

## Operator's Manual

Hydraulic excavator  
R 944 C

from serial number 22 915

### Document identification

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### Product identification

**Manufacturer:** LIEBHERR France S.A.S.  
**Type:** R 944 C  
**Type no.:** 786 / 791 / 792 / 793 / 1000 / 1079 / 1119 / 1151 / 1284  
**Conformity:** CE

### Address

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# Performance

Liebherr crawler excavators feature state-of-the-art technology and high-quality workmanship. The most important components of the drive system are all produced by Liebherr factories and are perfectly coordinated to each other. The engine generation, as further developed for the “C-series”, assures an effective power delivery, a high degree of efficiency, long life expectancy and complies with the emission standard IIIA / Tier 3.

## High Productivity

### High digging and break-out forces

The R 944 C features high digging and break-out forces due to optimal attachment geometry. The remarkable forces are especially accomplished with the utilization of large-size stick and bucket cylinders.

### Regeneration Plus

The feature “Regeneration Plus“ guarantees quicker attachment lowering, less pressure loss and more safety. A high productivity is achieved due to the optimizing and consolidating of the functions “pressure-less lowering”, “regeneration” and “load holding valves” in connection with a high hydraulic output.

## Liebherr Engine Technology

### Liebherr Diesel Power

The 6-cylinder in-line engine, developed for the R 944 C with the new common rail injection assures an effective power output, a high efficiency and a long life expectancy.

Already at a low speed range the engine develops a high output and contributes substantially to the economical operation of the entire machine.

### Emission reduces combustion

The new engine generation with optimal performance density assures for a more environmentally-friendly fuel combustion. Higher ignition pressures and the newly designed injection technology guarantee the compliance with the emission standard IIIA / Tier 3.

### Heavy-duty undercarriage

- An extensive undercarriage selection for every application: mechanically or hydraulically adjustable, various track- gages and -lengths
- Combination of high-strength steel plates with steel castings for a smooth stress flow



### Multi-function tool carrier

- For every material and application the correct digging tool
- Change-over of mechanical and hydraulic tool in a matter of seconds due to a modular quick coupler system designed and manufactured by Liebherr:
- Likufix for the change-over of all hydraulic and mechanical tools from the dash board in the operator station
- Liebherr quick coupler adapter for the change-over of mechanical tools

# Lift Capacities

with Gooseneck Boom 6,45 m

## Stick 2,10 m

| Height (m) | Under-carriage | Radius of load from centerline of machine (m) |               |              |             |     |      |
|------------|----------------|---|---------------|--------------|-------------|-----|------|
|            |                | 3,0   | 4,5           | 6,0          | 7,5         | 9,0 | 10,5 |
| 12,0       | HD-S           |   |               |              |             |     |      |
|            | HD-SL          |   |               |              |             |     |      |
| 10,5       | HD-S           |   |               |              |             |     |      |
|            | HD-SL          |   |               |              |             |     |      |
| 9,0        | HD-S           |   |               |              |             |     |      |
|            | HD-SL          |   |               |              |             |     |      |
| 7,5        | HD-S           |   |               | 9,4# ( 9,4#) |             |     |      |
|            | HD-SL          |   |               | 9,4# ( 9,4#) |             |     |      |
| 6,0        | HD-S           |   |               | 9,9 ( 9,9#)  | 6,9 ( 8,9#) |     |      |
|            | HD-SL          |   |               | 9,9# ( 9,9#) | 7,5 ( 8,9#) |     |      |
| 4,5        | HD-S           |   | 14,3 (14,5#)  | 9,3 (11,0#)  | 6,6 ( 9,2#) |     |      |
|            | HD-SL          |   | 14,5# (14,5#) | 10,1 (11,0#) | 7,2 ( 9,2#) |     |      |
| 3,0        | HD-S           |   | 12,8 (17,2#)  | 8,7 (12,2#)  | 6,3 ( 9,8#) |     |      |
|            | HD-SL          |   | 14,1 (17,2#)  | 9,5 (12,2#)  | 6,9 ( 9,8#) |     |      |
| 1,5        | HD-S           |   | 12,0 (16,7#)  | 8,2 (12,9#)  | 6,0 (10,2#) |     |      |
|            | HD-SL          |   | 13,4 (16,7#)  | 9,0 (12,9#)  | 6,6 (10,2#) |     |      |
| 0          | HD-S           |   | 11,9 (17,2#)  | 7,9 (13,0#)  | 5,9 (10,0 ) |     |      |
|            | HD-SL          |   | 13,2 (17,2#)  | 8,7 (13,0#)  | 6,4 (10,0 ) |     |      |
| -1,5       | HD-S           | 16,2# (16,2#)                                 | 12,0 (15,7#)  | 7,9 (12,2#)  | 5,8 ( 9,5#) |     |      |
|            | HD-SL          | 16,2# (16,2#)                                 | 13,3 (15,7#)  | 8,7 (12,2#)  | 6,4 ( 9,5#) |     |      |
| -3,0       | HD-S           | 15,5# (15,5#)                                 | 12,2 (13,2#)  | 8,0 (10,4#)  |             |     |      |
|            | HD-SL          | 15,5# (15,5#)                                 | 13,2# (13,2#) | 8,8 (10,4#)  |             |     |      |
| -4,5       | HD-S           |   | 9,2# ( 9,2#)  |              |             |     |      |
|            | HD-SL          |   | 9,2# ( 9,2#)  |              |             |     |      |
| -6,0       | HD-S           |   |               |              |             |     |      |
|            | HD-SL          |   |               |              |             |     |      |

## Stick 2,60 m

| Height (m) | Under-carriage | Radius of load from centerline of machine (m) |               |              |             |              |      |
|------------|----------------|---|---------------|--------------|-------------|--------------|------|
|            |                | 3,0   | 4,5           | 6,0          | 7,5         | 9,0          | 10,5 |
| 12,0       | HD-S           |   |               |              |             |              |      |
|            | HD-SL          |   |               |              |             |              |      |
| 10,5       | HD-S           |   |               |              |             |              |      |
|            | HD-SL          |   |               |              |             |              |      |
| 9,0        | HD-S           |   |               |              |             |              |      |
|            | HD-SL          |   |               |              |             |              |      |
| 7,5        | HD-S           |   |               |              |             | 6,6# ( 6,6#) |      |
|            | HD-SL          |   |               |              |             | 6,6# ( 6,6#) |      |
| 6,0        | HD-S           |   |               | 9,2# ( 9,2#) | 7,0 ( 8,3#) |              |      |
|            | HD-SL          |   |               | 9,2# ( 9,2#) | 7,6 ( 8,3#) |              |      |
| 4,5        | HD-S           | 21,2# (21,2#)                                 | 13,3# (13,3#) | 9,5 (10,3#)  | 6,7 ( 8,8#) | 4,9 (6,3#)   |      |
|            | HD-SL          | 21,2# (21,2#)                                 | 13,3# (13,3#) | 10,3 (10,3#) | 7,3 ( 8,8#) | 5,4 (6,3#)   |      |
| 3,0        | HD-S           |   | 13,2 (16,2#)  | 8,8 (11,6#)  | 6,3 ( 9,4#) | 4,8 (7,9 )   |      |
|            | HD-SL          |   | 14,5 (16,2#)  | 9,6 (11,6#)  | 6,9 ( 9,4#) | 5,2 (7,9 )   |      |
| 1,5        | HD-S           |   | 12,2 (17,7#)  | 8,2 (12,6#)  | 6,0 ( 9,9#) | 4,6 (7,7 )   |      |
|            | HD-SL          |   | 13,5 (17,7#)  | 9,0 (12,6#)  | 6,6 ( 9,9#) | 5,1 (7,8 )   |      |
| 0          | HD-S           | 6,7# ( 6,7#)                                  | 11,8 (17,6#)  | 7,9 (12,9#)  | 5,8 ( 9,9 ) | 4,5 (7,6 )   |      |
|            | HD-SL          | 6,7# ( 6,7#)                                  | 13,1 (17,6#)  | 8,7 (12,9#)  | 6,4 (10,0 ) | 5,0 (7,7 )   |      |
| -1,5       | HD-S           | 14,6# (14,6#)                                 | 11,8 (16,4#)  | 7,8 (12,4#)  | 5,7 ( 9,7#) |              |      |
|            | HD-SL          | 14,6# (14,6#)                                 | 13,1 (16,4#)  | 8,6 (12,4#)  | 6,3 ( 9,7#) |              |      |
| -3,0       | HD-S           | 18,2# (18,2#)                                 | 12,0 (14,3#)  | 7,8 (11,1#)  | 5,8 ( 8,4#) |              |      |
|            | HD-SL          | 18,2# (18,2#)                                 | 13,3 (14,3#)  | 8,6 (11,1#)  | 6,4 ( 8,4#) |              |      |
| -4,5       | HD-S           | 13,1# (13,1#)                                 | 10,8# (10,8#) | 8,1 ( 8,2#)  |             |              |      |
|            | HD-SL          | 13,1# (13,1#)                                 | 10,8# (10,8#) | 8,2# ( 8,2#) |             |              |      |
| -6,0       | HD-S           |   |               |              |             |              |      |
|            | HD-SL          |   |               |              |             |              |      |

## Stick 3,30 m

| Height (m) | Under-carriage | Radius of load from centerline of machine (m) |               |              |             |            |      |
|------------|----------------|---|---------------|--------------|-------------|------------|------|
|            |                | 3,0   | 4,5           | 6,0          | 7,5         | 9,0        | 10,5 |
| 12,0       | HD-S           |   |               |              |             |            |      |
|            | HD-SL          |   |               |              |             |            |      |
| 10,5       | HD-S           |   |               |              |             |            |      |
|            | HD-SL          |   |               |              |             |            |      |
| 9,0        | HD-S           |   |               |              |             |            |      |
|            | HD-SL          |   |               |              |             |            |      |
| 7,5        | HD-S           |   |               |              | 7,2 (7,3#)  |            |      |
|            | HD-SL          |   |               |              | 7,3# (7,3#) |            |      |
| 6,0        | HD-S           |   |               |              | 7,1 (7,5#)  | 5,1 (5,7#) |      |
|            | HD-SL          |   |               |              | 7,5# (7,5#) | 5,5 (5,7#) |      |
| 4,5        | HD-S           |   |               | 9,4# ( 9,4#) | 6,8 (8,1#)  | 5,0 (7,3#) |      |
|            | HD-SL          |   |               | 9,4# ( 9,4#) | 7,3 (8,1#)  | 5,4 (7,3#) |      |
| 3,0        | HD-S           | 8,3# ( 8,3#)                                  | 13,6 (14,7#)  | 8,9 (10,8#)  | 6,4 (8,8#)  | 4,8 (7,6#) |      |
|            | HD-SL          | 8,3# ( 8,3#)                                  | 14,7# (14,7#) | 9,8 (10,8#)  | 7,0 (8,8#)  | 5,2 (7,6#) |      |
| 1,5        | HD-S           | 4,6# ( 4,6#)                                  | 12,4 (17,0#)  | 8,3 (12,0#)  | 6,0 (9,5#)  | 4,6 (7,7 ) |      |
|            | HD-SL          | 4,6# ( 4,6#)                                  | 13,7 (17,0#)  | 9,1 (12,0#)  | 6,6 (9,5#)  | 5,0 (7,7 ) |      |
| 0          | HD-S           | 8,5# ( 8,5#)                                  | 11,8 (17,6#)  | 7,8 (12,7#)  | 5,7 (9,9 )  | 4,4 (7,5 ) |      |
|            | HD-SL          | 8,5# ( 8,5#)                                  | 13,1 (17,6#)  | 8,6 (12,7#)  | 6,3 (9,9#)  | 4,8 (7,5 ) |      |
| -1,5       | HD-S           | 13,2# (13,2#)                                 | 11,6 (17,0#)  | 7,6 (12,6#)  | 5,6 (9,7 )  | 4,3 (7,4 ) |      |
|            | HD-SL          | 13,2# (13,2#)                                 | 12,9 (17,0#)  | 8,4 (12,6#)  | 6,1 (9,7 )  | 4,8 (7,5 ) |      |
| -3,0       | HD-S           | 18,7# (18,7#)                                 | 11,6 (15,4#)  | 7,6 (11,6#)  | 5,6 (9,0#)  |            |      |
|            | HD-SL          | 18,7# (18,7#)                                 | 13,0 (15,4#)  | 8,4 (11,6#)  | 6,1 (9,0#)  |            |      |
| -4,5       | HD-S           | 16,6# (16,6#)                                 | 11,9 (12,6#)  | 7,8 ( 9,6#)  |             |            |      |
|            | HD-SL          | 16,6# (16,6#)                                 | 12,6# (12,6#) | 8,6 ( 9,6#)  |             |            |      |
| -6,0       | HD-S           |   | 7,7# ( 7,7#)  |              |             |            |      |
|            | HD-SL          |   | 7,7# ( 7,7#)  |              |             |            |      |

