User manual

18.8.2009

Firmware V1.1

2012KCI

Weighing display

Nokeval

INTRODUCTION

2012KCI is an input card specially designed for Konecranes. It can be placed in any of Nokeval F series large displays, like 1000F4.

The card provides two 2-8 V analog input channels. The upper end of these can be scaled freely and independently on each channel. Optionally the input card can be companioned with another input card, forming a third analog input.

The channels can be tared with a digital input. There is also one digital input that can be used to show "Flt" in the display.

A sling select switch position can be indicated with 16 freely programmable display texts. The switch is read via four digital inputs. Whenever the sling switch position is changed, the corresponding text is displayed for a while.

Each input can be enabled or disabled by a digital input, and the sum of the enabled inputs is displayed.

The display unit can be equipped with a serial communications card, providing a RS-232 and a RS-485 port. Nokeval SCL and Modbus RTU protocols are supported. The card allows reading the analog and digital inputs. If configured so, 2012KCI does not update its display at all but allows the display to be controlled over the serial bus.

The wide power supply range 41...265 VAC will cover most applications, making ordering simpler.

Table of contents

Quick set-up

For a quick set-up, the minimum set of information can be obtained from sections:

- Supply voltage and earthing on page 7
- Signal connections on page 8
- Quick configuration menu on page 12

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ORDERING

Ordering

Example: 1000F4–2012KCI–RS–DI8–48/230VAC

The order code consists of several parts. The first part describes the large display type, the next parts define the card types (up to three cards), and the last part describes the supply voltage.

Large display type

Nokeval has four cases for large field displays. These are:

575 Five 57 mm digits, plastic enclosure
1000 Three to four 100 mm digits, steel
1100 Five to six 100 mm digits, steel
1800 Three to five 180 mm digits, steel

The letter F after the case size tells the type of the internal electronics.

The number after the letter F defines the number of display digits.

Input card type

These large displays use Nokeval 2000 series input cards. A custom input card 2012KCI has been designed for KCI. (In addition, two older cards 2011KCI and 2211KCI have been used.)

Other cards

2000-DI8 card provides eight digital inputs. They are used to select input channel to be displayed, to tare the inputs, and to read the sling switch. In the order code, this card is expressed as "-DI8-" only.

2000RS is a serial communications card, allowing RS-232 and RS-485 communication with the display unit. In the order code, it is expressed "-RS-".

If three analog inputs are desired, the display unit can be equipped with two 2012KCI cards. The order code is then 1000F4-2012KCI-2012KCI-DI8-230VAC for example.

Power supply options

The large field displays are available with two power supply options:

Name	Voltages
-24VDC	24 ±15% VDC or VAC
-48/230VAC	41...265 VDC or VAC

In some cases the internal electronics unit is not capable of powering the large digits. In this case, there is an auxiliary power supply fitted inside the case. This does not affect the order code.

Most common models

1000F4-2012KCI-RS-DI8-48/230VAC: four 100mm digits, 2 inputs, serial comms, digital inputs, power 48 to 230 VAC.

1000F4-2012KCI-2012KCI-DI8-48/230VAC: four digits, 3 inputs, digital inputs, power 48 to 230 VAC.

Spare parts ordering

Spare input card:
2012KCI-IN

Spare electronics unit including input card:
SP-EL2012KCI-RS-DI8-48/230VAC (or whichever supply and cards)

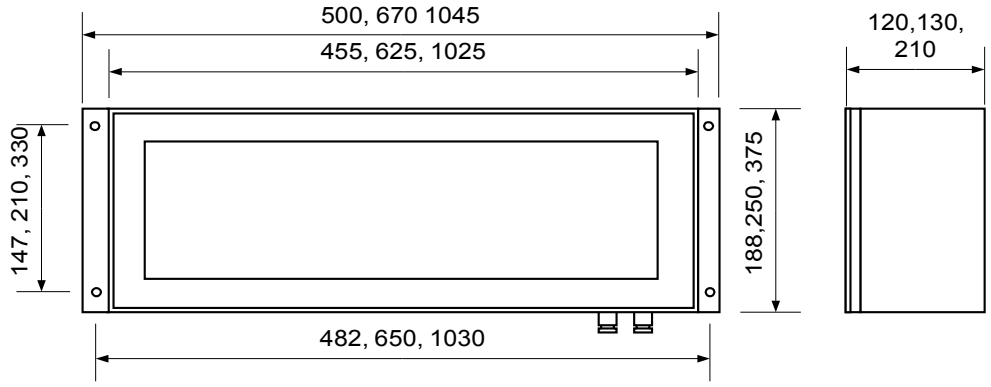
Spare ribbon cable from el unit to large digits:
SP-CA-EL1000F

Spare large digit:
SP-100DISP (100 mm digit)

INSTALLING

Mounting

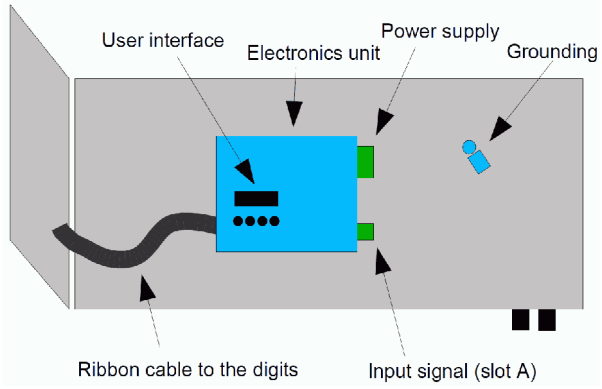
Dimensions for 1000F, 1100F, and 1800F:

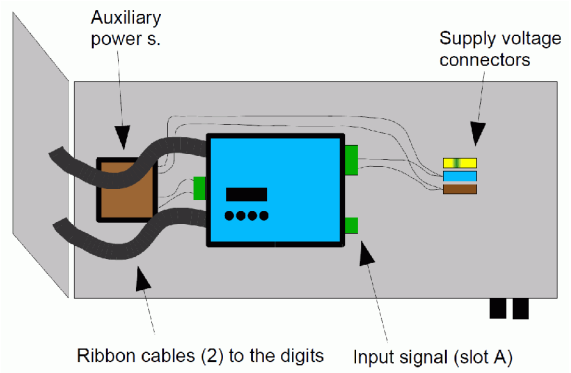


Opening the case

To access the electrical connections and the small user interface used for configuring the unit, the steel case has to be opened. First unscrew all the screws surrounding the display, then lift off the black steel frame and the red plexiglass. Finally unscrew the screw that is located on the right hand side of the rightmost digit. Now the display assembly may be turned away on its hinges.

