

MISTRAL 40 - 45 - 50

TRAINING MANUAL
P/N 3651914M3 - EDITION 01-2003

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Landini

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SAFETY NOTES

Personal risk

This warning symbol draws your attention to messages that are important for your safety.
Read the safety notes carefully and comply with the recommended precautions to avoid potential dangers and safeguard your health and personal safety.
This symbol appears in the text along with the following key words:

WARNING - To warn of unsuitable repair operations with potential consequences that could affect the repair technician's safety.

DANGER - To indicate warnings that specifically denote potential dangers for the operator's safety or for other directly or indirectly involved persons.



1

Avoid accidents

The majority of accidents that occur in workshops are caused by failure to comply with some simple and fundamental rule of caution and safety. Therefore IN MOST CASES THEY CAN BE AVOIDED: all that's needed is to foresee the possible causes and consequently act with due care and caution.

However well a machine is designed and built, it is never possible to absolutely exclude all hazardous situations.

A careful and prudent mechanic is the best guarantee against accidents.

Strict compliance with even only one elementary safety rule would be sufficient to avoid many serious accidents.

DANGERNever carry out any cleaning, lubricating or servicing operations whilst the engine is running.

General rules

- Carefully comply with the prescribed maintenance and repair procedures.
- Do not wear rings, watches, jewelry, unfastened or hanging garments, such as ties, torn clothing, scarves, unbuttoned jackets or with open zip-fasteners that could become caught in moving parts. You are advised to wear approved safety garments, such as: non-slip footwear, gloves, safety goggles, helmets, etc.
- Never carry out repair work on the machine whilst someone is sitting in the driver's seat, unless this person is an authorized operator who is helping with the operations in progress.
- Only operate the machine and use the relative implements when you are sitting in the driver's seat.
- Do not carry out any work on the machine when the engine is running, unless this is specifically prescribed.
- Stop the engine and make sure that the pressure has been relieved from the hydraulic circuits before removing any caps, covers, valves, etc.
- All servicing work must be carried out with the utmost care and attention.
- Ladders and platforms used in workshops or in the field must comply with the current safety regulations.
- Disconnect the batteries and label all the controls to warn others that work is being carried out. Block the machine and all implements that must be raised.
- Do not check or fill fuel tanks, batteries, or use ignition fluid when smoking or near naked flames as these liquids are inflammable.
- The brakes are disengaged when released by hand for servicing work: in these cases, the machine must be kept under control by means of chocks or similar.

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GENERAL FEATURES

GENERAL FEATURES	MISTRAL 40
ENGINE	
- Version/Position	3TNE88 - ELAN/vertical
- Manufacturer	Yanmar
- Cycle	diesel, four-stroke
- Injection	direct
- Number of cylinders in line	3
- Cylinder liners	formed in the crankcase
- Bore (mm)	88
- Piston stroke (mm)	90
- Total swept volume (cm^3)	1642
- Firing order	1 - 3 - 2
- Compression ratio	18:1
- Power DIN 70020 (ISO 3046/1) (HP/kW)	34/25 (37.5/27.5)
- Top rate on load (RPM)	2800
- Idling rate (RPM)	2995
- Maximum torque (Nm)	105
- Maximum torque rate (RPM)	1800
- Idling rate (RPM)	1000
- Rotation direction	Anti-clockwise (viewed from flywheel)
- Number of main bearings	4
- Recommended diesel fuel	ISO 8217 DMA, BS 2869 A1 or A2 (cetane N.: 45 min)
- Lubrication system	Forced lubrication with trochoid pump
- Capacity of lubricating oil reservoir (liters)	4.7
- Recommended lubricating oil	See section 100
- Cooling system	Coolant/Radiator
- Capacity of cooling fluid reservoir (liters)	2.0
- Cooling fan	Fan with 6 blades, ∅ 335 mm
- Regulator	Centrifugal mechanical type (all speeds)
- Ignition system	Electrical