## Stick 4,10 m

| Height (m) | Under-carriage | Radius of load from centerline of machine (m) |               |              |            |             |            |
|------------|----------------|---|---------------|--------------|------------|-------------|------------|
|            |                | 3,0   | 4,5           | 6,0          | 7,5        | 9,0         | 10,5       |
| 12,0       | HD-S           |   |               |              |            |             |            |
|            | HD-SL          |   |               |              |            |             |            |
| 10,5       | HD-S           |   |               |              |            |             |            |
|            | HD-SL          |   |               |              |            |             |            |
| 9,0        | HD-S           |   |               |              |            |             |            |
|            | HD-SL          |   |               |              |            |             |            |
| 7,5        | HD-S           |   |               |              |            | 4,3# (4,3#) |            |
|            | HD-SL          |   |               |              |            | 4,3# (4,3#) |            |
| 6,0        | HD-S           |   |               |              |            | 5,2 (6,2#)  |            |
|            | HD-SL          |   |               |              |            | 5,6 (6,2#)  |            |
| 4,5        | HD-S           |   |               |              |            | 6,9 (7,1#)  |            |
|            | HD-SL          |   |               |              |            | 7,1# (7,1#) |            |
| 3,0        | HD-S           | 20,2# (20,2#)                                 | 12,6# (12,6#) | 9,2 ( 9,6#)  | 6,5 (8,0#) | 4,8 (7,0#)  | 3,6 (4,8#) |
|            | HD-SL          | 20,2# (20,2#)                                 | 12,6# (12,6#) | 9,6# ( 9,6#) | 7,0 (8,0#) | 5,2 (7,0#)  | 4,0 (4,8#) |
| 1,5        | HD-S           | 9,4# ( 9,4#)                                  | 12,8 (15,4#)  | 8,4 (11,0#)  | 6,0 (8,8#) | 4,5 (7,4#)  | 3,5 (5,4#) |
|            | HD-SL          | 9,4# ( 9,4#)                                  | 14,1 (15,4#)  | 9,2 (11,0#)  | 6,6 (8,8#) | 5,0 (7,4#)  | 3,8 (5,4#) |
| 0          | HD-S           | 9,4# ( 9,4#)                                  | 11,8 (16,9#)  | 7,8 (12,0#)  | 5,7 (9,3#) | 4,3 (7,4 )  |            |
|            | HD-SL          | 9,4# ( 9,4#)                                  | 13,2 (16,9#)  | 8,6 (12,0#)  | 6,3 (9,3#) | 4,8 (7,5 )  |            |
| -1,5       | HD-S           | 12,2# (12,2#)                                 | 11,4 (17,0#)  | 7,5 (12,3#)  | 5,5 (9,5#) | 4,2 (7,3 )  |            |
|            | HD-SL          | 12,2# (12,2#)                                 | 12,7 (17,0#)  | 8,3 (12,3#)  | 6,0 (9,5#) | 4,6 (7,3 )  |            |
| -3,0       | HD-S           | 16,1# (16,1#)                                 | 11,3 (16,0#)  | 7,4 (11,9#)  | 5,4 (9,2#) | 4,2 (7,1#)  |            |
|            | HD-SL          | 16,1# (16,1#)                                 | 12,7 (16,0#)  | 8,2 (11,9#)  | 5,9 (9,2#) | 4,6 (7,1#)  |            |
| -4,5       | HD-S           | 19,5# (19,5#)                                 | 11,5 (13,9#)  | 7,5 (10,5#)  | 5,4 (7,9#) |             |            |
|            | HD-SL          | 19,5# (19,5#)                                 | 12,8 (13,9#)  | 8,3 (10,5#)  | 6,0 (7,9#) |             |            |
| -6,0       | HD-S           | 13,7# (13,7#)                                 | 10,3# (10,3#) | 7,6# ( 7,6#) |            |             |            |
|            | HD-SL          | 13,7# (13,7#)                                 | 10,3# (10,3#) | 7,6# ( 7,6#) |            |             |            |

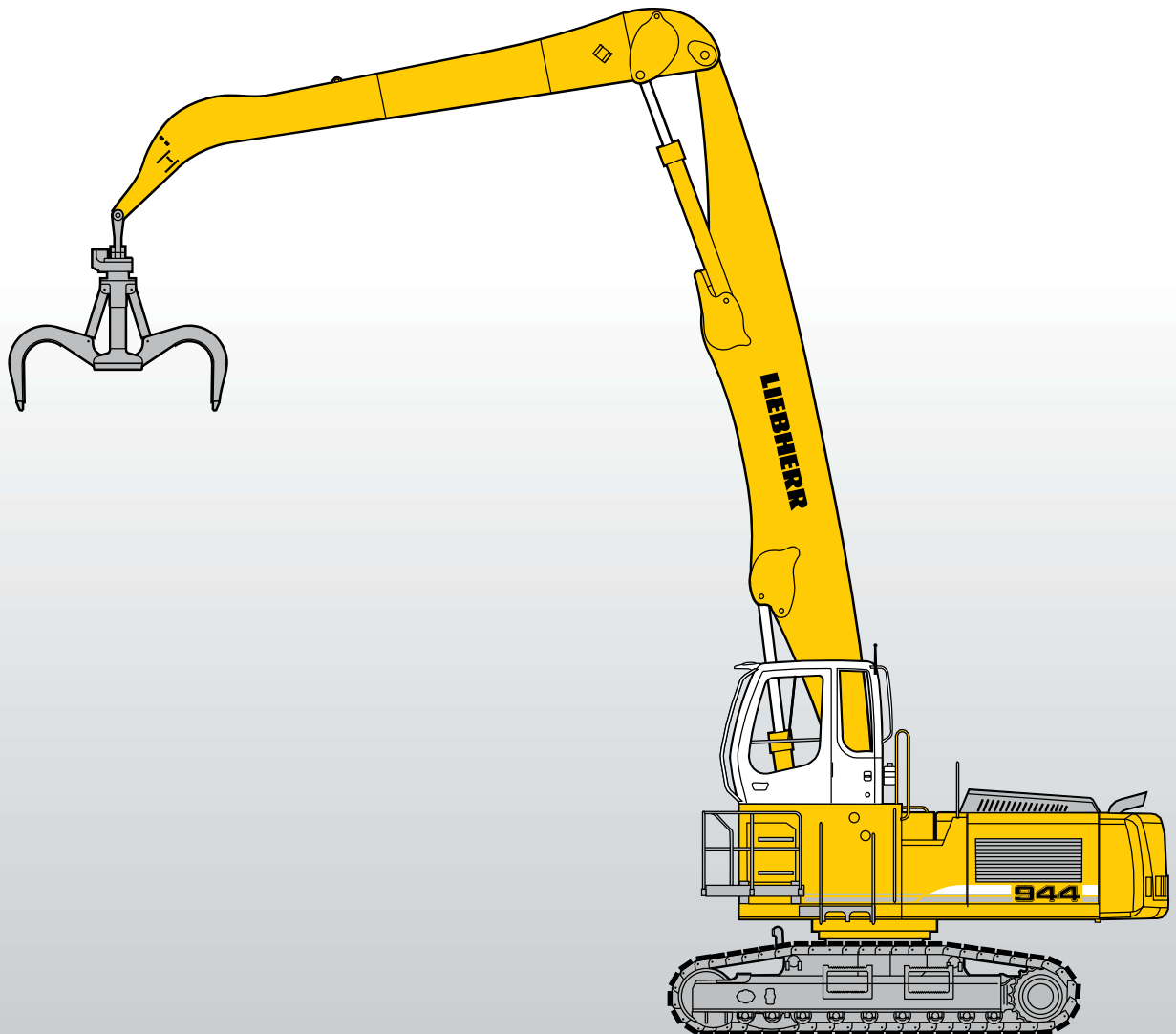
The lift capacities on the load hook of the Liebherr quick change adapter 66 without attachment are stated in metric tonnes (t), and can be lifted 360° on firm, level supporting surface. Values quoted in brackets are valid for the undercarriage when in longitudinal position. Capacities are valid for 600 mm wide triple grouser pads. Indicated loads are based on ISO 10567 standard and do not exceed 75 % of tipping or 87 % of hydraulic capacity (indicated via #). Maximum load for the quick change adapter's load hook is 18 t. Without quick change adapter the lift capacities will increase by 430 kg, without bucket cylinder, link and lever they increase by an additional 570 kg. Lifting capacity of the excavator is limited by machine stability, hydraulic capacity and maximum permissible load of the load hook.

According to European Standard, EN 474-5: In the European Union excavators have to be equipped with an overload warning device, a load diagram and automatic check valves on the hoist cylinders, when they are used for lifting operations which require the use of lifting accessories.

# Machine for Industrial Applications **R 944 C**

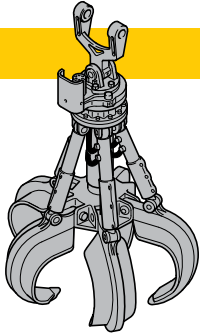
Litronic®

Operating Weight: 46,100 –47,100 kg  
Engine Output: 190 kW / 258 HP



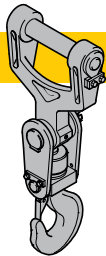
# LIEBHERR

# Variety of Tools



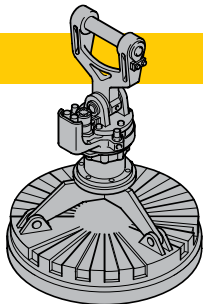
## Multiple Tine Grapples

|  |          | open tines     |      | semi-closed tines |      | closed tines |      |      |
|--|----------|----------------|------|-------------------|------|--------------|------|------|
| <b>Grapple Model 69</b><br>(4 tines)   | Capacity | m <sup>3</sup> | 0,80 | 1,10              | 0,80 | 1,10         | 0,80 | 1,10 |
|  | Weight   | kg             | 1345 | 1395              | 1535 | 1640         | 1900 | 2060 |
| <b>Grapple Model 70 C</b><br>(5 tines) | Capacity | m <sup>3</sup> | 0,80 | 1,10              | 0,80 | 1,10         | 0,80 | 1,10 |
|  | Weight   | kg             | 1485 | 1590              | 1705 | 1860         | 1950 | 1995 |



## Crane Hook with Suspension

|                        |    |      |
|------------------------|----|------|
| Max.load               | t  | 12,5 |
| Height with suspension | mm | 930  |
| Weight                 | kg | 96   |



## Electromagnets with Suspension

Magnet information on request

For further information see color brochure "Add-on tools for material-handling technology". To operate a magnet the installation of a generator is required; please contact your Liebherr dealer or the factory for further information.

- Repeated strikes against an object leads to damage to the steel structures and machine components.
- Please refer to your LIEBHERR dealer if special teeth for heavy-duty or special applications are required.
- Do not attach too large bucket or bucket with side cutters or that are during operations with rocky material. This would prolong the work cycles and may lead to damage to the bucket as well as further machine components.
- With the 2x45° offset articulation, the offset position may only be employed if the working tool or the attachment does not touch the material.
- Operation of the offset articulation to drill into the material is not permitted.
- Do not lift the machine during operation. Should this happen, lower the machine slowly back to the ground.
- Do not let the machine fall heavily on the ground and do not hold it back with the hydraulics. This would damage the machine.
- During operation with the attachment it is forbidden to raise the machine with the dozing blade (e.g. carving at the ceiling when tunnelling).

### **Safe use with a hydraulic hammer**

- The hydraulic hammer must be selected with particular care. When using a hydraulic hammer not permitted by LIEBHERR, steel structures or the other machine components can become damaged.
- Before beginning breaking tasks, position the machine on firm and level ground.
- Use a hydraulic hammer designed exclusively for breaking stone, concrete and other breakable materials.
- Only operate the hydraulic hammer in the longitudinal direction of the machine and with the windshield closed or with a front protective grid.
- Ensure during hammer operation that no cylinder is entirely extended or retracted and that the stick is not in the vertical position.
- In order to avoid damages to the machine, try not to break stone or concrete while performing retraction and extension motions of the hydraulic hammer.
- Do not apply the hydraulic hammer uninterrupted for more than 15 secs. at a time to the same place. Change the breaking point. Too long uninterrupted operation of the hydraulic hammer leads to an unnecessary overheating of the hydraulic oil.
- Do not use the drop force of the hydraulic hammer to break stone or other materials. Do not move obstacles with the hydraulic hammer. Misuse of this nature would damage both the hammer and the machine.
- Do not use the hydraulic hammer to lift objects

### **Safe use when loading and unloading (particularly when loading and unloading wood)**

- According to use, it can be necessary when working with a grab to move with the equipment raised and the load lifted up; this applies, for example, when loading and unloading wood.