Inside the main case





The left picture shows the parts in models with no auxiliary power supply, while the right picture shows with an auxiliary power supply.

The electronics unit

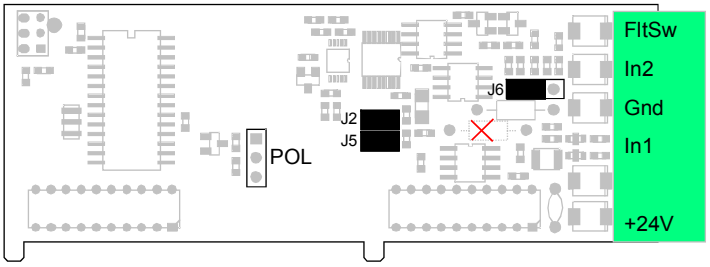
The electronics unit may be opened or detached from the case. To open it, unscrew the four M3 screws that are holding the cover on its corners. If the unit has to be detached, unscrew the other screws on its top and bottom sides. Normally there is no need to open the electronics unit. **Caution! Opening the electronics unit exposes parts carrying lethal voltages on units powered with more than 24 V supply!**

Jumpers

All the jumpers are factory set to serve most of the installation situations and normally need no attention.

2012KCI

The input card 2012KCI jumpers are factory set. However their correct position is shown in the picture:



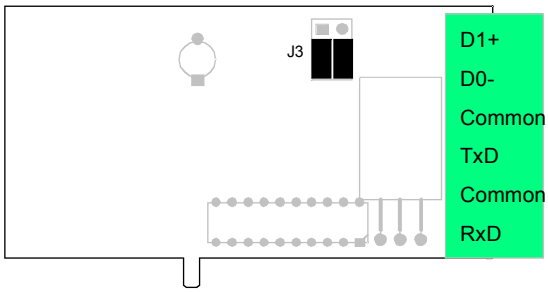
2000-DI8

The digital input card 2000-DI8 does not have any jumpers.

2000-RS

The serial communications card 2000-RS has jumpers for RS-485 bus termination and fail-safing. The factory default is no termination, no fail-safe, which is usable in most situations. Only if the RS-485 bus is longer than 50 m, the termination should be engaged.

2000-RS



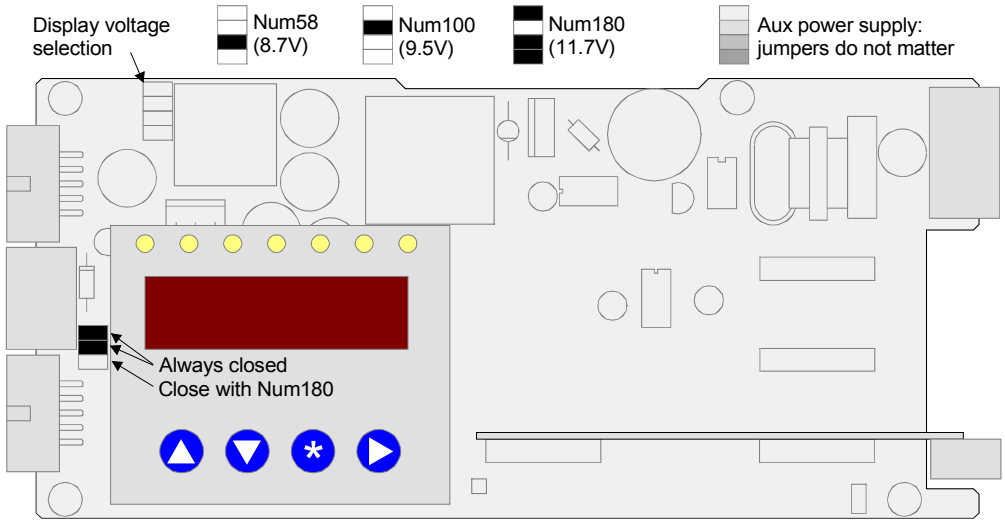

No term, no failsafe. Middle of the bus devices.


Term, no failsafe. Last device on the bus.

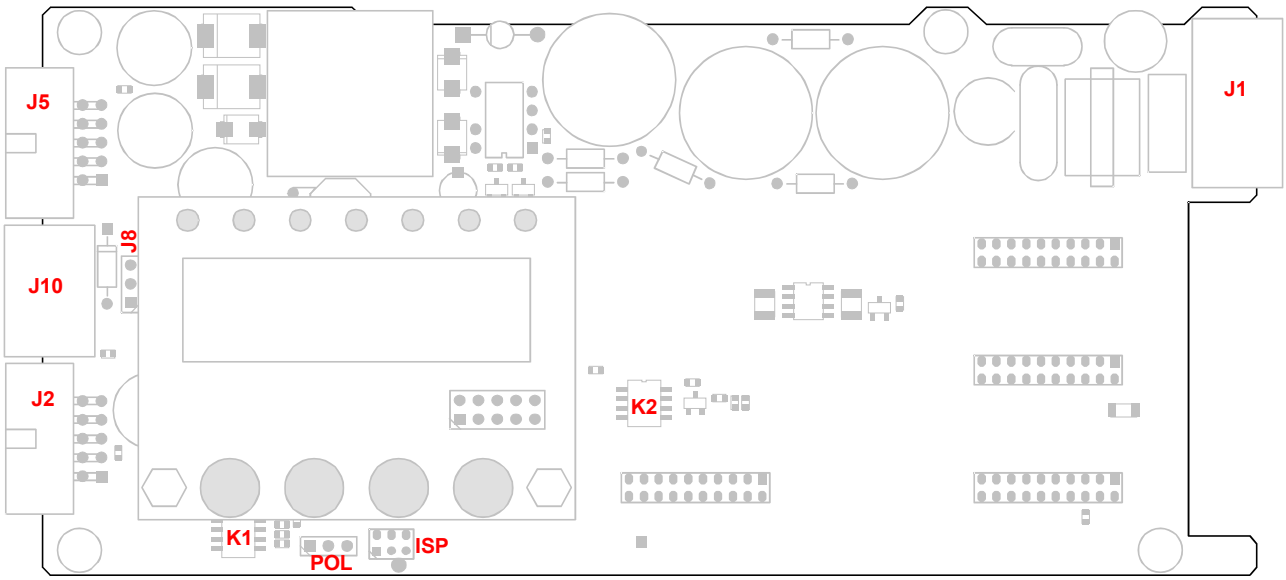

Term and FS. Last device on the bus, if there is no other fail-safes.

