Evaluation unit

DUO XPERT LB 478 MPLM

Operating Manual
56925-8BA2

Rev. No.: 00, 07/2019
Embedded software version as of vers. 1.6.0 (CPU) and 1.6.0 (MU)

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Table of Contents

1 About this Operating Manual

1.1 Applicable Documents

This manual contains the following document:

- Technical Information Id. No. 56925TIM (see appendix)

1.2 Some Prior Remarks

The product is handed over to you by the manufacturer BERTHOLD TECHNOLOGIES GmbH & Co. KG (designated as Berthold in the following) in a complete and functionally reliable condition.

This operating manual illustrates how to:

- set up/install the product
- make electrical connections
- perform measurements
- apply software settings
- carry out maintenance on the product
- fix errors
- disassemble the product
- dispose of the product.

Read these instructions thoroughly and completely before working with the product. We have tried to compile all information for safe and proper operation for you.

However, should questions arise which are not answered in this operating manual, please refer to Berthold.

1.3 Storage Place

This operating manual as well as all product-related documentation relevant to the respective application must be accessible at all times near the device.

1.4 Target Group

This operating manual is directed at qualified specialist personnel who are familiar with handling electrical and electronic assemblies as well as with communication and measuring techniques.

Specialist personnel refers to those who can assess the work assigned to them and recognise possible dangers through their specialist training, knowledge and experience as well as knowledge of the relevant regulations.

1.5 Validity of the Operating Manual

The operating manual is valid from the delivery of the Berthold product to the user until its disposal. Version and release date of this operating manual can be found in the bottom of each page. Modification services are not performed by the manufacturer Berthold.

The manufacturer reserves the right to make changes to this operating manual at any time without stating reasons.

NOTICE

The current revision of this operating manual replaces all previous versions.

1.6 Structure of the Operating Manual

This operating manual has been divided into chapters. The series of chapters should help you to familiarise yourself quickly and properly with the operation of the product.

1.7 Copyright

This operating manual contains copyright-protected information. None of the chapters may be copied or reproduced in any other form without prior authorisation from the manufacturer.

1.8 Representation

Identifier	Meaning	Example
Quotation mark	Field in the soft-wareuser interface	"Calibrate"
Vertical line	Path specification	Settings | Selection
Pointed brackets	Keys and buttons	<Update>
Round brackets	Image reference	Connect the plug (fig. 1, item 1)

In the software description, the term "clicking" is used if a process is to be activated. This also refers to the pressing of a button or an area on the touch display if a mouse is not used for control.

1.9 Warning notes

Warning notes are designed as follows:

Signal Word

Source and consequence
Explanation, if required
u Prevention
In case of emergency

- **Warning symbols:** (warning triangle) draws attention to the hazard.
- **Signal word:** Indicates the severity of danger.
- **Source:** Specifies the type or source of danger.
- **Consequence:** Describes the consequences of non-compliance.
- **Prevention:** Specifies how the hazard can be avoided.
- **In case of emergency:** Specifies which actions are required in the event of the occurrence of risk.

1.9.1 Symbols Used in the Operating Manual

In this manual, warning instructions before instructions for action refer to risks of injury or damage to property. The hazard-prevention measures described must be observed.

⚠ DANGER

Indicates an **imminent**, major hazard, which will certainly result in serious injuries or even death if the hazard is not avoided.

⚠ WARNING

Indicates a **potential** hazard, which can result in serious injuries or even death if the hazard is not avoided.

⚠ CAUTION

Refers to a **potentially dangerous** situation, which can result in medium or minor physical injuries or damages to property, if it is not avoided.

NOTICE

If this information is not observed, deterioration in the operation and/or property damage may occur.

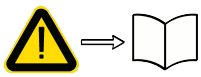
IMPORTANT

Sections marked with this symbol point out important information on the product or on handling the product.

Tip

Provides tips on application and other useful information.

1.9.2 Symbols Used on the Device



Read the operating manual

Please observe the instructions in this operating manual.

Electrostatic discharge

Please note the handling instructions. Electrostatically endangered components. Please observe the instructions in this operating manual.

Protective earth connection

At this position, connect the protective earth conductor (PE).

Equipotential bonding connection

At this position, connect the equipotential bonding conductor.

Direct voltage

The device is operated with direct voltage and may only be connected with a direct voltage source.

Alternating voltage

The device is operated with alternating voltage and may only be connected with an alternating voltage source.

No domestic waste

The electric product must not be disposed of in domestic waste.

1.10 Conformity

The company Berthold hereby declares in its sole responsibility that the design of this product, which is brought to the market by Berthold, complies with relevant EU directives stated in the original declaration of conformity.

This statement shall become void in the case of changes not authorised by Berthold or improper use.

For the original declaration of conformity, please refer to Declaration of Conformity in the document “Technical Information”.

2 Safety

2.1 Dangers and safety measures

- Read these instructions thoroughly and completely before working with the product.
- Store the instructions where they are accessible for all users at all times.

2.2 Proper Use

The evaluation unit DuoXpert LB 478 MPLM (EVU) measures the level together with compatible detectors and an appropriate radiation source and may only be used for this purpose.

The following constitutes proper use:

- Adhering strictly to the instructions and operation sequences and not undertaking any different, unauthorised practices which could endanger your safety and the operational reliability of the EVU!
- Observing the given safety instructions!
- Carrying out the prescribed maintenance measures or having them carried out for you!
- Only use accessories and spare parts from Berthold.

Improper use to be prevented:

- Failing to observe the specified safety instructions and instructions for the operation, maintenance and disposal in the operating manual.
- Any non-compliance with the present operating manual for the supplied products.
- Applying conditions and requirements which do not conform to those stated in the technical documents, data sheets, operation manuals and assembly instructions and other specific guidelines of the manufacturer.
- Use of the product if parts of it are damaged or corroded. This also applies for seals and used cables.
- Restructuring or changing the system components.
- The product is not suitable for use in potentially explosive areas and may therefore not be operated in such areas. The product is not explosion-proof.
- Operation ...
  - in a state where live parts are accessible.
  - in a wall housing with inadequately sealed glands and / or insufficiently tightened or damaged cable glands.
- Operation without the safety precautions provided by the manufacturer.
- Manipulation or avoidance of existing safety equipment.

Berthold shall only accept liability for / guarantee the correspondence of the device to its publicised specifications.

If the product is used in a way which is not described in the present operating manual, the device's protection is compromised and the warranty claim becomes invalid.

NOTICE

The device is not approved according to IEC 61508 “Functional safety of safety-related electric/electronic/programmable electronic systems”.

2.3 Qualification of the Personnel

NOTICE

A minimum requirement for all work on or with the product would be employees with general knowledge who are instructed by an expert or authorised person.

At different parts in this operating manual, reference is made to groups of people with certain qualifications who can be entrusted with different tasks during installation, operation and maintenance.

These three groups of people are:

- Employees with General Knowledge
- Experts
- Authorised Persons.

Employees with General Knowledge

NOTICE

Employees with general knowledge must always be guided by an expert at the very least. When dealing with radioactive substances, a radiation safety officer must also be consulted.

Employees with general knowledge are e.g. technicians or welders, who can undertake different tasks during the transportation, assembly and installation of the product under the guidance of an authorised person. This can also refer to construction site personnel. The persons in question must have experience in handling the product.

