LIEBHERR

Mobile crane with telescopic boom

LTM 1220-5.2

LTM 1220-5-2-006

Operating instructions

BAL-No.: 17212-03-02

Pages: 1243

Works-Number	
Date	

ORIGINAL OPERATING MANUAL

The operating manual is part of the crane!

It must always be available within reach!

The traffic regulations and those for crane operation must be observed!

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1 Crane chassis

1.1 Frame

In-house manufactured, weight-optimised, distortion-resistant box structure made from high-strength, close-grained structural steel.

1.2 Supports

4-point support, fully hydraulically extendable horizontally and vertically.
Automatic support levelling.
Electronic slope indicator.

1.3 Motor

6-cylinder diesel, manufactured by Liebherr, model D 846 A7, water-cooled.
Performance: 370 KW at 1900 rpm
Maximum torque: 2355 Nm at 1200 - 1500 rpm
Exhaust emissions according to guidelines per 97/68/EC Stage 3 and EPA/CARB Tier 3.
Fuel tank: 490 l

1.4 Transmission

ZF 12-speed transmission system with automatic switching system AS-TRONIC.
ZF intarder attached directly to the transmission.
Two-stage transfer gearbox, with lockable distributor differential.

1.5 Axles

All 5 axles are welded and made from high-strength, close-grained structural steel.
All axles with steering.
Axles 2, 4 and 5 are planetary axles with differential locks.

1.6 Suspension

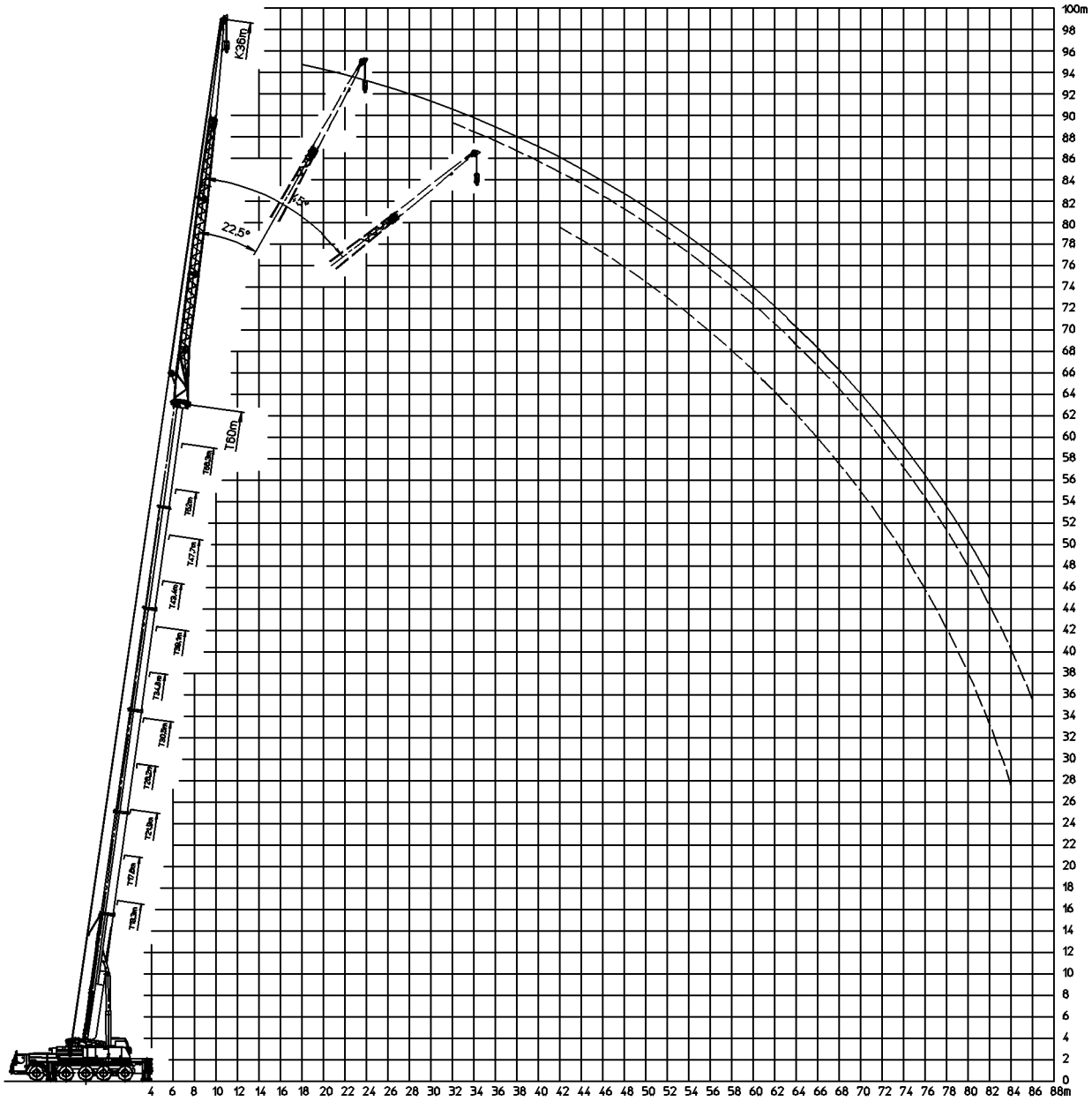
All axles with "Level-matic suspension" hydro-pneumatic suspension and hydraulically lockable.

1.7 Tires

10 tires.
Tire size: 385 / 95 R 25

1.8 Steering

ZF servocom power steering gear, dual circuit system with hydraulic servo mechanism and auxiliary stand-by pump, powered from the axle.
The axles 3, 4 and 5 are steered electro-hydraulically, depending on the speed, and from 30 km/hr., the third and fourth axle are affixed to straight forward travel.
From 60 km/hr., the fifth axle is affixed for straight forward travel.
Steering in correspondence with EC-guideline 70/311/EEC.



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Telescopic boom with folding jib (TK 36 m)

1 Planning crane operation

In addition to a perfectly working crane and a well-trained crew, **crane operation planning** is an important principle of safe crane operation.

DANGER
Missing information increases the risk of accidents!
Crane operation may not be possible or improvisation can result if a crane operator does not have all the required data.
▶ A crane operator must have exact data before starting any work!

The crane operator must obtain or receive the necessary information in a timely fashion before driving to the work site. In particular:
– type of crane operation
– work site (travel distance)
– route
– height and width clearance measurements
– electrical transmission lines (including voltages)
– space restrictions at the work site
– movement restrictions caused by buildings
– weight and dimensions of the load(s) to be hoisted
– required hoisting height and boom projection
– ground bearing capacity at the work site

Based on the above information, the crane operator must assemble the equipment required to operate the crane:
– hook block / load hook
– auxiliary boom
– separate lifting accessories
– counterweight
– underlay materials for support pads

3 Checking the rigging and fastening points

The rigging and fastening points are marked as follows:
P1: Rigging points.
P2: Fastening points.

Before every operation and at regular intervals, check the rigging points **P1** and the fastening points **P2** for cracks of the welding seam, significant corrosion, wear and distortion.
The inspection criteria are:
– Completeness of rigging points **P1** and fastening points **P2**.
– Distortion of carrying parts.
– Mechanical damage such as severe nicks.
– Changes in diameter due to wear.
– Significant corrosion (pitting).
– Cracks on carrying parts.
– Cracks or other damage on the welding seam.

WARNING
Risk of accident!
When using rigging and fastening points which are not operationally safe, severe personnel damage and property damage can occur!
▶ Have rigging and fastening points, which are not operationally safe replaced with new rigging and fastening points by authorized and trained expert personnel!
▶ When hooking and unhooking the rigging and fastening equipment, handle carefully to avoid crushing, sheering, catch and impact points!
▶ Eliminate damage of rigging and fastening equipment due to sharp edged stress loads!

11.3 Obligations of the crane operator

1.) Before starting to work, the crane operator must check the brake function and the emergency shut off devices. He must monitor the condition of the crane for obvious defects. On wireless controlled cranes, he must check the assignment of control unit and crane.
2.) The crane operator must cease crane operation in case of problems endangering the safety.
3.) The crane operator must report all defects on the crane to the appropriate supervisor, also to his replacement in case of crane change.
4.) The crane operator must make sure that:
   - All control devices are set to neutral or idle position before release of the energy supply to the drive components.
   - The control devices are set to neutral or idle position and the energy supply is shut off before leaving the control platform.
   - When taking down the control unit for wireless control, the control unit is secured to prevent unauthorized operation.
5.) The crane operator must ensure that cranes subjected to wind are not operated past the limits which were set by the crane manufacturer, and that the boom is taken down at least when the critical wind speeds for the crane are reached and at the end of the work.
6.) The crane operator must monitor the load at all crane movements or the load tackle devices when moving the crane without a load, if they could cause a dangerous situation. If observation is not possible, then the crane operator may move the crane only with the aid of a guide.
7.) The crane operator must give warning signs when necessary.
8.) The crane operator may not move loads over personnel.
9.) Any loads attached by hand may only be moved by the crane operator after he received a clear sign from the person who attached the load, the guide or any other responsible party which was assigned to that task by the contractor. If signals must be used to communicate with the crane operator, then these signals must be agreed upon before use between the responsible party and the crane operator. If the crane operator determines that the loads are not properly attached, then he may not move these loads.
10.) As long as a load is suspended on the crane, the crane operator must keep the control devices within reach. This does not apply for towing of vehicles with towing cranes.
11.) The crane operator may not run up to end positions operationally, if they are limited by the emergency limit switches.
12.) After a load moment limiter was triggered, the crane operator may not take on an overload by pulling in / raising the boom.
13.) The crane operator may **not** bypass the overload protection to increase the hoisting power of the crane.

15 Supporting

DANGER
The crane can topple over!
When actuating the supports with attached load and / or at loaded derrick ballast guying, the incline and the force conditions of the entire boom system change!
There is **no** shut off by the LICCON overload system!
The crane can topple over!
Personnel can be severely injured or killed!
- ▶ When a load is suspended, it is prohibited to actuate the support!
- ▶ When the derrick ballast guying is loaded, it is prohibited to actuate the support!

It is absolutely essential that the crane be supported exactly in accordance with the load charts to ensure safe crane operation.
The match of the sliding beams placement surfaces must be observed to ensure proper force transfer between the sliding beams.
The crane may only be supported in these extension conditions.

WARNING
Danger of tipping over!
If only the load side sliding beams are extended, the crane can tip over when turning or setting down the load!
- ▶ Move all 4 sliding beams and support cylinders out according to the data in the load chart!
- ▶ In intermediate positions between the support bases supporting is prohibited!
- ▶ Pin sliding beams to support base according to the load chart!
- ▶ Fully insert and secure the pins!

WARNING
Risk of tipping the crane due to incorrectly extending the sliding beams!
The load suspended on the hook causes tension and deformation of the hoist rope and telescopic boom. The same applies for operation with lattice jib and guy ropes. If the load is dropped from the fastening ropes or if the fastening or hoist rope breaks in this situation, a sudden relief occurs. The boom snaps back quickly. This can cause the crane to topple over.
Despite previous assumption, it might become necessary to swing the load to the opposite side. This can cause the crane to topple over.
When turning from the vehicle longitudinal direction, the crane can topple over due to the boom or counterweight momentum.
- ▶ It is imperative that all 4 sliding beams and support cylinders are extended according to the load chart specifications!

21 Dangers when working together with several cranes

21.1 Joint lifting of a load with two cranes

Before lifting a load jointly with two cranes, the operator of the cranes or a representative of the operator must determine the work sequence and assign a responsible supervisory person for the operation. The responsible supervisory person must monitor the operation.

Note

- ▶ The total weight and the center of gravity of the load must be known exactly!
- ▶ Carry out the job planning in detail and with care!

When the operational conditions or the work to be carried out require:

- ▶ Set up an assembly plan and operating instructions for the operation!

WARNING

Danger of tipping and overload of load carrying components!

If the load is not lifted or lowered exactly evenly by both cranes, then the center of gravity changes. One of the two cranes can be overloaded and topple over!

Personnel can be killed or seriously injured!

- ▶ Observe the national valid standards, regulations and accident prevention guidelines!
- ▶ Determine the utilization degree of the cranes in operation, depending on the complexity of the load lift!
- ▶ Plan for sufficient safety reserves!
- ▶ Utilize the load values given in the load chart manual for the used crane configuration to no more than the utilization degree of maximum 80 %!

In drawing is shown how the center of gravity for the load changes if the load is lifted or lowered unevenly. Already a slight incline of the load can cause the crane to be overloaded!
If the load on crane 1 **(L_1)** is lowered, the load on crane 2 **(L_2)** increases. As a result, crane 2 can be overloaded as a result of the load reduction of crane 1, without any action of its own!

21.2 Working ranges of several cranes overlap

WARNING

Risk of collision!

If the working ranges of several cranes overlap, there is a danger of collision!

Personnel can be injured or killed!

Significant property damages can result!

- ▶ The contractor or his representative must determine the work sequence in detail in advance!
- ▶ The contractor or his representative must ensure flawless communication between crane operators!
- ▶ The crane operators must ensure through calm operating mode, that no collisions occur due to uncontrolled movements! The crane operators must have been trained and instructed accordingly.

If the communication between the crane operators is not ensured by sound or visual connection, then suitable measures must be taken, such as using radio communication, guides or similar.

Note

- ▶ If guides are used, then the signals must be agreed upon between them and the crane operators, see section “Hand signals for guidance”!

24.2.1 Legal prerequisites

Make sure that the following prerequisites are met:

- Special arrangements were made for the use of the lifting cage (cherry picker) according to the requirements of national laws!
- If required by national laws: The use of the crane to lift personnel was reported to the state agency for occupational health and safety. The lifting procedure may possibly require a special permit!
- Before the implementation of the lifting procedure with the aid of a work-specific risk analysis for the possibility of rescuing personnel in emergencies was defined!
- To rescue personnel in emergencies, precautionary measures must be present on the crane, if they are required by national laws!
- The measures for safe operation near power lines, depending on the conditions on the job site and the national laws / national regulations were observed and adhered to!

24.2.2 Prerequisites for crane equipment and accessories

Make sure that the following prerequisites are met:

- Before lifting personnel, the crane was inspected. No damage was found!
- The lifting cage (cherry picker) is utilized according to national laws and / or standards and according to intended purpose!
- Before lifting personnel, the lifting cage (cherry picker) was carefully inspected. No damage was found!
- Every emergency rescue device was inspected and its operational readiness was determined, if required by national laws!
- Any hooks in use must be equipped with a latch, which prevents the hook mouth to open. According to national laws, the latch must be manually closable or lockable or must automatically close via a spring!

24.2.3 Inspection before operation

Make sure that the following inspections are made before use of the lifting cage (cherry picker):

- On every new construction site and after every modification or repair: To ensure the operating safety of the lifting cage (cherry picker) and the lifting equipment, a test with 125 % of the nominal load carrying capacity of the lifting cage (cherry picker) without personnel must be carried out! During the test, the lifting cage (cherry picker) may only be lifted just above the ground!
- A test lift with loaded lifting cage (cherry picker) without personnel must be carried out! The weight in the lifting cage (cherry picker) for the test lift must be at least as large as the weight of the personnel and the weight with the work equipment carried along! For this test lift, the course of all planned movements of the lifting procedure must be simulated!
- This test lift must be carried out for every location on a construction site, where personnel must be carried!

24.2.4 Prerequisites for operation with lifting cage (cherry picker)

Make sure that the following prerequisites are met for operation with lifting cage (cherry picker):

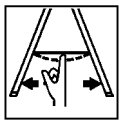
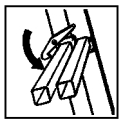
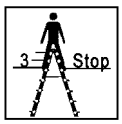
- The rope pull is limited to 50 % of the maximum rope pull!
- The crane is utilized with 50 % of its maximum load capacity of the valid load chart!

25 Crane operation in case of thunderstorms

In weather conditions, which can include lightning:

- Stop work on the crane.
- If possible, place the load down.
- If possible, telescope the boom in or put it down and bring it into a safe condition.

If this is not possible, the crane operator's cab must remain occupied by the crane operator to keep the crane and the load always under control.

Sign	Explanation
	Face the ladder when climbing up or down the ladder.
	Before use, pay attention that the stepladder opens completely.
	Make sure the upper end of the ladder is placed correctly.
	Make sure that the safety strut engages.
	Maximum number of users on the ladder.
	Before use, make sure it is safely engaged.
	Correct access.
	When climbing the ladder, wear suitable shoes.
	Stepladders: Access the ladder, without railing, to no more than the third step from the top.

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3 Attachment and fastening points

3.1 Fastening and hook points on the telescopic boom

Fastening points **A**, fastening point **B**, fastening point **C**, fastening point **D** and fastening point **E** are installed on the telescopic boom.

DANGER
When working aloft, there is a danger of falling!
If the following notes are not observed, the assembly personnel could fall and suffer life-threatening injuries!

- ▶ Before any assembly / disassembly work and maintenance work on the crane superstructure and the telescopic boom, the assembly personnel must wear the approved safety harnesses and protective equipment.
- ▶ For assembly / disassembly work, the ladder **with hook device** is engaged on pipe **2**, see also section “Installing hook device on ladder”.
- ▶ The assembly personnel must secure itself with approved safety harnesses on fastening point **A** or fastening point **B** or fastening point **C** or fastening point **D** or fastening point **E** to prevent falling.

DANGER
Danger of damage!

- ▶ Never hang loads or objects on fastening points **A**, fastening point **B**, fastening point **C**, fastening point **D** or fastening point **E**.

