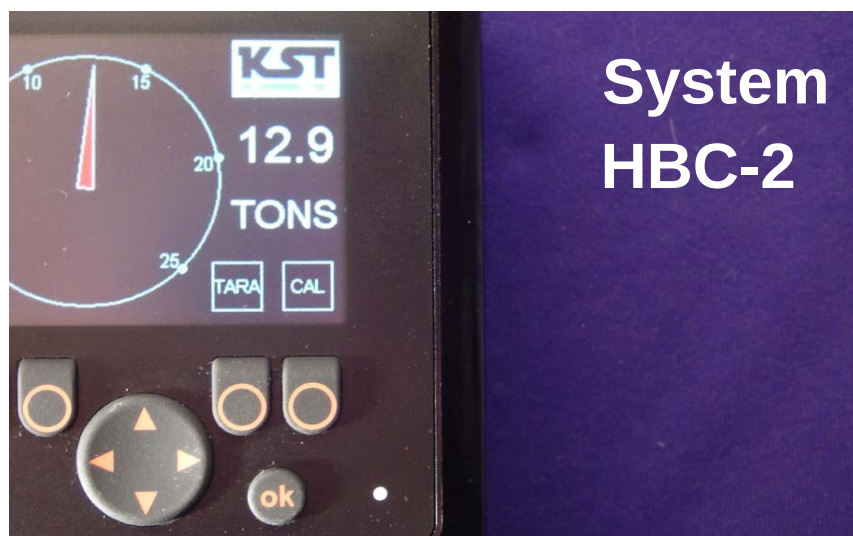
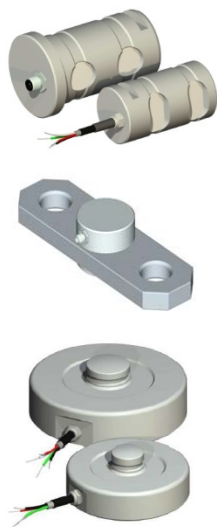


Load Display, Loadmoment Control and Overload Protection for Boom Cranes



Installation and Calibration Manual

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.

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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 HBC-2 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 6,3 mm, 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 HBC-2 is suitable for all applications where limit values have to be monitored by up to four redundant load sensors and motion Cut-Out will be activated when the preset limits are reached.

This system is classified to SIL-2 resp. PL d (EN 13849-1) respectively and by so is connected to many safety controls starting from the sensors up to motion Cut-Outs.

The system is of redundant design to guarantee correct motion Cut-Out in case of a failure of one or more load sensors, failure of the electronic or failure of the crane electric.

The load sensors are of dual-channel design to check relevance of their output data..

Also the electronic consists of two independent systems operating as master and slave.

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 HBC-2 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.

Mechanical Mounting of the SIC Anglesensor

The angle sensors are intended to be mounted on the left side of the boom (seen from the rear). That is, when looking at the angle sensors, they rotate clockwise as the boom picks up. The angle sensors are mounted so that they are horizontal (M12 connector points exactly downwards) when the boom is at 45 °.

It is recommended that the HBC-2 system is already functional when mounting the angle sensors.

Since they are already adjusted at the factory, the angle can be read off and the assembly fine adjustment can be made so that the angle readout corresponds to the boom angle. To be controlled by pressing the F2 key; see "Displaying the sensor values".

Important:



1. Of the two sensors, one is connected to an analog input of the master controller and the other to the slave controller. See wiring diagram 263117-01 and the configuration sheet. The angle sensors are marked accordingly. They must not be intermixed because of the pre-adjustment already made.
2. For the two angle sensors to really work redundantly, they must be mounted independently of each other. If a common mounting plate can not be avoided, it must be adequately secured, e.g. welded to the boom.

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 and the two channels of the redundant load sensor(s) are on the same level.:



Example of a boom crane with different operation modes

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 current loadmoment is displayed analog in %. This is calculated from the current load in relation to the permissible load according to the radius-dependent loadchart. The current load in tonnes is the value shown at the top right (for example, 5.23T).

Below, marked with "M" is the value of the current cutout limit for this mode and this radius. This is the value from the loadchart + possibly a percentage surcharge that can be entered, see chapter "Cutout limits", page 14. The current radius (projection) in meters and the boom angle in angular degrees appear below this.

If provided, the current operating mode is displayed.

The load values can be tared (set to zero) by pressing the F3 key "TARE" or a positive pulse on the C-IN9 input of the master. The field TARA is then red and the display values of the load go to zero. A repeated pulse or pressure on the same key returns to the normal display. If the system has load-dependent analog outputs for a large-digit display, these also go to the zero-ton value.

The TARA function is only effective on the display, cutouts etc. are still related to the actual load.

Large Digit Display (option)



An optional part of system HBC-2 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.



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

Operation hours		KST
Total Winch1	23.45	
Load Hours Winch1	12.32	
Total Winch2	0.00	
Load Hours Winch2	0.00	

Example for 2
hoists

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.