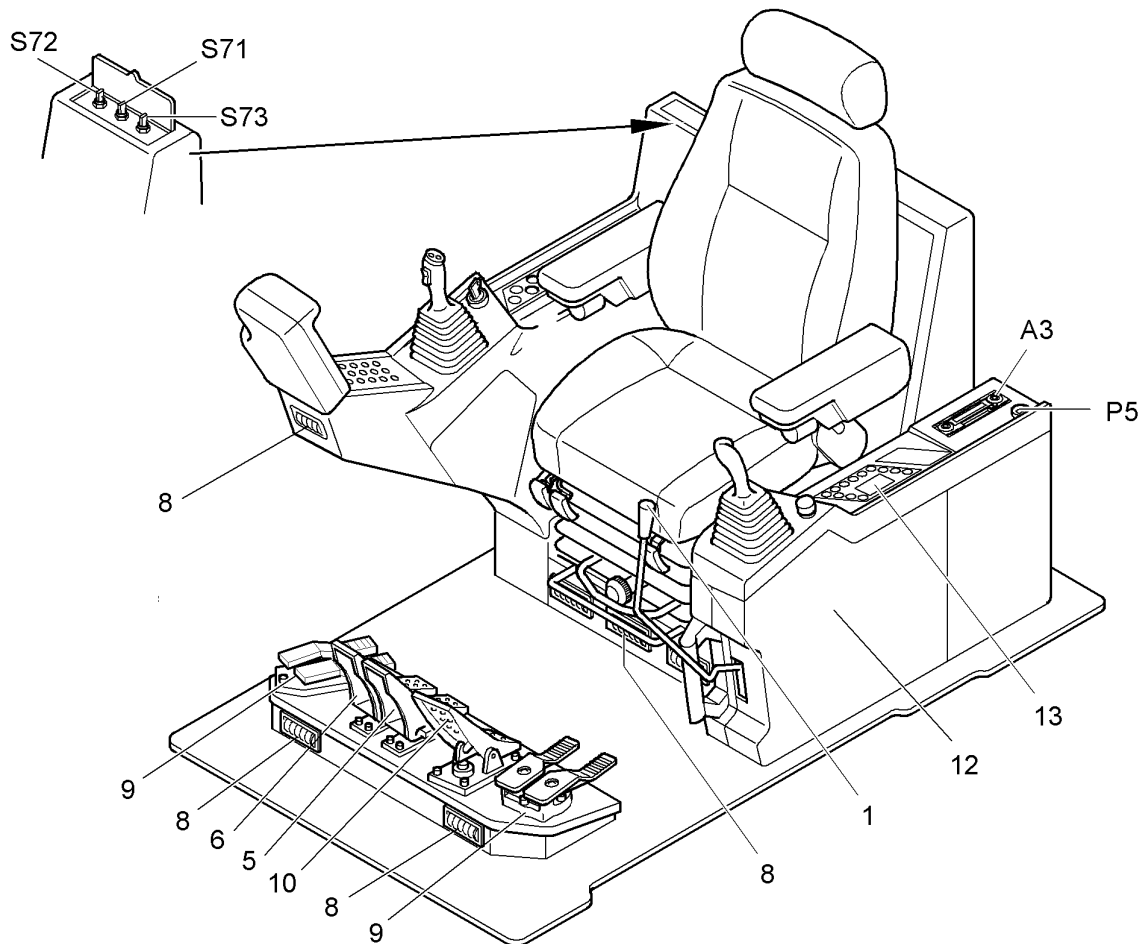
## Hydraulic hoses and sheathed cables.

- It is forbidden to carry out repair work on hydraulic hoses and sheathed cables!
- All hoses, sheathed cables and bolt connections must be checked regularly every 2 weeks for externally visible damage and any possible damage must be immediately checked for leakage.
- Never check for leaks with your bare hands, use a sheet of paper or something else.
- Any damaged parts must be removed immediately! Spurting oil can lead to injury and burns.
- Even with correct storage and permitted load, hoses and sheathed cables are subject to the natural aging process. This restricts their duration of use.
  - Incorrect storage, mechanical damage and unauthorized load are the most common causes of failure.
  - In relation to duration of use, current norms, regulations and guidelines pertaining to hoses and sheathed cables at place of use must be adhered to.
  - Use at the limit range of permissible load can shorten duration of use (e.g. high temperatures, frequent movement cycles, extremely high pulse frequencies, multiple shift usage).
- Hoses and sheathed cables should be replaced if the following are found during inspection:
  - Damage to the outer sheath as far as the liner (e.g. chafing, cuts and cracks);
  - Brittleness of the outer sheath (fracture formation in hose material);
  - Deformations which do not correspond to the natural form of the hose or sheathed cable, whether in a unpressurized or pressurized state or on bends e.g. sheath separation, blistering;
  - Unsealed areas;
  - Non-adherence to requirements during installation;
  - Damage or deformations to the hose fittings which reduce the tightness of the fittings or the hose / fitting connection;
  - Hoses working themselves out of the fittings;
  - Corrosion of the fittings which reduces function and tightness;
- When replacing hoses and sheathed cables, use only original replacement parts.
- Install and mount hoses and sheathed cables correctly. Do not mix up the connections.
- The following is to be noted when replacing hoses and sheathed cables:
  - Always ensure that the hoses and sheathed cables are installed free of torsion. For high-pressure hoses, the screws from the half-clamps or full flange must always be attached to both hose ends and should only be tightened afterwards.
  - When tightening the flange on high-pressure hoses and sheathed cables with bent fittings, the side with the bent fitting must always be tightened first and then the side with the straight fitting tightened afterwards.
  - Any mounting clamps which are located in the centre of the hose may only be attached and tightened subsequently.
  - Check daily to ensure that all clamps, covers and protective devices are properly fastened. Doing this will prevent vibration and damage during operation.
  - Install the hoses and sheathed cables in such a way that they cannot chafe on other hoses, sheathed cables or parts.
  - A minimum distance from other parts of approx. half the exterior diameter of the hose is recommended. The distance should not, however, be less than 10 to 15 mm.
  - When replacing the hoses or sheathed cables on moving parts (e.g. from the boom to the stay), check before initial start-up that there are no chafing areas in the entire area of movement.

## 3 Control and operation

### 3.1 Operating and control elements

#### 3.1.1 Overview of the operator's standing position



**Fig. 3-1** Operator's standing position

|           |   |            |  |
|-----------|---|------------|--|
| <b>1</b>  | Servo control safety lever                | <b>13</b>  | Heating/air-conditioning system            |
| <b>5</b>  | Pedal for left drive unit                 | <b>A3</b>  | Radio (optional extras)                    |
| <b>6</b>  | Pedal for right drive unit                | <b>P5</b>  | Operating hours counter                    |
| <b>8</b>  | Air vent, heating                         | <b>S71</b> | Automatic / manual speed adjustment switch |
| <b>9</b>  | Equipment operation (optional extras)     | <b>S72</b> | + / - speed switch                         |
| <b>10</b> | Positioning swing brake (optional extras) | <b>S73</b> | Emergency operation switch                 |
| <b>12</b> | Fuse box                                  |            |  |

## Area A : Analog-value display



### P2 – Diesel engine coolant temperature display

The display must be in the green area when operating the machine.

In the event of overheating (over 100 °C / 212 °F during more as 3 seconds), the red LEDs **P2.1** at the end of indicator **P2** light up.

Simultaneously, the buzzer in the cab also sounds and the error will be saved as error code **E 503**.

The engine power is automatically reduced.

- ▶ Stop working as soon as possible.
- ▶ Allow the engine to continue to idle high.
- ☐ If the alarm warning exceeds 60 seconds.
- ▶ Allow the engine to low idle for another 3 to 5 minutes.
- ▶ Switch off the engine.
- ▶ Find and correct the cause of the problem.
- ☐ If the overheating is stronger (over 104 °C / 219 °F during more as 7 seconds), the corresponding symbol is displayed on the main screen and the error will be saved as error code **E 523**.
- ▶ Switch off the engine immediately.



### P3 – Fuel level display

The display's illuminating LEDs indicate the amount of fuel remaining in the tank.

When the red LEDs **P3.1** illuminate, a reserve quantity of 10-20% is still in the tank, depending on the type of machine.

## Area B :Indicator lights



### H2 – Indicator light, low engine oil pressure

The indicator light illuminates if the engine oil pressure drops below a given value during more than 3 seconds when the machine is operating.

The buzzer in the cab also sounds.

When this indicator light illuminates, the error will be saved as error code **E 501**.

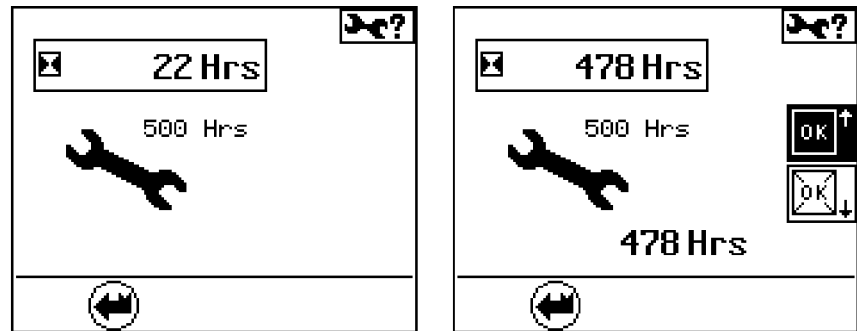
- ▶ Bring the engine to a low idle immediately.
- ▶ Switch off the engine immediately.
- ☐ If the pressure remains too low for 5 other seconds, the corresponding symbol is displayed on the main screen and the error will be saved as error code **E 522**.
- ▶ Find and correct the cause of the problem.

**To exit the menu:**

- ▶ Press the **Back** key.
  - ↳ The sub-menu will be aborted.

**Menu "Set Service" - confirmation of the execution of a recurring service work**

This menu gives information about the falling due of the next service work and allows to confirm the execution of the service work after it just has been carried out.



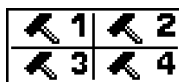
**Fig. 3-12** Menu "Set Service"

The operating hours of the next service due (in this example, "500 Hrs") and the current operating hours ("478 Hrs") are displayed in the menu.

An upcoming service work can be confirmed a maximum of 50 operating hours before the service interval is due.

When this time period has been reached a query will appear to ask whether the service work has been carried out.

- If the service work has been carried out.
  - ▶ Press the **Up** arrow key.
    - ↳ The choice "OK not crossed out" will be displayed with a black background.
  - ▶ Press the **Menu** key.
    - ↳ The current operating hour will be stored as the time for the last carrying out of a recurring service work.
    - ↳ The operating hours indicating the next service due will be increased by the duration of a service interval (as an example they augment from 500 to 1000 working hours).
- If the service work has not been carried out.
  - ▶ Press the **Back** key.
    - ↳ The sub-menu will be aborted.

**Menu "Set option" - selection of the flow and pressure limitations**

This menu allows to allocate flow and pressure limitation options to external input I1 (choice of the maximum oil flows and system pressure depending on the mounted working tool).

In this menu, the operator can choose between 10 predefined options. For each option a pressure limitation and a flow limitation is assigned. When an option is chosen, the limitation values assigned to this option are effective as soon as the command of the optional tool is actuated (actuation of the foot pedal for hammer or grapple for example).