1.3 Driving on inclines and slopes

Abbreviation	Item
ß	Inclination angle (slope of roadway)
L	Length of horizontal roadway section
Rc	Maximum permitted roadway bend radius

Note

▶ The luffing cylinder is fully retracted!

The road conditions over which the crane can travel are limited by the clearance of the boom from the ground. The permissible values are given in the separate operating instructions for the dolly! Level crossings, ascents/descents, ramps, as well as entries and exits on inclines with a slope angle **ß** higher than that specified in the separate dolly operating instructions, should only be traversed in exceptional circumstances. See section entitled “permitted exceptional circumstances” for more information.

WARNING

Risk of accident if bending radius is less than the maximum permissible value of **Rc**!

Do not drive on a roadway with a bending radius **Rc** lower than that specified in the separate dolly operating instructions. If this is not observed, severe errors may occur:

The crane can be severely limited in its steering ability!

The dolly can lose contact with the ground and swing uncontrollably to the side!

The rear tires or axles of the crane can be overloaded!

The luffing cylinder can be damaged!

Personnel can be killed or injured!

▶ Do not fall below the maximum permissible bending radius of **Rc**!

1.3.1 Permitted exceptional circumstances when driving on slopes and inclines

The permitted inclination angle **ß** for entering and exiting slopes and inclines can exceed the value given in the separate dolly operating instructions by maximum 1.5° when operating the crane at walking speed (maximum 5 km/h) and providing the danger area is blocked off. Block off the danger area to avoid any risk of injury or damage to objects when the dolly loses contact with the ground causing the dolly and boom to swing out to the side. The opposite lane should be blocked off and the crane secured to prevent collisions. No persons other than the driver should be present inside the danger area. The driver must wear a seat belt. Position an adequate number of helpers outside the danger area for supervision purposes. The helpers should signal the driver to stop the traversing movement if it becomes apparent that the dolly is losing contact with the ground or the crane tires are becoming increasingly deformed. In this case the traversing movement should be immediately halted.

1.2 Operating elements on camera-monitor*

61	Button	• ON / OFF
62	Remote control sensor	
63	Brightness sensor	• Automatic brightness regulation
64	Camera selection button	
65	Menu button	• The following functions can be selected in the menu: • Scale • KA 1 (mirror) • Automatic time • Color • Brightness • Contrast • Tint (only for NTSC)
66	Button	• Increase volume
67	Button	• Decrease volume
68	Switch	• Day / night switch
69	Button	• Shift channel up
70	Button	• Shift channel down

Right support control unit:

266	Display	• Slope indicator
267	LED 1°	
268	LED 5°	
269	Button	• Support control unit release **Note:** Before the support cylinders or the sliding beams can be moved, the support control unit release **269** must first be operated.
271	Button	• Retract all support cylinders and align horizontally
272	Button	• Extend all support cylinders and align horizontally
273	Button	• Engine off
274	Button	• Engine on
275	Button	• Reduce engine Rpm
276	Button	• Increase engine Rpm
277	LED	• Illuminates with support control unit release
280	Button	• Retract right front support cylinder
281	Button	• Extend right front support cylinder
282	Button	• Retract right rear support cylinder
283	Button	• Extend right rear support cylinder
284	Button	• Extend right front sliding beam
285	Button	• Retract right front sliding beam
286	Button	• Extend right rear sliding beam
287	Button	• Retract right rear sliding beam
288	Button	• Retract left front support cylinder
289	Button	• Extend left front support cylinder
290	Button	• Retract left rear support cylinder
291	Button	• Extend left rear support cylinder
292	Display	• Right front support force display
293	Display	• Right rear support force display
294	Display	• Left front support force display
295	Display	• Left rear support force display

2 Work station - Driver's cab

DANGER
Risk of accident due to incorrect mirror and / or steering wheel adjustment!
- ▶ Move driver's seat, mirrors and steering wheel to required positions before setting off.
- ▶ Never adjust the driver's seat, the mirror or the steering wheel while driving.

2.1 Adjusting the driver's seat

The pneumatically suspended driver's seat **10** can be adjusted to suit every body size.
If desired, the driver's seat can be equipped with IPS* (Integrated Pneumatic System). IPS* provides additional side lumbar support.

- ▶ The suspension rigidity is adjusted automatically.
- ▶ Block the horizontal suspension **1**.
- ▶ Infinitely variable height adjustment with “Memory function” **7**.
- ▶ Adjust the horizontal setting **2**.
- ▶ Adjust the backrest **8**.
- ▶ Adjust the seat cushion incline **6**.
- ▶ Adjust the seat cushion depth **4**.
- ▶ Lower the oscillation system **5**.
- ▶ Adjust the cushioning **9** (infinitely variable).
- ▶ Adjust the seat heater* **3**.
- ▶ Backrest, adjust the lower section (LWS*) **10**.
- ▶ Backrest, adjust the upper section (LWS*) **11**.
- ▶ Adjust the side cushion guide (IPS*) **12**.

Lowering vehicle

▶ Press and hold down button **143** and then press button **119**.

Result:

– The left front vehicle level is lowered.

▶ Press and hold down button **143** and then press button **120**.

Result:

– The right front vehicle level is lowered.

▶ Press and hold down button **143** and then press button **135**.

Result:

– The left rear vehicle level is lowered.

▶ Press and hold down button **143** and then press button **136**.

Result:

– The right rear vehicle level is lowered.

Lowering entire vehicle

▶ Press and hold down button **143** and then press button **119**, button **120**, button **135**, button **136**.

Result:

– The vehicle level is fully lowered.

2.2 Checking the instruments after starting the engine

The following indicator lights must turn off when the engine is running:

▶ Check the indicator light for the engine oil pressure **233**.

Troubleshooting

Does the engine oil pressure control light **233** stay illuminated or is no oil pressure displayed?

There is a danger of engine damage.

▶ Turn the engine off immediately!

▶ Check the indicator light - preheat **184**.

▶ Check the charge indicator light **235**.

▶ Check the indicator light - gear oil temperature **227**.

▶ Check the indicator light - steering circuit I **185**.

The steering circuit II control light **186** only extinguishes at a speed of approx. 10 km/h.

▶ Check the indicator light - steering circuit II **186**.

▶ Check the indicator light - air pressure circuit I **237**.

▶ Check the indicator light - air pressure circuit II **239**.

▶ Check the indicator light - air pressure circuit III **241**.

3.5 Automatic gear box

3.5.1 General

The automatic gear box can be used in automatic or in manual shift mode. The transmission has 12 forward gears and 2 reverse gears. The current gear positions will be indicated on the display **223**.

3.5.2 Switching between automatic and manual shift mode

When the ignition is turned on, the automatic mode is activated automatically. In the neutral “N” and reverse “R” drive range, the manual mode is always activated.

▶ Press button **104** to change between automatic and manual shift mode.

Result:

– The indicator light on button **104** does **not light up**: Automatic mode
– The indicator light on button **104 lights up**: Manual shift mode.

3.5.3 Setting off

DANGER
Danger of fatal injury due to rolling crane!
When the parking brake **3** is released, the vehicle starts to roll immediately.

▶ When the parking brake **3** is released, brake crane with service brake **1** or accelerate with engine control **2**.

The starting gear is automatically established by the transmission according to the preceding drive resistance. It can be manually corrected upward or downward. To do so, change to manual shift mode. Thereafter it is possible to change immediately back to automatic mode.
In starting mode, the clutch is open if engine control is not activated. The clutch will close if the engine control is lightly activated.
Make sure that the following prerequisites are met:

– the crane is at a standstill,
– the transmission is in neutral position “N”,
– the parking brake **3** has been applied.

▶ Apply the service brake **1** gently.
▶ Press the button **100** for reverse driving.

or

■ Press the button **102** to drive forward.
▶ Correct the starting gear, if necessary.
▶ Release the service brake **1**.
▶ Activate the engine regulation **2** gently.

Result:

– The clutch engages. This is indicated by a slight jerk.

▶ Release parking brake **3** and activate engine regulation **2** as required.

Result:

– The vehicle begins to roll.

3.6 Creeper gear (off-road gear / manoeuvring mode)

Creeper gear consists of the following operating modes:

1.) Off-road gear
Off-road gear can be added separately.

2.) Manoeuvring mode.
Manoeuvring mode assumes off-road gear.

3.6.1 Off-road gear

When switching over to off-road driving, there is an automatic switch-over to manual shift mode, starting in 2nd gear. Switching (V1...V4 or R1 ...R2) is only possible when the vehicle is stationary. Make sure that the following prerequisites are met:

– the crane is at a standstill,
– the transmission is in neutral position “N”,
– the parking brake **3** has been applied.

Addition of off-road gear

▶ Press the button **107**.

Result:

– Off-road gear is added.
– The function control on the button **107** lights up.

▶ Apply the service brake **1** gently and hold down.
▶ Press the button **100** for reverse driving.

or

■ Press the button **102** to drive forward.
▶ Release the parking brake **3**.
▶ Release the service brake **1**.

Result:

– The vehicle begins to move.

Turning off off-road gear

▶ Press the button **107**.

Result:

– Off-road gear is turned off.
– The function control on the button **107** turns off.

3.8 Tempomat

A drive speed of more than 20 km/h can be stored using the tempomat. The tempomat is operated with the steering column switch **7**. When the tempomat is activated, the control light **220** illuminates and the speed setting will be indicated for a brief period on the display **223**.

Use the tempomat only when traffic conditions permit a steady speed. It may not be possible to maintain the speed on ascending or descending gradients.

Take the foot off the gas pedal when the tempomat is turned on.

DANGER

Danger of skidding on slippery road surfaces!

▶ Do not use tempomat on slippery road surfaces!

Make sure that the following prerequisites are met:

– the automatic mode is turned on,
– the driving speed is greater than 20 km/h,
– the service brake and the retarder are not activated.

3.8.1 Saving the tempomat speed

Ensure that tempomat is not activated.

▶ Accelerate the vehicle to the desired speed.

▶ Operate the steering column switch **7** in direction **8** or direction **9**.

Result:

– The stored speed will be briefly indicated on the display **223**.
– The indicator light **220** lights up.

3.8.2 Displaying the current tempomat speed

Ensure that tempomat is activated. The indicator light **220** lights up.

▶ Operate the steering column switch **7** in direction **8** or direction **9**.

Result:

– The stored speed will be briefly indicated on the display **223**.

4.4 Turning the differential locks off

CAUTION
Danger of damage to drive axles as well as the entire drive train!
Considerable damage can be caused by driving on solid, tractive ground with a good grip with added differential lock.
▶ Turn the differential locks off again as soon as possible.

Make sure that the following prerequisites are met:
– the vehicle is stationary,
– the transmission is in neutral position “N”.

Turning off the longitudinal differential lock automatically turns off any transversal differential locks that are active.
▶ Press button **138** and button **143**.
Result:
– The function controls on button **138**, button **140** and button **141** go out.
– All differential locks are turned off.

▶ Press button **140** and button **143**.
Result:
– The function control on the button **140** turns off.
– Transversal differential lock axle 1 (with 10x8 drive)* + axle 2 is turned off.

▶ Press button **141** and button **143**.
Result:
– The function control on the button **141** turns off.
– Longitudinal differential lock axle 4 + transversal differential lock axle 4 + axle 5 is turned off.

6 Towing

6.1 General towing regulations

The following towing regulations must be adhered to:

– For the towing procedure, release the parking brake or the brake system will be damaged.
– When towing, the speed must always remain below 20 km/h.
– Use the manoeuvring coupling to tow the vehicle.
– Only tow with a tow bar.
– Turn on the hazard warning system and the headlight.
– When towing always switch the transfer transmission to freewheel.

6.2 Towing with a defective engine and / or transmission

If the engine cannot be started, a pressurized air supply must be established from the towing vehicle to the mobile crane. A hose coupling is attached at the front under the bumper to supply compressed air to the mobile crane to be towed.
Use a hose line to connect the external supply with the towing vehicle.

DANGER
Risk of accident!

▶ The supply pressure of the compressed air brake system of the mobile crane to be towed must be at least 6 bar.
▶ With the engine turned off the vehicle can only be steered from a speed of 5 km/h - 10 km/h.

▶ Actuate the switch **50** and shift the transfer transmission to freewheel.
▶ Using the travel range switch **101**, switch the gear box to the neutral position “N”.

6.3 Towing with an intact engine

6.3.1 Towing in case of damage on the transfer transmission

▶ Disconnect the drive shafts from the distributor gear to the drive axles on the drive axles and tie them up.
▶ Using the travel range switch **101**, switch the gear box to the neutral position “N”.
▶ Let the engine run at low idle speed.

6.3.2 Towing in case of damage to the drive axles

Only authorized and specially trained personnel can carry out towing arrangements in case of damage to the driving axles.

▶ Assign specially trained personnel to carry out this work.

6.4 Extended manoeuvring coupling*

Note

▶ Only the hook block may be engaged on the extended manoeuvring coupling* to move the crane vehicle. If the crane vehicle is towed, the manoeuvring coupling without extension must be assembled on the crane vehicle.
▶ The tightening torque for the mounting screws of the manoeuvring coupling is 540 Nm.

▶ Remove the extended manoeuvring coupling*.
▶ Remove extension on manoeuvring coupling.
▶ Assemble the manoeuvring coupling without extension on the crane vehicle.

2.3 Extending support cylinders with support control unit

DANGER
Danger of accident when supporting!
- ▶ Ensure that there are no persons or objects present in the danger zone when the support cylinders are being extended and retracted.
- ▶ Raise the crane until the wheels are no longer touching the ground.
- ▶ Do not extend the support cylinders all the way during crane operation (up to stop position)! If support cylinder has been moved out all the way, retract again by at least 10 mm.

Ensure that the crane has been lifted so that the wheels are no longer touching the ground.

2.3.1 Supporting manually

Supporting the crane

Extend individual support cylinders evenly by pressing the relevant buttons and support the crane.
The support cylinders initially move at minimum speed and accelerate to maximum speed after 2.5 s.
- ▶ Left support control unit: Press button **251**, button **253**, button **259** and button **261**.
- ▶ Right support control unit: Press button **281**, button **283**, button **289** and button **291**.

Aligning the crane horizontally

DANGER
Crane can topple over!
If the crane is not aligned horizontally, it may tip over and cause fatal injury!
- ▶ Be sure to level the crane!
- ▶ The maximum permitted deviation from the horizontal position is 0.5 % (0.3°)!

- ▶ Extend and retract individual support cylinders until the innermost light emitting diode (LED) lights up.

Result:
– The crane is horizontal.

3.2 Extending sliding beams from the crane cab

DANGER
Danger of fatal injury if crane falls over!
▶ Always extend all 4 sliding support beams, i.e. also on the side opposite the load.

Only one sliding beam may be extended at a time.
▶ Press function key F7 **7** and select the desired sliding beam.

Result:
– Selector (double arrow) appears on the selected sliding beam.

Note
▶ When the sliding beam extends, the inner beam is first completely extended before the outer beam is extended.

▶ Press function key F5 **5** and extend the sliding beam to the required support base.
▶ Extend all sliding beams to the required support bases.

DANGER
Risk of accidents if the crane topples over!
The crane may topple over if the following conditions are not met.
▶ The sliding beams must be pinned to prevent movement of the bearing surfaces after positioning!
▶ Pin in and lock all retaining pins.
▶ Do not support in intermediate positions!

▶ Secure and lock all sliding beams with retaining pins **1** and retaining pins **2**.

Note
▶ Use retaining pin **1a** instead of retaining pin **1** to pin the “right rear” sliding beam.

1 Operating and control instruments

1.1 General operating elements

300	Armrest	
301	Seat contact switch	
302	Hand lever	• Adjustment of seat cushion incline
303	Button	• Lumbar support in lower part of backrest
304	Button	• Lumbar support in upper part of backrest
305	Hand lever	• Lock for horizontal seat adjustment
306	Hand lever	• Backrest incline adjustment
308	Rotary switch	• Switching between fresh air / recirculated air
309	Rotary switch	• Blower 3-stage
310	Regulator knob	• Temperature Cab heater
311	Electrical socket 24 V	
312	Cab lighting	
313	Latch	• Step retainer Pull handle and hold: Step unlocked. Release and engage the handle: Step locked.
314	Reservoir	• Windshield washer fluid
315	Charge indicator light	• Superstructure engine
316	Indicator light	• Superstructure engine preheating, heat flange control
317	Charge indicator light	• Chassis engine
318	Indicator light	• Chassis engine preheating, flame starting system
319	Ignition switch	• Chassis engine
320	Ignition switch	• Superstructure engine
321	Thermostat*	• Auxiliary heater
322	Battery master switch	
323	Lock screw	• Adjusting the control platform in lengthwise direction
324	Switch*	• Seat heater
325	Set screw	• Adjustment of armrest incline
326	Locking lever	• Armrest height adjustment

1.5 Operating elements on the control console (cranes with two winches)*

Control console, left:

400 Master switch left (MS 2)

Winch 2

- Move the master switch **400** in direction Y+ (forwards): Winch 2 spools out and the load is lowered.
- Move the master switch **400** in direction Y- (backward): Winch 2 spools up and the load is raised.

Slewing gear:

- Move the master switch **400** in direction X+ (to the right): The slewing gear turns to the right.
- Move the master switch **400** in direction X- (to the left): The slewing gear turns to the left.

401 Button

- Bypass of the seat contact switch **or** if the seat contact switch is actuated: Addition of the vibration sensor **403**.

402 Button

- Addition of the rapid gear for winch(es) and luffing up

403 Vibration sensor

- Winch turn sensor, (vibrator) winch 2 **or** turn sensor, (vibrator) slewing gear

404 Button

- Lock the engine regulation of superstructure engine

Note:
Pressing the button **404** will lock the engine regulation in its current position.