1000FBAS24 V1.0 (24VDC models)

The electronics unit base card has jumpers for large display voltage selection. They are factory set but still illustrated here.



1000FBAS230 V1.1 (48/230V models after June 2009)



The DIP switch positions, read from top downwards. K2.2 means the second switch of K2.

Display type	K1	K2.2
575F (8.5V)	ON-ON-ON-OFF	OFF
1000F, 1100F (9.5V)	ON-OFF-OFF-ON	OFF
1800F (12V)	OFF-ON-ON-ON	ON

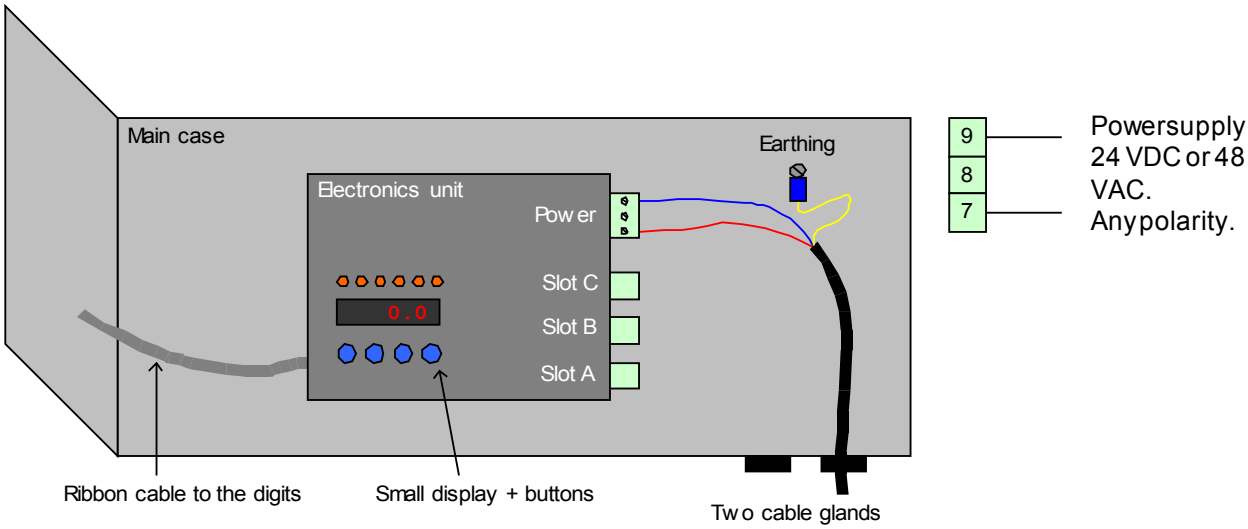
K2.3 and K2.4 should always be ON.

1000FBAS230 V1.1 does not require an auxiliary power supply even at 1800F6.

The middle pins of the microcontroller programming connector ”ISP” have to be shorted with a 2mm jumper.

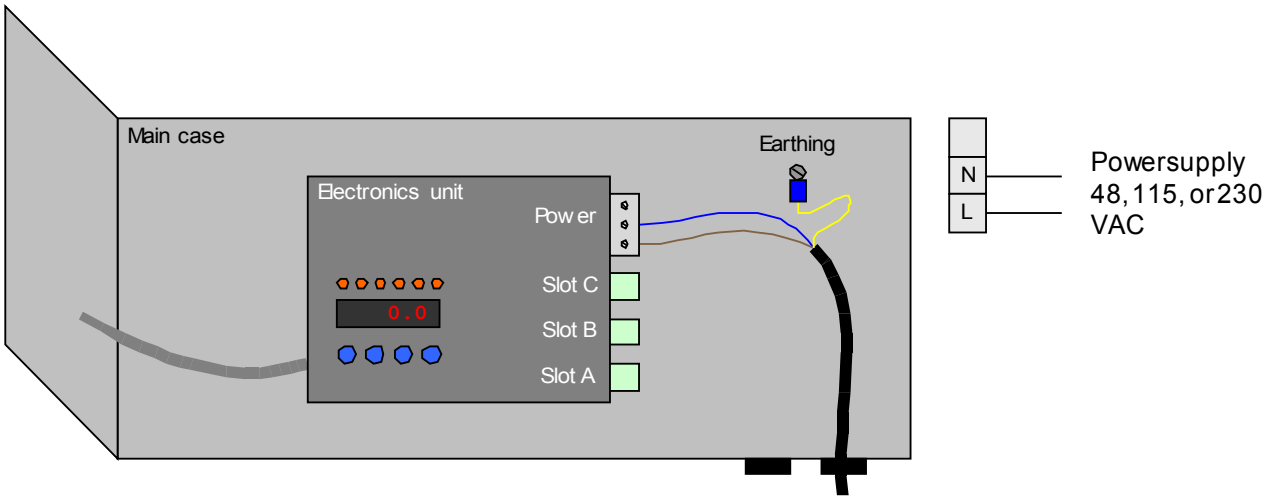
Supply voltage and earthing

24VDC model



Bring the supply voltage to the connector indicated in the picture. It is recommended to earth the enclosure using the M4 screw provided for additional protection against disturbances. A pre-fuse is not necessary, but if one is used, it should be at least 2 AT.