Experts

Experts are persons who have sufficient knowledge in the required area due to their specialist training and who are familiar with the relevant national health and safety regulations, accident prevention regulations, guidelines and recognised technical rules.

Expert personnel must be capable of safely assessing the results of their work and they must be familiar with the content of this operating manual.

Authorised Persons

Authorised persons are those who are either designated for the corresponding task due to legal regulations or those who have been authorised by Berthold for particular tasks. When dealing with radioactive materials, a radiation safety officer must also be consulted.

2.4 Operator's Obligations

The operator of the product must regularly train his personnel in the following topics:

- Observation and use of the operating manual and the legal provisions.
- Intended operation of the product.
- Observation of the plant security instructions and the operating instructions of the operator.
- Regular monitoring/maintenance of the product.

3 System Description

3.1 Overview

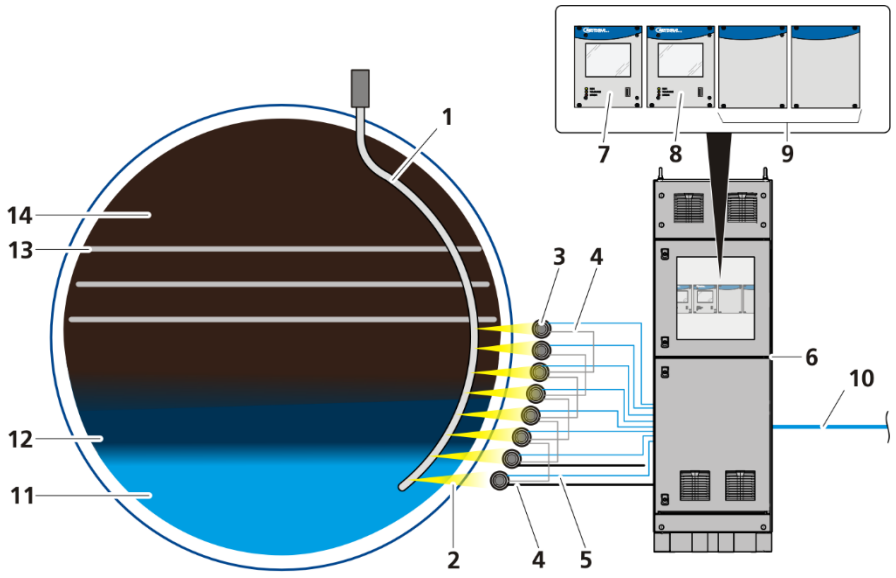
Multiphase Level Measurement (MPLM) systems can be used to determine the interface position between liquid phases or the height of different product layers.

Berthold's EmulsionSENS is used to determine multiphase layers and consists of detectors and evaluation units.

A complete measuring system consists of the following components, which are, according to customer's order, individually assembled:

- Evaluation unit DuoXpert LB 478 MPLM (master and extension module)
- EmulsionSENS Control Cabinet
- Source
- Shields
- Point detector / rod detector(s) LB 480

These instructions concern the operation of the evaluation unit DuoXpert LB 478 MPLM (Fig. 1, item 7 and item 8). The operation of other system components is part of the independent instructions of the respective system components. Depending on the measuring task and the composition of the measuring product and containers, different arrangements and system components are required.



1	Dip pipe	8	Evaluation unit LB 478 extension module
2	Radiation beam	9	Blind panels (for further extension modules)
3	LB 480 Detectors	10	Communication line (4-20mA) to DCS
4	Power supply 24 V DC	11	Water
5	Communication line (RS485)	12	Emulsion
6	Electronic cabinet	13	Grids
7	Evaluation unit LB 478 Master	14	Oil

Fig. 1 Example measurement arrangement

3.2 Measuring Principle

The Multiphase Level Measurement system EmulsionSENS consists of radiometric density devices LB 480 at different elevations through the measurement span (see Figure 1) and evaluation units LB 478 MPLM. Such an arrangement allows accurate measurement of the density at each of these positions and provides a density profile of the fluids as they separate inside the vessel.

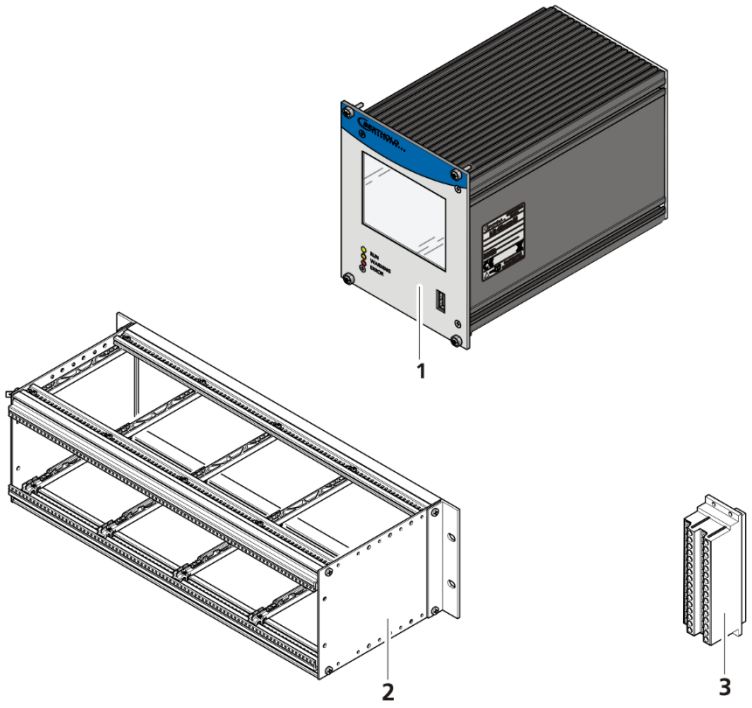
The density measurement is based on the through-beam method and uses the physical laws of absorption of radiation by matter. The resulting measurement effect is the ratio I/I0 between the unattenuated radiation I0 and the radiation I weakened by the measured medium.

The density values of the individual detectors LB 480 are sent to the evaluation unit LB 478 via RS485. By means of an algorithm implemented in the evaluation unit LB 478, interface levels can be calculated from the measured density values. This allows the operator to see where the top of a layer is located as well as the bottom of a layer.

Tip

Further information on the functional principle of the detectors can be found in the operating manual of the detector.

3.3 System Components



1 Master-EVU / extension module with wide range supply (100-240 V AC, 50/60 Hz) Alternatively with 24 V supply (18-32 V DC)
2 19" subrack
3 Clamp block for electrical connections

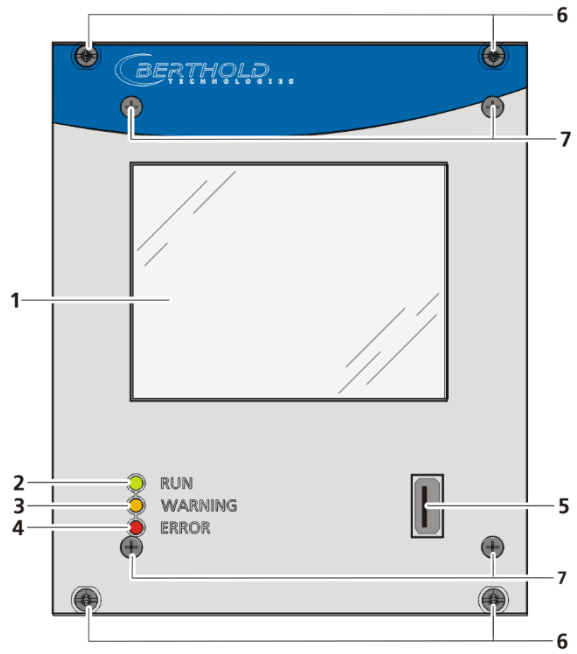
Fig. 2 System components

3.3.1 Front/rear view EVU

Front view EVU

The following control elements are found on the front of the EVU:

- LEDs for status display of individual operating states
- 3.5'' Touch display
- USB port.



