

iVISO *mentor* QVGA



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User Manual

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Introduction

1. GENERAL INFORMATION

This manual describes the functions and operation of the **iVISOR mentor QVGA** load moment indicator (LMI).

The purpose of the load moment indicator (below called the LMI) is to provide key information to the operator of the loader which is needed for the operation of the loader within the operating ranges specified by the manufacturer. The LMI provides the operator with information about the angle and height of the boom, working radius, rated load and the actual load.

The **iVISOR mentor QVGA** load moment indicator comprises a central microprocessor unit with an integrated display and operating console together with various sensors to record measured values. The system components are connected via CAN bus.

The system works on the principle of a target / actual comparison. The actual value, resulting from the pressure and angle measurement, is compared with the target values stored in the central unit's memory and analysed by the microprocessor.

If the crane nears its safe load limit, the system will warn the crane operator by means of both acoustic and optical signals. In addition, as soon as the crane reaches an unauthorized operating status, all crane movements will be switched off that would increase the load moment on the crane.

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2. IMPORTANT NOTES

The LMI is an operating aid that warns the crane operator of imminent overloading or of the approach of the hook block to the boom head, in order to avoid possible property damage or injury to personnel.

The device is not, nor is it intended to be, a substitute for good operator judgment and/or experience, nor does it remove the need for utilizing only recognized safe procedures during crane operations.

CAUTION

The crane operator continues to bear ultimate responsibility for safe operation of the crane. He must ensure that he fully understands and follows the displayed notes and instructions in their entirety.

Before beginning crane operations, the crane operator must carefully read and understand the entire manual in order to ensure that he is aware of the operation and limitations of both the LMI and the crane itself.

Proper functioning is dependent upon proper daily inspection and observation of the operating instructions set forth in the manual.

WARNING

The LMI is not able to provide aid to the crane operator unless it has been properly adjusted and unless the correct load capacity chart and the correct operating code have been entered for the respective rigging configuration. The correctness of the LMI settings must be guaranteed before beginning crane work in order to avoid damage to property and severe or even fatal injuries to personnel.

WARNING

This system can be equipped with an external key-operated switch located in the crane operator's cab. This key-operated switch overrides control lever function switch-off by the LMI or by the hoist limit switch system. This switch may only be used during emergency situations, and even then only by authorized personnel. Failure to observe these instructions could result in damage to property and severe or even fatal injuries to personnel.

WARNING

The LMI 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 LMI settings must be ensured before beginning crane work in order to avoid damage to property and severe or even fatal injuries to personnel.

Introduction

3. SYSTEM DESCRIPTION

The iVISOR *mentor QVGA* load moment indicator system comprises a central microprocessor unit with an integrated display and control console together with various sensors to record the measured values.

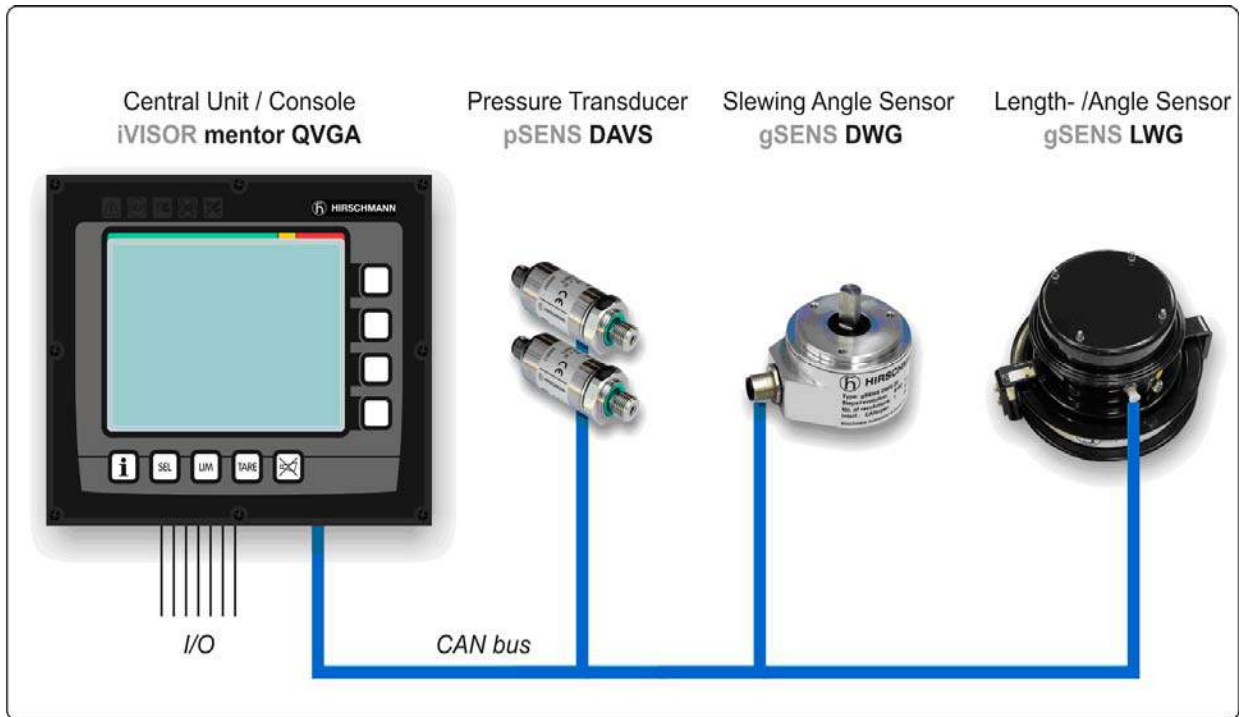


Fig. 1: Components of the iVISOR *mentor QVGA* LMI system (without optional extras)

The system operates on the principle of reference/real comparison. The actual value is compared with the calculated reference values and evaluated by the system. An overload warning signal is triggered on the display and operating console once limit values are reached. All crane movements that increase the load moment are switched off at the same time.

The crane-specific data specified by the manufacturer, such as load capacity charts, boom weights, centers of gravity and dimensions, are stored in the central data memory. This data is the reference information used to calculate the operating conditions.

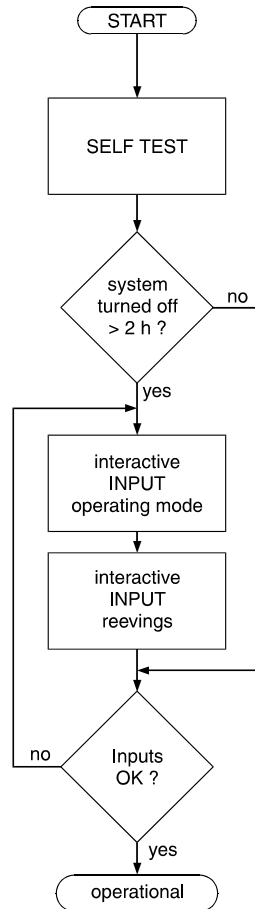
The boom angle and length is measured by means of an length/angle sensor that is mounted on the boom. The crane load is determined indirectly with the aid of pressure transducers.

The operating console is located in the operator's cab in plain view of the crane operator. All displays and operating elements have background illumination for enhanced ease of recognition. The console contains various operating elements as well as a multifunction LC display, all of which are described in detail in chapter 3.2

The contrast of the LC display is adjustable manually in accordance with ambient light levels.

Introduction

3.1 System start



Upon switching on, the system boots and starts with an automatic test of the LMI system, lamps and audible alarm. During the test, the LC display shows the start screen.



If the system was turned off for more than two hours, the setup configuration has to be entered after the system test. (⇒ chapter 4)

First, the operating mode is determined by an interactive step-by-step interrogation of the rigging states.

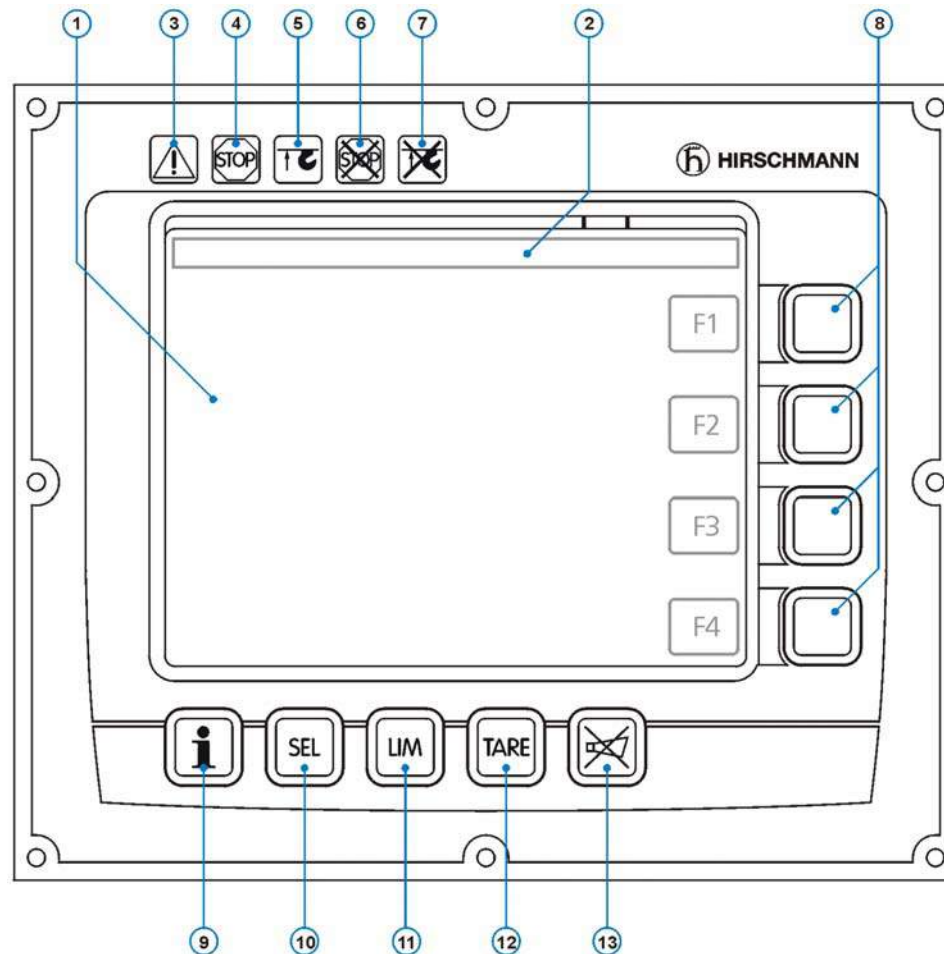
Next is the interactive input of the reevings.

