YANMAR

Assembly Instructions

INDUSTRIAL ENGINES

L-AE SERIES
L-N SERIES
L-V SERIES

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1. ASSEMBLY INSTRUCTIONS (ORIGINAL) FOR YANMAR L-SERIES DIESEL ENGINES

For partly completed machinery, according to Machinery Directive 2006/42/EC, as described in Annex VI.

1.1 Coverage

This document shows instructions to install the L-series single cylinder air cooled diesel engines correctly into the machine on the assembly line, so as not to compromise the safety and health of people around the engine*. Not following these instructions might cause danger, damage or serious injury.

* For any other technical information regarding the installation of the engine, not limited to safety and health only, please refer to the Application Manual and/or Operation Manual of the engine concerned.

1.2 Product Overview

■ General description

The following Base engine models of the L-series are sold in Europe. The base model name is always followed by a code of at lease eight numbers and characters, that can vary per application and engine specification.

For example: L70N5DF1T1AA.

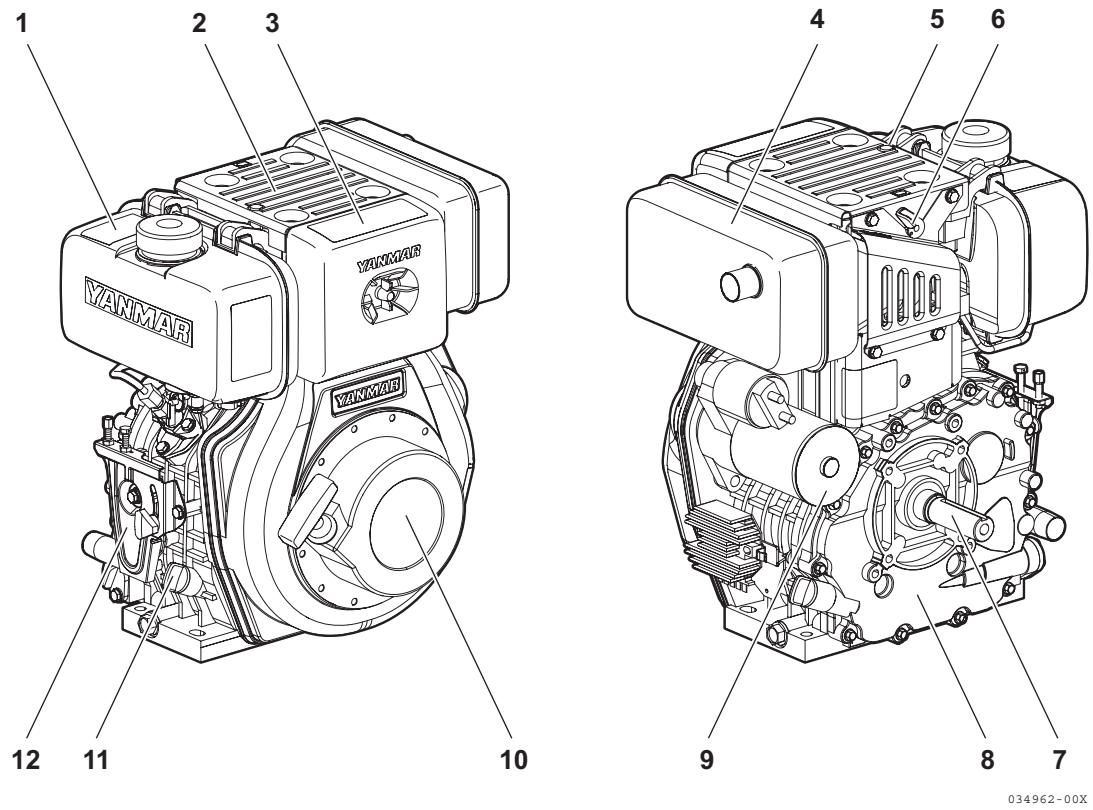
L-AE series	L-N series	L-V series
L48AE	L48N	L48V
L70AE	L70N	L70V
L100AE	L100N	L100V

These engines are designed to deliver power to drive machines by means of a “**direct coupled drive**” or “**belt drive**”, for a wide range of applications and not for independent running or applications for which the engine is not intended.
Since designing the application and installing the engine require special knowledge and skill, always consult your authorized Yanmar industrial engine dealer or distributor in order to:

- Select optional equipment to match the specific operational conditions and environment.
- Maximize engine performance with a minimum amount of downtime and safety related incidents by carefully matching the characteristics of the engine with the driven machine.
- Plan for safe fuel piping, exhaust piping, electrical wiring, ventilation, and accurate engine installation.
- Design your applications in such a way that they meet requirements of the local authorities.

1.3 Component Identification

Figure 1 shows where major engine components are located.