405 Button

- Horn

410 Switch

- Swing the crane cab
- Position 2 (actuated on top): The crane cab swings down.
- Position 0 (center position): Off.
- Position 1 (actuated on the bottom): The crane cab swings up.

411 Button

- Turn the “slewing gear parking brake” off / on

412 Button

- Bypass of overload protection is used to luff in with suspended load

DANGER
The exceedance may only be carried out if the overload was caused by luffing down at freely suspended load and the crane operator is absolutely certain that luffing up the load will take it out of the overload range.

E	Special function keys	• Monitor brightness adjustment • **E3** and **E1**: Turn background illumination on / off. • **E3** and **E2**: Brightness adjustment in three stages. • Additional functions of the special function keys are program-dependent and are further explained in the descriptions of the individual LICCON programs
F	Function keys	• The function keys should always be used in conjunction with the function key icon line displayed on the monitor
G	Monitor	• Display of the individual programs (example: “Operation” program)
H	SHIFT key	• Second-level key assignments, for example “Supervisor function”
I	LED displays	• Monitor supply voltage present

4.2.3 The function key line

The function key line consists of function keys **F1** to **F8** and the function key icon bar above it. The function keys correspond to the various function key icons above them.
Various functions are indicated by the function key icons, or they may refer to the following changes:

– Operating mode
– Set up condition

Not all function keys have to be assigned icons on the LICCON monitor. This depends on the program selection.
Pressing a function key changes the appearance of the icon above, its meaning, or its textual content.

F1 Vertical paging	• Depending on the size of the monitor, up to 10 load chart lines can be displayed at once. If a chart consists of more than 10 lines, then the display is spread over several pages. When pressing a key, the next page of the load chart will be displayed, and the number of the current page in the “general information line” will be counted up by 1. When the last page is reached, page 1 will appear again after pressing the function key **F1**.
F2 Main geometry status	• Options for setting the different main boom operating modes of the crane (if available). The types are described by abbreviations and length data in the icon. • Example: **T** for **Telescopic boom**.
SHIFT and **F2**	• Previous main boom (if present)

3	“Dynamic utilization bar display” icon	
3.1	8-digit organization number	• Identifies the type of load chart that has been selected and the operating mode
3.2	Short code	• Identifies the selected set up configuration
3.3	Utilization scale	• Marking from 90 % utilization: **Advance warning.** • Marking at 100 % utilization: **STOP shut-off.**
3.4	Utilization bar of crane	• According to load chart and reeving
3.5	Engine speed	• In [rpm] • **Note:** “????” is displayed for an invalid rotational value (for approximately 10 seconds). A fixed rpm is set in the event of a problem. The digital display blinks, and an error message is displayed.
3.5.1	Engine rpm lock	• The engine rpm can be locked on the master switch. If the engine rpm has been locked, the icon “+” appears behind the rpm display.
4	“Boom radius” icon	
4.1	Radius	• In [m] or [ft] Identifies the horizontal center of gravity distance of the load (on the load hook selected by the operating mode) from the center of rotation of the superstructure, measured on the ground. This also takes into account the boom flexation due to its own weight and the suspended weight of the load. • **Note:** “? ? ? . ?” is displayed, if geometrical data or sensor values are missing, so that the radius cannot be calculated.
4.2	Main boom angle to the horizontal	• In [°] • **Note:** “? ? ? . ?” is displayed, when the geometrical data or the sensor values are missing, so that the main boom angle cannot be calculated.

5.2.5 Acoustic warning on the LICCON monitor

Acoustic warnings on the LICCON monitor are indicated by the warning sound “Horn”.
The warning sound “Horn” is divided into two categories:

– “Horn” is a beeping sound of a duration of approximately 0.5 seconds, which is repeated in a second cycle.
– “Short horn” is a beeping sound of a duration of approximately 0.1 seconds, which is repeated in a second cycle.

7 Horn icon	• When the horn icon is shown in the LICCON monitor, any acoustic signals which will occur can be shut off by pressing the function key **F8**. • If an error message is shown in the horn icon **7** in field **7.1**, then the present error can be determined through it in the diagnostics manual. Pressing the function key **F8** twice, automatically changes to the error determination screen of the test system. The error is displayed there in documentary form.

Acoustic signal “Horn”

1.) Sounds in addition to the optical display of an error message in field **7.1** in case of operational errors are found, which lead to a shut off of a crane movement.
Operational errors are:
- Overload
- Boom outside the angle range of the load chart
- Boom outside radius range of the load chart
- Extension condition of telescopic sections not in accordance with the load chart

2.) In case of application errors with error number (LICCON Error Code LEC). For example sensor errors, which occur due to insufficient sensor signals or a defective sensor.
The following sensors are monitored:
- Hoist limit switch
- Length sensors
- Angle sensors
- Pressure sensors
- Wind sensor
- Battery voltage
- Inductive sensors

Acoustic signal “Short horn”

Sounds in addition to the visual display of error messages without an error number and which do not lead directly to crane movement shut off by the LICCON overload protection
Monitored error messages are:
- Maximum permissible wind speed exceeded (only for activated wind sensor*).
- Maximum or minimum support force exceeded (only with active support force monitoring*).
- Crane utilization value for “Advance warning” (90 %) reached

Priority acoustic signal

– The “Horn” alarm has higher priority than the “Short horn” alarm, i.e. “Horn” takes preference over “Short horn”.
– The “Horn”, as well as the “Short horn” immediately become active again if an error recurs!

2 “Wind speed” icon	• The wind speeds are displayed in [m/sec.] or [ft/sec.] depending on the units of measurement shown in the load chart
2.1 “Wind speed” icon	• In [m/s] or [ft/s]
2.2 Current wind speed	
2.2.1 Wind sensor (WS) 2 (accessory)	• Wind sensor 2 present: Telescopic boom head: No display. Accessories: current wind speed of WS2 is displayed • Wind sensor 2 **not** present: Telescopic boom head: No display. Accessories: “???” is statically displayed
2.2.2 Wind sensor (WS) 1 (telescopic boom head)	• Wind sensor 1 present: Telescopic boom head: current wind speed at WS1 is displayed Accessories: current wind speed at WS1 is displayed • Wind sensor 1 **not** present: Telescopic boom head: “???” is statically displayed by WS1 Accessories: “???” is statically displayed by WS1
2.3 Maximum permissible wind speed	• With icon text “max”: • The value depends on the operating mode and the set up configuration **Note:** If access to a load chart is not possible, then the maximum value starts to blink and the acoustic alarm “Short horn” sounds. If the current wind speed value exceeds the displayed maximum value, the maximum value starts to blink and the acoustic alarm “Short horn” sounds. **The crane movements will not be shut off!**

5.6 The function key line

The function key line consists of function keys **F1** to **F8** and the function key icon bar above it. The function keys correspond to the various function key icons above them.

The function key icons may trigger a function or they change their appearance upon the push of a key (function keys) and thereby their definition.

Not all function keys must have assigned icons. This depends on the “active” program selection.

Pressing a function key changes the appearance of the icon above, its meaning, or its textual content.

F1 Function key
- Zero point for hook travel display winch2*
- Pressing the function key **F1** causes the “Set winch display to zero” icon to appear, i.e. the winch 2* hook path display in the winch icon above is set to “000.00” when the key is pressed. The path measurement begins here.

F2 Function key
- Zero point for hook travel display winch 1
- Pressing the function key **F2** causes the “Set winch display to zero” icon to appear, i.e. the winch1 hook path display in the winch icon above is set to “000.00” when the key is pressed. The path measurement begins here.

F3 Function key
- Turn monitoring icons on / off
- The function key **F3** can be used to turn all the monitored auxiliary functions in the crane on or off
- The appearance of the icon changes according to the status:
  - “Thick border” = auxiliary function icons turned off
  - “Thin border” = auxiliary function icons turned on
- **Note:**
  The monitoring system of all auxiliary functions is always active; only the icons can be faded out. If a monitored limit has been exceeded, an acoustic warning (horn) sounds and the corresponding icon is displayed, even if the monitoring icons have been hidden.

F4 Function key
- Change monitoring page (if present)
  See also section “Monitored auxiliary functions”

F5 Function key
- Not assigned

F6 Function key
- Not assigned

7 “Control parameter” program

The “Control parameter” program offers the following possibilities:
– Preselection of maximum rotation speed of slewing gear.
– Preselection of the maximum winch rotation speed and activation / deactivation of winch 1 and winch 2.*
– Preselection of the maximum luffing speed of the telescopic boom.

During the “control parameter” program the set up key **D** is monitored. If the set up key **D** is operated during the program, then the program is immediately switched back to the “Operation” program.

DANGER
Risk of accident!
▶ **Never** change the maximum speeds or the activation / de-activation of the winches during a crane movement.

7.1 Starting the program

▶ Press program key **P6**.

9.3 Supporting

For a detailed description, see Crane operating instructions, chapter 3.05.

9.3.1 Manual supporting

4	Monitoring and control field	
4.1	Crane icon	
4.2	Support base	• [m] or [ft]
4.3	Function selectors	• For selecting the support cylinders
4.4	Function selectors	• For selecting the sliding beams

Function key line in monitoring / control mode (during program start)

F2	Function key	• Sliding beam illumination, turn on / off manually
F3	Function key	• Extend preselected support cylinder(s)
F4	Function key	• Retract preselected support cylinder(s)
F5	Function key	• Extend preselected sliding beam
F6	Function key	• Retract preselected sliding beam
F7	Function key	• Select the sliding beam
F8	Function key	• Press 1x **=** to turn the acoustical signal off • Press twice **=** fields that are displayed visually in the “Horn” icon are automatically displayed in the error determination display. See also chapter 7.10 “Diagnostics”.

Note

Note

- ▶ Only one sliding beam may be selected for safety reasons.
- ▶ Operating function keys “F3” and “F4” is only meaningful if a sliding beam has also been pre-selected. A horn sounds if no support cylinder has been selected.
- ▶ For safety reasons, the functions of the function keys “F3” to “F6” are only active as long as the appropriate key is pressed.
- ▶ A “rhythmic beeping sound” sounds for the duration of the function as acoustic feedback.

6	Keypad	• The relevant support is selected or deselected using keys 1 to 4.
21	“Incline” icon	• See section: Crane operation in "Support" program.

9.5 Sliding beam length display*

4	Monitoring and control field	
4.1	Crane icon with support numbers	
4.2	Support base	• In [m] or [ft]
4.7	Sliding beam length values	• As a percentage of the maximum extension length • The sliding beam length values blink in the ranges that are unsuitable for supporting
4.8	Percentage sign	• Unit for sliding beam length display

Function key line when program starts (monitoring / control):

F8	Function key	• Press once: Turn the acoustic signal off. • Press twice: Any errors shown in the “Horn” icon are automatically displayed on the error determination screen (see chapter “Diagnostics”).

11.2 Active stand-by operation / alarm

The operating programs and the monitor displays function exactly the same as in the turn-on procedure for the LICCON computer system with engine start (crane operation).

No crane movements are possible. If a crane movement is selected anyway, a message appears on the LICCON monitor.

Example: **Control turning shut off, the crane engine is not running.**

The duration of the stand-by operation is 15 minutes, of which 3 minutes are the stand-by alarm. Operating the LICCON computer system during stand-by operation automatically extends the stand-by time.

▶ In **stand-by operation no** keys are pressed on the monitor.

Result:

– The stand-by alarm (horn) is reached after 12 minutes.
– This screen appears on the monitor: **STANDBY** (see illustration).

▶ Now press any key on the LICCON monitor.

Result:

– System switches back to the interrupted program.
– The stand-by time is extended by another 15 minutes.

▶ During the **stand-by alarm** (Duration: 3 minutes) **no** keys on the monitor are pressed.

Result:

– The LICCON computer system shuts completely off. The shut off is announced by acoustical signals 60 seconds in advance (short horn) and 30 seconds in advance (long horn). The power supply of the LICCON computer system turns off.
– This screen appears on the LICCON monitor: **CRT self test: ERROR: Host Interface: Break!** (Refer to the illustration) and the indicator light **315** and the indicator light **316** blink. In this case, this is not an error message from the LICCON computer system, the error message appears only on the monitor because the connection between the monitor and the CPU is broken.

11.3 Start prevention

Starting the engine again after complete shut down of the LICCON computer system:

▶ Return the ignition switch **320** first to position “0”.
▶ Turn the ignition switch **320** to position “I” (note the preheating time).
▶ Turn the ignition switch **320** briefly to position “II”.

Result:

– The engine starts.

2.6 Operating the windshield wiper / windshield washer system

2.6.1 Operating the windshield wiper

The windshield wipers for the front and the roof window are operated with a 2-stage switch (first stage - intermittent, second stage - continuous wipe).

▶ To activate the windshield wiper on the front window:
Actuate the switch **366**.

or

To activate the windshield wiper on the roof window:

- Actuate the switch **368**.

2.6.2 Operating the windshield washer system

The windshield wipers on the front and roof windows can be assisted by a windshield washer system. Before the start of the cold season, fill the container for the window washer fluid with standard antifreeze mix.

▶ To activate the windshield washer system for the front window:
Press the button **365**.

or

To activate the windshield washer system for the roof window:

- Press the button **367**.

2.7 Opening the front window

WARNING
Danger of injuring hands if they become trapped!
▶ Be careful with your hands when closing the front window.

A pair of nitrogen gas cylinders provide help to lift the front window.

▶ To open from inside, just press on the front window.

or

If you only want to partly open the window:

- Use the attached strap to set the desired opening angle.

2.8 Checking the horn

Note
Use of horn!
▶ Only use the horn in dangerous situations to maintain its warning effect.

▶ Before starting work, check that the horn is functioning.

4 LICCON computer system after engine start

The LICCON computer system is only operational with the engine running.

4.1 Waiting for the boot up phase

After being turned on, the LICCON computer system boots up and carries out a self-test, see Crane operating instructions, chapter 4.02.

▶ Wait for the boot up phase.

Result:

– The set up screen appears on the LICCON monitor.

Normally, the most recently set equipment configuration and reeving number will be displayed.

If a master switch is moved away from the zero position during the boot up phase, the function circuit of the electrical safety chain is interrupted.

▶ In this case:
Turn the engine and the ignition off and restart.

Troubleshooting

An error message appears on the LICCON monitor?

▶ Turn the engine and the ignition off and restart.

▶ The LICCON computer system automatically displays the troubleshooting display.

Troubleshooting

The LICCON monitor does not show the most recently set set up configuration and reeving number?

If there has been a data loss in the memory (cold start), then the first valid set up configuration appears in the set up screen. The reeving number is set to “0”.

▶ Set the set up configuration and reeving number again.

4.2 Taking over the previously selected set up configuration and hoist rope reeving

Check in the operating screen if the correct short code and the correct reeving number have been set.

▶ If the settings on the operating screen are correct:
Press function key “F8” **8**.

Result:

– The “Set up” program is terminated and the adjusted parameters are accepted for the newly started “Operation” program.

5.2 Acoustic and optical warning devices

Note

▶ Overview of acoustic and optical warnings, see Crane operating instructions, chapter 4.20.

– The acoustic and optical warning devices must be functioning and operational.
– Take care of any possible detriments in function, such as snow on the warning lights.

5.3 Hoist limit switch “Hoist top”

The hoist limit switch is intended to prevent the hook block from running against the boom head.
Before every crane application, the function of the hoist limit switch must be checked by running against the switch weight with the hook block.
For installation purposes and in emergency cases, the hoist limit switch can be bypassed, see Crane operating instructions, chapter 4.20.

WARNING

Falling load and property damage!
If the hoist limit switch is defective, there is the danger that the hook block or the load hook is pulled against the pulley head!
Falling load and property damage can result!
Personnel can be severely injured or killed!

▶ Crane operation without or with defective hoist limit switch is prohibited!
▶ Repair or replace a defective hoist limit switch!

The hoist limit switch must actuate when the hoist limit switch weight is lifted by the load hook / hook block:

– When the hoist limit switch is actuated, the icon **12** “Hoist top” appears in the operating screen. The crane movements “Spool up winch”, “Luff telescopic boom down” and “Telescope the telescopic boom out” are shut off.

5.3.1 Quick test Hoist limit switch

When the hoist limit switch weight is lifted:

– The icon **12** “Hoist top” must appear in the operating screen.
– The actuated crane movement must be shut off.

1 General

Make sure that the following prerequisites are met:
– The crane is supported and aligned in horizontal direction according to the data in the load chart.
– The step at the entry of the crane operator's cab is moved out.
– The counterweight is attached and secured according to the data in the load chart.
– The crane engine is running.
– The hook block is correctly reeved as shown in reeving plan.
– All safety devices have been adjusted according to the data in the load chart.
– There are no persons or objects in the danger zone.

DANGER
Risk of accident!
▶ In order to protect the crane and reduce the danger of accidents always use the master switch slowly and sensitively.
▶ Ensure that there are no obstacles in the crane's working area and no persons in the danger zone.
▶ Give a short warning signal (horn) before starting a crane movement.

1.1 Superstructure

1.1.1 Locking the upper carriage

For crane operation only “to the rear” or when “driving with the equipment in place”, mechanically lock the superstructure to the chassis.

Note
LICCON overload protection
▶ The release of LICCON overload protection can only happen if the superstructure is properly locked to the chassis.

▶ Press the button **369**.

Result:
– The locking mechanism of the superstructure is locked.
The icon **1** appears on the LICCON monitor.

1.1.2 Releasing the superstructure locking mechanism

▶ Once the superstructure is locked:
Press the button **369** again.

Result:
– The locking mechanism of the superstructure is unlocked.