Now the LC display shows all inputs and awaits acknowledgment or cancelling.

Upon acknowledgment of the inputs the system is ready for operation. In the event of a malfunction, a corresponding error code "E##" will appear on the Data display (1). (> refer to error code table)

3.2 Displays and controls

The illustration shows the displays and controls of the iVISOR *mentor QVGA* console. The numbers in the illustration correspond to the numbers in the following functional description for each item.



- | | | | |
|---|--|----|--|
| 1 | Data display (background lit) | 8 | Function keys F1 ... F4 |
| 2 | Bar graph (utilisation) | 9 | "Info" key (system information) |
| 3 | Prewarning light | 10 | System setup button |
| 4 | Overload warning light (load moment) | 11 | "LIM" button (working area definition) |
| 5 | Hoist limit warning light (A2B) | 12 | "Tare" button |
| 6 | "LMI bypass" warning light (flashes if bypassed) | 13 | "Alarm off" button |
| 7 | "A2B bypass" warning light (flashes if bypassed) | | |

Displays and controls

(1) Data display

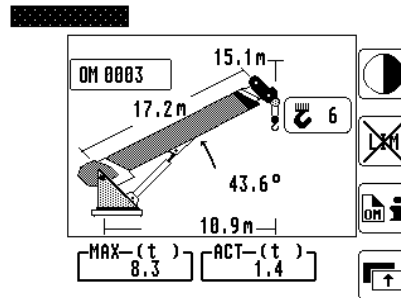
The *Data display* (1) is dot matrix LC display with background illumination and extended temperature range, on which essential data are displayed depending on the operating mode, such as load values, geometry and crane data, symbols etc. The design enables good legibility even in bright sunlight, and at night too thanks to the integrated background lighting.

Examples of display menus (values are not real)

Start after system test



Display, normal operation



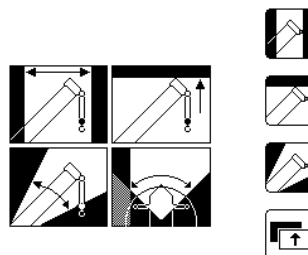
Entry to Info menu

| AI | RAW Val. | PHYS. | DIG I/O |
|-----|----------|-------|---------|
| ≡ | 18.5 | 17.2 | DIG I/O |
| P-P | 17.8 | 117.5 | Key |
| P-R | -1.9 | -10.4 | Header |
| ↗ | 12.9 | 43.6 | Header |
| ↘ | -34.8 | -32.1 | Header |
| | | | Header |
| | | | Header |

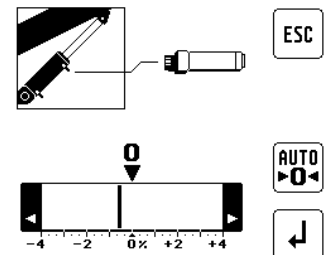
Display of LMI values

| LMI VALUES | |
|---------------|-----------|
| OPER. MODE | 000003 |
| REEVING | 6 |
| PISTON PRESS. | 117.5 bar |
| ROD PRESS. | -10.4 bar |
| ANGLE | 43.64 ° |
| LENGTH | 17.16 m |
| RADIUS | 10.93 m |
| ACTUAL LOAD | 1.43 t |

Entry menu – working area definition



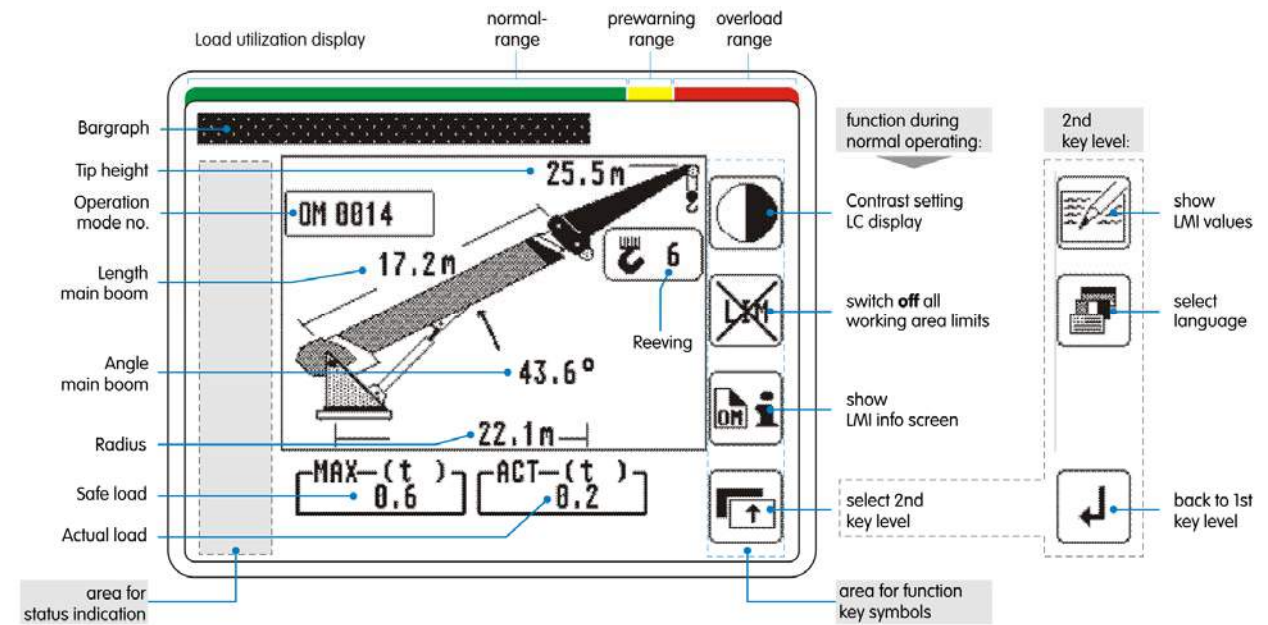
*Service menu (code-protected)
Pressure sensor adjustment*



You can find a detailed description of symbols and displays in the chapters and the appendix of this manual.

Displays and controls

Data display (example w/o man basket):



Notes:

- If required, various symbols are displayed in the “status indication” field (refer to chapter 3.3).
- If required, active working area limits are displayed by the relevant symbols. The relevant symbol **flashes** if the limit value is reached or exceeded.
- In the “function key symbols” field, the symbol allocated to the relevant function key appears.

(2) Utilisation display (bar graph)



The *Utilisation display (bar graph)* indicates how much of the admissible load moment (rated moment) is used. As the rated moment changes constantly during loader operation, the load moment display also changes constantly.

The utilisation display is marked with differently coloured fields:

green: "Safe" operation (0...90% of rated moment)

yellow: "Prewarning range" (90...100% of rated moment)

red: "Overload range" (> 100% of rated moment)

(3) "Pre-warning" light



When this amber display light comes on, this indicates that the utilisation of the crane has reached the specified pre-warning range. **An overload situation could therefore be imminent!**

At the same time, the acoustic alarm sounds an interrupted signal.



For the crane operator, this means that the work can only be continued with caution.

(4) "Overload" warning light



This red display light lights up to indicate that the maximum capacity has been reached or exceeded.

At the same time, the acoustic alarm sounds an uninterrupted signal and, depending on the system wiring, load moment-increasing boom movements are stopped.

By actuating the key  the acoustic alarm can be suppressed after a minimum 5-second warning.

Displays and controls

(5) "Hoist limit" warning light (A2B)


This red warning light lights up when the hoist limit switch contacts open, i.e. when a hoist limit situation has occurred. The acoustic alarm sounds and load-moment-increasing crane movements are switched off at the same time.

| |
|--|
| NOTE |
| <p>A hoist limit situation occurs when the hook block comes into contact with the boom head. The danger exists in such situations that the hoist rope will break, causing the load to fall. A hoist limit situation could arise from the load being pulled against the boom head or from the boom being extended or lowered without the hoist rope being spooled off the winch.</p> |

(6) "LMI bypass" warning light

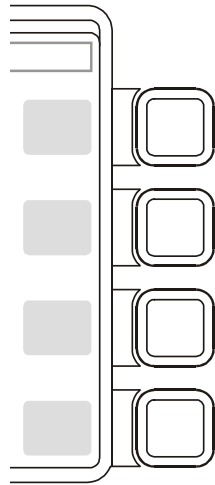

This warning light flashes when the cut-out function of the LMI system has been manually bypassed.

(7) "Hoist limit switch bypass" warning light


This red warning light lights up when the switch-off function of the hoist limit switch has been manually bypassed.

Displays and controls

(8) Function keys F1 ... F4



Function keys with the allocated symbol.
During normal operation

(9) “Info” key



Key to bring system information and service menus.
Refer to chapter 5 and chapter 6.2.

(10) “SEL” key



Key to set up LMI system.
Refer to chapter 4.

(11) “LIM” key



Key to set up working area limits.
Refer to chapter 4.3

Displays and controls

(12) “Tare” key



The “*TARE*” key is used to display the net load on the *actual load display*. The net load is the actual load less the lifting gear and hook block. The “*TARE*” key must be pressed **before** the lift process starts.

After actuation, the current load display is reset to zero (tared). After lifting the load, the actual load display shows the net load (working load). Once the working radius changes (due to a change of angle or radius), the display changes back to the actual load and the tare function is ended.