1 – Fuel Tank
2 – Top Cover
3 – Air Cleaner
4 – Muffler
5 – M8 Hole for Lifting Eye
6 – Decompression Lever
7 – Power Take off
8 – Crankcase
9 – Electric Starter
10 – Recoil Starter
11 – Oil Fill Cap
12 – Speed Control Device

Figure 1

1.4 Safety

■ Safety statements

Yanmar is concerned for your safety and your machine's condition. Safety statements are one of the primary ways to call your attention to the potential hazards associated with incorporating Yanmar L-series engines into the final machine.
Follow the precautions listed throughout these assembly instructions before and during installation and initial operation, for your safety, the safety of others and to protect the performance of your engine.

Keep the labels free from dirt or torn and replace them if they are lost or damaged. Also, if you need to replace a part that has a label attached to it, make sure you order the new part and label at the same time.

1.5 Explanation Safety Symbols



This safety alert symbol appears with most safety statements. It means attention, become alert, your safety is involved! Please read and abide by the message that follows the safety alert symbol.

⚠ DANGER

Danger (the word “DANGER” is in white letters with a red rectangle behind it) - indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Danger is limited to the most extreme situations.

⚠ WARNING

Warning (the word “WARNING” is in black letters with an orange rectangle behind it) – indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Caution (the word "CAUTION" is in black letters with a yellow rectangle behind it) - indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Caution without the safety alert symbol indicates a potentially hazardous situation that can cause damage to the machine, personal property and/or the environment or cause the machine to operate improperly.

1. ASSEMBLY INSTRUCTIONS

1.6 General Instructions

Assembly Step	Instruction	Safety Remark
1. Storage	If possible, store the engine in its original packaging.	**⚠ WARNING** **CRUSH HAZARD!**  **• When you need to transport an engine for repair, have a helper assist you to attach it to a hoist and load it on a truck.**  **•Never stand under a hoisted engine. If the hoist mechanism fails, the engine will fall on you, causing death or serious injury.** **• Failure to comply will result in death or serious injury.**
	Take precautions that the engine/box is always stable and cannot fall on the ground. Keep the number of stacked up packages within the maximum allowed according to the type of package.  Protect the engine packaging from water and moisture.	
2. Opening packaging	The engine can be delivered in different types of packaging: • Carton box • Steel returnable pallet	**⚠ CAUTION** **Beware of sharp nails or edges when opening the packaging.**
	Remove the bolts or nuts that connect the engine foots to the pallet by using proper tools.	
3. Hoist	Take precautions that the engine is always stable and cannot fall to the ground.	**⚠ WARNING** **CRUSH HAZARD!**   **Crane operating overhead.** **Stay alert!**
	Check the engine weight (see **Table 1**) and decide the suitable lifting method.	
	Check the damage of lifting gears and chains before lifting up the engine.	
	Use the threaded M8 hole in one of the cylinder head bolts to mount a lifting eye (see **Figure 1**). Attach the lifting gear to the lifting eye only.	
	Lift the engine from the pallet in the upright position only and do not approach under and surroundings of the lifted engine.	

Table 1 Yanmar engine reference weights (dry)

Base engine model	Engine weight (kg)
L48AE/L48N/L48V	32
L70AE/L70N/L70V	41
L100AE/L100N/L100V	53.5

Note: Weights are for reference only.
The actual engine weight can vary, depending on which auxiliary parts are mounted. Be sure your lifting equipment is plentiful capable of lifting this engine weight safely.

NOTICE

When working on the engine, always use personal protective equipment and protective clothing according to the local safety regulations.

- Use appropriate tools only.
- Bolt tightening torques should be applied as specified by the manufacturer.

1. ASSEMBLY INSTRUCTIONS

<table>
<tr><th>Assembly Step</th><th>Instruction</th><th>Safety Remark</th></tr>
<tr><td rowspan="3">4. Clean working</td><td>Keep all openings in the engine (temporarily) protected, to prevent dirt or dust entering the engine.</td><td rowspan="3">⚠ CAUTION
WEAR EYE PROTECTION!

