

# SkyAzúl

EQUIPMENT SOLUTIONS



## iFLEX5 / iSCOUT (Sennebogen Lattice Boom Crane)



Operator's, Installation, and Service Manual



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SLI-System iFLEX5 for Sennebogen Lattice Boom Crane

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System description

## 1. Introduction

The function of the **iFLEX5** safe load indicator and control system is to provide the information necessary for the operation of the crane within the operating ranges specified by the manufacturer. With the aid of various sensors, the SLII monitors different crane functions and transmits ongoing crane performance data to the crane operator. This data changes continuously as the crane moves.

The system warns the crane operator via audio and visual signals when the crane is approaching the maximum safe working load. As soon as the crane is in an impermissible operating situation, any crane actions that increase the crane load are switched off.

The SLI system includes a graphical user interface **iSCOUT expert VGA** whose functions are determined by the crane manufacturer. Symbols make it easy to select from the programmed functions. The text display enables switching to other languages while operating the crane.

The **iFLEX5** based safe load indicator and control system comprises major components which are connected via a CAN bus.

System description

## 2. IMPORTANT NOTES

The SLI is an operating aid, which warns the crane operator of impending overload or the proximity of the hook block to the head of the boom in order to prevent possible injury to persons or property.

The system cannot and shall not replace good judgement and/or experience on the part of the crane operator or the use of recognised safe working practises in the use of cranes.

### **ATTENTION**

**The crane operator is not exonerated from responsibility for the safe operation of the crane. The driver shall ensure that the displayed notes and instructions are fully understood and observed.**

**Before starting crane operations the crane operator must read through and understand this manual and the crane manufacturer's operating manual to guarantee familiarity with the operation and limits of the SLI and the crane.**

### **ATTENTION**

**If any displays reveal a discrepancy between the actual load and the displayed load, ask your nearest SkyAzúl, Equipment Solutions service centre to carry out equipment repairs or to recheck the calibration of the SLI.**

### **WARNING**

**Every change to the crane structure or change to the crane requires that you check the calibration of the SLI for your crane.**

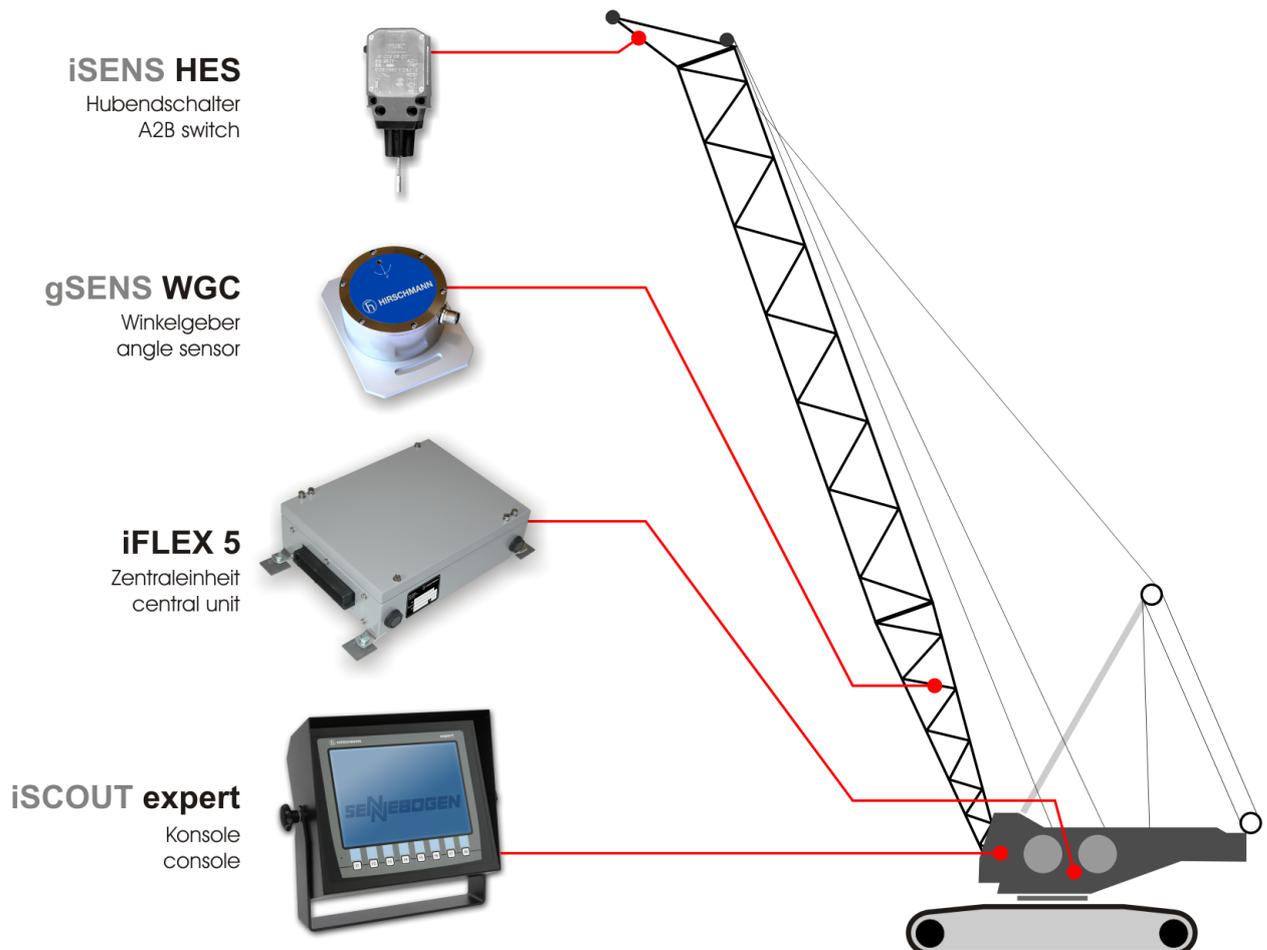
### **WARNING**

**This system can be equipped with a key switch that bypasses the shut-off for the control lever function through the SLI or the lifting limit switch system. This switch may only be used in an emergency and only by authorised personnel. Ignoring this instruction may result in damage to property and serious or even fatal injury.**

System description

### 3. DESCRIPTION OF SYSTEM

The SLI and control system comprises an **iFLEX5** central unit, an **iSCOUT expert VGA** console and various sensors for detecting measured values.



The system operates on the basis of target/actual value comparisons. The actual value is compared to the calculated target values and analysed by the system. An overload warning signal is actuated on the display and operating console when the limit values are reached. At the same time, all load moment-increasing crane actions are switched off.

The crane-related, manufacturer specified data such as safe working loads, weights of booms, centres of gravity and dimensions are stored in the central data memory. This data forms the reference values for calculating the operating conditions.

The boom angle is detected by an angle transmitter attached to the boom. The crane load is indirectly determined with the aid of force and/or pressure sensors.

System description

### 3.1 System start

After switching on, the system starts an automatic test run of the SLI system, the display and the controls as well as of the acoustic alarm.

During the test run, the start screen is displayed.

In case of a malfunction an error code E## message is displayed at the status line. (ref. chapter "error code table")

After the system has passed through the system test without errors, the OM input menu appears.

The previous entries will be displayed.

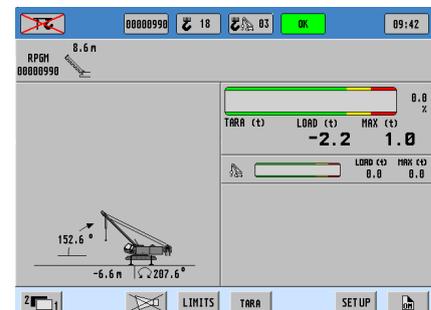
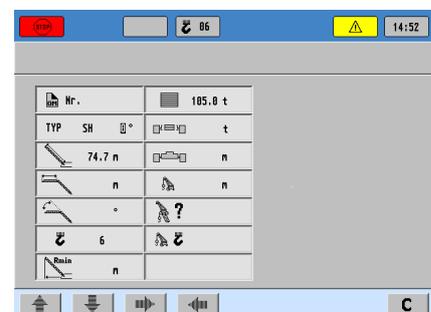
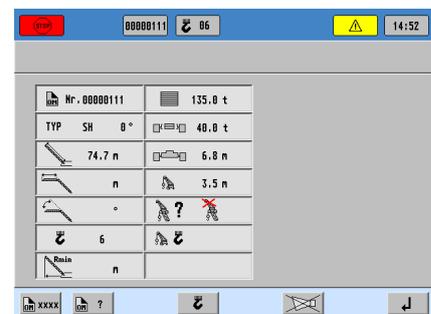
**Each time a change is made to the crane structure** you need to setup the system by entering the corresponding operating mode with button F1 or F2. (refer to chapter 4.1).

**Only if the crane structure has not been modified** the values can be applied simply by confirming with button F8.

Otherwise press F1 or F2 for setup the SLI to the modified crane structure.

If F2 was pressed, the menu for step-by-step setup is displayed:

If a rigging condition is recognized (digital input for rigging state is active), the rigging screen appears:



The SLI cannot perform correctly unless it has been properly adjusted. The prerequisite for this is making conscientious and correct entries during the set-up procedure, in accordance with the actual configuration of the crane. The correctness of the SLI settings must be ensured before beginning crane work in order to avoid damage to property and severe or even fatal injuries to personnel.

System description

## 3.2 Operating console

The console fulfils several functions:

- it is used by the crane operator to input data into the SLI system (operating mode, reeving number etc.)
- it displays key data and information during the crane operation
- it is used to call-up and display system information for service technicians

The operating console is housed in the crane cab within the visual field of the crane operator. All displays are backlit for extra visibility. The console has various elements that are described in chapter 3.3.

System description

### 3.3 Display and controls

Figure 1 shows the display and operating elements of the console **iSCOUT expert VGA**:

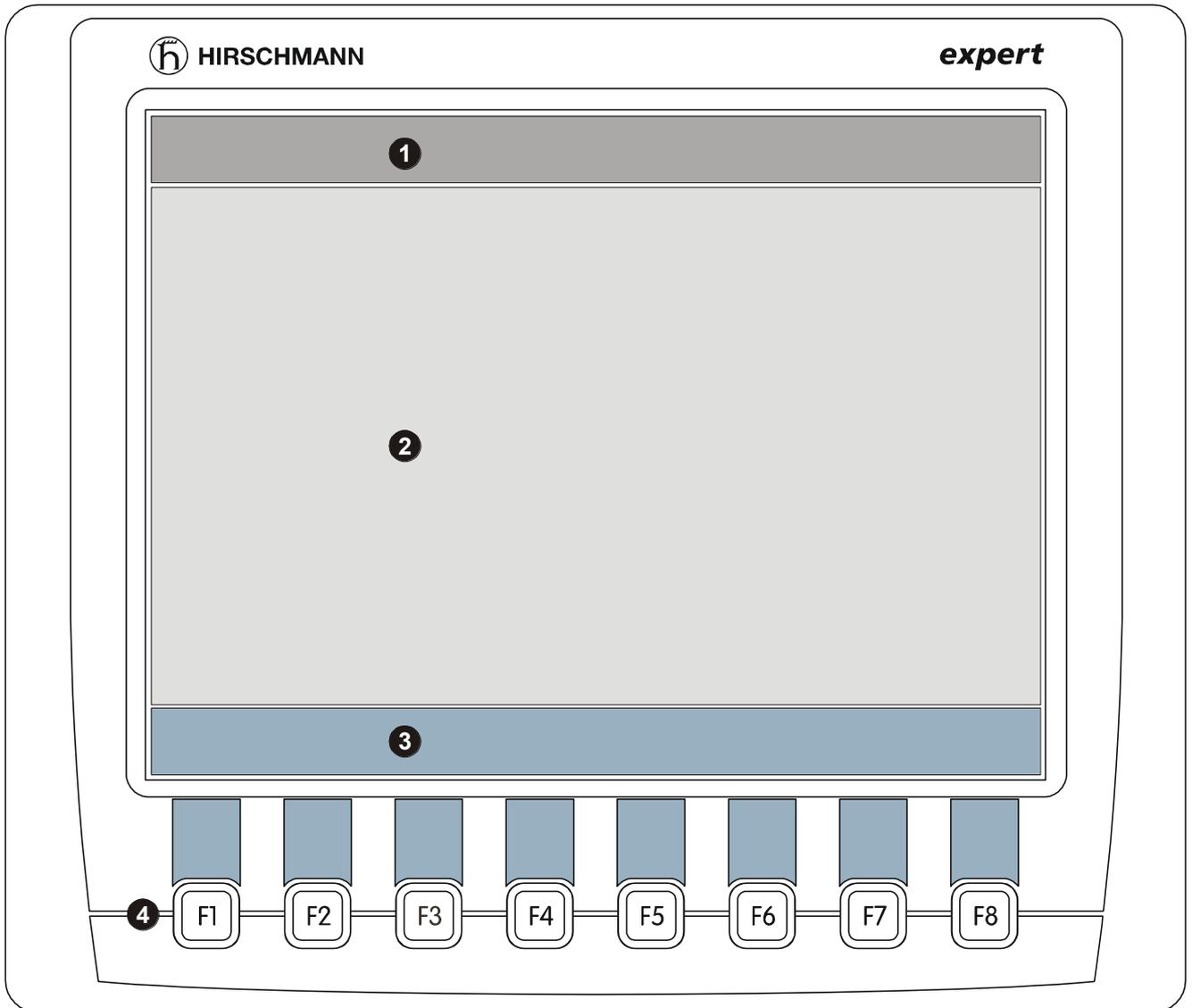


Fig. 1

- ❶ Status display
- ❷ Image area
- ❸ Function line with symbols
- ❹ Function keys F1 ...F8