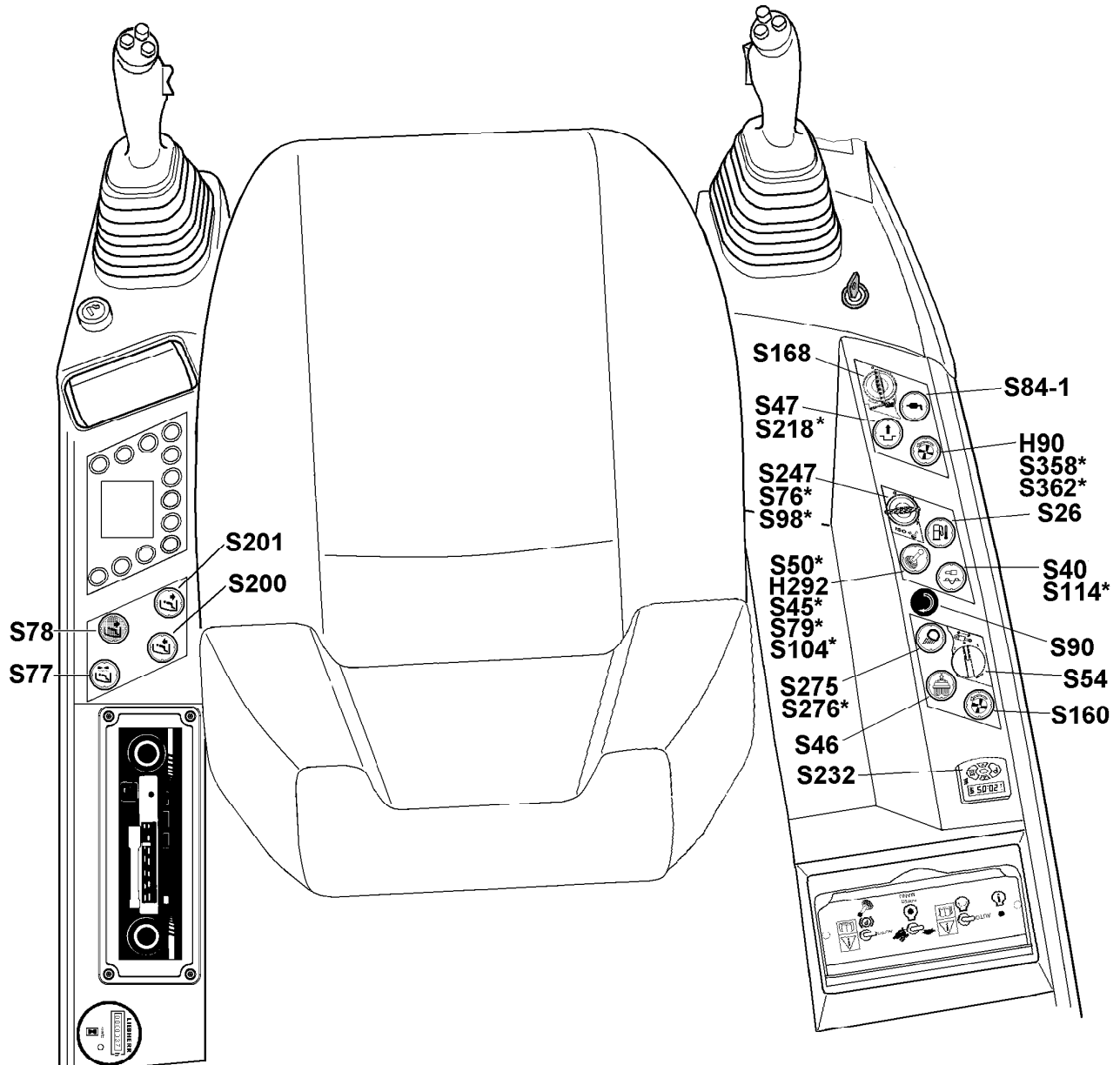
**Note !**

To start in bleeding mode is preconised only in case of running with fuel tank empty or in case of emptying of the fuel system.

When starting in mode "Purge", the engine will emit black smoke.

As soon as the engine rpm reaches 800 rpm, the menu "purge" is not accessible any more.

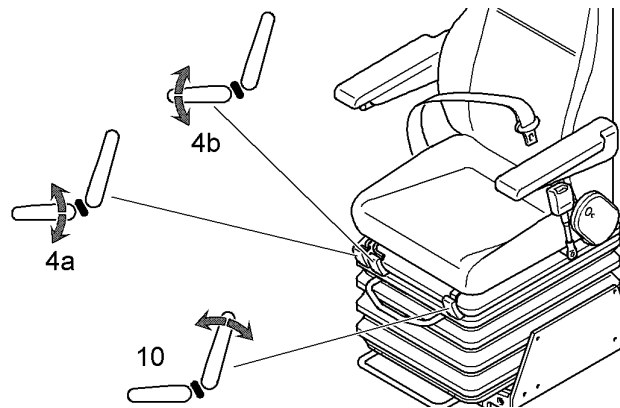
### 3.1.6 Controls and instrumentation for optional equipments



**Fig. 3-29** Controls for optional equipments

\* The location of these controls may be different, depending on the type of the other installed optional equipments.

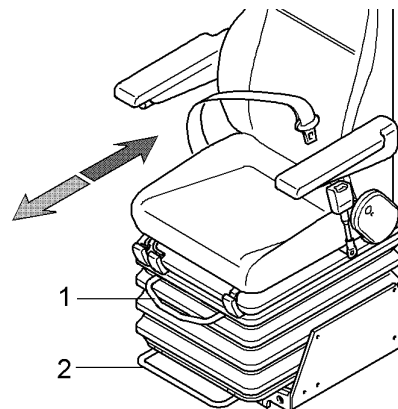
### Setting the seat and backrest



**Fig. 3-37** Setting the seat and backrest

- ▶ Rear seat inclination: Pull lever **4a** up, set the inclination and release the lever.
- ▶ Front seat inclination: Pull lever **4b** up, set the inclination and release the lever.
- ▶ Backrest: Pull lever **10** up, set the inclination and release the lever.

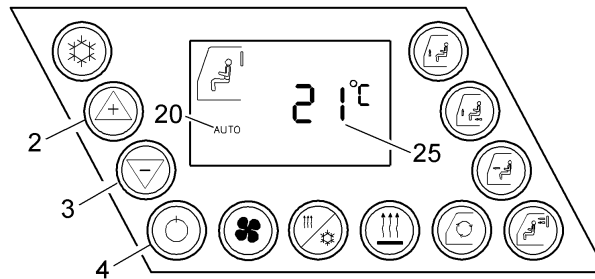
### Setting the horizontal seat position



**Fig. 3-38** Setting the horizontal

- ▶ Pull up the lever **1** to push the operator's seat in the horizontal direction.
- ▶ Pull up the lever **2** to push the operator's seat and control panels in the horizontal direction.

## Turning the control unit on



**Fig. 3-50** Turning the control unit on and setting the cab temperature

- ▶ Turn the system on using the key 4.
  - ↳ The software version will be displayed for approx. 12 seconds while the control unit carries out a self test.

The heating and the ventilation of the cab are operating. The heating output and the fan speed will be controlled automatically if the **AUTO** symbol (**20**) is displayed.

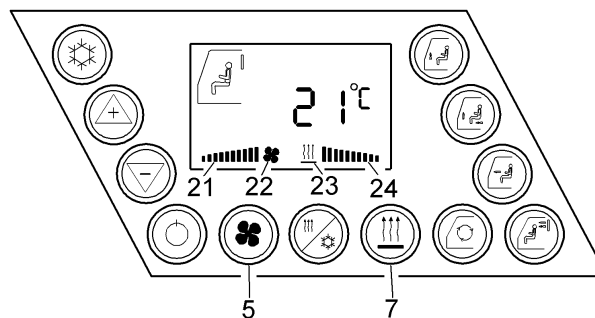
## Setting the desired cab temperature

The four-digit segment indicator **25** shows the desired cab temperature.

- ▶ Use the key **2** to increase the temperature.
- ▶ Use the key **3** to reduce the temperature.

The adjusted temperature will remain until the next change via keys 2 and 3 is made.

## Manual setting of the heating output



**Fig. 3-51** Setting of the heating output and of the fan speed

- ▶ Press the key **7** to adjust the heating output manually.
  - ↳ the heating symbol **23** is displayed and will flash for 5 seconds.
  - ↳ the bar graph **24**, showing the adjusted heating output, is displayed.
- ▶ As long as the heating symbol **23** is flashing, the heating output can be increased or reduced manually using the keys **2** or **3**.
- ▶ Press the key **7** again, to return to automatic operation.
  - ↳ the symbols **23** and **24** will go off, the symbol **20** is displayed again.

## Manual setting of the fan speed

- ▶ Press the key **5** to adjust the fan speed manually.
  - ↳ the fan symbol **22** is displayed and will flash for 5 seconds.
  - ↳ the bar graph **21**, showing the adjusted fan speed, is displayed.

### 3.3.1 Before starting the machine

#### General information

**Note!**

When using the machine at a specific height above sea level and in connection with certain outside temperatures, the performance and service life of the Diesel engine with turbocharging is decisively affected.

Under these conditions, there is also an increased risk of the coolant circuit and the hydraulic oil overheating.

On this machine, the maximum power of the LIEBHERR Diesel engine is automatically reduced by the electronic engine controller when operating in the above mentioned conditions (sea level and exterior temperature).

#### Activities before starting

**Caution!**

It is only possible to extinguish a source of fire if it is accessible.

- ▶ Before starting, unlock all locks on the panelling of the hydraulic excavator.
  - ↳ In the event of fire, the doors can be opened immediately and the fire extinguished.

Arrangement of locks: see Maintenance chapter

**Caution!**

With the activities referred to below, a machine that is already warm from operating, there is a risk of scalding or burning from hot coolant or oil.

- ▶ Please ensure that you read the information provided in the Maintenance chapter on carrying out these activities.

Before starting the machine, the following activities should be carried out on a daily basis:

- Check the oil level in the engine\*.
- Check the coolant level in the diesel engine\*.
- Check the oil level in the hydraulic tank\*.
- Drain the fuel system, if required\*.
- If required, remove any ice and snow from the engine hood in the area of the cooling and combustion air intake.

\* For how to carry out the activities, see the Maintenance chapter.

- ▶ Insert the code key **1** in the code lock **S74** and then remove.
  - ↳ The LED goes out.
  - ↳ A signal tone sounds.
- ▶ The anti-theft device is activated.
- ▶ You have 9 seconds to start the electrical system with the ignition key.

If the ignition is not switched on within 9 seconds, the code key will have to be reinserted in the code lock.

When the ignition is switched off, the anti-theft device activates itself automatically after 30 seconds.

- ▶ To reorder the code key, give the code number entered on the accompanying code card (credit card format).

### 3.3.11 Immobilizer with electronic ignition key (option)

#### System description

The system consists of a mechanical locking system and an independently functioning, electronically coded, immobilizer.

When activated, the electronically coded immobilizer disconnects the starting and main control circuits of the machine.

The control of the immobilizer is microcomputer based. The electronic key of the immobilizer is a transponder, which is securely integrated into the key handle.

#### Activation of the immobilizer

- ▶ Turn the key in "0" position.
  - ↳ the immobilizer will be automatically activated after 5 seconds.
- ▶ Pull the key away from the ignition switch.



#### Note!

The immobilizer is activated and will stay activated, as long as the key stays in position '0', no matter if the key remains inserted or is pulled out of the switch.

#### Deactivation of the immobilizer

- ▶ Insert the key into the ignition switch and turn it to the contact position "1".
  - ↳ the immobilizer is deactivated.



#### Note!

Reading of the transponder will only take place when the mechanical key in the starting switch has made alive the control circuit of the machine (24V on clamp 15). This makes it necessary to first open the mechanical locking system before the electronic key is checked.

Thus, the immobilizer cannot be manipulated as long as the ignition is turned off.

## Repair and maintenance



### Danger!

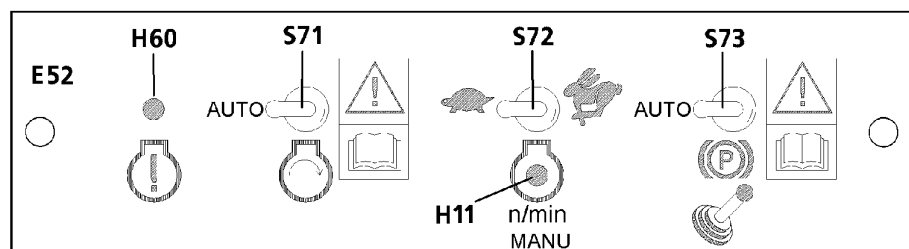
Repair and maintenance work on the cab, lifting frame or on the related hydraulics system should be carried out – as far as possible – with the cab lowered.

- ▶ For repair and maintenance work which can only be carried out when the cab is raised, the cab should be supported by equipment which is suitable for this purpose.

## 3.4 Operating the excavator in safety modes

### 3.4.1 Board E52 for safety mode of Diesel engine & servo control

The safety board E52 is situated at the rear end of the right side control desk. Thanks to this printed board, the excavator can, in case of a failure in the main electronic circuit, be maintained operating temporarily and with some restrictions.