NOTE: The actual load includes the load suspension device, the lifting cable and all load limit stop equipment. The net load is the current load without any load limit stop equipment. Display errors can be caused by environmental factors, e.g. wind on the boom or load.

(13) “Alarm acknowledge” key



When this key is pressed, the acoustic alarm can be suppressed after sounding for at least 5 secs.

After around 10 secs., the alarm sounds again if the reason which triggered the alarm is still present.

The acoustic alarm sounds in the following cases:

System test, overload status, LMI system fault, and operating errors detected by the system.

Displays and controls

3.3 Status displays

If required, various symbols are displayed in the “status area” of the data display (1). Some of the symbols flash depending on the operating status.



LMI error in combination with a code (refer to error code list)



Constant: radius monitoring active

Flashing: limit reached or exceeded.



Constant: height monitoring active

Flashing: limit reached or exceeded.



Constant: boom angle monitoring active

Flashing: limit reached or exceeded.



Constant: slew angle monitoring active

Flashing: limit reached or exceeded.



Constant: virtual wall monitoring active

Flashing: limit reached or exceeded.

4. Configuration SETUP

The configuration setup procedure allows the operator to input the crane configuration using interactive displays.



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

The correct setting is of utmost importance for the proper functioning of the system and the crane.

Therefore, only operators who are thoroughly familiar with the crane and the operation of the system should execute this configuration procedure.

4.1 Interactive operation mode setup

It is necessary to setup the mode of operation of the LMI system every time the crane structure has been changed or if the system has been turned off for more than 2 hours.

If the system was switched off, for example during short breaks (less than 2 hours), all adjustments remain stored. When switching on again the system these adjustments can be acknowledged by merely pressing the "Enter" key (provided that the crane configuration has not been modified!).

During the programming procedure the Load Moment Pre-warning Light (3) and the Load Moment Limit Light (4) will light up and the aggravating crane movements will be interrupted.

The LMI programming procedure consists of the following steps (interactive operation):

- setting the boom type configuration
- specify jib / selecting man basket /
- setting outrigger configuration
- specify working range
- setting option: stowed jib operation
- setting hoist
- setting reevings
- confirming of inputs

For easy operation, the computer guides the operator through the procedure step by step.

Configuration Setup

Calling up the function: (automatically with system restart if shut down time longer than 2 hours ago)



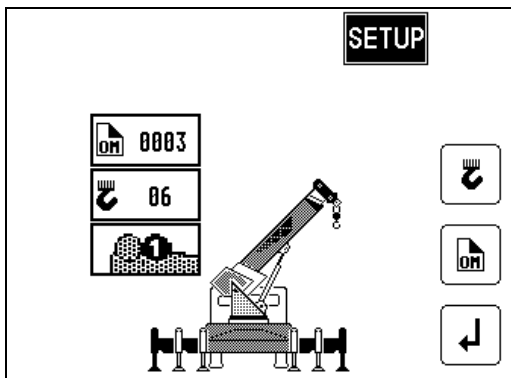
Actuate "SEL" key

Overview menu with symbols appears, with any previously programmed limits. In this menu screen, the operator is prompted to confirm the previous made entries or to renew the setup.

The system will temporarily interrupt the movements of the crane during the setup procedure.

Check the displayed values before confirming them!

- Start setup procedure or confirm previous settings:



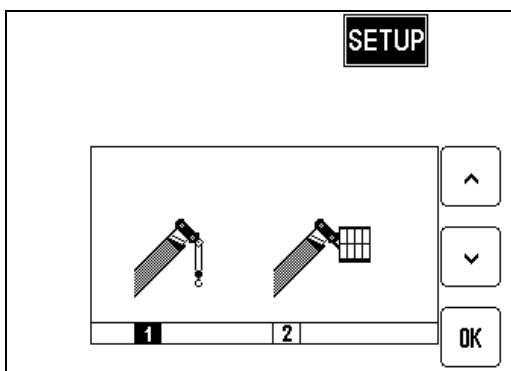
Setup reeving

START configuration setup procedure

OK, only if all entries are correct

The entering of the mode of operation code is completed after this confirmation, and the normal operation screen is displayed.

- Select main boom with or without man basket:



1=boom operation 2=man basket operation

Cursor to next position

Cursor to previous position

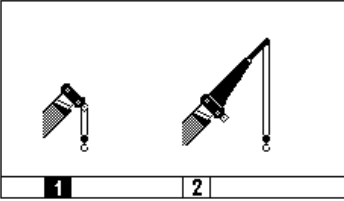
Confirm selection, go to next step

>

Configuration Setup

- Select boom with or without jib:

SETUP



^

v

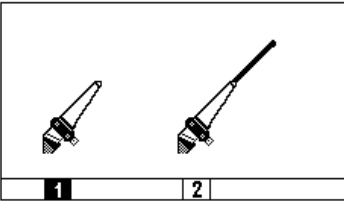
OK

1=main boom 2=Main boom with jib

| | |
|----|------------------------------------|
| ^ | Cursor to next position |
| v | Cursor to previous position |
| OK | Confirm selection, go to next step |

- Select jib length: (if jib operation was selected)

SETUP



^

v

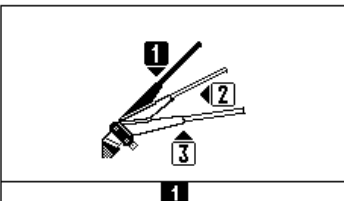
OK

1=short jib 2=long jib

| | |
|----|------------------------------------|
| ^ | Cursor to next position |
| v | Cursor to previous position |
| OK | Confirm selection, go to next step |

- Select jib offset angle:

SETUP



^

v

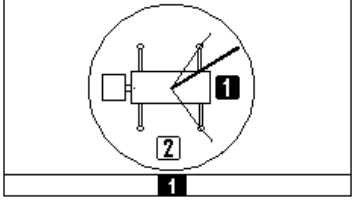
OK

1=offset 1 2=offset 2 3=offset 3

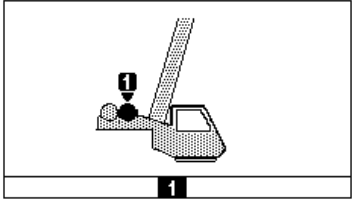
| | |
|----|------------------------------------|
| ^ | Cursor to next position |
| v | Cursor to previous position |
| OK | Confirm selection, go to next step |

Configuration Setup

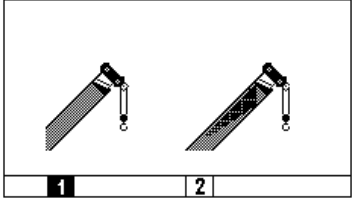
- Select working area:

| SETUP | | 1=over front 2=360° |
|---|----|------------------------------------|
|  | ^ | Cursor to next position |
| | v | Cursor to previous position |
| | OK | Confirm selection, go to next step |

- Select hoist:

| SETUP | | 1=main hoist 2=auxiliary hoist |
|---|----|------------------------------------|
|  | ^ | Cursor to next position |
| | v | Cursor to previous position |
| | OK | Confirm selection, go to next step |

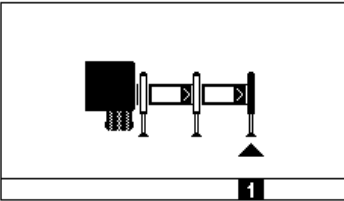
- Select boom with or without stowed jib: (not with man basket operation)

| SETUP | | 1=main boom 2=man boom with stowed jib |
|---|----|--|
|  | ^ | Cursor to next position |
| | v | Cursor to previous position |
| | OK | Confirm selection, go to next step |

Configuration Setup

- Select outrigger position: (not with man basket operation)

SETUP



^

v

OK

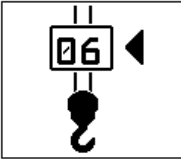
1=max 2=mid 3=min 4=on rubbers

| | |
|--|------------------------------------|
| | Cursor to next position |
| | Cursor to previous position |
| | Confirm selection, go to next step |

- Select reeving: (not with man basket operation)

0003

06



^

v

OK

| | |
|--|----------------------------------|
| | Increase value |
| | Decrease value |
| | Confirm reeving, go to next step |

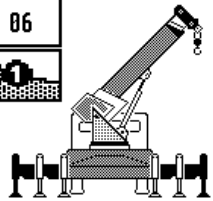
- Confirm inputs:

In this menu screen (example), the operator is prompted to confirm the entries once again. Please check the displayed values before confirming them!

SETUP

0003

06



DEL

OK

| | |
|--|--|
| | Discard settings and renew setup procedure |
| | |
| | OK , only if all entries are correct The setup procedure is completed after confirmation. The normal operation screen is displayed. |

Configuration Setup

4.2 Quick adjusting the reeving

It is necessary to program the system by entering the respective number of reeving each time the rope reeving arrangement is modified.

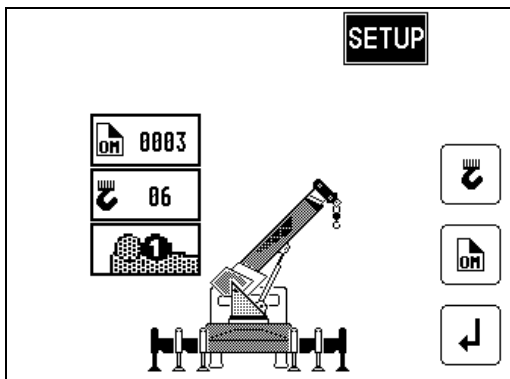
Calling up the function:



Actuate "SEL" key

The system will temporarily interrupt the movements of the crane during the setup procedure.

- Start setup procedure



Note: Start of setup reeving procedure is not possible with man basket operation!