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DRIVING TORQUE VALUES

PARTS TO TORQUE	Thread	Driving torque values	
		Nm	kgm
Cylinder head fixing bolts (1)	M10 x 1.25	85.3 ÷ 91.2	8.7 ÷ 9.3
Connecting rod cap fixing bolts (1)	M9 x 1.0	44.1 ÷ 54.0	4.5 ÷ 5.5
Flywheel fixing bolts (1)	M10 x 1.25	83.4 ÷ 88.3	8.5 ÷ 9.0
Main bearing cap fixing bolts (1)	M12 x 1.5	96.1 ÷ 100.1	9.8 ÷ 10.2
Drive shaft V-pulley fixing bolts (1)	M14 x 1.5	112.8 ÷ 122.6	11.5 ÷ 12.5
Injector nuts (2)	M6 x 1.0	6.9 ÷ 8.8	0.7 ÷ 0.9
Automatic lead fixing nuts (2)	M12 x 1.75	58.9 ÷ 68.7	6.0 ÷ 7.0
Bearing nut centrifugal weights of governor (2)	M12 x 1.25	44.1 ÷ 49.1	4.5 ÷ 5.0
Fixing nut of high pressure diesel fuel pipe sleeve (2)	M12 x 1.5	29.4 ÷ 34.3	3.0 ÷ 3.5
Hex bolts (7T) and nut (2) (3)	M6 x 1	9.8 ÷ 11.8	1.0 ÷ 1.2
	M8 x 1.25	22.6 ÷ 28.4	2.3 ÷ 2.9
	M10 x 1.5	44.1 ÷ 54.0	4.5 ÷ 5.5
	M12 x 1.75	78.5 ÷ 98.1	8.0 ÷ 10.0
PT plugs (2)	1/8″	9.8	1.0
	1/4″	19.6	2.0
	3/8″	29.4	3.0
	1/2″	58.9	6.0
Pipe joint bolts (2)	M8	12.8 ÷ 16.7	1.3 ÷ 1.7
	M12	24.5 ÷ 34.3	2.5 ÷ 3.5
	M14	39.2 ÷ 49.1	4.0 ÷ 5.0
	M16	49.1 ÷ 54.0	5.0 ÷ 5.5

(1) Parts spread with lubricating oil.

(2) Parts not spread with lubricating oil.

(3) a. When aluminium parts are mounted, tighten the bolts to 80% of the driving torque value given in the table.

b. 4T bolts and check nuts must be tightened to 60% of the torque value given in the table.

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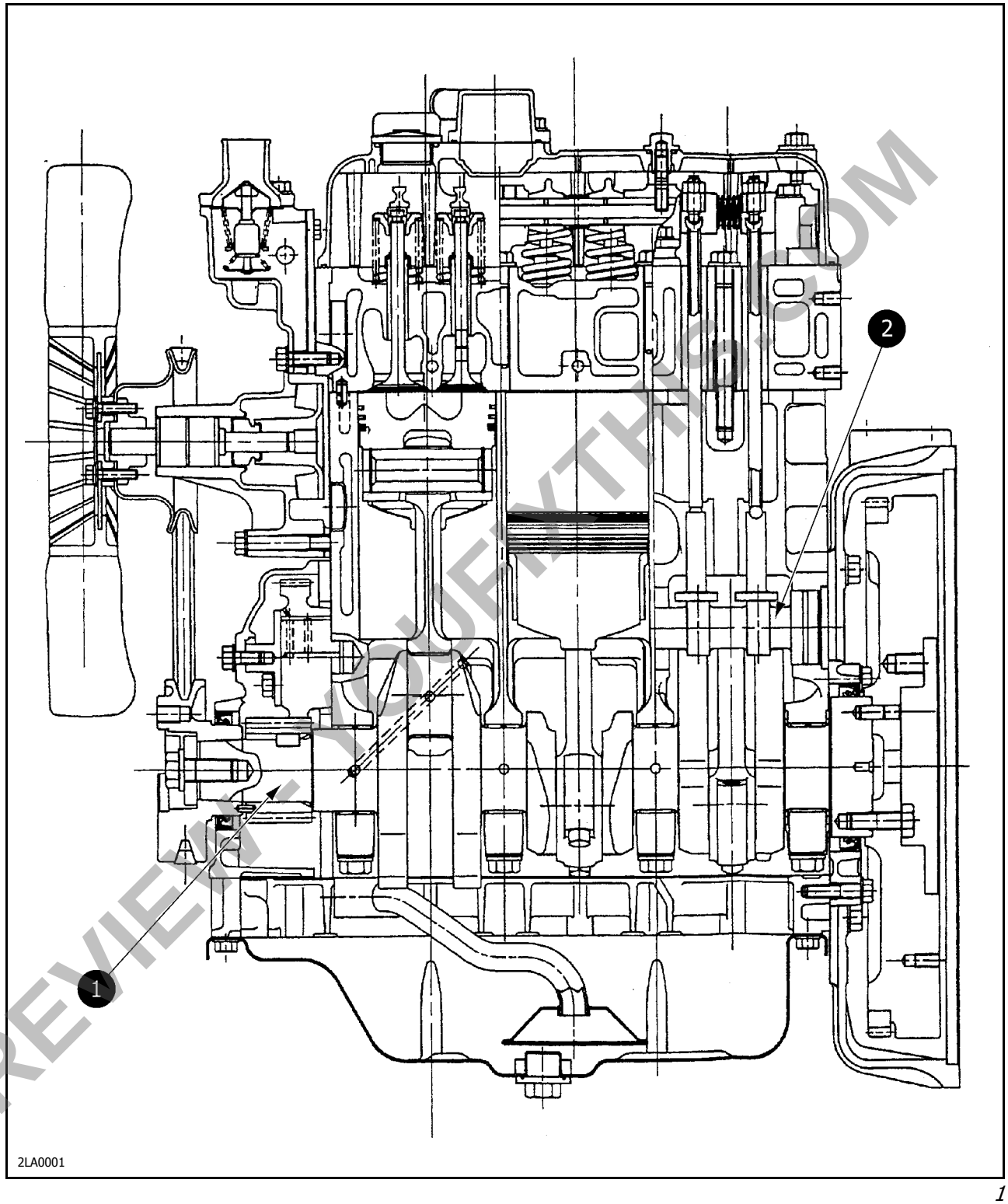
ENGINE TROUBLESHOOTING

