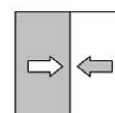




Operating manual

EA16

Measured value display
Component for installation of the panel



Masthead

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1 Safety guidelines

1.1 General



WARNING

This operating manual contains instructions fundamental to the installation, operation and maintenance of the device that must be observed unconditionally. It must be read by the assembler, operator and the specialized personnel in charge of the instrument before it is installed and put into operation.

This operating manual is an integral part of the product and therefore needs to be kept close to the instrument in a place that is accessible at all times to the responsible personnel.

The following sections, in particular instructions about the assembly, commissioning and maintenance, contain important information, non-observance of which could pose a threat to humans, animals, the environment and property.

The instrument described in these operating instructions is designed and manufactured in line with the state of the art and good engineering practice.

1.2 Personnel Qualification

The instrument may only be installed and commissioned by specialized personnel familiar with the installation, commissioning and operation of this product.

Specialized personnel are persons who can assess the work they have been assigned and recognize potential dangers by virtue of their specialized training, their skills and experience and their knowledge of the pertinent standards.

1.3 Risks due to Non-Observance of Safety Instructions

Non-observance of these safety instructions, the intended use of the device or the limit values given in the technical specifications can be hazardous or cause harm to persons, the environment or the plant itself.

The supplier of the equipment will not be liable for damage claims if this should happen.

1.4 Safety Instructions for the Operating Company and the Operator

The safety instructions governing correct operation of the instrument must be observed. The operating company must make them available to the installation, maintenance, inspection and operating personnel.

Dangers arising from electrical components, energy discharged by the medium, escaping medium and incorrect installation of the device must be eliminated. See the information in the applicable national and international regulations.

Please observe the information about certification and approvals in the Technical Data section.

1.5 Unauthorised Modification

Modifications of or other technical alterations to the instrument by the customer are not permitted. This also applies to replacement parts. Only the manufacturer is authorised to make any modifications or changes.

1.6 Inadmissible Modes of Operation

The operational safety of this instrument can only be guaranteed if it is used as intended. The instrument model must be suitable for the medium used in the system. The limit values given in the technical data may not be exceeded.

The manufacturer is not liable for damage resulting from improper or incorrect use.

1.7 Safe working practices for maintenance and installation work

The safety instructions given in this operating manual, any nationally applicable regulations on accident prevention and any of the operating company's internal work, operating and safety guidelines must be observed.

The operating company is responsible for ensuring that all required maintenance, inspection and installation work is carried out by qualified specialized personnel.

1.8 Pictogram explanation



DANGER

Type and source of danger

This indicates a **direct** dangerous situation that could lead to death or **serious injury** (highest danger level).

a) Avoid danger by observing the valid safety regulations.



WARNING

Type and source of danger

This indicates a **potentially** dangerous situation that could lead to death or **serious injury** (medium danger level).

a) Avoid danger by observing the valid safety regulations.



CAUTION

Type and source of danger

This indicates a **potentially** dangerous situation that could lead to slight or serious injury, damage or **environmental pollution** (low danger level).

a) Avoid danger by observing the valid safety regulations.



NOTICE

Note / advice

This indicates useful information of advice for efficient and smooth operation.

2 Product and functional description

2.1 Use as intended

The EA16 is a measuring value display unit for measuring transducers with output signals for current and voltage acc. to IEC 60381. Up to four measuring transducers in two or three-conductor versions can be connected.

Typical applications

- Measured value display in clean room

Important features

- 3.5" (8.9 cm) TFT Touch LCD colour display
- Configurable colour switching
- 2 or 4 channel mode with ...
 - 2 or 4 configurable analogue inputs for uniform signals (0/4 ... 20 mA, 0 ... 10 V) acc. to IEC 60381 (signal ranges can be selected freely within the limits; see Technical Data)
 - 2 or 4 configurable analogue outputs with possibility of characteristic curve spread and reversal with any offset
 - 2 or 4 configurable switching outputs with potential-free relay contacts or semiconductor switches
- USB interface
- Optional data logger function with data storage on Micro SD card
- Complete adjustment of all parameters and measuring point protocol⁽¹⁾ are possible via PC software

2.2 Function diagram

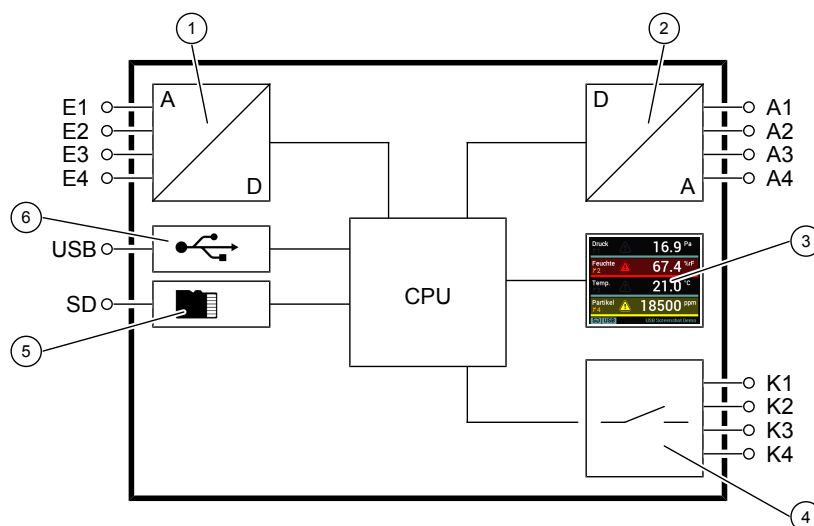


Illustration 1: Function diagram

1	Analogue inputs	2	Analogue outputs
3	Touch colour display	4	Switching outputs
5	Micro SD memory card	6	Micro USB interface

⁽¹⁾ Parameter profile

2.3 Design and mode of operation

The measuring signals of up to four connected measuring transducers can be analysed simultaneously by the microcontroller electronics. The configurable 3.5" touch display can display up to four measuring values at the same time. A configurable colour switch serves to present specific operating modes. Optionally, the device can be delivered with a data logger function.

The processed input signals are converted into the following output signals:

- 2 or 4 configurable switching outputs. Parameters, such as activation and deactivation points, switching function or delay, are available for this purpose. The switching states are displayed with symbols on the display.
- 2 or 4 analogue outputs with configurable output range. Every output signal can be set freely within the input range after taking the signal limits into account (see Technical Data). The characteristic curve change can be made in a linear, rooted, tabular or mathematic form proportional to the displayed value.

All parameters can also be set on the device via the touch display or (optionally) via a PC software. The measuring value display unit has a USB interface to which a USB stick can be connected for this purpose. For instance, the USB stick can be used to export configurations easily to other devices. With the PC software, a measuring point protocol⁽²⁾ is possible.

⁽²⁾ Parameter profile

3 Installation and assembly

The EA16 is designed for panel installation and is supplied fully assembled. Please see the supplied electro-technology documents for the dimensional drawings and information about the electrical connection of the panel. Panels can always be supplied in the following mounting types.

Wall-mounting

Via a recess in the wall in the clean room. The minimum installation depth is 49 mm. The panel is attached with sunk-head screws.

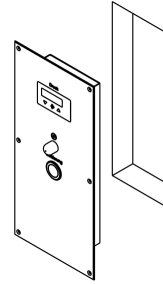


Illustration 2: Wall-mounting

Surface installation

Via surface-mounted housing on the wall of the clean room. The minimum installation depth is 52 mm. The panel is attached to the surface-mounted housing with sunk-head screws.

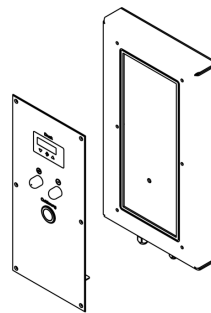


Illustration 3: Surface installation

Channel assembly

Via a cut-out in the channel. The minimum installation depth is 49 mm. The panel is attached with sunk-head screws.

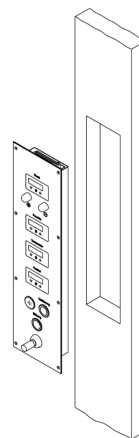


Illustration 4: Channel installation

4 Commissioning

4.1 General

All electrical supply, operating and measuring lines, and the pressure connections must have been correctly installed before commissioning.



NOTICE

Pictures

All illustrations are examples to demonstrate a certain situation. The contents of the screen may vary greatly on the unit. For instance, the names of the input channels can be freely selected; the status displays for the switch outputs can be hidden and lots more.

Explanation of symbols

This table explains how the different objects (menu, parameters etc.) are shown in the texts in these operating instructions.

Symbol	Description
Operating keys	
▲	Increasing
◀	Left
↵	OK
▶	right side
▼	Decreasing
Esc	Cancel
☒	Yes on
☐	no Off
	Touch the screen (with your hand or stylus pen), the symbol may be in a different colour
△	Paging symbol
Menu	
Parameterization	Menu Name
Surname	Parameter name
<Value>	System parameter value
Access Rights	
🔒	No access
🔍	read only
NOTICE! Swipe function	
	Important comments e.g. only swipe function
	Further links

4.2 Measured value display

There are two options for the measured value display presentation.

- Tile view
- List view

The colour of the individual chapters can be changed depending on the respective input signal. To do this, certain thresholds are configured for each colour in the menu **Colour change**. The associated colours represent the respective operating statuses.

In the list view, the background shadowing and the warning symbol assume the function of the tiles. The colours are controlled depending on the input signal like the tiles.

Depending on the unit model (2-channel/4-channel), there are different presentation variants [► 17] for the measured value display.

4.2.1 Tile view

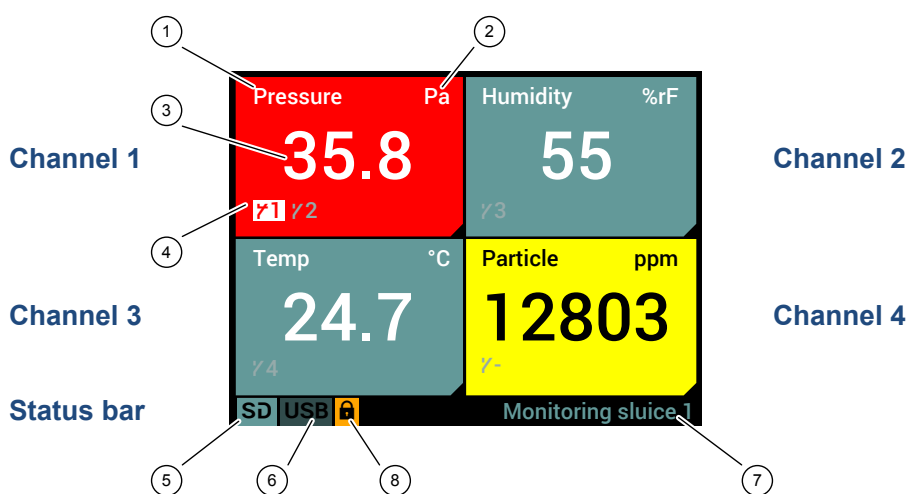


Illustration 5: Measured value display

1	Channel name	2	Einheit
3	Measurement	4	Status switch output
5	Status SD card	6	Status USB
7	Unit designation or Date / Time	8	Login symbol

γ-	No contact assigned
γ1	Contact switched
γ1	Contact not switched

Illustration 6: Status display

The example of a switch output demonstrates how the status display works.

1. The symbol for the switch output lights up, if the contact is switched.
2. The backlighting disappears, if the contact is not switched. The contact symbol is shown in grey.

NOTICE! Back lighting

The backlighting colour is usually white. However the backlighting for a yellow tile is black.

In the status displays for the SD card and USB interface, access to the medium is symbolised by orange backlighting. The green backlighting shows that a unit is connected. The backlighting is grey, if no unit is connected.

A logged-in user is shown by the login symbol. If the user is inactive, he will be automatically logged out after a timeout time has expired.

Detail view channel 1

Tip the respective tile to go to the detail view of a channel. Return to the measured value screen in the same way. The following uses the detailed view of the first channel to demonstrate all channels.



Illustration 7: To detail view

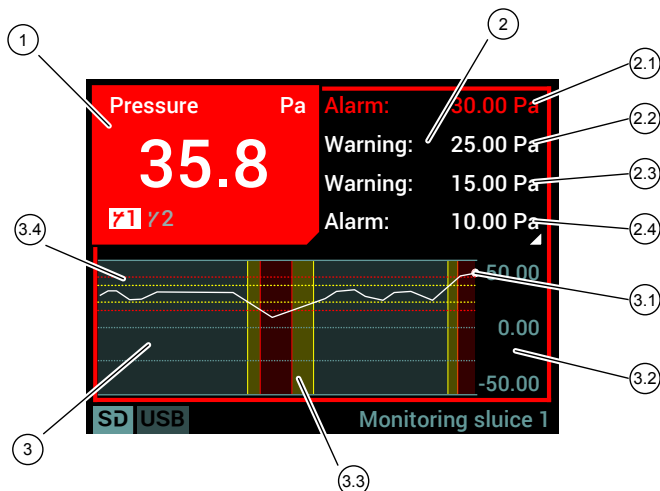


Illustration 8: Detailed view

1	Measured value display	3	Trend display
2	Status display	3.1	Current measured value
2.1	Threshold high - red	3.2	Measuring range
2.2	Threshold high - yellow	3.3	Colour change
2.3	Threshold low - yellow	3.4	Limit lines of the thresholds
2.4	Threshold low - red		

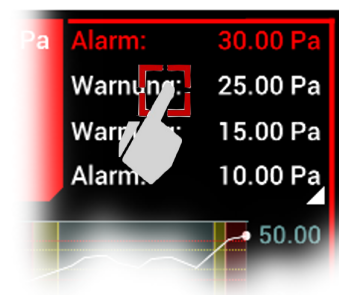


Illustration 9: Scroll

The scrolling symbol shows that there are further pages belonging to the status display. Touch anywhere on the status display to show the next page. At the end, you automatically return to the first page.