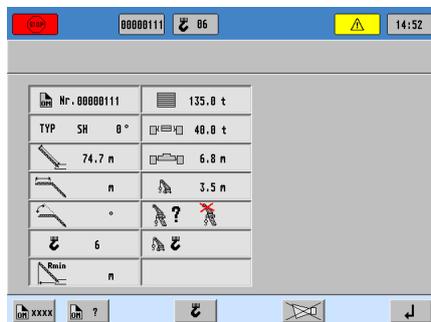
System description

## Data display

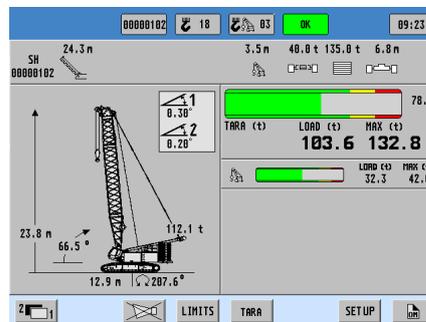
The *data display* of the Hirschmann **iSCOUT expert VGA** console is a backlit graphical TFT VGA colour LCD display, which shows the key data for each operating mode, e.g. load values, geometry and crane data, symbols etc.

## Sample displays:

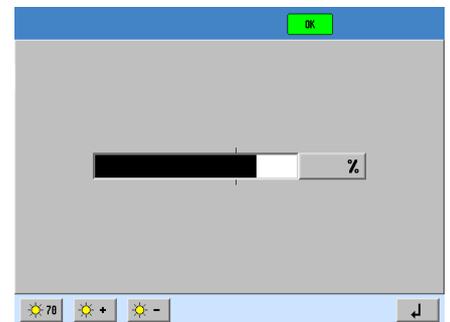
Setup menu (operating mode)



Normal operation display (runner)



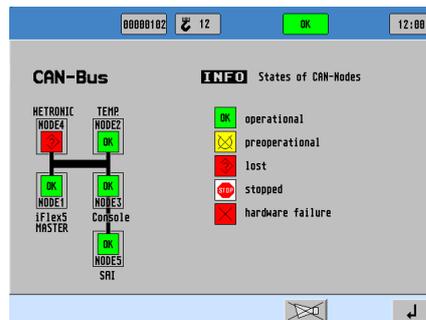
Display settings menu



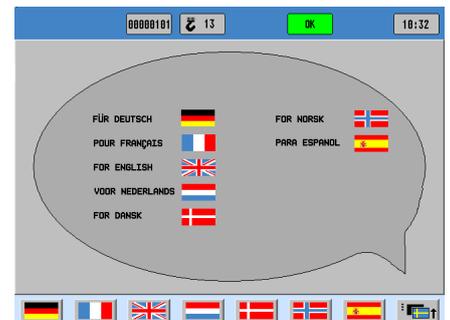
Service menu (digital outputs)



Service menu (bus-info)



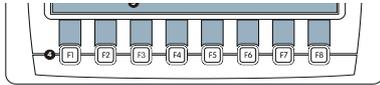
Language selection menu



You will find detailed descriptions of these symbols and displays in the later sections and in the appendix of this manual.

System description

## Function keys F1...F8



These keys are used to select certain functions within the interactive menu screens. The symbols above the keys indicate the function.

The meanings for individual symbols are given in the appendix.

## “Anti Two-Block” status indicator



This red symbol on the status display lights up when the contacts of the lifting limit switch open, i.e. a lifting limit has been reached. The audio alarm sounds and any load moment-increasing crane movements are immediately switched off.

### NOTE

A lift-end status occurs if the hook block comes into contact with the head of the boom. In this case, there is a danger of the hoist-cable breaking and dropping the load. The cause of the lift-end status could be that the load is being pulled against the boom head or that the boom is being extended or lowered without releasing the hoist cable.

## “Load moment pre-warning” status indicator



This yellow symbol on the status display lights up when the crane load exceeds 90 % of the respective reference safe working load and an overload situation is imminent.

### ATTENTION

This means that the crane operator needs to proceed with the utmost caution.

System description

### “Overload” status indicator



This red symbol on the status display indicates to the crane operator that an overload situation has occurred.

It lights up when the crane load has reached 100% of the maximum safe working load for the current operating situation.

The audio alarm is sounded. Any load moment-increasing crane movements are immediately switched off.

### "HETRONIC" status indicator (\*option)



*\*only for systems, which are equipped with an optionally crane remote control.*

This symbol on the status display indicates that the remote control is active.

### "Low temperature monitoring I" status indicator (\*option)



*\*only for systems, which are equipped with the optionally function "load reduction at low temperature operation".*

This yellow symbol on the status display indicates that the ambient temperature has reached or has fallen below a programmable limit (typ. -25°C) and the automatic rated load reduction (programmable limit, typ. 60%) is active.

### "Low temperature monitoring II" status indicator (\*option)



*\*only for systems, which are equipped with the optionally function "load reduction at low temperature operation".*

This red symbol on the status display indicates that the ambient temperature has reached or has fallen below a programmable limit (typ. -40°C) and the automatic cut-off for crane movements has been activated.

System description

### “Alarm off” function key



By actuating this function key, the acoustic alarm is suppressed after at least 5 seconds of alarm duration. After approx. 10 seconds the alarm sounds again if the cause of the alarm being triggered has not been remedied.

The audio alarm sounds in the following instances:

System test, overload situation, proximity to lifting limit (if lifting limit switch functions are detected by the SLI system), SLI system malfunction and operating errors recognised by the system.

### “TARE” function key



The “TARE” function key is used to output the net load to the *actual load display*. The net load is the actual load minus the load hoisting gear and hook block. The “TARE” function key must be pressed **before** the start of the hoisting operation.

After pressing the “TARE” key the actual load is set to zero (tared). After the load has been hoisted the actual load display is shown followed by the net load (working load). As soon as the working load changes (because of change of angle or radius) the display returns to the actual load and the tare function is cancelled.

**NOTE:** The actual load includes the hook block, the hoisting cable and all hoisting gear. The net load is the actual load on the hook without hoisting gear. Display errors can be caused by environmental influences e.g. wind affecting load or boom.

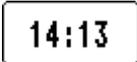
### Sensor “Ambient light brightness” (*does not exist on this system*)



This sensor detects the ambient light level and increases or reduces the background lighting of the LC display and the controls accordingly, e.g. at dawn or dusk.

System description

### 3.4 Description of the status symbols

	Error Code display LMB
	Display system time
	Mode of operation display
	Number of reevings, main boom
	Number of reevings, runner
	Head limit switch "jib down" active
	Head limit switch "jib up" active
	LMB: Shut-off > Lower fly boom
	LMB: Shut-off > Raise fly boom
	Exceeding A-frame pressure
	Minimum fly boom force not attained
	<b>Option</b> Monitoring of pressure switch A-trestle: <b>Message:</b> A-trestle pressure too high. Cut-off of the movement "Raise boom".
	<b>Option</b> Monitoring of A-trestle freewheeling: <b>Message:</b> A-trestle freewheeling malfunction. Cut-off of the movement "Raise boom".
	Main unit rigging with monitoring in case of mobile A-trestle. <b>Message:</b> Inadmissible constellation during rigging of main unit.
	<b>Option</b> Track width/outrigger monitoring (according to EN 13000:2014): <b>Message:</b> Actual state does not correspond to the expected state. Error message E86 and cut-off.
	Tilt monitoring: <b>Message:</b> Tilt angle exceeded. Cut-off.
	Main unit rigging: <b>Message:</b> Implausibility in switching inputs. Error message EB4 and cut-off.
	Lower main boom: <b>Message:</b> Place boom in longitudinal direction. Lowering button  becomes active on reaching a limit angle. In connection with warning symbol.

You will find additional notes on the status symbols in the LM7G system software description.

System description

### 3.5 Description of menu structure

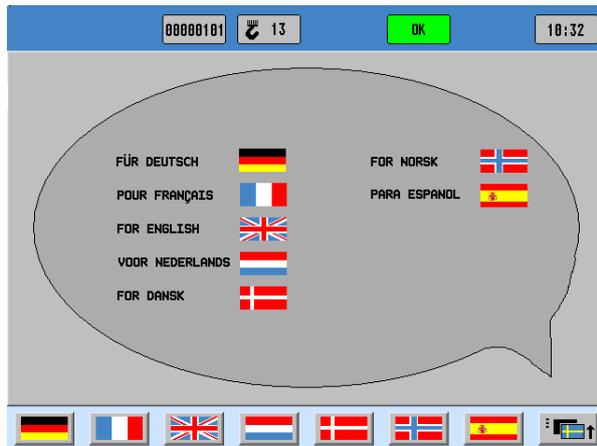
Start screen:



Function keys:

F1:  
F2:  
F3:  
F4:  
F5:  
F6: Horn off  
F7:  
F8:

Language selection:



Function keys:

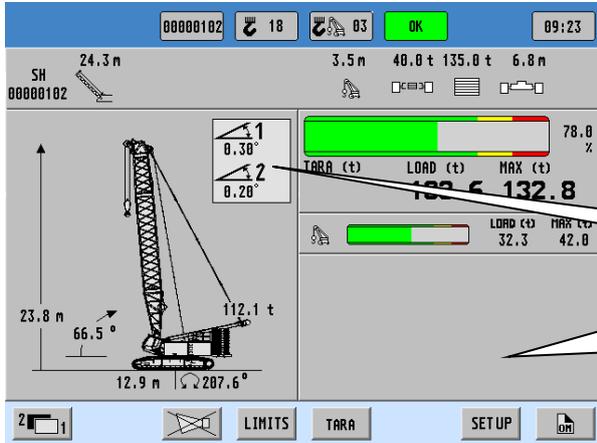
F1: German  
F2: French  
F3: English  
F4: Dutch  
F5: Danish  
F6: Norwegian  
F7: Spanish  
F8: ... more languages



F1: Swedish  
F2: Russian  
F3: -  
F4: -  
F5: -  
F6: -  
F7: -  
F8: ...back

System description

Main menu SLI:



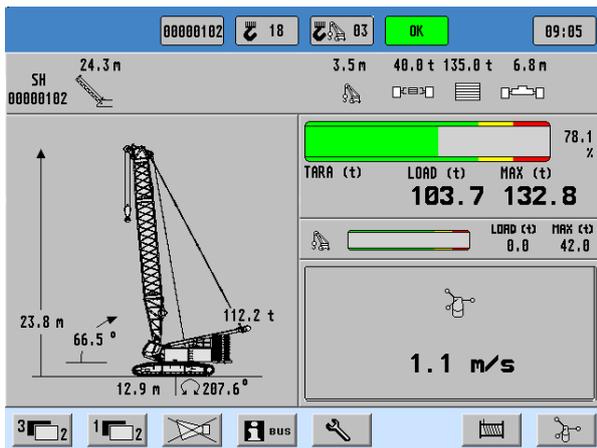
Function keys:

see following page  
Neigungsüberwachung  
(Krängung)

