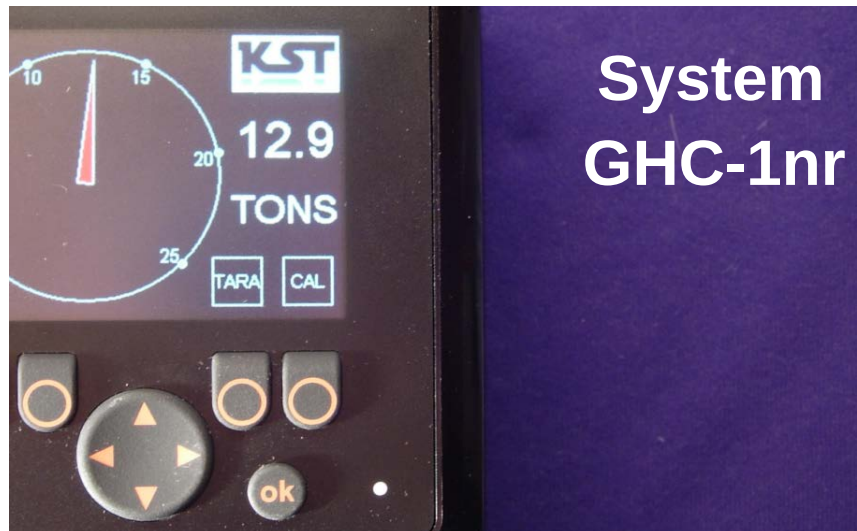
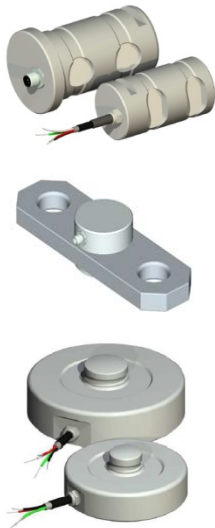


Load Display and Overload Protection for Bridge Cranes with non-redundant sensors



Installation and Calibration Manual

Note: This manual gives a general overview. Kindly refer also to your configuration sheet to find your project specific settings and parameters!

Preface

Content

This manual is part of the equipment or system supplied by KST. Keep this manual in a safe place and ensure it is available to all users.

Disclaimer of Liability

The content of this manual is subject to change. KST do not provide any guarantee for this material, including the associated guarantee regarding merchantability and suitability for certain intended purposes.

KST accept no liability for errors in the content of this manual or for direct or indirect damage in connection with the provision and use of this manual.

Copyright

This manual is protected by copyright and all rights are reserved. This manual may not be duplicated, reproduced or translated into another language, either wholly or in part, without prior written permission of KST.

Trademarks

The usage of common names, trade names, trademarks etc. in this documentation should not be construed to mean that such names, even without special identification, are free in the sense of trademark and trademark protection legislation and hence usable by anyone.

Use for the Intended Purpose

This device/system is intended exclusively for the tasks described in this manual. Any other use shall be construed as being inappropriate. KST accepts no liability for damage caused by inappropriate or impermissible use. This device/system may only be used if it is in perfect technical condition.

Qualification of the Operating Personnel

Only appropriate qualified personnel may work with this device/system, i.e. persons:

- who are familiar with the operation or installation and commissioning
- who know the current regulations for the prevention of accidents.

To whom it concerns

This manual addresses

- Engineers designing machinery and equipment
- Service technicians familiar with installation and maintenance of machinery equipped with electronic control units.

Use of other Components

KST hereby make express reference to the fact that any parts or accessories not supplied by KST have not been tested or released by KST. The installation and/or use of such products may therefore have a negative effect to the design properties of this device and thus impair active and/or passive safety. No liability can be accepted for damage caused by the use of spare parts and accessories manufactured by third parties.

Marking of Notices

Sources of danger and other important notices are marked in this manual as follows:



WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. It provides instructions to take precautions to avert danger.



CAUTION

CAUTION indicates a dangerous situation. It warns of damage to property and provides instructions to avert danger.