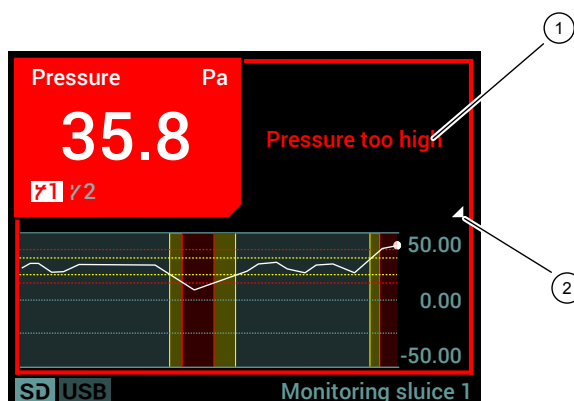


Illustration 10: Detail view alarm message

1	Message high - red (input 1)	2	Paging symbol
---	------------------------------	---	---------------

4.2.2 List view

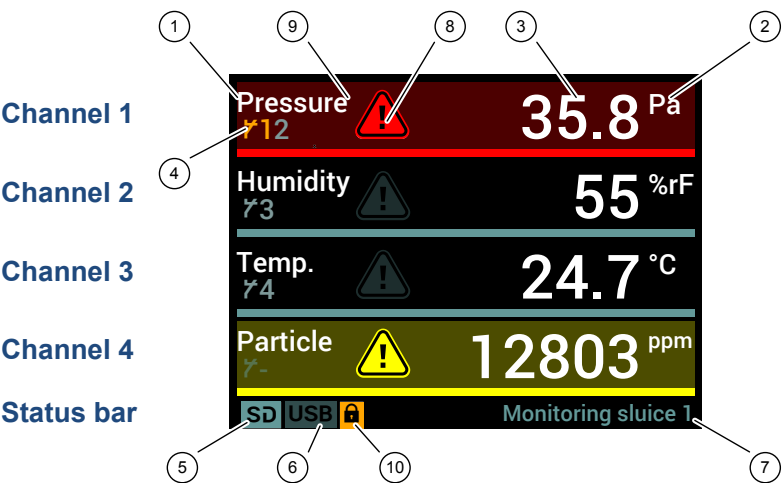


Illustration 11: Measured value display

1	Channel name	2	Einheit
3	Measurement	4	Status switch output
5	Status SD card	6	Status USB
7	Unit designation or Date / Time	8	Warning signs
9	Background shadowing	10	Login symbol

-  No contact assigned
-  Contact switched
-  Contact not switched

Illustration 12: Status display

The example of a switch output demonstrates how the status display works.

1. The symbol for the switch output goes orange, if the contact is switched.
2. The symbol for the switch output goes grey, if the contact is idle.

NOTICE! Back lighting

In the status displays for the SD card and USB interface, access to the medium is symbolised by orange backlighting. The green backlighting shows that a unit is connected. The backlighting is grey, if no unit is connected.

A logged-in user is shown by the login symbol. If the user is inactive, he will be automatically logged out after a timeout time has expired.

Detail view channel 1



Illustration 13: To detail view

Tip the respective list entry to go to the detail view of a channel. Return to the measured value screen in the same way. The following uses the detailed view of the first channel to demonstrate all channels.

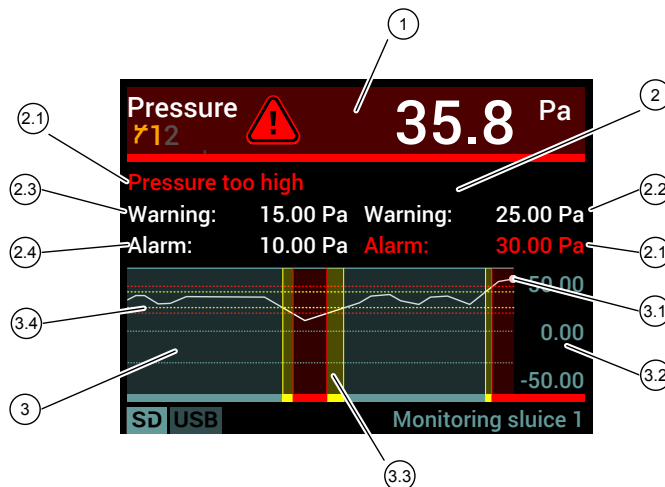


Illustration 14: Detailed view

1	Measured value display	3	Trend display
2	Status display	3.1	Current measured value
2.1	Threshold high - red	3.2	Measuring range
2.2	Threshold high - yellow	3.3	Colour change
2.3	Threshold low - yellow	3.4	Limit lines of the thresholds
2.4	Threshold low - red		

4.2.3 Presentation variants

The unit is available in a 2-channel and 4-channel version. This setting is made ex-works.

The detail views are identical to the detail views of the 4-channel version.

The analogue inputs on both versions can be switched off individually. This status is indicated by OFF in the respective tile (or list). If two analogue outputs are switched in the 4-channel version, the presentation variant of the 2-channel model is shown on the measured value display.

2-channel tile view

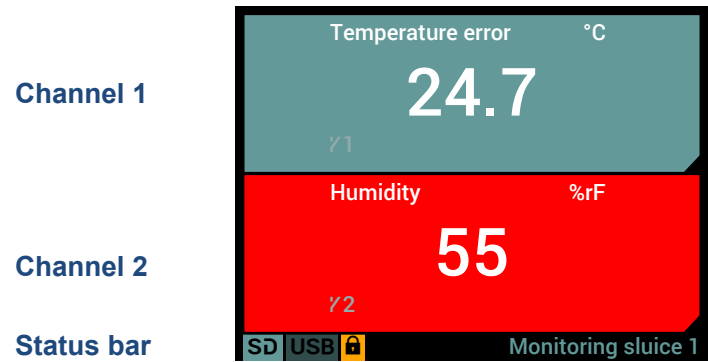


Illustration 15: 2-channel measured value display

2-channel list view

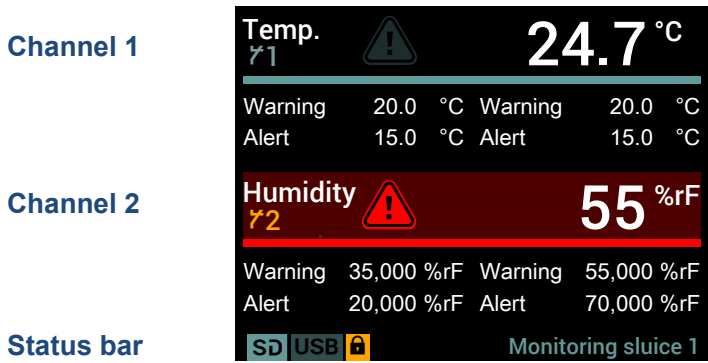


Illustration 16: 2-channel measured value display

4.3 Control elements

The unit is equipped with a TFT Touch LCD colour display. It is operated via a list menu and the input interfaces that depend on the functions.

The touch function is not explained because so many devices have this state-of-the-art function.

We recommend using a stylus pen.

Example: Password input

Touch anywhere on the status bar to go to the menu. The following menu appears on the screen:

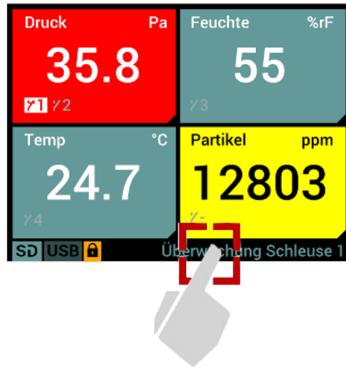


Illustration 17: Menu input

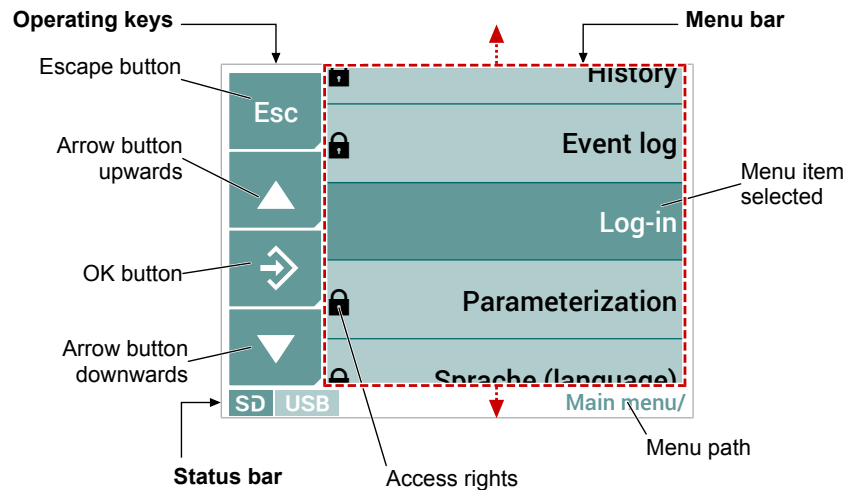


Illustration 18: Main menu

The dotted red line marks the picture section. This can be moved using the arrow keys ▲▼, the arrow shows the respective direction.

The menu entry in the centre of the screen is always selected and opened by pressing the OK button ➡. Alternatively, a menu entry can also be touched to open it.

In this example, the screen opens when a password is entered. The menu path shows where you are in the menu tree.

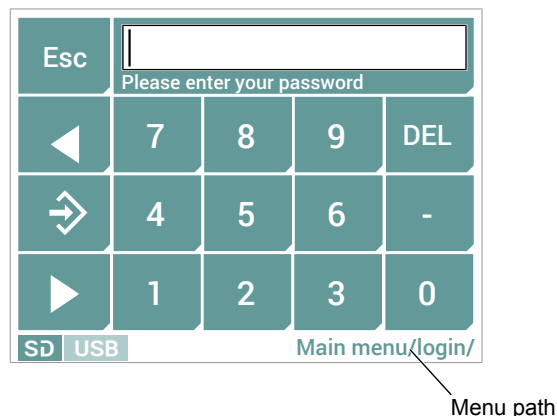


Illustration 19: Main menu/login

Enter the password and complete the input by pressing the OK button ➡. A message appears on the screen showing the user type you have logged in as. Once you have acknowledged the message, you return to the main menu.

5 Parameterization

5.1 General Information

The EA16 is a highly complex measured value display with a control system that can be learned intuitively. Due to its complex structure and the option of supplementing functions by means of the firmware update, not all functions can be explained in full in these operating instructions.

The following describes the basic functions of the unit and how they are used.



NOTICE

Value ranges

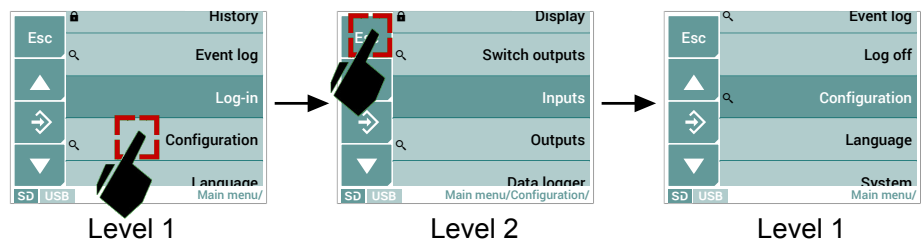
The presented value ranges of the parameters correspond to the default values of the factory configuration. If certain parameters are changed (e.g. measuring range), the value ranges of the dependent parameters (e.g. thresholds) are automatically adjusted. For this reason, the actually displayed value ranges may differ from the value ranges shown in these instructions. The latter only serves as a typical example.

5.2 Navigation in the menu tree

The menu can have up to six levels. Several user profiles with different read/write rights are filed in the user administration. Access to menus and parameter settings depends on the user type.

The menu tree is navigated based on the following scheme:

(a) Level change by direct tapping



(b) Level change by positioning the screen section

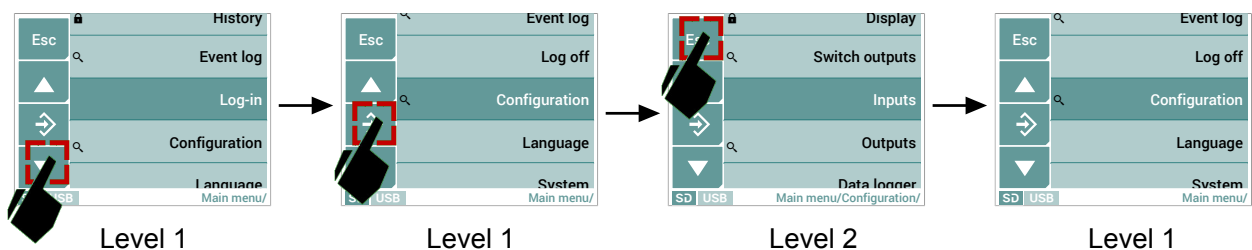


Illustration 20: Navigation menu tree

5.3 Value input

The following provides a description of the input interfaces that are used to enter the values. A differentiation is made between the input of numbers and the input of texts. The screens shown are examples only and may vary in terms of their layout and presentation.

Their functionality can be learned intuitively and is always based on the same principle.