3.2 Luffing the folding jib*

Make sure that the following prerequisite is met:
– the switch **430** is set to position right “luff folding jib”

▶ Deflect the master switch 1 **420** in direction X-.

Result:
– Folding jib is raised.

▶ Deflect the master switch 1 **420** in direction X+.

Result:
– Folding jib is raised.

6.2 General

The “Telematik” automatic telescopic boom control system consists of:
– The dual action telescoping cylinder
– The hydraulically operated gripper pinning
– The hydraulically operated boom pinning

The gripper and boom pins are mechanically interlinked, in other words the telescope section can only be unpinned when at the same time the gripper is locked with this telescope section.
In the LICCON telescoping screen the crane operator can see, in dynamic graphics, the pinning state of the telescopic boom, the position of the individual telescopes in relation to each other, and the extension status of the telescoping cylinder.
Due to the automatic telescoping procedure, the crane operator can easily telescope the telescoping boom, as he does not have to concern himself with the pinning or unpinning of the telescoping cylinder or the telescopes. The LICCON telescoping control system therefore makes possible very straightforward telescoping, only the desired telescoping targets need to be entered into the system.
The LICCON telescoping control system decides the sequence in which the individual telescopes will be moved in order to achieve the desired end state. After setting the desired telescoping targets, all telescoping movements, as well as locking and unlocking, are carried out fully automatically.
The following procedures are carried out by the system:
– Locking and unlocking of the telescoping cylinder
– Pinning and unpinning of the telescopes
– Sequence for the telescopes to be telescoped in order to achieve the desired end state

This automatic process will however only be carried out as long as the master switch is operated.
The master switch determines the direction and the speed of the telescoping movement. In this way the crane operator has continuous control over the crane.
The direction of the cylinder movement is set by the LICCON computer system.
If the telescopic boom is lengthened, with the result that currently unreachable telescopes must be moved, then they must first be retracted until the last telescope to be moved is reached. In this case, in order to lengthen the telescopic boom (telescope out), telescoping in must first take place.
The LICCON computer system displays the direction in which the next telescoping must be done. The master switch must also be pressed to correspond to this direction setting. In this way the connection between the direction of movement of the appropriate master switch and the telescope continues.
Thus it is possible to move to a telescoping target automatically without an operating screen. It is therefore also not essential to keep watching the LICCON monitor all the time.
If the direction needs to be changed by the master switch, the telescopic boom remains stationary if the current direction is to be maintained. This also means that the master switch must be moved in the other direction. If there is no further movement in the other direction, this means that the telescope target has been reached. This state is showing visually in the operations screen. If the master switch is still being pressed, then after 3 to 5 seconds, the system switches to the telescoping screen.

2 Reeving the hoist rope with the auxiliary reeving rope

WARNING
Risk of falling!
The assembly personnel, due to an erroneous operation of the crane function or slip on the telescopic boom, can fall and be killed!
- ▶ The telescopic boom may only be accessed if the assembly personnel is protected with suitable safety measures to prevent them from falling!
- ▶ If retaining ropes are present on the telescopic boom, then the assembly personnel must hang an approved fall arrest system to the retaining ropes of the telescopic boom on the left and right with both snap hooks and secure themselves in case of falls. See crane operating instructions, chapter 2.04 and chapter 2.06!
- ▶ Without appropriate safety measures, it is **strictly** prohibited to step on the telescopic boom!
- ▶ If railings are present for the crane, then they must be brought into the corresponding position and secured for assembly / disassembly.
- ▶ Carry out all assembly work from a safe place!

2.1 Reeving procedure

Make sure that the following prerequisites are met:
- The crane is properly supported and horizontally aligned.
- The crane is ballasted according to the load chart.
- The LICCON overload protection has been set according to the load chart.
- The telescopic boom is fully telescoped in.
- The telescopic boom has been luffed to the rear or the side.
- The telescopic boom is luffed down in 0° position.

- ▶ Wear approved fall arrest system and protective equipment, see Crane operating instructions, chapter 2.04.
- ▶ Install the hook device on the ladder, see Crane operating instructions, Chapter 2.06.

WARNING
Risk of falling!
- ▶ Hang the ladder in such a way onto the hoist gear and on the telescopic boom that it cannot fall over! See Crane operating instructions, chapter 2.06.

- ▶ If no railing is installed on the crane superstructure:
  Hang the ladder on the hoist gear and set it up safely, see Crane Operating instructions, Chapter 2.06.
- ▶ If a railing is installed on the crane superstructure:
  Set the railing on the crane superstructure into assembly / disassembly position, see Crane operating instructions, chapter 2.06.
- ▶ Secure the assembly personnel from falling: Hook assembly personnel with fall arrest system on the respective fastening points, see Crane operating instructions, chapter 2.06.

4.2 Removing the load hook*

Make sure that the following prerequisites are met:
- The crane is properly supported and horizontally aligned.
- The crane is ballasted according to the load chart.
- The LICCON overload protection has been set according to the load chart.
- The telescopic boom is fully telescoped in.
- The telescopic boom has been luffed to the rear or the side.
- The telescopic boom is luffed down in 0° position.
- The ground is level and of sufficient load carrying capacity.

4.2.1 Lowering the load hook

WARNING
Crushing of hands!
When guiding the load hook by hand, hands or fingers can be crushed!
The load hook could roll away!
▶ Make sure the load hook is safely positioned!

▶ Place the load hook **26** on the ground.
▶ Remove the hoist limit switch weight, see section “Removing the hoist limit switch weight”.

4.2.2 Detaching the hoist rope

▶ Push the retaining pin **6** into the rope lock **1**, move the lever **5** sideways and hold it in this position.

Result:
- The latch **4** is moved to the side and the locking clamp **8** is released.

▶ Push the hoist rope in the direction of the load hook and detach the locking clamp **8**.
▶ At the pulley head remove the spring retainers on the rope retaining pipe **14** and on the rope retaining pipe **15** and pull the rope retaining pipe out, see section “Reeving the hoist rope with the assembly winch”.
▶ Unreeve the hoist rope from the pulley head.
▶ Insert the rope retaining pipes again and secure with spring retainers.

Counterweight [t]	Combination	Individual weight [t]
	Counterweight plate **4**	12
	Auxiliary ballast **5**	10
	Auxiliary ballast **5**	10

1.2 Checking the counterweight plates

DANGER
Risk of accident due to damaged counterweight plates!
If damaged counterweight plates are loaded, the stable seating of the counterweight plates can no longer be guaranteed.
▶ Replace damaged counterweight plates!

Before assembling or disassembling the counterweight plates, check visually for damage and foreign matter.
When depositing the counterweight plate **1** on the centering cone **9** and stacking the counterweight plates, make sure that no foreign matter gets between the counterweight plates.

3.3 Lifting the individual counterweight plates from the vehicle frame with the own crane

Adjust the LICCON overload protection according to the load chart and ballasted counterweights.

DANGER
Risk of accident due to toppling crane!
The boom lengths and boom projection radii specified in the load chart may not be exceeded. If this is not observed, there is a risk of accidents as the crane can topple over!
▶ The boom lengths and boom projection radii noted in the load chart must be strictly observed!

▶ Individually attach counterweight plates to the cables and deposit these on the transport vehicle with the crane.

3.4 Driving with counterweight plates placed on vehicle frame

The axle loads increase with the counterweight plates on the vehicle.

DANGER
Exceeding the axle load and total weight increases the risk of accidents!
If the axle loads and the overall vehicle weight are excessively increased due to non-compliance, the brake performance is also reduced in direct proportion to the excess weight! The steering system, service brake, parking brake and retarder no longer meet EU guidelines!
▶ Do not exceed the specified axle load or total weight under any circumstances!

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1.3.2 3-pulley hook block

Reeving	Rope fixed point
4x	On the pulley head
5x	On the hook block
6x	On the pulley head
7x	On the hook block

WARNING
Expanded working / danger zone of the crane!
Due to the function “Exceedance of shut off limits of the LICCON overload protection” it is possible that the working / danger zone of the crane is significantly expanded!
If these circumstances are not observed, collisions and accidents can occur!
Personnel can be severely injured or killed!

- ▶ With activated function “Exceedance of shut off limits of the LICCON overload protection” take an expanded working / danger zone of the crane into account and monitor it!

Warning light 12.3					
Case	**Utilization of crane**	**Acoustic warning**	**Visual warning**		
		Signal turntable	**Green**	**Yel-low**	**Red**
Case 001	From 0 % to 89 %		O^1		
Case 002	From 90 % to 100 %			O^1	
Case 003	Above 100 %	X^1			O^2
Case 004	-				O^2
Case 005	From 0 % to 89 %		O^1		
Case 005	From 90 % to 100 %			O^1	
Case 005	Above 100 %	X^1			O^2
Case 006	-				O^2
Case 010	From 0 % to 89 %		O^1		
Case 010	From 90 % to 110 %			O^1	
Case 010	Above 110 %	X^1			O^2
Case 011	Up to 110 %			O^1	
Case 011	Above 110 %	X^1			O^2
Case 016	From 0 % to 89 %		O^1		
Case 016	From 90 % to 110 %			O^1	
Case 016	Above 110 %	X^1			O^2
Case 018	No value available				O^2
Case 020	No value available				O^2

O = cannot be turned off
O^1 = warning light **12.3** lights up
O^2 = warning light **12.3** blinks
X^1 = can be shut off by momentarily pressing the button **35** on the right control console or the right instrument panel, effective at the earliest after five seconds

2.4.1 Luffing in with suspended load

If the maximum permissible load moment is exceeded, the LICCON overload protection turns off all crane movements that increase the load moment.
In the icon **22** (load moment display) the utilization bar **22.1** has exceeded the 100 % mark and in the LICCON monitor appears the icon **19**
This shut off limit can be exceeded by actuating the button **5** “luffing in with suspended load”.
Make sure that the following prerequisites are met:
– The crane engine is running.
– The standby mode on the LICCON monitor is not active.
– Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.

Note
▶ If the load is reduced by luffing up, then the button **5** “luffing in with suspended load” is not functioning.
▶ For the procedure when the button **5** “luffing in with suspended load” is not functioning, see section “Exceedance of maximum permissible load moment”.

▶ Press the function key **5** “luffing in with suspended load” and hold it.

Result:
– The LICCON overload protection is inactive.

▶ Luff the load in.

Result:
– If the crane reaches a normal operation status (utilization below 100 % and no active shut off) then the icon **19** turns off, normal crane operation is possible again.

The function “luffing in with suspended load” is also deactivated:
– When the function key **5** “luffing in with suspended load” is not longer actuated
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– If the standby mode on the LICCON monitor is active
– In case of defect of an associated sensor (LML)
– At engine stop

The function “luffing in with suspended load” is deactivated:
– The LICCON overload protection is active.

▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

2.7 Exceeding the shut off limits of the LICCON overload protection during erection / take down procedures (assembly operation)

Note

- ▶ If the crane is in the area “no load chart available”, there is a shut off of crane operation by the LICCON overload protection and the icon **19** appears in the LICCON monitor.
- ▶ By an actuated set up key **D**, the function “exceedance of shut off limits of the LICCON overload protection” can be activated, all erection / take down procedures can be carried out within the erection / take down charts, for which no load charts are available.

WARNING

Danger of accident during erection / take down procedures!

If the erection / take down charts are not observed, the crane could collapse, the boom can break off or the crane can topple over!

Personnel can be severely injured or killed!

- ▶ The erection / take down charts must be observed!
- ▶ Press the set up key **D** only when the configuration status has been entered correctly in the LICCON computer system and matches the actual situation!

Make sure that the following prerequisites are met:

- The master switches and the set up key **D** are **not** actuated.
- Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.
- Radio operation* is not active.
- The crane engine is running.
- The standby mode on the LICCON monitor is not active.
- The erection / take down charts are adhered to.
- The configuration status has been entered correctly into the LICCON computer system.

▶ Turn the set up key **D** to the right (touching).

Result:

- The assembly icon **30** appears in the area “load chart available”.
- The assembly icon **31** appears in the area “no load chart available”.
- The erection / take down procedures can be carried out.

The function “exceedance of shut off limits of the LICCON overload protection” turns off:

- If the set up key **D** is pressed again
- When all master switches are for 10 seconds after actuation of the set up key **D** in neutral position (with “load chart available”)
- When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
- At engine stop
- When an area with existing load chart is reached (erection procedure)

The function “exceedance of shut off limits of the LICCON overload protection” has / was shut off:

- The assembly icon **30** or the assembly icon **31** in the LICCON monitor turns off.

▶ After completion of the erection / take down procedures, make sure that the assembly icon **30** or the assembly icon **31** no longer appear in the LICCON monitor.

Warning light 12.3					
Case	**Utilization of crane**	**Acoustic warning**	**Visual warning**		
		Signal turntable	**Green**	**Yel-low**	**Red**
Case 001	From 0 % to 89 %		O^1		
Case 002	From 90 % to 100 %			O^1	
Case 003	Above 100 %	X^1			O^2
Case 004	-				O^2
Case 005	From 0 % to 89 %		O^1		
Case 005	From 90 % to 100 %			O^1	
Case 005	Above 100 %	X^1			O^2
Case 006	-				O^2
Case 010	From 0 % to 89 %		O^1		
Case 010	From 90 % to 100 %			O^1	
Case 010	Above 100 %	O			O^2
Case 011	From 0% to 100 %			O^1	
Case 011	Above 100 %	O			O^2
Case 016	From 0 % to 89 %		O^1		
Case 016	From 90 % to 100 %			O^1	
Case 016	Above 100 %	O			O^2
Case 018	No value available				O^2
Case 020	No value available				O^2

O = cannot be turned off
O^1 = warning light **12.3** lights up
O^2 = warning light **12.3** blinks
X^1 = can be shut off by momentarily pressing the button **35** on the right control console or the right instrument panel, effective at the earliest after five seconds

3.4.1 Luffing in with suspended load

If the maximum permissible load moment is exceeded, the LICCON overload protection turns off all crane movements that increase the load moment.
In the icon **22** (load moment display) the utilization bar **22.1** has exceeded the 100 % mark and in the LICCON monitor appears the icon **19**
This shut off limit can be exceeded by actuating the button **5** “luffing in with suspended load”.
Make sure that the following prerequisites are met:
– The crane engine is running.
– The standby mode on the LICCON monitor is not active.
– Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.

Note
▶ If the load is reduced by luffing up, then the button **5** “luffing in with suspended load” is not functioning.
▶ For the procedure when the button **5** “luffing in with suspended load” is not functioning, see section “Exceedance of maximum permissible load moment”.

▶ Press the function key **5** “luffing in with suspended load” and hold it.

Result:
– The LICCON overload protection is inactive.

▶ Luff the load in.

Result:
– If the crane reaches a normal operation status (utilization below 100 % and no active shut off) then the icon **19** turns off, normal crane operation is possible again.

The function “luffing in with suspended load” is also deactivated:
– When the function key **5** “luffing in with suspended load” is not longer actuated
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– If the standby mode on the LICCON monitor is active
– At engine stop

The function “luffing in with suspended load” is deactivated:
– The LICCON overload protection is active.

▶ Carry out crane movements in such a way that no repeated shut off by the LICCON overload protection occurs.

3.7 Exceeding the shut off limits of the LICCON overload protection during erection / take down procedures (assembly operation)

Note

- ▶ If the crane is in the area “no load chart available”, there is a shut off of crane operation by the LICCON overload protection and the icon **19** appears in the LICCON monitor.
- ▶ By an actuated set up key **D**, the function “exceedance of shut off limits of the LICCON overload protection” can be activated, all erection / take down procedures can be carried out within the erection / take down charts, for which no load charts are available.

WARNING

Danger of accident during erection / take down procedures!

If the erection / take down charts are not observed, the crane could collapse, the boom can break off or the crane can topple over!

Personnel can be severely injured or killed!

- ▶ The erection / take down charts must be observed!
- ▶ Press the set up key **D** only when the configuration status has been entered correctly in the LICCON computer system and matches the actual situation!

Make sure that the following prerequisites are met:

– The master switches and the set up key **D** are **not** actuated.
– Either the seat contact button **29** or one of the buttons **1** of the master switches are actuated.
– Radio operation* is not active.
– The crane engine is running.
– The standby mode on the LICCON monitor is not active.
– The erection / take down charts are adhered to.
– The configuration status has been entered correctly into the LICCON computer system.

▶ Turn the set up key **D** to the right (touching).

Result:

– The assembly icon **30** appears in the area “load chart available”.
– The assembly icon **31** appears in the area “no load chart available”.
– The erection / take down procedures can be carried out.

The exceedance of the shut off limits of LICCON overload protection turns off:

– if the set up key **D** is pressed again
– When all master switches are for 10 seconds after actuation of the set up key **D** in neutral position (with “load chart available”)
– When either the seat contact button **29** nor one of the buttons **1** of the master switches are actuated
– At engine stop
– When an area with existing load chart is reached (erection procedure)

The function “exceedance of shut off limits of the LICCON overload protection” has / was shut off:

– The assembly icon **30** or the assembly icon **31** in the LICCON monitor turns off.

▶ After completion of the erection / take down procedures, make sure that the assembly icon **30** or the assembly icon **31** no longer appear in the LICCON monitor.

11 Exceeding the overload protection

DANGER

Increased accident risk when exceeding the overload protection!

As section 4.2.6.3.2 of EN 13000 does not put the requirements of appendix 1 of the EC machinery directive 89/37/EC into concrete terms, the overload protection has not been designed according to this definition.

Proper and destined use of the crane is ensured due to the construction of the overload protection system and observance of the information in the Crane operating instructions. All **sensibly foreseeable erroneous operations** of the crane have been taken into consideration.