IMPORTANT

IMPORTANT indicates possible damage for the product and provides instructions to avoid such possible damage conditions.

NOTE

Operating directions and recommendations as well as supplementary comments. Does not indicate a hazardous situation.

Safety Instructions

Follow the instructions given in this manual. Failure to observe instructions as well as operation other than for the intended use as described below, wrong installation or incorrect handling can severely impair safety of people and equipment.

This manual is intended for persons who, on account of their training and experience can be considered as experts familiar with the relevant standards, regulations, rules for the prevention of accidents under all operating conditions,

This system has to be installed, calibrated and put into operation by professionals (programmer or service technician) only. Please notice that all external signals have to be within the limits specified by KST. Subsequent extensions have to be agreed with KST.

This system can be operated in a temperature range according to the specifications given in the datasheet. Due to the additional self-heating of the housing the system temperature can exceed the ambient temperature.

In case of any malfunction or uncertainty in regard to the use and specifications given please contact KST.

Improper handling or misuse of the system can severely impair the safety of people and equipment and will result to the exclusion of liability and loss of warranty.



Danger of electrical short-circuits

Switch of all supply voltages during the wiring at system commissioning.



Penetration of water and dirt can damage the system

Never clean the system or parts thereof with a high pressure cleaner



Connecting to an unsuitable power supply can cause damage to the system

The system may only be connected according to the belonging circuit diagram



The use of components or extensions not approved by KST can impair the active and/or passive EMC response.

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General

System GHC-1nr is factory-adjusted as far as possible. System adjustments on site are described in this manual.

Tools and Material required

- Certified test weights for sensor calibration
- Multimeter for fine tuning of analogue outputs if necessary
- Standard tools used for electric installations
- Faston plugs 6,3mm, strands, shrink tubes, cable connectors etc.



The supply voltage has to be checked before beginning with adjustments. System Calibration may only be carried out by qualified personnel (see Preface „qualified personnel“ at page 2). Improper adjustment can lead to faulty Cut-Outs and displays. In that case, any and all warranty claims shall be voided.

Introduction

System GHC-1nr is suitable for all applications where limit values have to be monitored by up to four load sensors and motion Cut-Out will be activated when the preset limits are reached.

This system is equipped with many safety controls starting from the sensors up to motion Cut-Outs.

In addition to the load Cut-Out relays there is a diagnostic relay **Kdiag** presenting an independent Cut-Out.

As this diagnostic relay opens just in case of an error it has to be connected to the electric system of the crane to guarantee its deactivation as soon as the diagnostic relay opens.

Furthermore it shall be indicated to the operator that a Cut-Out has been activated by the diagnostic relay to check for the reason and to start required repairs.



Mounting of the GHC-1nr Housing



- Make sure the housing is stable and well fixed on a solid surface
- The housing **MUST** always be mounted with the cables going downwards. Be aware that any water penetrating the housing nearly always went through cables and cable glands that have not been well fixed and sealed. Please note that only one round cable per cable gland is allowed. Each cable has to be of sufficient diameter to let the rubber seal inside the cable gland secure perfect sealing



- Avoid any close distance to sources of strong magnetic, electric and electromagnetic fields emitted by transformers, power relays, radio transmitters, telephones or other.
- Never place the in- and outgoing cables parallel or close to other cables that lead high currents causing noise radiation that could disturb the system's function.

System Operation

Preparation



Make sure all cable connections have been installed in accordance with the circuit diagram delivered separately to this manual to follow specific customer requirements. Power the system only thereafter.

Operation Elements of the Console; Standard Operation

After powering the system standard information will be displayed (Main Display) if the system has been installed correctly :



Example picture!

4 softcoded pushbuttons of individual functions, or each menu point , indicated at the display above

Keys are marked from left to right by:
F1, F2, F3 and F4

4-directions rockerswitch.
Used to select menupoints or for passcode input.

ok-Button used to confirm settings and to return to menus described in this manual.