5.3.1 Input of number values

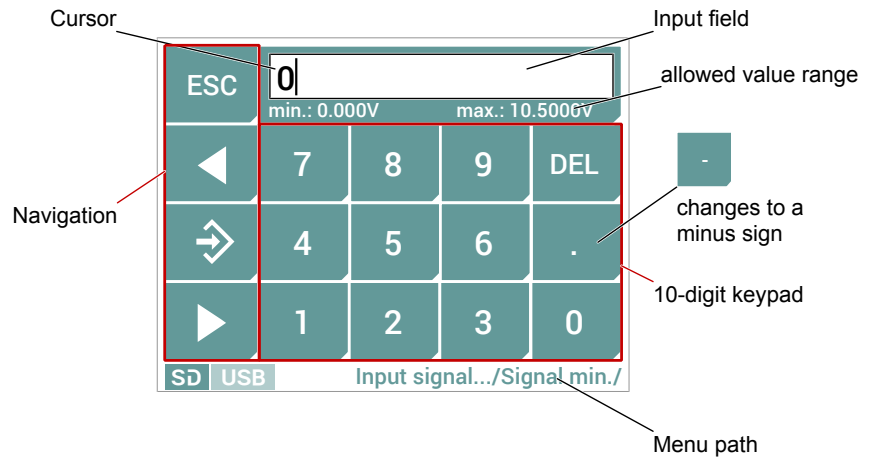


Illustration 21: Number input

Negative integers can be entered by deleting the number value (0 in the example) in the display. The decimal point then changes to a minus sign and can be used.

5.3.2 Text input

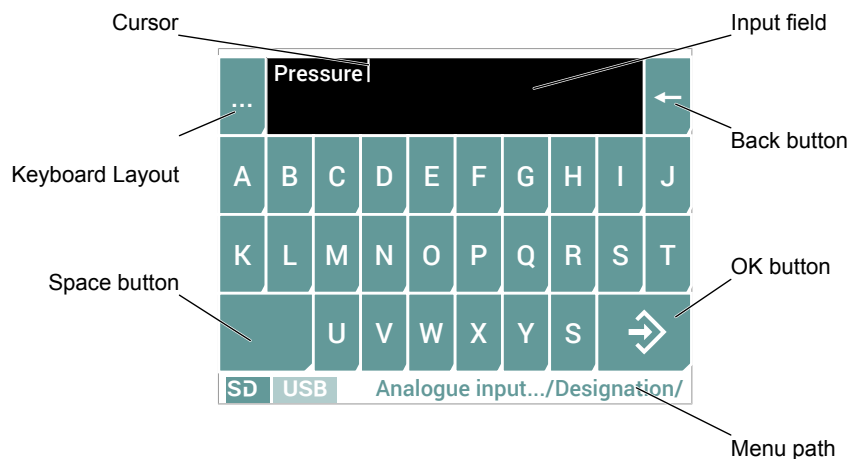


Illustration 22: Text input

The key ... is used to change the assignment of the key pad, and lower case letters, numbers and special characters can be used.

5.3.3 Dialogue box

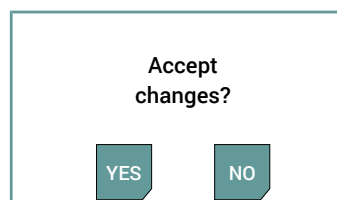


Illustration 23: Dialogue box

This or a similar dialogue box appears, if the user needs to confirm something. Parameter changes are accepted after they have been confirmed with Yes, and are logged in the activated event log.

5.4 Main menu [Level 1]

Menu path: Main menu/

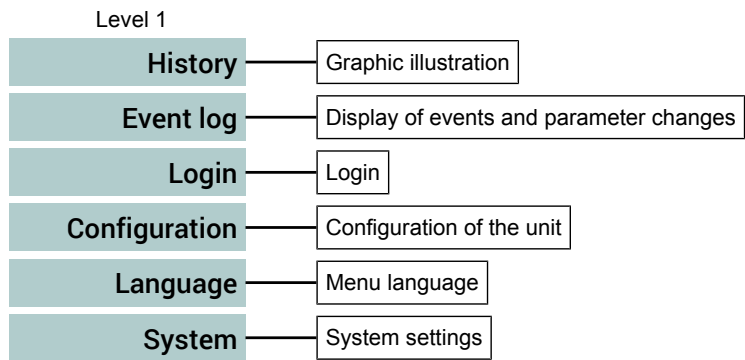
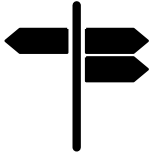


Illustration 24: Main menu [Level 1]

Signpost [► Page]



Menu: History [Level 2] [► 21]
Menu: Event log [Level 2] [► 22]
Menu: Login [Level 2] [► 23]
Menu: Configuration [Level 2] [► 23]
Menu: Language [Level 2] [► 46]
Menu: System [Level 2] [► 46]

5.4.1 Menu: History [Level 2]

Menu path: Main menu/History/



Illustration 25: Menu: History

The recorded measured values are presented in a chart in this menu. There is a wide range of functions available to analyse the data.

5.4.2 Menu: Event log [Level 2]

Menu path: Main menu/Event log/

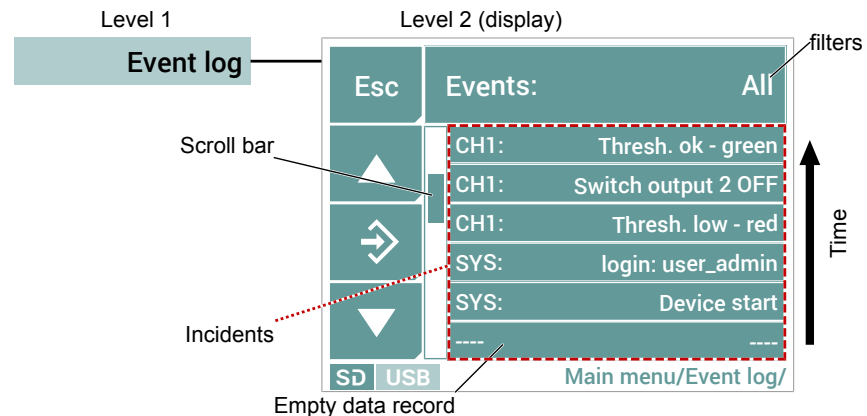


Illustration 26: Menu: Event log

A filter can be used to select which type of event should be shown. The respectively active filter is shown in the title line. The following settings are possible for the filter:

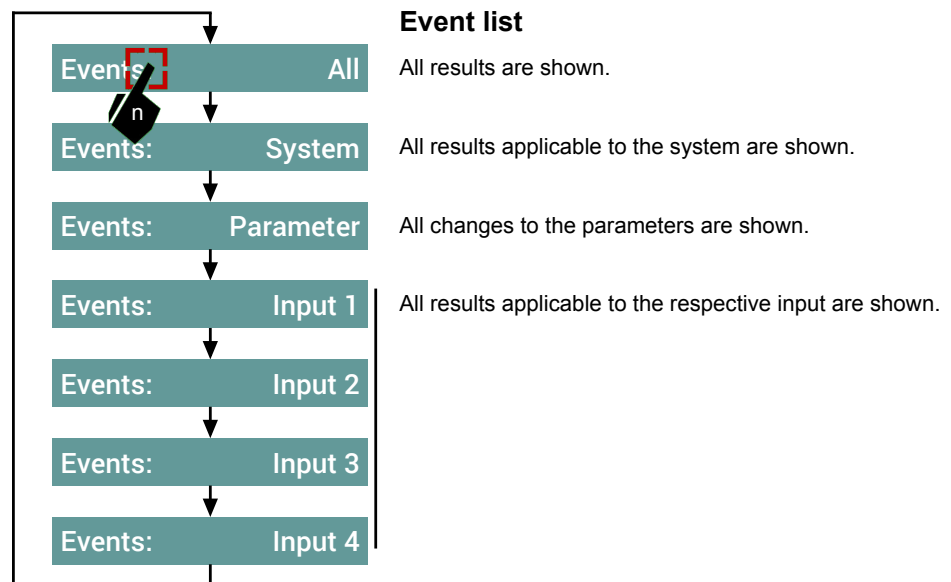


Illustration 27: Navigation filter

A certain filter is selected by repeatedly (x-times) touching the title line.

The event list is shown depending on the filter presentation. An event list comprises max. 30 data records. 6 data records each form a screen page. The entire page memory therefore comprises 5 pages. A scroll bar indicates what page you are on within the page memory. The page memory can be navigated using the arrow keys ▲▼.

An event can be called up by touching it. The dialogue box that appears provides more information about the event and also an option to allow graphic display.

The dialogue box displays the following information:

- Date: 2016-04-05
- Time: 13:12:25:800
- Source: System
- Event: login: user_admin

An 'OK' button is located at the bottom of the box.

Illustration 28: Example dialogue box

5.4.3 Menu: Login [Level 2]

Menu path: Main menu/Login/

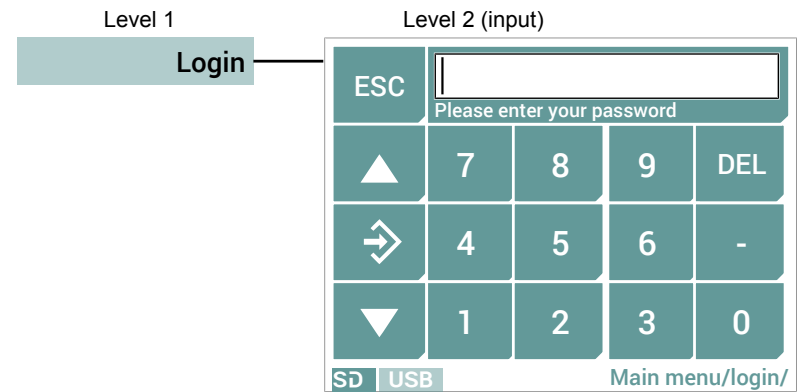


Illustration 29: Menu: Login

Enter the password and complete the input by pressing the OK button . A message appears on the screen showing the user type you have logged in as. Once you have acknowledged the message, you return to the main menu.

5.4.4 Menu: Configuration [Level 2]

Menu path: Main menu/Configuration/

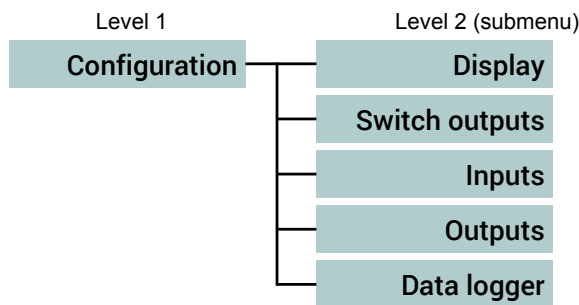


Illustration 30: Menu Configuration

Signpost [► Page]

Menu: Display [Level 3] [► 24]

Menu: Switch outputs [Level 3] [► 25]

Menu: Inputs [Level 3] [► 26]

Menu: Outputs [Level 3] [► 40]

Menu: Datalogger [Level 3] [► 42]



5.4.4.1 Menu: Display [Level 3]

Menu path: Main menu/Configuration/Display/

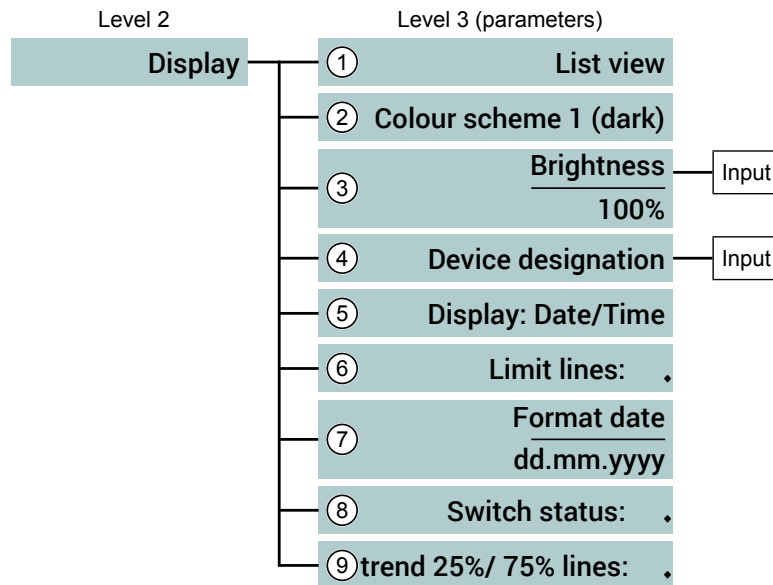


Illustration 31: Menu Display (Example)

Item	Value range	Description
1	List view Tile view	The presentation type of the display is selected with this parameter.
2	Colour scheme 1 (dark) Colour scheme 2 (light)	The design of the display is selected with this parameter.
3	Brightness 30% ... 100%	The display brightness can be set in 10% steps with this parameter. The setting has an immediate impact on the display.
4	Device designation 0 ... 29 characters	Any sequence of characters can be used for the unit designation. Please note that the presentation is limited by the space available in the status line.
5	Display: Date/Time Display: Designation	This parameter defines what is shown in the status line.
6	Limit lines ☒ Yes (standard value) ☐ No	This parameter defines whether the set limit values are shown in the detail view.
7	Format Date dd.mm.yyyy	The date format is set with this parameter.
8	Switch status ☒ Yes (standard value) ☐ No	This parameter defines whether the status of the switch outputs in the operating display should be shown.
9	trend 25%/ 75% lines ☒ Yes (standard value) ☐ No	This parameter defines whether or not the trend lines at 25% and 75% of the input signal should be shown.

5.4.4.2 Menu: Switch outputs [Level 3]

Menu path: Main menu/Configuration/Switch outputs/

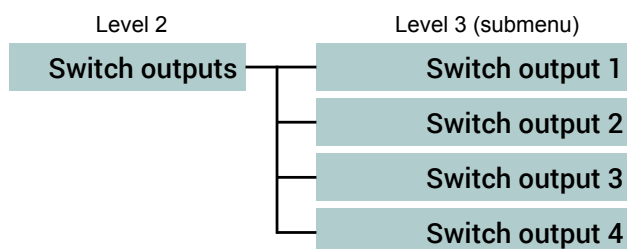


Illustration 32: Menu Switch outputs

All switch outputs are configured in the same way. Therefore the associated parameters are explained below using the example of switch output 1.