1 3.5'' Touch display
2 RUN LED
3 WARNING LED
4 ERROR LED
5 USB port
6 Mounting screws
7 Screws front plate

Fig. 3 Front view of the EVU

Operation Display / Touch Screen

The EVU is operated via the touch screen. Alternatively, the device can be connected to a mouse at the USB port. The device can also be operated by remote control (see chap. 7.3.1).

NOTICE

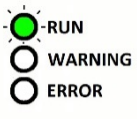
Damage to the touch screen

Pointed or sharp objects can damage the plastic surface of the touchscreen.

u Operate the touch screen only with your fingers or with a touch pen or connect a mouse. The mouse pointer automatically becomes visible when a mouse is inserted into the USB port.

Status displays of the master EVU

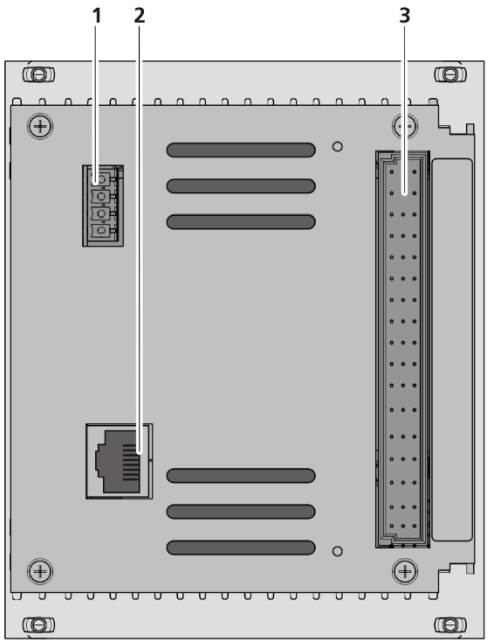
The LEDs (Fig. 3, items 2-4) below the touch display show the current operating status of the master EVU.

Display LED	Description
	**RUN** This LED lights up green if the device is in operation and fault-free. The current measurement is carried out.
	**RUN (flashing)** The RUN LED flashes green while the measurement is (held) in the STOP state by user actions (e.g. stop function, simulation mode, plateau recording).
	**WARNING** This LED lights up yellow when a system event of the type "Outside of specification", "Maintenance required" or "Function check" is present. All system events are described in chapter 9.2.
	**ERROR** This LED lights up red if a system event of the type "Failure" is present. The current measurement is retained. Check the Device Setup. All system events are described in chapter 9.2.
	**RUN / WARNING / ERROR flashing** All three LEDS flash during the system test which is performed as part of the start up process.

Rear view EVU

The following connections are located on the back of the EVU:

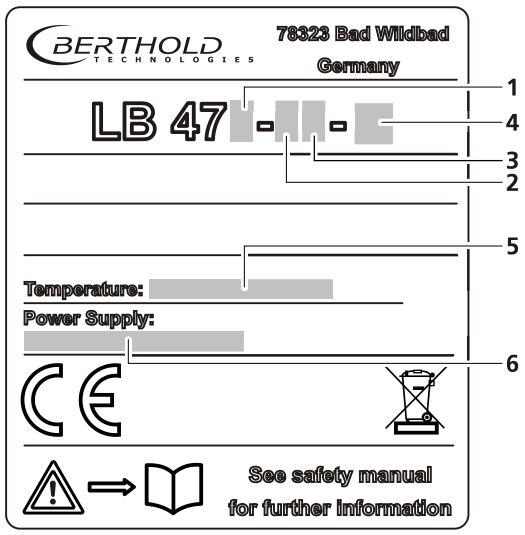
- Master/slave connector, 4-pin
- RJ45 socket for Ethernet
- 32-pin plug connector



1 Master/slave 4-pin connector
2 RJ45 socket for Ethernet
3 32-pin plug connector

Fig. 4 Rear view EVU

3.3.2 Type plate



1	Application	4	Master (M) or extension module (E)
2	Approval explosion protection (0 = no explosion approval)	5	permissible temperature range for operation (ambient temperature)
3	Power supply (1 = 24 V DC; 2=100…240 V AC -10 +10%)	6	Power specifications

Fig. 5 Type plate

3.3.3 Software

The EVU is delivered with pre-installed software. The revision status (version) of the software can be seen on the screen display when starting up the EVU or in the menu "Device information" (Chapt. 7.1.2).

This operating manual describes the software version 1.6.0 (Control Unit / CU) and 1.6.0 (Measurement Unit / MU).

3.4 Storage

Keep devices in a dry (no condensation), dark (no direct sunlight), clean and lockable room. Stay within the temperature range for storage (see document “Technical Information”).

4 Installation

4.1 General Instructions

The applicable national regulations of the country of use have to be observed! Repair and maintenance on the devices may only be performed by experts (see chapter 2.3). In case of doubt, the complete device must be returned to Berthold for repair.

NOTICE

The Evaluation unit is not explosion protected and is not designed for hazardous environments.

Only mounting accessories approved by Berthold should be used for installation of the devices. The device should only be operated if firmly installed.

4.2 Unpacking/Scope of Delivery

The product will be delivered completely configured according to the purchase order. Check your delivery for completeness and damage according to your order. Please report missing, defective or incorrect parts immediately.

4.3 Installation in the 19" subrack

The 19" subrack can be equipped differently, depending on requirements. The rear clamp blocks (Fig. 6, item 3) are used for the electrical connection.

NOTICE

The 19" subrack may only be installed in a dry environment.

The subrack is installed in a 19" control cabinet or a control panel (switchboard). The 4 side holes that should be provided with fitting screws are used to fasten the subrack.

NOTICE

The EVU is delivered equipped, depending on the order. The installation of the modules is only necessary if:

- Another measurement channel is to be fitted
- A defective module is to be replaced

4.3.1 Installation with clamp blocks

⚠ DANGER

Danger to life from electric shock!