Impermissible crane operation with exceeded overload protection – with the aim of increasing the maximum load-bearing capacity of the crane above the rated value in the load chart, or to extend the designated working range of the crane – does not constitute a **sensibly foreseeable erroneous operation**, rather **a deliberate improper use with high risk of accident**!

The possible risks and consequences of such deliberate improper use are detailed in the Crane operating instructions.

Such deliberate improper use can neither be prevented by means of the constructive design, nor by means of information in the Crane operating instructions!

- ▶ Actuate the set up key **D** only according to the Crane operating instructions!
- ▶ Any other use of the set up key than that described in the Crane operating instructions is prohibited!

12.2.4 Disassembly of lattice sections on self-supporting auxiliary booms using an auxiliary crane

The illustrations serve as examples. The illustrations may differ depending on the crane.

WARNING
Risk of fatal injury when disassembling auxiliary booms!
If the pins are not unpinned in the given sequence, lattice sections may suddenly fold down or even fall down. This can result in life-threatening injuries to personnel.
▶ Pins must be unpinned in the order specified!

- ▶ Release and unpin the pins at both sides (level **B**) at point **1**, illustration **1**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **2**, illustration **2**.
- ▶ Release and unpin the pins at both sides (level **B**) at point **3**, illustration **3**.
- ▶ Release and unpin the pins at both sides (level **A**) at point **4**, illustration **4**.

12.3.4 Flying disassembly of lattice sections

The illustrations serve as examples. The illustrations may differ depending on the crane.
The flying disassembly of lattice sections can be used on:
– Derrick boom
– Main boom

Note
▶ Before guying the pivot section, the boom is secured to prevent it from falling down!
▶ There are various possibilities to secure the boom to prevent it from falling down!

Guying the pivot section in flying mode with the SA-frame

▶ Place the boom on the ground, see illustration **2**.

or

WARNING
Lattice section incorrectly attached!
If the fastening equipment is attached on the bitts **2** when securing the boom, then the bitts will be overloaded! The lattice section will be damaged and the boom can fall down! Personnel can be severely injured or killed!
If the auxiliary crane is used to secure the boom for flying disassembly:
▶ Do **not** fasten the lattice section on the bitts **2**, see illustration **1**!
▶ Attach the fastening equipment in the area of point **P1** on both sides on the lattice section, see detail **X**!
▶ Make sure that the long fastening equipment is used, so that the angle between the cross section of lattice section and guyed fastening equipment is at least 60°, see detail **Y**!

■ Secure the boom with the auxiliary crane, see illustration **3**.

or

WARNING
Falling boom!
If the boom is not properly and securely supported from below, then the boom can fall down!
▶ Support the boom properly and safely with suitable material!

■ Support the boom, see illustration **4**.
Result:
– The guy rods can be disassembled.

▶ Place down, secure and disassemble the guy rods.
▶ Pin and secure the guy rods SA-frame on the pivot section.
▶ Tighten the guy rods SA-frame until the boom is in horizontal position.
Result:
– Pivot section is guyed in flying mode with the SA-frame, see illustration **5**.
– The lattice sections can be disassembled in flying mode.

1.1.3 3-piece folding jib, see illustration 3

Position	Description	Length
1	Adapter	1.5 m
2	Reducer section	7.55 m
3	End section	9.3 m
4	Folding jib extension	7 m
6	Pivot section	3.65 m
Length of 3-piece folding jib		29 m

1.1.4 4-piece folding jib, see illustration 4

Position	Description	Length
1	Adapter	1.5 m
2	Reducer section	7.55 m
3	End section	9.3 m
4	Folding jib extension	7 m
5	Folding jib extension	7 m
6	Pivot section	3.65 m
Length of 4-piece folding jib		36 m

2.4.1 Assembly procedure, part 1

When swinging the folding jib support **18** in and out, ensure that the spring pin **8** is unlocked with one hand and that the folding jib support **18** is moved overhead with the other hand.

- ▶ Release and unpin the spring pin **8**.
- ▶ Swing the folding jib support **18** out until the spring pin **8** reengages.

For a “hydraulic folding jib” (TNZK operation), the hydraulic line must be uncoupled before swinging the folding jib out.

- ▶ If a hydraulic folding jib is carried along:
  Uncouple the hydraulic line at the point **E**.
- ▶ Attach the auxiliary rope **17** on point **C**.
- ▶ If a double folding jib is carried along:
  Release and unpin the pin **23**.
- ▶ If a double folding jib is carried along:
  Pull the nylon rope **13** and loosen the lock between the end section **3** and the reducer section **2**.
- ▶ Start the crane engine.
- ▶ Press button **451** and swing the folding jib out with the swing cylinder until it can be pinned at point **A**.
- ▶ Insert the pins **9** on top and bottom at point **A** and secure.

DANGER
Danger of fatal injuries due to toppling folding jib!
Special retaining clips must be used to secure the pins **9**. The use of spring pins or spring retainers on the pins **9** is not permitted. The folding jib may only be unlocked at point **D**, when the pins **9** are pinned and secured at the top and bottom at point **A**.

- ▶ Pin and secure pins **9** at point **A** on top and bottom.

- ▶ Swing the safety bracket **15** with assembly rod **11** to the side.
- ▶ Press the lever **16** with the assembly rod **11** upward and latch it into the link **14**.
- ▶ Press button **451** and swing the folding jib with the swing cylinder all the way out.
- ▶ Unlock the swing cylinder **10** with assembly rod **11**.

DANGER
Danger of fatal injuries due to toppling folding jib!
The folding jib may topple due to an assembly error.

- ▶ Standing under the folding jib during the swing procedure is prohibited!
- ▶ Standing in the swing area as well as in the folding area of the folding jib is prohibited!

- ▶ Swing the reducer section **2** with the auxiliary rope **17** by 180° until it can be pinned on the top and at the bottom at the point **B**.

2.7 Assembling the 4-piece folding jib

The 4-piece folding jib is a folding jib that has been extended with a folding jib extension **4** and a folding jib extension **5**.
Make sure that the following prerequisites are met:

– The folding jib is attached on the telescopic boom or on the telescopic boom extension.
– An auxiliary crane with an adequate load-bearing capacity is available.

DANGER
Risk of accident when assembling / disassembling the 4-piece folding jib!
If the following conditions are not fulfilled, people may be fatally injured during assembly / disassembly.

▶ People may not stand under the folding jib when pins are removed!
▶ The pins must be pinned and unpinned in the order specified in the operating instructions!
▶ Attach fastening ropes in such a way that no angular pull occurs!

▶ Attach the reducer section **2** to auxiliary crane and tighten the fastening rope slightly.

or

■ Attach the reducer section **2** with the end section **3** on the auxiliary crane and tighten the fastening rope slightly.

DANGER
Risk of accident due to distorted pins!
Angular pulling or excessive / low hoisting force of the auxiliary crane may result in distortion of the pins.
Distorted parts can suddenly fly off when the pins are unpinned.

▶ When the pins are unpinned, the “lifting force” of the crane must be adapted to the “weight” of the parts being lifted!
▶ Do **not** remove difficult to remove pins by force!
▶ Remove the reason for the distortion!

▶ Release and unpin the pins **50** on both sides.
▶ Release the pins **51** on both sides and unpin from the outside to the inside.
▶ Place the reducer section **2** down.

or

■ Place the reducer section **2** with the end section **3** down.
▶ Fasten the folding jib extension **5** to the auxiliary crane and insert into the fork heads on the pivot section **6**.
▶ Pin the folding jib extension **5** with the pivot section **6**: Pin the pins **50** on both sides from the outside to the inside and secure.

Note

▶ Before unpinning and pinning the pins **X**, unbolt the extension **Y** or on accordingly. Then secure the pins **X** on both sides with spring retainers. Before driving on public roads, the extension **Y** must be removed again, and the pins **X** must be secured on both sides with the spring retainers.

▶ Pin the pins **51** on both sides from the outside to the inside and secure.

4.1 Angle assembly with hoist rope as holding cable

WARNING
Danger of damage to the folding jib and the hoist rope!
If the telescopic boom is telescoped out or luffed down as long as the hoist rope is tightened on the assembly fixed point, the hoist rope and the folding jib may be damaged.
- ▶ Do not telescope the telescopic boom out or luff it down with the hoist rope attached to the assembly fixed point!
- ▶ Angle assembly with the hoist rope as holding cable is only permitted for operation with single folding jibs and double folding jibs!

4.1.1 Preparatory work

- ▶ Unreeve the hoist rope on the lock.
- ▶ Remove the hoist limit switch weight.
- ▶ For operation with double folding jib
  Guide the press fitting **42** into the assembly fixed point **43**.

or

For operation with the single folding jib
- ■ Guide the press fitting **42** into the assembly fixed point **41**.
- ▶ Tighten the hoist rope by **carefully deflecting** the appropriate manual control lever.

4.1.2 Angle settings

The folding jib can be operated in angles 0 °, 22.5 ° and 45 °. The relevant angle is set using the pin **36**.

DANGER
Risk of accident if folding jib “folds down” inadvertently!
If the following notes are not observed, the folding jib can “fold down” inadvertently!
- ▶ Do **not** unpin the bore **35**!
- ▶ Do not unpin pin **36** unless the folding jib is being held by the hoist rope!

- ▶ Release pin **36** and unpin from bore **33**.
- ▶ With angle setting of 22.5 °
  Pin and secure the pin **36** in the bore **34**.

or

With angle setting of 45 °
- ■ Insert pin **36** in transport retainer.

4.1.3 Positioning the folding jib

- ▶ Pin and secure the pin **36** in the bore **34 or** in the transport retainer.
- ▶ Spool the hoist rope out by deflecting the appropriate manual control lever and raise the telescopic boom at the same time until the lug **37** lies against the appropriate pin and the folding jib is supported by the pin.
- ▶ Release the press fitting on the assembly fixed point.

6.3 Electrical connections on the double folding jib

6.3.1 Single hook operation, illustration 17

Only the hoist limit switch **S945** on the double folding jib is active during single hook operation. The hoist limit switch **S940** on the single folding jib is unplugged.

- Actuate the hoist limit switch **-S930** mechanically.
- If attached to the telescopic boom:
  Actuate the hoist limit switch* **-S931** mechanically.
- Insert the cable plug **-X500** into the socket **-X556V**.
- Insert the cable plug **-X505** into the socket **-X501**.
- Insert the adapter **-X556** into the socket **-X502**.
- Insert the hoist limit switch **-S945** with the cable plug **-X502** into the socket **-X556H**.
- Insert the wind speed sensor* with the cable plug **-X556W** into the socket **-X556**.
- Insert the flashing beacon* with the cable plug **-X460** into the socket **-X460Y**.
- **Or** insert the high voltage warning* with the cable plug **-X486** into the socket **-X486Y**.

6.3.2 Two hook operation, illustration 18

During two hook operation the hoist limit switch **S930** on the telescopic boom and the hoist limit switch **S945** on the double folding jib are active! The hoist limit switch **S940** on the single folding jib is unplugged.

- If attached to the telescopic boom:
  Actuate the hoist limit switch* **-S931** mechanically.
- Insert the cable plug **-X500** into the socket **-X556V**.
- Insert the cable plug **-X505** into the socket **-X501**.
- Insert the adapter **-X556** into the socket **-X502**.
- Insert the hoist limit switch **-S945** with the cable plug **-X502** into the socket **-X556H**.
- Insert the wind speed sensor* with the cable plug **-X556W** into the socket **-X556**.
- Insert the flashing beacon* with the cable plug **-X460** into the socket **-X460Y**.
- **Or** insert the high voltage warning* with the cable plug **-X486** into the socket **-X486Y**.

9.1 Change over with the hoist rope as retaining rope

9.1.1 Preparatory work

WARNING
Danger of damage to the folding jib and the hoist rope!
If the telescopic boom is telescoped out or luffed down as long as the hoist rope is tightened on the assembly fixed point, the hoist rope and the folding jib may be damaged.
- ▶ Do not telescope the telescopic boom out or luff it down with the hoist rope attached to the assembly fixed point!
- ▶ Change over with the hoist rope as retaining rope is only permitted for operation with single folding jibs and double folding jib!

- ▶ Lower the telescopic boom until the hook block can be reeved out on the end section of the folding jib.
- ▶ Reeve out the hoist rope on the hook block.
- ▶ Remove the hoist limit switch weight.
- ▶ For operation with double folding jib
  Guide the press fitting **42** into the assembly fixed point **43**.

or

For operation with the single folding jib
- ■ Guide the press fitting **42** into the assembly fixed point **41**.
- ▶ Tighten the hoist rope by **carefully deflecting** the appropriate manual control lever.

WARNING
Danger of damage to the folding jib and the hoist rope!
- ▶ As soon as the folding jib has reached the 0 ° stop, the “lifting” and “luffing” movement must be stopped immediately.

- ▶ Luff the telescopic boom down and simultaneously spool up the hoist rope so that the folding jib is always kept at the same height of approx. 1.0 m - 1.5 m above the ground until the 0 ° position (stop on pull bracket) has been reached.

9.1.2 Positioning the folding jib

DANGER
Risk of accident if folding jib “folds down” inadvertently!
If the following notes are not observed, the folding jib can “fold down” inadvertently!
- ▶ Do **not** unpin the bore **35**!
- ▶ Do not unpin pin **36** unless the folding jib is being held by the hoist rope!

- ▶ Release the pin **36** and unpin from bore **34 or** remove from the transport retainer.
- ▶ Pin and secure the pin **36** in the bore **33**.
- ▶ Disconnect the hoist rope on the assembly fixed point.

11.4 Removing the single folding jib carried on the crane, part 2

DANGER
Danger of fatal injuries due to toppling folding jib!
The folding jib may topple due to a disassembly error.
- ▶ Standing under the folding jib during the swing procedure is prohibited!
- ▶ Standing in the swing area as well as in the folding area of the folding jib is prohibited!

- ▶ Swing the folding jib backward until the swing cylinder **10** is locked to the folding jib.
- ▶ Start the crane engine.
- ▶ Press button **450** and swing in the folding jib with the swing cylinder until the lock **43** engages audibly.
- ▶ Check whether the lock **43** has engaged properly.

DANGER
Danger of fatal injury when unpinning the pins **9**!
If the pins **9** are unpinned before the lock **43** has engaged, then the folding jib will fall down and possibly cause fatal injury to the assembly personnel.
- ▶ The pins **9** may not be unpinned until the lock **43** has engaged and the manual lever **16** has been secured with the safety bracket **15**.

- ▶ Secure the manual lever **16** with the safety bracket **15**.
- ▶ Release the pin **9** at point **A**, unpin and insert into transport retainer.
- ▶ Press button **450** and swing the folding jib with swing cylinder in all the way.

Result:
– When carrying the double folding jib along, the reducer section **2** is locked with the end section **3**.

- ▶ If a double folding jib is carried along:
  Insert and secure pin **23**.

When swinging the folding jib support **18** in and out, ensure that the spring pin **8** is unlocked with one hand and that the folding jib support **18** is moved overhead with the other hand.
- ▶ Unpin the spring pin **8** and swing in the folding jib support **18** until the spring pin **8** engages.
- ▶ Secure the spring pin **8**.
- ▶ If a hydraulic folding jib is carried along:
  Connect the hydraulic line to the hydraulic cylinder at the point **E**.
- ▶ Remove the auxiliary rope **17**.

“Hydraulic folding jibs” have an overflow tank attached to the hydraulic cylinder. The overflow tank must be emptied when it is full. Even when the folding jib is not carried along on the crane.
- ▶ For operation with a hydraulic folding jib:
  Empty the overflow tank on the hydraulic cylinder.

11.7 Removal of 4-piece folding jib

DANGER
Risk of accident when assembling / disassembling the 4-piece folding jib!
If the following conditions are not fulfilled, people may be fatally injured during assembly / disassembly.
- ▶ People may not stand under the folding jib when pins are removed!
- ▶ The pins must be pinned and unpinned in the order specified in the operating instructions!
- ▶ Attach fastening ropes in such a way that no angular pull occurs!
- ▶ Do not remove folding jib until it has been secured with the auxiliary crane to prevent it from falling!
- ▶ Do not lean the ladder against the folding jib!

- ▶ Attach the reducer section **2** to auxiliary crane and tighten the fastening rope slightly.

or

- ■ Attach the reducer section **2** with the end section **3** on the auxiliary crane and tighten the fastening rope slightly.

DANGER
Risk of accident due to distorted pins!
Angular pulling or excessive / low hoisting force of the auxiliary crane may result in distortion of the pins.
Distorted parts can suddenly fly off when the pins are unpinned.
- ▶ When the pins are unpinned, the “lifting force” of the crane must be adapted to the “weight” of the parts being lifted!
- ▶ Do **not** remove difficult to remove pins by force!
- ▶ Remove the reason for the distortion!

- ▶ Release and unpin the pins **54** on both sides.
- ▶ Release the pins **55** on both sides and unpin from the outside to the inside.
- ▶ Place the pins **54** and the pins **55** in the transport retainer.
- ▶ Place the reducer section **2** down.

or

- ■ Place the reducer section **2** with the end section **3** down.
- ▶ Attach folding jib extension **4** to the auxiliary crane and tighten the cable lightly.
- ▶ Release and unpin the pins **52** on both sides.
- ▶ Release the pins **53** on both sides and unpin from the outside to the inside.
- ▶ Place the folding jib extension **4** down.
- ▶ Place the pins **52** and the pins **53** in the transport retainer.
- ▶ Attach folding jib extension **5** to the auxiliary crane and tighten the cable lightly.