Menu: Switch output 1 [Level 4]

Menu path: Main menu/Configuration/Switch outputs/Switch output 1

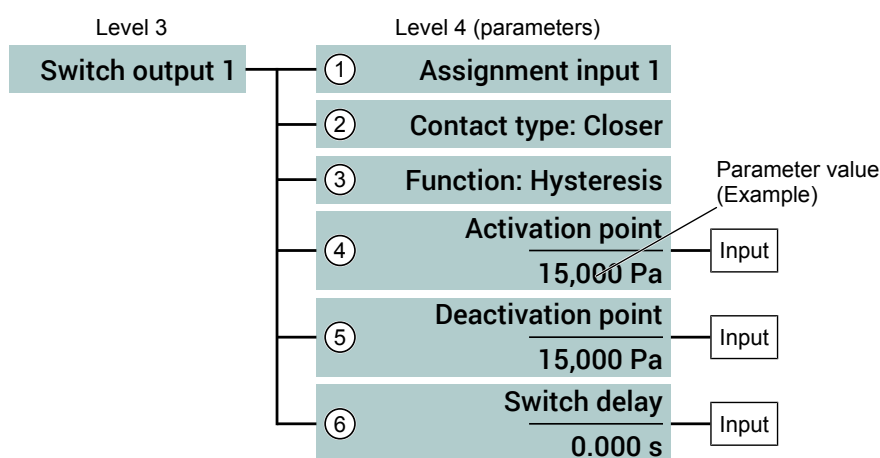


Illustration 33: Menu Switch output 1 (example)

Item	Value range	Description
1	Assignment input: 1 Assignment input: 2 Assignment input: 3 Assignment input: 4 Assignment input: -	This parameter assigns switch output 1 to an input (1...4) or witches it off (-).
2	Contact type: Closer Contact type: Opener	This parameter defines whether or not the switch output 1 works with an open contact or make contact.

The parameter list changes depending on the parameter **function**:

Hysteresis

3	Function: Hysteresis	Hysteresis function
4	Switch-on point	An input window opens. The possible input limit values depend on the set measuring range.
5	Switch-off point	

Window

3	Function: Window	Window function
4	Window max.	An input window opens. The possible input limit values depend on the set measuring range.
5	Window min.	
6	Switch delay 0 = OFF 0.01 ... 10800 s	A switch delay of the switch output can be defined in 10 ms steps with this parameter.

Hysteresis function

Key:

- Input signal
- Measuring range
- Increasing input signal
- ← Decreasing input signal

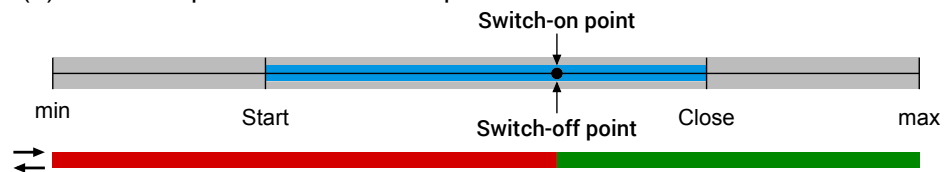
⌌ **NO: Make contact**

- Contact closed
- Contact open

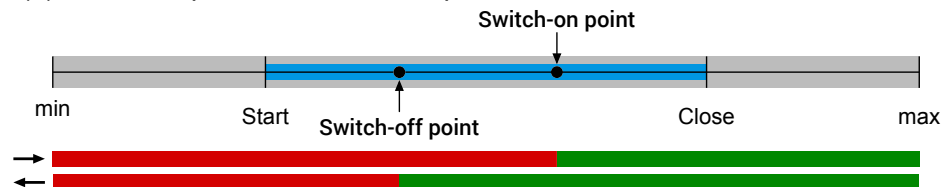
⌌ **NC: Break contact**

- Contact open
- Contact closed

(a) Activation point = Deactivation point



(b) Activation point > Deactivation point



(c) Activation point < Deactivation point

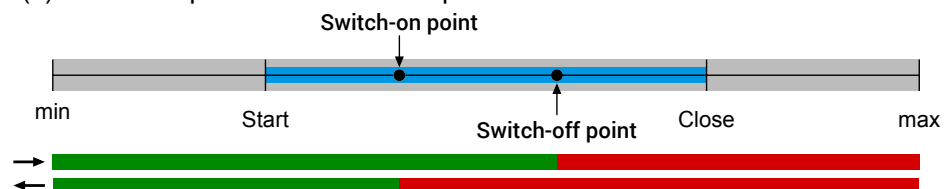


Illustration 34: Hysteresis function

Window function

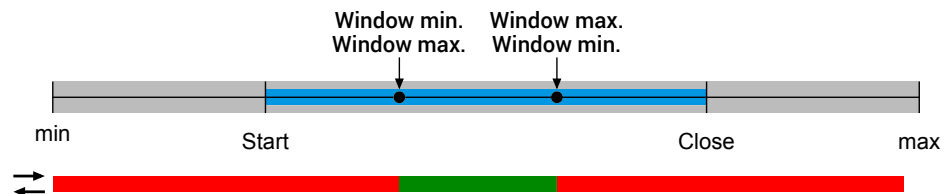


Illustration 35: Window function

5.4.4.3 Menu: Inputs [Level 3]

Menu path: Main menu/Configuration/Inputs/

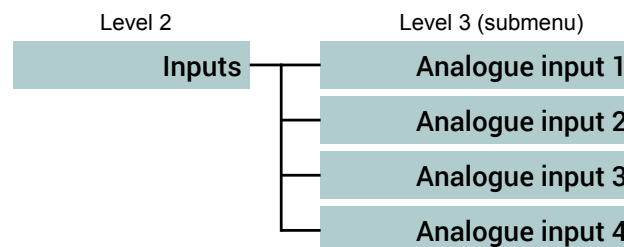


Illustration 36: Menu: Inputs

All analogue inputs are configured in the same way. Therefore the associated parameters are explained below using the example of Analogue input 1 ► 27].

Menu: Analogue input 1 [Level 4]

Menu path: Main menu/Configuration/Inputs/Analogue input 1

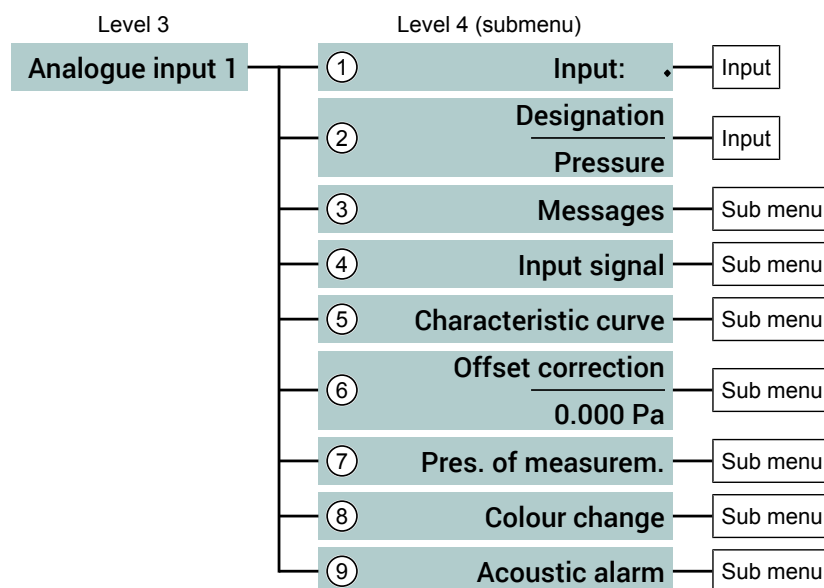


Illustration 37: Menu Analogue input 1

Signpost [► Page]

Submenu: Messages [Level 5] [► 28]

Submenu: Input signal [Level 5] [► 29]

Submenu: Characteristic curve [Level 5] [► 30]

Submenu: Offset correction [Level 5] [► 34]

Submenu: Pres. of measurem. [Level 5] [► 34]

Submenu: Colour change [Level 5] [► 35]

Submenu: Acoustic alarm [Level 5] [► 37]

Item	Value range	Description
1	Input ☒ Active (standard value) ☒ Inactive	The respective analogue input can be deactivated with this parameter.
2	Designation Pressure	Designation is entered (e.g. pressure) that should appear on the measured value display.
3	Messages	The messages that are dependent on the colour change are issued in this submenu.
4	Input signal	The signal type and input signal range are set in this submenu.
5	Characteristic curve	The characteristic curve parameters are defined in this submenu.
6	Offset correction	An offset correction can be carried out in this submenu.
7	Pres. of measurem.	The integer and decimal places are defined in this submenu.
8	Colour change	The limit thresholds for the colour change are defined in this submenu.
9	Acoustic alarm	The limit thresholds for the alarm are defined in this submenu.

Input: Designation [Level 5]

Menu path: Main menu/Configuration/Inputs/Analogue input 1/Designation/

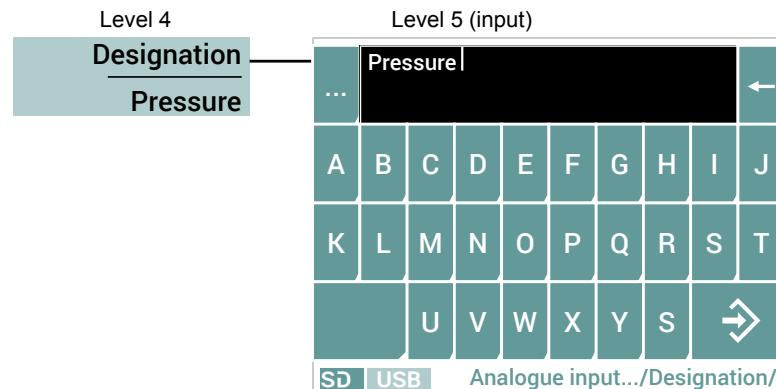


Illustration 38: Input: Designation

Submenu: Messages [Level 5]

Menu path: Main menu/Configuration/Inputs/Analogue input 1/Messages

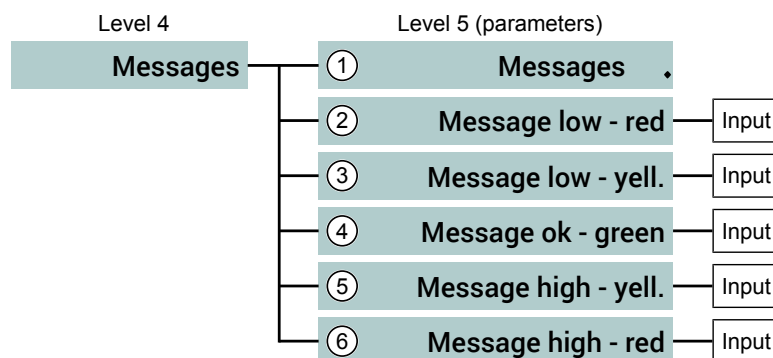


Illustration 39: Menu: Messages

Item	Value range	Description
1	Messages ☒ Yes (standard value) ☐ No	This parameter defines whether or not status messages for the applicable input should be shown on the operating display.
2	Message low - red	The reporting test for the lower threshold value - red is defined with this parameter.
3	Message low - yell.	The reporting test for the lower threshold value - yellow is defined with this parameter.
4	Message ok - green	The reporting test for the 'green range' is defined with this parameter.
5	Message high - yell.	The reporting test for the upper threshold value - yellow is defined with this parameter.
6	Message high - red	The reporting test for the upper threshold value - red is defined with this parameter.

If parameter 2 ... 6 are called up, an input window is opened as shown in section Text input [► 20].

The following chart shows the connection between the thresholds and the colour change.

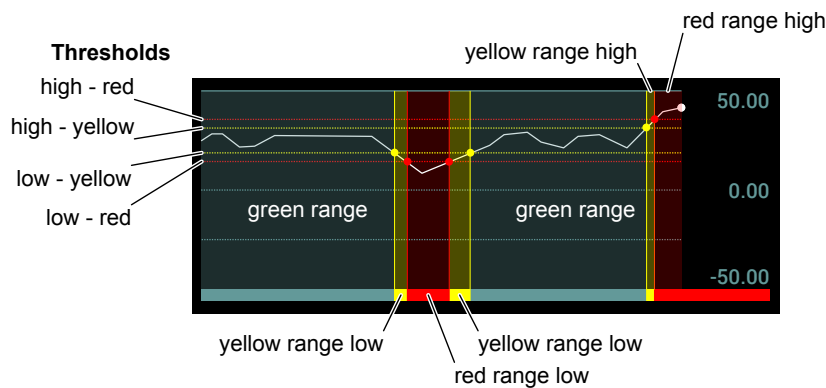


Illustration 40: Thresholds

Submenu: Input signal [Level 5]

Menu path: Main menu/Configuration/Inputs/Analogue input 1/Input signal

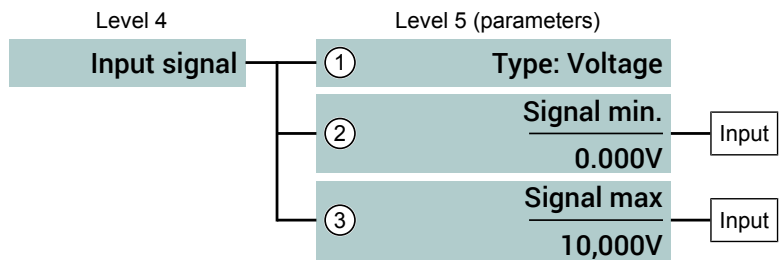


Illustration 41: Menu Input signal

Item	Value range	Description
1	Type: Voltage Type: Current	The signal type is defined with this parameter. Depending on the signal type, the units of the following parameters will change.
2	Signal min. 0.000V ... 10.500 V 0.000mA ... 20.500 mA	This parameter defines the lower signal limit of the input signal. This entry must lie within the permissible signal limits.
3	Signal max. 0.000V ... 10.500 V 0.000mA ... 20.500 mA	This parameter defines the upper signal limit of the input signal. This entry must lie within the permissible signal limits.