Inclination monitoring (heeling)

in this field:  
Additional notes and warnings  
according to EN 13000

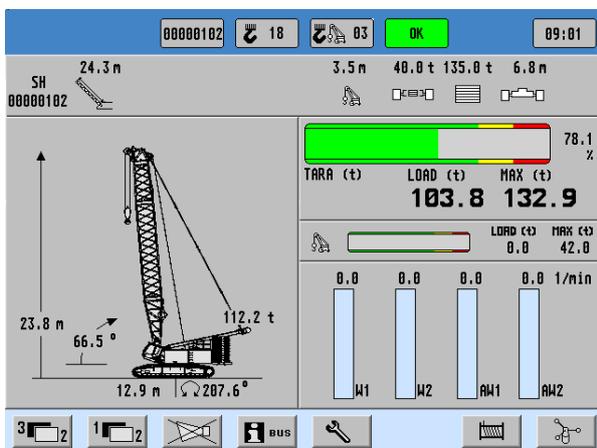
Wind speed display:



Function keys:

see following page

Winch speed display:



Function keys:

see following page

## System description

**Buttons level 1****Function keys:**

- F1: Changeover from level 1 to level 2
- F2: -
- F3: Horn off
- F4: Working range limitation (chapter 4.3)
- F5: Tare key
- F6: -
- F7: Setup-Mode key (*only if EN 13000 mode is active*)
- F8: Operating mode/reeving change (chapter 4)

**Buttons level 2****Function keys:**

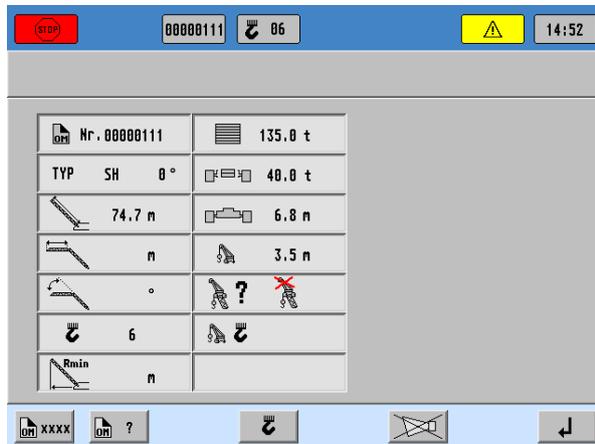
- F1: Changeover from level 2 to level 3
- F2: Changeover from level 2 to level 1
- F3: Horn off
- F4: Bus system overview
- F5: Switch to the service screen
- F6: -
- F7: Display winch speed on/off
- F8: Wind speed display on/off

**Buttons level 3****Function keys:**

- F1: -
- F2: Changeover from level 3 to level 2
- F3: Horn off
- F4: -
- F5: Switch between metric (m and t) and domestic (ft and kips) and back
- F6: Language selection
- F7: Brightness setting TFT display
- F8: Set time

## System description

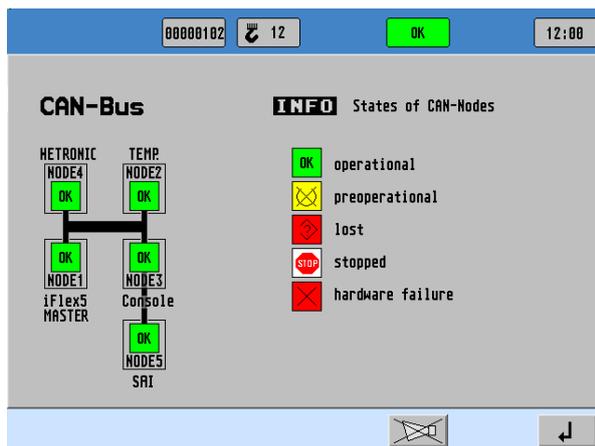
## Mode of operation selection:



## Function keys:

- F1: Enter operating mode directly
- F2: Select operating mode interactively
- F3: -
- F4: Enter reeving
- F5: -
- F6: Horn off
- F7: -
- F8: Back to main menu

## Bus information screen:



## Function keys:

- F1: -
- F2: -
- F3: -
- F4: -
- F5: -
- F6: Horn off
- F7: -
- F8: Back to call up screen

## Notes:

- Symbol for CAN-Bus participator "**HETRONIC**" only visible on systems with crane remote control
- Symbol for CAN-Bus participator "**TEMP**" only visible on systems with temperature-dependent capacity reduction

Programming

## 4. SLI programming

When switching on the system, firstly it is necessary to enter the operating parameters according to the actual crane configuration. Correct inputting requires accuracy on the part of the crane operator.

**NOTE:** If the system is switched on, the previous entries will be displayed and can be applied simply by confirming with "OK", but only if the crane structure has not been modified.

**This process is in two parts:**

- Programming the SLI to the set-up status of the crane using the right operating code for the selected safe working load table or with the interactive menu structure (*chapter 4.1*)
- Input of cable reeving according to the actual reeving (*chapter 4.2*)



**Inputting the incorrect operating mode code and cable reeving number into the SLI can lead to damage to property and/or severe or even fatal injury to personnel.**

**The correct input of the operating mode code and cable reeving number is therefore of fundamental importance for the correct function of the system and the crane.**

**These entries must therefore always be carried out by crane operators who are fully conversant with the safe working loads and the use and operation of the SLI and the crane.**

To start the programming process, press the  function key from the main menu.

### Threshold for Operating mode change

The adjustment/change of the operating mode is not possible if the crane load has exceeded a programmed threshold.

In this case a symbol appears on the display:



**Remedy:** Reduce crane load, than adjust operation mode.

Programming

## 4.1 Programming the operating mode (OM code)

Each time a change is made to the crane structure you need to reprogram the system by entering the corresponding operating mode.

*During programming the crane actions will be temporarily interrupted by the system.*



### WARNING

Inputting the incorrect operating mode code and into the SLI can lead to damage to property and/or severe or even fatal injury to personnel.

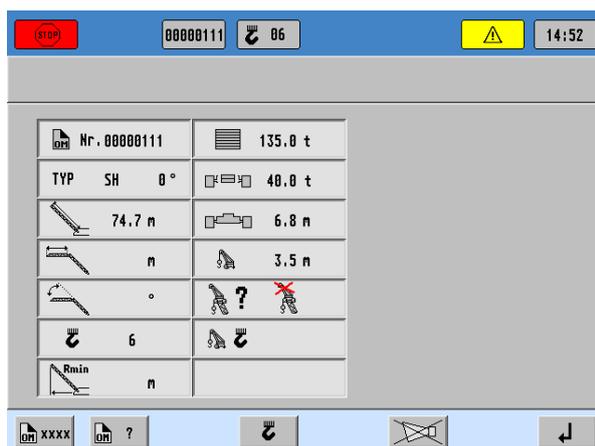
The correct input of the operating mode code is therefore of fundamental importance for the correct function of the system and the crane.

These entries must therefore always be carried out by crane operators who are fully conversant with the safe working loads and the use and operation of the SLI and the crane.

### Call up function:

automatically after system start or by actuating the  function key from the main menu.

The menu screen for setting the operating mode appears. The operating mode selection can be done by entering an operating code directly or interactively:



### Basic operating mode selection menu:

**F1: Direct operating mode definition  
(with OM code)**

**F2: Interactive operating mode selection**

F3: -

F4: Enter reeving

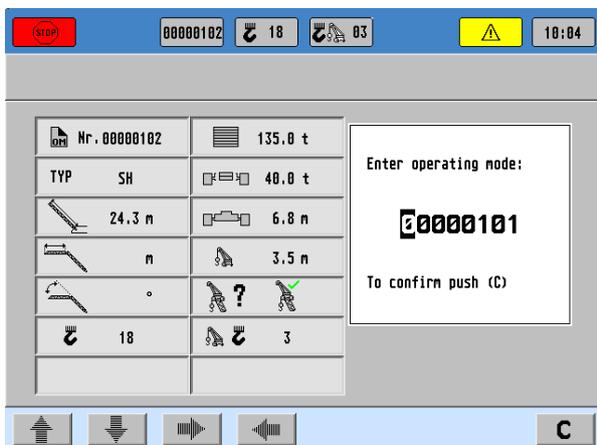
F5: -

F6: Horn off

F7: -

F8: Confirm displayed values

Programming

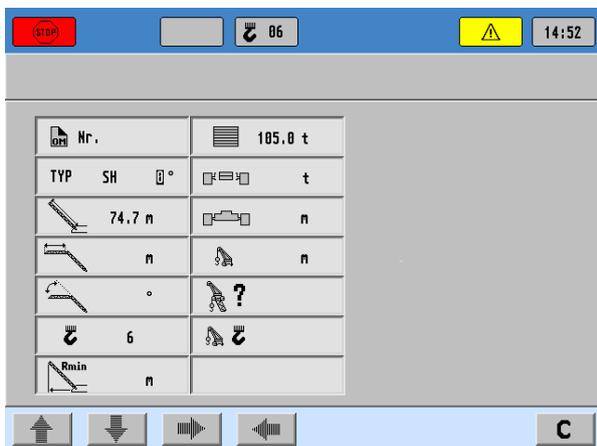


**Direct operating mode definition:**

Cursor is automatically positioned at the first digit..  
Input digits using function keys:

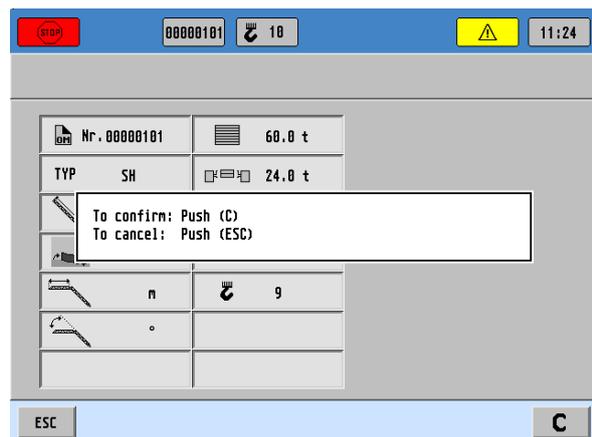
- ▲ Increase numerical value
- ▼ Decrease numerical value
- ▶ Select next number to the right
- ◀ Select next number to the left
- C Confirm entry / Back to main menu

If the selected operating mode is not found, the following message appears: "Mode of operation does not exist"



**Interactive operating mode selection:**

Interactive operating mode selection determines a suitable operating mode from the features that are selected. The selection is checked for plausibility and definitions that are not required are suppressed. (e.g. there is no possibility of selecting the fly boom length, if it does not exist)



**Confirmation request:**

The confirmation menu appears if the operating mode code has been changed. The user is asked to confirm entries again in this menu screen. This procedure should prevent any accidental changes or entries

Please check the values displayed before you confirm!

After confirming using the **C** function key, the main menu appears again

Programming

## 4.2 Programming the rope reeving

Each time you change the rope reeving you need to reprogram the system by entering the corresponding reeving number.

*During programming the crane actions will be temporarily interrupted by the system.*

### **WARNING**

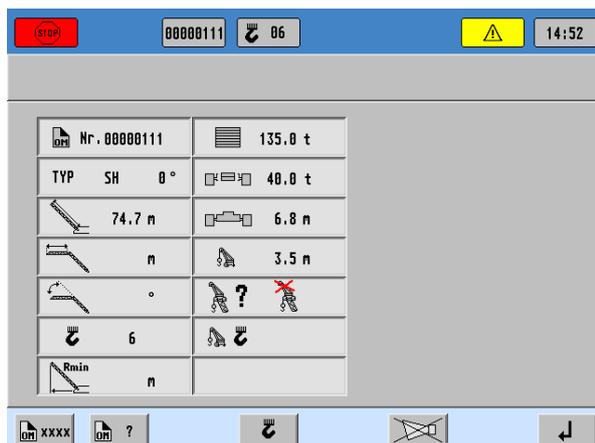
Inputting the incorrect operating mode code and rope reeving number into the SLI can lead to damage to property and/or severe or even fatal injury to personnel.

The correct input of the operating mode code and rope reeving number is therefore of fundamental importance for the correct function of the system and the crane.

These entries must therefore always be carried out by crane operators who are fully conversant with the safe working loads and the use and operation of the SLI and the crane.