LED, flashing green in standard operation

The analogue display shows the total actual load lifted (both winches). Right beside the identical digital output in tons. The load displayed can be tared to zero by use of the F3 button „TARE“. In this case, TARE will be illuminated in red and the load displayed will go to zero. Another actuation of this key will return to the standard display.

The TARE function is just effective to the display. Cut-Out etc. will still refer to the actual load.

Large Digit Display (option)



An optional part of system GHC-1nr is a large digit display indicating the total load parallel to the console display. If TARE is activated at the console the large digit display will follow.

The tared condition will be indicated by a flashing yellow LED right of the „t“. The LED will be off in non-tared condition.



Transfer of the total load from the console to the large digit display takes place by a current signal of 4 to 20 mA. Therefore, a difference between the indication at the standard display and the large digit display is possible but should be in the limit of 0,1 tons.

Operating hours counter

Bedrijfsuren		KST
Totaal hijslier1	0.00	
Lastafhankelijk hijslier1	0.00	

*Note: Example picture;
i.e. the display of your specific
system might be different.*

By key entry F1 the operating time meter shows at the upper line the total operating hours of the crane (the time the winch has been in operation). See circuit diagram digital signal to IN7)

Load related operating hours according to the FEM 9.755 are displayed below.

This indication will stay as long as F1 is held. The operating hours counter records continuously and can be cleared solely by entry to the password protected adjustment menu (see applicable chapter)

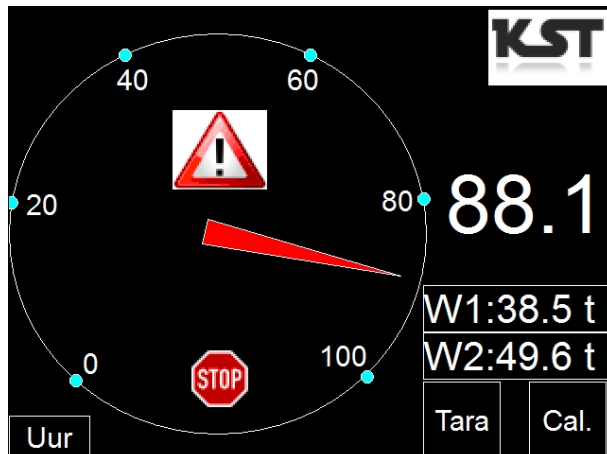
Display of Sensor Outputs

Sensorwaarde		KST
S1 26.0 T	12320 uA	
S2 27.7 T	12844 uA	

*Note: Example picture;
i.e. the display of your specific
system might be different.*

By pressing key F2 out of the main display the channel values of the load sensors will be displayed for service. This indication will stay as long as F2 is held The calibrated values in tons are displayed in the yellow areas and the electric values in uA or mV in the green areas. **Please note that the relation between tons and uA may differ from picture above in your specific system, same as number of sensors.**

Prewarning and Maximum Load Cut-Out



*Note: Example picture;
i.e. the display of your specific
system might be different.*

Once the actual load is equal to the prewarning load (90% of the Overload-limit for total load) a warning triangle will appear on the display.

If the actual load exceeds the set limits) a STOP sign will appear and the respective Cut-Out relay of the central electronic will be activated.

Please note that the example screen-picture above may differ from screen in your specific system.

Settings / Calibration

Preliminary Note

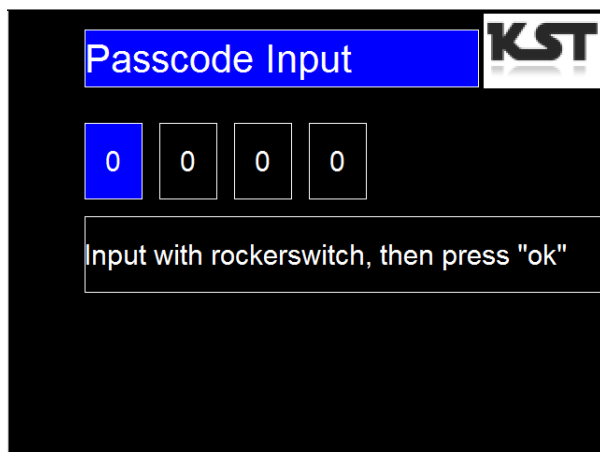


Limits of the monitoring system as well as calibration of the load displayed will be performed by use of the setting menu. That means all these adjustments are relevant to safety !