**Fig. 3-75** Control board for safety operation E52

|            |   |            |  |
|------------|---|------------|--|
| <b>E52</b> | Printed board for safety operation  | <b>S71</b> | Switch / engine start in safety mode           |
| <b>H11</b> | Warning light / Diesel engine in safety mode                                | <b>S72</b> | Switch / RPM selection in safety mode          |
| <b>H60</b> | Warning light / operating error on Diesel engine with safety mode turned on | <b>S73</b> | Switch / servo pressure circuit in safety mode |

### Starting the Diesel engine in safety mode

In normal operation, the engine is started via the main electronic circuit when the ignition key is turned to start position.

In case the engine can no longer be started or kept running due to troubles in the control electronics, it can be started in safety operation via the starting switch S71

- ▶ Turn the ignition key in start position and at the same time push the safety start switch S71 to the right.
- ▶ Keep the switch pushed to the right until the engine starts
  - ↳ The warning light **H11** turns on.
  - ↳ The symbol **S71a** is displayed on the screen.
  - ↳ The engine is now operating in safety mode.



- Check the maintenance status of the machine, particularly with respect to: tyre pressure, brakes, steering, mechanical connections etc.
- Do not steer, brake, accelerate, shift gears, move or load the machine's equipment jerkily.
- To reduce vibrational load, adjust the machine speed to suit the route as follows:
  - Reduce speed when driving on difficult terrain;
  - Drive around obstacles and avoid driving on very difficult terrain.
- Keep the terrain on which the machine is working and driving in good condition:
  - Remove large stones and obstacles;
  - Fill in ruts and holes;
  - Have machines ready to prepare and maintain suitable ground conditions and calculate in sufficient time to carry out any work required.
- Drive longer distances (e.g. on public roads) at an appropriate (medium) speed.
- Use special auxiliary systems (if available) which reduce vibration for machines that are driven frequently.  
If such auxiliary systems are not available, regulate speed to avoid "oscillating" the machine.

### 3.6.1 Low idle automatic

This device automatically reduces the engine speed to idle after several seconds if no hydraulic functions are activated by the joystick or the pedals. This saves fuel and reduces the amount of noise. Touching the joystick or operating the pedals takes the engine speed back to its original level.



Automatic idling is started by pressing switch **S20**.

- ▶ Press switch.
  - ↳ Low idle automatic is activated.
  - ↳ LED in switch illuminates.
- ▶ Press switch again.
  - ↳ Low idle automatic is deactivated.
  - ↳ LED in the switch goes out.

**To set the time within which the engine is set back to idle after the joystick has been released:**

- ▶ Press and hold switch.
  - ↳ LED in the switch flashes.
- Desired time span is reached.
- ▶ Release the switch.
  - ↳ LED in switch illuminates.
  - ↳ Low idle automatic is activated.

In each case, when a hydraulic function is activated, the speed which was previously set using the electrical speed adjustment function will be reset automatically.



#### Caution!

Low idle automatic must be switched off when starting the diesel engine and when driving on gradients. The LED in the switch must not illuminate.



When the machine is operated with a special equipment, it may be necessary to previously select the appropriate option in the menu "set option" (depending on the function and/or the size of the auxiliary user). This selection of the pumps parameters determines pressure and oil flow adjustment in the hydraulic circuit.

- ▶ Check, and if necessary correct the selection of the pumps parameters before you start working with a special equipment.



#### Caution!

A wrong choice of the option could lead to damage or unsatisfactory operation of the additional equipment due to inadequate pressure and/or oil flow in the circuit.



#### Notice!

The choice of an option does neither have an influence upon the allocation of the pedals, nor lead to the switching-off of pedal function.

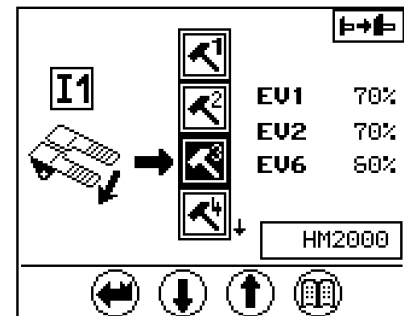
## Control of the hydraulic hammer

The hydraulic hammer is always controlled by the pedal 9m.

The operation of a hydraulic hammer requires the previous selection of the correct pump parameters option which has been allocated to this hammer, using the menu "Set Option" of the display.

Normally the designation appearing in the lower right corner of the screen must correspond to the definition of the installed hammer.

In case of a doubt, contact your supervisor to obtain this information.



- ▶ Push down the foot pedal 9m.  
↳ The hydraulic hammer is activated.

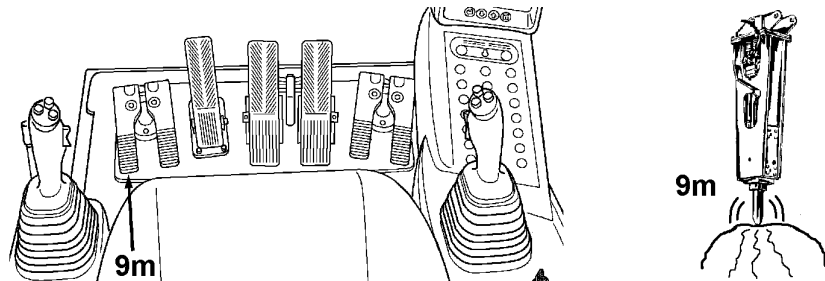


Fig. 3-93 Control of a hydraulic hammer



#### Note!

If the machine is used frequently or for long periods for hammer work, there is a risk that the hydraulic oil is contaminated more than in usual conditions.

- ▶ Reduce the maintenance intervals for hydraulic oil and return filter cartridges changes to suit the recommendations for working in heavy dust conditions.

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With the specified load, the machine can be rotated from 360° on even and horizontal ground.

## Using the overload warning device



### Danger!

When carrying out load hoisting work with the machine, the relevant accident prevention precautions are to be observed.

The overload warning device does not shut down the machine if the permissible load torque is exceeded. The operator of the machine will only be informed of the situation.

### Mode of operation

The overload warning device comprises a constant pressure switch which is connected to the piston of the boom hydraulic cylinders.



If the load pressure in the boom hydraulic cylinders reaches the level of the shift pressure, the pressure switch emits a signal, the warning symbol appears on screen and the buzzer sounds.

The shift pressure in the pressure switch is selected in such a way that the stability factors can be maintained even if in an unsupported state (small stationary torque).

### Starting the overload warning device



### Danger!

No load hoisting work may be carried out if the overload warning device is defective.

- ▶ Have the overload warning device repaired by a professional.



- ▶ Press switch **S18**.
  - ↳ Overload warning device is activated.
  - ↳ LED in switch illuminates.

### The operator must check the function of the overload warning device before each work shift.

- ▶ To check the overload warning device, extend the boom hydraulic cylinders to the stop.
- ▶ Push the joystick further in the direction Raise boom.
  - ↳ The warning symbol must illuminate.
  - ↳ The buzzer must sound.



### Caution!

This is only a functional test of the warning system (qualitative test), but it does not mean that the adjustment is correct.

For this reason, the overload device must in addition be checked by a professional in accordance with the testing and setting information provided in the service manual (quantitative test):

- before the first use of the overload warning device,
- each time it is required by the locally applying regulation for lifting operation.

- ▶ Connect hydraulic hose **11** and hydraulic hose **12** for the shell cylinder supply to the pipes for the shovel tilting cylinder.
- ▶ For a grab with a hydraulic torsional mechanism, also connect hoses **13** and **14** to the pipes for this auxiliary device.

### Operating the grab

- ▶ Carry out all work movements several times without a load (open and close the shell or move the grab to the left and to the right) so that any air that may be present in the hydraulic circuits can escape.

### Dismounting the grab

- ▶ Set the grab down onto level ground with the shell fully opened.
- ▶ Turn off the engine and, with the ignition key in the contact position, push the right joystick (for Open and Close grab) briefly to the left and then to the right in order to remove the pressure in the hydraulic circuits.
- ▶ To relieve the grab's torsional mechanism, press the two pushbuttons in the left (or left and right – optional extras) joystick for "Turn grab".
- ▶ Separate hydraulic hose **11**, hydraulic hose **12** and, if present, hydraulic hoses **13** and **14** from the pipes on the shovel arm.
- ▶ Close open lines immediately to prevent any dirt entering.
- ▶ Support the grab so that it is stable.
- ▶ Unscrew disk **6** and knock bolt **4** carefully out. You may have to start the engine and raise the equipment slightly to do this.



### Symbol "Quick change adapter"

The symbol appears:

- during the locking process or
- when the locking pins are retracted.

### Two-hand operation

The quick-change adapter is activated using two-hand operation. The locking pins can only be moved at first if button **S47** and one of the pushbuttons **L** or **R** are pressed.

The control has a hold function which allows both joysticks to be operated simultaneously when attaching and dismantling work tools. If one of the pushbuttons, **L** or **R** is continued to be pressed, button **S47** can be released and the direction of movement of the locking pins is retained.

If the direction of movement is to be changed, button **S47** and the relevant pushbutton **L** or **R** must be pressed.



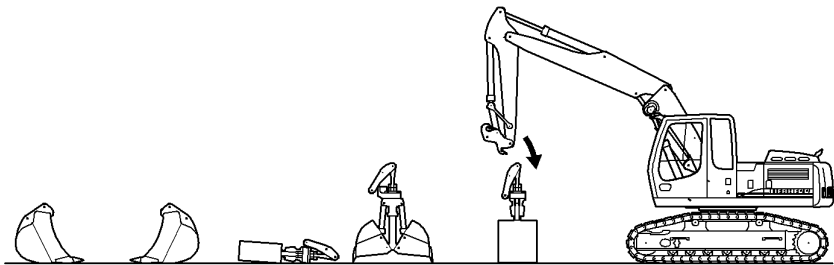
### Caution !

The extension of the locking pins (locking of the coupler) is possible even without depressing **S47**.

However this must be absolutely avoided since it causes a quick wear of the sealing rings in the LIKUFIX hydraulic coupling system.

### Attaching the work tool

To move the equipment into position:



**Fig. 3-117** Positioning the equipment

- ❑ The equipment must be standing stable or lay loose on the ground.
- ▶ Move the stanchion and work tool into position.
- ▶ Insert the shovel tilting cylinder fully.

To unlock the quick-change adapter:

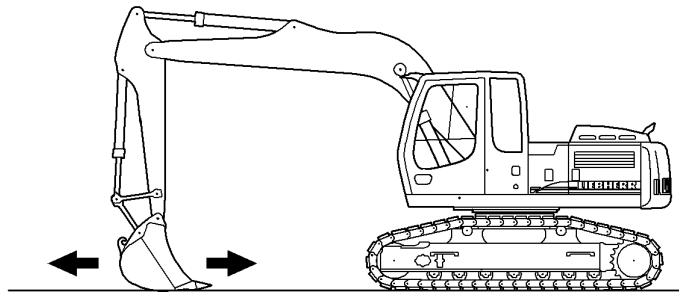
- ▶ Press switch **S19**.
  - ⚡ Quick-change adapter is activated.
  - ⚡ LED in switch illuminates.
- ▶ Press and hold button **S47**.
  - ⚡ Quick-change adapter is activated.
- ▶ Press and hold pushbutton **R** until the locking pins are fully inserted.
  - ⚡ The buzzer sounds.
  - ⚡ The symbol "Quick changer" appears on screen.
  - ⚡ The quick-change adapter is unlocked.



- ▶ Distribute the grab material evenly over the loading area of the transport vehicle by slewing the backhoe bucket and the stick out, slewing the upper carriage and possibly also moving the boom.
- ▶ If the backhoe bucket is not sufficiently emptied or there is still grab material in the backhoe bucket, slew the backhoe bucket in and out several times to loosen the grab material.

### 3.8.5 Skimming

Skimming work can either be carried out using the bucket or with a skimming shield (optional extra).



**Fig. 3-130** Skimming

- The machine must be in the working position.
- The support should be raised.



#### **Danger!**

Serious risk of injury when moving the machine.