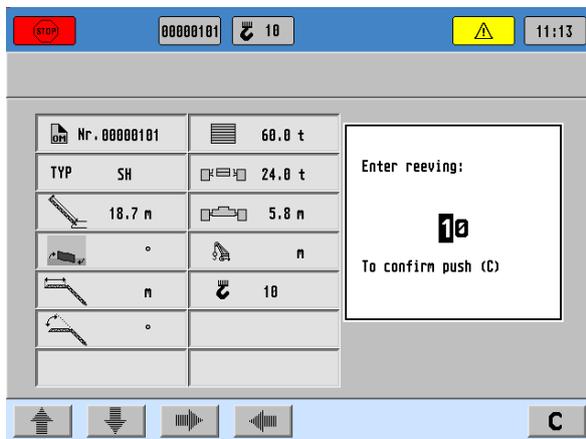
Call up function:

by actuating the  function key from the main menu.:



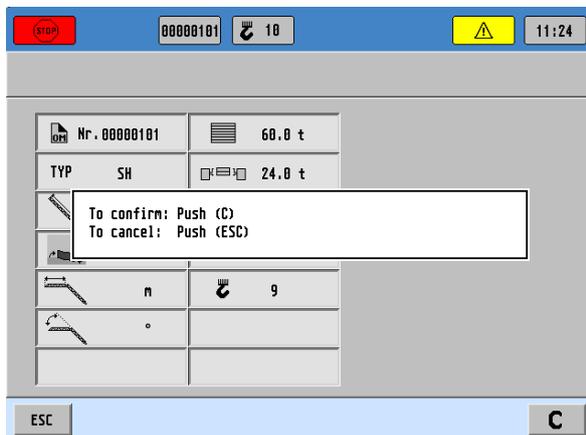
After actuating the  function key the reeving is entered:

## Programming

**Cable reeving number input:**

- ▲ Increase numerical value
- ▼ Decrease numerical value
- ▶ Select next number to the right
- ◀ Select next number to the left
- C Confirm entry / Back to main menu

The entry is confirmed with the **C** button.

**Confirmation request:**

The confirmation menu appears if the cable reeving number has been changed. The user is asked to confirm entry again in this menu screen. This procedure should prevent any accidental changes to the entry

Please check the values displayed **before** you confirm!

After confirming using the **C** function key, the main menu appears again

Programming

### 4.3 Working area monitoring

The SLI system has programmed functions for monitoring the working area in accordance with the area of use of the crane:

- easy to program by menus
- functions can be used individually or in combination
- acoustic alarm and display of a symbol when a programmed limit value is reached or exceeded
- clear display of the programmed limit values in an information menu screen
- Shut-off the relevant boom movements when a programmed limit value is reached or exceeded



#### WARNING

The “Working area monitoring” function described below is an aid for moving the crane within adjustable boom ranges.

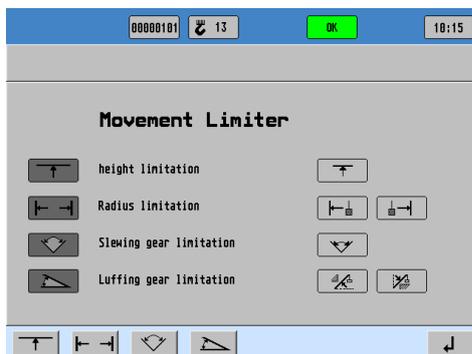
Reaching or exceeding a programmed limit value will stop the relevant boom movements!

The crane driver alone is responsible for the safe operation of the crane!

Calling up the function:

Actuate function key **LIMITS** from the main menu.

Working area limits are indicated by the following symbols:



< symbols in the status display

Constant display: Limits activated

flashing display: Limits exceeded

< symbols on limit info page

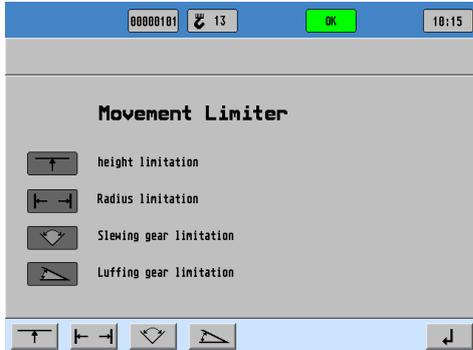
(with indication of active limits on right side of the screen)

	height limitation	(⇒ refer to chapter 4.3.1)
	radius limitation	(⇒ refer to chapter 4.3.2)
	slewing angle limitation	(⇒ refer to chapter 4.3.3)
	luffing angle limitation	(⇒ refer to chapter 4.3.4)
	back to SLI main menu	

Programming

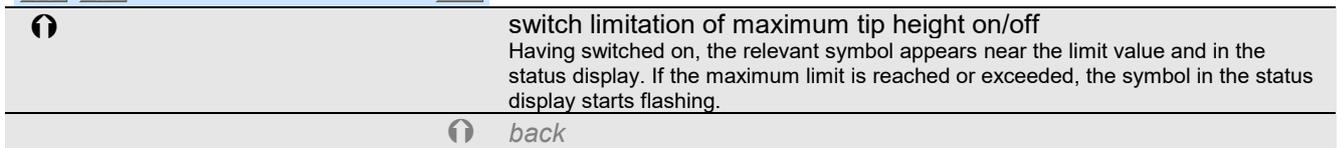
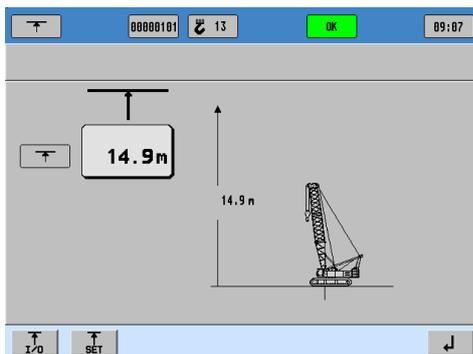
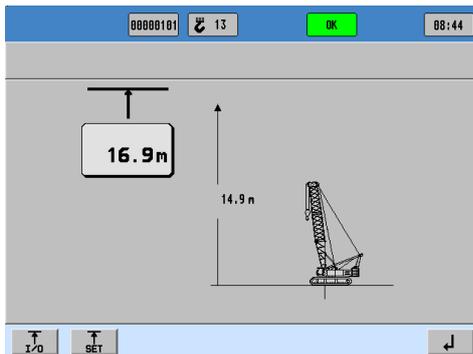
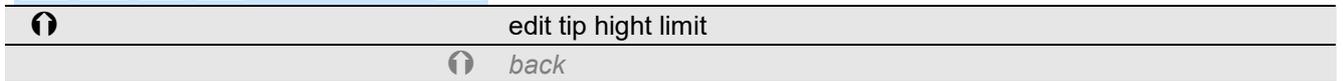
### 4.3.1 Tip Height Limitation

Programmable function for the limitation of the maximum tip height.



Actuate function key **LIMITS** from the main menu.

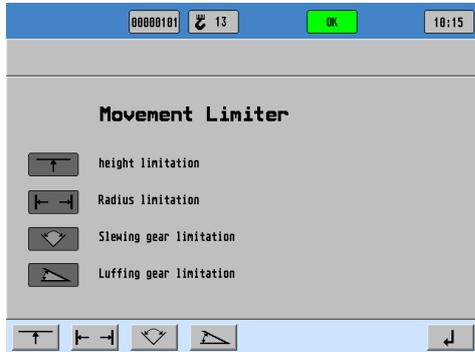
Overview menu with symbols appears, (with any previously programmed limits).



Programming

### 4.3.2 Radius Limitation

Programmable function for the limitation of the minimum and / or maximum boom radius.

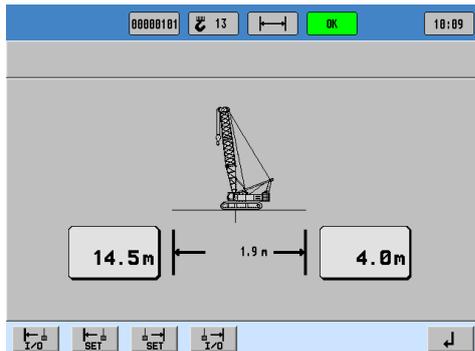


Actuate function key **LIMITS** from the main menu.

Overview menu with symbols appears, (with any previously programmed limits).

edit radius limit(s)

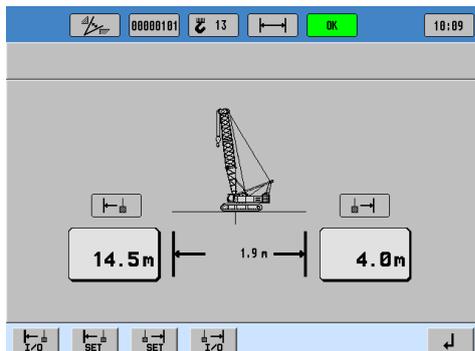
back



save actual boom radius as **minimum** radius limit

save actual boom radius as **maximum** radius limit

back



switch limitation of **minimum** radius on/off  
Having switched on, the relevant symbol appears near the limit value and in the status display. If the minimum limit is reached or exceeded, the symbol in the status display starts flashing.

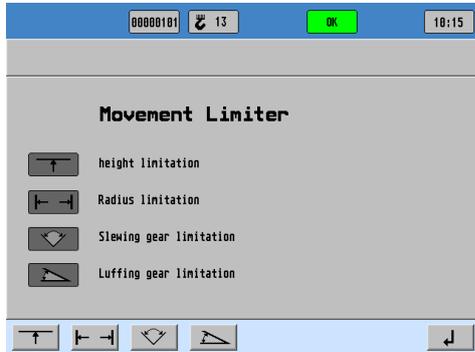
switch limitation of **maximum** radius on/off  
Having switched on, the relevant symbol appears near the limit value and in the status display. If the maximum limit is reached or exceeded, the symbol in the status display starts flashing.

back

Programming

### 4.3.3 Slewing Angle Limitation

Programmable function for the limitation of the left and / or right slewing angle.



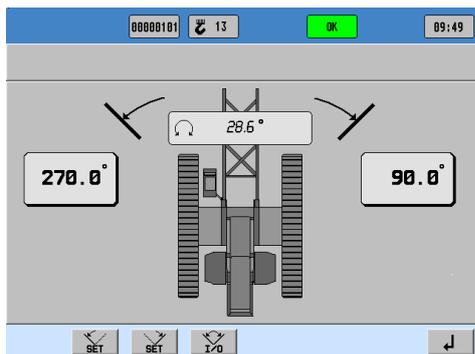
Actuate function key **LIMITS** from the main menu.

Overview menu with symbols appears, (with any previously programmed limits).

edit slewing angle limit(s)

---

back



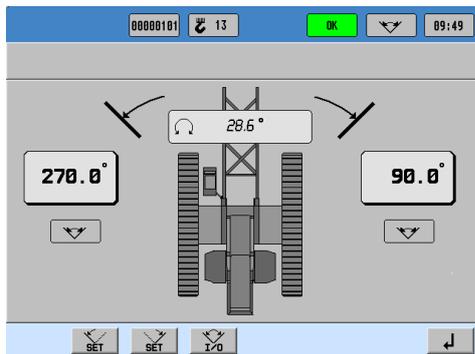
save actual slewing angle as **left** limit

---

save actual slewing angle as **right** limit

---

back



switch limitation of slewing angle on/off  
Having switched on, the relevant symbol appears near the limit value and in the status display. If a limit is reached or exceeded, the symbol in the status display starts flashing. (NOTE: The limitation of the left and right slewing angle can only be switched on/off together.)

---

back

Programming

### 4.3.4 Luffing Angle Limitation

Programmable function for the limitation of the upper and / or lower boom luffing angle.

	<p>Actuate function key <b>LIMITS</b> from the main menu.</p>
<p>edit luffing angle(s)</p> <p>back</p>	<p>Overview menu with symbols appears, (with any previously programmed limits).</p>
	<p>save actual boom luffing angle as <b>upper</b> angle limit</p>
<p>save actual boom luffing angle as <b>lower</b> angle limit</p> <p>back</p>	<p>save actual boom luffing angle as <b>lower</b> angle limit</p>
	<p>switch limitation of <b>upper</b> luffing angle on/off Having switched on, the relevant symbol appears near the limit value and in the status display. If the upper limit is reached or exceeded, the symbol in the status display starts flashing.</p>
<p>switch limitation of <b>lower</b> luffing angle on/off Having switched on, the relevant symbol appears near the limit value and in the status display. If the lower limit is reached or exceeded, the symbol in the status display starts flashing.</p> <p>back</p>	<p>switch limitation of <b>lower</b> luffing angle on/off Having switched on, the relevant symbol appears near the limit value and in the status display. If the lower limit is reached or exceeded, the symbol in the status display starts flashing.</p>

Programming

## 4.4 Depositing / Erecting the boom

**Depositing** the boom:

- Set boom in longitudinal direction.
- Boom down until cut-off.
- Press button . This activates the special rigging operation mode.
- Message „Move carrier to rigging position“ is displayed. Put down the boom.

**Erecting** the boom: (after switching the LMB system off and on)

- Press button . This activates the special rigging operation mode.
- Boom up into working operation.