2.2 Fold boom nose into operating position, Fig. 3 and 4

DANGER
Accident hazard due to possible fall of the boom nose!
If the swivel pin **7** is unbolted, the boom nose drops.
▶ Never unbolt the swivel pin **7**!

▶ Release bolts **6** at point **C** and unbolt.

CAUTION
Risk of crushing fingers!
Fingers may be crushed when folding the boom nose.
▶ Do not crush fingers when folding the rope pulley **5**!

▶ Fold down rope pulley **5** until a bolt can be attached at point **D**.
▶ Attach bolt **6** and secure.

2.3 Assembly of the auxiliary boom carried on the crane

2.3.1 Swinging the auxiliary boom into operating position

- ▶ Attach the auxiliary rope **9** on point **C**.
- ▶ Release and unpin the spring pin **3**.
- ▶ Swivel auxiliary boom out until it can be pinned at point **A**.
- ▶ Insert the pins **4** on top and bottom at point **A** and secure.

DANGER
Danger of fatal injury due to toppling auxiliary boom!
Special retaining clips must be used to secure the pins **4**. The use of spring pins or spring retainers on the pins **4** is not permitted. The auxiliary boom may only be released at point **D** if the pins **4** are pinned and secured at the top and bottom at point **A**.
- ▶ Pin and secure pins **4** at point **A** on top and bottom.

- ▶ Swing the safety bracket **5** with the assembly rod to the side.
- ▶ Push the lever **6** with the assembly rod up and latch into the bracket **7**.

DANGER
Danger of fatal injury due to toppling auxiliary boom!
Due to an assembly error, the auxiliary boom could fall down.
- ▶ Standing under the auxiliary boom during the swing operation is prohibited!
- ▶ Standing in the slewing area or the folding area of the auxiliary boom is prohibited!

- ▶ Swing the auxiliary boom with the auxiliary rope **9** by 180 ° until it can be pinned at point **B** on the top and bottom.

DANGER
Danger of fatal injury due to toppling auxiliary boom!
- ▶ Special retaining clips must be used to secure the pins **8**.
- ▶ The use of cotter pins or spring retainers is prohibited on the pins **8**!

- ▶ Insert the pins **8** on top and bottom at point **B** and secure.
- ▶ Remove the auxiliary rope **9**.

3 Erection

3.1 Preparatory work

Make sure that the following prerequisites are met:

- The crane is properly supported and horizontally aligned.
- The counterweight has been installed on the turntable according to the load chart.
- The telescopic boom is fully telescoped in.
- The auxiliary boom has been assembled according to the load chart and the operating instructions.
- All limit switches have been correctly installed and are fully functional.
- All pin connections have been secured.
- The hoist rope has been correctly placed in the rope pulleys and is secured with the rope retaining pins to prevent it from jumping out.
- There are no loose parts on the telescopic boom or the auxiliary boom.
- The telescopic boom, the auxiliary boom and its components (such as: Limit switch, airplane warning light, wind speed sensor) must be free of snow and ice in winter.

DANGER
Risk of accident!
Incorrectly installed or non-functioning limits switches as well as falling parts (such as: pins, cotter pins, ice) can cause accidents!
▶ Install all limit switches, pins and cotter pins properly.

▶ Check if all prerequisites have been met.

3.2 Erection procedure

DANGER
Danger of accidents due to toppling of the crane!
The radii specified in the load chart may not be exceeded or fallen below, even if there is no load on the hook! If this regulation is not observed, the crane can topple over.
▶ Compare and check the settings on the LICCON computer system with the actual configuration status!

Adjustment of the LICCON overload protection, refer to chapter 4.02.
▶ Set and confirm the LICCON overload protection according to the required set up configuration.
▶ Luff the telescopic boom up with installed auxiliary boom until the LICCON issues the release.
▶ Telescope the telescopic boom out to the values specified in the load chart.

1 Minimum required hook block weight

WARNING
Falling components and hook block!
If the chosen hook block weight is not large enough. then the hoist rope pulls the hook block between the boom head and the winch from a certain hoisting height suddenly upward. As a result, the boom head and the hook block can be damaged. Damaged components and the hoist rope between the boom head and the winch can fall down.
If slack rope forms between the winch and the boom head when spooling the winch out, then the hook block can suddenly fall down.
Personnel can be severely injured or killed!
- ▶ Calculate the minimum required hook block weight before lifting the load!
- ▶ Select the weight of the hook block depending on the calculation!

If the weight of the hook block is not sufficient:
- ▶ Select a heavier hook block or increase the weight of the hook block with fastening items, load tackle, auxiliary weights or modification kits!

NOTICE
Rope damage due to insufficient weight of the hook block!
If the hook block is operated with a higher reeving than is required by the load on the respective boom length, the minimum required hook block weight increases.
If the hook block weight is too low to tighten the hoist rope sufficiently, spooling problems may occur on the winches when lowering and lifting the hook block due to slack rope formation. Rope damage can result.
If no minimum system-related hoist reeving is required for the operating mode:
- ▶ Reeve the hook block at the minimum depending on the maximum rope pull and the weight of the load to be lifted!

If the weight of the hook block is not sufficient:
- ▶ Select a heavier hook block or increase the weight of the hook block with fastening items, load tackle, auxiliary weights or modification kits!

Note
Recommendation for selection of hook block weight!
If the maximum load capacity for the respective boom configuration is not exceeded by an additional weight increase of the hook block:
- ▶ Increase the minimum required hook block weight additionally by at least 10%!

If an additional weight increase of the hook block due to the maximum load capacity for the respective boom configuration is not possible:
- ▶ Lower the hook block only with utmost caution!

Note
Observe the permissible hook block weights for erection and take down of the boom system!
If the permissible hook block weight for erection and take down of the boom system is exceeded due to the own weight increase of the hook block, then the boom system cannot be erected or taken down with this hook block weight.
- ▶ Observe the permissible hook block weights for erection and take down in the erection and take down charts!

If the permissible hook block weight for erection and take down is exceeded:
- ▶ Remove auxiliary weights for the erection and take down of the boom system!

1.1 Calculating the minimum required hook block weight

5 Removing the single blocks

5.1 Preparing the hook block for removal

Note
- ▶ The unreeving of the hook blocks is described in chapter 4.06 of the Crane operating instructions!
- ▶ Observe the “permissible hook block weights” in the erection and take down charts!

Make sure that the following prerequisites are met:
- – The ground is sufficiently load bearing to take on the weight of the hook block and the auxiliary weights safely.
- – The ground is level and horizontal.

- ▶ Lower the hook block completely to the ground.
- ▶ When the hook block was placed down on the ground properly:
  Unreeve the hoist rope according to chapter 4.06 of the Crane operating instructions!

5.2 Removing the auxiliary weights

Note
- ▶ Each auxiliary weight's own weight is marked on the auxiliary weight!

WARNING
Toppling of hook block!
If the auxiliary weights are removed one-sided, the hook block can topple over!
Personnel can be severely injured or killed!
- ▶ The auxiliary weights may only be removed **individually** and alternately on the left and right on the hook block!
- ▶ The difference between the left and the right side at removal of the auxiliary weights may never be more than one auxiliary weight!
- ▶ Asymmetrical removal of auxiliary weights is prohibited!

WARNING
Falling auxiliary weights!
If the auxiliary weights on the pulley block are not properly removed, then they can fall down at removal!
Personnel can be severely injured or killed!
- ▶ Standing under a suspended auxiliary weight is prohibited!

- ▶ Attach the auxiliary weight **10** on the ring screw **14** on the auxiliary crane.
- ▶ Tension the tackle carefully.

1 General

The hook block weight is the weight that is required to lift the maximum load using the respective boom combination.

DANGER
Risk of accident if crane is overloaded or overturns!
▶ Do not reeve a larger hook block that the one that is required to lift the maximum load specified in the load chart.

2 Setup and takedown chart for the T-operation

The telescopic boom can be fully lowered as far as the specified distances without LMB monitoring. Additional assembly parts, for example, the auxiliary boom, may not be attached.

	Boom position, T-operation		
		toward the side	
Counterweight [t]	toward the rear	wide support base	reduced support base
74	T-60.1	T-60.1	T-60.1
54	T-60.1	T-60.1	T-52.0
44	T-60.1	T-60.1	T-43.4
42	T-60.1	T-60.1	T-43.4
34	T-56.3	T-56.3	T-34.8
32	T-52.0	T-52.0	T-34.8
22	T-39.1	T-39.1	T-21.9
12	T-26.2	T-26.2	T-21.9
0	T-21.9	T-21.9	T-17.6

3 Setup and takedown chart for the TK/TNZK operation

The telescopic boom T-13.3 (0/0/0/0/0) can be completely lowered with the specified folding jib lengths without any LMB monitoring.

	Boom position, TK/TNZK operation		
		toward the side	
Counterweight [t]	toward the rear	wide support base	reduced support base
74	K-36.0	K-36.0	K-36.0
54	K-36.0	K-36.0	K-36.0
44	K-36.0	K-36.0	K-36.0

1.2.2 Turning off

▶ Press the button **144**.

Result:

– The function control on the button **144** turns off.
– A shut off delay runs each time the auxiliary heater is turned off.
The keypad unit remains on even if the ignition key has been removed.

CAUTION
Danger of property damage!
▶ Turn the battery master switch off only when the heater shut off delay is over.

When the shut off delay is over:
– The indicator light **180** turns off.
– The keypad unit turns off automatically.

1.2.3 Operation with timer*

For a detailed description of the timer **29** refer to the enclosed manufacturer's operating instructions.
▶ Set the required turn-on time, temperature and duration of heater operation on the timer **29**.

1.2.4 Venting the system

When draining the engine coolant, the contents of the heating system will also be drained because the engine and heater operate as one circuit. When refilling the system, it must be carefully bled.
▶ Fill the coolant via the expansion tank of the engine cooling circuit as specified in the lubrication chart.
▶ Start the engine, see Crane operating instructions, chapter 3.04.
▶ Set the button **145** to level 3.
▶ Check the expansion tank for air bubbles.

Result:

– The engine is bled as soon as no more air bubbles rise up.

▶ When no more air bubbles appear in the expansion tank:
Set the button **146** for the driver's cab temperature to level 0.

Result:

– The heating circuit will be bled.

▶ Check the expansion tank for air bubbles.

Result:

– The heater circuit is bled as soon as no more air bubbles rise up.

2 Heating the crane operator's cab

The cab can be heated with three independent types of heat:
– Engine-dependent heater
– Engine-independent auxiliary heater with engine preheating, at ambient temperatures of up to -40 °C, WEBASTO; Thermo 90 S*
– Engine-independent auxiliary heater with engine preheating, at ambient temperatures of less than -40 °C, WEBASTO; DBW 2020*, Air Top 5000*

The individual adjustment of the heater (for both engine-dependent and engine-independent auxiliary heaters*) is carried out with the control elements under the crane operator's seat as well as via switches and indicator lights on the instrument panel.

CAUTION
Risk of damage to the heater control units* when carrying out electrical welding work on the crane!
▶ Remove the negative and positive cables from the vehicle and crane superstructure batteries and apply the positive cable respectively to the vehicle earth.

2.1 Heater operation

2.1.1 Adjusting the temperature

The cab is heated with the engine coolant.
▶ Adjust the regulating valve **310**.

2.1.2 Adjusting the ventilation

▶ Set 3-level fan switch **309**.
Result:
– The air volume will be regulated.

2.1.3 Adjusting the recirculated air / fresh air

▶ Actuate the changeover switch **308**.

2.4.1 Operating the climate control system

Make sure that the following prerequisites are met:
- The battery master switch is turned on.
- The engine is running.

▶ Actuate the switch **354**.

Result:
- The indicator light **342** lights up.
- The air conditioning system* is turned on and ready to operate.

▶ Turn on the fan with the rotary switch **309**.
▶ Adjust temperature with the regulating valve **310**.
▶ Open or close the air vents, as desired.

Troubleshooting

The temperature from the air vents is not noticeably below the ambient temperature?
The air circulation or the fresh air filter or evaporator are dirty.
▶ Check the air circulation and fresh air filter for contaminants and clean or replace, as necessary.
▶ Check the evaporator for contaminants and clean, if necessary.

▶ If none of these measures are helpful, contact Service at Liebherr-Werk Ehingen!

2.4.2 Turning the climate control system off

▶ Turn the switch **354** off.

Result:
- The indicator light **342** turns off.
- The climate control system* is turned off.

1.2.5 Lifting the hoisting gear

- ▶ Switch ball valve **7**, ball valve **10** and ball valve **11**.
- ▶ Turn ball valve **8** and ball valve **9** downwards.

1.2.6 Lowering the hoisting gear

- ▶ Switch ball valve **8**, ball valve **9** and ball valve **11**.
- ▶ Turn ball valve **7** and ball valve **10** downwards.

1.3 Emergency operation with the drive motor

In cranes with two engines (crane motor and drive motor), the superstructure can be supplied with power using the drive motor and a hydraulic transformer **14**.

1.3.1 Preparing the crane for emegency operation

- ▶ Remove the dummy plugs on the hydraulic connections.

The different diameters of the hydraulic lines prevent incorrect piping.

- ▶ Connect the hydraulic connections from the chassis to the transformer **14**.
- ▶ Connect the hydraulic connections from the transformer **14** to the superstructure.
- ▶ Switch the ball valve **13** to emergency operation.

1.3.2 Emergency operation

Run drive motor at a maximum speed of 1100 min^{-1} during emergency operations.

- ▶ Start drive motor.
- ▶ Refer to the previous section or to the emergency operations tag on the crane superstructure to select the ball valves (1 - 11) for the appropriate crane movement.

Moving the hand lever **12** determines the speed of the each crane movement.

- ▶ Operate the hand lever **12** and carry out the relevant crane movement carefully.

1.3.3 Completing emergency operation

DANGER
Risk of accident!

- ▶ Following the “emergency operation”, always turn the ball valves to “crane operation”.

- ▶ Switch all ball valves to “crane operation”.
- ▶ Switch off the drive motor.
- ▶ Disconnect the hydraulic lines and bolt with dummy plugs.

5.1 Warning notes

5.1.1 Preparatory work

WARNING
Fatal injury when driving or operating the crane during maintenance, inspection or repair work!
If the mobile crane is operated during maintenance, inspection or repair work, then personnel can be killed or severely injured!
This could result in high property damage!
- ▶ During maintenance, inspection or repair work, it is strictly prohibited to drive or operate crane!
- ▶ Show clearly with signs that maintenance, inspection or repair work is being carried out on the mobile crane!
- ▶ Use signs which show without a doubt that it is prohibited to drive and operate the crane! The national regulations regarding labeling on mobile cranes and on the signs must be observed!
- ▶ Carry out maintenance, inspection or repair work only with authorized and trained expert personnel.
- ▶ It is prohibited for unauthorized personnel to remain in the danger zone!

- ▶ Turn the engine on the crane superstructure and the crane chassis off!
- ▶ Apply the “parking brake crane chassis”.
- ▶ If possible:
  Lock the driver's cab and the crane operator's cab.
- ▶ Hand the ignition key from the crane superstructure and the crane chassis to an authorized person.

5.1.2 Warning notes on risk of burns

WARNING
Risk of burns during maintenance or inspection work!
While carrying out maintenance or inspection work, you can get severe burns on hot surfaces of the crane components! This applies especially for the exhaust system or the travel gear!
- ▶ Let any components to be maintained or inspected cool off!
- ▶ Do not spill any service fluids over the hot components!
- ▶ Avoid short circuits in the electrical system, especially on the battery!
- ▶ Replace or change missing or defective protective insulation!

5.1.3 Warning notes for rotating parts

WARNING
Risk due to rotating parts!
If inspection work must be carried out while the engine is running, a significant danger exists due to rotating parts and the ignition system!
Personnel can be severely injured!
- ▶ Proceed especially careful!
- ▶ Never reach into rotating parts!
- ▶ Never reach into the cooler fan when the engine is warm! The cooler fan could turn on suddenly!

	First maintenance	Regular maintenance, every			Minimum maintenance	Checks	
	after	250 h 5000 km	500 h 10000 km	1000 h 20000 km	Annually	Daily	Weekly
Perform function test					X		

[1] Every 500 km to 2000 km for frequent off-road driving.
[2] At least 1x a year for frequent off-road driving.
[3] in hot climates 2 x a year
[4] Note chapter 7.04, Maintenance guidelines - Crane chassis.
[5] Only when using ZF-Ecofluid M, otherwise every 2 years.

1 Diesel engine

Never step on fuel lines during maintenance or repair work in the engine area!

DANGER
Danger of fire!
- ▶ Make sure that the engine area is kept free of diesel fuel.
- ▶ Extreme cleanliness is vital, particularly during filter changes and bleeding. Wipe up any spilled fuel!
- ▶ When changing the filter it is advisable to place some cotton rags underneath to absorb the fuel before removing the filter.

1.1 Engine oil

1.1.1 Checking the oil level

Make sure that the following prerequisites are met:
– The crane vehicle is in horizontal position.
– The diesel engine is turned off and the oil has collected in the oil pan.

- ▶ Remove the dipstick **1** and wipe it off.
- ▶ Reinsert the dipstick **1** and pull it out again.

The oil level must be between the min. and max. mark on the dipstick **1**.
- ▶ Check the oil level.

NOTICE
Danger of damaging the engine!
If the oil level has dropped below the minimum mark, add engine oil according to the lubrication chart until the oil level is between the minimum and maximum marks!
- ▶ Add engine oil and check again!

- ▶ Reinsert the dipstick **1**.

1.1.2 Changing the oil

Refer to separate operating instructions “LIEBHERR Diesel engines”.