Faults	Possible causes	Remedies
The engine fails to start	**1.** Battery slightly low.	Check, recharge the battery and replace it if necessary.
	2. Connections to battery terminals corroded or slack.	Clean, inspect, tighten the nuts and, if necessary, replace any excessively corroded terminals and nuts.
	3. Circuit open.	Close the circuit.
	4. Intake/exhaust valve play incorrect.	Adjust valve play.
	5. Intake/exhaust valve seized.	Replace.
	6. Piston rings seized or broken.	Replace piston ring.
	7. Cylinder and piston rings worn.	Lap and use larger size parts.
	8. Big end pins and bearings seized.	Repair or replace.
	9. Foreign body in combustion chamber.	Demount and repair the chamber. Remove the foreign body.
	10. Intake/exhaust valve timing incorrect.	Adjust the valve play and check the timing of the intake/exhaust valves.
	11. Incorrect timing of injection pump on engine.	Correctly time the injection pump on engine.
	12. Impurities or water accumulated in the fuel pipes.	Detach the pipes, the injection pump and thoroughly clean them. If necessary, clean and dry the fuel tank.
	13. No fuel in tank	Fill tank.
	14. No fuel supplied to injection pump	Check and, if necessary, replace the fuel pump.
	15. Air in the fuel circuit.	Check the pipes, unions, fuel pump, filters and injection pump for air. Lastly, bleed the circuit.
	16. Starter motor damaged.	Repair or replace the starter motor.
	17. Thermostarter inefficient.	Check or replace the thermostarter.

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SECTIONS



1

Longitudinal section of engine (mod. MISTRAL40).

1. Drive shaft
2. Camshaft

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ENGINE SPLITTING AND REMOUNTING

Splitting

DANGER

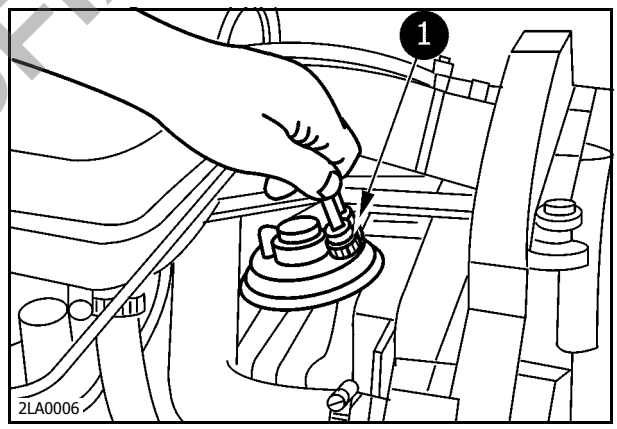
Lift and handle all heavy parts with lifting equipment of an adequate capacity.
Make sure that the units or parts are supported by appropriately sized harness and hooks.
Make sure that there are no bystanders near the load being lifted.

DANGER

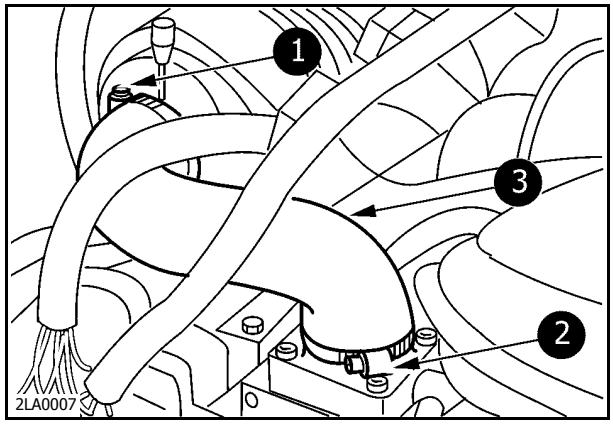
Handle all parts with great care. Do not put your hands or fingers between one part and the next. Wear approved safety garments such as goggles, gloves and safety footwear.

Proceed in the following way:

1. Split the clutch assembly (see section 300).
2. Disconnect the electrical connection (1) from the horn.
3. Unscrew the clamps (1, 2) and remove the intake sleeve (3).



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DESCRIPTION OF THE OPERATING MODE OF THE HYDRAULIC POWER LIFT'S VALVE SYSTEM

Three phases always occur during power lift operation, regardless of whether it is used in the position control or draft control mode or with contemporaneous draft and position control (Intermix):

Valve system in the neutral phase

Valve system in the lifting phase

Valve system in the discharge phase

To make the descriptions clearer, these three phases will therefore be illustrated individually. However, remember that the three phases take place without any specific order when the power lift operates, particularly in the draft control and Intermix modes.