Checks before start-up

## 5. CHECKS BEFORE START-UP

Before the start of the crane operations the following electrical connections must be checked to guarantee that the SLI system is correctly cabled for the set-up status of the crane.

### ○ Crane with main hoisting gear only

If operating the crane with only the main boom and no boom extension or fly boom there are no extra connections needed. You need to ensure however that the lifting limit switch weight is correctly attached to the main boom hoisting cable. If there is an even number of cable strands the lifting limit switch weight is attached to the “dead end” of the hoisting cable. If there is an uneven number of cable strands the lifting limit switch weight is attached to the strand with the lowest working speed.

If the crane is operating with a main boom extension or fly boom, the connecting cable must be attached between the socket on the fly boom and the socket on the main boom. The weight of the main boom lifting limit switch must be suspended and attached to the lifting limit switch of the extension and/or the fly boom.



**Unless the lifting limit switch is relocated the lifting limit switch system will not work properly. There must be no lifting limit switch attached to the main boom when operating with the extension/fly boom.**

### ○ Crane with main and auxiliary hoisting gear

If the main boom extension and/or fly boom are not in use the bypass plug should be plugged into the socket on the main boom and the lifting limit switch weight attached to the main boom.

If the crane is operating with a main boom extension and/or fly boom, the connecting cable must be attached between the socket on the extension and/or fly boom and the socket on the main boom. Weights should also be attached to the main boom's lifting limit switch as well as to the extension and/or fly boom.

If the boom extension or the fly boom are in the working position and if the main boom is not equipped with a hoisting cable the lifting limit switch weight on the main boom must be removed to prevent endangering personnel or damaging equipment.

The following additional checks must be made after checking the electrical cable connections for each set-up status:

1. Check all cable connections to system components for damage
2. Check the lifting limit switch and lifting limit switch weight for ease of movement
3. Check the spring-loaded cable reel for ease of movement, cable drum pre-tension and correct cable winding.
4. Check the mechanical and electrical installation of power cells on fly booms (if present).

Checks before start-up



The checks below must be carried out with care to prevent damage to the crane and injury to personnel. The trouble-free function of the SLI system depends on successful completion of these checks before the work begins. If the crane operator is unable to see when the hook block is getting close to the pulley head, an assistant must be appointed to attach them. The crane operator must be ready to stop the crane immediately if the SLI system is not working correctly, i.e. if the red warning lights do not light up, the audio alarm does not sound and the crane actions such as hoisting, extending and lowering are not switched off.

Check the *lifting limit switch warning light* and the audio alarm as follows:

1. Lift the weight attached to the lifting limit switch by hand. As soon as the weight is raised the audio alarm should sound and the *lifting limit switch warning light* should light up.
2. Pull the hook block with the main hoisting gear slowly towards the lifting limit switch weight. As soon as the hook block lifts the weight, the audio alarm should sound, the *lifting limit switch warning light* should light up and the hoisting gear should be switched off. Lower the hook block slightly to remedy this situation.
3. Lower the main boom slowly to simulate a possible lifting limit situation. As soon as the hook block lifts the weight, the audio alarm should sound and the *lifting limit switch warning light* should light up and the rocking gear should be switched off. Lower the hook block slightly to remedy this situation.
4. Extend the boom slowly to simulate a potential lifting limit situation. As soon as the hook block lifts the weight, the audio alarm should sound, the *lifting limit switch warning light* should light up and the extension function should be switched off. Lower the hook block slightly to remedy this situation.



**If the warning light and the audio alarm do not function as described and the crane actions are not switched off the system is not working properly. The malfunction must be remedied before commencing work.**

5. If the crane is fitted with a main boom extension and/or a fly boom, repeat the checking procedure for the lifting limit switches for the extension/fly boom.
6. Check whether the displayed main boom length agrees with the actual length.
7. Check whether the displayed angle of the main boom agrees with the actual angle.
8. Check whether the displayed working load of the crane agrees with the actual working load.
9. Check the load display by lifting a known load. The load display must be accurate to within the prescribed tolerance.

Checks before start-up

## 5.1 Operation

The SLI is ready to operate once it has been correctly set up. The crane operator must therefore be familiar with all the SLI controls and make the correct inputs before the crane can commence work. All settings must be checked by lifting a known load and comparing with the information displayed by the SLI.

The safe working load values include the weight of the hook block, the sling cables and the other load suspension equipment. This combined weight must be subtracted from the values of the safe working load to work out the actual net load.



**If any displays reveal a discrepancy between the actual load and the displayed load, ask your SkyAzúl, Equipment Solutions service centre to carry out equipment repairs or to recheck the calibration of the SLI.**



**Every change to the crane structure or change to the crane requires that you check the calibration of the SLI for your crane.**

Service and maintenance

## 6. SERVICE AND MAINTENANCE

The repair and maintenance of the load moment limiter system involves inspecting the following:

1. Cables that connect the different parts of the system together.  
If a cable is damaged it should be replaced immediately.
2. The insulation of the length transmitter cable and/or the lifting limit switch cable and the cable bushes. If the insulation or the cable bushes are damaged, replace these parts immediately.
3. Check the lifting limit switch for ease of movement.
4. Check that the cable drum is adequately pre-tensioned.
5. Check for oil leakage from the pressure absorber on the tipping cylinder and the connecting hoses.

**Personnel without special training may only remedy malfunctions listed in the error table. They may not replace defective mechanical parts or cables.**

Service and maintenance

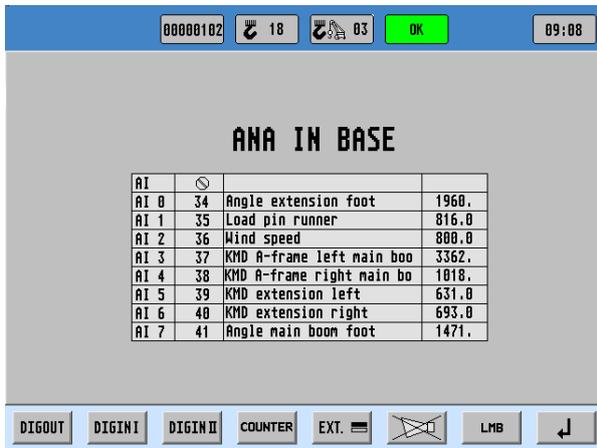
### 6.1 Info and service menus

The system includes various menus in which system information can be displayed.

#### Service screens Basic board

##### ANALOG Analog Inputs

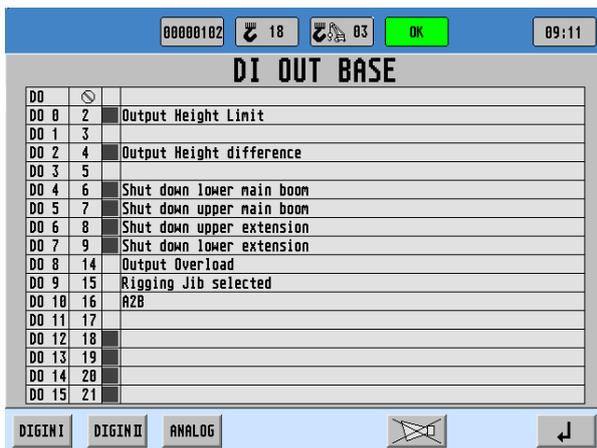
Function keys:



- F1: Overview of digital outputs
- F2: Overview of digital inputs 1
- F3: Overview of digital inputs 2
- F4: Winding counter
- F5: switch to I/Os of extension board
- F6: Horn off
- F7: SLI service screen
- F8: Back to main menu

##### DIGOUT Digital outputs

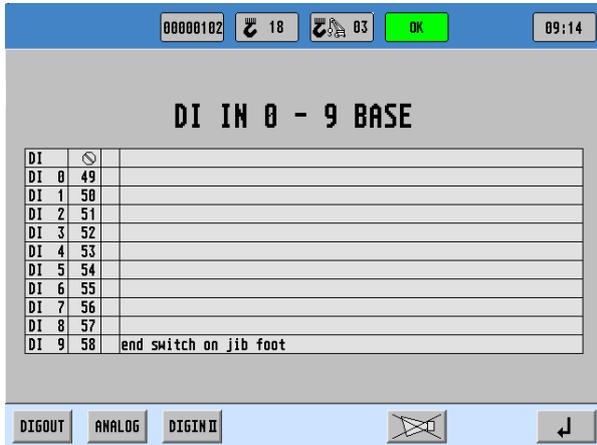
Function keys:



- F1: Overview of digital inputs 1
- F2: Overview of digital inputs 2
- F3: Overview Analog in
- F4: -
- F5: -
- F6: Horn off
- F7: -
- F8: Back to main menu

Service and maintenance

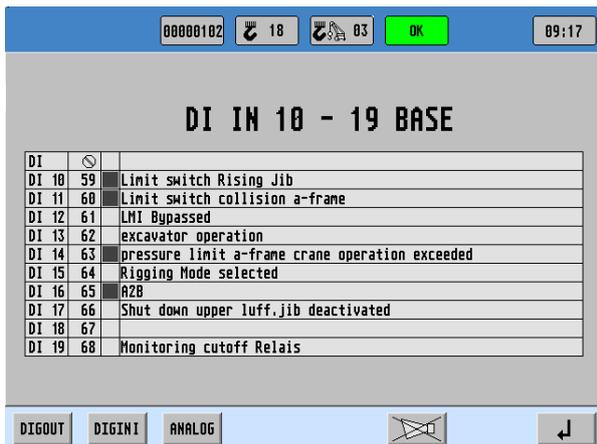
**DIGIN I** Digital inputs I



Function keys:

- F1: Overview of digital outputs
- F2: Overview Analog in
- F3: Overview of digital inputs 2
- F4: -
- F5: -
- F6: Horn off
- F7: -
- F8: Back to main menu

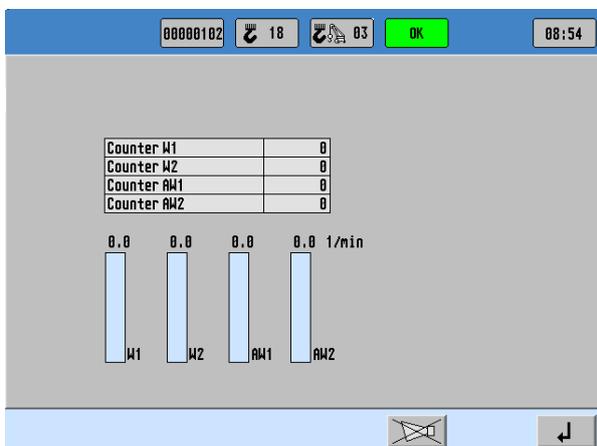
**DIGIN II** Digital inputs II



Function keys:

- F1: Overview of digital outputs
- F2: Overview digital inputs 1
- F3: Overview of analog inputs
- F4: -
- F5: -
- F6: Horn off
- F7: -
- F8: Back to main menu

**COUNTER** Winding counter



Function keys:

- F1:
- F2:
- F3:
- F4:
- F5:
- F6: Horn off
- F7:
- F8: Back to main menu

Service and maintenance

### LMB Service screen SLI

Service LMB			
OH	000102		
Angle main boom foot	66.5 °	KMD A-frame left main bo	100.9 t
Angle MB head	80.3 °	KMD A-frame right main bo	11.4 t
Angle extension foot	12.5 °	KMD extension left	-2.5 t
Angle Jib head	44.6 °	KMD extension right	-0.8 t
Radius	12.9 m	Load pin runner	0.00 t
Angle A-frame	152.6 °	Temperature	123.4 °
pressure rigging cylinder	32.8 bar	Actual Load	103.7 t
Lever Arm Force	21.0 n	Actual Moment	1179. m t
Lever Arm Hoist	3.3 n	Actual load runner	0.0 t

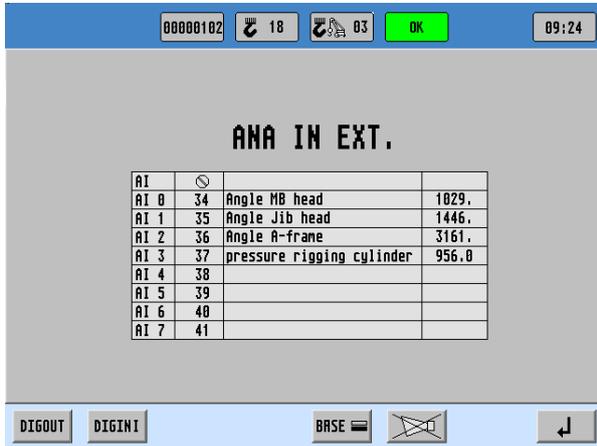
### Function keys

- F1: -
- F2: -
- F3: -
- F4: -
- F5: -
- F6: Horn off
- F7: -
- F8: Back to main menu

