shown, in 2 or 3 stages
- Remove the 4 bolts
- Remove the cylinder head and its gasket
- Remove the cylinder and its bottom seal

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**To remove the piston**
- Remove the circlips (1) with pliers
  P/N 752000
- Remove the gudgeon pin
- Remove the piston
- Remove the needle bearing race from the connecting rod end
To remove the inlet manifold and valve
- Remove the inlet manifold (2) 2 fixing bolts (1)
- Remove the inlet manifold
- Remove the valve assembly (3)
- Remove the gasket (4)
- Tightening torque when refitting: 1 m.daN

**Note:** the gasket must be renewed each time it is removed.
- Check that the valve assembly blades and support are in perfect condition

**Note:** The position of the limiter must be 6.2 ± 0.3 mm from the valve support
To open the engine casings
- Remove the RH casing (2) six fixing bolts (1)

- Fit the protective cap P/N 68007 to the crank 68007
- Fit to the RH casing tool P/N 755983 secured by 2 bolts
- Hold the connecting rod to prevent it from coming into contact with the casings
- Tighten the tool centre screw until the casings separate

- Remove the RH casing
- Remove the 2 locating pins (3) and the gasket (4)
**DISASSEMBLY**

*To remove the crankshaft*
- Fit the protective cap P/N 69098 to the crank assembly
- Fit to the casing tool P/N 64706 fitted with plate P/N 754006 modified as indicated in chapter "Special Tools"

- Fit the assembly to the casing with 4 bolts (1) (the plate opening facing the cylinder side)
- Tighten the tool centre screw holding the crank with one hand on the other side until it is fully extracted

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**Checking the crankshaft**
- Using a set of shims, check the big end side play
- The maximum side float on the connecting rod end must not exceed: 7/10mm

- The out-of-round values measured on the ends of the crank assembly should not exceed 5/100 mm and must be measured:
  - 50 mm from the transmission side end
  - 50 mm from the magneto flywheel end
REFITTING SPECIFIC COMPONENTS

To fit the crank assembly bearings

Note:
- The crank assembly bearings and seals must be renewed each time the engine casings are opened
- When the casings are opened, if the bearings stay on the crank assembly, use tool P/N 755585 to remove them
- If the bearings stay in the casings, the casings should be heated with a heat gun to remove them

This operation should be done quickly in order to remove and refit a bearing to each casing

- Set one of the casings (1) on its mating surface, heat it (80 to 90°C) until the bearing drops out of its own accord
- Remove the seal
- While the casing is expanded fit the new bearing (2) fully home in its housing
- Fit a new seal (3) in each casing using tool P/N 756668

Note: The tool P/N 756668 enables fitting of both seals. Each side of the tool is dedicated to one of the seals.

The seals should be positioned as follows:
- The seal on the drive pulley side 6 ±0.5 mm from the outer edge of the casing (LH engine casing)
- The seal on the magneto flywheel side 17.5 ±0.5 mm from the outer edge of the casing (RH engine casing)
**Assembling the engine casings**
- Insert the crankshaft into the LH casing bearing
- Tighten pin P/N 750069 on the end of the crank assembly
- Fit tool P/N 64706 fitted with plate P/N 754006 on pin
- Centre the assembly on the casing using 4 bolts (1)
- Fit centring tool P/N 64710 to tool P/N 64706
- Tighten pin nut P/N 69104 on pin P/N 750069 in order to bring the crankshaft into contact with the bearing ensuring that the connecting rod is facing the cylinder side

**Note:** hold the crankshaft on the RH side with the rotor fitted over the key

- Fit the two locating pins(2) and a new paper gasket (3) **with no oil or grease** to the LH casing
- Fit the RH casing onto the LH casing / crankshaft assembly taking care not to damage the seal with the pin if the pin is still on the crankshaft
- Tighten pin P/N 750069 on the end of the crankshaft
- Fit to the casing and in the following order:
  - washer P/N 750808 (50x29x3mm)
  - tool P/N 64706
  - centring tool P/N 64710
- Tighten pin nut P/N 69104 until the casings are fully closed

**Note:** Hold the crankshaft by the fixed flange fitted to the splines

- Fit and tighten the 6 securing bolts (1)
  - Tightening torque: 1 m.daN

- **Check the crankshaft turns freely in the casings**

- Cut the casing seal flush at (A) and (B)
- Grease the crankshaft and bearings with 2-stroke oil
**REFITTING SPECIFIC COMPONENTS**

*To fit the piston*
- Check the cylinder/piston assembly pairing (A)

<table>
<thead>
<tr>
<th>PAIRING</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cylinder</strong></td>
<td><strong>Piston</strong></td>
</tr>
<tr>
<td>1</td>
<td>A1</td>
</tr>
<tr>
<td>11</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A2</td>
</tr>
<tr>
<td>22</td>
<td></td>
</tr>
</tbody>
</table>

- Fit the needle bearing cage (1) into the connecting rod little end after lubricating it with 2-stroke oil
- Fit the piston to the connecting rod, the positioning spigots on the piston rings facing the inlet side
- Fit the gudgeon pin and circlips

**Important**: The circlips must be changed each time they are removed
- The circlip gaps (2) must face upwards or downwards, but under no circumstances to the side
To fit the cylinder
- Fit a new bottom seal (1), the right way round, without oil or grease
- Ensure that the piston ring gaps are opposite the piston positioning spigots
- Fit the cylinder (2) and insert it while compressing the piston rings by hand
- Check the bottom seal is properly positioned on the casing using a cylinder head fixing bolt (3)

To fit the cylinder head
- Check the cylinder head mating surface is in perfect condition
- Fit the 4 fixing bolts to the cylinder head with their washers
- Fit the gasket to the cylinder head, with the bead (A) on the cylinder head side