Important: motion Cut-Out and the diagnostic program (except sensor- and system error messages) are deactivated. The service engineer/commissioner of the crane is responsible for safe operation during sensor calibration and setting of switching points.

By key entry F4 “CAL” on the main display the password input field will appear.

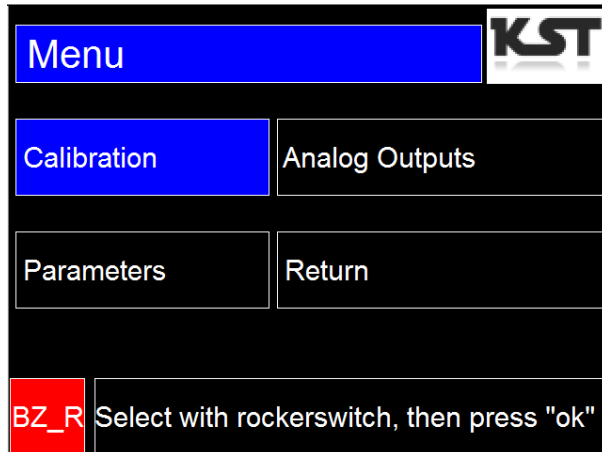


The 4 digit password may now be entered by use of the central rockerswitch starting from the left position. Pushing the “up” of the rockerswitch will increase and “down” will decrease the digits displayed. Pushing the “right” or “left” of this rockerswitch will lead to the next or the previous position.

Once the entire password has been entered, the display will change by pressing the “ok” key to the setting menu. In case the entered password is incorrect, an error message will be displayed and the display will return to the main display.

Setting Menu

After input of the correct password and confirming by the “ok” button, the display will change to the setting menu.



*Note: Example picture;
i.e. the display of your specific
system might be different. Not all
system do have analogue outputs
to calibrate.*

Selection of the menu requested is effected by use of the rockerswitch and will lead from one backlit menu to the next one. Key entry “OK” will change the display to the desired menu.

Clearing of the Operation Hour Counter

Clearance of the operating-time-meter is performed by holding key F1 “BZ_R” for 5 seconds. The colour of the square will turn from red to yellow and the values of operating hours will be set to zero and will start counting again from thereof.

Please note that the example screen-picture above may differ from screen in your specific system.

Setting of Limits and Parameters

Overload Limits

After selection of "Parameters" and pressing the "ok" button, the first page with overload-limit settings will appear:



Note:
Example picture!

See allocation OLx => Function => Dig.Output => relay in your configuration sheet

Go with the rockerswitch to the digits one by one and key in the wanted load limit in the same way as the Passcode before. A load limit of e.g. 10,3 Tons appears on screen as 0 1 0 , 3



Note that only fields can be reached, where inputs are relevant to your system.

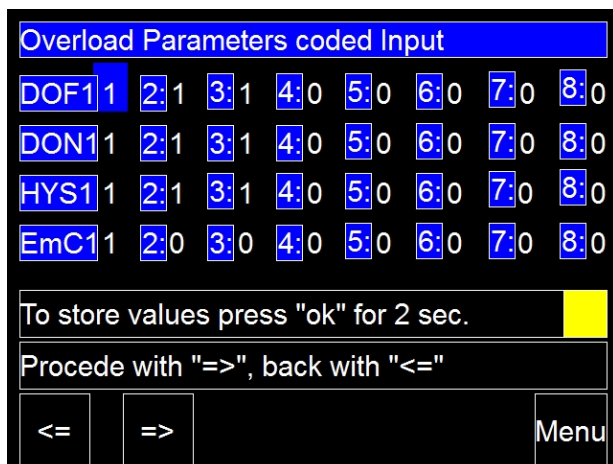
After all settings are made on the screen, press and hold the ok-button for ca 2 seconds, until the little yellow field turns blue. This is the indication, that the limits have been stored permanently.