48/230VAC model

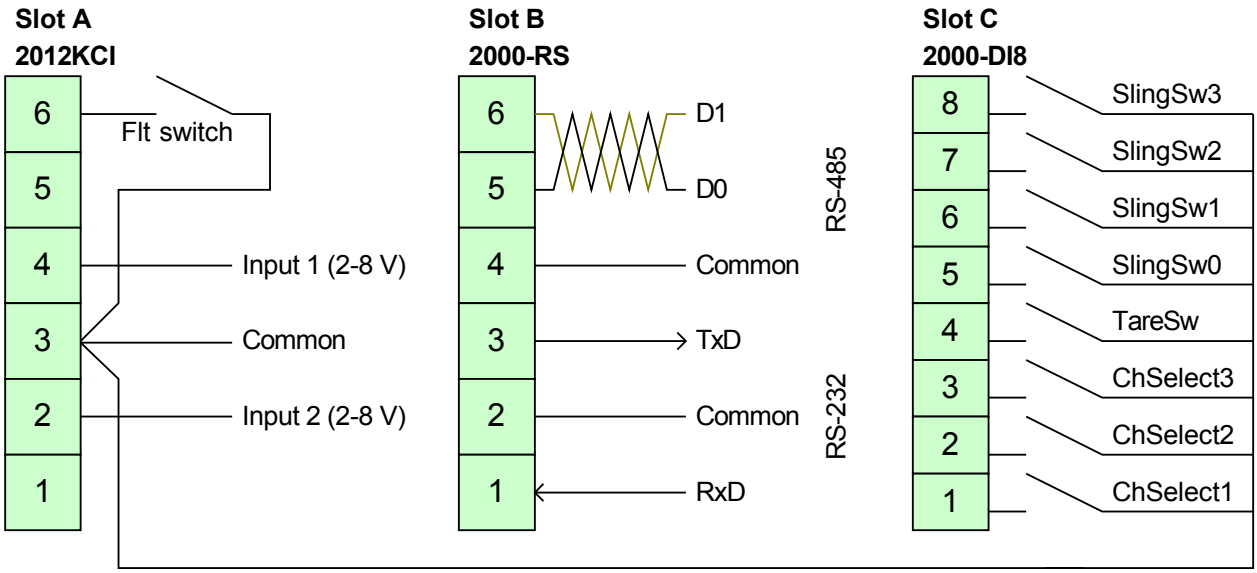


Bring the Live and Neutral wires to the electronics unit as in picture. A pre-fuse is not necessary, but if one is used, it should be at least 1 AT.

Connect the Protective Earth wire to the M4 screw using the Faston connector provided - a Faston crimping tool is needed.

For electrical safety, the power and signal wires must be fastened using cable ties or equivalent so that if one signal wire is detached, it can not touch any of the power supply wires, or vice versa.

Signal connections



2012KCI

The 2-8 V analog signals are connected in slot A terminals 4 (channel 1) and 2 (channel 2). The negative wire is connected in terminal 3 (common).

The third analog input is connected in slot B terminals 4 (signal) and 3 (common), if the unit is equipped with two 2012KCI cards.

Serial communications

The RS-485 bus is connected in slot B terminals 6 (D1 or + or Nokeval A), 5 (D0 or – or Nokeval B), and 4 (common), if equipped with a serial communications card. See also jumpers above. The D1 and D0 should be of a twisted pair, while the common wire may be anything. The cable should be shielded and the shield earthed at one end only.

Digital inputs

The digital input card is usually in slot C. The lowest terminal (nearest to the bottom of the main case) is 1. The digital inputs have the following usage:

Terminal	Name	Description
C1	ChSelect1	Enables channel 1 to be calculated in the sum displayed. Works in Multi mode only.
C2	ChSelect2	Enables channel 2 to be calculated in the sum displayed.
C3	ChSelect3	Enables channel 3 to be calculated in the sum displayed.
C4	TareSw	Tares the inputs. Requires that configuration setting Inputs\TareEnable is switched on.
C5	SlingSw0	Lowest bit of the sling select switch.
C6	SlingSw1	...
C7	SlingSw2	...
C8	SlingSw3	Highest bit of the sling select switch.

These are active low inputs, suitable for NPN type outputs or relay or switch contacts. The display unit pulls them to 5 V, and detects if they are externally pulled to 0 V. The negative/common end of the switches is connected in 2012KCI card terminal 3.

Moreover, the 2012KCI card in slot A has one digital input: terminals 6 (signal) and 3 (common). Activating it will make the display to show "Flt" instead of the weighing readings.

Configuring

The display unit may be configured either on the small display and buttons inside the main case, or via a serial bus if equipped with a serial communications card. It is also possible to attach a programming cable to the input card.

Inside buttons

Open the main case as explained above. Use the small display and four buttons to configure the display unit. Using the buttons is explained in chapter User interface.

Via serial bus

If the display unit is equipped with a serial communications card, the configuration may be done via the RS-232 or 485 bus. If the unit is configured for Nokeval SCL protocol, then MekuWin software is needed, available for Microsoft Windows. Select the same protocol, baud rate and address in both MekuWin and the display unit.

If the unit is configured for Modbus protocol, then the configuration may be changed using Modbus Holding register functions, or alternatively with Mekuwin again.

Via a programming cable

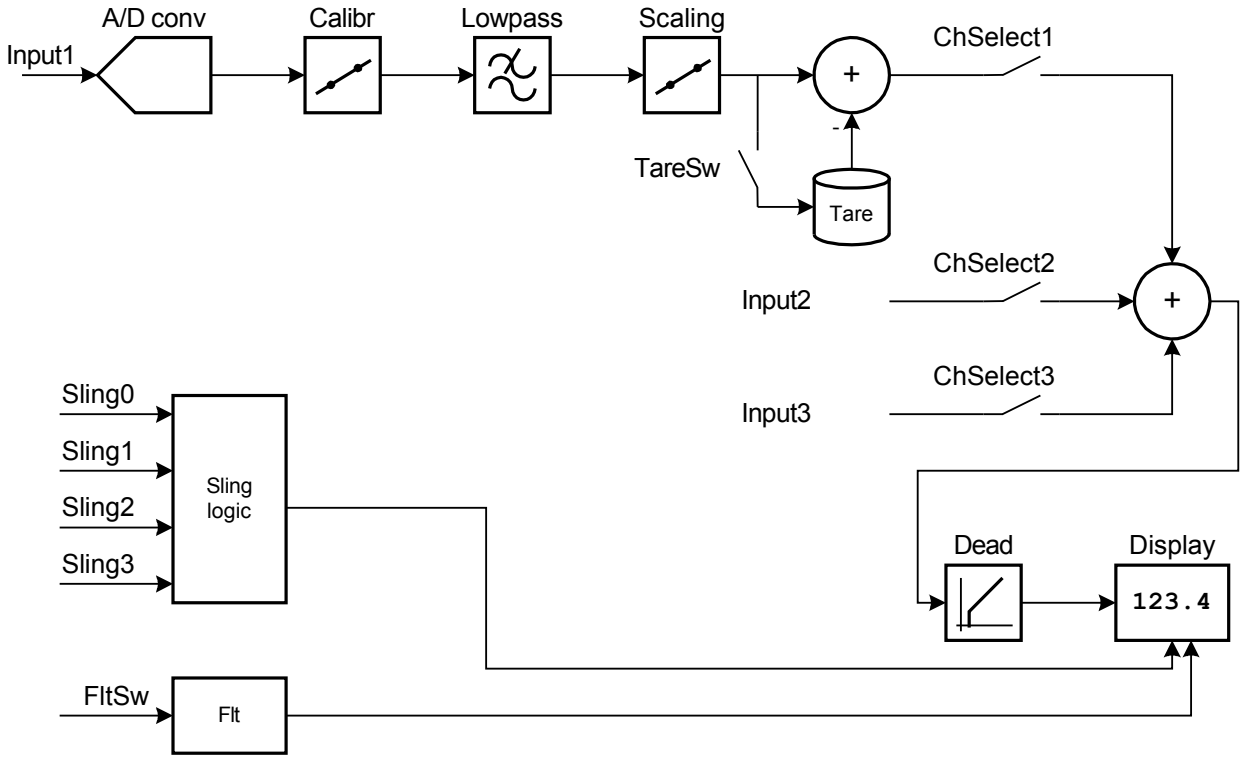
If the display unit is not equipped with a serial communications card, a programming cable may be used. The cable is attaced to a pin header marked "POL" on the input card in slot A. To access it, both the main case and the electronics unit cover have to be opened. **Removing the electronics unit cover exposes parts carrying lethal voltages on units with supply voltage more than 24 volts!**