Service and maintenance

**Service screens** Extension board

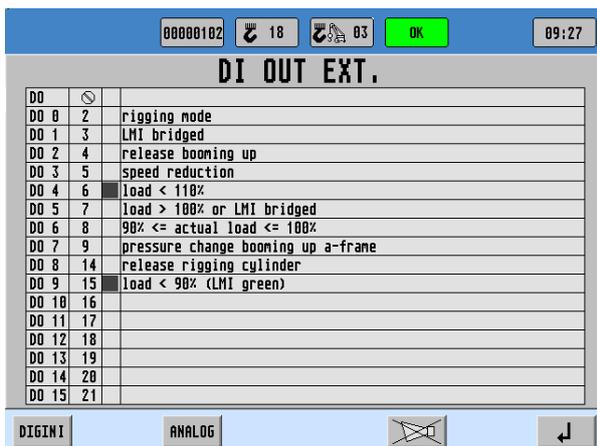
**ANALOG** Analog Inputs



Function keys:

- F1: Overview of digital outputs
- F2: Overview of digital inputs 1
- F3: -
- F4: -
- F5: switch to I/Os of basic board
- F6: Horn off
- F7: -
- F8: Back to main menu

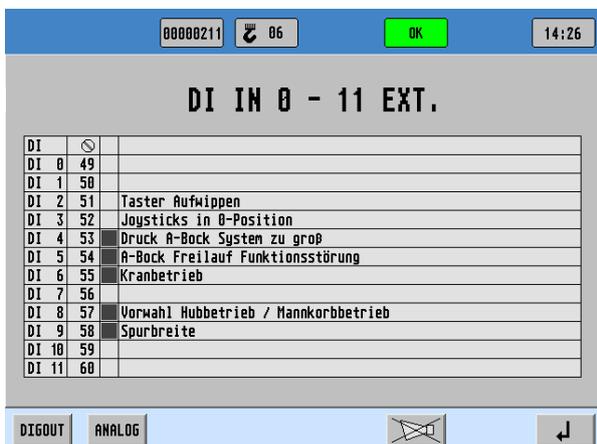
**DIGOUT** Digital outputs



Function keys:

- F1: Overview of digital inputs 1
- F2: -
- F3: Overview analog inputs
- F4: -
- F5: -
- F6: Horn off
- F7: -
- F8: Back to main menu

**DIGIN I** Digital inputs I



Function keys:

- F1: Overview of digital outputs
- F2: Overview analog inputs
- F3: -
- F4: -
- F5: -
- F6: Horn off
- F7: -
- F8: Back to main menu

Troubleshooting

## 7. TROUBLESHOOTING

### 7.1 General information

In the event of a malfunction or an operating error that is recognised by the system, codes shown in the *data display* status field indicate the cause of the malfunction.

Error in the SLI system:



in conjunction with a code number

The error codes in the following error table describe the various errors that can occur with this system. Malfunctions in the SLI system that are caused by exceeding specified limits or operating errors on the part of the crane operator can normally be remedied by the crane operator without assistance.

Errors in the microprocessor system **must always be** remedied by factory-trained customer service personnel. In this case please contact your local Hirschmann customer service centre.

## Troubleshooting

**7.2 SLI system error table** (to LMI software LM7G)

Error code	Error	Cause	Remedy
<b>E01</b>	Radius range undershot or angular field exceeded	<ul style="list-style-type: none"> <li>Over-tipping means that the minimum radius specified in the respective safe working load is undershot or the maximum angle is exceeded.</li> <li>Lever arm of the load is too small, there can be no meaningful calculation can be made</li> </ul>	<ul style="list-style-type: none"> <li>Tip boom to a radius or angle specified in the safe working load table.</li> <li>luff down</li> </ul>
<b>E02</b>	Radius range exceeded or angular field undershot	<ul style="list-style-type: none"> <li>Over-tipping means that the maximum radius specified in the respective safe working load table is exceeded or the maximum angle is undershot.</li> </ul>	<ul style="list-style-type: none"> <li>Tip boom to a radius or angle specified in the safe working load table.</li> </ul>
<b>E04</b>	Operating mode not acknowledged or invalid.	<ul style="list-style-type: none"> <li>Invalid operating mode selected.</li> <li>The selected operating mode is not contained in the Flash EPROM or has been disabled.</li> </ul>	<ul style="list-style-type: none"> <li>Use the keypad to enter the correct operating mode according to the operating conditions.</li> <li>Check programming of Flash-EPROM.</li> </ul>
<b>E05</b>	Boom length not existent.	<ul style="list-style-type: none"> <li>Non-existent boom length selected.</li> <li>The selected boom length is not contained in the Flash EPROM or has been disabled.</li> </ul>	<ul style="list-style-type: none"> <li>Use the keypad to enter the correct length code according to the operating conditions.</li> <li>Check programming of Flash-EPROM.</li> </ul>
<b>E06</b>	In the case of auxiliary luffing booms: Auxiliary boom radius range exceeded or angular field undershot	<ul style="list-style-type: none"> <li>Over-tipping of the auxiliary boom means that the maximum radius specified in the respective safe working load table is exceeded or the maximum angle is undershot.</li> </ul>	<ul style="list-style-type: none"> <li>Luff auxiliary boom to a radius or angle specified in the load table.</li> </ul>
<b>E07</b>	Defective response from overload relay on SLI board.  Relay must have closed but 2 <sup>nd</sup> contact still registered as inactive or 2 <sup>nd</sup> contact registered as active when the relay must have opened.	<ul style="list-style-type: none"> <li>Overload relay defective.</li> <li>SLI board defective</li> <li>“Emergency stop” input actuated (PDB variable overload relay is invalid)</li> </ul>	<ul style="list-style-type: none"> <li>Replace SLI unit</li> <li>Deactivate “Emergency stop” input</li> </ul>
<b>E11</b>	Lower limit value in “Force, main boom guying, right” measurement channel undershot	<ul style="list-style-type: none"> <li>Cable from central unit to force sensor defective or water in plugs.</li> <li>Force sensor defective.</li> <li>Electronic component in measurement channel defective.</li> </ul>	<ul style="list-style-type: none"> <li>Check cables and plugs, replace if necessary.</li> <li>Replace force sensor.</li> <li>Replace iFLEX5 expansion pack.</li> </ul>
<b>E12</b>	Lower limit value in “Angle, head of main boom” measurement channel undershot (if appl.)	<ul style="list-style-type: none"> <li>Cable from central unit to angle transmitter defective or water in plugs.</li> <li>Angle sensor defective.</li> <li>Electronic component in measurement channel defective.</li> </ul>	<ul style="list-style-type: none"> <li>Check cables and plugs, replace if necessary.</li> <li>Replace angle sensor.</li> <li>Replace basic iFLEX5 unit.</li> </ul>

## Troubleshooting

Error code	Error	Cause	Remedy
<b>E13</b>	Lower limit value in "Force, fly boom guying, right" measurement channel undershot	<ul style="list-style-type: none"> <li>• Cable from central unit to pressure sensor defective or water in plugs.</li> <li>• Pressure sensor defective.</li> <li>• Electronic component in measurement channel defective.</li> </ul>	<ul style="list-style-type: none"> <li>• Check cables and plugs, replace if necessary.</li> <li>• Replace pressure sensor.</li> <li>• Replace iFLEX5 expansion pack.</li> </ul>
<b>E14</b>	Lower limit value in "Force, main boom guying, left" measurement channel undershot	<ul style="list-style-type: none"> <li>• as E11</li> </ul>	<ul style="list-style-type: none"> <li>• as E11</li> </ul>
<b>E15</b>	Lower limit value in "Angle, foot of main boom" measurement channel undershot	<ul style="list-style-type: none"> <li>• Cable from central unit to angle transmitter defective or water in plugs.</li> <li>• Angle sensor defective.</li> <li>• Electronic component in measurement channel defective.</li> </ul>	<ul style="list-style-type: none"> <li>• Check cables and plugs, replace if necessary.</li> <li>• Replace angle sensor.</li> <li>• Replace basic iFLEX5 unit.</li> </ul>
<b>E16</b>	Lower limit value in "Angle, foot of fly boom" measurement channel undershot	<ul style="list-style-type: none"> <li>• Cable from central unit to angle transmitter defective or water in plugs.</li> <li>• Angle sensor defective.</li> <li>• Electronic component in measurement channel defective.</li> </ul>	<ul style="list-style-type: none"> <li>• Check cables and plugs, replace if necessary.</li> <li>• Replace angle sensor.</li> <li>• Replace basic iFLEX5 unit.</li> </ul>
<b>E17</b>	Lower limit value in "Force, fly boom guying, left" measurement channel undershot	<ul style="list-style-type: none"> <li>• as E13</li> </ul>	<ul style="list-style-type: none"> <li>• as E13</li> </ul>
<b>E18</b>	Lower limit value in "Inclination X-direction" measurement channel undershot	<ul style="list-style-type: none"> <li>• Sensor defective</li> <li>• CAN cable defective</li> </ul>	<ul style="list-style-type: none"> <li>• Replace sensor</li> <li>• Check cables and plugs</li> </ul>
<b>E19</b>	Lower limit value in "Inclination Y-direction" measurement channel undershot	<ul style="list-style-type: none"> <li>• Sensor defective</li> <li>• CAN cable defective</li> </ul>	<ul style="list-style-type: none"> <li>• Replace sensor</li> <li>• Check cables and plugs</li> </ul>
<b>E1A</b>	Lower limit value in "Jib angle" measurement channel undershot (if appl.) With SHLH: „Main boom head angle“	<ul style="list-style-type: none"> <li>• as E15</li> </ul>	<ul style="list-style-type: none"> <li>• as E15</li> </ul>
<b>E1B</b>	Lower limit value in "A-frame angle" measurement channel undershot	<ul style="list-style-type: none"> <li>• as E15</li> </ul>	<ul style="list-style-type: none"> <li>• as E15</li> </ul>
<b>E1C</b>	Lower limit value in "Pressure support cylinder A-Frame" measurement channel undershot.	<ul style="list-style-type: none"> <li>• Cable from central unit to pressure sensor defective or water in plugs.</li> <li>• Pressure sensor defective.</li> <li>• Electronic component in measurement channel defective.</li> </ul>	<ul style="list-style-type: none"> <li>• Check cables and plugs, replace if necessary.</li> <li>• Replace pressure sensor.</li> <li>• Replace basic iFLEX5 unit.</li> </ul>
<b>E1D</b>	Lower limit value in "Wind speed" measurement channel undershot (if appl.)	<ul style="list-style-type: none"> <li>• as E16</li> </ul>	<ul style="list-style-type: none"> <li>• as E16</li> </ul>