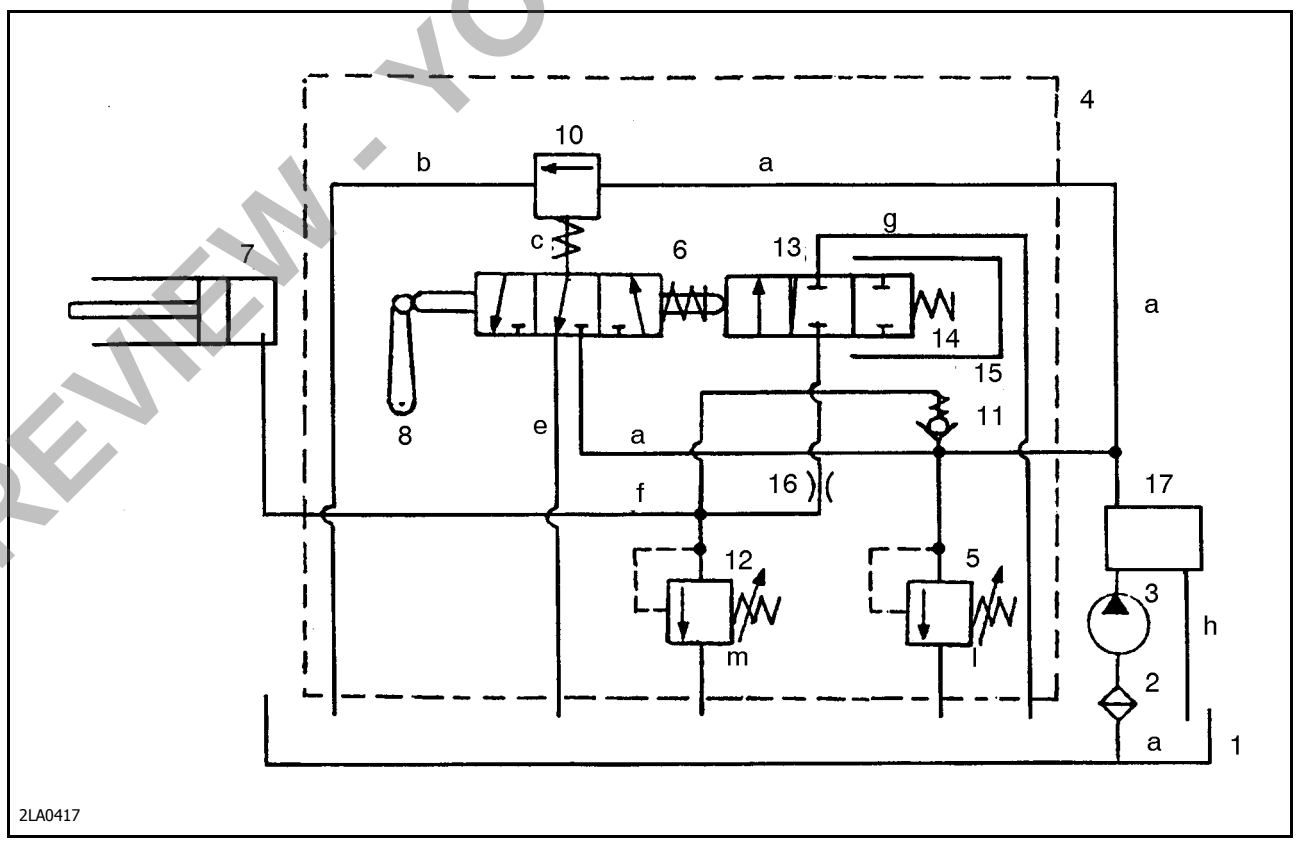
Neutral phase

As soon as the engine is started, the pump (3) draws oil from the tank (1) through the filter (2) and sends it through duct (a) where it encounters the valve stem (6) in the central position of its travel, which shuts off the delivery to the control unit (c).

Meanwhile, the oil passes through duct (a) formed inside the valve system, and reaches the check valve (11) that supplies the ram (7). This remains closed as oil from the pump cannot reach a sufficiently high pressure to open it owing to the lesser opening resistance of the servo valve (10). This latter is able to open thanks to the open piloting hole (c) which allows the oil in the piloting chamber (d) to discharge into the housing through ducts (c) and (e). This allows the oil from the pump to discharge into the housing through duct (b).

Note that ducts (a) and (f) in the valve system are races made around the body (4) so that the oil can reach the various valves. The oil in the ram (7) and duct (f) is blocked by the discharge valve (13) which is shut, thus the circuit is tight.

The cylinder safety valve (12) protects the circuit between the ram (7) and the discharge valve (13), opening and discharging the pressure peaks created when the tractor jolts or when the implement strikes against the ground.