Submenu: Characteristic curve [Level 5]

The parameter function determines the characteristic curve type and can accept the following values:

1. <Characteristic curve: linear> [► 30]
2. <Characteristic curve: Root extracted> [► 32]

Each characteristic curve type requires other parameters so that the menu changes depending on the parameter value:

a) Characteristic curve: linear [Level 5]

Menu path: Main menu/Configuration/Inputs/Analogue input 1/Characteristic curve/

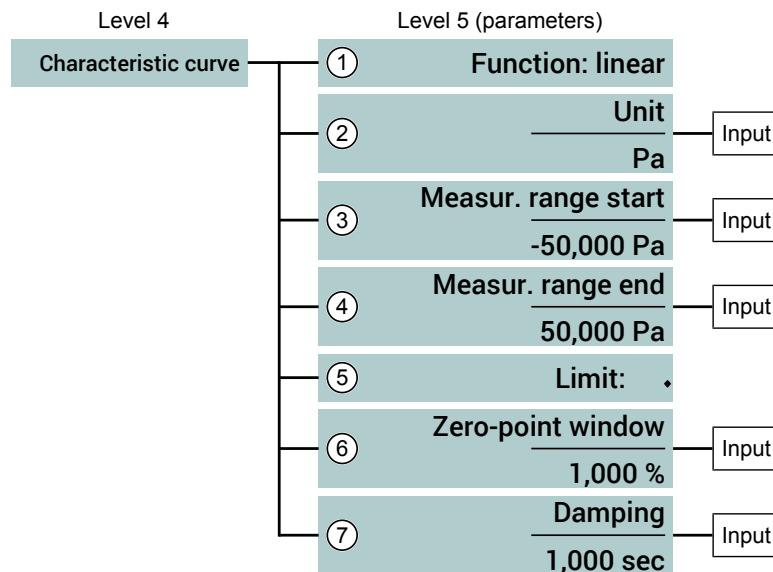


Illustration 42: Menu Characteristic curve linear

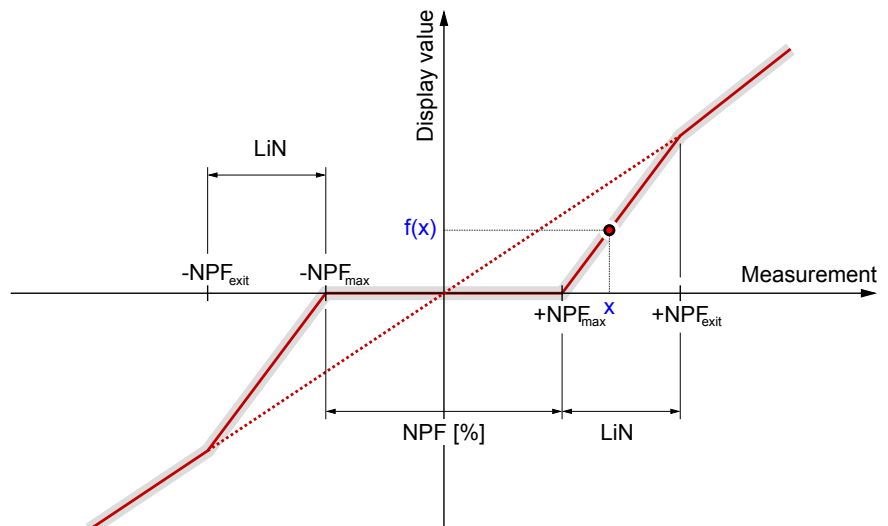
NOTICE! The output signal always follows the display value

Item	Value range	Description
1	Function: linear	This parameter creates a linear input characteristic curve.
2	Unit	A variable unit for the input signal is defined with this parameter.
3	Measur. range start	The start of the measuring range is defined with this parameter.
4	Measur. range end	The end of the measuring range is defined with this parameter.
5	Limits ☒ Yes (standard value) ☐ No	The display and analogue signal can be limited to the set measuring range (start - end) with this parameter.
6	Zero-point window 0.00 ... 25.00 %	This parameter is used to set a range around zero at which the measured value is set to zero (see fig.).
7	Damping 0.000 ... 30.000 s	The input signal can be dampened with this parameter.

Zero-point window

In many cases, unsteady readings are not a problem during normal operating mode, but this is not true for the idle state, i.e. if a display value of zero is expected.

You can use the parameter **Zero-point window** to define a range around zero (NPF). All measured values within the zero-point window are displayed as a zero value on the display. If the measured value leaves this range, the display value $f(x)$ is initially approached. From a window value NPF_{exit} , the measured value and the reading match again.



MB_A = Measuring range start
 MB_E = Measuring range end
 NPF = Zero-point window

LiN = Linear approximation range

Linear approximation:

$$NPF_{max} = |MB_E - MB_A| * \frac{NPF}{100}$$

$$f(x) = \frac{|x| - NPF_{max}}{NPF_{exit} - NPF_{max}} * NPF_{exit}$$

$$NPF_{exit} = 2 * NPF_{max}$$

Illustration 43: Zero-point window

b) Characteristic curve: Rooted [Level 5]

Menu path: Main menu/Configuration/Inputs/Analogue input 1/Characteristic curve/

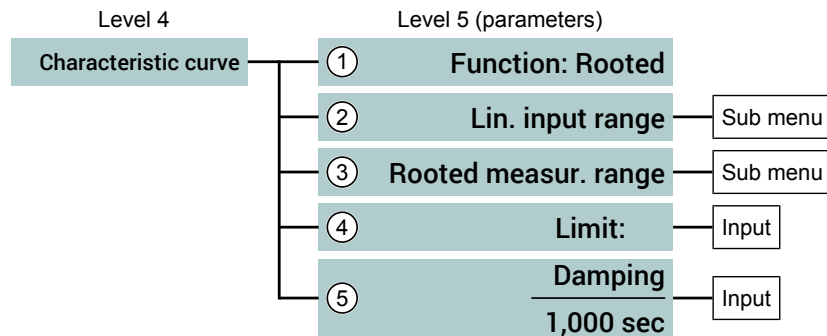


Illustration 44: Menu Characteristic curve root extracted

The input characteristic curve can be switched to a root extracted characteristic curve with the parameter value *<Function: rooted>*. There are two additional submenus on the parameter level.

- In the Submenu: Lin. input range [Level 6] [► 32] the input range is configured according to the technical data of the sensor that is used.
- In the Submenu: Rooted measur. range [Level 6] [► 33] the measuring range (start, end, unit) is configured.

Item	Value range	Description
1	Function: Rooted	This parameter creates a root extracted input characteristic curve.
2	lin. input range	Submenu for configuration of the linear input range.
3	Rooted measur. range	Submenu for configuration of the root extracted measuring range.
4	Limits ☒ Yes (standard value) ☒ No	The display and output signal can be limited to the set measuring range (start - end) with this parameter.
5	Damping 0.000 ... 30.000 s	The input signal can be dampened with this parameter.

Submenu: Lin. input range [Level 6]

Menu path: Main menu/Configuration/Inputs/Analogue input 1/Charac. curve/Lin. input range

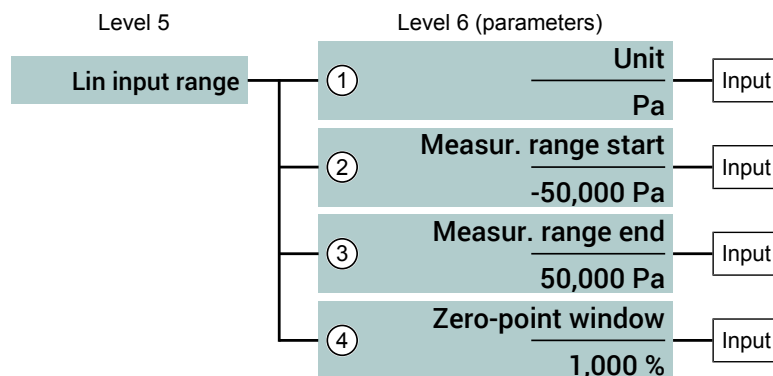


Illustration 45: Submenu: Lin. input range

Item	Value range	Description
1	Unit	A variable unit for the input signal is defined with this parameter.
2	Measur. range start	The start of the measuring range is defined with this parameter.
3	Measur. range end	The end of the measuring range is defined with this parameter.
4	Zero-point window 0.00 ... 25.00 %	This parameter is used to set a range around zero at which the measured value is set to zero. *)

*) See section a) Characteristic curve: linear [Level 5] [► 30].

Submenu: Rooted measur. range [Level 6]

Menu path: Main menu/Configuration/Inputs/Analogue input 1/Charac. curve/Rooted extracted input range

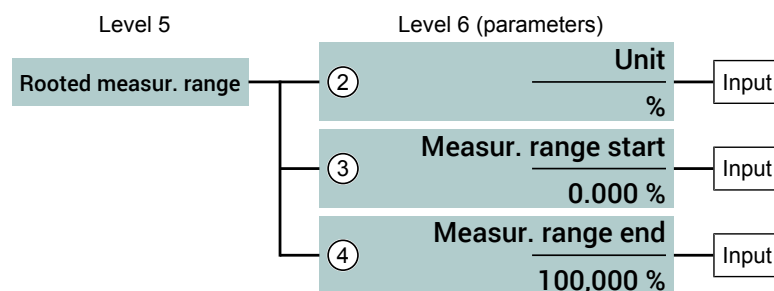


Illustration 46: Submenu: Root extracted measuring range

Item	Value range	Description
1	Unit	A variable unit for the root extracted input signal is defined with this parameter. This unit appears on the measured value display.
2	Measur. range start	The start of the measuring range is defined with this parameter.
3	Measur. range end	The end of the measuring range is defined with this parameter.

Submenu: Offset correction [Level 5]

Menu path: Main menu/Configuration/Inputs/Analogue input 1/Offset correction

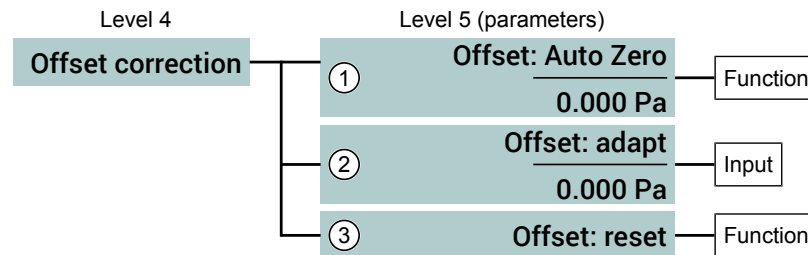


Illustration 47: Menu Offset correction

Item	Value range	Description
1	Offset: Auto Zero	The Auto Zero function is used to set the current measured value to the display value zero.
2	Offset: adapt	The offset can be adjusted manually within the given limits with this parameter.
3	Offset: reset	This parameter is used to set the offset to zero.

Submenu: Pres. of measurem. [Level 5]

Menu path: Main menu/Configuration/Inputs/Analogue input 1/Pres. of measurem./

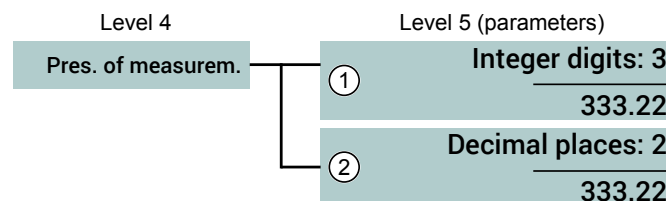


Illustration 48: Menu Pres. of measurem.

There are max 6 positions available for showing the measured value.

Item	Value range	Description
1	Integer digits	The number of places in front of the decimal point with this parameter.
2	Decimal Places	The number of places after the decimal point is set with this parameter.

Submenu: Colour change [Level 5]

Menu path: Main menu/Configuration/Inputs/Analogue input 1/Colour change/

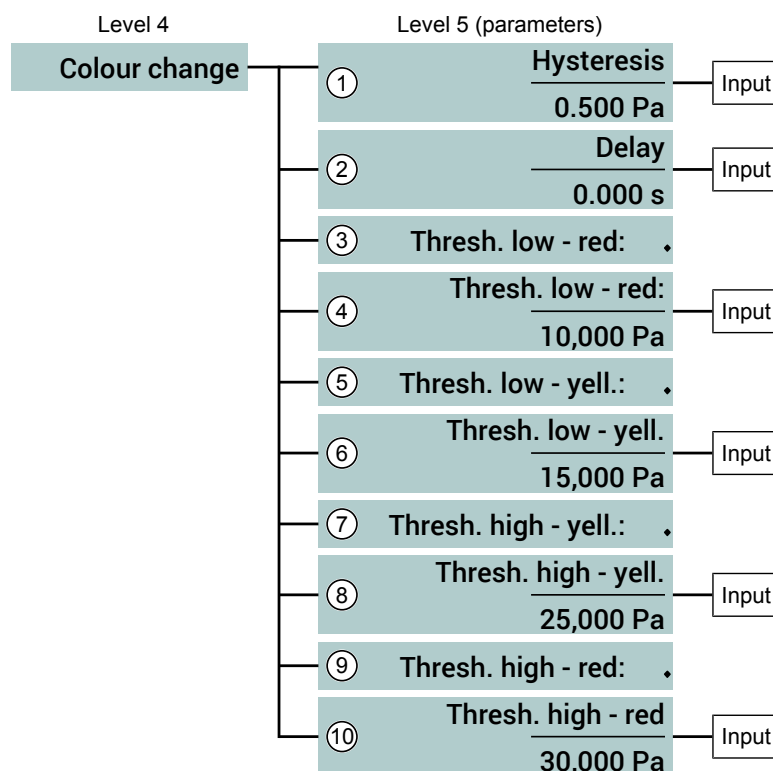


Illustration 49: Menu Colour-change

NOTICE! Value range

The displayed value range of some parameters depends on the set measuring range. The following value ranges serve as examples.