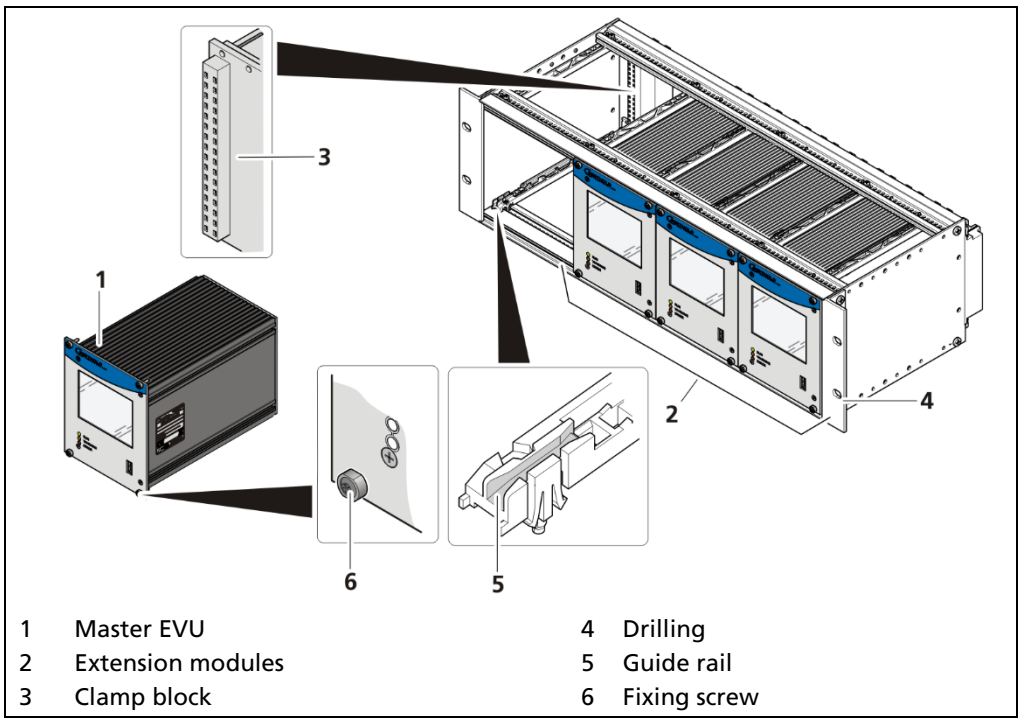
- u Installation/maintenance may only be carried out if the device has been de-energised.
- u Test of absence of harmful voltages when the front side is open.

In case of an electric shock, carry out first aid measures and immediately call an emergency service.

NOTICE

The master's EVUs / extension modules must be secured against pulling out by fixing screws (Fig. 6, item 6).

The device must be disconnected from the mains voltage before it is pulled out.



1	Master EVU	4	Drilling
2	Extension modules	5	Guide rail
3	Clamp block	6	Fixing screw

Fig. 6 19" subrack with clamp block

1. Set master EVU / extension module (Fig. 6, item 1, item 2) in the guide rails (Fig. 6, item 5).
2. Carefully slide module into the subrack until the plug connector is inserted into the clamp block.
3. Tighten fixing screws (Fig. 6, item 6).

u The EVU is correctly inserted and can be connected.

5 Electric Installation

5.1 General Instructions

⚠ DANGER

Danger to life from electric shock!

- The installation may only be carried out by a qualified electrician.
- Please adhere to the relevant safety regulations.
- Open the housing only in a dry environment and for installation, maintenance and servicing.
- During installation and servicing on the hardware as well as during wiring of the detector, the measuring system, connected relay contacts and all inputs and outputs must be de-energised.
- Connect only devices onto the product that comply with the applicable safety standards.

In case of an electric shock, carry out first aid measures and immediately call an emergency service.

NOTICE

Apply the voltage of the specified and marked range only!

NOTICE

The relay of the LB 478 MPLM can only switch low voltages. Please note the specifications in appendix Technical Information.

The voltage parameters of all devices connected to the outputs of the product (e.g. relay circuit, RS-485, current output) must comply with the limit values of the safety directives for electrical measurement, control, regulation and laboratory devices (DIN EN 61010-1) and be equipped with double or reinforced insulation.

These protective measures are necessary to avoid the risk of contact with life-threatening voltages.

Changing the installation without precise knowledge of this operating manual is not permitted.

General important points for installation

- Connect the earth conductor.
- Ground the housing.
- Please observe the information signs on the devices.

5.1.1 Circuit Breaker

A circuit breaker according to DIN EN 61010-1

- must be available,
- must be easily accessible for the maintenance personnel and
- is to be included in the company-internal documentation.

The master EVUs / extension modules are not equipped with a separate ON/OFF switch to connect or disconnect the voltage supply. Make sure that the system can be de-energised via the external power supply.

The circuit breaker can be installed as an automatic fuse or switch and has to comply with the requirements according to IEC 947-1 and IEC 947-3. If a fuse is applied, it must not be triggered under a current strength of 4 A per device.

IMPORTANT

The circuit breaker must be located near the device and be properly marked as belonging to it.

5.1.2 Cables and Lines

- u Lines are to be connected with special care.
- u Connection lines and routing must comply with the applicable regulations.
- u When routing the cables, make sure that the cable insulation cannot be mechanically damaged by sharp edges or movable metal parts.
- u Use the approved Berthold cable or a cable with equivalent specifications for the connection.

For intrinsically safe systems, the detector must be connected to the equipotential bonding of the system. The detector is connected via a 2-core (0.2 ... 2.5 mm²) cable with approx. 5 ... 10 mm diameter. A screened cable can be used in systems with extremely strong electrical noise. The screen may only be laid out on one side of the detector. The maximum cable length depends on the cable resistance, which may not exceed a total (there and back) of 40 ohms. For standard cables from Berthold (Id. no. 32024), this results in a cable length of 1000m, from the evaluation unit to the detector. For intrinsically safe systems, the maximum permissible inductance and capacitance of the cable should be considered to the max. 40 ohm.

When routing the connection lines, make sure that

- u no dirt or moisture reaches the connection room,
- u the conductors are not damaged when the cable insulation is removed,
- u the conductor insulation or the sleeve of the wire end ferrules reach into the housing of the terminal unit,
- u blank, conductive segments of the lines (e.g. wires of a litz wire) do not reach outside the terminal unit,
- u the wire end ferrule or the stripped wire have a length of 8 mm so that the wire is held securely in the clamp,
- u the line insulation reaches into the sleeve of the wire end ferrule if these components are used,
- u the admissible minimum bending radius for the respective line cross-section is not exceeded and

- the cables are laid out in a strain-relieved and friction-free manner.
- Only use cables whose diameters are approved for the respective cable gland. The cables must comply with the requirements and cross-sections specified in the technical data.
- The connected cables must be appropriate for temperatures of at least 10°C above the maximum admissible ambient temperature.

5.1.3 Cable Glands and Blanking Elements

- The feeding of cables into the wall housing is only permitted via a cable entry.
- Cable glands must be suitable for the respective application.
- All cable glands must be assembled according to manufacturer's instructions and be tightened to the appropriate tightening torque.
- Cable glands that are not required for installation must be covered with suitable blanking elements.
- Line cross-sections must comply with the respectively used cables.
- Cable bushings and blanking elements must comply with the applicable IP protection class and with the requirements for the operational environment.
- We recommend ordering missing cable glands, blanking elements or adapters from Berthold.

5.1.4 Protective earth and equipotential bonding

- The protective earth conductor has to be connected to the terminals marked with "PE".
- The housing must be connected to local equipotential bonding.

5.1.5 EIA-485 (RS-485) Network

For integration of EVU units into an EIA-485 (RS-485) network, all participants must be connected one after the other in the configuration Master-Master. Star connection is not permitted.