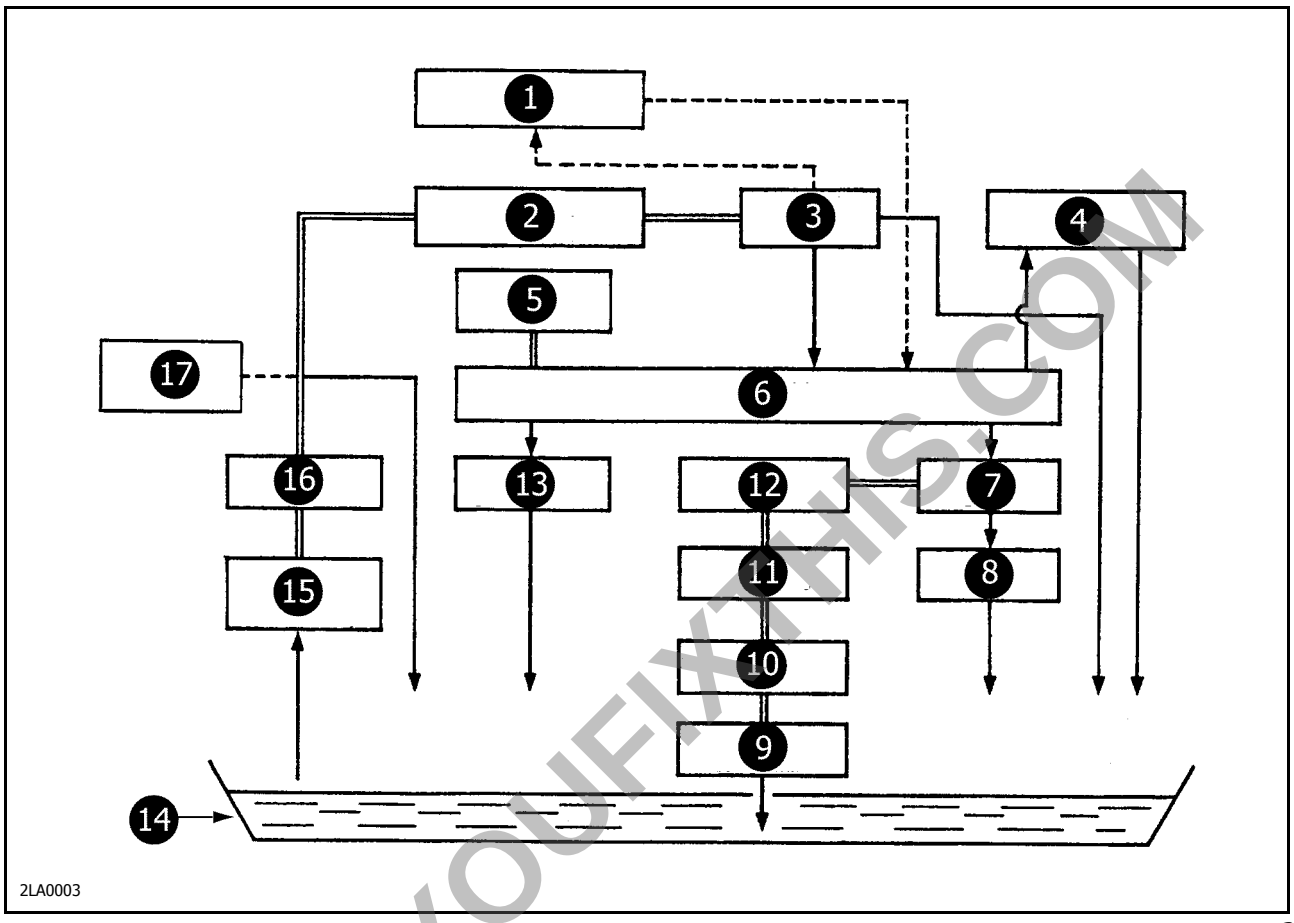


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LUBRICATION, COOLING AND FUELLING CIRCUIT DIAGRAMS



3

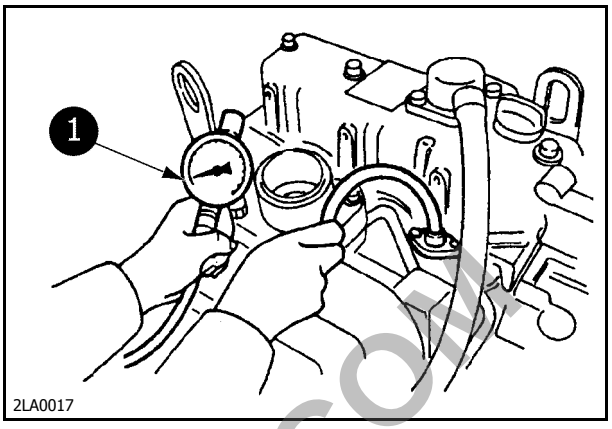
Engine lubrication circuit diagram.