Item	Value range	Description
1	Hysteresis 0.00 ... 100.00 Pa	The hysteresis of the colour change is defined with this parameter.
2	Delay 0.000s ... 3600.000s	The delay time for the colour change is set with this parameter.
3	Thresh. low - red ☒ Yes ☒ No	The name threshold is activated with this parameter.
4	Thresh. low - red -100.00 ... 100.00 Pa	Input of the threshold
5	Thresh. low – yell. ☒ Yes ☒ No	The name threshold is activated with this parameter.
6	Thresh. low – yell. -100.00 ... 100.00 Pa	Input of the threshold
7	Thresh. high – yell. ☒ Yes ☒ No	The name threshold is activated with this parameter.
8	Thresh. high – yell. -100.00 ... 100.00 Pa	Input of the threshold

Item	Value range	Description
9	Thresh. high red ☒ Yes ☒ No	The name threshold is activated with this parameter.
10	Thresh. high red -100.00 ... 100.00 Pa	Input of the threshold

Colour change limit thresholds

Colour changes that correspond to certain operating statuses can be defined with the thresholds.

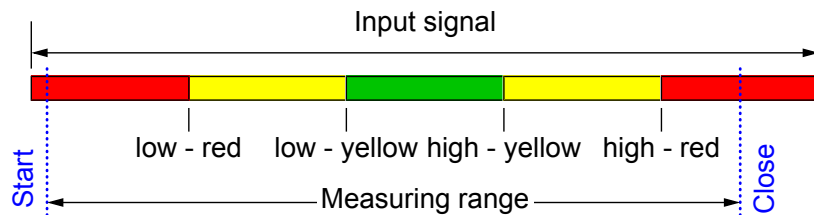


Illustration 50: Thresholds

Hysteresis

The parameter value defines the distance to the threshold. The following picture is created with a parameter value of 0.5:

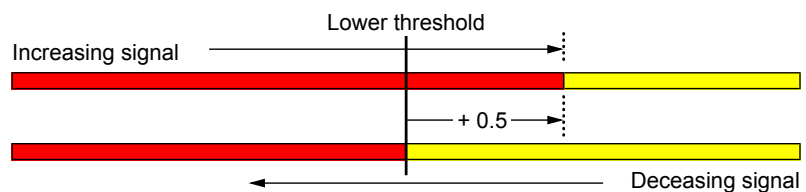


Illustration 51: Hysteresis

Delay time

A delay time for the colour change is defined with this parameter. As soon as the measured value exceeds the limit threshold ⁽³⁾ a timer starts with the programmed delay time. The colour change takes place as soon as the timer has expired and the overstepping of the threshold during this time remained. If the measured value drops below the threshold whilst the timer is still running, it is reset and the colour change does not take place.

⁽³⁾ incl. hysteresis,

Submenu: Acoustic alarm [Level 5]

Menu path: Main menu/Configuration/Inputs/Analogue input 1/Acoustic alarm/

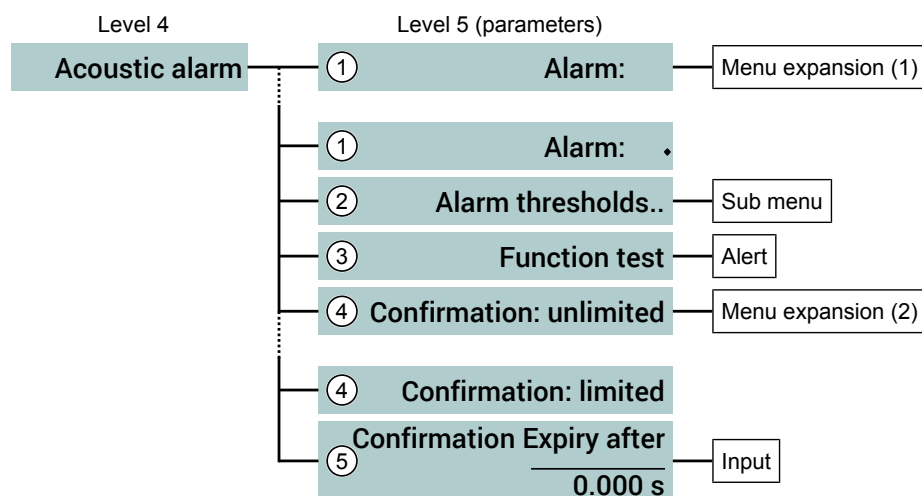


Illustration 52: Menu Acoustic alarm

Item	Value range	Description
1 Alarm	☒ Yes ☒ No (standard value)	At this point, the acoustic alarm can be switched on or off. The menu expands when the alarm is switched on.
2 Alarm thresholds		Submenu for configuration of the alarm thresholds.
3 Function test		This button is used to check the function of the alarm encoder.
4 Confirmation:	Unlimited (standard value) limited	This parameter is used to determine how the unit behaves when the acoustic alarm is acknowledged. Unlimited: The acoustic alarm is set to rest when it is acknowledged. The alarm message is still shown. Limited: The acoustic alarm is only at rest for a certain time after it has been acknowledged. The alarm message is still shown.
5 Confirmation Expiry after	0.000 sec	This parameter sets the time after which the acoustic alarm sounds again.

Submenu: Alarm thresholds [Level 6]

Menu path: Main menu/Configuration/Inputs/Analogue input 1/Acoustic alarm/Alarm thresholds

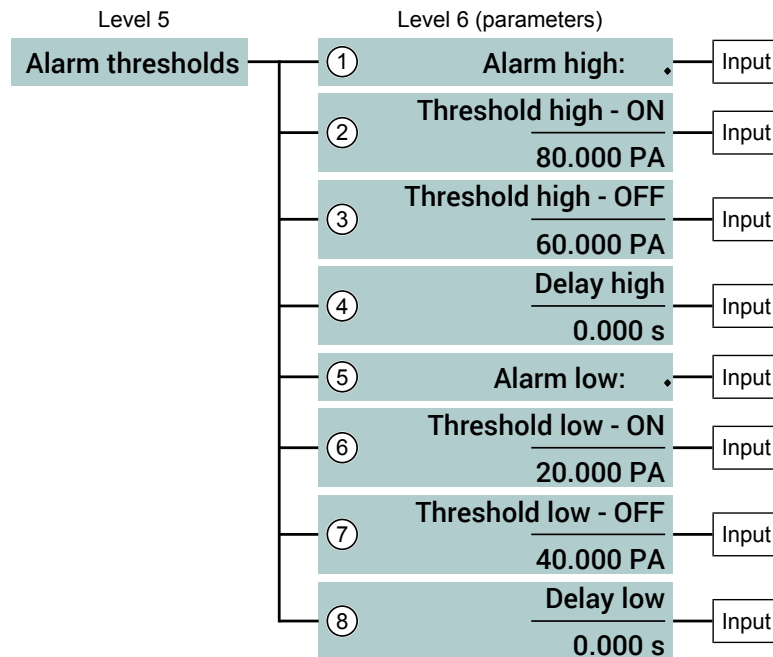
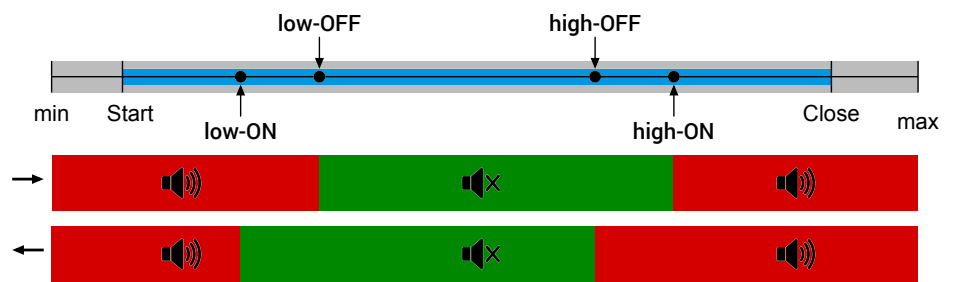


Illustration 53: Submenu: Alarm thresholds

Item	Value range	Description
1	Alarm high ☒ On (standard value) ☒ Off	The upper alarm threshold can be switched on or off with this parameter.
2	Threshold high - ON -50.0 ... 150.0 Pa	The activation point of the upper alarm threshold is defined with this parameter.
3	Threshold high - OFF -50.0 ... 150.0 Pa	The deactivation point of the upper alarm threshold is defined with this parameter.
4	Delay high 0 ... 3600 s	Alarm signal delay for the upper alarm threshold.
5	Alarm low ☒ On (standard value) ☒ Off	The lower alarm threshold can be switched on or off with this parameter.
6	Threshold low - ON -50.0 ... 150.0 Pa	The activation point of the lower alarm threshold is defined with this parameter.
7	Threshold low - OFF -50.0 ... 150.0 Pa	The deactivation point of the lower alarm threshold is defined with this parameter.
8	Delay high 0 ... 3600 s	Alarm signal delay for the upper alarm threshold.

Key:

-  Input signal
-  Measuring range
-  Increasing input signal
-  Decreasing input signal
-  No alarm
-  Alert

*Illustration 54: Alarm thresholds*

5.4.4.4 Menu: Outputs [Level 3]

Menu path: Main menu/Configuration/Outputs/

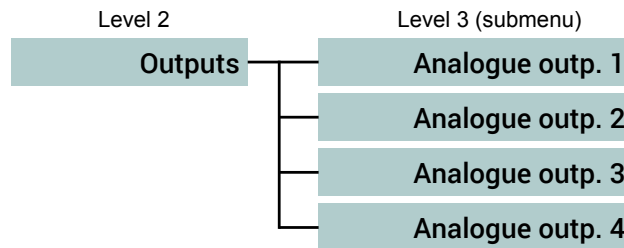


Illustration 55: Menu Outputs

All analogue outputs are configured in the same way. Therefore the associated parameters are explained below using the example of Analogue output 1 [► 27].

Menu: Analogue outp. 1 [Level 4]

Menu path: Main menu/Configuration/Outputs/Analogue output 1/

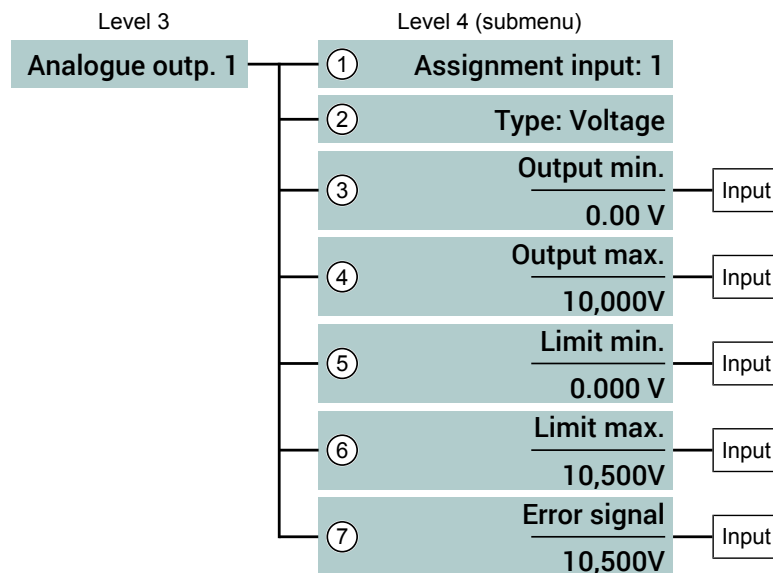


Illustration 56: Menu Analogue output 1

Item	Value range	Description
1	Assignment input: 1 Assignment input: 2 Assignment input: 3 Assignment input: 4 Assignment input: -	The respective input signal is assigned to the analogue output 1 with this parameter.
2	Type: Voltage Type: Current	This parameter is used to define whether the output signal is of the type current or voltage. The value range of the following parameters change depending on how this is defined.
3	Output min. 0.000 ... 10.500V 0.000 ... 21.500mA	This parameter is used to define the output signal that is issued in the measuring range start of the assigned input signal.
4	Output max. 0.000 ... 10.500V 0.000 ... 21.500mA	This parameter is used to define the output signal that is issued in the measuring range end of the assigned input signal.
5	Limit min.	This parameter defines the lower limit of the output signal.

Item	Value range	Description
	0.000 ... 10.500V 0.000 ... 21.500mA	
6	Limit max. 0.000 ... 10.500V 0.000 ... 21.500mA	This parameter defines the upper limit of the output signal.
7	Error signal 0.000 ... 10.500V 0.000 ... 21.500mA	The error signal type is defined with this signal.

Assignment input

It is always possible to assigned all output signals A1...A4 to a single input signal (e.g. E1).