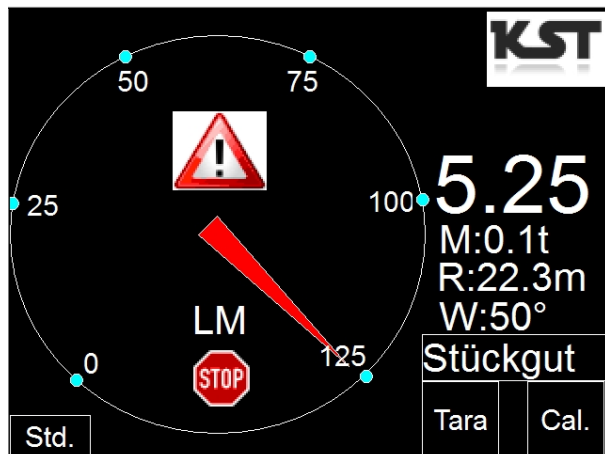
This indication will stay as long as F1 is held. The operating hours counter records continuously and can be cleared solely by entry to the password protected adjustment menu (see applicable chapter)

Display of Sensor Outputs

Sensor-Werte		KST
S1 Ch.1 2.6 T	11715 uA	
S1 Ch.2 2.6 T	11785 uA	
S2 Ch.1 2.6 T	11816 uA	
S2 Ch.2 2.6 T	11863 uA	
S3 Ch.1 66.0 °	13946 uA	
S3 Ch.2 66.0 °	13705 uA	

By pressing key F2 out of the main display the channel values of the redundant 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



If the load reaches the value of the warning 90% of the loadchart, a warning triangle appears on the display.

If the load exceeds the cutout limit value (in % of the load table, which can be set in the menu; see Configuration sheet), a STOP symbol appears and the cutout relay is switched off.

If the system has an auxiliary hoist with a radius-independent shutdown limit, reaching this limit is indicated by a separate STOP character.

Simultaneously, within the set waiting time, system HBC-2 expects a repeating signal to confirm all applicable crane motions have been stopped (see circuit diagram and configurations sheet, digital signal to master IN7 = main and or master IN6 = aux) .

In case no repeating signal appears an emergency Cut-Out will be activated by the diagnostic relay (see "error messages").

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

Settings / Calibration

Preliminary Note

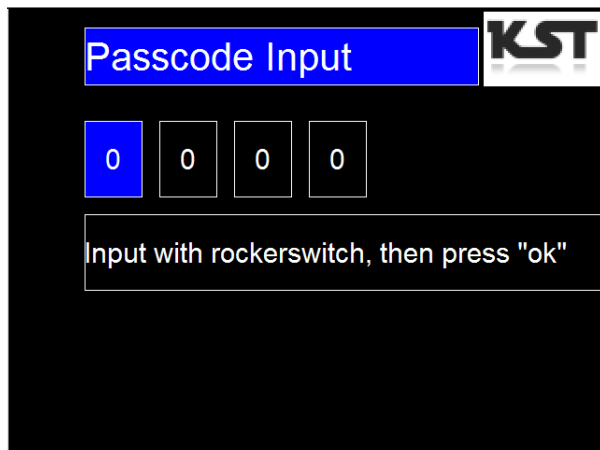


Limits of the monitoring system as well as calibration of the load displayed will be performed by use of the setting menu. That means all these adjustments are relevant to safety !



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.

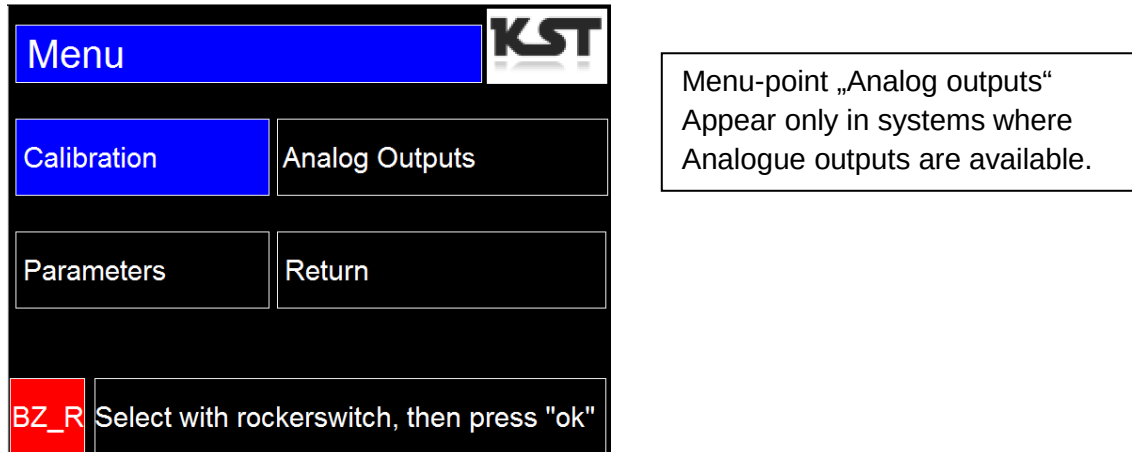


The 4 digit password may now be entered by use of the central rockerswitch starting from the left position. Pushing the “up” of the rockerswitch will increase and “down” will decrease the digits displayed. Pushing the “right” or “left” of this rockerswitch will lead to the next or the previous position.