Press button F2 "=>" to go the setting of overload parameters.



These values are relevant to safety. The user of this system is solely responsible for correct setting of this value.

Overload Parameters



These inputs are coded, i.e. the numbers behind each parameter can be set between 0...3
The number of the parameter is related to the number of the overload limit, e.g. HYS4 is the hysteresis of overload switchpoint 4 with overload limit 4.

DOF = Delay Cut-Out

- 0 = immediately, no delay
- 1 = 300 ms
- 2 = 1000 ms
- 3 = 2000 ms

Warning: Safety related cut-out
Switchpoint MUST NOT have a
delay of more than 300 ms.

DON = Delay Switch-On after Cut-Out

- 0 = immediately, no delay
- 1 = 500 ms
- 2 = 1000 ms
- 3 = 2000 ms

HYS = Hysteresis

- 0 = 1% (of respective overload value)
- 1 = 5%
- 2 = 10%
- 3 = 20%

“5% hysteresis” for instance means, that after cut-out, the load has to be reduced by at least 5% to switch on again.

EmC = Emergency Cut-Out

- 0 = no emergency cut-out / Disabled
- 1 = 10%
- 2 = 20%
- 3 = 40%



This value has to be understood as the „**final emergency brake**“. It is the percentage above the respective Cut-Out value but it must be still in a range the crane can lift without damage.

The slave system will activate a Cut-Out by the diagnostic output once the actual load value reaches the set value, which should not happen in practise.

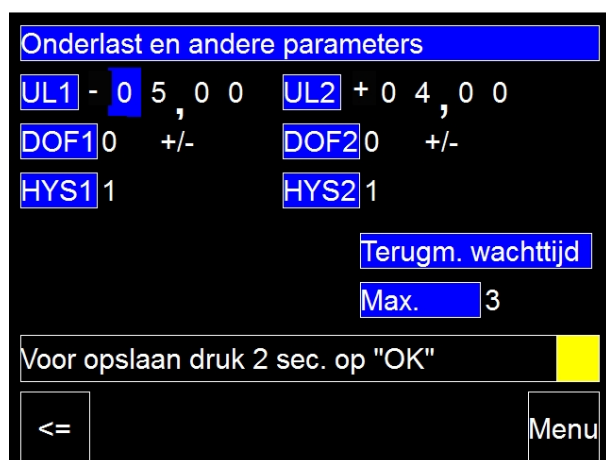


All these values are relevant to safety. The user of this system is solely responsible for correct setting of this value.

After all settings are made on the screen, press and hold the ok-button for ca 2 seconds, until the little yellow field turns blue. This is the indication, that the limits have been stored permanently.

Press button F2 “=>” to go the setting of:

Underload Parameters and other settings



The way of inputting and meaning is the same as for overload.



Note that only fields can be reached, where inputs are relevant to your system.

Coding of parameters is:

DOF = Delay Cut-Out

0 = immediately, no delay

1 = 500 ms

2 = 1000 ms

3 = 2000 ms

DON = Delay Switch-On after Cut-Out is fixed to 1s.

+/-

With this field, the underload value can be set either to positive or to negative values.

HYS = Hysteresis

0 = 1% (of respective underload value)

1 = 5%

2 = 10%

3 = 20%

See configuration sheet to find whether underload cutouts are applied and what their function is!

C-O Waiting time (not relevant for this project)

0 = 1000 ms

1 = 2000 ms

2 = 4000 ms

3 = 8000 ms

This is the time that the system allows for the cut-out feedback signal (neg. Slope B-IN7) to come to avoid emergency cut-out via diagnostic output.