## Troubleshooting

Error code	Error	Cause	Remedy
<b>E1E</b>	Lower limit value in "Force, man basket" measurement channel undershot	<ul style="list-style-type: none"> <li>as E 11</li> </ul>	<ul style="list-style-type: none"> <li>as E 11</li> </ul>
<b>E1F</b>	Lower limit value in "Force, load pin auxiliary jib" measurement channel undershot	<ul style="list-style-type: none"> <li>Cable from central unit to load pin defective or water in plug.</li> <li>Load pin defective</li> <li>Electronic component in measurement channel defective.</li> </ul>	<ul style="list-style-type: none"> <li>Check cables and plugs, replace if necessary.</li> <li>Replace load pin.</li> <li>Replace iFLEX5 expansion board.</li> </ul>
<b>E21</b>	Upper limit value in "Force, main boom guying, right" measurement channel exceeded	<ul style="list-style-type: none"> <li>as E11</li> </ul>	<ul style="list-style-type: none"> <li>as E11</li> </ul>
<b>E22</b>	Upper limit value in "Pressure main boom support cylinder" measurement channel exceeded.	<ul style="list-style-type: none"> <li>as E12</li> </ul>	<ul style="list-style-type: none"> <li>as E12</li> </ul>
<b>E23</b>	Upper limit value in "Force, fly boom guying, right" measurement channel exceeded	<ul style="list-style-type: none"> <li>as E13</li> </ul>	<ul style="list-style-type: none"> <li>as E13</li> </ul>
<b>E24</b>	Upper limit value in "Force, main boom guying, left" measurement channel exceeded	<ul style="list-style-type: none"> <li>as E11</li> </ul>	<ul style="list-style-type: none"> <li>as E11</li> </ul>
<b>E25</b>	Upper limit value in "Angle, foot of main boom" measurement channel exceeded	<ul style="list-style-type: none"> <li>as E15</li> </ul>	<ul style="list-style-type: none"> <li>as E15</li> </ul>
<b>E26</b>	Upper limit value in "Angle, foot of fly boom" measurement channel exceeded	<ul style="list-style-type: none"> <li>as E16</li> </ul>	<ul style="list-style-type: none"> <li>as E16</li> </ul>
<b>E27</b>	Upper limit value in "Force, fly boom guying, left" measurement channel exceeded	<ul style="list-style-type: none"> <li>as E13</li> </ul>	<ul style="list-style-type: none"> <li>as E13</li> </ul>
<b>E28</b>	Upper limit value in "Inclination X-direction" measurement channel exceeded	<ul style="list-style-type: none"> <li>Sensor defective</li> <li>CAN cable defective</li> </ul>	<ul style="list-style-type: none"> <li>Replace sensor</li> <li>Check cables and plugs</li> </ul>
<b>E29</b>	Upper limit value in "Inclination Y-direction" measurement channel exceeded	<ul style="list-style-type: none"> <li>Sensor defective</li> <li>CAN cable defective</li> </ul>	<ul style="list-style-type: none"> <li>Replace sensor</li> <li>Check cables and plugs</li> </ul>
<b>E2A</b>	Upper limit value in "Jib angle" measurement channel exceeded (if appl.) With SHLH: „Main boom head angle“	<ul style="list-style-type: none"> <li>as E15</li> </ul>	<ul style="list-style-type: none"> <li>as E15</li> </ul>
<b>E2B</b>	Upper limit value in "A-frame angle" measurement channel exceeded	<ul style="list-style-type: none"> <li>as E15</li> </ul>	<ul style="list-style-type: none"> <li>as E15</li> </ul>

## Troubleshooting

Error code	Error	Cause	Remedy
<b>E2C</b>	Upper limit value in "Pressure support cylinder A-Frame" measurement channel exceeded.	<ul style="list-style-type: none"> <li>as E1C</li> </ul>	<ul style="list-style-type: none"> <li>as E1C</li> </ul>
<b>E2D</b>	Upper limit value in "Angle, auxiliary boom head" measurement channel exceeded (if present)	<ul style="list-style-type: none"> <li>as E16</li> </ul>	<ul style="list-style-type: none"> <li>as E16</li> </ul>
<b>E2F</b>	Upper limit value in "Force, load pin auxiliary jib" measurement channel exceeded	<ul style="list-style-type: none"> <li>as E1F</li> </ul>	<ul style="list-style-type: none"> <li>as E1F</li> </ul>
<b>E37</b>	Error in logical program progress	<ul style="list-style-type: none"> <li>System program defective.</li> <li>Flash EPROM defective</li> </ul>	<ul style="list-style-type: none"> <li>Re-load system program</li> <li>Replace central unit</li> </ul>
<b>E38</b>	System program and data PROM do not match.	<ul style="list-style-type: none"> <li>The SLI system program is incompatible with the programming in the Data PROM.</li> </ul>	<ul style="list-style-type: none"> <li>Swap system program or Data PROM file.</li> </ul>
<b>E39</b>	System program and TLK PROM do not match.	<ul style="list-style-type: none"> <li>The system program in the SLI is incompatible with the programming in the TLK EPROM.</li> </ul>	<ul style="list-style-type: none"> <li>Swap system program PROM or TLK-PROM file.</li> </ul>
<b>E3A</b>	Data PROM and TLK PROM do not match.	<ul style="list-style-type: none"> <li>Different crane models in Data PROM and TLK PROM.</li> </ul>	<ul style="list-style-type: none"> <li>Swap Data PROM and TLK-PROM</li> </ul>
<b>E51</b>	Error in crane data PROM	<ul style="list-style-type: none"> <li>Crane data PROM has no valid data.</li> <li>Flash EPROM defective</li> </ul>	<ul style="list-style-type: none"> <li>Load valid data into crane data PROM.</li> <li>Replace central unit</li> </ul>
<b>E52</b>	Error in safe working load curve PROM	<ul style="list-style-type: none"> <li>Memory module erroneously bypassed</li> <li>Flash EPROM defective</li> </ul>	<ul style="list-style-type: none"> <li>Load valid data into crane data PROM.</li> <li>Replace central unit</li> </ul>
<b>E53</b>	Error in crane data PROM (Bank 2)	<ul style="list-style-type: none"> <li>Memory module erroneously bypassed</li> <li>Flash EPROM defective</li> </ul>	<ul style="list-style-type: none"> <li>Load valid data into crane data PROM.</li> <li>Replace central unit</li> </ul>
<b>E56</b>	Error in crane data PROM	<ul style="list-style-type: none"> <li>Crane data PROM has no valid data when calibration taking place.</li> <li>Flash EPROM defective</li> </ul>	<ul style="list-style-type: none"> <li>Load valid data into crane data PROM.</li> <li>Replace central unit</li> </ul>
<b>E57</b>	Error in serial crane data PROM	<ul style="list-style-type: none"> <li>Serial crane data PROM has no valid data.</li> <li>Flash EPROM defective</li> </ul>	<ul style="list-style-type: none"> <li>Specify ser. crane data PROM with data (with test program or online function) then restart SLI.</li> <li>Replace central unit</li> </ul>
<b>E61</b>	Error in CAN bus data transfer in all modules	<ul style="list-style-type: none"> <li>CAN bus cable between central unit and sensor unit defective or not connected (additional A2B error symbol )</li> <li>CAN Bus cable between central unit and console defective or not connected (additional BUS error symbol)</li> <li>CAN Bus Port in the central unit defective</li> <li>Short circuit in Can Bus cable</li> <li>Bus devices switched off because application is inoperative</li> </ul>	<ul style="list-style-type: none"> <li>Check the connection between the central unit and the sensor unit</li> <li>Check the connection between the central unit and the console</li> <li>Replace central unit</li> <li>Replace CAN Bus cable</li> <li>Connect to terminal for diagnosis</li> </ul>

## Troubleshooting

Error code	Error	Cause	Remedy
<b>E66</b>	Errors in the values of the digital inputs	<ul style="list-style-type: none"> <li>PDB variable "BEPB00", "BEPB01" or "BEPB02" are invalid</li> </ul>	<ul style="list-style-type: none"> <li>System software to version 3.22 or higher</li> <li>Replace central unit</li> </ul>
<b>E6B</b>	CAN signal from rotary encoder invalid	<ul style="list-style-type: none"> <li>Sensor failure</li> <li>Cabling defective</li> </ul>	<ul style="list-style-type: none"> <li>Replace sensor</li> <li>Check cabling</li> </ul>
<b>E81</b>	Too great a discrepancy between the angles at the head and foot of the main boom.(if present)	<ul style="list-style-type: none"> <li>The angle with respect to the horizontal at the head of the main boom is 8 degrees more than the angle at the foot of the boom.</li> </ul>	<ul style="list-style-type: none"> <li>Check the angle transmitter at the head of the boom.</li> <li>Check the angle transmitter at the foot of the boom.</li> <li>Check value in B10.75</li> </ul>
<b>E82</b>	Too great a discrepancy of the angles at the head and foot of the auxiliary boom. (if present)	<ul style="list-style-type: none"> <li>The angle to the horizontal at the head of the auxiliary boom is 5 degrees more than the angle at the foot of the boom.</li> </ul>	<ul style="list-style-type: none"> <li>Check the angle transmitter at the head of the auxiliary boom.</li> <li>Check the angle transmitter at the foot of the auxiliary boom.</li> </ul>
<b>E83</b>	Max. force, main boom guying	<ul style="list-style-type: none"> <li>Max. force, main boom guying exceeded</li> </ul>	<ul style="list-style-type: none"> <li>Reduce force of main boom guying</li> </ul>
<b>E84</b>	Incorrect set-up status	<ul style="list-style-type: none"> <li>The data EPROM does not contain the selected set-up status.</li> </ul>	<ul style="list-style-type: none"> <li>Select another set-up status.</li> <li>Check programming of Data PROM.</li> </ul>
<b>E85</b>	Error in radius calculation	<ul style="list-style-type: none"> <li>The calculated radius is too small (negative bowing)</li> </ul>	<ul style="list-style-type: none"> <li>Check programming of Data PROM.</li> </ul>
<b>E86</b>	Faulty support state	<ul style="list-style-type: none"> <li>An operating mode for extended track width is selected, but the crane is set with narrow track width.</li> <li>An operating mode for narrow track width is selected, but the crane is set with extended track width.</li> </ul>	<ul style="list-style-type: none"> <li>Select correct operating mode</li> <li>Adjust support state (track)</li> </ul>
<b>E88</b>	Incorrect main boom position when operating with auxiliary rocker boom	<ul style="list-style-type: none"> <li>When operating with auxiliary rocker boom the main boom is outside the prescribed angular field</li> <li>Angle measuring device of main boom defective.</li> </ul>	<ul style="list-style-type: none"> <li>Tip main boom into permissible range.</li> <li>Check the angle measuring device of the main boom.</li> </ul>
<b>E89</b>	Incorrect position of auxiliary boom when operating at fixed angle or when fitting the auxiliary boom (if present)	<ul style="list-style-type: none"> <li>When operating at a fixed angle with respect to the main boom the auxiliary boom is outside the prescribed angular field</li> <li>The auxiliary boom is outside the specified angular field when fitting the auxiliary boom</li> <li>Angle measuring device of auxiliary boom defective.</li> </ul>	<ul style="list-style-type: none"> <li>Tip auxiliary boom into permissible range.</li> <li>Tip auxiliary boom into permissible range for fitting.</li> <li>Check the angle measuring device of the auxiliary boom.</li> </ul>
<b>E8A</b>	Error in controller	<ul style="list-style-type: none"> <li>Controller is not running</li> </ul>	<ul style="list-style-type: none"> <li>Re-start system</li> </ul>
<b>E98</b>	SLI Watchdog activated	<ul style="list-style-type: none"> <li>SLI processing time exceeded</li> </ul>	<ul style="list-style-type: none"> <li>Reset system</li> <li>Connect to terminal for diagnosis</li> </ul>
<b>EA1</b>	A2B switch has triggered	<ul style="list-style-type: none"> <li>Hook was raised too far</li> </ul>	<ul style="list-style-type: none"> <li>Lower hook</li> </ul>
<b>EA2</b>	Overload	<ul style="list-style-type: none"> <li>Load exceeds the permitted safe load</li> </ul>	<ul style="list-style-type: none"> <li>Reduce load</li> <li>Reduce load radius</li> </ul>
<b>EA3</b>	Pre-warning	<ul style="list-style-type: none"> <li>Load exceeds 90% of the permitted safe load</li> </ul>	<ul style="list-style-type: none"> <li>Reduce load</li> <li>Reduce load radius</li> <li>Continue operation with increased caution</li> </ul>
<b>EA8</b>	Error temperature sensor for reduction of the permitted load	<ul style="list-style-type: none"> <li>Value of the sensor out of the permitted range</li> </ul>	<ul style="list-style-type: none"> <li>Replace temperature sensor</li> </ul>

## Troubleshooting

Error code	Error	Cause	Remedy
<b>EA9</b>	Temperature error	<ul style="list-style-type: none"> <li>ambient temperature is &lt; -40°C or value in DGA 11.2.4 out of range</li> </ul>	<ul style="list-style-type: none"> <li>Operate crane in ambient temperature of more than -40°C</li> </ul>
<b>EAB</b>	A2B switch, short circuit	<ul style="list-style-type: none"> <li>Internal short circuit, A2B switch</li> <li>Short circuit, A2B switch cabling</li> </ul>	<ul style="list-style-type: none"> <li>Replace A2B switch</li> <li>Check/replace cabling</li> </ul>
<b>EAC</b>	A2B switch circuit broken	<ul style="list-style-type: none"> <li>Internal A2B switch circuit broken</li> <li>A2B switch cabling circuit broken</li> </ul>	<ul style="list-style-type: none"> <li>Replace A2B switch</li> <li>Check/replace cabling</li> </ul>
<b>EAD</b>	Invalid signal from A2B switch	<ul style="list-style-type: none"> <li>Internal defect</li> <li>Error CAN bus timing</li> </ul>	<ul style="list-style-type: none"> <li>Replace A2B switch</li> <li>Check/replace cabling</li> </ul>
<b>EB1</b>	Fallen below lower limit value of "Length of cable on winch"	<ul style="list-style-type: none"> <li>No cable on the winch (* EB1 only)</li> <li>No pulse generator for winch measurement</li> <li>No compensation made for cable length</li> <li>Incorrect cable/winch parameters in data programming</li> <li>Counter inputs not configured</li> <li>Counter inputs defective</li> </ul>	<ul style="list-style-type: none"> <li>Re-compensate for cable length on the winch</li> <li>Fit pulse generator or switch off function in data program</li> <li>Cable length, re-compensate for positions</li> <li>Check/change parameters in data program</li> <li>Change I/O configuration</li> <li>Replace iFLEX5</li> </ul>
<b>EB2</b>	Upper limit value "Length of cable on winch" exceeded	<ul style="list-style-type: none"> <li>Cable completely unwound and winch continuing to turn (* EB2 only)</li> <li>as EB1</li> </ul>	<ul style="list-style-type: none"> <li>Re-compensate for cable length on the winch</li> <li>as EB1</li> </ul>