1. Heat exchanger (on request)
2. Oil filter (with bypass valve)
3. Pressure governor valve
4. Injection pump
5. Pressure switch
6. Main cylinder block duct
7. Main bearing
8. Big end bearing
9. Tappets/cam surfaces
10. Rocker arms
11. Rocker arm pin
12. Camshaft bearing
13. Intermediate gear pin
14. Oil sump
15. Oil intake pipe (with gauze filter)
16. Oil pump
17. Safety valve

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7. Connect the compression tester **002 MT MIS** (with an adapter and pressure gauge (1)) to the tested cylinder and take the measurements by allowing the internal combustion engine to run by means of the starter motor until the pressure gauge reading becomes stable.



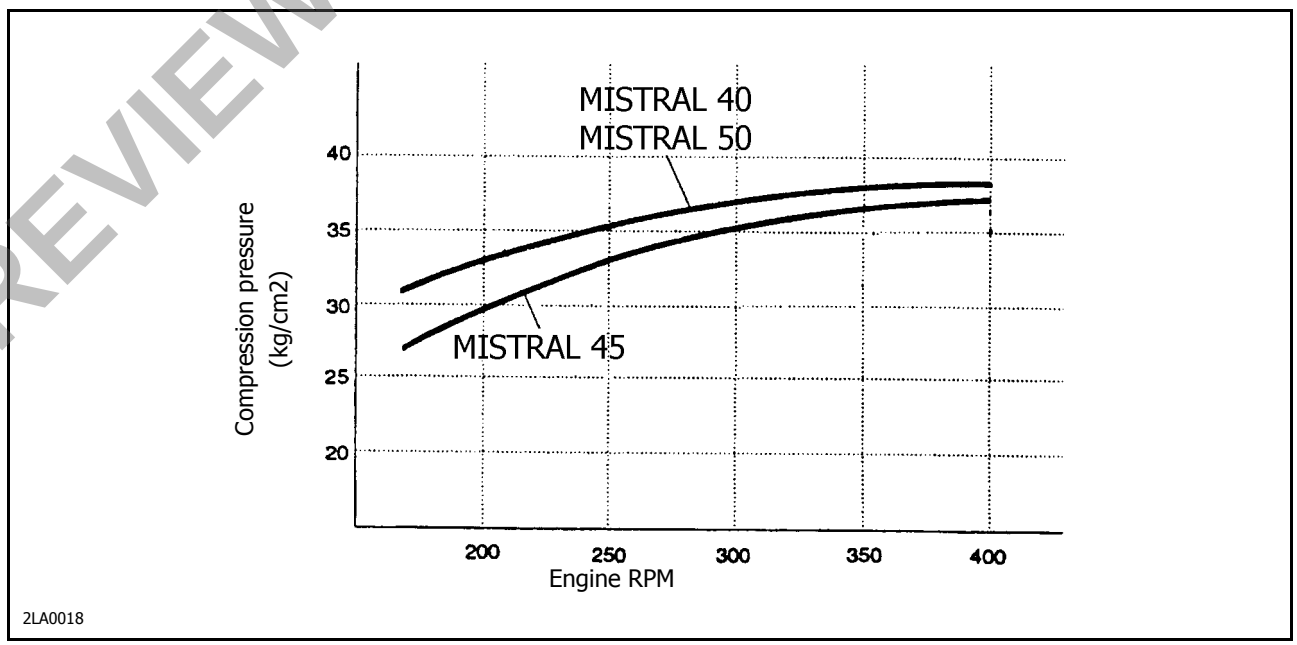
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8. Test the compression in the remaining cylinders by repeating the previously described operations 4-5-6-7.

Compare the measured values with the ones in the table below:

Model	Compression pressure at 250 RPM. (kg/cm^2)		Difference in the compression pressure off the various cylinders (kg/cm^2)
	Normal	Limit	
MISTRAL 40	35 ± 1	28 ± 1	2 ÷ 3
MISTRAL 45	33 ± 1	26 ± 1	2 ÷ 3
MISTRAL 50	35 ± 1	28 ± 1	2 ÷ 3

Also consider that the compression decreases by about 1% for each 100 meters of altitude above sea level and that, depending on the engine rate, the pressure variation presents the trends indicated in the fig. 18.



