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## Notes for the user

This service handbook is designed for trained specialists of the Liebherr organisation and their dealers.

This service handbook contains special knowledge for repairing Liebherr construction machines. Basic specialist knowledge on electronics, hydraulics, mechanics and engine technology is not contained in this service handbook. Therefore specialized training and qualifications are necessary. Liebherr recommends participation in the Liebherr training program for construction machines.

In this service handbook you will find information on:


- Special tools
- Technical data
- Maintenance intervals and maintenance tasks
- Testing and adjustment tasks
- Structure and function descriptions
- Removal and installation tasks
- Circuit diagrams, hydraulic plans and technical drawings

You will find information on controls and operation in the operating instructions. Information on spare parts are in the spare parts catalogue. Please observe the local accident prevention laws.

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Technical changes are reserved.


## Warning symbols

	This is the warning symbol. It warns you of potential injuries. To prevent injury or death, carry out all the measures identified by this warning symbol.
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The warning symbol always appears together with the signal words

**DANGER**  
**WARNING**  
**CAUTION**

	<b>DANGER</b>	Indicates a hazardous situation that will immediately lead to serious or fatal injury if it is not avoided.
	<b>WARNING</b>	Indicates a hazardous situation that may lead to serious or fatal injury if it is not avoided.

	<b>CAUTION</b>	Indicates a hazardous situation that may lead to minor or moderate injury if it is not avoided.
	<b>ATTENTION</b>	Indicates a hazardous situation that may lead to damage if it is not avoided.

## Structure of warnings

Warnings in this document are structured as follows:







### **WARNING**

Here you will find information about the type and source of danger. Here you will be informed about possible consequences of not paying attention to the warning.

▶ Here you will be called on to take measures to avoid the dangerous situation.

## Other designations

Symbol	Meaning
	<b>Note</b> Indicates useful tips and information.
	This symbol means: Carry out a task.
	This symbol means: Requirements must be fulfilled.
	This symbol means: Results of a task.
-	This symbol indicates a list.

*Symbols*

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# 010 Introduction

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## 010.1 Safety instructions

### 010.1.1 General safety instructions

1. Familiarise yourself with the “**operating manual**” before starting up the machine.  
Make sure that you are in possession of and have read and understood additional instructions applicable to any special equipment installed on your machine.
2. Only expressly authorised personnel may operate, service or repair the machine.  
Observe the legal minimum ages.
3. Only trained or instructed personnel may operate the machine. Clearly assign responsibility for operation, rigging, maintenance and repair work.
4. Clearly establish the driver’s responsibilities (also with respect to traffic regulations) and authorise him to refuse to carry out unsafe instructions from third parties.
5. Personnel undergoing training, instruction or who are not yet fully qualified may only be allowed to work on the machine under constant supervision by an experienced person.
6. Now and again check that your personnel are working safely and are aware of possible dangers in observance of the “**operating manual**” .
7. Wear safe working clothes when working on the machine.  
Do not wear rings, wristwatches, ties, scarves, unbuttoned jackets, loose clothing or similar garments, as they can become caught in the machinery and cause injury.  
Certain tasks require safety goggles, safety boots, hard hats, gloves, reflective vests, ear protection etc.
8. Ask the site manager about any special safety regulations in force on the site.
9. Do not hold onto the steering column, the control panel or the control levers when getting on or off the machine.  
You might inadvertently trigger movements which could lead to accidents.
10. Never jump down from the machine. Use the steps, ladders and platforms provided for getting on and off.
11. Keep all handles, steps, rails, gangways, platforms and ladders free from oil, grease, mud snow and ice. This reduces the risk of slipping, tripping up or falling.
12. Familiarise yourself with the emergency exit through the right cab door and/or the rear window.
13. Unless there are other instructions, perform maintenance and repair work as follows:  
Procedure:
  - Park the machine on firm, level ground and lower the working attachment to the ground.
  - Move all control levers to neutral.
  - Shut down the engine and take out the ignition key.
14. Before starting any work on the hydraulic circuit, you must also press the working hydraulics lockout button and actuate all pilot control units (joystick and pedals) in both directions in order to reduce the control pressure and accumulated pressure in the operating circuits. You must then reduce the internal tank pressure.
15. Lock the working hydraulics to prevent accidental actuation before leaving the driver’s cab.  
Lock the working hydraulics in accordance with the instructions in the “**operating manual**”.