The first and last station (physical, independent of the master's position) on the network needs a terminating resistor of 121 Ω.

5.2 Wiring diagram

The detectors LB 480 are connected to the evaluation unit via the RS485 terminals. Connect the communication lines according to assignment to clamp blocks (Fig. 7). Observe the circuit diagrams of the EVU in the document “Technical Information”.

NOTICE

Observe the circuit diagrams of the control unit and the detectors for connecting.

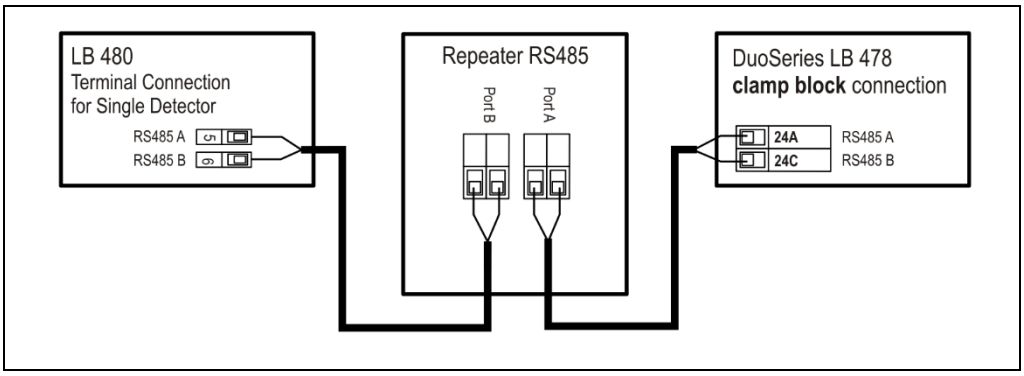


Fig. 7 Communication connection detector-EVU

5.3 Electrical connection in the 19" subrack

The electrical connections are made via clamp blocks. These clamp blocks are already installed in the 19" subracks and are also available as an optional accessory.

⚠ DANGER

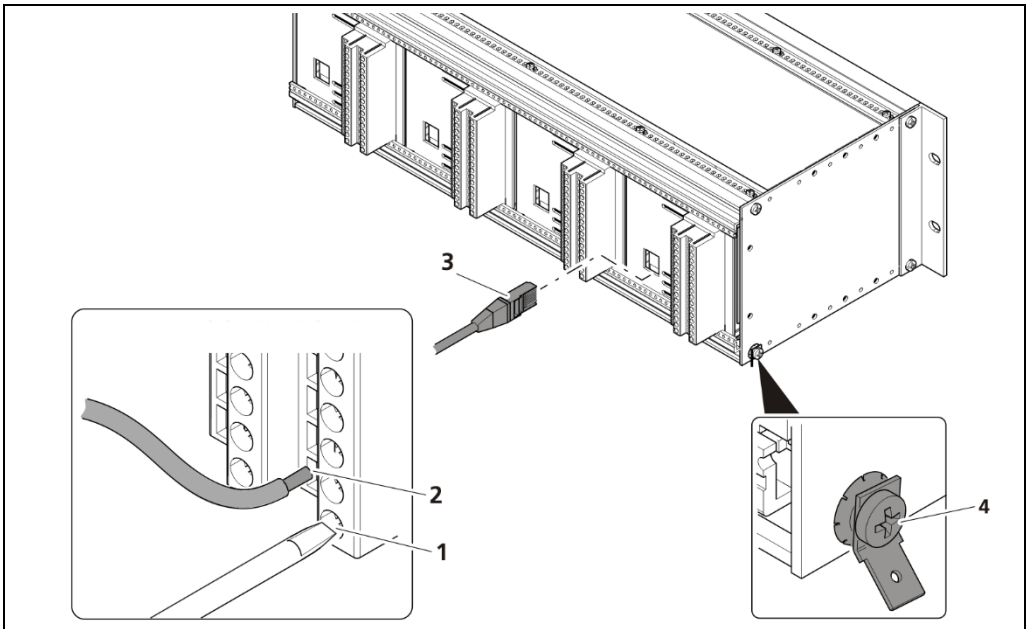
Danger to life from electric shock!

- u The installation may only be carried out by a qualified electrician.
- u Please adhere to the relevant safety regulations.
- u Installation/maintenance may only be carried out if the device has been de-energised.
- u Only open the device when free of voltage.

In case of an electric shock, carry out first aid measures and immediately call an emergency service.

IMPORTANT

In the case of applications with clamp blocks a contact protection must be provided by the customer when voltage is applied. The cable connections of clamp blocks have to be in accordance with IEC 61010-1 (2010).



1 Clamping screw (M2.5)
2 Opening terminal connection
3 RJ45 connector (network)
4 PE connection

Fig. 8 Electrical connection in the 19" component rack

1. Connect the lines to the clamp blocks according to assignment (see chapt.5.2 and the document "Technical Information"), note in addition the wiring diagrams of the control unit.
2. Open the clamping screw (Fig. 8, item 1) and insert the stripped wire (min. 8 mm).
   - u The terminal connections are designed for wires with a conductor cross-section from 0.2 mm² to 2.5 mm².
3. Screw the clamping screws with a tightening torque of 0.4 - 0.5 Nm.

4. Plug the network plug into the RJ45 socket (Fig. 8, item 3) (optional).
5. Check the correct connection of the PE conductor (Fig. 8, item 4).

NOTICE

Note the specification relating to Protective earth and equipotential bonding in chapter 5.1.4 .

u The connection was made correctly.

5.4 Switching current output

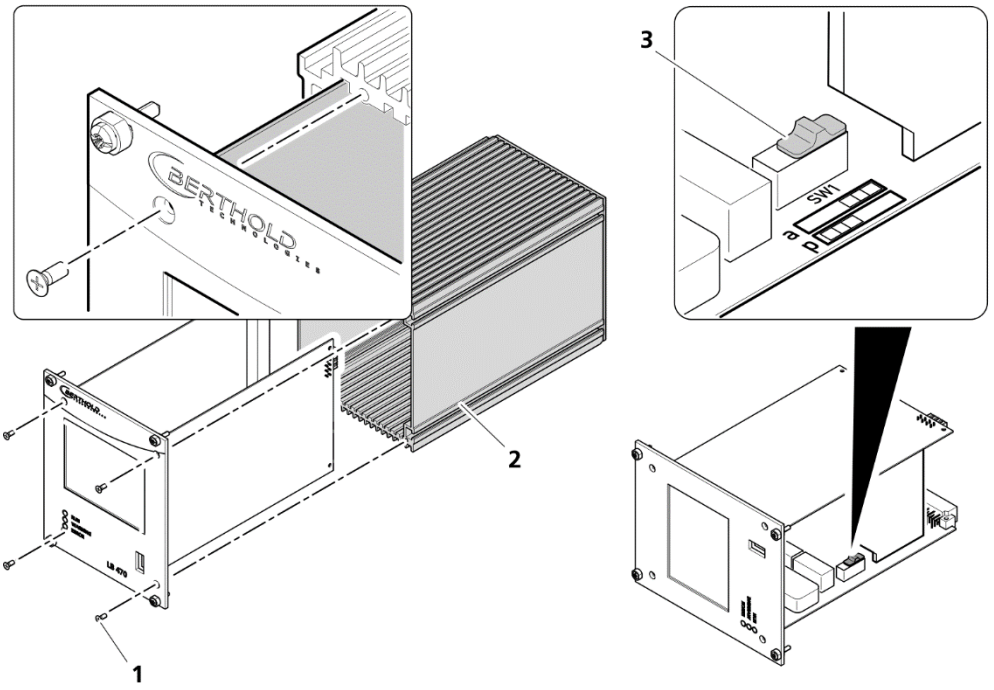
Switching between "SOURCE" (active) and "SINK" (passive) is possible using the slide switch on the I/O board. Factory setting EVU is delivered in "SOURCE" mode.