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.



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(s)

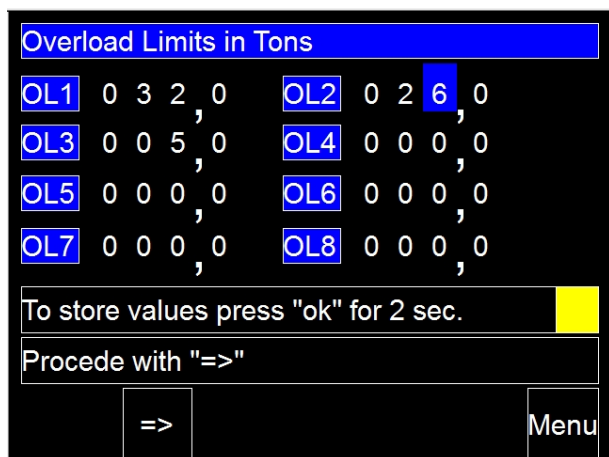
Clearance of the operating-time-meter is performed by holding key F1 “BZ_R” for 5 seconds. The colour of the square will turn from red to yellow and the values of operating hours will be set to zero and will start counting again from thereof.

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:



Overload Limits in Tons	
OL1	0 3 2, 0
OL2	0 2 6, 0
OL3	0 0 5, 0
OL4	0 0 0, 0
OL5	0 0 0, 0
OL6	0 0 0, 0
OL7	0 0 0, 0
OL8	0 0 0, 0

To store values press "ok" for 2 sec.

Procede with "=>"

=> Menu



Kindly view the actual allocation OL <-> Switchpoint / Relay in the 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.

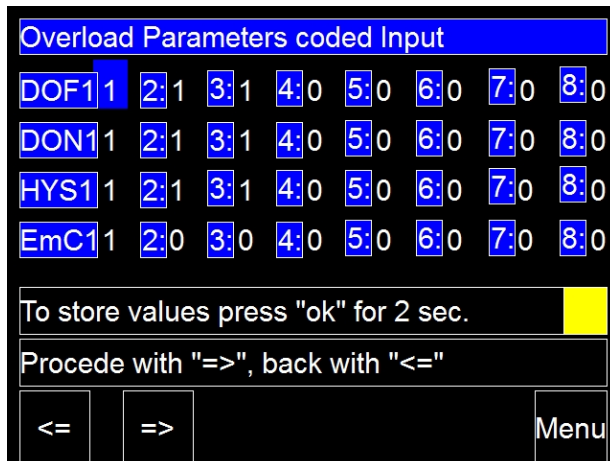
Press button F2 "=>" to go the setting of overload parameters.



WARNING

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 **NOT to be used for safety applications!**
- 3 = 2000 ms **NOT to be used for safety applications!**

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 be slave-unit

- 0 = no emergency cut-out
- 1 = 5%
- 2 = 10%
- 3 = 15%



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.

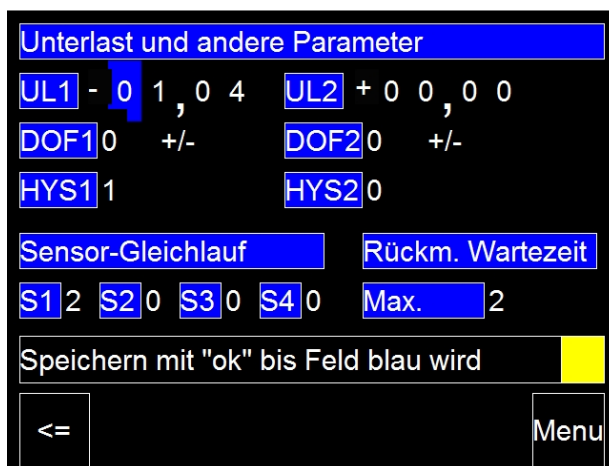


All these values are relevant to safety. The user of this system is solely responsible for correct setting of this value.

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 screenshot shows a configuration screen titled "Unterlast und andere Parameter". It contains several input fields for underload limits and other settings. The fields are arranged in a grid-like fashion. At the bottom, there is a yellow button labeled "Speichern mit 'ok' bis Feld blau wird" and a "Menu" button.

Unterlast und andere Parameter	
UL1 - 0 1, 0 4	UL2 + 0 0, 0 0
DOF1 0 +/-	DOF2 0 +/-
HYS1 1	HYS2 0
Sensor-Gleichlauf Rückm. Wartezeit	
S1 2 S2 0 S3 0 S4 0	Max. 2
Speichern mit "ok" bis Feld blau wird	
<=	Menu

See configuration sheet
For actual settings of
Underload Limits.

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, the delay Switch-on after cutout is fixed to 1 second.

+/-

Toggle for positive or negative value of switchpoints. View signature at UL value.

HYS = Hysteresis

0 = 1% (of respective underload value)

1 = 5%

2 = 10%

3 = 20%

Allocation of underload switchpoints is:

No UL switchpoints

C-O Waiting time

0 = 500 ms

1 = 1000 ms

2 = 2000 ms

3 = 4000 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.