16. Secure all loose parts of the machine.
17. Never start up a machine without first making a thorough tour of inspection and checking if any warning signs are missing or illegible.
18. Observe all signs with warnings or safety instructions.
19. Special safety apparatus must be fitted to the machine for certain applications. If this is the case, only work with this apparatus fitted and in working order.
20. Do not make any modifications, extensions or conversions to the machine with possible safety implications without the approval of the supplier. This also applies to installing and adjusting safety apparatus and valves, as well as to welding load-bearing components.
21. Avoid standing near the diesel engine while it is running. People that have a pacemaker must not stand next to the diesel engine while it is running (minimum distance 50 cm).
22. Do not touch live components of the solenoid controlled unit pumps on their electrical connections.

### 010.1.2 Instructions on preventing crushing injuries and burns

1. Do not work under the attachment if it is not resting on the ground or supported.
2. Do not use any ropes or chains which are damaged or which have insufficient load bearing capacity.  
Wear protective gloves when handling wire ropes.
3. When working with the attachment, never align the boreholes with your fingers, instead, use a suitable mandrel for this purpose.
4. Make sure no objects come into contact with the fan when the engine is running.  
Objects which fall or project into the fan will be thrown back out or destroyed and could damage the fan.
5. When the machine is near operating temperature, the engine cooler system is hot and pressurised.  
Do not touch parts carrying cooling water.  
This can lead to burns.
6. Only check the coolant level once the cap on the expansion tank has cooled down enough to touch.  
Carefully open the cap to let out excess pressure.
7. When running at or near the operating temperature, the engine oil and hydraulic oil are hot.  
Avoid touching hot oil or parts which carry oil.
8. Wear goggles and safety gloves when working on the battery.  
Avoid sparks and naked lights.
9. Never let anyone move the bucket or other working attachments into position by hand.
10. Any time you open the engine compartment, prevent the compartment doors from falling shut using the struts provided.
11. Before starting up the machine, close and lock the engine compartment doors and the battery compartment cover.
12. Never lie under the machine when it is raised using the working attachment, unless the undercarriage is securely supported using wooden beams.
13. Avoid touching hot surfaces and liquids. This can lead to burns.

### 010.1.3 Instructions on preventing fires and explosions

1. When refuelling, the engine must be turned off. Switch off the auxiliary heater, if installed.

2. Do not smoke. Avoid naked flames when refuelling or where batteries are being recharged.
3. Always follow the instructions in the “**operating manual**” when starting the engine.
4. Check the electrical system.  
Immediately eliminate all faults such as loose connections, worn cables or burnt out fuses and bulbs.
5. Do not carry combustible fluids on the machine outside the tanks provided.
6. Regularly check all lines, hoses and bolted connections for leaks and damage.
7. Repair the leaks immediately and replace the damaged components.  
Oil escaping from leaks can easily cause fires.
8. Make sure that all brackets and protective plates are properly installed to prevent vibrations, abrasion and heat build-up.
9. Starting agent (ether) is a particularly dangerous fire hazard.  
Never use ether starting agent near heat sources, naked lights (such as cigarettes) or in poorly ventilated spaces.
10. Do not use starting agents containing ethers to start diesel engines with pre-glow or flame glow systems.  
Otherwise there is a risk of “**Explosion**” !
11. Familiarise yourself with the location and use of fire extinguishers and find out about fire alarm and firefighting facilities on site.