## Troubleshooting

Error code	Error	Cause	Remedy
<b>EB3</b>	Upper limit value "Hook height" exceeded	<ul style="list-style-type: none"> <li>No cable between pulley head and hook</li> <li>as EB1</li> </ul>	<ul style="list-style-type: none"> <li>as EB1</li> </ul>
<b>EB4</b>	Plausibility error in crane operation / rigging operation	<ul style="list-style-type: none"> <li>The signals of the digital inputs "crane operation" and "rigging operation" are contradictory</li> </ul>	<ul style="list-style-type: none"> <li>Check digital inputs 6 (extension board) and 15 (basic board)</li> <li>Check value in A2.16</li> </ul>
<b>EB4</b> till LM7G V1.13	Redundancy error in force, main boom guying left/right with jib operation	<ul style="list-style-type: none"> <li>The measurement channels "force left" and " force right " show different values</li> </ul>	<ul style="list-style-type: none"> <li>Check value in DGB10.32</li> <li>guy ropes unequal loaded</li> <li>Replace defective load cell</li> </ul>
<b>EB7</b> from LM7G V1.14	Redundancy error in force, main boom guying left/right with jib operation	<ul style="list-style-type: none"> <li>The measurement channels "force left" and " force right " show different values</li> </ul>	<ul style="list-style-type: none"> <li>Check value in DGB10.32</li> <li>guy ropes unequal loaded</li> <li>Replace defective load cell</li> </ul>
<b>ED0</b>	Datalogger	<ul style="list-style-type: none"> <li>Event recorder not activated</li> </ul>	<ul style="list-style-type: none"> <li>Check value A2.2.</li> </ul>
<b>EDA</b>	Datalogger: Memory write error	<ul style="list-style-type: none"> <li>Records cannot be written</li> </ul>	<ul style="list-style-type: none"> <li>Reset system</li> <li>Connect to terminal for diagnosis</li> </ul>
<b>EDB</b>	Datalogger: Battery-backed memory error	<ul style="list-style-type: none"> <li>Battery memory is invalid. Address pointer for records is invalid.</li> </ul>	<ul style="list-style-type: none"> <li>Data Logger: read out data as soon as possible, otherwise you risk losing data!</li> <li>Connect to terminal for diagnosis</li> </ul>
<b>EDC</b>	Datalogger: Watchdog activated	<ul style="list-style-type: none"> <li>Datalogger processing time exceeded</li> </ul>	<ul style="list-style-type: none"> <li>Reset system</li> <li>Connect to terminal for diagnosis</li> </ul>
<b>EDD</b>	Memory back-up battery is flat	<ul style="list-style-type: none"> <li>Buffer battery has insufficient charge</li> </ul>	<ul style="list-style-type: none"> <li>Replace battery and then reset the time</li> </ul>
<b>EDE</b>	Datalogger: Datensatz konnte nicht geschrieben werden	<ul style="list-style-type: none"> <li>Memory access was not successful</li> </ul>	<ul style="list-style-type: none"> <li>Reset system</li> <li>Connect to terminal for diagnosis</li> </ul>
<b>EDF</b>	Datalogger: Record cannot be written	<ul style="list-style-type: none"> <li>Memory must be reactivated</li> </ul>	<ul style="list-style-type: none"> <li>Reset system</li> </ul>
<b>EFD</b>	SLI Watchdog extension	<ul style="list-style-type: none"> <li>A function that is needed for longer than 0.5 sec is active e.g. writing Flash PROM</li> </ul>	<ul style="list-style-type: none"> <li>Message is reset automatically after a few seconds.</li> </ul>

**NOTE:**

*If an error message is displayed that is not contained in this list, please contact your local Hirschmann customer service centre.*

Appendix

## INFORMATION LEAFLET 1

### Cut-out values for boom cranes with variable safe working loads depending on variable safe working load

We set the crane cut-out values on the basis of the safe working load tables and technical drawings provided by the manufacturer.

These theoretical cut-out values must be checked in all operating modes by carrying out tests on the crane using pre-weighed test loads and at least in the following set-up statuses depending on the crane construction type.

- **Crane in operation, fixed boom length:**  
Smallest, mid and largest radii at shortest, mid and longest boom length and at these boom lengths with shortest, mid and longest fly booms.
- **Crane in operation, variable boom length:**  
Smallest, mid and largest radius at every possible length and with all fly booms.

## INFORMATION LEAFLET 2

### Important notes for the crane operator

The SLI is an operating aid, which warns the crane operator of impending overload or the proximity of the hook block to the head of the boom in order to prevent possible injury to persons or property.

The system cannot and must not replace good judgement and/or experience on the part of the crane operator or the use of recognised safe working practises in the use of cranes. The crane operator is not exonerated from responsibility for the safe operation of the crane. The driver shall ensure that the displayed notices and instructions are fully understood and observed. Before the start of any crane operation, the crane operator must read through and understand the entire manual to guarantee familiarity with the use and limits of the SLI and the crane. Trouble-free operation depends on the correct daily inspections and observance of the operating instructions given in this manual.

The SLI can offer the crane operator help only when it has been correctly configured and the correct safe working load and the correct operating codes have been entered for the respective set-up status. To avoid damage to property and serious or possibly fatal injury to personnel it is essential that the SLI settings be checked to ensure that they are correct before starting crane operations.



**This system can be equipped with a key switch that bypasses the shut-off function of the SLI system. This switch may only be used in an emergency and only by authorised personnel. Ignoring this instruction may result in damage to property or serious or even fatal injury.**

Appendix

### **INFORMATION LEAFLET 3      Important notes for the crane operator**

The guidelines of VDI 3570, the German association of engineers for the design of crane overload safety devices, apply in Germany. Reference is made in particular to the nature and limits of the term overload safety devices.

“Overload safety devices should prevent accidents and endangerment as far as possible to persons, property, the load or the crane as a result of overload when working with cranes. The operator and crane operator must take into account the fact that overload safety devices cannot detect every danger in time and their function may be impaired by unforeseeable influences. You are therefore advised to exercise due caution and be aware of your responsibility not to infringe operating directives or exceed the crane working loads. Overload safety devices are not for normal use. They should only be activated in an emergency. The safe working load of the hoist should not be diminished by an overload safety device.”

#### **VDMA information sheet for overload safety devices (load moment limiters) for boom cranes**

The boom crane delivered to you is equipped with an overload safety device (overload safety cut-out) according to §24 of the German accident prevention guidelines for “Boom cranes“ which ensures that the hoist and the boom retracting gear of the crane is switched off if the admissible load moment is exceeded. In order to lessen the overall load, it must be possible to reverse actions after the overload safety device has issued a warning. It must also be possible to lower loads e.g. after switching off the hoist.

The installation of the overload safety device (overload cut-out) should prevent the crane from lifting loads that might threaten its stability. The overload safety device (overload cut-out) is therefore an emergency-off switch, which disables any actions, which would increase the crane’s load moment in the event of the crane being overloaded, thereby preventing possible accident or damage. To ensure that the overload safety device can fulfil its function as a safety device the following should be noted:

1. Overload safety devices (overload cut-outs) must not be used in normal operation to switch off the hoist or the boom retracting gear. The crane operator must be sure that the load to be lifted does not exceed the safe working load of the crane. Overweight loads that exceed the crane’s safe working load must be rejected even if an overload safety device is present. Similarly the device should never be used as a weighing device and the crane must never be loaded beyond its maximum permissible load.
2. The freeing of fixed loads must be carried out only in agreement with the crane manufacturer and only with cranes that are suitably equipped for this purpose. The overload safety device (load moment limiter) must not be used as a device for force measurement in such cases.
3. The inbuilt overload safety device must be maintained regularly and its functional safety checked before starting any operation. According to §35 of the German accident prevention guidelines for “Boom cranes“, maintenance of the crane involves regular checking of the overload safety device.
4. The overload safety device is not generally automatically adjusted to every operating status of the crane. If the operating mode of the crane alters in any way therefore the crane operator is obliged to adjust the overload safety device to the changed safe working load/load moment range. In this case, read the user manual provided by the manufacturer for the overload safety device. The safe operation of the equipment and the accident-free operation of the crane depends to a great extent on careful compliance with this directive. Inaccurate overload safety device adjustment e.g. setting a large load moment when the supports are retracted, is far more dangerous than a crane with no load safety protection because the operator is deceived into a false sense of security which could lead to serious accidents.

## Appendix

5. The overload safety device (overload cut-out) must be relocated and/or reset by the crane operator to when converting the crane in accordance with different operating statuses and the changed safe working load and/or load moment range, e.g.:
  - a) When extending and retracting the outriggers (switch to large or small load moment)
  - b) When changing the boom length by:
    - manually extending and retracting (telescoping)
    - assembling and disassembling intermediate sections
  - c) When rotating or slewing the crane within the larger or smaller stability moment range (switch to large or small load moment)
  - d) In transition to another safe working load range via multiple reeving of the cable strands of the hoist or the boom retracting gear
6. It should be expressly mentioned that the result of improper use of the crane could result in the overload safety device not functioning and/or the driving gear not switching off fast enough. In this case accidents cannot be completely excluded even when an overload safety device has been fitted. This applies in particular to:
  - under-hooking of load or the load suspension equipment
  - excessive deceleration forces
  - loads falling into cable
  - lifting on an angle
  - driving crane on a steep slope
  - soft ground
  - windy conditions
7. If a device for switching off or bypassing the overload safety device (load moment limiter) is present then it must be used only in the presence of the crane supervisor, e.g. when checking the crane, taking into account particular precautionary measures and in cases specified by the crane manufacturer.

**Careful observance of the conditions contained within this information sheet and in the operating instructions of the crane manufacturer is essential to ensure the safe operation of the overload safety device (overload cut-out).**

**If in doubt, always refer to the manufacturer's operating instructions. If this does not suffice you need to contact the respective company.**

**The warranty is null and void if you interfere with the mechanism of the overload safety device.**

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Appendix

## **INFORMATION LEAFLET 4      Notes for electromagnetic compatibility (EMC) for electrical systems affected by magnetic fields**

Electromagnetic fields are increasingly affecting electronic systems and can cause malfunctions. We can offer the following advice for the avoidance of such problems according to the present state of the art:

1. The preventative measures proceed from the principle of shielding electronic circuits against radiated high frequencies with an enclosed low-ohm safety sheath for high frequency interference.
  - All components have metallic outer casings with earth potential;
  - All cables are shielded. The shielding surface must be designed to lie flat on all transition surfaces and must be an effective conductor.
  - Crane masses and electronic masses must be coupled at only a single point in the system.
2. The general precautions listed under item 1 cannot ensure full protection against electromagnetic fields in every case because the extent and the type of effect depends on local conditions.

Influencing factors include:

- particularly unfavourable arrangement of aerials with respect to the system ,
- very high transmission rates,
- inconsistent compliance with the precautions listed under item 1 due to local conditions,
- long cables,
- coupling of interference into supply lines.

In unfavourable circumstances you will need to carry out experiments on site with measures in addition to the preventative measures listed under item 1, e.g.

- insert filters or use capacitors to short circuit the interfering frequencies
- create or isolate connections between masses,
- use double-shielded cable (guarded shield system).

Appendix

## **INFORMATION LEAFLET 5      Notes on operating safety when carrying out repairs to display and operating consoles**

**Caution:** Liquid crystal displays contain liquid chemical substances inside the display. Special care and vigilance is therefore required:

- when operating equipment containing LCD displays
- during storage and transport (danger of breakage!)
- when disposing of no longer usable or surplus LCD displays

**Possible causes of danger are the effects of skin contact with chemicals from broken LCD displays. Wash thoroughly with soap and water if the chemicals wet any part of your body. Exercise particular care with open wounds!**







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