⚠ DANGER

Danger to life from electric shock!

- u The switching may only be carried out by a qualified electrician.
- u Please adhere to the relevant safety regulations.
- u Switching may only be carried out if the device has been de-energised.
- u Only open the device when free of voltage.

In case of an electric shock, carry out first aid measures and immediately call an emergency service.



1 Cable glands
2 Housing
3 Slide switch (a=active "SOURCE"; p=passive "SINK")

Fig. 9 Switching of the current output

1. Loosen the four sunken screws on the front side of the EVU (Fig. 9, item 1).
1. Pull out the housing (Fig. 9, item 2) carefully.
2. Slide the switch (Fig. 9, item 3) to position a for "active" (SOURCE), to position p for "passive" (SINK).
3. Carefully insert the front panel into the housing. Pay attention to the correct guide rail!
4. Screw the front panel to the housing (Fig. 9, item 2) with the four screws (Fig. 9, item 1).

u The switching has been carried out correctly.

6 Operation of the Software

6.1 System start

Fig. 10 Start screens with display of the software version

System start with invalid application software

A different menu structure is present in this mode.

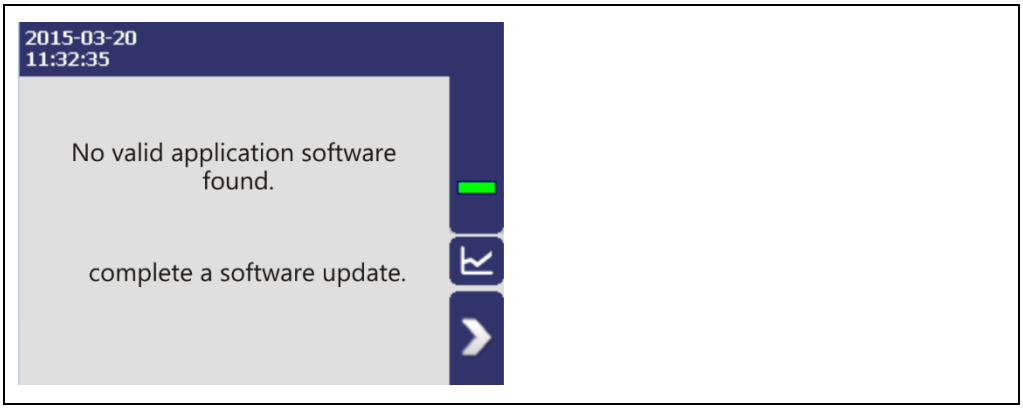


Fig. 11 Start screen (Invalid application software)

IMPORTANT

The communication between the sensor and EVU is limited to 1200 baud. Accordingly, there is a load time for data that are retrieved in the detector.

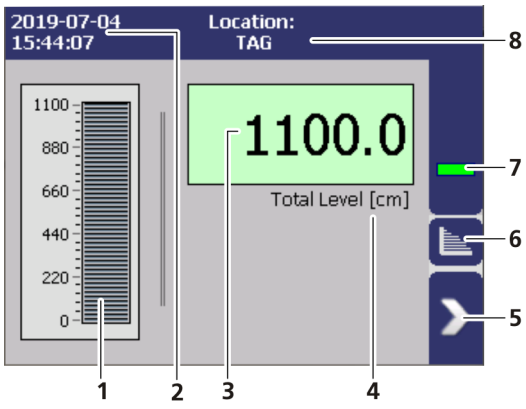
All set values as well as the calibration data are stored in a non-volatile memory.

The real-time clock for date and time is buffered via a capacitor and continues to run for up to approx. 4 weeks even when the device is switched off. See also "Date and time" on page 49.

6.2 EVU standard display

IMPORTANT

Changing the language of the user interface is changed in menu Device Setup | Setup | System | Interfaces | Languages.

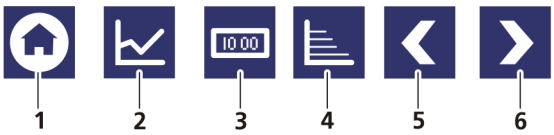


1	Level scale	5	Button “Menu”
2	Date and Time	6	Button “Diagram”, “Monotonized densities”
3	Process value	7	State information
4	Selected Interface [Unit]	8	Location

Fig. 12 Standard display of the EVU

Level scale	The scale range of the value is displayed.
Date and Time	The date and time displayed in the menu Device Setup | Setup | System | Date/Time was set.
Process value	The current process value with the set unit is displayed.
Selected Interface	The set interface from the menu Device Setup | Setup | Outputs | Analog Outputs
Unit	The set unit from the menu Device Setup | Setup | System | Units is displayed
Button “Menu”	The main menu opens
Button “Diagram”	The view changes to diagram and monotonized densities
Status information	The current system status is displayed.
Location	Name of the measuring point in the menu Device Setup | Identification.

6.3 Navigation

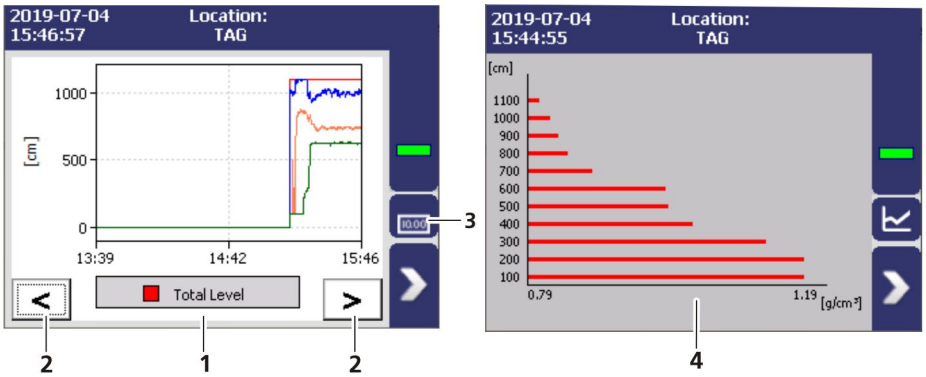


1	Home (standard display)	4	Display of monotonized densities
2	Diagram display	5	One menu level back
3	Data display	6	One menu level forward

Fig. 13 Icons for navigation

6.3.1 Diagram display

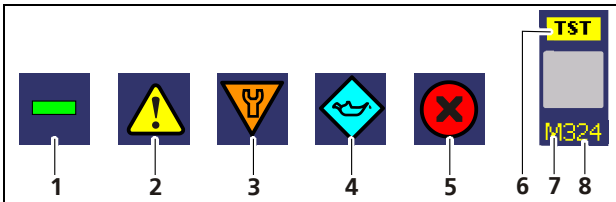
Clicking the symbol (Fig. 12, item 6) changes the view to the display monotonized of densities (Fig. 14, item 4; only available for the master unit). Clicking the symbol (Fig. 13, item 2) changes the view to the diagram display. The diagram of the extension modules shows only the time course of the selected interface, whereas the master unit shows the time c ourse of all interfaces. The arrow keys (Fig. 14, item 2) are used to view the colors (Fig. 14, item 1) of the interfaces lines.