3.2 Changing the oil

Make sure that the following prerequisites are met:
– The crane vehicle is in horizontal position.
– The gear has warmed up.

▶ Remove the oil filler plug **1** and the level control screw **2**.
▶ Remove the oil drain plug **3**, drain the oil and determine the oil quantity.

Note
▶ During removal, the check valves **4** must remain on the supply line **5** and the return line **6** on the transfer gear box.

▶ Remove the supply line **5** and the return line **6** on the transfer gear box, drain the oil and determine the oil quantity.
▶ If necessary:
Carefully blow out the oil lines with maximum 4 bar to drain all the oil.

Note
▶ If the determined oil quantity is significantly less that the oil quantities specified in chapter 7.06, then this is a sign that there is a leak in the oil circuit. Find the reason for the leaky oil circuit and fix it.

▶ Check the supply line **5** and the return line **6** for damage.
▶ Install the supply line **5** and the return line **6** properly.
▶ Install the oil drain plug **3** and the level control screw **2** with a new seal and tighten.
▶ Add the complete oil quantity for the transfer gearbox with oil cooler and line as specified in the lubrication chart on the oil filler plug **1**. See chapter 7.06 and 7.07.
▶ Install the oil filler plug **1** with a new seal and tighten.
▶ Drive the mobile crane about 10 km.

Note
▶ After about 10 km, the oil cooler is filled with oil.

▶ Check the oil level as described in paragraph “Checking the oil level” and add more oil or drain oil, as necessary.

5 Compressed air and brake system air dryer

5.1 Replacing the granular cartridge

CAUTION
Danger!
The granular cartridge of the air dryer **1** is under spring tension.
▶ Caution when replacing the cartridge.

▶ Replace granular cartridge once per year.

6 Tires / wheels

Note
▶ See Crane operating instructions, chapter 8.01!

6.1 Checking the tires

While doing this, also check the spare tire*.

DANGER
Risk of accident!
▶ Regularly check the tires for damage, depth of tread, foreign particles and tire pressure!

6.2 Changing the wheel

Note
▶ See the Crane operating instructions, chapter 9.02!

1.2 Engine coolant

The coolant level is monitored by the LICCON computer system. If the coolant level is too low the icon **13** “Coolant level too low” appears on the LICCON monitor.
The coolant temperature for the crane engine can be read on the LICCON monitor in [°] on the “Engine coolant temperature” icon **12**.

DANGER
Danger of skin burns!
▶ The engine must be cold when checking the coolant.

- ▶ Turn the cap **2** on the filler neck of the water cooler expansion tank to the 1st notch.
- ▶ Release excess pressure.
- ▶ Remove the cap **2**.
- ▶ Check the coolant level.

Add coolant as specified in the lubrication chart only on the filler neck of the water cooler expansion tank.
- ▶ Add coolant to overflow level if necessary.

1.3 Air filter

The air filters are monitored by the LICCON computer system. If the vacuum increases in the intake line due to dirty filter units, the “Air filter contaminated” **14** icon is displayed on the LICCON monitor.
- ▶ If the “Air filter contaminated” **14** icon appears:
  Clean or replace the filter insert.

1.4 Diesel particle filter*

DANGER
Danger of igniting the diesel particle filter*!
▶ The diesel particle filter* may only be regenerated under the supervision of operating personnel!

Carry out the operation and maintenance of the diesel particle filter* according to the separate operating instructions of the diesel particle filter* manufacturer.

4.4 Cycle control

The central lubrication system is progressively monitored. This means that a proximity switch converts the piston strokes of the central lubrication system distributor into electric control signals and relays them to the control unit. If the control signals are not present or incomplete, the indicator light **340** displays a malfunction or a problem by blinking.

4.4.1 Blinker code - cycle control

During operation

– Ignition on, ready for operation:
  The indicator light **340** lights up for 1.5 s and turns off.
– Lubrication active:
  The indicator light **340** lights up statically.

In case of a problem

– Error of monitoring period of cycle input, lubrication time larger monitoring period cycle input
  The indicator light **340** lights up for 1 s and is off for 1 s etc.
– Error CPU, Error memory.
  The indicator light **340** lights up for 0.5 s and is off for 0.5 s etc.

4.5 Access into the automatic lubrication (intermediate lubrication)

This allows intermediate lubrication processes to be carried out after crane washing, or the grease lines are re-filled with grease after a repair.

▶ With the ignition turned on, press the red button **7** on the engine protection housing of the pump.

4.6 Filling the grease container

CAUTION
Risk of damage due to insufficient lubrication!

▶ There must be sufficient grease in the grease container **1** at all times.
▶ Observe utmost cleanliness when filling the grease container **1**!

▶ Fill the grease container **1** with a grease pump via the grease fitting **2** on the central lubrication pump.

7 Slewing gear

Maintain utmost cleanliness during all work to prevent any dirt from entering the inside of the gear.

7.1 Checking the oil level

Make sure that the following prerequisites are met:
– The crane is in horizontal position.

▶ Remove the dipstick **1** and wipe it off.
▶ Reinsert the dipstick **1** and pull it out again.

The oil level must be between the two notches on the dipstick **1**.
▶ Check the oil level.

CAUTION
Danger of gear damage!
If the oil level has dropped below the lower notch, add oil according to the lubrication chart until the oil level is between the two notches.
▶ Add oil and check again.

▶ Reinsert the dipstick **1**.

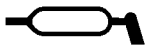
7.2 Changing the oil

Make sure that the following prerequisites are met:
– The crane is in horizontal position.
– The gear is warm.

▶ Open the oil filler port by unscrewing the dipstick **1**.
▶ Remove the oil drain plug **2** with the seal ring and drain the oil.
▶ Clean the oil drain plug **2** and sealing surface on the housing.
▶ Install the oil drain plug **2** with new seal ring and tighten.
▶ Add oil as specified in the lubrication chart on the oil filler port until the oil level is between the two notches on the dipstick **1**.
▶ Close the oil filler port by screwing in the dipstick **1**.
▶ Check the oil level as described above.

2 Lubrication schedule

2.1 Lubrication schedule - Crane chassis



Note

▶ The lube points are marked with this icon.

1.7 Service items and lubricants (continuation)

Line	Usage	Ambient temperature for driving and crane operation	
		-25 °C to +50 °C	-40 °C to +30 °C
25	Support pad with equalization Glide shoes of cab guide on vehicle frame LTC 1045-3.1	Special regulations: Liebherr **LWE Id. No.: 861303608** Liebherr Telescope grease 9613 Plus	Special regulations: Liebherr **LWE Id. No.: 861303608** Liebherr Telescope grease 9613 Plus
26	Plastic slide bearing Sliding beam	Special regulations: Liebherr **LWE Id. No.: 861303608** Liebherr Telescope grease 9613 Plus	Special regulations: Liebherr **LWE Id. No.: 861303608** Liebherr Telescope grease 9613 Plus
27	Plastic slide bearing Telescopic boom	Special regulations: Liebherr **LWE Id. No.: 861303608** Liebherr Telescope grease 9613 Plus	Special regulations: Liebherr **LWE Id. No.: 861303608** Liebherr Telescope grease 9613 Plus
28	Outer slide bearing Telescopic boom Guide rail on Telescoping cylinder	Special regulations: Liebherr **LWE Id. No.: 861303308** Liebherr Special grease 1336 (Spray grease)	Special regulations: Liebherr **LWE Id. No.: 861303308** Liebherr Special grease 1336 (Spray grease)
29	Inner slide bearing Telescopic boom (only during assembly)	Special regulations: Liebherr **LWE Id. No.: 861303308** Liebherr Special grease 1336 (Spray grease)	Special regulations: Liebherr **LWE Id. No.: 861303308** Liebherr Special grease 1336 (Spray grease)

2.1.2 Error message in the display unit

▶ After display of an error message in the display unit:
Press the i-key **110**.

Result:

– The error code is shown alternately as long as the i-key **110** is pressed.

In the error code, two different error types are differentiated:

– Operating errors - Error code starts with a “b”.
– System errors / application errors - Error code starts with an “E”.

Note

LICCON Error Code Manual (LICCON Error code list)

▶ All error numbers / LEC are listed in the “LICCON Error Code Manual” (LICCON error code list).

▶ If an error code starts with a “b”:
Correct the operating error.

▶ If an error code starts with an “E”:
Call up the test system, see Diagnostics operating instructions.

or

In case of lack of clarity:

■ Consult Liebherr Service.

2.1.3 Error message in the LICCON monitor

▶ After display of an error message in the LICCON monitor:
Press the function key **F8**.

Result:

– Acoustic warning is turned off.

▶ Press function key **F8** again.

Result:

– The error code is displayed on the LICCON monitor (error determination display in the “test system”).
– In addition, all errors are listed in a separate error list (error text, cause, remedy).

In the error code, two different error types are differentiated:

– Operating errors - Error code starts with a “B”.
– System errors / application errors - Error code starts with an “E”.

▶ If an error code starts with a “B”:
Correct the operating error.

▶ If an error code starts with an “E”:
Call up the test system, see Diagnostics operating instructions.

or

In case of lack of clarity:

■ Consult Liebherr Service.

2.1.4 Calling up the test system

Note

▶ For calling up the test system, see Diagnostics operating instructions!

3.5 LICCON monitor

3.5.1 Operating errors: Did an alarm function occur?

Note
- ▶ For procedure of shut off of crane movement, see Crane operating instructions, chapter 4.20.
- ▶ For a detailed description of alarm functions, see Crane operating instructions, chapter 4.02.
- ▶ In case of an alarm function, an error message **3** with LICCON error code appears at the same time.

The following alarm functions are indicated by blinking icons on the LICCON monitor:
- Boom limitation **41**
- Hoist top limit switch **42**
- Advance warning **43**
- LMB Stop **45**

The limit ranges of the crane movements are monitored by:
- Hoist limit switch
- Angle sensors
- Pressure sensors
- Length sensors
- Wind sensor
- Inductive sensors

If the limit ranges for these sensors are exceeded, the crane movements are turned off (LMB-STOP).
- ▶ Correct the operating error.

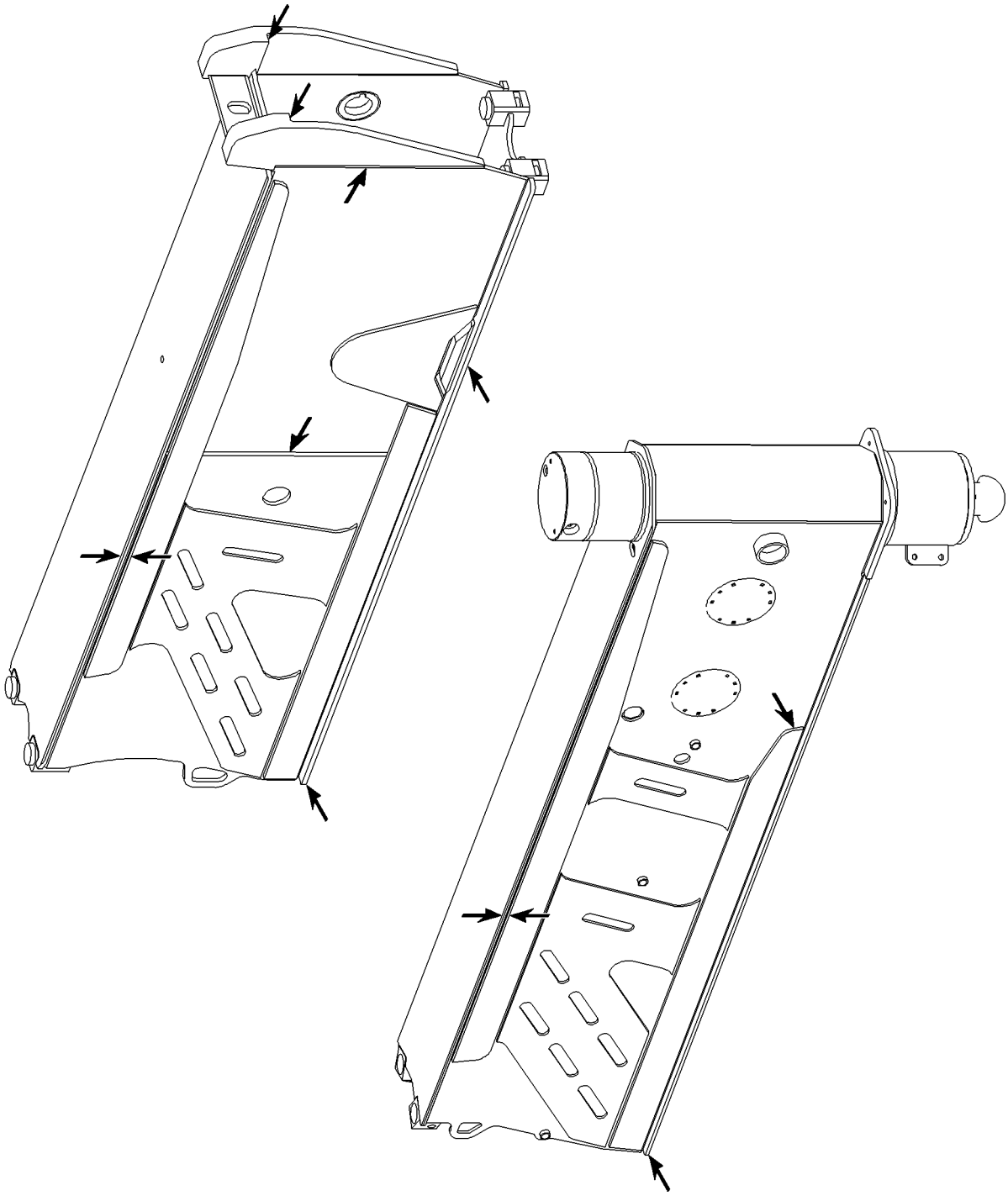
3.6 Is telescoping not possible?

- Telescoping is not functioning.

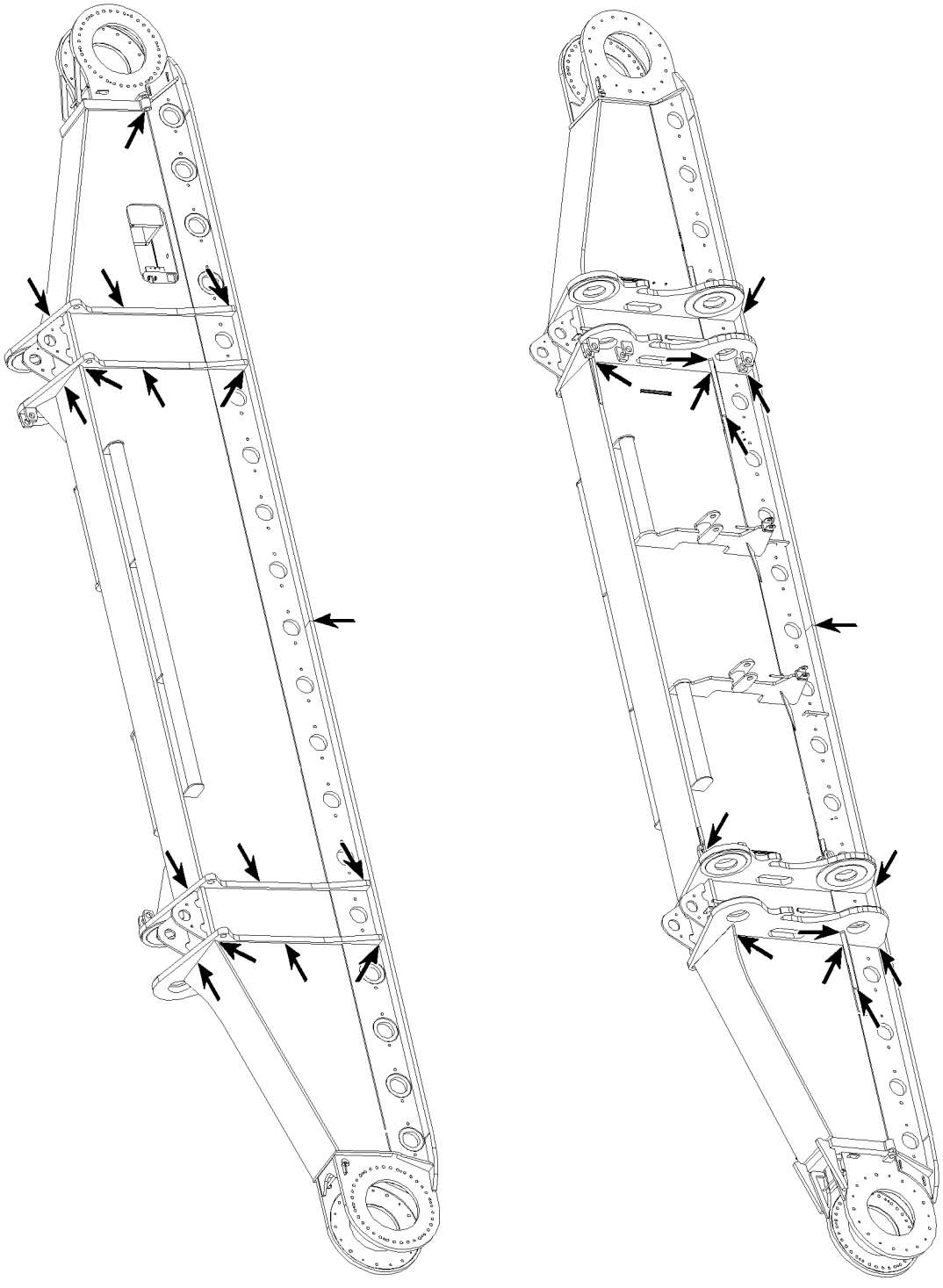
Possible causes:
- An operating error has occurred.
- A system error has occurred.
- The valves are mechanically defective.
- The electrical connection is interrupted.