#### 010.1.4 Safety instructions for start-up

1. Each time you start up the machine, make a thorough tour of inspection.
2. Check the machine for loose bolts, cracks, wear, leaks and deliberate damage.
3. Never start up a damaged machine.
4. Make sure the damage is rectified immediately.
5. Ensure that all hoods and covers are closed and locked. Check that all the warning and instruction signs are in place.
6. Clean the windows and interior and exterior mirrors, and secure the doors and windows against inadvertent movement.
7. Make sure no-one is working on or underneath the machine. Warn any bystanders before you start up the machine.
8. After getting into the driver’s cab, adjust the seat, the inside and outside mirrors, the control lever and the seat belt so that you can work comfortably.
9. Sound insulation equipment on the machine must be in place during operation.

#### 010.1.5 Safety precautions during start-up

1. Before starting, check that all control lamps and instruments are working properly.
2. Move all control levers to neutral.
3. Before starting the engine, briefly sound the horn to warn anyone else in the vicinity of the machine.
4. Only start the machine when sitting in the driver’s seat.
5. Unless otherwise instructed, start the engine in accordance with the instructions in the “**operating manual**” .
6. Start the engine and then check all display and monitoring equipment.
7. Only run the engine in enclosed spaces when there is sufficient ventilation.  
If necessary, open the windows and doors to ensure adequate fresh air.
8. Run the engine until both it and the hydraulic oil are at operating temperature.  
Low oil temperatures lead to sluggish performance.
9. Check that the attachment controls are working properly.

10. Carefully drive the machine to open ground and check the service brake, the steering, the signals and lighting.

### 010.1.6 Instructions for safe working

1. Before starting work, familiarise yourself with the features of the site, as well as any special regulations and warning signals.  
The working environment includes obstacles in the working area and on access roads, the firmness of the terrain and any protective barriers to prevent the public from entering the site.
2. Always keep a safe distance from overhangs, drops, slopes and unsafe terrain.
3. Be especially careful with variable terrain conditions, poor visibility and changeable weather.
4. Find out where the supply pipes to the site are, and be especially careful when working near them. If necessary, notify the relevant authorities.
5. Keep a safe distance away from overhead power lines.  
When working near overhead power lines, keep the attachment well away from them.
  - There is a risk of “**fatal injury**” .
  - Find out about the safety clearances to be observed.

**If the machine comes into contact with live power lines:**

  - Do not get out of the machine.
  - If possible, move the machine to a safe distance away from the danger area.
  - Warn any bystanders not to approach or touch the machine.
  - Arrange for the power to be switched off.
  - Only get out of the machine when you are sure that the power line you have touched or damaged has been switched off.
6. Before driving or working with the machine, check that the accessories are safely stowed away.
7. When driving on public roads, paths and spaces, observe the traffic regulations, and make sure the machine is in a fit condition to use public roads if this is not already the case.
8. Always switch on the lights in darkness and poor visibility.
9. Do not take passengers on the machine.
10. Only work seated and wearing a safety belt.
11. Report any malfunctions and make sure that any necessary repairs are carried out immediately.
12. Take personal care to ensure that no-one is endangered when the machine starts moving.
13. Before starting work, check the brake system as instructed in the “**operating manual**” .
14. Never get out of the driver’s seat when the machine is still in motion.
15. Never leave the machine unattended with the engine running.
16. When driving the machine, lower the working attachment to the transport position and carry the load as close as possible to the ground.
17. Avoid movements which could cause the machine to tip over.  
If the machine does start to tip over or slide sideways, put down the attachment immediately and point the machine downhill.  
Wherever possible, work up or downhill and not sideways to the slope.
18. Drive carefully on rocky or slippery terrain and on slopes.
19. Only drive downhill within the permitted speed limit, otherwise you could lose control of the machine.  
The engine must be running at the rated speed and you should only reduce the travel speed using the pedals.