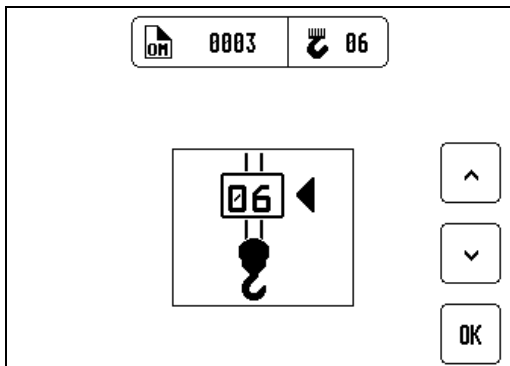
Setup reeving

START configuration setup procedure

OK, only if all entries are correct

The entering of the mode of operation code is completed after this confirmation, and the normal operation screen is displayed.

- Select reeving: (not with man basket operation)



Increase value

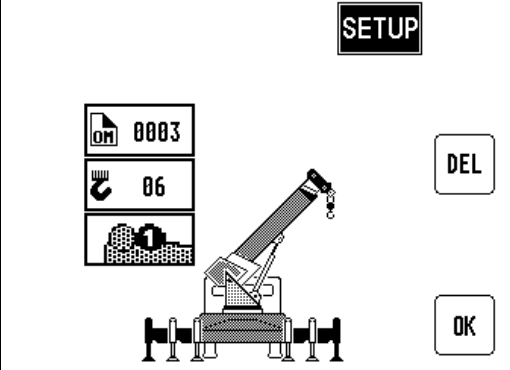
Decrease value

Confirm reeving

Configuration Setup

- Confirm inputs:

In this menu screen, the operator is prompted to confirm the entries once again.
Please check the displayed values before confirming them!



SETUP

0003
06
[Gear Icon]

DEL

OK

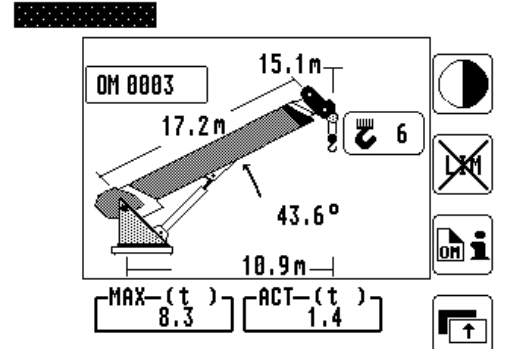
Discard settings and renew setup procedure

OK, only if all entries are correct
The setup procedure is completed after confirmation.
The normal operation screen is displayed.

Configuration Setup

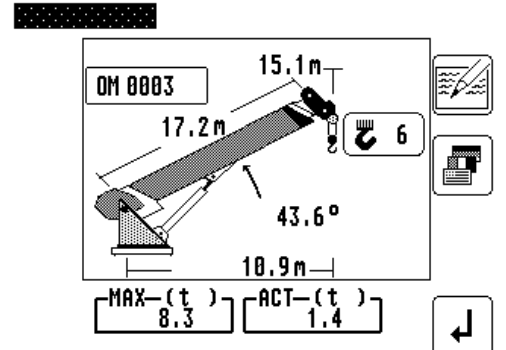
4.3 Adjusting the language

The system features a function which allows language selection for the display menus. The following languages are selectable: English, German, French, Spanish and Russian.



- Call up the function from the normal operating screen:

| | |
|--|--------------------------------|
| | Contrast setting |
| | Delete all working area limits |
| | Info screen operation mode |
| | to key level 2 |



Key level 2:

| | |
|--|---------------------------|
| | to LMI value overview |
| | Language selection |
| | |
| | back to key level 1 |

- Select desired language

| | | |
|---|---------|---|
| 1 | English | |
| 2 | German | |
| 3 | French | |
| | | ↑ |


| | |
|--|--|
| | 1 for English |
| | 2 for German |
| | 3 for French |
| | switch to key level 2 for more languages |

Working area definition

4.4 Working area definition system (WADS)

The LMI 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 value in an information menu screen.

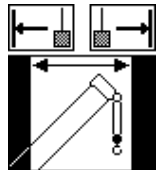
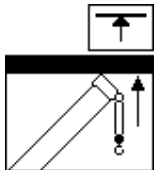
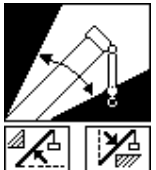

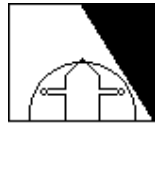






WARNING

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

Reaching or exceeding a programmed limit value does not stop the boom movements!

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

Working area limits are indicated by the following symbols:

| Limit type: | Radius (min. and max.) | Height | Boom angle (min. and max.) | Slew angle (left and right) | "Virtual" wall (up to 5 walls) |
|--|---|---|--|---|---|
| Symbols on limit info page: <i>with active limits displayed</i> |  |  |  |  |  |
| Symbols in the status display: <i>Constant = limit active</i> <i>Flashing = Limit reached or exceeded</i> |  |  |  |  |  |
| refer to chapter: | ⇒ 4.4.1 | ⇒ 4.4.2 | ⇒ 4.4.3 | ⇒ 4.4.4 | ⇒ 4.4.5 |

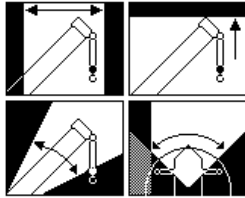




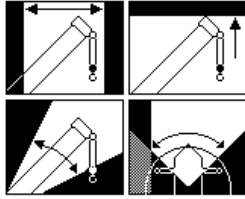




Working area definition

Calling up the function



Actuate LIM key

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

| | | Refer to chapter: | |
|---|---|--------------------------|-------|
|  |  | Radius monitoring | 4.4.1 |
| |  | Tip height monitoring | 4.4.2 |
| |  | Boom angle monitoring | 4.4.3 |
| |  | Go to next key level | |
|  | <i>second key level:</i> | | |
| |  | Slew angle monitoring | 4.4.4 |
| |  | Virtual wall monitoring | 4.4.5 |
| |  | Go to previous key level | |
| |  | back / end limit menu | |

Working area definition

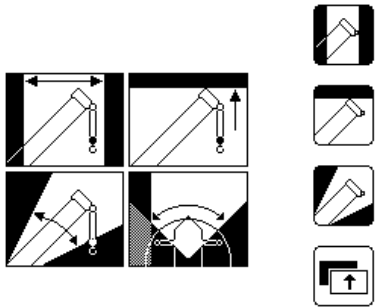




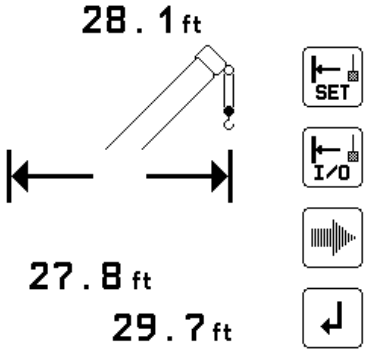




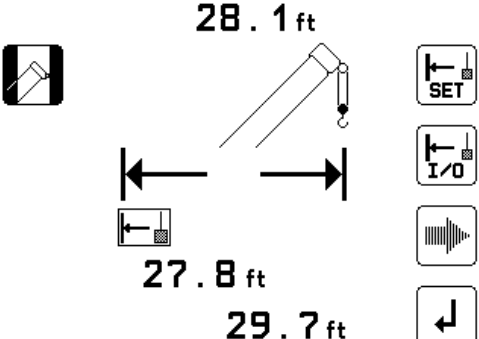





4.4.1 Radius monitoring

Programmable function to monitor the minimum and / or maximum boom radius



Calling up the function

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

| | |
|---|---|
|  | <ul style="list-style-type: none">  edit radius limit  edit height limit  edit boom angle limit  Go to next key level |
|  | <ul style="list-style-type: none">  save current boom radius as minimum limit (the last saved value for the min. boom radius is displayed)  switch monitoring of minimum boom radius on / off (having switched on, the relevant symbol appears near the limit value and in the status display)  jump to settings of maximum boom radius  back to limits main menu |
|  | <ul style="list-style-type: none">   save current boom radius as minimum limit (the last saved value for the min. boom radius is displayed)  switch monitoring of minimum boom radius on / off (having switched on, the relevant symbol appears near the limit value and in the status display)  jump to settings of maximum boom radius  back to limits main menu |

The settings for programming the **maximum boom** radius are similar.

Working area definition

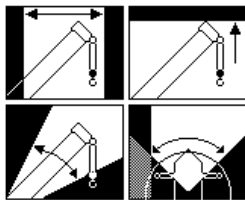




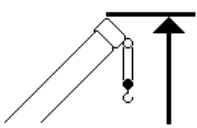





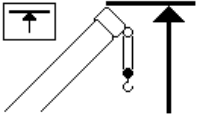



4.4.2 Tip height monitoring

Programmable function to monitor the maximum height of the boom tip



Calling up the function

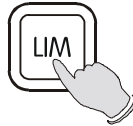
Overview menu with symbols appears, with any previously programmed limits.

| | |
|---|--|
|  | <ul style="list-style-type: none">  edit radius limit  edit height limit  edit boom angle limit  Go to next key level |
| <p style="text-align: center;">131.3ft</p>  <p style="text-align: center;">40.3ft</p> | <ul style="list-style-type: none">  switch monitoring of maximum tip height on / off (having switched on, the relevant symbol appears near the limit value and in the status display)  save current tip height as maximum height (the last saved limit value is displayed)  back to limits main menu |
|   <p style="text-align: center;">40.3ft</p>  <p style="text-align: center;">40.3ft</p> | <ul style="list-style-type: none">  switch monitoring of maximum tip height on / off (having switched on, the relevant symbol appears near the limit value and in the status display)  save current tip height as maximum height (the last saved limit value is displayed)  back to limits main menu |