Nokeval provides two alternative programming cables: "POL-RS232" for RS-232 port, and "DCS772" for USB port.

In addition, an adapter for the pin header, called "POL-3PIN", is required.

A free software MekuWin is used. Select SCL protocol, 9600 baud, and address 0 or 126.

OPERATION



Input processing

The two or three inputs are measured using an analog-to-digital converter. The reading is scaled to 0…1 using factory adjusted calibration values so that 0 corresponds to the lowest input signal 2 V and 1 corresponds to 8 V. This reading is lowpass filtered on each channel independently if the lowpass filter is enabled in the Conf menu Inputs/Lopass. The lowpass filter reduces noise and fast fluctuations, and should be used only if these are visible. The filter is bypassed for a couple of seconds after power-up.

The reading is then multiplied by a user-settable (Inputs/Hi1 to Hi3) coefficient to get the "engineering reading" in desired units, which may be kg, tons, lbs or any.

If the taring function is enabled (Inputs/Tare-Enable), the Tare value is subtracted from the reading. The current non-tared reading can be copied to be the tare value by using digital input C4 on a digital input card 2000-DI8. Minimum pulse width needed is 100 ms, and the taring is performed only once after the digital input is activated – keeping the input active will not cause successive tarings. The tare value is stored in an EEPROM memory and will be retained even if power supply is cut off. Every input channel has independent tare value memory.

Display

There is three display modes to select of. In "Single" mode, only input channel 1 reading is displayed. This mode is used when only one input is used.

In "Multi" mode, three digital inputs are used to select one or more channels: the sum of the selected channels is calculated and this sum is displayed. The selection is done via digital inputs C1…C3 located on the optional 2000-DI8 card. If none of the channel select inputs is active, the NoChs setting in the configuration menu defines what is displayed.

In "Remote" mode, the display may be controlled via an RS-232 or RS-485 bus (a serial communications card 2000RS is required). There is a safety timer: if the display is not remotely updated every 10 seconds, dots will be displayed: ".....".

The Dead function may be used to round the display reading to zero when the actual reading goes below a user-selected threshold.

Sling

The position of the sling switch may be wired to this display with four digital lines. These form a four-bit word, allowing 16 different positions. There is possible to program a text corresponding each position. After power-up and every time the switch position is changed, the associated sling text is displayed for a user-selectable time 0 to 10 seconds. Using the sling requires the digital input card 2000-DI8, using its terminals 4…7.

The sling position inputs are "debounced" as a group: the new position is accepted when all the four lines have retained the same state at least 80 ms.

Flt switch

The input card 2012KCI has one digital input. Closing a switch connected to it will make the display to show "Flt" (except in Remote state).

Serial communications

The RS-232 and RS-485 serial ports allow controlling the display, reading the analog inputs, reading the digital inputs, and changing the configuration settings.

USER INTERFACE

This chapter describes how to use the small display and buttons inside the display unit to perform configuration. The contents of the configuration menu is described in chapter Configuration menu.

The small display inside the case and the large display always show the same contents, except that the large display may have less than 6 digits and then the end of the message may be cropped off.

The displays may be in the following states:

- Normal state – displaying the readings (or controlled externally via the serial bus).
- Configuration state – changing the settings.
- Quick configuration state – changing the most primary settings.
- Monitor state – displaying the readings and other variable data for troubleshooting.
- Card type programming state – for experts only.

Normal state

After power-up, the unit is in the normal state, displaying the input readings according to the configuration and the digital inputs.

The small indicator leds above the small display have the following meanings:

A1	A2	A3	A4	M1	M2	Conf
Input 1 enable	Input 2 enable	Input 3 enable	Tare switch	Serial Rx	Serial Tx	Configuration
Indicate the states of the digital inputs 1 to 3 on the digital input card.			Indicates the state of the digital input 4.	Indicates that something happens on the serial bus.	Indicates that this unit has received a valid command and is replying to it.	Indicates that the displays are in the configuration or monitor state.

Quick configuration menu

Press ✱ until Mode is displayed to enter the quick configuration menu.

Select the item by using buttons ▲▼. To see or edit a value, push ▶. To edit the value, see the subsection Editing in the section Configuration state below. The items in the menu are:

- **Mode:** Select Single for a single-channel display, or Multi for a multi-channel display.
- **Hi 1:** First input channel scaling; the displayed reading at 8 V input.
- **Hi 2:** Second input channel scaling; visible only in Multi mode.
- **Dec:** How many digits to show after the decimal point.

To exit, push repeatedly ✱ until Save is displayed and then once more.

Configuration state

Entering

Press the ✱ and ▲ keys simultaneously two seconds in the normal state to enter the configuration state. When entered, the Conf led will light.

Navigating

The menu is organizated hierarchically. You can move within one menu using the ▲▼ keys and enter a submenu with the ▶ key. Returning from a submenu is done with the ✱ key. The menu

contents is described in chapter Configuration menu.

Editing

To see or edit a setting value, press ▶ key.

Most data types are edited simply with ▲▼ keys, finally exiting with ✱ key.

Floating point values, such as scaling and the lopass filter, are edited with ▲▼▶ keys: select digit to edit (blinking) with ▶ and change it with ▲▼. When the decimal point is blinking, it can be moved with ▲▼. The first digit can be replaced with a minus sign.

When editing a **string**, there are two modes: moving mode and editing mode. Button ▶ switces between these modes. In moving mode, ▲▼ can be used to move the cursor. The display may scroll when going beyond the ends, if the string is longer than the display. In editing mode, the character at the cursor can be changed with buttons ▲▼. Available are Ascii characters 32…94, and a terminating character, which is indicated as three stacked dashes '≡'. The string is ended with a terminating character. Space (Ascii 32) is indicated as underscore '_'. To exit, push ✱.