Sensor 1..4 Red.Limits

0 = 2% of the nominal load for each sensor, e.g. sensorcapacity x reeving

1 = 4%

2 = 7%

3 = 10%

This is the maximum permitted difference between the 2 channels of the redundant sensor signal, related to the hoist capacity. Example: If the hoist is 5T and 3=10% is chosen, then the system allows max 500 kg difference before it comes up with a sensor redundancy error.



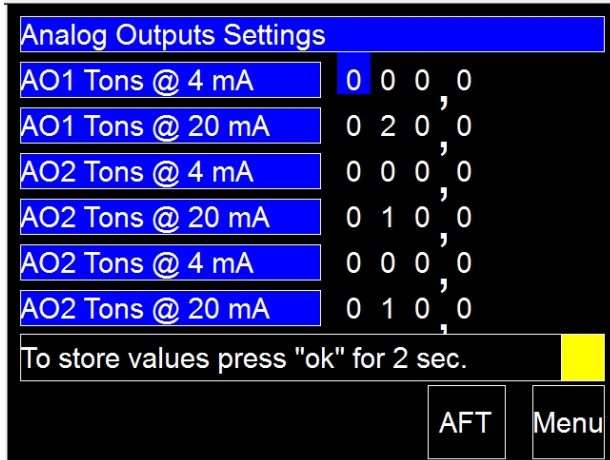
All these value are relevant to safety. The user of this system is solely responsible for correct setting of this value.

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:



Analog Outputs Settings				
AO1 Tons @ 4 mA	0	0	0	0
AO1 Tons @ 20 mA	0	2	0	0
AO2 Tons @ 4 mA	0	0	0	0
AO2 Tons @ 20 mA	0	1	0	0
AO2 Tons @ 4 mA	0	0	0	0
AO2 Tons @ 20 mA	0	1	0	0

To store values press "ok" for 2 sec.

AFT Menu

In the same way as before, the loads can be set, at which the analogue outputs 1, 2 and 3 shall give 4 respectively 20 mA. Between these points, it will give a linear output.

AO1 (F-OUT9 via CPI module) is the analogue output for total load, AO2 (F-OUT10 via CPI module) for the load left side and AO3 (F-OUT11 via CPI module) for the load right side.

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.

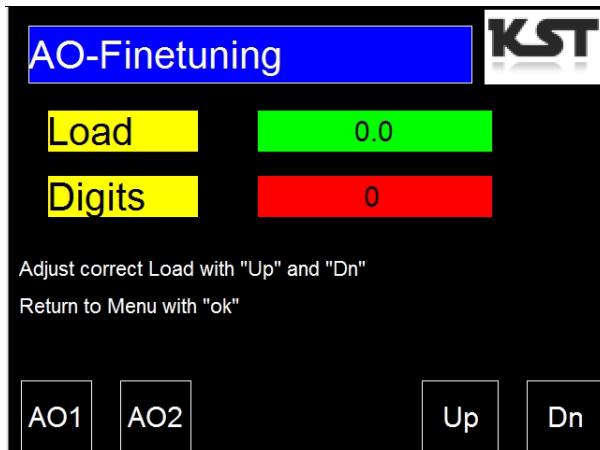
Fine tuning of analogue outputs (only AO1 and/or AO2)



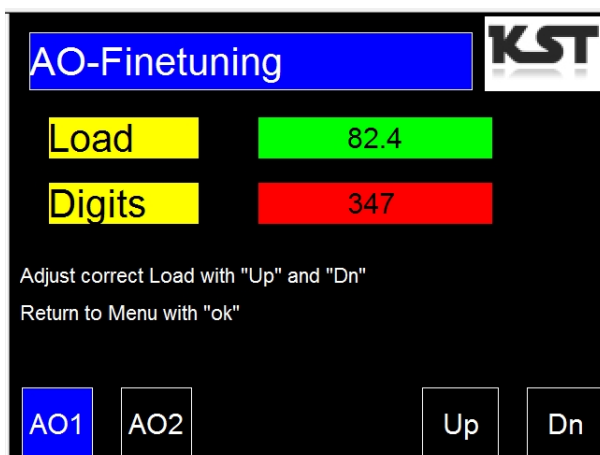
Note: This is done already during final test of the system, therefore advised not to do this without a severe reason.

Finetuning is done at DIGITS of 60, 120, 236, 470 and 704. These Digits is not a Load Value, but duty-cycle of the PWM-output.