Working area definition

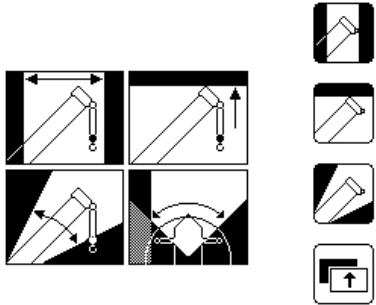




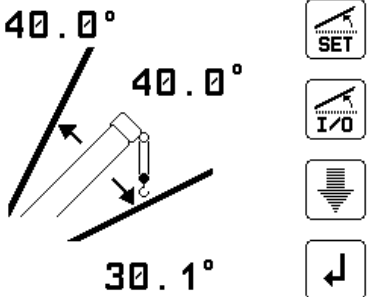




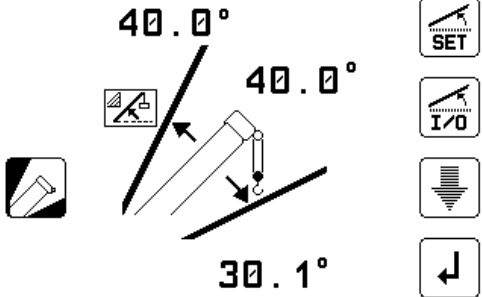




4.4.3 Boom angle monitoring

Programmable function to monitor the upper and / or lower boom angle



Calling up the function

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

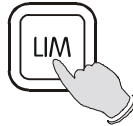
| | |
|---|--|
|  | <ul style="list-style-type: none">  edit radius limit  edit height limit  edit boom angle limit  Go to next key level |
|  | <ul style="list-style-type: none">  save current boom position as upper angle limit (the last saved value for the upper boom angle is displayed)  switch monitoring of upper boom angle on / off (having switched on, the relevant symbol appears near the limit value and in the status display)  jump to settings of lower boom angle  back to limits main menu |
|  | <ul style="list-style-type: none">  save current boom position as upper angle limit (the last saved value for the upper boom angle is displayed)  switch monitoring of upper boom angle on / off (having switched on, the relevant symbol appears near the limit value and in the status display)  jump to settings of lower boom angle  back to limits main menu |

The settings for programming the **lower boom angle** are similar!

Working area definition

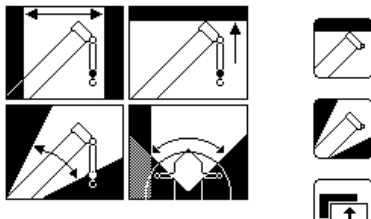








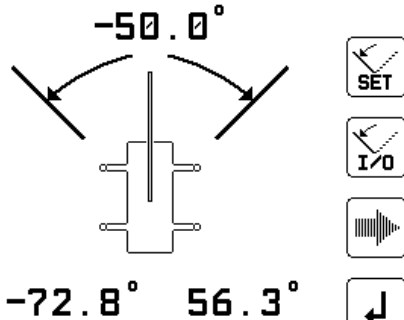




4.4.4 Slew angle monitoring

Programmable function to monitor the left and / or the right slew angle



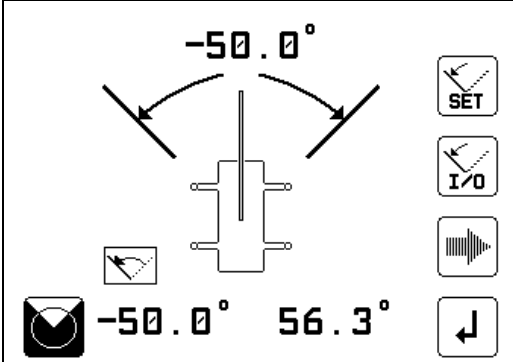




Calling up the function

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

| | |
|---|--|
|  | <ul style="list-style-type: none">  edit radius limit  edit height limit  edit boom angle limit  Go to next key level |
|  | <ul style="list-style-type: none">  edit slew angle limit  edit virtual wall  back |
|  | <ul style="list-style-type: none">  save current slew angle as left limit (the last saved value for the left slew angle is displayed)  switch monitoring of left slew angle on / off (having switched on, the relevant symbol appears near the limit value and in the status display)  jump to settings of right slew angle  back to limits main menu |

>

Working area definition

| | |
|---|---|
|  | <p>  save current slew angle as left limit (the last saved value for the left slew angle is displayed) </p> |
| | <p>  switch monitoring of left slew angle on / off (having switched on, the relevant symbol appears near the limit value and in the status display) </p> |
| | <p>  jump to settings of right slew angle </p> |
| | <p>  back to limits main menu </p> |

The settings for programming the **right slew angle** are similar!

Working area definition

4.4.5 Virtual wall monitoring

Programmable function to monitor the working area by up to 5 "virtual" walls



Calling up the function

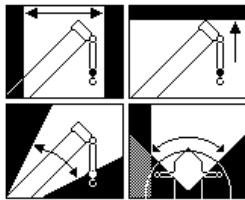




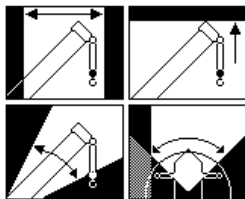




Overview menu with symbols appears, with any previously programmed limits.

The working area definition system helps the operator to define the crane's working area. This is done by creating vertical wall(s) that can represent obstacles (i.e. buildings, towers, poles, etc.) in the crane's working range. The wall(s) are set by defining points with the boom tip along the outer limits of the operator's work area, see setup procedure below. Because these walls are defined by the operator and are not "actual real" walls, we refer to them as "virtual" walls. When setting the walls, always keep a safe working distance to any obstacles. Never work outside a safe working area as outlined by common practice, standards, and manuals.

A virtual wall is set by defining two points. To prevent inaccuracies when defining the two points for the virtual wall, use the following to rules:

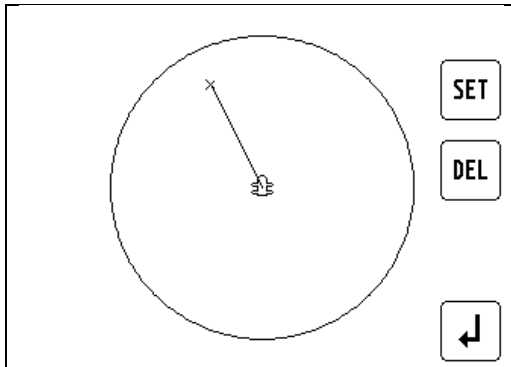
- The two points should be the same distance form the obstacle
- Set the two points at the maximum distance apart, which can be safely reached by the boom tip

The operator can setup up to 5 virtual walls, the first wall is defined by a straight line between two set points. The second through fifth walls are created by one new point and the previously selected point. After the walls have been set, the system alerts the operator and when the boom approaches them. This is done both visual and audible. Similarly, the "virtual wall" symbol in the main screen blinks.

| | | |
|---|---|---|
|  |  | edit radius limit |
| |  | edit height limit |
| |  | edit boom angle limit |
| |  | Go to next key level |
|  |  | edit slew angle limit |
| |  | edit virtual wall(s) (the previous stored walls will be displayed, if any) |
| |  | Go to previous key level |
| |  | back to limits main menu |

>

Working area definition



SET

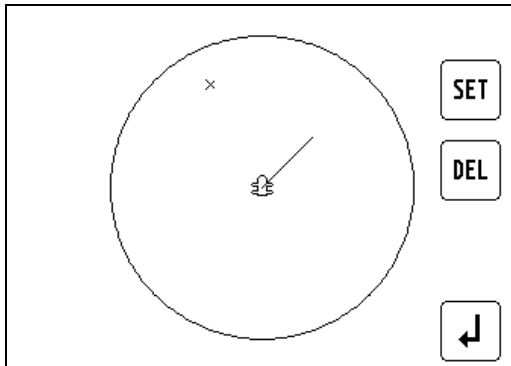
set a point in the working area to start a wall
(having pressed SET, the point is marked by " X")

DEL

delete existing walls

↩

back to limits main menu



SET

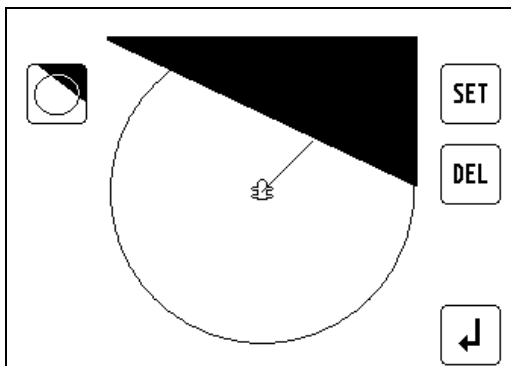
move the boom tip to an other point of the imaginary wall... and
set the second point in the working area to create a virtual wall

DEL

delete existing walls

↩

back to limits main menu



SET

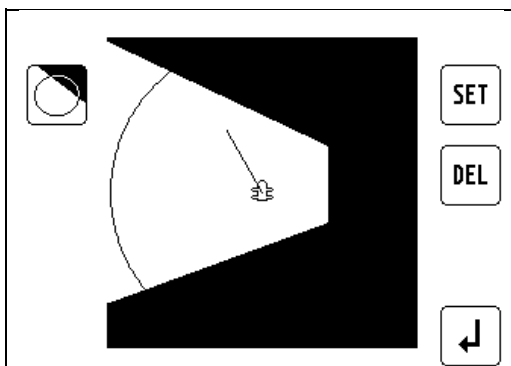
allows for further walls to be added (up to 5 virtual walls)

DEL

delete existing walls

↩

back to limits main menu



SET

< example with 3 virtual walls

DEL

↩

Information menus

5. Information menus

The system contains various menus in which system information is displayed.







In the "Calibration menus" area, settings which affect system behaviour can also be made. Access to these menus is therefore code-protected and reserved only for trained service personnel.

NOTE: The service menus described in this user manual are provided for information only. They do not constitute a description or instructions for the alignment process.