Exiting

When all settings are done, exit from the configuration menu with ✱ key. Two options are shown: Save to keep the settings made, and Undo, to discard all changes. Select ▲▼ Save or Undo and push ✱. Or push ▶ to get back to the menu.

Monitor state

Monitoring can be used to examine some internal readings. The built-in monitoring is started by pressing ✱ and ▼ together. Select the item using ▲▼ keys, and finally exit with ✱.

The last item is **Diag**, that can be used to see diagnostic messages. Push ▶. If nothing happens, then there are no messages. If happens, try ▲▼ to see if there are several messages. Exit with ✱.

The possible diagnostic messages are:

- **AD Error**: A/D converter is not working. Needs service.

Card type programming

Each of the supported card types has one byte stored in its EEPROM chip so that the microcontroller can recognize the card. These bytes are factory set and should need no attention. However the method to check and edit the byte is shown.

In the normal state, press ▲▼▶ together. CTYP A should appear in the display. Select ▲▼ the slot where the card lies, and push ▶. Check that the byte value corresponds to the card type according to the table, and if not, edit the value. Exit with ✱.

2012	33
2000-RS	17
2000-DI8	53
2000-BCD	52

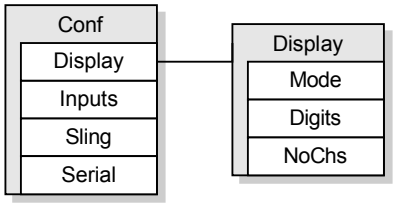
CONFIGURATION MENU

This chapter describes the contents of the configuration menu. How to access the menu using the small display and buttons inside the case, see chapter User interface. How to access them using the Mekuwin software, see Mekuwin user manual.

The configuration menu is divided into four submenus, one for the display, one for the analog inputs, one for the sling display, and one for the serial communications. How these blocks operate, see chapter Operation.

For scaling the inputs only, a Quick configuration menu can be used, see chapter User interface, section Quick configuration menu.

Display submenu



Mode

Defines how the display behaves in the normal state. There are three options:

- Single: The display shows input 1 reading and does not care about the channel select digital inputs. This mode is used when there is only one input signal connected.
- Multi: The display shows the sum of the selected channels. The selection is made via three digital inputs on the 2000-DI8 card.
- Remote: The display is controlled via a serial bus. If the display contents is not updated within 10 seconds via the serial bus, points are displayed "....".

Digits

The number of digits in the large display. Selectable between 3 and 6.

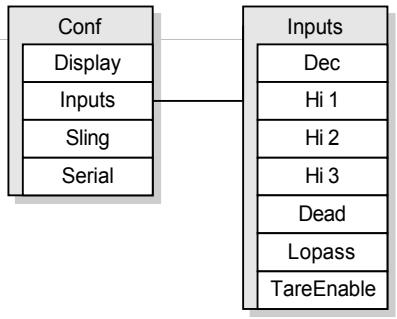
NoChs

What is displayed in Multi mode when no channels are active. This setting is visible only when Mode=Multi.

- Zero: Displays the sum of the selected channels, which is always zero.
- Dot: One decimal point is displayed, otherwise the display is empty.
- Dashes: "- - - -" is displayed.
- Blank: The display is totally blank.

Inputs submenu

Dec



Defines how many digits after the decimal point should be displayed. If set negative, the corresponding number of digits before the decimal points is rounded to zero.

The table below shows how a reading of 123.45678 is displayed on various Dec values:

Dec	Display	Notes
-3	0	Rounded to nearest 1000
-2	100	Rounded to nearest 100
-1	120	Rounded to nearest 10
0	123	Integer
1	123.5	One digit after point
2	123.46	
3	123.457	

Hi1, Hi2, Hi3

Scalings for the analog inputs. When the input signal is at its maximum (8 volts), the reading for the input 1 is Hi1. This may be expressed in any units: kg, lbs, ton…

If the Display Mode is set to Single, only Hi 1 is shown. Hi 3 is shown only when there is two 2012 cards installed.

Dead

Dead zone around zero. Smaller readings than Dead are rounded to zero on the display. If Dead=0, negative readings are prevented. If Dead is set negative, the function is disabled and all readings are shown as are.

Lopass

Third-order lowpass filter for the inputs. Removes noise and disturbances from the reading. Set the time constant (63% of step change) in seconds. Set to 0 to disable.

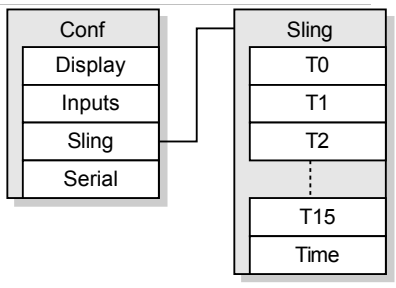
TareEnable

Defines if the tare function is used or not. If switched on, the inputs may be tared by giving a pulse in the digital input 4 on the 2000-DI8 card. 2012KCI will then store the readings of the three inputs to a non-volatile tare memory and subtract those readings from all readings after that.

Sling

The Sling menu is visible only when a 2000-DI8 card is installed.

T0…T15



Texts associated to the different sling switch positions. The four digital inputs are considered as a 4-bit binary word (not Gray coded) forming a value of 0…15, and these correspond to texts 0…15.

T0 is displayed when all the digital inputs are non-active. T1 is displayed when the lowest input is active (terminal C4), T2 when the second lowest is active, etc.

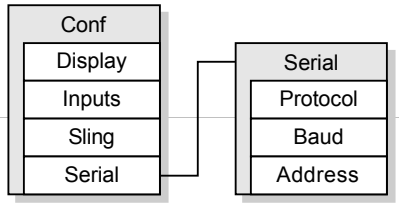
The texts may be up to 8 characters. It is recommended to edit them using a serial connection and PC software, although it is possible to edit them using the pushbuttons, requiring a person with good nerves.

Time

When the switch position is changed, the corresponding sling text is displayed for a while. The text is also displayed after power-up. The display time is defined by Time setting in the Sling submenu. Adjustable 0…10 seconds. If the sling display is not desired at all, set Time to 0.

Serial

Serial communications setup. Visible only if a 2000-RS card is installed.



Protocol

Available protocols: Nokeval SCL, Modbus RTU, and Ascii. These are described in the chapters of their own.