1 Diagrams
2 Arrow keys
3 Standard display

Fig. 14 Diagram display of the EVU

6.4 Status messages

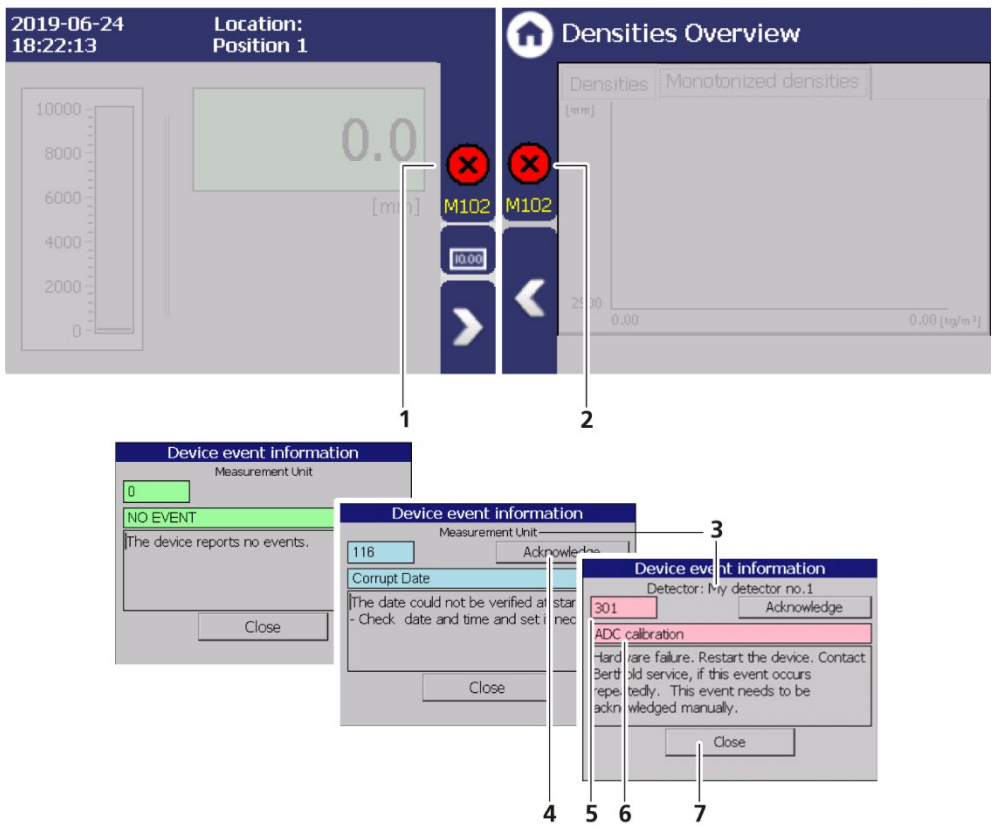


1	No event	5	Failure (error)
2	Outside of specification	6	Information test (simulation)
3	Function check	7	Character D (detector) or M (measuring unit)
4	Maintenance required	8	Event code

Fig. 15 Status information

6.5 Event Reports

Events are displayed in the standard display and in the submenus as a symbol. All events are displayed on the main screen. A specific “D” (for detector) indicates that a detector has an event, the prefix “M” (for measuring unit) indicates that there is an event in the LB 478 transmitter. In the event of a detector fault, the operating manual of the detector must be observed. Only the event with the highest priority will be displayed. Refer to the menus Transmitter Events (chapter 8.2) and Detector Event Log "Detector-Service" (chapter 7.3.2) for additional information.



1 Event reporting in the standard display
2 Event message in the menu structure
3 Device concerned (detector / measuring instrument)
4 Button <Confirm>
5 Error number
6 Title of event report
7 Button <Close>

Fig. 16 Event reports

1. Click on the icon (Fig. 16, item 1, item 2) to display detailed information about the event.
2. Click the button <Acknowledge> to confirm an event that requires a manual confirmation.

u The event description indicates the next event or reports no further events.

3. Click <Close> to return to the submenu or to the standard display.

u The icon disappears from the status information.

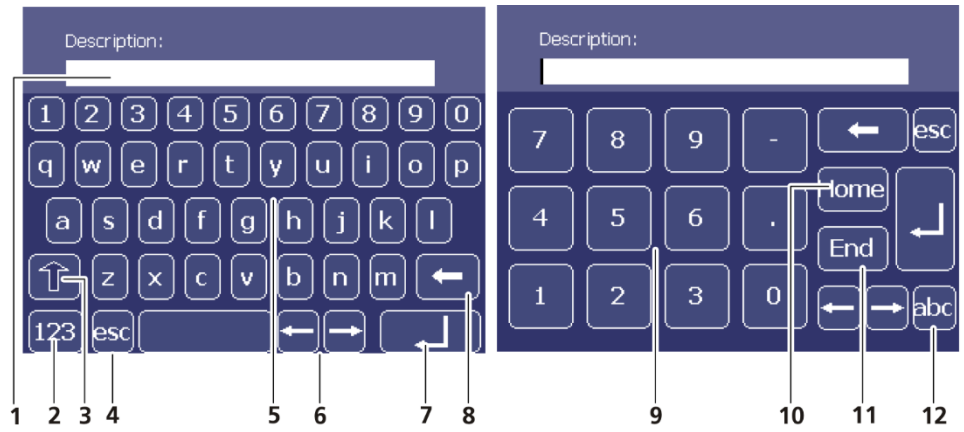
IMPORTANT

If you click the button <Close>, the event message is closed, the icon continues to be displayed.

6.6 Input field

NOTICE

The input field appears by clicking on the blue display panels.