Note
If the crane is equipped with the optional “Hydraulic emergency control* ”, then the crane can be taken down in case of failure of the crane hydraulic, crane electric and crane engine.
- ▶ For hydraulic emergency control, see Crane operating instructions, chapter 6.05.

8.00 Inspections of cranes

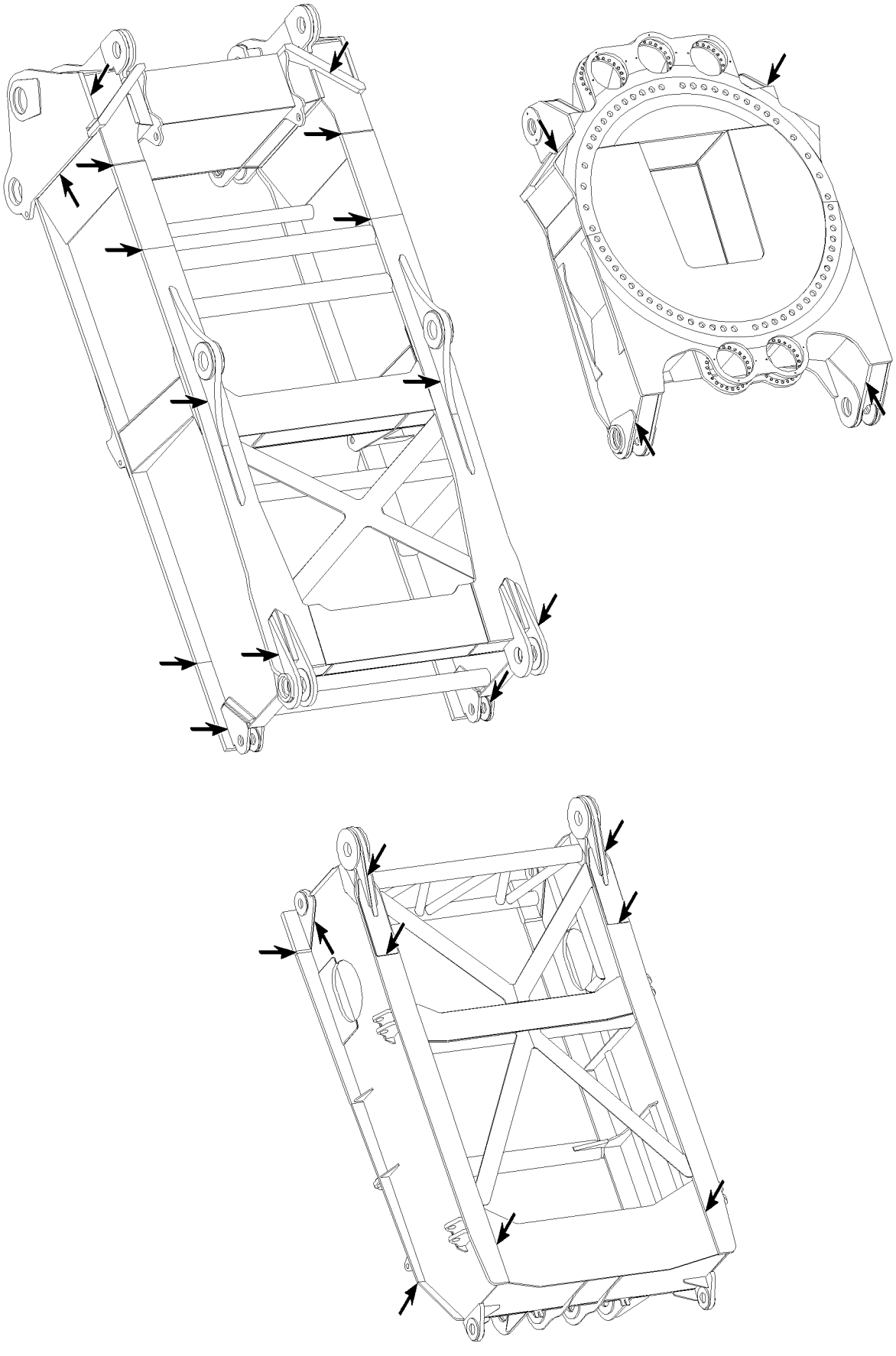


B105717 *Example for sliding beam*



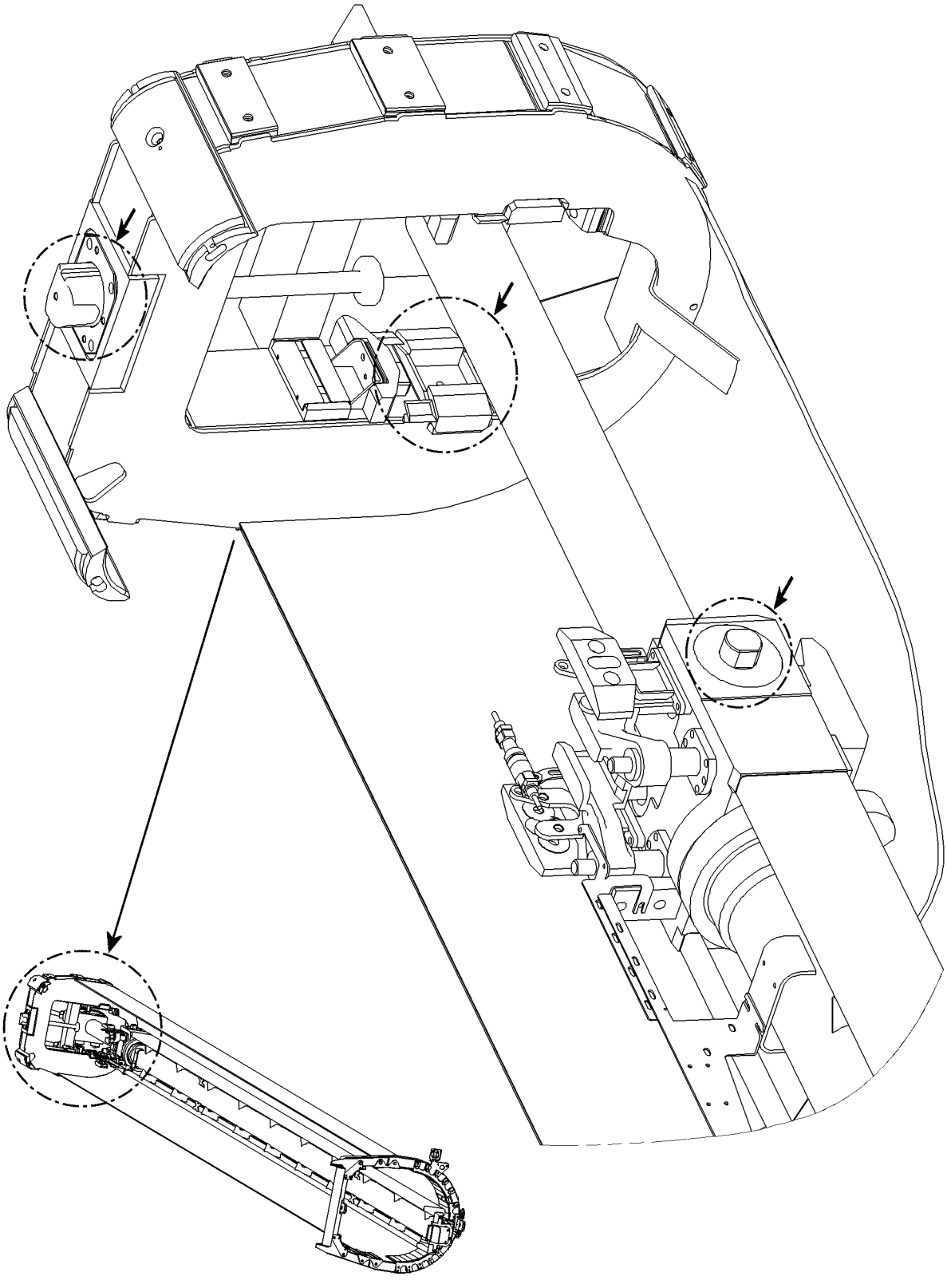
B105728

Example for crawler carrier

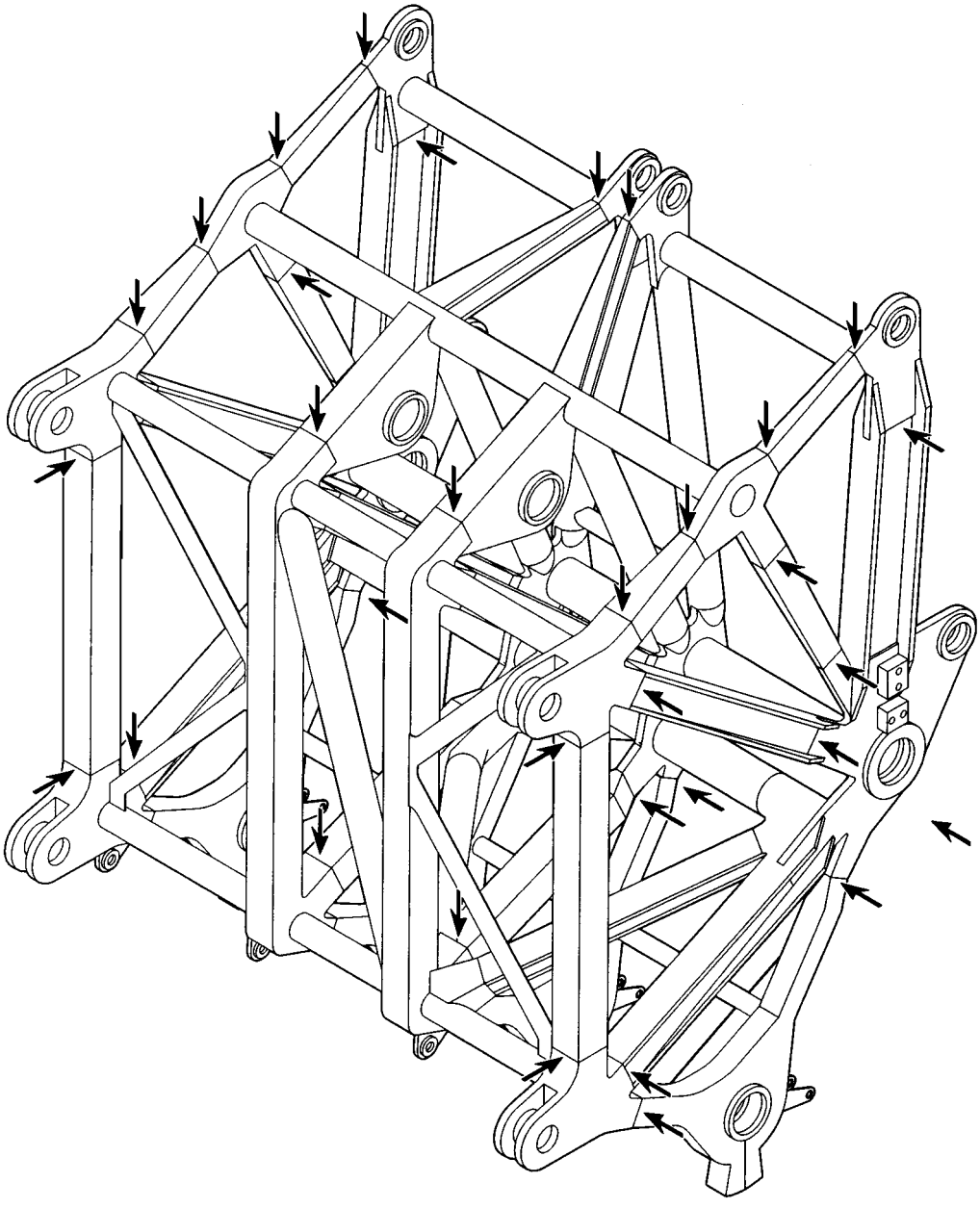


B105693

Example for turntable frame



B105891 *Example for push out mechanics telescopic boom*



B185054 *Example for pulley head*

Note

▶ The “theoretic service life” is not equal to the real (true) service life of a winch!

The actual life of the winch is affected by many additional outside factors; for example:

– Overloads caused by unapproved use of the crane.
– Inadequate maintenance: Oil is not changed in a timely manner.
– Improper operation:
  • Extreme acceleration or deceleration of the load.
  • Load falling into the ropes.
– Improper maintenance:
  • Using the wrong type of oil.
  • Too much or too little oil.
  • Contamination during oil change.
– Assembly errors during repair and maintenance.
– Undetected leakage.
– Incorrectly set safety devices.
– Hidden damage from accidents.
– Extreme environmental conditions:
  • Extreme low or high temperatures.
  • Corrosive atmosphere.
  • Dust and dirt.

4.2.2 Actually used part of the Service life

The crane operator is obligated to carry out an inspection of the crane at least once a year.
At this time, the actually used part of the theoretical service life must also be calculated. If necessary, the crane operator must contract an authorized inspector.
For the determination of the used part of the theoretical service life, the actual operating conditions (load spectrum) and the hoist gear operating hours for each inspection interval are to be determined.
The operator is responsible for the documentation in the crane inspection log.

Determining the operating conditions (load spectrum)

The load spectrum of the crane is divided into groups, please refer to ISO 4301/1.
Select one of the following load spectrums and record it in the crane inspection log for the respective inspection interval based on the actual operating conditions. A more precise determination of the load spectrum is permissible.

Load spectrum class: Light L1

Definition:

Power train or parts thereof are subjected to maximum stress only in exceptional cases, but normally only operate at very light loads.

Operating time rates:

10 % of the time at maximum load (dead load and 1/1 working load)
40 % of the time with dead load and 1/3 working load
50 % of the time only with dead load

Factor of load spectrum:

Km = 0.125

Graphic view:

7 Inspection of locking system of telescopic boom

7.1 For cranes with pneumatic boom locking system

- For inspection of function, see Crane operating instructions, chapter 8.11.
- For inspection of pin wear pattern, see Crane operating instructions, chapter 8.11.
- For inspection of wear, see Crane operating instructions, chapter 8.11.
- For inspection of safety control, see Crane operating instructions, chapter 8.11.

7.2 For cranes with telescopic boom system Telematik

- Inspection of the pull knob safety **1** and all mounting screws **2** for tight seating
- Inspection of twist guards of cylinder pinning **3** and the telescopic boom pinning **11**
- Inspection of the length sensor rope **4** for damage
- Inspection of the cylinder barrel in the area of all welding seams **5** for crack formation
- Inspection of the locking pockets **6** for damage
- Grease the guide rail **7**
- In case of leakage: Inspection of the piston rod **8** for grooves
- Inspection of the wear pattern on the cylinder pinning **3** and the telescopic boom pinning **11**
- Inspection of guide rail **7** for distortion of contour
- Inspection of plastic guide **9** on cylinder bottom for damage
- Inspection of all mounting screws **10** on the push out cylinder for tight seating

8. Inspection category: Chassis - pressurized air system[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Lines						
Hoses						
Cylinder						

9. Inspection category: Chassis - electrical system[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Motors						
Generators						
Battery						
Switch						
Lines						
Fuses						
Resistors						
Lighting						
Brake lights						
Indicator lights						
Tail lights						
Working lights						
Signaling systems						
Indicator lights						
Battery switch						
Limit switches: Transmission, steering, drive train						
Support pressure indicator[2]						

10. Inspection category: Chassis - control devices[1]						
Component inspected	**A**	**B**	**C**	**D**	**E**	**Comments**
Engine regulation						
Gear						
Couplings						
Circuits						
Brakes						
Steering						
Indicator displays						
Engine shut off line						

2.5.5 Reduction in rope diameter caused by damage to core rope

The rope diameter can be reduced as a result to damage to the core because of:

1.) Internal wear and notching
2.) Internal wear due to friction between individual strands and wires in the rope, particularly if it is subjected to bending
3.) Steel core breakage
4.) Break in internal layers of multi-strand ropes

If the rope diameter (average of two diameter measurements) is reduced by 3 % of the nominal diameter (rotation resistant ropes) or 10 % of the nominal diameter of other ropes due to these factors, the ropes must be taken down, even if no wire breaks are visible.

Note
Diameter of new ropes
▶ New ropes can have an actual diameter that is greater than the nominal diameter, meaning that proportionally greater wear is possible.

2.5.6 External wear

Abrasion of outer wires of outer rope strands as a result of rubbing contact under pressure with the grooves in the rope reels and drums. This condition is particularly evident in moving ropes in the areas in which they come into contact with rope pulleys when the load is being moved and braked, and manifest themselves as flattened surfaces on the outer wires. Abrasion is exacerbated by a lack of or incorrect lubrication as well as the effects of dust.
Wear reduces the breaking strain of steel ropes because the cross section of the steel is reduced. The rope must be taken down if the actual rope diameter has reduced by 7 % or more because of outer wear, even if no wire breaks are visible.

2.5.7 External and internal corrosion

Corrosion is a particular problem in maritime climates and atmospheres that are polluted by industrial emissions, reducing breaking strain and accelerating material fatigue because of the reduction in the rope material cross section, leading to irregular surfaces which are the starting point for stress cracks. Extreme corrosion can reduce the elasticity of the rope.

1.) External corrosion
Corrosion of the outer rope wires can be determined by visual inspection.
2.) Internal corrosion
This condition is more difficult to detect than external corrosion.

Note
Internal corrosion
▶ If there are any signs of internal corrosion the rope must be checked by a competent expert.

DANGER
Occurrence of internal corrosion!
▶ If the suspicion of extreme internal corrosion is confirmed, the rope must be taken down immediately.