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MAIN SPECIFICATIONS

MAIN SPECIFICATIONS	Nominal value	Value at limit of wear
Cylinder head		
Cylinder head combustion surface warp . . . . . (mm)	≤ 0.05	0.15
Valve housing angle		
- Intake	120°	-
- Exhaust	90°	-
Valve housing width		
- intake . . . . . (mm)	1.07 ÷ 1.24	1.74
- exhaust . . . . . (mm)	1.24 ÷ 1.45	1.94
Intake valve		
- Outer diameter of valve stem . . . . . (mm)	7.955 ÷ 7.975	7.9
- Inner diameter of valve guide . . . . . (mm)	8.010 ÷ 8.025	8.1
- Assembly play between valve stem and guide . . . . . (mm)	0.035 ÷ 0.070	0.2
Exhaust valve		
- Outer diameter of valve stem . . . . . (mm)	7.955 ÷ 7.970	7.9
- Inner diameter of valve guide . . . . . (mm)	8.015 ÷ 8.030	8.1
- Assembly play between valve stem and guide . . . . . (mm)	0.045 ÷ 0.075	0.2
Valve guide projection . . . . . (mm)	15	-
Depth of valve impression		
- Intake valve . . . . . (mm)	0.306 ÷ 0.506	1.0
- Exhaust valve . . . . . (mm)	0.3 ÷ 0.5	
Valve head thickness		
- Intake valve . . . . . (mm)	1.244 ÷ 1.444	0.5
- Exhaust valve . . . . . (mm)	1.35 ÷ 1.55	
Intake valve timing		
- Open b. T.D.C.	10° ÷ 20°	-
- Open a. B.D.C.	40° ÷ 50°	
Exhaust valve timing		
- Open b. B.D.C.	51° ÷ 61°	
- Open a. T.D.C.	13° ÷ 23°	
Valve spring		
- Free length . . . . . (mm)	42	-
- Slant	-	1.1
- Tension (when compressed 1 mm in length) . . . . . (kg)	2.36 (variable pitch)/3.101	-
Intake and exhaust valve play . . . . . (mm)	0.15 ÷ 0.25	-

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MAINTENANCE AND BATTERY INSPECTION

Relative density

The relative density of the battery acid indicates the charge status. When the battery is fully charged, the relative density of the electrolyte is at least 1.280 at 25°C.

Alternatively, the approximate charge status can be measured with a digital voltmeter (± 0.01V) come segue:

Less than 10.5 V Unserviceable battery*
Less than 11.8 V Battery discharged
Less than 12.3 V Battery half charged
More than 12.6 V Battery fully charged

* Consult the notes in chapter "TESTS" for instructions about how to recover a slightly sulphated battery.

The battery voltage must be measured with the battery discharged and:

A. After the battery has been discharged for at least 4 hours.

B. Turn on the headlights for 2 minutes if the tractor has been used recently or if the battery has been charged recently.

When a battery is discharged, the sulphuric acid in the electrolyte combines chemically with the plates and this action causes the relative density of the solution to diminish.

A battery densimeter will determine the relative density of the electrolyte in an element and the quantity of unused sulphuric acid in the solution will indicate the charge degree of that element.

The lower the temperature at which the battery must operate, the more the battery must be kept in fully charged conditions. For example, a battery with a relative density of 1.225 at 27°C (80°F) will operate the starter motor at mild ambient temperatures, but may not do this at low temperatures owing to inferior battery efficiency.

Table 1 illustrates the effect of the temperature on battery efficiency.

Table 1

Temperature	Efficiency of a fully charged battery
25.0°C	100%
-4.5°C	82%
-24.0°C	64%
-27.5°C	58%
-31.0°C	50%
-34.5°C	40%
-37.5°C	33%

Maximum battery life can be obtained by paying the necessary attention and making periodical inspections. The capacity delivered must not be exceeded by constant and excessive overcharging and the charging requisites must be maintained.

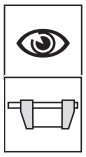
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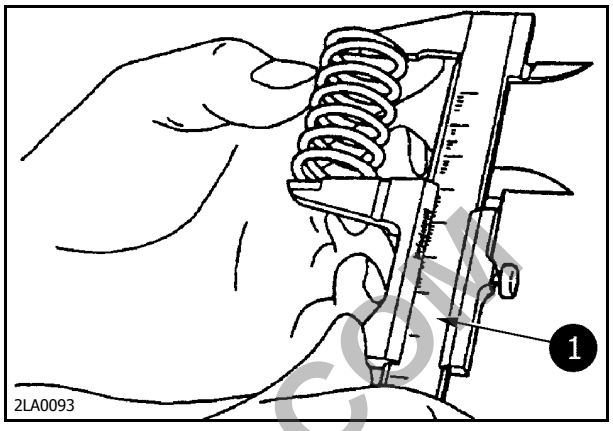
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Valve spring inspection

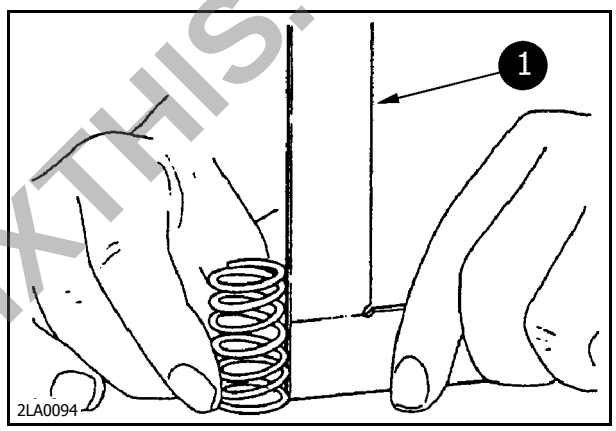


1. Check to make sure that the valve spring is not cracked or corroded.
2. Use a gauge (1) to measure the free length (length of the spring) and its slant (squareness of the coil side) using the square (1, fig. 97).