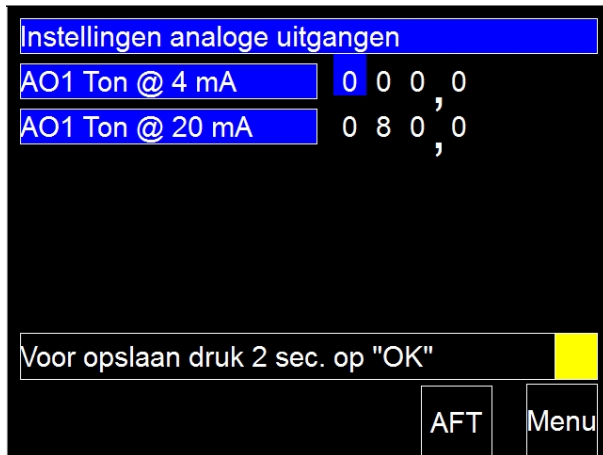
All these value are relevant to safety. The user of this system is solely responsible for correct setting of this value.

After all settings are made on the screen, press and hold the ok-button for ca 2 seconds, until the little yellow field turns blue. This is the indication, that the limits have been stored permanently.

Press button F4 "Exit" to go to the menu again.

Setting the analogue outputs (optional)

Choosing this menupoint brings:



*Note: Example picture;
i.e. the display of your specific
system might be different, because
the number of analogue outputs
can differ.*

See configuration sheet to find whether analogue outputs are applied and what their function is!

In the same way as before, the loads can be set, at which the analogue outputs 1 and 2 shall give 4 respectively 20 mA. Between these points, it will give a linear output.

After all settings are made on the screen, press and hold the ok-button for ca 2 seconds, until the little yellow field turns blue. This is the indication, that the limits have been stored permanently.

Press button F4 "Exit" to go to the menu again.

Calibration of Sensors



Important: in setting mode motion Cut-Out and the diagnostic program (except sensor- and system error messages) are deactivated. The service engineer/commissioner of the crane is responsible for safe operation during sensor calibration and setting of switching points.

Out of the setting menu go to “Calibrations” and confirm by “ok”

Zero - Load Calibration



*Note: Example picture;
i.e. the display of your specific
system might be different,
depending on amount of sensors,
that are calibrated at the same
time.*

This adjustment requires the crane without any load but with the load carrying attachment (e.g. the hook)

The small-printed numbers show the actual uA value of the sensors, which may be helpful for calibration. Dependend on your application, it may be either the channel1 values of a sensor or channel1/channel2. This is indicated. In example above, it is the channel1 values of 4 load-sensors. It is required, that the uA values of the sensors do not differ too much, e.g. max. 400 uA from sensor to sensor.

By entering key F1 “Zero” **for ca 2 seconds** the display shows a load value of 0 tons.



This procedure has to be done even the display shows already a value of 0 tons.

In case the ownweight of the load carrying attachment should be added to the load, this can be achieved by pressing F3 „Up“ and F4 „Down“ in steps of 0,1 tons.

The hence displayed value will be considered by the system as valid and needs no confirmation by the „ok“ button.



This value is relevant to safety. The user of this system is solely responsible for correct setting of this Cut-Out value.

Maximum Load Calibration

Button F2 “=>” will change the display to “Maximum Load Calibration”.



Error Messages

GHC-1nr checks continuously relevance of its sensor outputs and also itself. In addition the Cut-Out signal in case of a motion Cut-Out (see also "Introduction") is also checked.