Baud

Available baud rates:

- 1200
- 2400
- 4800
- 9600
- 19200
- 38400
- 57600

Address

Slave address of this device. On SCL, use addresses 0…123. This device will always respond in address 126 too.

On Modbus, use 1…247.

SCL PROTOCOL

SCL is a protocol used in Nokeval products. The commands and responses are in a human-readable text format, but the frames are formed using non-readable bytes.

SCL uses always 8 data bits, none parity, and 1 stop bit. A more detailed description of the Nokeval SCL protocol can be downloaded from the Nokeval WWW site.

Commands

TYPE ?

Returns the model name and software version ”2012KCI V1.1” without the quotation marks.

SN ?

Returns the serial number, e.g. ”A123456”.

MEA CH 1 ?

Returns the scaled reading of input 1. All the registers can be read this way. The response consists of characters -.0123456789. The scientific notation (e.g. 1E3) is not used.

The reading is represented with five significant digits (except negative readings with four), e.g. pi would be represented ”3.1416”.

The channels are:

Ch	Description
1	Analog input 1 scaled reading
2	Analog input 2
3	Analog input 3
4	Sum of the channels selected with the digital inputs

MEA SCAN 1 4

Returns the readings on channels 1…4 separated by one space. See MEA CH for channels and data representation.

DI CH 1 ?

Returns the state of the digital input 1: "0" if not active, "1" if active. The digital inputs are numbered:

Ch	Terminal	Description
1	C1	Channel 1 select
2	C2	Channel 2 select
3	C3	Channel 3 select
4	C4	Tare switch
5	C5	Sling 0
6	C6	Sling 1
7	C7	Sling 2
8	C8	Sling 3
9	A6	Flt switch

In the remote mode, the digital inputs may be used for any purpose. If the 2000-DI8 card is not installed, then only digital input 9 (Flt) is available.

DI SCAN 1 9

Returns the states of the digital inputs 1 to 9 separated by one space, e.g. "1 0 0 0 1 0 1 0 0".

DISP text

Displays any text. The display unit must be in the remote mode. The string is displayed starting from the leftmost digit. If less characters are sent that there is in the large display, the rest of the display is blanked. If more is sent, the extra characters are abandoned.

A dot and a comma are "adopted" to the previous character where possible; e.g. "DISP 1.2" will use only 2 digit positions on the large display because the dot will be presented on the same digit position as number 1.

To know how many digits there is in the large display, you may use command DISPMODE ?.

OUT CH 1 value

Displays a numeric value. The display unit must be in the remote mode. The value is first interpreted as a 32-bit floating point value, and then

reformatted to the display right-aligned and using the number of decimals that is selected in the configuration menu Inputs/Dec. This is usable if the remote device does not want to bother with formatting its reading to be displayable.

DISPMODE mode

Selects the display mode. This is the same as the setting Display/Mode in the configuration mode. Changing the mode with this command affects immediately, but the change will not be saved in EEPROM and is not retained if power is cut off. The modes available are:

M	Description
0	Single – input channel 1 always displayed
1	Multi – sum of channels selected by the digital inputs are displayed
2	Remote – the display may be controlled remotely with DISP or OUT CH 1 commands

DISPMODE ?

Returns the selected display mode as a number and the number of digits on the large display separated by one space. The response may be e.g. "1 4" for Multi mode and four digits.

MN xxxxx

Commands used by the Mekuwin configuration software.

MODBUS PROTOCOL

Supported commands:

- **2 Read Discrete Inputs:** reading the digital inputs.
- **3 Read Holding Registers:** reading the configuration settings.
- **4 Read Input Registers:** reading the readings.
- **6 Write Single Register:** changing the configuration settings.
- **16 Write Multiple registers:** changing the settings.
- **17 Report Slave ID:** checking the device type.
- **109 Meku:** Mekuwin configuration software uses this.

This transmitter uses always even parity (8E1). Serial bus address may be selected 1…247.

When the settings are changed by writing a Holding register, the settings are stored to the non-voltatile EEPROM memory immediately.

The maximum Modbus frame length is 100 bytes. This sets the limit to the number of registers accessed with commands 3 and 16.

The command 17 will return 0x11 <byte count> 0x00 0xFF, followed with ”2012KCI V1.1 A123456”, for example.

When the serial connection settings are changed, the changes do not affect until the transmitter is powered down. This is to prevent breaking the connection while making the changes.

Data types

- BOOL: Off/on setting. 0=False, 1=True in the lower (rightmost) byte.
- BYTE: One byte setting. Only the lower (rightmost) byte of the Modbus register is used.
- WORD: 16-bit setting.
- ENUM: Option list setting. The options listed in section Enum tables.
- FLOAT: 32-bit floating point number IEEE 754. Least significant word first (LSWF, little-endian).
- STRINGZ: Zero-terminated string. The terminating character may be missing when the whole space is used for characters.

Within one Modbus register, the data is represented the most significant byte first (MSBF, big-endian).

Holding registers

Register	Name	Type	Values
0..3	Remote display control	STRINGZ	Len=8
10..11	Remote display control	FLOAT	
2000	Conf\Display\Mode	ENUM	See table E1
2001	Conf\Display\Digits	BYTE	Unsigned 3...6
2002	Conf\Display\NoChs	ENUM	See table E2
2003	Conf\Inputs\Dec	BYTE	Signed -4...5
2004..2005	Conf\Inputs\Hi 1	FLOAT	Signed
2006..2007	Conf\Inputs\Hi 2	FLOAT	Signed
2008..2009	Conf\Inputs\Hi 3	FLOAT	Signed
2010..2011	Conf\Inputs\Dead	FLOAT	Signed
2012..2013	Conf\Inputs\Lopass	FLOAT	Unsigned
2014	Conf\Inputs\TareEnable	BOOL	
2015..2018	Conf\Sling\T0	STRINGZ	Len=8
2019..2022	Conf\Sling\T1	STRINGZ	Len=8
2023..2026	Conf\Sling\T2	STRINGZ	Len=8
2027..2030	Conf\Sling\T3	STRINGZ	Len=8
2031..2034	Conf\Sling\T4	STRINGZ	Len=8
2035..2038	Conf\Sling\T5	STRINGZ	Len=8
2039..2042	Conf\Sling\T6	STRINGZ	Len=8
2043..2046	Conf\Sling\T7	STRINGZ	Len=8
2047..2050	Conf\Sling\T8	STRINGZ	Len=8

2051..2054	Conf\Sling\T9	STRINGZ	Len=8
2055..2058	Conf\Sling\T10	STRINGZ	Len=8
2059..2062	Conf\Sling\T11	STRINGZ	Len=8
2063..2066	Conf\Sling\T12	STRINGZ	Len=8
2067..2070	Conf\Sling\T13	STRINGZ	Len=8
2071..2074	Conf\Sling\T14	STRINGZ	Len=8
2075..2078	Conf\Sling\T15	STRINGZ	Len=8
2079	Conf\Sling\Time	BYTE	Unsigned 0...10
2080	Conf\Serial\Protocol	ENUM	See table E3
2081	Conf\Serial\Baud	ENUM	See table E4
2082	Conf\Serial\Address	BYTE	Unsigned 0...255

In the Remote mode, the display may be controlled by writing Ascii characters and a terminating zero byte to holding registers 0…3. Alternatively, by writing a floating point number to registers 10…11, 2012KCI will format the number to the display using the number of decimals selected in the configuration menu Inputs/Dec.