Calling up the function:



Actuate the INFO key

| AI | RAW Val. | PHYS. | |
|---|----------|-------|---|
| ⇒ | 18.5 | 17.2 |  |
| P-P | 17.8 | 117.5 |  |
| P-R | -1.9 | -10.4 |  |
|  | 12.9 | 43.6 | Header |
|  | -34.8 | -32.1 | |
| | | |  |

to digital inputs and outputs overview

to calibration menus (access is code protected)


to software information screen

back

Digital in/outputs overview:

| DO | | | |
|----|----|------|--|
| 0 | 1 | 2000 | |
| 1 | 2 | 2000 | |
| 2 | 3 | | |
| 3 | 4 | | |
| 4 | 5 | | |
| 5 | 7 | | |
| 6 | 13 | | |
| 7 | 14 | | |


| DI | | | |
|----|----|--|--|
| 0 | 8 | | |
| 1 | 9 | | |
| 2 | 10 | | |
| 3 | 11 | | |

| | |
|---|------|
|  | back |
|---|------|




back

Information menus

Entry to calibration menus:

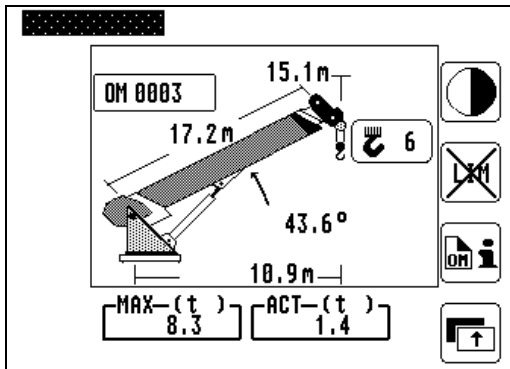
| | | |
|---|------------|--|
|  <p>Please enter servicecode: 55555</p> | ESC | abort input of service code |
| | + | increase marked numeric value |
| | - | reduce marked numeric value |
| | OK | mark the next figure, access after the last valid figure |

Software information screen:

| | | |
|--|---|-----------------|
| <p>SGG2 - V 3.14 - PAT-PDC System Software (c) 2006 -2009 HAC GmbH Ettlingen ----- I/O-config MQV6A V2.0 LS QN - (c) 20070419 HAC ----- CAN mapping st_1_7 HAC standard CAN config Inde x 1.7 19-02-2009</p> |  | scroll down |
| |  | scroll up |
| |  | back / end menu |

Information menus

5.1 Overview, LMI values



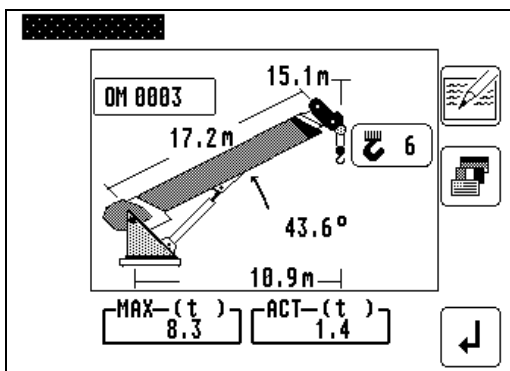
Call up the function from the normal operating screen:

Contrast setting

Delete all working area limits

Info screen operation mode

to key level 2



Key level 2:

to LMI value overview

Language selection

back to key level 1

Overview, LMI values:

| LMI VALUES | |
|---------------|-----------|
| OPER.MODE | 000003 |
| REEVING | 6 |
| PISTON PRESS. | 117.5 bar |
| ROD PRESS. | -10.4 bar |
| ANGLE | 43.64 ° |
| LENGTH | 17.16 m |
| RADIUS | 10.93 m |
| ACTUAL LOAD | 1.43 t |

back

6. Commissioning / Service / Maintenance

6.1 Checks before commissioning

Before commissioning, the signals and electrical connections must be checked to guarantee that the components of the LMI system are working properly.

- Check that the boom angles displayed match the actual angles
- Check that the slew angle displayed match the actual slew angle
- Check that the crane radius displayed matches the actual radius
- Check the load display by lifting a known load



If any of the displays shows any difference between the values displayed and the actual values, please contact your local service centre to have the LMI calibration checked or the system repaired.

www.hirschmann.com > [USA](#) > [Electronic Control Systems](#) > [Contact - ECS](#)



Following any modifications to the mechanical structure or changes to the load suspension devices, your loader's LMI calibration needs to be checked or corrected.

Commissioning / Service / Maintenance

6.3 Maintenance and Service

The maintenance and service of the LMI system comprises the following checks:

- the wiring connecting the various parts of the system to each other.
If a cable is damaged, it must be replaced immediately.
- the hydraulic connection to the pressure sensors for leaking oil.

Personnel without special training may only remedy the operating problems listed in the error table, and must not replace any mechanical or electrical parts or cables.

Once switched on, the system starts the boot procedure followed by an automatic test run of the LMI system, the lights and the acoustic alarm.

During this time, the data display is as follows:



During this test, check that the display is working, the lights come on and the acoustic alarm sounds. If the system does not start as described, please notify customer service before you continue working.

Troubleshooting

7. TROUBLESHOOTING

7.1 General information

In the event of a malfunction, if the range is not reached or is exceeded or if an operating error is detected by the system, a message appears on the data display (1) starting with an “E” followed by a two-digit code which indicates the reason for the malfunction.



The error codes listed in the following table describe the various error codes which can be displayed in this system.

Faults in the microprocessor system must be dealt with only by the manufacturer’s trained customer service personnel. If faults occur, please contact Hirschmann Service USA:

www.hirschmann.com > USA > Electronic Control Systems > Contact - ECS.

Error code list

7.2 Error code list (System program LSQN V 1.11)

| Error Code | Error | Cause | Elimination |
|------------|--|--|---|
| E01 | Fallen below radius range or angle range exceeded | <ul style="list-style-type: none"> Fallen below the minimum radius or gone past the maximum angle specified in the respective load chart due to luffing up the boom too far | <ul style="list-style-type: none"> Luff down the boom to a radius or angle specified in the load chart. |
| E02 | Radius range exceeded or fallen below angle range | <ul style="list-style-type: none"> Gone past the maximum radius or fallen below the minimum angle specified in the respective load chart due to luffing down the boom too far | <ul style="list-style-type: none"> Luff up the boom to a radius or angle specified in the load chart. |
| E03 | Non-permitted slewing zone (no load area) | <ul style="list-style-type: none"> The slewing zone with load is not permitted | <ul style="list-style-type: none"> Slew to permitted area |
| E04 | Operating mode not acknowledged or non permitted slewing zone | <ul style="list-style-type: none"> A non existing operating mode has been selected | <ul style="list-style-type: none"> Set the correct operating mode for the operating state in question |
| | | <ul style="list-style-type: none"> The boom is in a non-permitted slewing zone | <ul style="list-style-type: none"> Slew the boom to a permitted area. |
| E05 | Prohibited length range | <ul style="list-style-type: none"> Boom has been extended either too far or not far enough, e.g. if it is prohibited to go beyond a certain maximum boom length or with load curves for jibs where the main boom has to be extended to a certain length | <ul style="list-style-type: none"> Extend/retract boom to the correct length |
| | | <ul style="list-style-type: none"> Length sensor adjustment has changed, e.g. the cable slid off the length sensor reel. | <ul style="list-style-type: none"> Retract boom. Check the pre-stress of the cable reel (cable must be taut). Open the length sensor and carefully turn the length sensor pot counterclockwise until the detent by means of a screw driver |
| | | <ul style="list-style-type: none"> Clutch between length sensor pot and drive is defective | <ul style="list-style-type: none"> Replace the complete clutch including drive wheel and adjust length sensor pot as described above |
| E06 | Radius range exceeded or fallen below angle range with luffing jib operation | <ul style="list-style-type: none"> Maximum radius as specified in the load chart exceeded or fallen below minimum angle due to luffing down the luffing jib too far | <ul style="list-style-type: none"> Luff the jib to a radius or angle specified in the load chart. |
| E11 | Fallen below lower limit value for measuring channel "length main boom" | <ul style="list-style-type: none"> Length potentiometer is defective PDB variable for analog value not supported | <ul style="list-style-type: none"> Replace length potentiometer Setup of correct PDB variable for analog value in DGA6.i.3 |
| | | <ul style="list-style-type: none"> Electronic component in the measuring channel is defective | <ul style="list-style-type: none"> Replace sensor unit |

Error code list

| Error Code | Error | Cause | Elimination |
|------------|--|---|---|
| E12 | Fallen below the lower limit value in the measuring channel "pressure piston side" | <ul style="list-style-type: none"> Pressure transducer is defective. PDB variable for analog value not supported | <ul style="list-style-type: none"> Replace pressure transducer Setup of correct PDB variable for analog value in DGA6.i.3 |
| | | <ul style="list-style-type: none"> Electronic component in the measuring channel is defective. | <ul style="list-style-type: none"> Replace sensor unit |
| E13 | Fallen below lower limit value in the measuring channel "pressure rod side" | <ul style="list-style-type: none"> refer to E12 | <ul style="list-style-type: none"> refer to E12 |
| E14 | Fallen below lower limit value in measuring channel "force" | <ul style="list-style-type: none"> Force transducer defective Electronic component in the measuring channel is defective. | <ul style="list-style-type: none"> Replace force transducer Replace sensor unit |
| E15 | Fallen below lower limit value in measuring channel "angle main boom" | <ul style="list-style-type: none"> Angle potentiometer defective PDB variable for analog value not supported | <ul style="list-style-type: none"> Replace angle sensor Setup of correct PDB variable for analog value in DGA6.i.3 |
| | | <ul style="list-style-type: none"> Electronic component in the measuring channel defective. | <ul style="list-style-type: none"> Replace sensor unit |
| E16 | Fallen below lower limit value in measuring channel "angle 2" | <ul style="list-style-type: none"> Angle potentiometer defective | <ul style="list-style-type: none"> Replace angle sensor |
| | | <ul style="list-style-type: none"> Electronic component in the measuring channel defective. | <ul style="list-style-type: none"> Replace sensor unit |
| E17 | Fallen below lower limit value "length telescope I (+II)" | <ul style="list-style-type: none"> Length potentiometer defective | <ul style="list-style-type: none"> Replace length sensor. |
| | | <ul style="list-style-type: none"> Electronic component in the measuring channel defective | <ul style="list-style-type: none"> Replace sensor unit |
| E18 | Front outrigger overloaded | <ul style="list-style-type: none"> Front outrigger overloaded | <ul style="list-style-type: none"> |
| E1A | Fallen below lower limit value in measuring channel "slewing angle 1". slew below allowed range | <ul style="list-style-type: none"> Cable between the central unit and the slewing angle sensor defective or loose. Water inside the plug of the angle sensor | <ul style="list-style-type: none"> Check cable as well as plugs, replace, if need be. |
| | | <ul style="list-style-type: none"> 1-cannel slew sensor min. value DGA 11.5.7 <> 0 | <ul style="list-style-type: none"> move to allowed slew range |
| | | <ul style="list-style-type: none"> Slewing angle potentiometer is defective | <ul style="list-style-type: none"> Replace slewing angle sensor |
| E1B | Fallen below lower limit value in measuring channel "slewing angle 2" | <ul style="list-style-type: none"> Electronic component in the measuring channel defective | <ul style="list-style-type: none"> Replace sensor unit |
| | | <ul style="list-style-type: none"> refer to E1A | <ul style="list-style-type: none"> refer to E1A |
| E1C | Fallen below lower limit | <ul style="list-style-type: none"> Angle potentiometer defective | <ul style="list-style-type: none"> Replace angle sensor |