• Always wear eye protection when servicing the engine and when using compressed air or high-pressure water. Dust, flying debris, compressed air, pressurized water or steam may injure your eyes.
• Failure to comply may result in minor or moderate injury.</td></tr>
<tr><td>Only install the engine in a clean environment. Dust or dirt particles will cause damage to the engine.</td></tr>
<tr><td>Only install clean parts and hoses on the engine. Hoses should be clean on the inside as well.</td></tr>
<tr><td rowspan="3">5. Prepare engine room</td><td>Before incorporating the engine to the machine, check if the anti-vibration mounts are mounted correctly and on the right position.</td><td rowspan="3"></td></tr>
<tr><td>In some cases it might be necessary to install certain parts already on the engine or in the engine room before incorporating the engine in the machine.</td></tr>
<tr><td>Be sure all preparations are made in the engine room to install the engine smoothly in the machine.</td></tr>
<tr><td rowspan="3">6. Engine incorporation</td><td>If applicable, install the engine on a sub frame first.</td><td rowspan="3">NOTICE
• Never attempt to modify the engine’s design or safety features such as defeating the engine speed limit control or the diesel fuel injection quantity control.
• Modifications may impair the engine’s safety and performance characteristics and shorten the engine’s life. Any alterations to this engine may void its warranty. Be sure to use Yanmar genuine replacement parts.</td></tr>
<tr><td>Before installing the engine in the machinery, check and replace any parts, which may have been damaged during transport or hoist.</td></tr>
<tr><td>Do not temporarily remove parts from the engine to be used as spare parts, for other machines, or any other purpose.</td></tr>
<tr><td rowspan="4">7. Mounting the engine</td><td>Be sure the space where the engine should be installed in the machine is clean and gives good access for the engine.</td><td rowspan="4">⚠ CAUTION
Keep hands clear.
</td></tr>
<tr><td>Let down the engine and place the engine or the sub frame on the anti-vibration mounts and tighten the bolts correctly, so the engine is fixed securely to the machine.</td></tr>
<tr><td>Disconnect the lifting equipment only when the engine is fixed securely to the machine.</td></tr>
<tr><td>High pressure diesel fuel injection pipes should not be in contact with other parts.</td></tr>
</table>

Assembly Step	Instruction	Safety Remark
8. Connect engine and machine	Note: • The sequence of making the connections may vary depending on each application. • For most L-series engines the muffler, air cleaner, fuel tank and fuel line are already installed on the engine unit. • The machinery manufacturer should supply external connections that are not part of the engine specification, like fuel hoses, inlet- and exhaust piping and electrical wiring.	
8a. Connect the PTO	Connect all power take-off devices according to the instructions of these devices. Use the correct bolt type and tightening torque to connect them.	**⚠ CAUTION**  **Entrapment hazard!**
	Install the engine with output axis aligned with the centre of the driven device on the machine. Do not apply more overhang load than specified.	
8b. Install fuel line parts (For external fuel tank only)	If an external fuel tank is used, mount the electrical fuel feed pump (if applicable) and Fuel filter according to the instruction manual from Yanmar.	
8c. Connect the fuel hoses (For external fuel tank only)	Only use fuel hoses that are made from diesel fuel resistant material and have the correct diameter and pressure class.	
	Be sure not to mix up the fuel supply and the fuel return line connections.	
	Connect the hoses with suitable hose clamps.	
	When fuel hoses are bundled with a clamp, the fuel hoses should be protected by corrugated tube.	
8d. Install the intake system (For external air cleaner only)	Install the suitable air cleaner and connect it to the air intake manifold.	
	The air intake hose should be reinforced to avoid being deformed by vacuum pressure.	
8e. Install the exhaust system (For external muffler only)	The exhaust pipe and/or muffler have to be connected properly to the exhaust flange using the correct Yanmar exhaust gasket.	
	If a part of the exhaust system is mounted to the machine frame, a flexible pipe must be installed between that part and the engine to allow engine movements.	

1. ASSEMBLY INSTRUCTIONS

Assembly Step	Instruction	Safety Remark
8f. Install the electrical system (For electric starter only)	Do not use the high-pressure diesel fuel injection pipe or fuel hoses as fixation for any other parts, like electrical wiring.	**⚠ WARNING** **SHOCK HAZARD!**  • **Turn off the battery switch (if equipped) or disconnect the negative battery cable before servicing the electrical system.** • **Check the electrical harnesses for cracks, abrasions, and damaged or corroded connectors. Always keep the connectors and terminals clean.** • **Failure to comply could result in death or serious injury.**
	All wire connectors need to be secured using connector clamps to prevent the wire leads from breaking.	
	Do not clamp the wires to any fuel-, or exhaust system componen.	
	Never secure the wires on a hot surface, sharp edge, rotating, or vibrating part.	
	Avoid placing wiring in contact with oil. Insulate the wires completely.	
	Install a fuse to protect the harness against problems, such as a short circuit.	
8g. Connect the battery (For electric starter only)	The battery needs to be firmly secured and immovable using a mounting bracket.	**⚠ CAUTION**  **Batteries can leak sulphuric acid fluid.**
	Do not reverse the connection of the positive and negative leads of the battery cables. This will destroy the regulator and could cause the wire harness to burn.	
	The battery cable length needs to be adjusted properly and clamped.	
8h. Connect speed control cable (For remote speed control lever only)	The engine speed control cable should be connected properly. The cable should be adjusted in such a way, that both the minimum and maximum engine speed position can be reached.	
9. Fill engine oil	Only use the recommended engine oil type.	**⚠ WARNING** **FIRE HAZARD!** **Engine oil is flammable.** 
	Fill engine oil before starting the engine.	
	Use the indicated oil fill cap to fill the oil to the correct oil level.	
	Wipe off any spilled oil.	