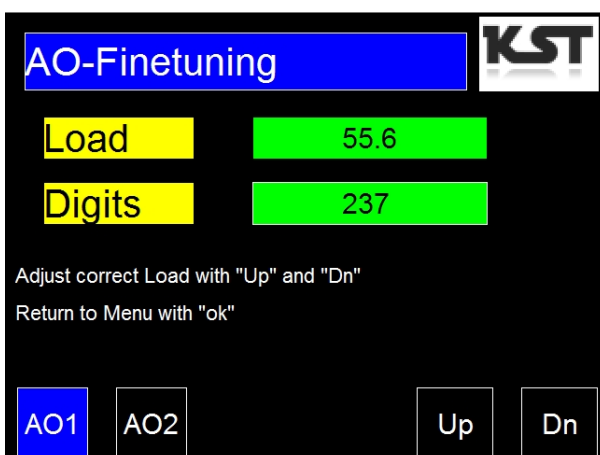
Make sure, that nothing is connected to the digital inputs C-IN9, IN10 and IN11 of the slave unit, and press the AFT button.



Select AO1 or AO2:



The field "Load" shows the respective load in HBC-2 that determines the selected AO. In order to finetune, the load must be changed to come close to any of the digit values given above:



Once, the field of the digit value turns green, the AO can be tuned with the Up and Dvn button. This can be seen on the external display or PLC that is connected to the AO.

Make this setting at one or more of the adjustment digit values.
Return to Menu with "ok".

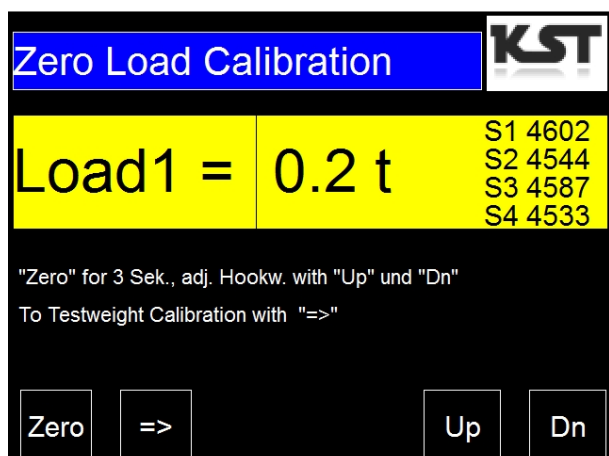
Calibration of Sensors



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



Refer to configuration sheet for project dedicated description of calibration method and procedure.

Dependend on the application, one or more sensors are set simultaneously in this menu point, which measure the load of the hoists. For this purpose, in addition to the actual load, the output signals of the participating sensors are also displayed in μA , e.g. Channel 1 and 2 of the redundant sensor. If several sensors are set at the same time, only the values of the first channel of the respective sensors will appear.



Which sensors / hoists are set in which step is shown in the configuration sheet

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

Push key F1 “Zero” **for ca 2 seconds to set the zero point.** The display turns to show 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.

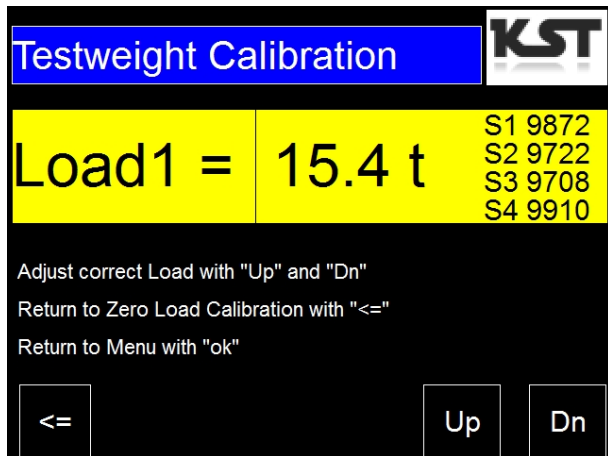
The hence displayed value will be considered by the system as valid and needs no confirmation by the „ok“ button.



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”.



For this calibration step, the crane has to be loaded with a testload of known weight which is as close as possible to the capacity of the crane. The load display must now be adjusted to be equal to the weight of the testload (with or without the load carrying attachment) by means of keys F3 “Up” or F4 “Dn”.



Key F3 and F4 in this menu are offering scrolling function. One or more individual entries are used for fine calibration. At permanent actuation of K3 or K4 the displayed value will scroll up or down



This step is relevant to safety. The user of this system is solely responsible for correct setting of the displayed value.

Pressing „ok“ will return to the setting menu. und from there to the main display.

Calibration of other load sensors (if necessary depending on the application) are done in the same way as for the Sensor 1.

Press the F2 button “=>” and do the calibration, until all sensors are done.



If safety functions had been deactivated by modifications of limit values prior to adjustment of the sensor, the correct limit values have to be set correctly in return and before the crane is used again.



Also the accuracy of the load indication has to be checked by several testweights. The deviation should be less than 3% of end value.