Sensor Error

In case both channels fail simultaneously the system will deactivate the diagnostic relay in return and will turn automatically to the sensor error display

Sensor-Error !				KST
S1	Ch.1	5.4	T	11886 uA
S1	Ch.2	5.4	T	11879 uA
S2	Ch.1	5.4	T	11957 uA
S2	Ch.2	5.4	T	11944 uA
S3	Ch.1	5.4	T	11982 uA
S3	Ch.2	5.4	T	11993 uA
S4	Ch.1	-3.2	T	48 uA
S4	Ch.2	-3.3	T	10 uA

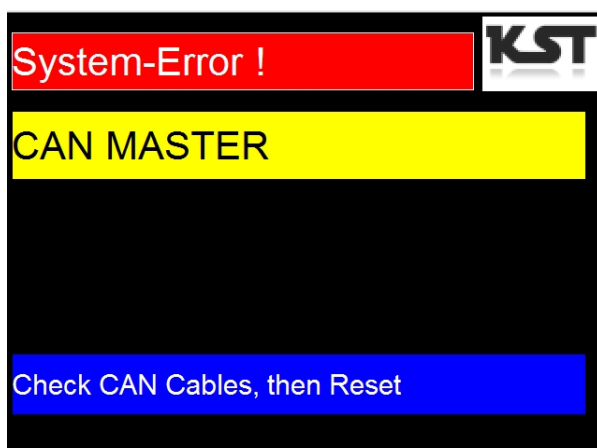
*Note: Example picture;
i.e. the display of your specific
system might be different,
depending on amount of sensors.*

The system will be ready for use again once the sensor signals have been are ok.

Please note that the relation between tons and uA may differ from picture above in your specific system, same as number of sensors.

System Error

The display checks the Master continuously. If the master does not respond, this display picture will come.





In that case a new start may work (voltage off and restart after some seconds). The wiring of the CANBUS inside the central box has to be checked followed by a new system start. In case the CANBUS cable is long (> 10m) or it is going through an area of high EMC emission, a 2nd CANBUS resistor of 120 Ohms between CAN_H and CAN-L shall be connected.

Otherwise, the system is not allowed to be used anymore, until this extremely unlikely error is repaired and corrected by customer service only.

Cut-Out Error and excessive overload error

The system performs a double Cut-Outcheck. On the one hand, following to a Cut-Out a downward slope at the input of IN7 / IN6 is expected as a sign that the crane has been stopped.

If that doesn't appear within the time, that was set as "C-O Waiting time", the diagnostic relay will Cut-Out and the main display shows "E-STOP!" on a magenta coloured background.



The second Cut-Out check detects, if the load after a Cut-Out continues to increase. If it reaches the „Emergency Cut-Out limit“ (see respective setting EmC, page 15), the diagnostic relay will also Cut-Out and the same information „E-STOP“ appears on the main display, but this time in red colour.

Even after the load has been suspended, the diagnostic relay will stay deactivated until a restart of the system (voltage off and restart after some seconds). This is to alarm that an emergency Cut-Out did appear.



Another possibility to reset the Cutout Error without Power-off is to confirm with pushbutton "ok" on the console or apply a short positive pulse at digital input C-IN11. In case of magenta field, on the Master-unit, in case of red field on Slave-unit.



It is crucial to check the Cut-Out circuits to detect the reason why standard Cut-Out by the Cut-Out relay failed.

Diagnostic-Output Error

GHC-1nr checks at system start (power-on) the functions of independent diagnostic outputs and -relay. In case of error, the relays do not switch on and a respective message will appear in the upper-left edge of the display:



In this case, the wiring of diagnostic in- and outputs (yellow/violet wires) need to be checked as well as the diagnostic relay.

Otherwise, the customer service must be informed.!

In order to grant an emergency operation of the crane until repair of the error, the diagnostic error can be quit by pressing and holding the "ok" button of the display for more than 5 seconds.

After that, the relays will switch on and the system will be functional, however with the indication "Emergency Operation" on the display.



Important:

Responsibility for using the crane under indicated „Emergency Operation“ is with the user. It must be checked daily if indication of the load is still correct and the system will cut-out regularly. The diagnostic outputs must be repaired to keep emergency operation time as short as possible.