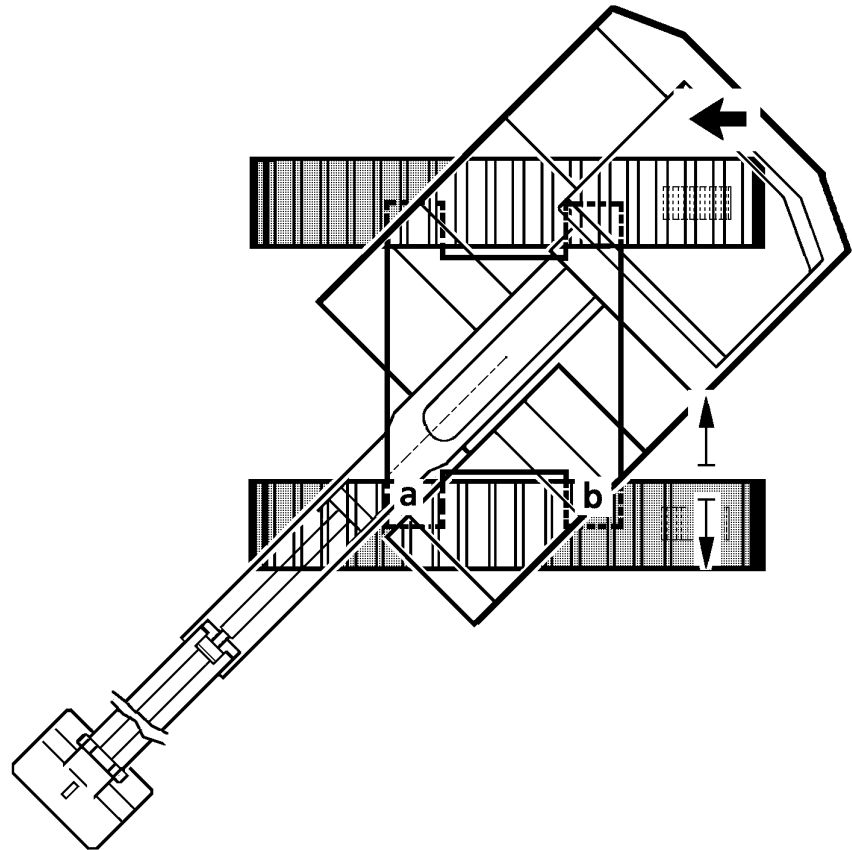
- ▶ Ensure that nobody is standing within the working area of the machine.



#### **Caution!**

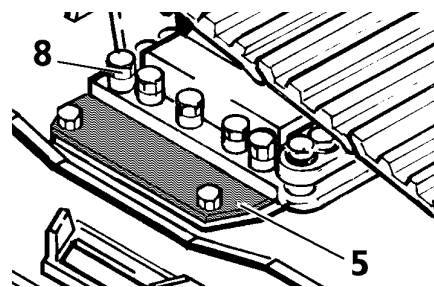
The machine could be damaged.

- ▶ Never move the machine while the work equipment is touching the ground.
- ▶ To skim with a backhoestick bucket, lay this on the ground (siehe Fig. 3-130) and move the stick slowly forwards and backwards. Move the boom steadily up and down while the stick is moving.
- ▶ If a skimming shield is present (optional extra), lower it to the ground and move slowly forwards and backwards with the machine.



**Fig. 3-143** Moving out the side frame on sprocket wheel side (rear side)

- ▶ Attach the mounting screws, but do not yet tighten them. If all the screws cannot be inserted by hand, then insert first the 2 or 3 mountingscrews on the rear or on the front mounting point all the way (but do not tighten them yet) and then move the side frame in or about a little so that the screws can be inserted easily.
- ▶ Tighten all the mounting screws (1 0 per mounting point in extended position) to the specified tightening torque.



**Fig. 3-144** Attach protective covers to side frames



**Caution!**

After moving out the side frames into extended position, the uncovered parts of the sliding surfaces on both side frames must be coated with grease and then protected using the 4 covers 5 which are delivered with the machine.

The mounting bolts 8 and their sleeves which are not used with the side frames in extended position must be stored in the tool box of the machine.

To ensure a maximum stability of the excavator, only operate it with the side frames in extended position!

## 4 Malfunctions

### Warning messages and fault messages:

- Various faults are displayed on screen in the form of indicator lights or symbols (see chapter “Control and operating elements”).
- Warning functions can also be supported acoustically (buzzer).

### Identifying and rectifying faults and errors:

- Faults can very often be traced back to incorrect operating or maintenance of the machine.

**For each fault, therefore, read the relevant chapter in the operating instructions carefully once more.**

- Analyse the cause of the fault and rectify it immediately.
- Describe the fault and all accompanying circumstances as precisely as possible if you contact LIEBHERR customer service.




Precise information makes it possible to find and rectify the cause of the fault quickly. Additionally, therefore, precise information on the type and serial number of the machine is also required.

- Do not carry out any work which you have not been trained to do.






*Fig. 4-1 LIEBHERR service*




**If the cause of the fault cannot be recognised or rectified using the error codes and fault charts, please consult LIEBHERR customer service.**

|  Fault / error |  Cause |  Solution |
|---|---|--|
| Slewing gear not functioning  | No servo control  | Push the safety lever down   |
|   |   | Switch on servo control  |
|   | Slewing gear brake activated  | Push the safety lever down   |
|   |   | Release slewing gear brake   |
| No working movement   | No servo control  | Push the safety lever down   |
|   |   | Switch on servo control  |
|   | No servo pressure present   | Consult customer service   |
|   | No pump high pressure present   | Consult customer service   |

### 4.2.3 Transmission

|  Fault / error |  Cause |  Solution         |
|---|---|--|
| Oil flowing out on track rollers, support rollers or leading wheel                              | Seal defective  | Replace seal   |
| Insufficient crawler tracking on leading wheel  | Leading wheel tracking on track roller mounting has too much play                       | Adjust the leading wheel tracking play   |
| Crawler jumps off or over   | Crawler tension too low / crawler wheel worn  | Adjust crawler tension   |
| Correctly tensioned crawler losing tension quickly during use                                   | Crawler tensioning cylinder defective   | Check crawler tensioning cylinder, change if required or seal (only authorized specialist personnel) |
| Track roller or support roller sticking   | Running gear extremely dirty  | Clean running gear   |

### 4.2.4 Electrical system

|  Fault / error |  Cause |  Solution              |
|---|---|---|
| Battery charge telltale light does not go out   | Drive belt for alternator loose or torn   | Tension or replace drive belt   |
|   | Alternator defective  | Replace alternator  |
| Batteries do not charge or charge poorly  | Batteries defective   | Replace batteries   |
|   | Battery connections dirty / oxidised  | Clean battery connections   |
|   | Cable loose or damaged  | Connect or replace cable  |
| Telltale light or display instrument not functioning or functioning incorrectly                   | Bulb burnt out, display instrument defective  | Replace defective part  |
| Some or all functions on instrument panel drop out  | Plug connector separated or damaged, earth lead interrupted, short circuit fuse defective | Mount plug connector correctly or change, rectify short circuit, replace fuse or activate overload cut-outs |

- The tests should be carried out in accordance with the monitoring and maintenance plan:
  - every 250 operating hours by the machine owner's maintenance personnel.
  - every 500 operating hours by authorised specialist personnel.
- It is advisable to carry out these tests: supported, on firm, horizontal substrate, with the equipment in longitudinal and cross direction for variable loads. Current accident prevention regulations must be adhered to.
- Special care must be taken when testing load-bearing components, particularly:
  - the steel chassis members and axle and transmission mountings, the support, the lower rim bearing support and tower and ball rim bearing.
  - the steel upper structure members and bearing block for boom and boom cylinder, the upper rim bearing support, the cab mount and the mount for swing gear and ballast.
  - the steel components of the working equipment, e. g. the boom, stay, quick change adaptor, and bucket.
  - hydraulic cylinders, axles, steering, bolts and bolt connections, steps, ladders and mounting elements.
- The crack test should be carried out visually. If a crack is suspected, the dye penetration test should be carried out as a crack test on areas which do not have good visibility, such as the rim bearing support, in order to increase testing safety.
- Any damage found must be rectified immediately. Welding work on load-bearing parts of the earth-moving machinery, loading devices and transport devices may only be carried out by trained specialist personnel and only in accordance with the accepted rules of welding engineering. In case of doubt, contact the LIEBHERR customer support service to discuss suitable remedies.



### **Welding, drilling, firing and grinding work**

- Any welding on structural parts (as undercarriage, uppercarriage, equipment parts,...) may only be done the manufacturer, or authorized official dealer. If this rule is neglected, the warranty is voided.
- Only carry out welding, drilling, firing and grinding work on the machine with express authorization. Clean dust and combustible materials off the machine and its surrounding areas before welding, drilling, firing or grinding. Ensure adequate ventilation. Risk of fire or explosion.
- Before welding repairs on other parts, always disconnect the battery. Always remove the negative terminal first and reconnect it last.
- Nevertheless if welding repair should be done on components which may contain inflammable gases (welded counterweight, hydraulic tank, fuel tank, ...), these components must be previously and sufficiently ventilated with pressurized air to avoid all fire or explosion hazard
- Before welding, connect the ground cable as close as possible to the welding point, so the welding current will not run through the swing ring, joints, gears, bushings, rubber parts and seals

### **Process materials**

- When working with oils, greases and other chemical substances, observe the appropriate current safety regulations for the product.
- Ensure that process materials and replacement parts are disposed of in a safe and environmentally acceptable manner.
- Take care when handling hot process materials (Risk of burning and scalding).

### 5.3.4 Operating material chart

| Designation                         | Medium   | Symbol  | Quantity (litres)* |
|-------------------------------------|--|---|--------------------|
| Fuel tank                           | Commercially available diesel fuel with sulphur content between 0,05% and 0.5% |  | 660                |
| Coolant                             | Anti-corrosion fluid and antifreeze<br>Fill with DCA 4<br>CI = SP-C            |  | 42                 |
| Windscreen washing system           | Commercially available windscreen washing fluid or methylated alcohol          | -   | 5,0                |
| Air conditioning system refrigerant | R 134 a  | -   | 1,6 kg             |
| Refrigerant oil in A/C compressor   | PLANETELF PAG SP 20  | -   | 0,21               |

**Tab. 5-4** Operating material chart

\* = Guide values

## 5.4 Specifications for fuels, lubricants and process chemicals

### 5.4.1 Diesel fuels

#### Specification



The diesel fuels must meet the minimum requirements of the fuel specifications outlined below.

Approved fuel specifications:

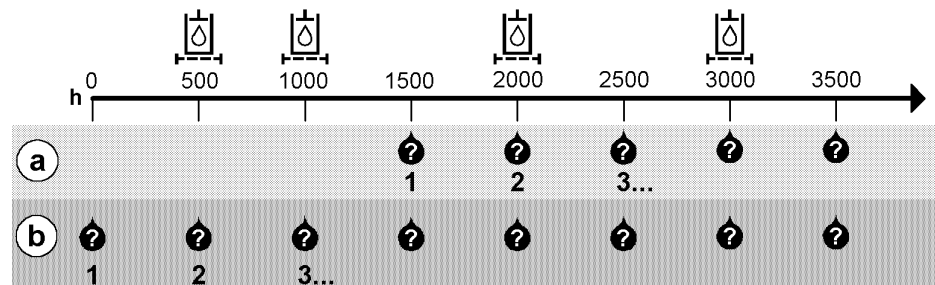
- DIN EN 590
- ASTM D 975 (89a) 1D and 2D

The use of fuels with other specifications is only permitted with the explicit consent of the LIEBHERR.

#### Sulphur content of diesel fuel

Fuel that meets the DIN EN 590 standard may contain maximum 50 mg/kg (maximum 0,005 weight percent) of sulphur.

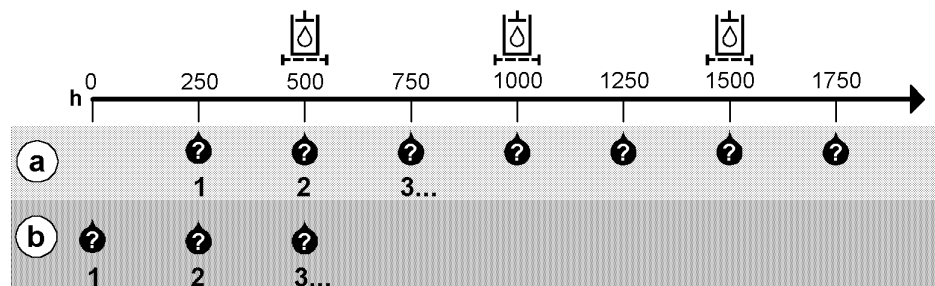
The reduction of sulphur content has raised the problem of diesel fuel lubrication characteristics. It has been shown that diesel fuels containing the maximum permitted European sulphur limit of 0.05 weight per cent can cause the fuel injection system to wear (particularly applicable to distributor-type injection pumps).