The input registers 0…11 are phantomed in holding registers 5000…5011 for applications that can not access the input registers.

Input registers

Register	Name	Type	Values
0..1	Mon\In1	FLOAT	Analog input 1 scaled reading
2..3	Mon\In2	FLOAT	Analog input 2
4..5	Mon\In3	FLOAT	Analog input 3
6..7	Mon\Sum	FLOAT	Sum of the channels selected by the digital inputs
8	Mon\ChSelect	BYTE	Channel select digital inputs as a byte 0…7
9	Mon\TareSw	BOOL	Tare switch state 0…1
10	Mon\SlingSw	BYTE	Sling switch inputs as a byte 0…15
11	Mon\FltSw	BOOL	Flt switch state 0…1

Discrete input registers

Register	Name
0	ChSelect0
1	ChSelect1
2	ChSelect2
3	TareSw
4	SlingSw0
5	SlingSw1
6	SlingSw2
7	SlingSw3
8	FltSw

Enum explanations

Table E1

Value	Mode
0	Single
1	Multi
2	Remote

Table E2

Value	NoChs
0	Zero
1	Dot
2	Dashes
3	Blank

Table E3

Value	Protocol
0	SCL
1	Modbus
2	Ascii

Table E4

Value	Baud
0	1200
1	2400
2	4800
3	9600
4	19200
5	38400
6	57600

ASCII PROTOCOL

When the display unit has been configured to use the Ascii protocol (Conf\Serial\Protocol) and Remote mode (Conf\Display\Mode), the display can be controlled with simple Ascii messages. A 2000-RS card must be installed.

Send the desired display message as is, terminated with CR, LF, or both. The display unit will never respond.

The message is displayed in the 6-digit small display and also in the large display. If the large display has less than 6 digits, the first characters will not appear in the large display.

CALIBRATION MENU

The calibration menu is for factory calibration and settings, and should be accessed only when necessary.

To enter the calibration menu from the small display, press ▲▼✱ one second, until Conf is displayed. Select ^v Cal and push >. Enter code v>v^*v. SN should be displayed.

The menu can also be accessed with MekuWin.

Contents of the menu

- SN: Serial number of the device. Can not be altered by user. May not be factory-set.
- IN1: Submenu for input channel 1 calibration.
- IN2: Submenu for input channel 2 calibration.
- IN3: Submenu for input channel 3, requires two 2012 cards.
- IN4: Not used.
- Disptest: If enabled, the display will produce a test pattern (not until exit from the menu).

Calibrating the inputs

Recalibration is very seldom needed. If the measurement reading is significantly wrong, the problem is most often somewhere else, or the device is damaged.

In each submenu, there are two items, Lo and Hi. The Lo value should be 0.05…0.10 and the Hi value 0.25…0.35.

To recalibrate the low end, feed a precise 2.000 V voltage to the appropriate input, and give a Lock command for the Lo calibration item. With MekuWin, use the L button. With buttons, make sure that Lo is in display (not the value) and press and hold > and then press ^, and release them both. The new value is displayed. Check that it is within the limits. Exit with *.

To recalibrate the high end, feed 8.000 V and do the same for the Hi item. Finally exit and save.

SPECIFICATIONS

Analog inputs 2012KCl

Nominal signal	2 to 8 VDC
Measmt range	-1…11 V or wider
Calibr accuracy	±5 mV
Thermal drift	±1 mV/°C
Overvolt protect	±32 VDC/VAC line-to-line
Overvolt category	Not rated; analog and digital inputs must not be connected to a voltage more than 50 VAC or 120 VDC with respect to ground.
Max cable length	30 m
Sample rate	4 Hz each channel

Digital inputs 2000-DI8

Input type	Active low, internal pull-ups 10 kohm to 5 V
Active state range	0…2 V
Passive state range	4…32 VDC
Overvolt protect	±32 VDC/VAC
Max cable length	30 m
Isolation	Isolated from the power supply but shares a common ground with the analog inputs

Serial communications 2000-RS

Buses	RS-232 and RS-485
Protocols	Nokeval SCL, Modbus RTU, Ascii
Baud rates	1200, 2400, 4800, 9600, 19200, 38400, 57600
Parity	SCL: 8N1; Modbus: 8E1
Response time	<500 ms
Max cable length	RS-485: 1000 m; RS-232: 10 m
Overvolt protect	±15 V line-to-line; ±1 kV line-to-ground
Isolation	Isolated from the analog and digital inputs and the power supply

Power supplies

24VDC model

Nominal voltage	24 VDC
Voltage range	20…32 VDC or 20...28 VAC
Power	<15 W
Pre-fuse	≥2 AT; not required

48/230VAC model

Nominal voltage	48, 115, or 230 VAC
Voltage range	41…265 VAC or VDC
Frequency	45…65 Hz
Power	<25 W
Pre-fuse	≥1 AT; not required
Protection	Enclosure: Class 1, protective earth. Inputs: Class 2, reinforced insulation.

Enclosure

Dimensions	See chapter Installing
Protection	IP65

Regulations

EMC immunity EN 61326

ESD	61000-4-2, 4 kV contact, criterion B
EM field	61000-4-3, 10 V/m, criterion A; analog inputs may deflect 0.1% of range
Burst	61000-4-4, any port: 2 kV, criterion B
Surge	61000-4-5, power supply: 1 kV line-to-line, 2 kV line-to-ground, criterion A
	61000-4-5, signal ports: not applied (short-distance wires)
Conducted RF	61000-4-6, any port: 10 V, criterion A; analog inputs may deflect 0.1% of range

EMC emission EN 61326

RF emissions	CISPR 16 class A
AC mains	CISPR 16 class A

Electrical safety EN 61010-1