Maintenance



System GHC-1nr is maintenance free

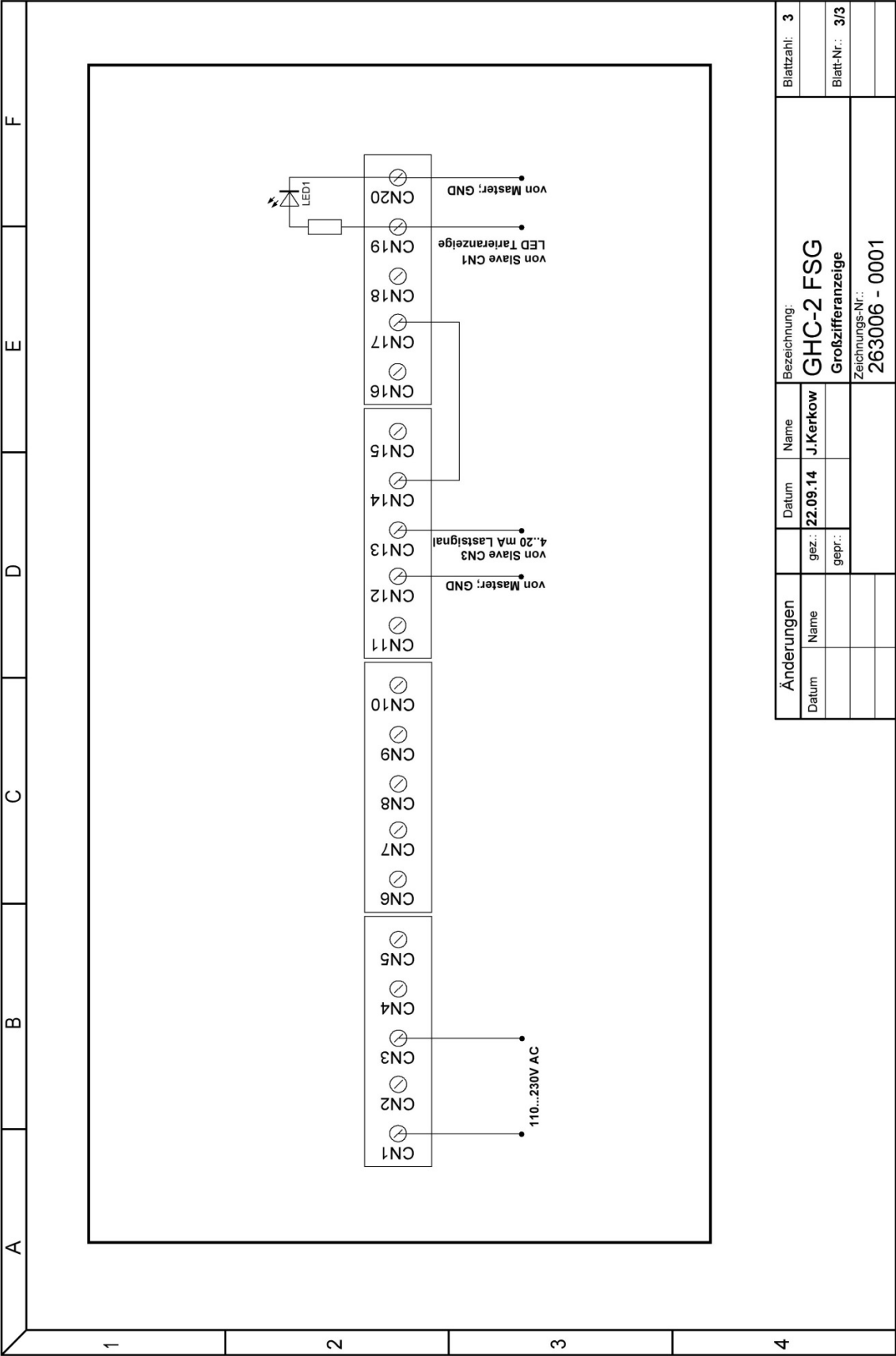
Nevertheless, visible damages of the central unit, the display, the sensors and their cables need to be repaired immediately to ensure correct function of the system.

Weekly Inspection



- Condition of the central unit, the display, the sensors and their cables
- Cut-Outtest

Appendix : Circuit Diagram Large Digit Display (optional)



NOTICES:_____.

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