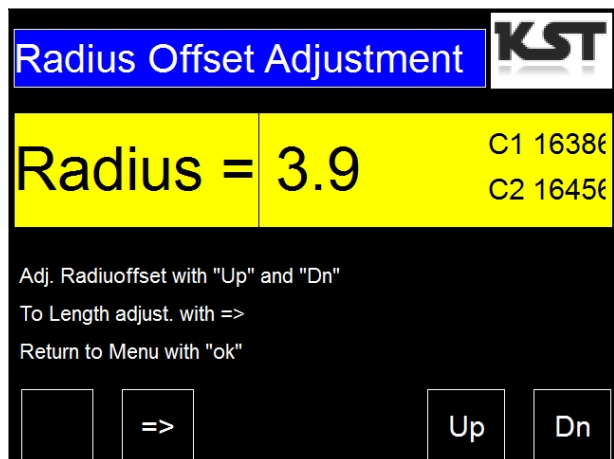
Adjustment Radius



Radius adjustment requires that the boom angle is measured correctly, this must be checked. The radius is calculated from the geometry of the crane and is stored as a table or formular in the software. HBC-2 offers a fine-tuning of the radius at two points with:

Offset = distance center of the turntable to the point of articulation of the boom in meters, to measure at the steepest boom angle

Length = radius at maximum projection in meters, to measure at the lowest boom angle



The screenshot shows the 'Radius Offset Adjustment' screen. At the top, there is a blue header with the text 'Radius Offset Adjustment' and the KST logo. Below this, a yellow box displays 'Radius = 3.9'. To the right of this box, two sensor values are listed: 'C1 16386' and 'C2 16456'. Below the yellow box, there is a black area with white text instructions: 'Adj. Radiuoffset with "Up" and "Dn"', 'To Length adjust. with =>', and 'Return to Menu with "ok"'. At the bottom, there are four buttons: a square button, an '>=' button, an 'Up' button, and a 'Dn' button.

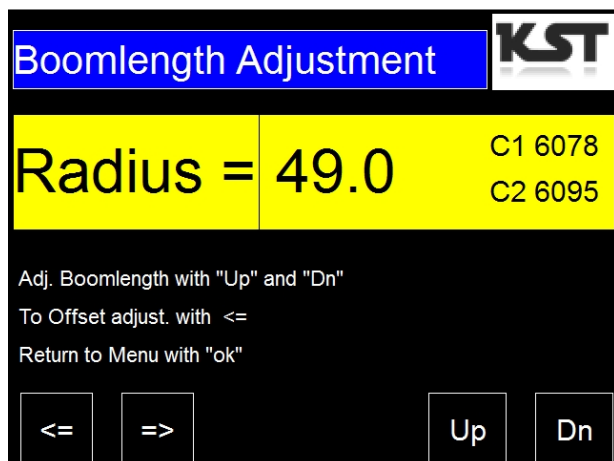
Offset:

Shown is the current radius in meters. Together with C1 and C2, which are the values of the two angle sensors in uA. The current value of the offset can be changed in increments of 0.1m with the keys "Up" and "Down" if required.

To do this, measure the actual radius and compare with the display. In order to keep the influence of the length from the radius as small as possible, it is necessary to erect the boom for this purpose maximally.

Length:

Boom down to the lowest possible boom angle and press the arrow pushbutton to reach this menupoint:



The screenshot shows the 'Boomlength Adjustment' screen. At the top, there is a blue header with the text 'Boomlength Adjustment' and the KST logo. Below this, a yellow box displays 'Radius = 49.0'. To the right of this box, two sensor values are listed: 'C1 6078' and 'C2 6095'. Below the yellow box, there is a black area with white text instructions: 'Adj. Boomlength with "Up" and "Dn"', 'To Offset adjust. with <=', and 'Return to Menu with "ok"'. At the bottom, there are four buttons: a '<=' button, an '>=' button, an 'Up' button, and a 'Dn' button.

Procedure to finetune radius the same as before.

Adjustment / calibration of anglesensor SIC



SIC is adjusted at the factory so the setting is purely mechanical.

Electrical adjustment is only necessary if an SIC is replaced or if it is essential to build the angle encoders on the right side of the boom.

A new electrical adjustment of the SIC angle sensors shall therefore be done only for a good reason!

With a new adjustment it is inevitable always to match BOTH SIC together!

To calibrate SIC, it must be brought and adjusted at 3 angles to the horizontal which are 0° , $+38^\circ$ and -38° . If SIC is mounted on the boom - with the required offset of 45° - the boom must then be moved to the $+45^\circ$, $+83^\circ$, $+7^\circ$. If this is not due to mechanical reasons, SIC must be calibrated without being mounted on the boom, as the above mentioned Angle values are mandatory.



After the angle value is reached for BOTH SIC, the corresponding button is pressed for 1 second. The key delay is used to prevent inadvertent overwriting of calibration data. If the corresponding value is stored, the keypad is filled in blue.



All values must be calibrated and the sequence: first 0° , then $+38^\circ$ and finally -38° must be observed.

If no angle value has been recorded yet, this menu item can always be left with "Menu". Likewise, if all 3 points were recorded.

Then check that the angle values are displayed correctly.

Error Messages

HBC-2 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.

Redundancy Error of Sensor

HBC-2 compares constantly the load values given by the sensor's channel 1 and 2. If the difference between both is above the limit value, it activates a Cut-Out by the diagnostic relay and will point automatically to the corresponding error message.

Redundancy Error ! 		
S4 Ch.1	-1.1 T	3045 uA
S4 Ch.2	4.9 T	11291 uA
Caution, read Manual!		
Select correct Channel, then "ok"		
Ch.1	Ch.2	

The display will show data of both channels of the relevant sensors. First the direct output values in uA or mV (small printing, right) followed by load values together with calibration data.