- Fit the bolt-washer, cylinder head and gasket assembly to the cylinder
- Tighten the cylinder head 4 fixing bolts in the order shown

- This operation is carried out in two phases:
  1. pre-tighten the bolts to a torque of 0.8 m.daN
  2. final torque: 1.2 m.daN
**REFITTING SPECIFIC COMPONENTS**

*To fit the magneto flywheel*
- Fit the key (1) to the crank
- Fit the stator and engine speed sensor assembly (2)
- Fit and tighten the stator assembly two fixing bolts (3)
  - Tightening torque: 1 m.daN
- Fit and tighten the engine speed sensor 2 securing bolts (4)
  - Tightening torque: 1 m.daN
- Fit the rotor to the crankshaft ensuring it is perfectly positioned on the key
- Lock the rotor with the adjustable pin wrench P/N 752237
- Fit and tighten the rotor nut
  - Tightening torque: 4 m.daN

*To fit the cooling system*
- Fit the cooling turbine and its 3 bolts
- Fit the volute (1) and cylinder cover (2) with their 4 bolts
  - Tightening torque: 1 m.daN

*To refit the air pump*
- Fit the air pump (1) with its 2 centring studs and a new **lightly** greased O-ring
- Fit and tighten the 4 securing bolts (2)
  - Tightening torque: 0.7 m.daN
To fit the starter dog (depending on the model)
- Fit the starter motor dog (1)
- Fit the starter ring (2) to the crankshaft and position it on the splines
- Fit the washer 12x22x1 (3)
- Fit the bearing and its securing bolt (4)

- Tightening torque: 1 m.daN

To fit the drive pulley assembly
- Fit the drive pulley with its guide hub onto the crank
- Fit the belt (6) to the guide hub
- Fit the fixed flange (7) to the crankshaft checking it is properly positioned on the crankshaft splines
- Fit the washer (8) and the nut (9) and tighten finger tight
- Lock the fixed flange with tool P/N 752237
- Tighten the nut

- Tightening torque: 4 m.daN

Note: it is forbidden to use a pneumatique torque gun; this may upset the crank position

Important: Precautions when refitting the drive pulley
Certain parts of the drive pulley must not be discarded or cut down to a smaller size.
Any modifications may cause the nut to tighten against the crankshaft splines instead of the fixed flange and damage the crankshaft splines
**MISCELLANEOUS OPERATIONS**

*To remove the starter system*
- Operate the starter quadrant (1) by hand and remove the kickstart drive gear (2) and its washer.

- Turn the cover over and remove circlip (3) with circlip pliers P/N 69117.
- Remove the washer, the starter quadrant (1) and the spring (4) from the transmission cover.

*To fit starter system*
- Fit the return spring (4), with the longest loop on peg (A) in the cover.
- Fit the starter quadrant (1) into the bearing bush previously greased.
- Hook the second loop (B) of the spring onto the starter quadrant.
- Set the spring so that the starter quadrant is positioned against its stop (C) in the cover.
- Turn the cover over and fit the washer and circlip to the quadrant shaft.
- Fit the washer (5) into the kickstart drive gear housing.
- Set the quadrant at around 1/8 turn in order to be able to fit the kickstart drive gear.
- Fit the kickstart drive gear pin (6) around the cover boss (D).
**Drive pulley rollers replacement**
- Remove the transmission cover 6 fixing bolts
- Remove the cover and the rubber stop of the stand
- Lock the fixed flange (1) with tool P/N 752237
- Remove the fixed flange nut (2) and washer (3)
- Remove the fixed flange
- Remove the belt (4)
- Remove the guide hub and the drive pulley (5)
- Check the washer 12x22x1 (6) is fitted and check its condition

- Remove the stop (8) 3 fixing bolts (7)
- Remove the stop
- Remove the holder (9) and its 3 plastic guides (10)
- Remove the 6 rollers (11) from the rotating flange (12)

The rollers must be changed if they show flats due to excessive wear.

Re-assemble in reverse order to dismantling without greasing the rollers.
Slightly grease the rotating flange bore (high temperature grease)

**Note:** Do not over-grease to avoid splashing the belt

- Tightening torque when refitting the drive pulley: 4 m.daN
To remove the clutch lining assembly
- Remove the transmission cover 6 fixing bolts
- Remove the cover
- Lock the clutch drum with the pin wrench P/N 752237
- Remove the nut
- Clamp the two strands of the belt to lower it between the flanges
- Remove the clutch drum and the clutch / driven pulley assembly and the belt
- Compress the clutch / driven pulley assembly with tool P/N 752127 clamped in the jaws of a vice
- Remove nut (1) using spanner P/N 756725
- Slacken tool P/N 752127

- Remove the clutch lining assembly (2), the upper centring sleeve (3), the spring (4) and the lower centring sleeve (5)
- Remove the 3 pins (6) from the governor seat
- Separate the fixed (7) and rotating (8) flanges
**To refit the clutch lining assembly**

After checking the 2 lip seals (9) and the 2 O-rings of the rotating flange (8) are in good condition, grease the governor seat 3 pins (6) (high temperature grease) and assemble the parts in reverse order to removal.

- Compress the clutch / driven pulley assembly with tool P/N 752127
- Tighten the nut (1)
  - Tightening torque when refitting: 4.5 m.daN

**Note:** Before fitting the clutch / drive pulley assembly to the input shaft, fit the belt into the pulley bottom by opening the flanges by hand
- Fit the clutch / drive pulley assembly
- Fit the clutch cover
- Fit and tighten the nut
  - Tightening torque: 4.5 m.daN

- Fit the transmission cover and the rubber stop of the stand
- Fit and tighten the cover 6 securing bolts
  - Tightening torque: 1 m.daN
RECOMMENDED

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