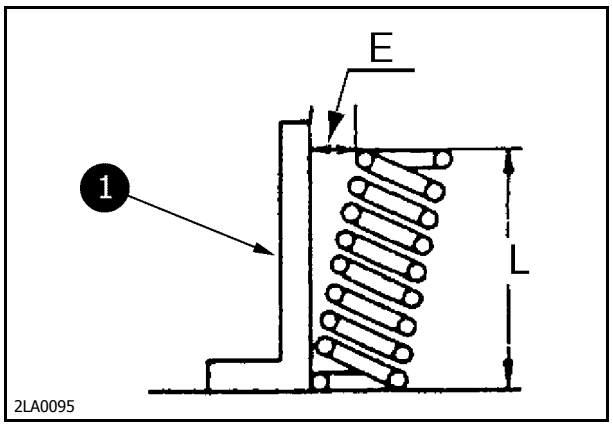


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Compare the obtained measuring results with the standard values given in the table on page 10.



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Key
1. Square
2. Slant error
3. Free length

Spring cap and cotter inspection

Check the contact between the inner surface of the spring cap and the circumference of the cotter, and the contact between the inner surface of the cotter and the race on the head of the valve stem. If the contact is irregular or the cotter has lowered, replace it with a new one.

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GEARBOX TRANSMISSION HOUSING - OVERHAUL

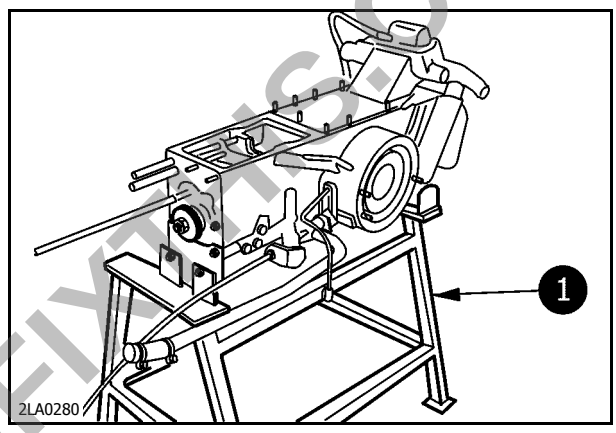
Demounting

WARNING

Handle all parts with great care. Do not put your hands or fingers between one part and the next. Wear approved safety garments such as goggles, gloves and safety footwear.

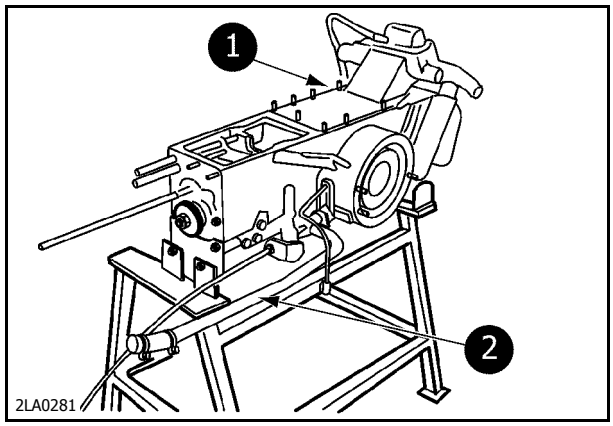
Proceed as follows:

1. Fix the gearbox-transmission housing to stand (1).



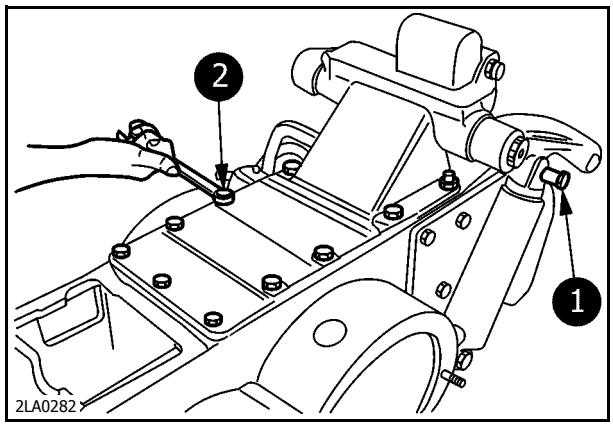
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2. Disconnect the diff lock hydraulic tubes (1) and the intake tube (2) of the gearbox-transmission housing lubricating system.



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3. Take out the pin (1) that connects the cylinders to the lifting links. Unscrew the bolts that fix the power lift cover.



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SECTION 700

HYDRAULIC CIRCUITS – REAR POWER LIFT

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