**Hydraulic oil in normal use****Fig. 5-8** Oil sampling and filters change in normal use

|   |                             |   |  |
|---|-----------------------------|---|--|
| h | Operating hours             | 1 | First oil sample                                 |
| a | Mineral oil                 | 2 | Second oil sample                                |
| h | Biodegradable hydraulic oil | 3 | Subsequent oil samples every 500 operating hours |

Oil change after 2000 operating hours, or when indicated by the lab report of the analysis.

Intervals for the change of the hydraulic oil return filter (20 / 5  $\mu\text{m}$ ): first change after 500 and 1000 operating hours, then every 1000 operating hours and after each hydraulic oil change.

**Hydraulic oil used in dust intensive applications****Fig. 5-9** Taking oil samples and changing return filters in heavy dust environments

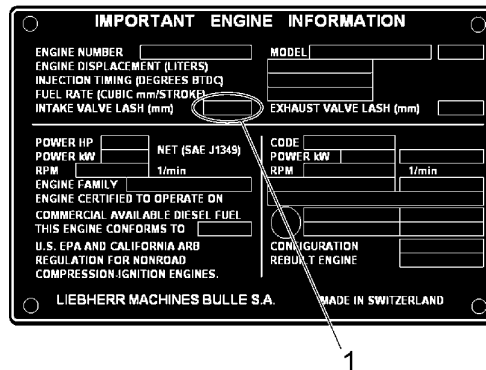
|   |                             |   |   |
|---|-----------------------------|---|---|
| h | Operating hours             | 1 | First oil sample                                  |
| a | Mineral oil                 | 2 | Second oil sample                                 |
| h | Biodegradable hydraulic oil | 3 | Subsequent oil samples: every 250 operating hours |

Oil change after 500 operating hours, or when indicated by the lab report of the analysis.

Interval for the change of the hydraulic oil return filter (10  $\mu\text{m}$ ): first change after 500 operating hours, then every 500 operating hours and after each hydraulic oil change.

### Checking and adjustment of valve clearance

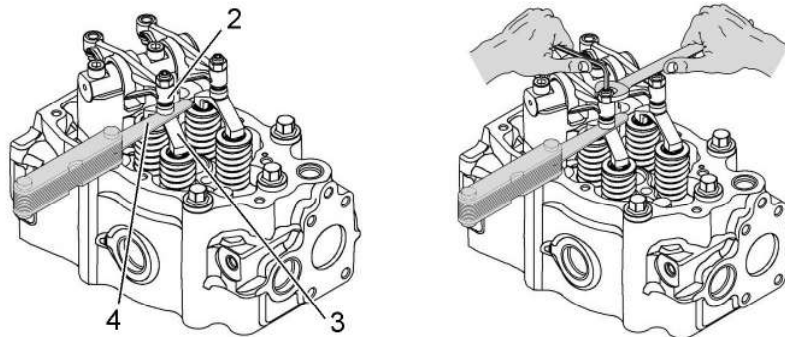
The clearance value for intake valves is indicated on the engine type identification plate.



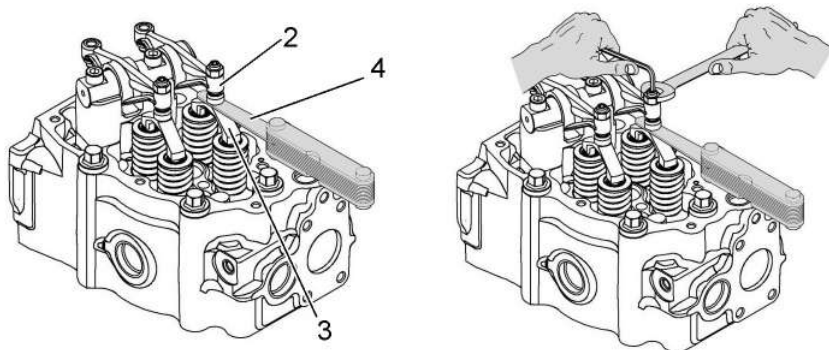
**Fig. 5-19** Clearance value for intake valves on the engine type identification plate.

1 Clearance value for intake valves \_ cold

► Insert feeler gauge 4 between crosshead 3 and rocker arm 2 and check the valve clearance.



**Fig. 5-20** Check and adjust intake valve clearance - cold



**Fig. 5-21** Check and adjust exhaust valve clearance of 0,40 mm - cold

2 Rocker arm

3 Crosshead

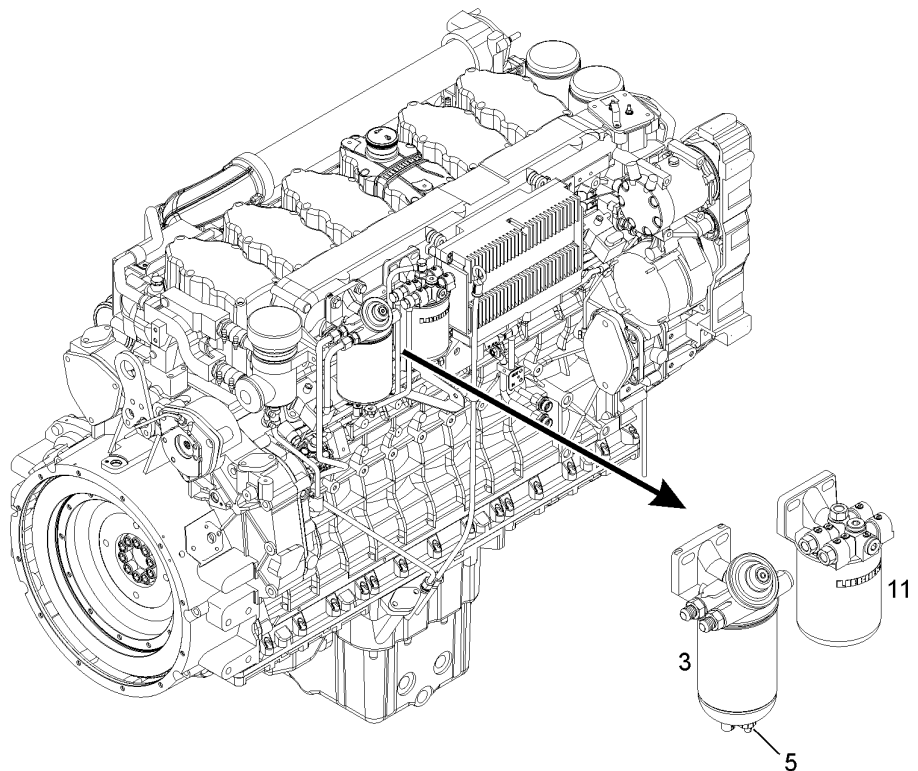
4 Feeler gauge

### 5.8.4 Emptying and cleaning the fuel tank

The tank floor is fitted with a drain valve **36**.

- ▶ Place a suitable container underneath.
- ▶ To drain off the water, unscrew the drain plug on the drain valve **36** by two turns until fuel which contains no water comes out.
- ▶ Retighten the plug.
- ▶ To empty, remove the fuel filler cap **15** and the drain valve **36** and collect the fuel in a suitable container.
- ▶ Check the fuel tank and fill strainer **20** regularly for contamination.
- ▶ If necessary, replace the fill strainer **20** and / or wash out the fuel tank.

### 5.8.5 Draining the fuel prefilter



**Fig. 5-30** Fuel filter cartridges

**3** Fuel pre-filter

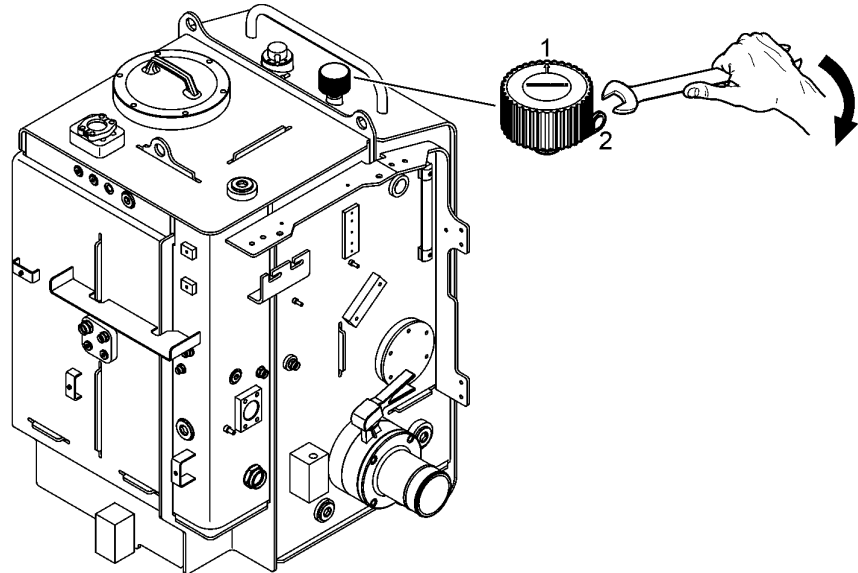
**5** Drain plug

**11** Fuel fine filter



**The water separator of the fuel pre-filter must be drained each time the symbol E528 appears in the display:**

- ▶ Position a collecting container.
- ▶ Daily, open the drain plug **5** of the fuel pre-filter **3**.
- ▶ Drain the water until fuel emerges.
- ▶ Retighten the drain plug.



**Fig. 5-38** Depressurizing the hydraulic system

#### To depressurize the hydraulic tank

- ▶ Unscrew the vent filter 1 by a **maximum** of one turn.
  - ↳ The hydraulic system will depressurize.

The vent filter 1 can be turned manually if safety stud 2 is inserted. An open-ended spanner can be used if the filter does not open easily.



#### Note!

- ▶ The retaining pin 2 (or key anti vandalism) must be systematically dismantled of the the filter and hung with the contact key.



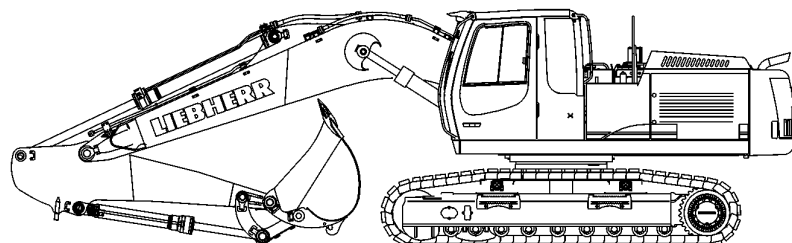
#### Danger!

The hydraulic oil is hot when at operating temperature and could be pressurized.

- ▶ Do not allow the hot oil or oil-bearing parts to touch the skin.

## 5.10.2 Checking the oil level, emptying and refilling the hydraulic tank

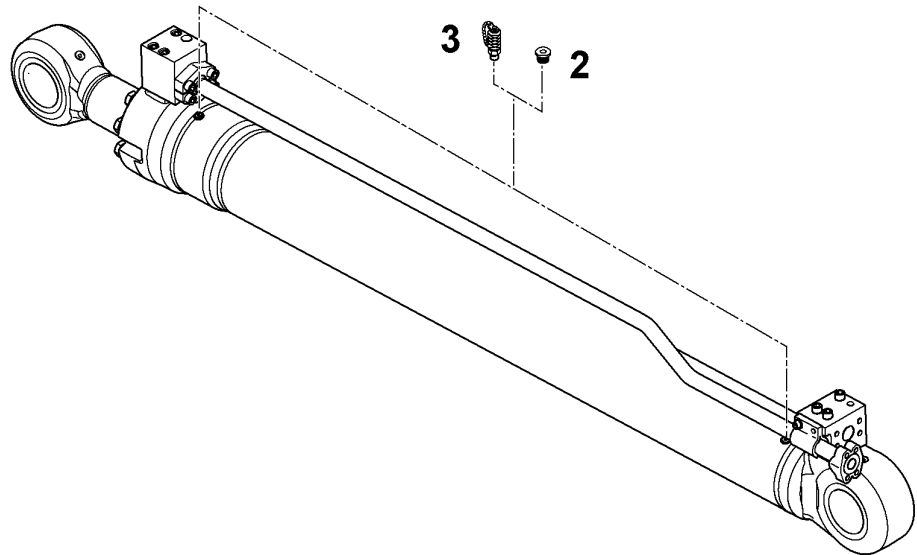
### Machine position



**Fig. 5-39** Machine position for checking the oil level of the hydraulic system

### 5.10.9 Bleeding the hydraulic cylinders

A cylinder must be bled after having changed the cylinder or after having worked on the cylinder (Sealing change,...) or after having worked on the cylinder hydraulic circuit (Hose change, ...).