<table>
<tr><th>Assembly Step</th><th>Instruction</th><th>Safety Remark</th></tr>
<tr><td rowspan="4">10. Fill fuel tank and fuel line</td><td>Fill the fuel tank with the correct type of diesel fuel. Do not overfill the fuel tank.</td><td rowspan="4">⚠ DANGER
FIRE AND EXPLOSION HAZARD!

• Diesel fuel is extremely flammable and explosive under certain conditions.
• Only fill the fuel tank with diesel fuel. Filling the fuel tank with gasoline may result in a fire and will damage the engine.
• Never refuel with the engine running.
• Wipe up any spills immediately.
• Keep sparks, open flames or any other form of ignition (match, cigarette, static electric source) well away when refuelling.</td></tr>
<tr><td>Open the fuel cock and prime the fuel supply line by using gravity or the electrical fuel feed pump (If applicable).</td></tr>
<tr><td>If the unit has an electric fuel pump, to prime the fuel system, turn the key switch to the ON position for 10 seconds to allow the electric fuel pump to prime the system.
If an external fuel filter is used, the fuel filter has an internal air bleed port.</td></tr>
<tr><td>Do not use the starter motor for priming the fuel system, as this may overheat the starter motor.</td></tr>
<tr><td rowspan="2">11. Check for leakages</td><td>After filling the fuel and oil systems, check if no oil or fuel is leaking.</td><td rowspan="2">NOTICE
If any problem is noted during the visual check, the necessary corrective action should be taken before you operate the engine.</td></tr>
<tr><td>Repair any leakage and wipe off spilled liquids first before proceeding to engine operation. Check any repair for leakage again.</td></tr>
<tr><td>12. Install safety guards</td><td>Protect all moving or rotating parts driven by the engine with guards or protective devices.</td><td></td></tr>
<tr><td rowspan="2">13. High temperatures</td><td>After and during operation, the engine and the exhaust system will be very hot. Take steps to eliminate the risk of touching hot parts.</td><td rowspan="2"></td></tr>
<tr><td>Additional adhesive warning labels for Hot Surfaces must be attached clearly visible on a cold surface close to the hot part(s).</td></tr>
</table>

1.7 Engine Starting

After all parts are installed according the Assembly instructions, and you have taken into account the below instructions and warnings, the engine may be started.

Never hold the key in the START position for longer than 15 seconds or the starter motor will overheat.

⚠ CAUTION

DO NOT OPERATE WITHOUT GUARDS IN PLACE



- **Never start the engine in gear. Sudden movement of the engine and/or machine could cause serious injury or death.**

- **Check before starting the engine that any tools or shop rags used during installation have been removed from the engine area.**
- **Do not run the engine independently from the machine but only after correct installation in the machine.**
- **Be sure all protective guards are installed properly, so moving or rotating parts cannot be touched.**
- **Do not use the engine for any other application as it is intended for.**
- **At all times the engine must be according to the original specification before running the engine.**
- **Make sure the components connected to the engine, but not supplied by Yanmar, comply with the engine requirements.**
- **Do not start the engine inside buildings without a suction system connected to the exhaust pipe.**

⚠ WARNING

BURN HAZARD!



- **Keep your hands and other body parts away from hot engine surfaces such as the muffler, exhaust pipe, turbocharger (if equipped) and engine block during operation and shortly after you shut the engine down. These surfaces are extremely hot while the engine is operating and could seriously burn you.**

- **Allow the engine to cool down before you start working on it.**
- **Failure to comply will result in serious injury.**

⚠ WARNING

EXHAUST HAZARD!



- **Never operate the engine in an enclosed area such as a garage, tunnel, ships hold, manhole or underground room without proper ventilation.**

- **Engine's exhaust gas contain Carbon Monoxyd. Accumulation of this gas within an enclosure could cause illness or death.**
- **Never block windows, vents or other ventilation if the engine is operating in an enclosed area.**
- **Make sure that all connections in the exhaust system are tight after repair.**

⚠ WARNING

HIGH-PRESSURE HAZARD!



- **Avoid skin contact with the high-pressure diesel fuel spray caused by a fuel system leak such as a broken fuel injection line. High-pressure fuel can penetrate your skin and result in serious injury. If you are exposed to high-pressure fuel spray, obtain prompt medical treatment.**
- **Never check for a fuel leak with your hands. Always use a piece of wood or cardboard. Have your authorized Yanmar industrial engine dealer or distributor repair the damage.**
- **Failure to comply could result in death or serious injury.**

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