Error code list

| Error Code | Error | Cause | Elimination |
|------------|---|---|--|
| | value in measuring channel "luffing jib angle" | <ul style="list-style-type: none"> Electronic component in the measuring channel defective. | <ul style="list-style-type: none"> Replace sensor unit |
| E21 | Upper limit value in measuring channel "main boom length" has been exceeded. | <ul style="list-style-type: none"> refer to E11 | <ul style="list-style-type: none"> refer to E11 |
| E22 | Upper limit value in measuring channel "pressure piston side" has been exceeded | <ul style="list-style-type: none"> refer to E12 | <ul style="list-style-type: none"> refer to E12 |
| E23 | Upper limit value in measuring channel "pressure rod side" has been exceeded. | <ul style="list-style-type: none"> refer to E12 | <ul style="list-style-type: none"> refer to E12 |
| E24 | Upper limit value in measuring channel "force" has been exceeded. | <ul style="list-style-type: none"> refer to E14 | <ul style="list-style-type: none"> refer to E14 |
| E25 | Upper limit value in measuring channel "main boom angle" has been exceeded. | <ul style="list-style-type: none"> refer to E15 | <ul style="list-style-type: none"> refer to E15 |
| E26 | Upper limit value in measuring channel "angle 2" has been exceeded. | <ul style="list-style-type: none"> refer to E16 | <ul style="list-style-type: none"> refer to E16 |
| E27 | Upper limit value in measuring channel "length telescope I (+II) has been exceeded. | <ul style="list-style-type: none"> refer to E17 | <ul style="list-style-type: none"> refer to E17 |
| E2A | Upper limit value in measuring channel "slewing angle 1" has been exceeded | <ul style="list-style-type: none"> refer to E1A | <ul style="list-style-type: none"> refer to E1A |
| | slew above allowed range | <ul style="list-style-type: none"> 1-cannel slew sensor max. value DGA 11.5.8 <> 0 | <ul style="list-style-type: none"> move to allowed slew range |
| E2B | Upper limit value in measuring channel "slewing angle 2" has been exceeded | <ul style="list-style-type: none"> refer to E1A | <ul style="list-style-type: none"> refer to E1A |
| E2C | Upper limit value in measuring channel "luffing jib angle" has been exceeded | <ul style="list-style-type: none"> Angle potentiometer defective Electronic component in the measuring channel defective. | <ul style="list-style-type: none"> Replace angle sensor Replace sensor unit |
| E31 | Error in the system program | <ul style="list-style-type: none"> The system program file is defective. Flash-EPROM defective | <ul style="list-style-type: none"> Upload valid system software Replace central unit |

Error code list

| Error Code | Error | Cause | Elimination |
|------------|---|---|---|
| E32 | Error in the power supply | <ul style="list-style-type: none"> +UB System not present at the system start +UB System not present at the system finish Contact problems at +UB switch off/on | <ul style="list-style-type: none"> +UB System and +UB Power must be wired separately: +UB System connected direct with the crane battery. +UB Power for switch on/off +UB switch off/on again |
| E37 | Error in the logical program flow | <ul style="list-style-type: none"> System program file is defective Flash-EPROM defective | <ul style="list-style-type: none"> Upload valid system software Replace central unit |
| E38 | System program and crane data file do not match. | <ul style="list-style-type: none"> The system program in the LMI does not match to the programming in the crane data file | <ul style="list-style-type: none"> Upload valid system program file or the valid crane data file |
| E39 | System program and load chart file do not match | <ul style="list-style-type: none"> The system program in the LMI and the programming in the load chart file do not match. | <ul style="list-style-type: none"> Upload valid system program file or the valid load chart file |
| E43 | Error in the write/read memory, (RAM) | <ul style="list-style-type: none"> Write/read memory (RAM) or central unit defective. | <ul style="list-style-type: none"> Replace central unit |
| E47 | Error in the monitored write/ read memory. The CRC verification of the monitored write/read memory provides an incoherent result | <ul style="list-style-type: none"> The CRC sign of the monitored write/read memory is wrong The buffer battery is discharged (< 2V at 1kOhm). Central unit defective. | <ul style="list-style-type: none"> Restart the LMI Replace buffer battery on the central unit. Replace central unit |
| E51 | Error in the crane data file | <ul style="list-style-type: none"> No valid data in the crane data file. Flash-EPROM defective | <ul style="list-style-type: none"> Upload valid crane data file Replace central unit |
| E52 | Error in load chart file. | <ul style="list-style-type: none"> No valid data in the load chart file Flash-EPROM defective | <ul style="list-style-type: none"> Upload valid load chart file Replace central unit |
| E53 | Wrong setup of min. analog inputs length1, angle1, pressure1 | <ul style="list-style-type: none"> Analog input not supported | <ul style="list-style-type: none"> Setup correct Flag in in DGA 6.i.2 |
| E56 | Error in crane data file. | <ul style="list-style-type: none"> No valid data in the crane data file during calibration. Flash-EPROM defective | <ul style="list-style-type: none"> Restore or upload valid crane data file Replace central unit |
| E57 | Error in serial crane data file. | <ul style="list-style-type: none"> Calibration data file does not contain valid data. Flash-EPROM defective | <ul style="list-style-type: none"> Upload calibration data file by changing data (OM, limits) and save Replace central unit |
| E61 | Error in the CAN bus data transfer for all CAN units | <ul style="list-style-type: none"> CAN Bus cable between the central unit and the sensor unit defective or not connected. | <ul style="list-style-type: none"> Check the connection between the central unit and the sensor units |
| | | <ul style="list-style-type: none"> Can bus port in the central unit defective | <ul style="list-style-type: none"> Replace the central unit |
| | | <ul style="list-style-type: none"> Short circuit in a CAN Bus cable | <ul style="list-style-type: none"> Replace Can Bus cable |

Error code list

| Error Code | Error | Cause | Elimination |
|------------|---|--|---|
| E62 | Error in the can bus data transfer of the pressure transducer sensor unit | • Cable between the central unit and the sensor unit defective. | • Check the cable to the sensor unit |
| | | • Can bus port in the central unit defective | • Replace the central unit |
| | | • Can bus port in the sensor unit is defective | • Replace the sensor unit |
| | | • Sensor unit is defective | • Replace the sensor unit |
| E63 | Error in the can bus pressure transducer sensor unit | • The analog values of the sensor unit are invalid | • Replace the sensor unit |
| E64 | Error in the can bus data transfer of the length/angle sensor unit | • See E62 | • See E62 |
| E65 | Error in the can bus length/angle sensor unit | • See E63 | • See E63 |
| E66 | Error in the data of the digital I/O MENTOR | • PDB variable invalid | • Change system software • Change MENTOR |
| E67 | Error in the can bus data transfer of the digital I/O external module | • PDB variable invalid | • Connect digital I/O external CAN module |
| E68 | Error in the can bus data transfer of the force sensor unit | • See E62 | • See E62 |
| E69 | Error in the can bus force sensor unit | • See E63 | • See E63 |
| E84 | Wrong rigging condition. | • The selected rigging condition is not contained in the crane data file. | • Select another rigging condition • Check the programming in the crane data file. |
| E85 | Error in the radius determination | • The computed radius is too small (negative deflection) | • Check the programming in the crane data file. |
| E89 | Operating mode switchover with load. | • The operating mode on the console has been switched over with the boom loaded. | • Select operating mode without load on the boom |
| E98 | LMI watchdog activated | • LMI processing time limit exceeded | • Reset system • Connect PC terminal and watch error messages |
| EAB | Short circuit in the A2B switch circuit (not with radio A2B) | • Short circuit in the A2B switch | • Replace A2B switch |
| | | • Short circuit in the cable to the A2B switch | • Replace cable to the A2B switch |
| EAC | A2B switch circuit disconnected (not with radio A2B) | • Disconnected cable in the A2B switch | • Connect or replace cable in the A2B switch |
| | | • Disconnected cable to the A2B switch | • Connect or replace cable to the A2B switch |

Error code list

| Error Code | Error | Cause | Elimination |
|------------|-------------------------------|---|---|
| EAD | No valid A2B switch status | <ul style="list-style-type: none"> • Sensor wrong function • CAN bus delay • Radio telegram delay module (radio A2B) • Radio telegram ID is invalid | <ul style="list-style-type: none"> • Replace A2B switch • Replace cable to the A2B switch • Replace battery of radio module (radio A2B) • Setup ID in DGA12.9 |
| EDB | Datalogger setup error | <ul style="list-style-type: none"> • Setup of the datalogger is cleared (ser. crane data file or battery buffered RAM) | <ul style="list-style-type: none"> • transfer data and setup datalogger again |
| EDC | Datalogger watchdog activated | <ul style="list-style-type: none"> • datalogger processing time limit exceeded | <ul style="list-style-type: none"> • Reset system • Connect PC terminal and watch error messages |
| EDD | Battery empty | <ul style="list-style-type: none"> • Battery check detected a low voltage of the battery | <ul style="list-style-type: none"> • change battery, after this setup of RTC |
| EDE | Record lost | <ul style="list-style-type: none"> • Not possible to save data because other task saves data at the same time | <ul style="list-style-type: none"> • Message disappears after a few seconds |
| EDF | Flash block full | <ul style="list-style-type: none"> • Not possible to save any more data | <ul style="list-style-type: none"> • Message disappears after a few seconds |
| EFD | LMI Watchdog extra time | <ul style="list-style-type: none"> • a function needs more than 0.5 sec, e.g. Flash PROM write | <ul style="list-style-type: none"> • Message disappears after a few seconds |

NOTE:

If an error message not included in the above list is displayed, please contact Hirschmann Service USA:
www.hirschmann.com > USA > Electronic Control Systems > Contact - ECS.