**Fig. 5-48** Hydraulic cylinder

2 Locking screw for bleeding

3 Test point

Hydraulic cylinders equipped with locking screws for bleeding **2** must be bled following the procedure 1 and Hydraulic cylinders, which are not equipped with these locking screws for bleeding must be bled following the procedure 2.

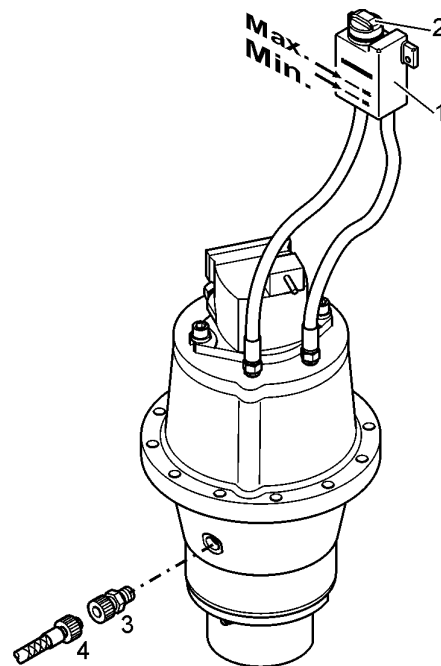
#### Procedure 1

- ▶ Unscrew the locking screws for bleeding **2** both side.
- ▶ Screw two test points **3** instead of the locking screws and attach an test hose on each test point.
- ▶ Make the the engine run at low idle (800-900 tr/mn).
- ▶ If possible, make the attachment move in order to have the side to be bled in the higher position.
- ▶ Lightly actuate the cylinder. It is recommended to bleed first the side, which does not necessitate a displacement of the cylinder (for example, if the cylinder is already retracted, first actuate the cylinder retraction in order to bleed the cylinder rod side).
- ▶ Redo this action until oil without air flows out of the test hose.
- ▶ Supply the other side of the cylinder and bleed it.
- ▶ Switch off the engine, remove the test hoses and replace the test points **3** by the locking screws **2**.
- ▶ Perform the procedure 2.

#### Procedure 2

- ▶ Make the the engine run at low idle (800-900 tr/mn).

### 5.11.2 Swing gear - Oil level check and oil change



**Fig. 5-58** Checking oil level and changing oil in swing gear

- |   |               |   |             |
|---|---------------|---|-------------|
| 1 | Oil reservoir | 3 | Drain valve |
| 2 | Cover         | 4 | Drain hose  |

#### To check the oil level:

When the gear oil is cold, the level in the expansion reservoir **1** should not be below the marking **Min.**

- ▶ Otherwise add oil until the level reaches the marking **Max.**

#### To drain the oil:

- ▶ Remove the cover **2**.
- ▶ Unscrew the cover of the drain valve **3** via the opening on the upperdeck.
- ▶ Screw the drain hose provided **4** to the drain valve **3** and let the oil flow out into a suitable container.
- ▶ Remove the hose **4**.
- ▶ Screw the cover of the drain valve **3** back on.

#### To add the oil:

- ▶ Add the oil in the reservoir until the level reaches the **Max.** marking.
- ▶ Screw the cover **2** back on.

- ❑ If a side frame does not extend or retract:
  - ▶ briefly actuate the travel drive on the respective side, in both travel directions if necessary (actuate the foot pedal without holding the S104 button pressed).

Should a side frame remain immobile despite initiating these travel movements, discontinue the track gauge adjustment procedure and notify LIEBHERR After-Sales-Service.



#### Caution !

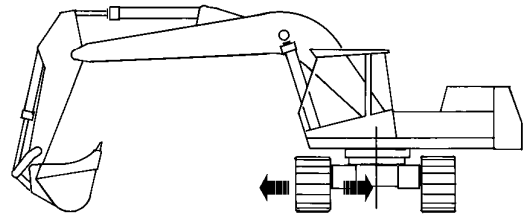
- Adjustment of the undercarriage width may only be resulted on firm, even underground, with the travel gear inactive.
- The track width should only ever be adjusted to the point of both side frames reaching their stop positions (completely extended or retracted, as well as in the centre position if featured).
- It is not permissible to work or to travel with the machine while the side frame are in fully retracted position or set in an intermediate position (between the fixed positions provided)
- The undercarriage is to be manoeuvred into the retracted track gauge whenever the machine is going to be out of operation for an extended period.

#### Track width adjustment for CVC undercarriages

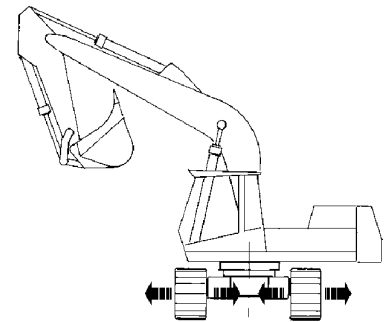
Operation of the excavator is only permitted when the undercarriage is in one of either end positions:

- Minimum track width (side frame retracted): provided exclusively for transport of the machine
  - Maximum track width (side frame extended): provided for operation of the machine with attachment
- ❑ Before adjusting the track width, machine fitted with an earthmoving attachment are to be maneuvered into one of the following four positions:

- Position the attachment at a 90° angle to the undercarriage and set down the attachment on the ground applying enough pressure to prop up the machine (if possible) to relieve pressure in the side frame being extended or retracted.



- Position the attachment at a 90° angle to the undercarriage and raise as near as possible to a vertical position.



- ▶ Loosen the lock nuts 1 of the stud bolts 2 on all side adjustment points.
- ▶ Progressively and crosswise tighten all side stud bolts 2 using a torque wrench.
- ▶ Tighten all side stud bolts to 50% of the nominal torque.
- ▶ Now tighten the side stud bolts 2 crosswise using a torque wrench to 100% of the nominal torque.
- ▶ Tighten the counternuts 1 of the side stud bolts 2 to the prescribed torque, while holding up the stud bolts.

### Setting the clearance on the CVT undercarriage

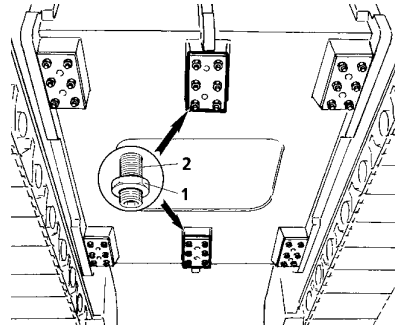
The setting of the clearance on the track width adjustment is resulted via the stud bolts located on the underside of the undercarriage central piece.

This setting must be carried out as often as is necessary.

During the setting of the clearance for track gauge adjustment, the undercarriage must always be in the "Side frame retracted" position.

Setting of the clearances is resulted as follows:

### Setting the middle stud bolts



**Fig. 5-82** *Setting the middle stud bolts*

- ▶ Loosen the lock nuts 1 of the stud bolts 2.
- ▶ Progressively and crosswise tighten the stud bolts 2 using a torque wrench.
- ▶ Tighten all stud bolts to 50% of the nominal torque.
- ▶ Now tighten the stud bolts 2 crosswise using a torque wrench to 100% of the nominal torque.
- ▶ Unscrew all stud bolts 2 around half a turn again one after the other.
- ▶ Tighten all lock nuts 1 of the middle stud bolts 2 to the prescribed torque, while holding up the stud bolts.

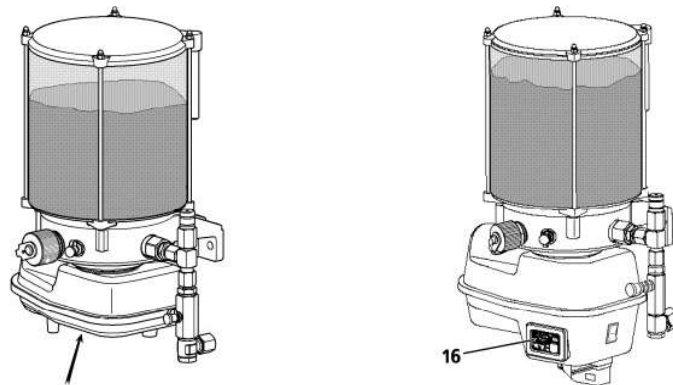
- With special attachments (telescopic stick, hydraulic offset boom, ...) some bearing points at the attachment or at the working tool are possibly not connected to the central lubrication system.
- ▶ This bearing points have to be lubricated daily via separately mounted, red marked lubricating nipples and using a grease gun or a manual grease pump.

**Notice!**

The standard undercarriages of crawler excavators do not require daily lubrication.

On undercarriages with special design necessitating regular lubrication (undercarriages with adjustable track width, ...) the lubrication points are not connected to the centralized lubrication. For description of the corresponding lubrication works, see the subgroups related to the special maintenance for these undercarriages.

### 5.14.2 Semi automatic and full automatic systems



**Fig. 5-93** *Semi automatic system Full automatic system*

The serially installed lubrication pump must be turned on and off via a switch in the cab by the operator (half automatic system) The lube pump is without control unit.

#### **16** Integrated control unit

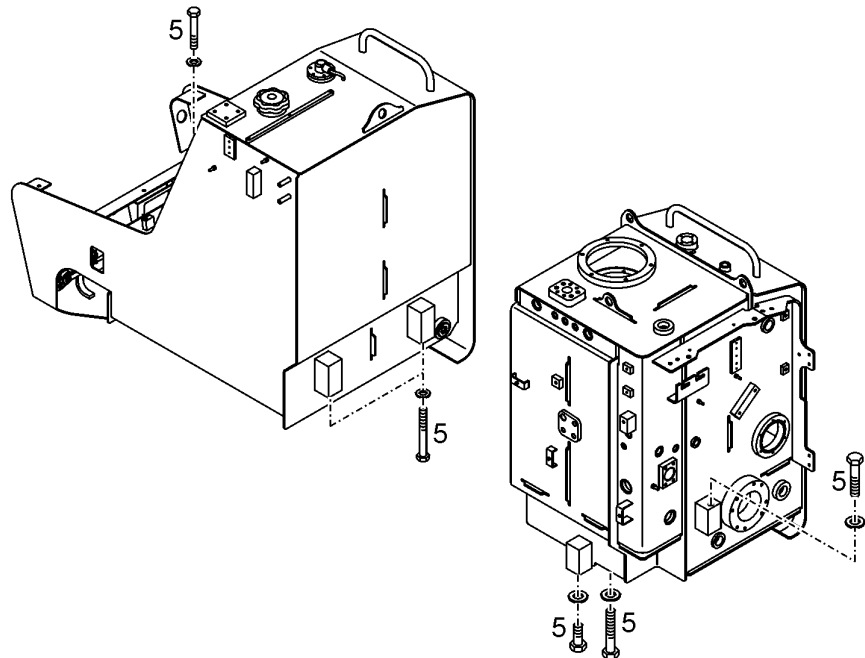
The electric motor of the optional mounted full automatic system comprises an electronic control unit 16, which triggers the lubrication cycles on and off during the operation of the machine.

### 5.14.3 Operation of the semi automatic system

In the semi – automatic system, the pump is controlled by the push button **S84** on the rear control desk of the driver's cab.

- With the Diesel engine running,
- ▶ Depress the button **S84**.
  - ↪ The control light in the button lights up.
  - ↪ The lubrication procedure is started.

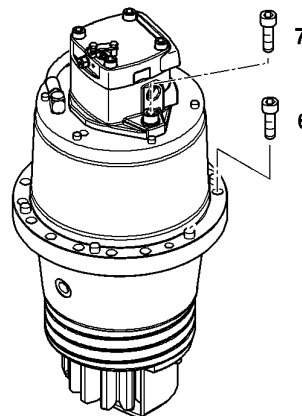
### 5.16.3 Mounting screws of the hydraulic oil and fuel tank



**Fig. 5-105** Hydraulic oil tank and fuel tank mounting bolts

The mounting screws **5** (M20 - 10.9) must be torqued to 560 Nm (410 ft.lbs.)

### 5.16.4 Mounting screws of the swing gear and motor



**Fig. 5-106** Swing gear and swing motor mounting bolts

The mounting bolts **6** (M20 - 10.9) of the swing gear must be torqued to 560 Nm (410 ft.lbs).

Torque mounting bolts **7** (M20 - 10.9) of the swing motor to 560 Nm (410 ft.lbs).

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