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

In case the direct output values are different to the calibrated data of the sensor, the sensor will have to be repaired or replaced (if it is not a faulty sensor cable). The latter can be assumed if the unadjusted value is close to zero.

On the assumption that at least one of the channels transmits correct data, the system offers an emergency function to allow crane operation until a replacement sensor has been installed.

The operator may select channel 1 or 2 depending on which sensor delivers the correct output and confirm with „ok“.

The system then will reactivate the diagnostic relay, will return to the main display and will indicate "Emergency Operation"



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. A replacement sensor must be installed to keep emergency operation time as short as possible.



Following each system reactivation (Power-up) the system will go to the redundancy error mode. The emergency operation mode will have to be selected and confirmed until the failure is eliminated.



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

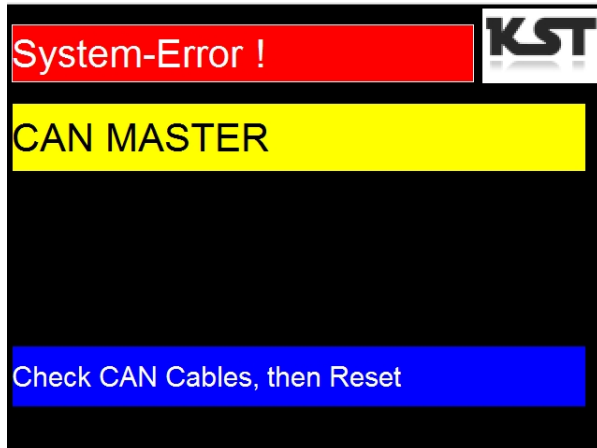
Sensor-Error !		KST
S1 Ch.1 5.4 T	11886 uA	
S1 Ch.2 5.4 T	11879 uA	
S2 Ch.1 5.4 T	11957 uA	
S2 Ch.2 5.4 T	11944 uA	
S3 Ch.1 5.4 T	11982 uA	
S3 Ch.2 5.4 T	11993 uA	
S4 Ch.1 -3.2 T	48 uA	
S4 Ch.2 -3.3 T	10 uA	

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

Master and slave do cross-checking continuously. If the result is negative a system error of master or slave will be displayed if localizable.



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. Otherwise this extremely unlikely error can be corrected by customer service only.

Cut-Out 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 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), the diagnostic relay will also Cut-Out and the same information „EM.CUT!“ 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 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.

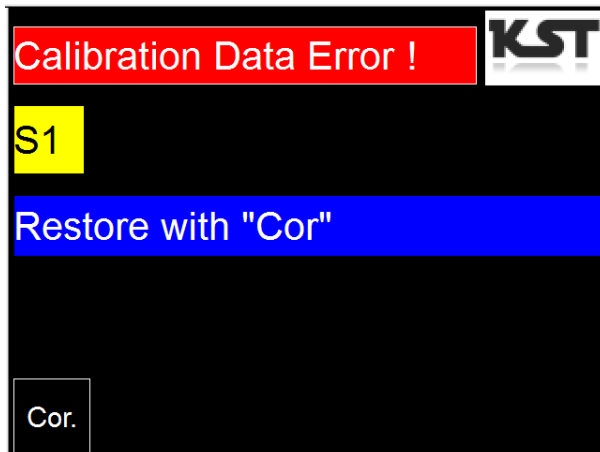


It is crucial to check the Cut-Out circuits to detect the reason why standard Cut-Out by the Cut-Out relay failed.

Discrepancy Error of Sensor Calibration Data

The system continuously detects the relevance of the balanced and stored data, even a relevance error is far from likely.

In case such a discrepancy has been detected, the diagnostic relay will be deactivated and the display will change to error information for the respective sensor.



The system may possibly re-construct the data by pressing key F1 "Cor."

If re-constructing was successful, the load will be determined and displayed on the basis of re-constructed data.

After confirmation that the displayed load of the respective hoist is correct, the re-constructed data will be used as valid, the diagnostic relay will be activated and the display will return to the standard display

If data are not obtainable by re-constructing or the displayed load is incorrect (key „NO“) and the error remains, use key F2 "Cal." To return to the calibration menu after entering the password.

If calibration data of other sensors are also corrupted, the routine will turn to this automatically.

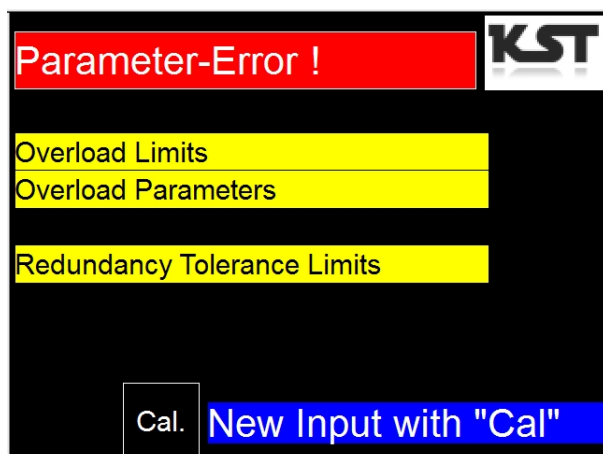


Any confirmation that the displayed load is correct, after data re-constructing is only permitted to authorized personnel !Any responsibility remains with the user.