Output signal

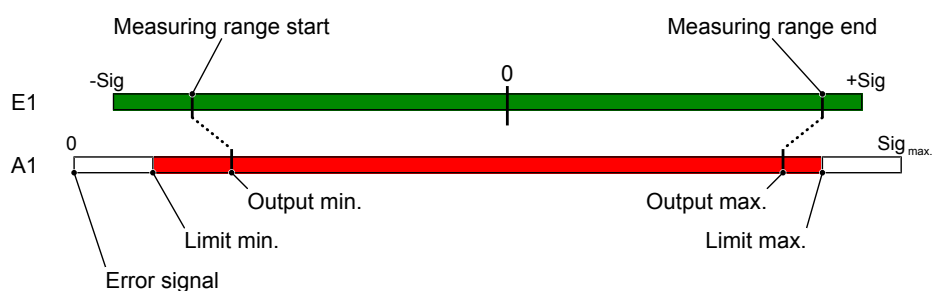


Illustration 57: Signal limits

5.4.4.5 Menu: Datalogger [Level 3]

Menu path: Main menu/Configuration/Datalogger/

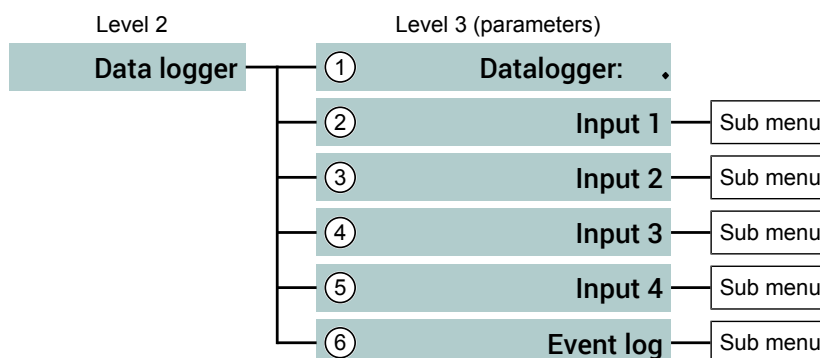
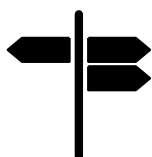


Illustration 58: Menu Datalogger

Signpost [► Page]

Menu: Input 1 [Level 4] [► 42]

Menu: Event log [Level 4] [► 43]



Item	Value range	Description
1	Data logger ☒ Yes ☒ No	The datalogger function can be switched on or off with this parameter.
2	Input 1	Sub menu
3	Input 2	Sub menu
4	Input 3	Sub menu
5	Input 4	Sub menu
6	Event log	Sub menu This menu can be used to define which events are logged and which are not logged.

The datalogger is configured in the same way for all inputs. Therefore the associated parameters are explained below using the example of input 1.

Menu: Input 1 [Level 4]

Menu path: Main menu/Configuration/Datalogger/Input 1/

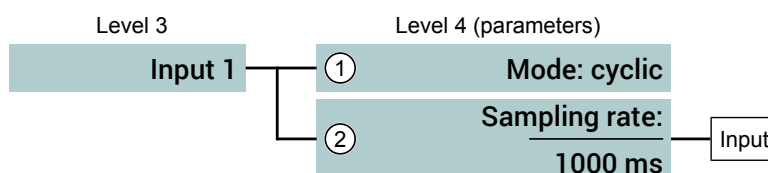


Illustration 59: Menu input 1

Item	Value range	Description
1	Mode: cyclic ☒ OFF	The datalogger function for input 1 can be switched on or off with this parameter.
2	Sampling rate 125 ms, 250 ms, 500 ms, 1 ... 30 s, 1 ... 30 min	This parameter is used to determine the intervals in which the data is saved.

Menu: Event log [Level 4]

Menu path: Main menu/Configuration/Datalogger/Event log/

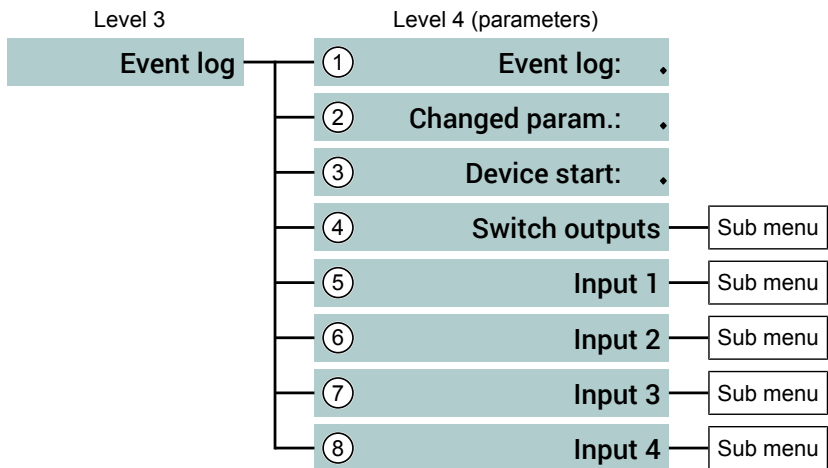


Illustration 60: Menu Event log

Signpost [▶ Page]

- Submenu: Switch outputs [Level 5] [▶ 44]
- Submenu: Input 1 [Level 5] [▶ 45]



Item	Value range	Description
1	Event log: ☒ ON ☒ OFF	The event log can be switched on or off with this parameter.
2	Changed param.: ☒ ON ☒ OFF	This parameter determines whether or not the changes to the parameter should be logged.
3	Device start: ☒ ON ☒ OFF	This parameter determines whether or not the device start should be logged.
4	Switch outputs	Sub menu
5	Input 1	Sub menu
6	Input 2	Sub menu
7	Input 3	Sub menu
8	Input 4	Sub menu

The event logger is configured in the same way for all inputs. Therefore the associated parameters are explained below using the example of input 1.

Submenu: Switch outputs [Level 5]

Menu path: Main menu/Configuration/Datalogger/Switch outputs/

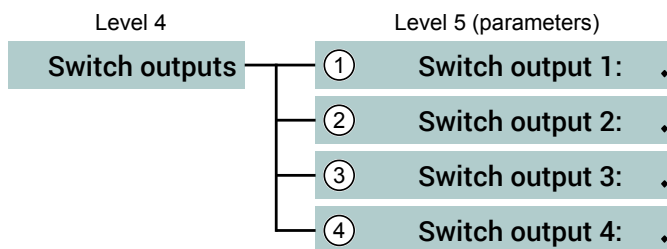
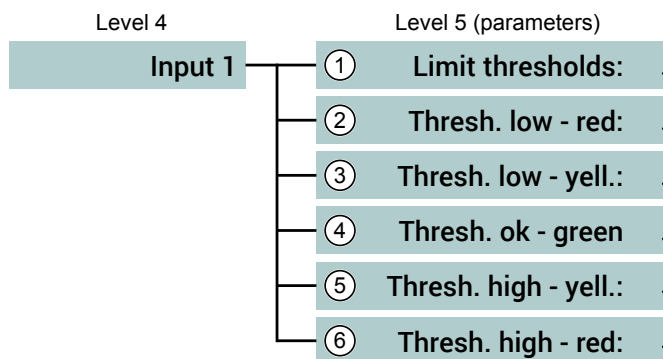


Illustration 61: Menu Switch outputs

Item	Value range	Description
1	Switch output 1: ☒ ON ☒ OFF	This parameter determines whether or not the switch output 1 should be logged.
2	Switch output 2: ☒ ON ☒ OFF	This parameter determines whether or not the switch output 2 should be logged.
3	Switch output 3: ☒ ON ☒ OFF	This parameter determines whether or not the switch output 3 should be logged.
4	Switch output 4: ☒ ON ☒ OFF	This parameter determines whether or not the switch output 4 should be logged.

Submenu: Input 1 [Level 5]*Menu path: Main menu/Configuration/Datalogger/Input 1/**Illustration 62: Menu input 1*

Item	Value range	Description
1	Limit thresholds ☒ ON ☒ OFF	This parameter determines whether or not the thresholds should be logged.
2	Thresh. low - red ☒ ON ☒ OFF	This parameter can be used to activate or deactivate the logging of the respectively stated thresholds.
3	Thresh. low – yell. ☒ ON ☒ OFF	
4	Thresh. ok - green ☒ ON ☒ OFF	
5	Thresh. high – yell. ☒ ON ☒ OFF	
6	Thresh. high red ☒ ON ☒ OFF	

5.4.5 Menu: Language [Level 2]

Menu path: Main menu/Language/

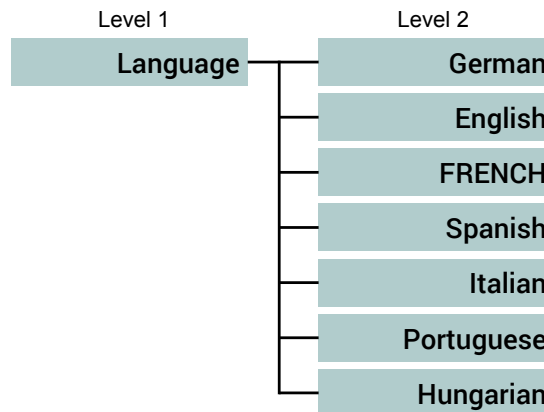


Illustration 63: Menu Language

The menu language can be changed in this menu. A dialogue box opens in which the change needs to be confirmed.



Illustration 64: Dialogue box

5.4.6 Menu: System [Level 2]

Menu path: Main menu/System/

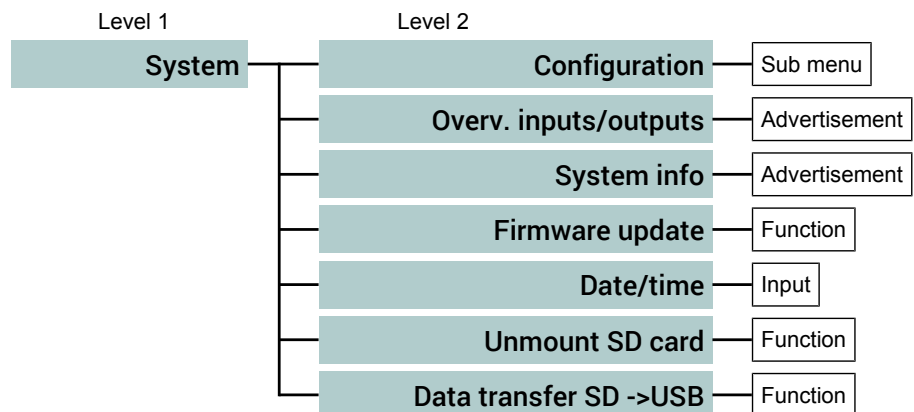


Illustration 65: Menu System

5.4.6.1 Menu: Configuration [Level 3]

Menu path: Main menu/System/Configuration../

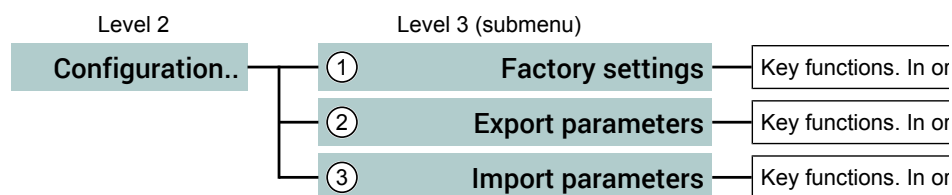


Illustration 66: Menu Configuration..

Item	Value range	Description
1	Factory settings	The default settings are restored with this function.
2	Export parameters	This function allows the current parameter values to be exported to an SD card or USB stick.
3	Import parameters	This function allows the saved parameter values to be imported from an SD card or USB stick.

The functions **Export/import parameter** serve data backup. They can also be used to transfer configurations from one device to another.

5.4.6.2 Menu: Overview inputs/outputs [Level 3]

Menu path: Main menu/System/Overview inputs/outputs/

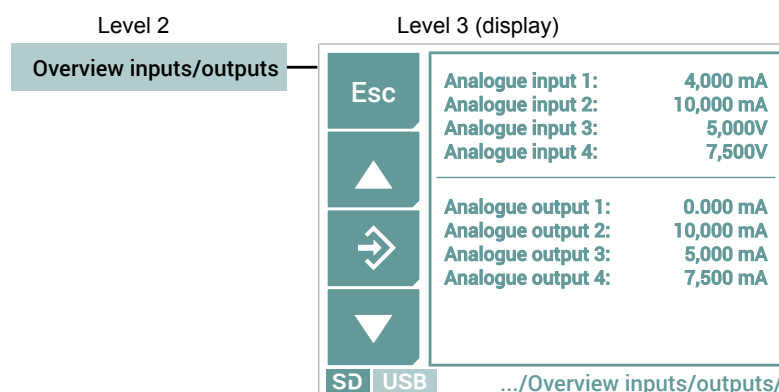


Illustration 67: Menu Overview inputs/outputs

The current status of the inputs and outputs are shown directly on the display. Deactivated analogue inputs and analogue outputs are shown.

Example

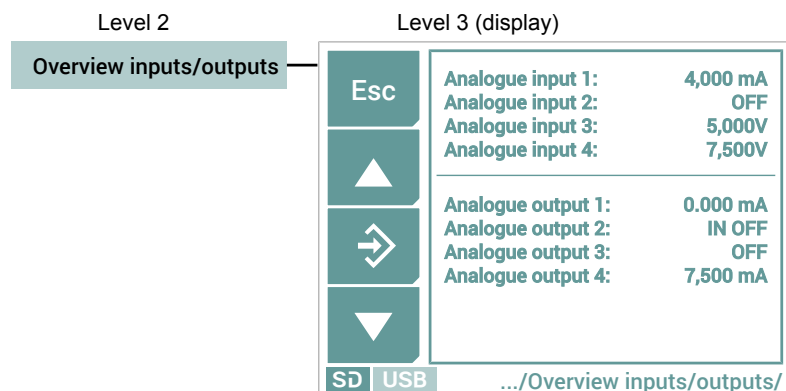


Illustration 68: Menu: Overview inputs/outputs OFF

- Analogue input 2: OFF
This display means that the input has been switched off.
- Analogue input 2: IN OFF
This display means that the input assigned to the output has been switched off.
- Analogue input 3: OFF
This display means that the analogue output has been switched off.