Appendix: Important notes for crane operators and crane operating companies

NOTICE 1 Cut-out values for boom cranes with load-bearing capacity which varies depending on the differing load

The crane cut-out values are determined by us on the basis of the load tables and design drawings specified by the crane manufacturers.

These theoretical cut-out values must be checked by tests on the crane with balanced test loads in all operating modes and at least with the following equipment depending on the crane design.

- **Cranes with fixed boom length during operation:**
Smallest, middle and largest radius at shortest, middle and longest boom length, and at these boom lengths at the shortest, middle and longest tip booms.
- **Cranes with boom length which can change during operation:**
Smallest, middle and largest radius at every length stage and all tip booms.

NOTICE 2 Important information for the crane driver

The LMI is an operating aid which warns the crane driver of an imminent overload to prevent personal injury or damage to property.

This system cannot and is not intended to be used as a substitute for the crane driver's good judgement or experience or the application of acknowledged safe working practices when using cranes. It does not release the crane driver from his responsibility for safe operation of the crane. He must ensure that he understands and complies fully with the information and instructions displayed. Before he starts work with the crane, the crane driver must have thoroughly read and understood the entire manual to ensure that he knows the operation and the limits of the LMI and the crane. Perfect functioning depends on the correct daily checking of the system and compliance with the operating information provided in this manual.

The system can only help the crane driver if the LMI is correctly set and the right load table and correct operating mode number is entered for the particular equipment. To prevent damage to property and serious or even fatal injury to people, the correct setting of the LMI must be guaranteed before crane work begins.



This system can be fitted with a manually operated external device (key switch / button) which bypasses the cut-out function of the LMI or lift limit switch system. The switch or button may only be actuated in emergencies and by authorised personnel. Non-compliance with these instructions can result in damage to property and serious or even fatal injuries to people.

Appendix: Important notes for crane operators and crane operating companies

NOTICE 3 Important information for the crane operator

In the Federal Republic of Germany, the guidelines of the Association of German Engineers [*Verein deutscher Ingenieure*] VDI 3570 apply for the design of overload protections for cranes. They also make reference to the sense and limits of overload protections.

“Overload protections are intended as far as possible to prevent accidents, risks to people and property, the load and the crane during the operation of the crane due to overloading. The operator and crane driver must take into account that an overload protection cannot detect all risks in time and a malfunction due to undetectable factors is possible. You therefore must continue to exercise caution and remain responsible for compliance with the operating specifications and loading of the crane. Overload protections are not to be used operationally. They are only to be used in an emergency. The load-bearing capacity of the lifting gear is not to be reduced by an overload protection.”

VDMA notice for overload protections (load moment limiters) on boom cranes

The boom crane supplied to you is equipped, in accordance with §24 of the UVV “Boom crane”, with an overload protection (overload cut-out), by which the lifting gear and the boom retractor of the crane are switched off if the admissible load moment is exceeded. To be able to remove a load after actuating the overload protection, movement in the opposite direction must still be possible. It must therefore still be possible to lower the load, e.g. after disabling the lifting gear.

Fitting the overload protection (overload cut-out) is intended to prevent the crane from picking up loads which endanger its stability. The overload protection (overload cut-out) is thus an emergency switch which, in the event of the crane being overloaded, disables all movements which would increase the load moment and thus prevents possible damage or injury. For the overload protection to perform its function as a safety device, the following must be observed:

1. Overload protections (overload cut-outs) are not to be used in normal operation to switch off the lifting gear of the boom retraction device. The crane driver must in any event check for himself that the crane's carrying capacity is not exceeded by the load to be lifted. Excessive loads above the carrying capacity of the crane are not to be lifted despite an overload protection being fitted. Nor should the overload protection ever be used as scales and the crane must not be loaded above the highest maximum load in any case.
2. Fixed loads may only be pulled off in agreement with the manufacturer and only with cranes set up specially for this. When used in this way, the overload protection (load moment limiter) may not be used as an operational device for measuring force.
3. The overload protection fitted must be maintained on a regular basis and its functional reliability must be checked before work commences. In accordance with §35 of the UVV “Boom crane”, the regular testing of the overload protection is part of the crane maintenance.
4. The overload protection does not automatically adjust to the crane's different modes of operation. The crane driver therefore must adjust the overload protection to the altered carrying capacity or load moment range when the crane's mode of operation changes. Here, the manufacturer's instructions for the overload protection fitted are to be observed. The reliable functioning of the equipment and accident-free operation of the crane depend heavily on the careful observation of these provisions. An incorrectly set overload protection, e.g. a high load moment when the supports are retracted, is substantially more dangerous than a crane without an overload protection as it can give the crane driver a false sense of security; this can lead to serious accidents.

Appendix: Important notes for crane operators and crane operating companies

5. The overload protection fitted (overload cut-out) must be adjusted to the altered carrying capacity or load moment range by the crane driver when the crane is adjusted to different operating situations, e.g.:
 - a) when the support is extended and retracted (switch to the large or small load moment)
 - b) when the boom length changes due to:
 - manual extension and retraction (telescoping)
 - fitting and removal of connectors
 - c) when turning or slewing the crane in the area of the larger or smaller standing moment (switching to the large or small load moment)
 - d) when transferring to another carrying capacity range by multiple cutting-in of the cable lines of the lifting gear or boom retraction device.
6. It must be expressly stated that incorrect use of the crane can render the overload protection ineffective or can result in the drive gear not cutting out sufficiently quickly. In this case, accidents cannot be completely ruled out despite an overload protection being fitted. This applies, for example, for:
 - under-hooking of the load or load suspension gear
 - excessive forces of inertia
 - loads falling into the cable
 - diagonal pull
 - crane travel in an area of heavily sloping ground
 - soft subsoil
 - wind loading.
7. If a device for switching off or bypassing the overload protection (load moment limiter) is fitted, then it may only be used subject to special precautions in the presence of the crane supervisor, e.g. when testing the crane, and in the situations of use specified by the crane manufacturer.

Careful compliance with the provisions contained in this notice and in the crane manufacturer's directions for use is the prerequisite for the safe operation of the overload protection (overload cut-out).

In the event of any doubt, the manufacturer's instructions for use are to be consulted. If this is not sufficient, the relevant company should be consulted.

Unauthorised interventions in the mechanism of the overload protection invalidate any claims under the warranty.

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Düsseldorf-Oberkassel

Appendix: Important notes for crane operators and crane operating companies

NOTICE 4 Notes on the electromagnetic compatibility (EMC) of electronic systems under the effect of electromagnetic fields

Electromagnetic fields increasingly affect electronic systems and can cause malfunctions; they can be avoided by taking preventive state-of-the-art measures:

1. Preventive measures are based primarily on the fundamental principle of screening electronic circuits against radiating high frequency by a closed low-ohm protective skin for high-frequency interference.
 - All components have outer housings made of metal with earthing option;
 - Only cables with shielding braid are used. The shielding layer must be made so that it is readily conductive over the surface at all connections.
 - Connecting the crane earth and the electronic earth at only one point in the system.
2. The general measures listed in item 1 cannot however ensure complete protection against electromagnetic fields in the individual case as the scale and type of effect depends on the local conditions.

The influencing factors include:

- particularly unfavourable arrangement of antennas to the system,
- very high transmission performance,
- consistent compliance with the measures in item 1 not possible due to local conditions,
- long cables,
- coupling of interference in the power lines.

In unfavourable situations, therefore, it is essential to take measures over and above preventive precautions, in compliance with the principles stated in item 1, experimentally on site, e.g.:

- insertion of filters or short-circuiting of interference frequencies by condensers,
- making or breaking earth connections,
- use of double-screened cables (guarded shield system).

Appendix: Important notes for crane operators and crane operating companies

NOTICE 5 Notes on works safety during repairs to display and control consoles

Caution: Liquid crystal displays contain fluid chemical substances inside the display. Particular caution and care is therefore essential:

- when operating equipment containing LCDs
- during storage and transport (danger of breakage)
- in the disposal of LCDs which can no longer be used or which are surplus to requirements.

Possible sources of danger are chemical action in the event of skin coming into contact with broken LCD displays. Therefore, in the event of contact, wash the wetted areas of the body thoroughly with soap. Particular care is called for in the event of open wounds.

NOTICE 6 Installation specifications for display and control consoles without an enclosed metal housing

To prevent radio interference, high-frequency equipment and installations which come under the general approval which the Federal Minister for Post and Telecommunications published in his Official Journal no. 163/1984 as Decree no. 1045/1984 and no. 1046/1984, must comply with the limit values and requirements stipulated therein.

For display and control consoles without an enclosed metal housing (instrument panel installation), therefore, the cable shield must be connected directly onto the instrument panel in front of the console by means of a cable clamp.

Revision History

| Rev. | Date | Changes | Name |
|-------------|-------------|---|-------------|
| Rev. A | 2009-02-26 | First edition System software SQG2 V 3.14 LMI software LSQN V 1.11 (20090223) Graphics V 1.00 Application MQVGA V 1.00 (20090220) | Konopka |