Discrepancy of Cut-Out Data

The system continuously checks the relevance of the entered and stored Cut-Out threshold and switching parameters, even if a relevance error is far from likely.

In case such a discrepancy has been detected, the diagnostic relay will Cut-Out and the display will change to the corresponding error display



All data showing a discrepancy will be indicated.

Key F2 „Cal.“ will change the display to enter the password and to enter the values again or to confirm.

Note: Even if the parameters are shown correctly, they must be confirmed.



Important:

Entering of values requires to actuate key F3 „UP“ or F4 „DOWN“ at least once to apply the indicated values..

Diagnostic-Output Error

HBC-2 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 HBC-2 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.

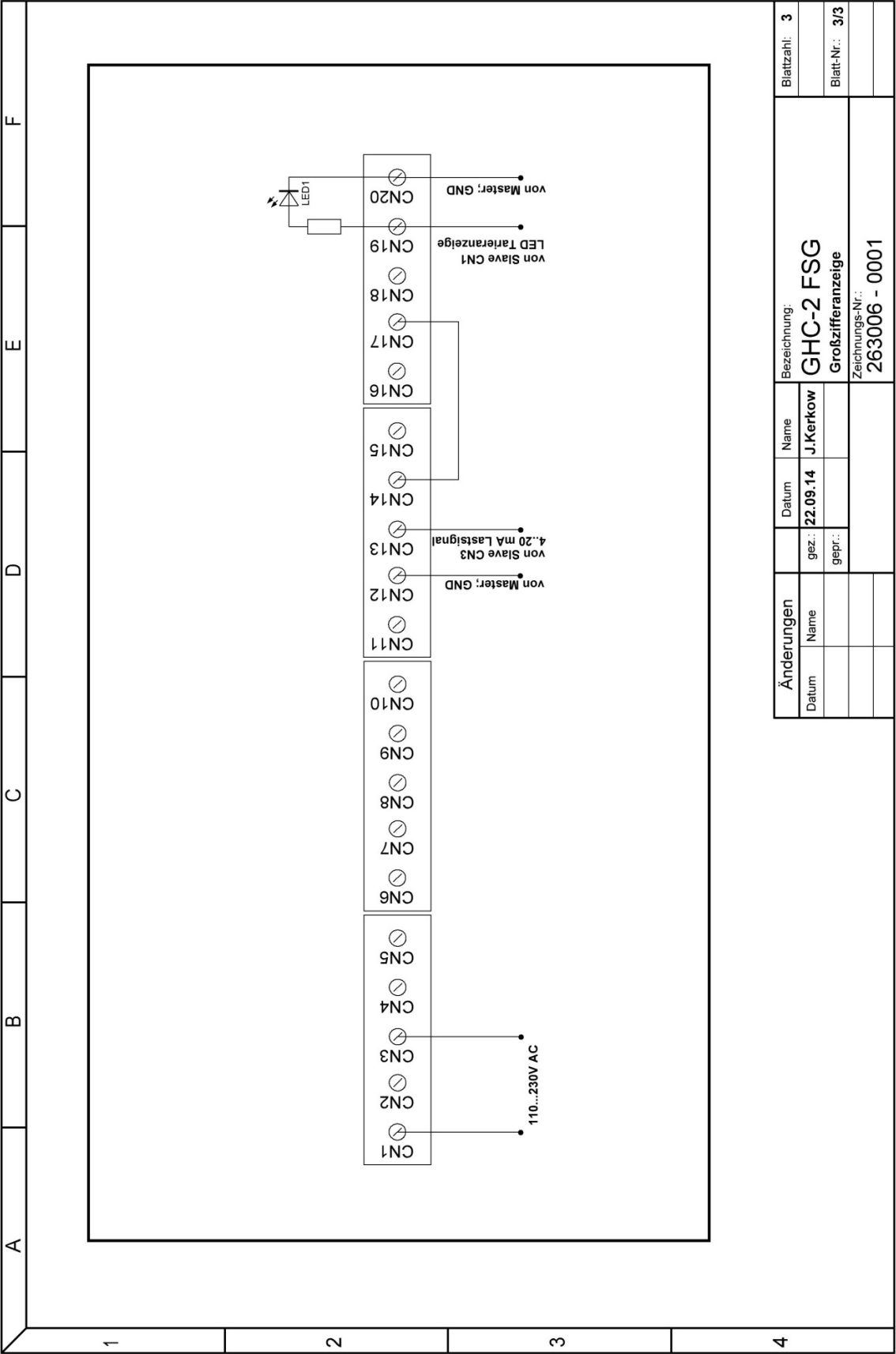


Weekly Inspection

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



Appendix A: Circuit Diagram Large Digit Display (optional)



NOTICES:_____.

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