5.4.6.3 Menu: System info [Level 3]

Menu path: Main menu/System/System info/

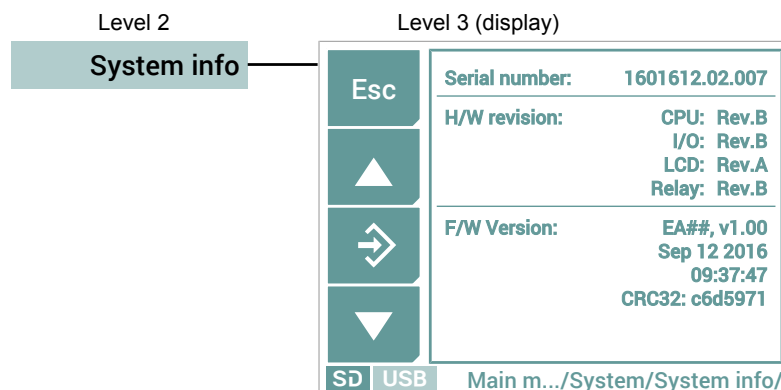


Illustration 69: Menu System info

At this point, the system data for the hardware and firmware of the unit are shown. The presented data serve as an example.

5.4.6.4 Menu: Firmware update [Level 3]

Menu path: Main menu/System/Firmware update/

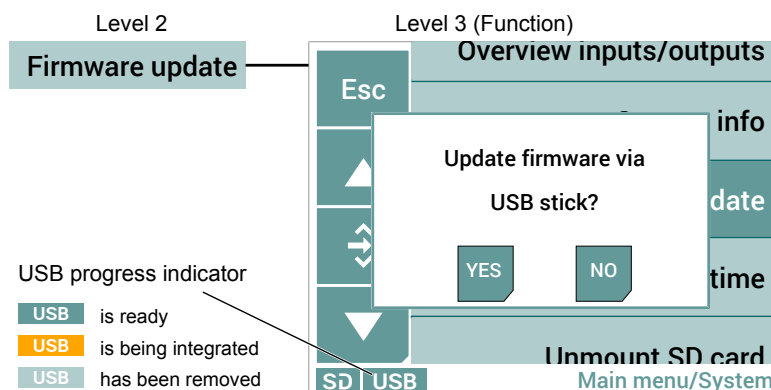


Illustration 70: Menu Firmware update

The firmware can be updated with this function. Before starting the update, the USB stick must be integrated into the system (mounted) As long as the stick is not yet ready, the USB symbol in the status line is shown in yellow. As soon as this process is completed, the backlighting turns to green.

5.4.6.5 Menu: Date/Time [Level 3]

Menu path: Main menu/SystemDate/Time/

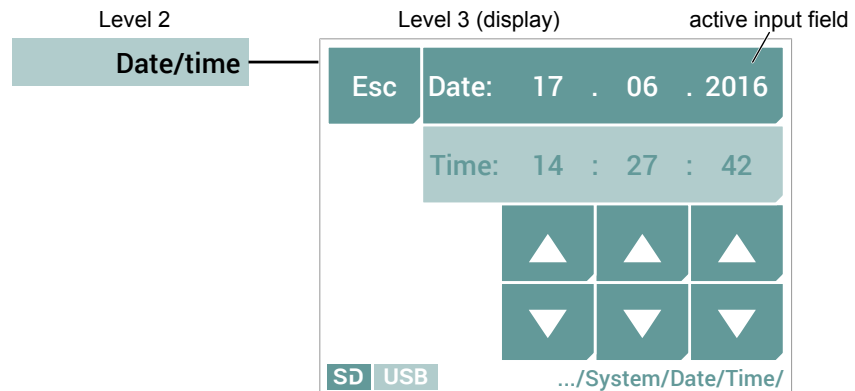


Illustration 71: Menu: Date/Time

The date and time are same way. This is shown using the example of the date.

1. Touch the date field to activate the input field.
2. Use the arrow keys to set the day, month and year. If you keep the button pressed, the respective value changes automatically (repeat function).

5.4.6.6 Menu: Unmount SD card [Level 3]

Menu path: Main menu/System/Unmount SD card/

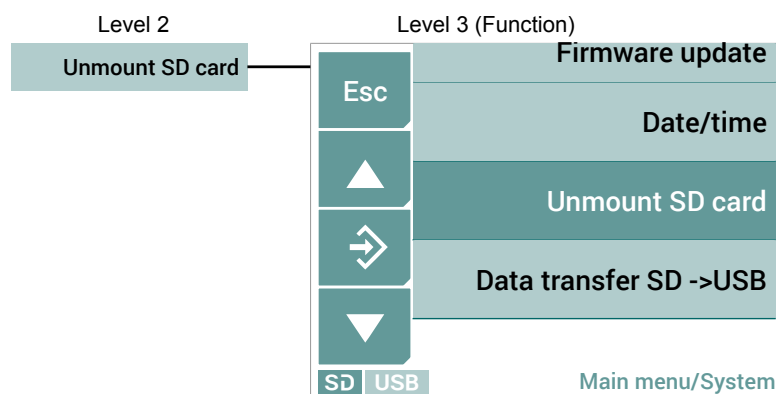


Illustration 72: Menu: Unmount SD card

Unmount SD card

Before the SD card is removed, it must be disconnected from the system. To do this, touch the menu item **Unmount SD card**. The following displayed messages take you through the process.

Import SD card

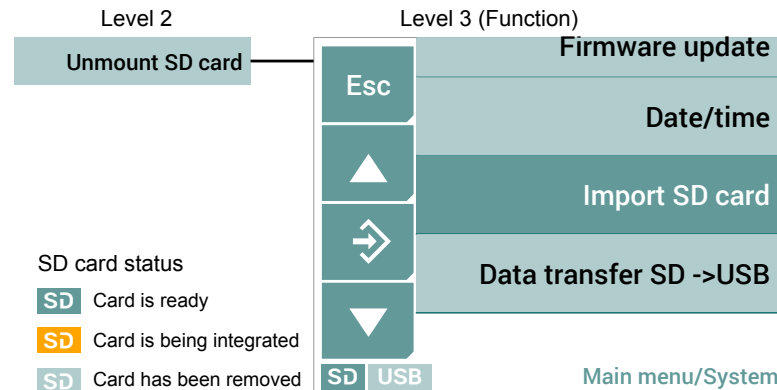


Illustration 73: Menu: Import SD card

Touch the menu item **Import SD card** to import the SD card again. The following displayed messages take you through the process.

5.4.6.7 Menu: Data transfer SD->USB [Level 3]

Menu path: Main menu/System/data transfer SD>USB/

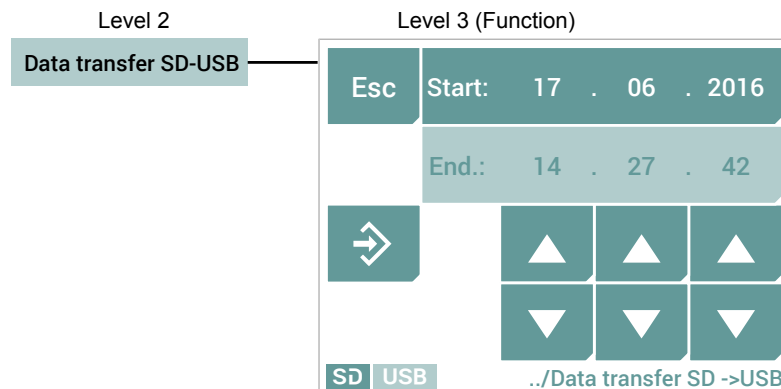
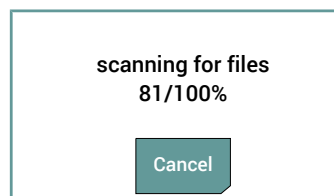


Illustration 74: Menu: Data transfer SD ->USB

Data transfers can only be performed in a daily basis. The duration of the transfer depends on the configuration of the datalogger. In the case of very large time periods and a high logging rate, the transfer may take a long time. During the transfer process the outputs are 'frozen'.

The transfer is started with the OK button. The following dialogue box appears.



The progress of the transfer process is shown. It is possible to interrupt the transfer process.

6 Technical data

6.1 Generalities

The stated technical data only refer to the measuring value display unit EA16 and never take into account the properties of the connected measuring transducer.

The EA16 is designed as a component for panel installation and is only supplied fully assembled and wired. Please see the supplied electro-technology documents of the respective panel for information about the electrical connection.

6.2 Input variables

Depending on the model, the measured value display unit EA16 has 2 or 4 analogue inputs for measuring transducers with output signals current or voltage acc. to IEC 60381.

Input range	Min. signal range	Resolution	Input resistance	Overload protection
0 ... 20 mA	4 mA	12 Bit	$\leq 30 \Omega$	PTC max. 32 DC/ 140 mA
4 ... 20 mA	4 mA		$\leq 30 \Omega$	PTC max. 32 DC/ 140 mA
0 ... 10 V	2.5V		$\geq 200 \text{ k}\Omega$	max. 32 V

6.3 Output parameters

6.3.1 Analogue outputs

Depending on the model, the measured value display unit EA16 has 2 or 4 analogue outputs with programmable uniform signals acc. to IEC 60381.

Output signal	Min. signal range	Resolution	Signal range
0 ... 20 mA	4 mA	12 Bit	0.0 ... 21.5 mA
4 ... 20 mA	4 mA		0.0 ... 21.5 mA
0 ... 10 V	2.5V		0.0 ... 10.5 V

6.3.2 Switching outputs

Depending on the model, the measured value display unit EA16 has none, 2 or 4 switch outputs with a programmable switching function. Optionally, the unit can be supplied with potential-free relay contacts or potential-free semiconductors (MOSFET).

Programmable switching function

Make contact (NO)

Break contact (NC)

Relay contacts

	AC	DC
Max. switching voltage	32V	32V
Max. switching current	2A	2A
Max. switching output	64 VA	64 W

Semiconductor contacts

	AC	DC
Allowed switching voltage	3 ... 32 V	3 ... 32 V
Max. switching current	1A	1A
Continuous current	0.25A	0.25A
Max. switching output	8 VA	8 W
Forward resistance R_{on}	$\leq 1 \Omega$	$\leq 1 \Omega$

6.4 Measurement accuracy

Characteristic value	Unit	Value
Max. characteristic curve deviation ⁺⁾	% FS	0.10
Typ. characteristic curve deviation ⁺⁾	% FS	< 0.05
Max. temperature coefficient range ^{x)}	% FS/10K	0.10
Typ. temperature coefficient range ^{x)}	% FS/10K	< 0.025
Max. temperature coefficient zero-point ^{x)}	% FS/10K	0.10
Typ. temperature coefficient zero-point ^{x)}	% FS/10K	< 0.025

⁺⁾ Characteristic curve deviation (non-linearity and hysteresis) at 25°C and rated voltage input range with linear, not spread characteristic curve.

^{x)} In relation to the input range with a linear, not spread, characteristic curve.

6.5 Digital interfaces

Type	
USB interface	Micro USB 2.0
SD card slot	Micro SD up to 32 GB

6.6 Display and operating interface

Characteristic value	Value
Display size	3.5"
LCD type	TN TFT
Resolution	320 x 240 Pixel
Touch	Resistive

6.7 Auxiliary energy

Characteristic value	Value
Rated Voltage	24 V DC
Admissible operating voltage	$U_b = 18 \dots 32 \text{ V DC}$
Power consumption	Max. 10 W

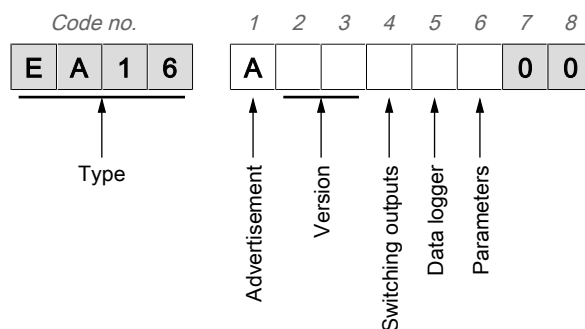
6.8 Application conditions

Characteristic value	Value
Permissible ambient temperature	-5 ... +50 °C
Admissible storage temperature	-10 ... +70 °C
Admissible media temperature	see data sheet of the connected measuring transducer
Enclosure protection class	see the electro-technology documents panel (RT#####)
EMC (204/108/EC)	EN 61326-1:2013 EN 61326-2-3:2013
RoHS (2011/65/EU)	EN 50581:2012

6.9 Construction design

Please see the electro-technology documents for information about the panel (RT#####).

7 Order Codes



Display

[1] ← **Code no.**

A 3.5" TFT Touch LCD (horizontal)

Version

[2.3] ← **Code no.**

20 2 channels (2 inputs, 2 outputs, 2 switch outputs)

40 4 channels (4 inputs, 4 outputs, 4 switch outputs)

Switching outputs

[4] ← **Code no.**

0 without

R with relay contacts

H with semiconductor switches

Data logger

[5] ← **Code no.**

0 no

1 yes (32 GB Micro SD card)

Parameters

[6] ← **Code no.**

S Standard configuration

K Customer-specific configuration

8 Attachments

8.1 EU Declaration of Conformity



EU Declaration of Conformity

(Translation)

For the product described as follows

Product designation **Measuring value display**

Type designation **EA16**

it is hereby declared that it corresponds with the basic requirements specified in the following designated directives:

2014/30/EU EMC Directive

2011/65/EU RoHS Directive

The products were tested in compliance with the following standards.

Electromagnetic compatibility (EMC)

EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

EN 61326-2-3:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

RoHS

EN 50581:2012 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Also they were subjected to the conformity assessment procedure „**Internal production control**“.

The object of the declaration described above is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Sole responsibility for the issue of this declaration of conformity in relation to fulfilment of the fundamental requirements and the production of the technical documents is with the manufacturer.

Manufacturer **FISCHER Mess- und Regeltechnik GmbH**

Bielefelder Str. 37a
32107 Bad Salzuflen, Germany
Tel. +49 5222 974 0

Documentation representative Mr. Stefan Richter
Dipl. Ing.
General Manager R & D

The devices bear the following marking:



Bad Salzuflen,
2016-09-28


S. Richter
General Manager R & D

09010175 CE EN EA16 Rev A 09/16



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Illustration 75: CE_DE_EA16