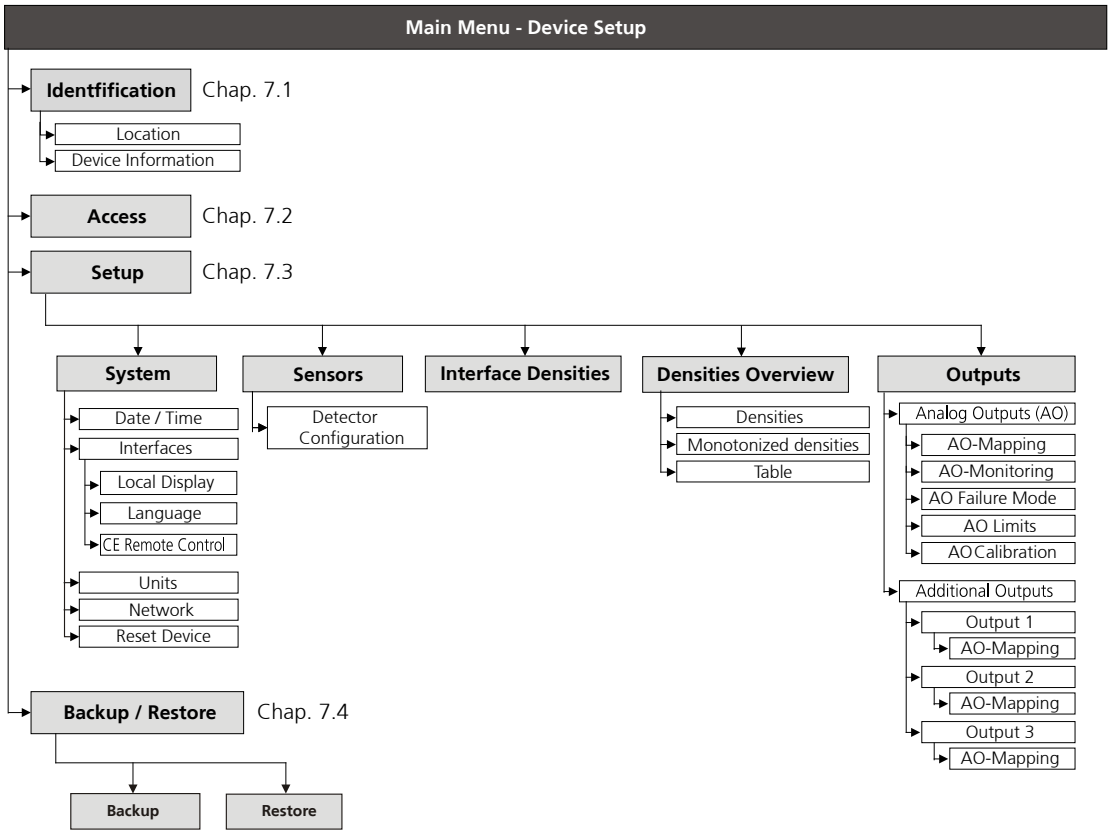


1	Input line	7	Input key
2	Shift key for numbers	8	Delete key
3	Shift to upper case characters	9	Number field
4	Escape key	10	Home (item1) key
5	Keypad	11	End key
6	Navigation buttons	12	Shift key for letters

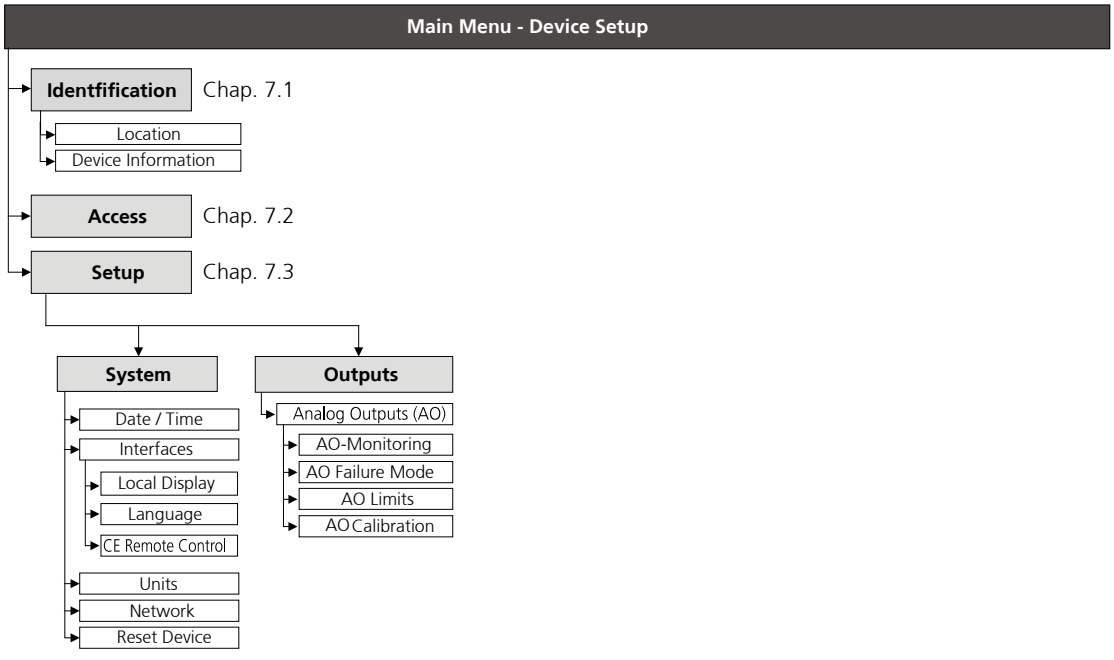
Fig. 17 Screen keyboard

7 Main Menu Device Setup

Menu structure master EVU



Menu structure extension modules



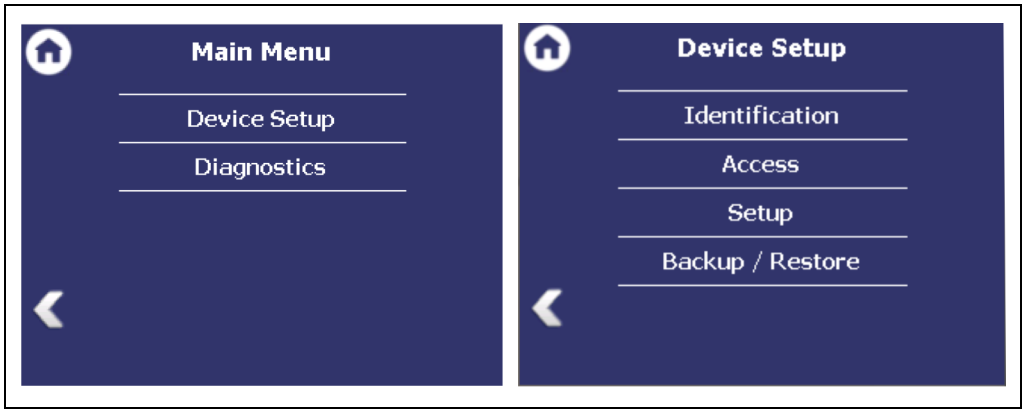


Fig. 18 Menu “Main Menu”, “Device Setup”

7.1 Menu Identification

Device Setup | Identification

You can make the following settings and read information in the Identification menu:

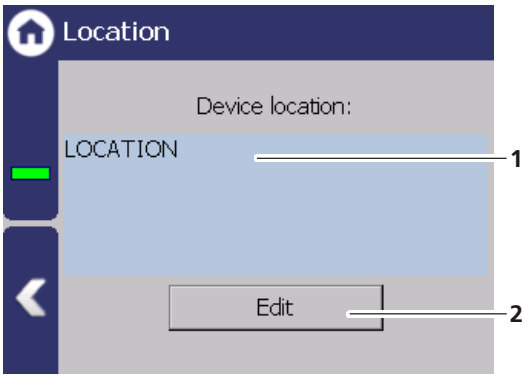
- Display and change the location name
- Display of hardware and software information
- Display of the device ID
- Perform software update

Fig. 19 Menu “Identification“

7.1.1 Location

Device Setup | Identification | Location

The location of the evaluation unit is displayed in the “Location” menu. The name can only be edited (7.2 Menu Access) in the access level "Standard". The Location is displayed on the EVU standard display (Fig. 12, item 8).



1 Name Device location
2 Button <Edit>

Fig. 20 Device location

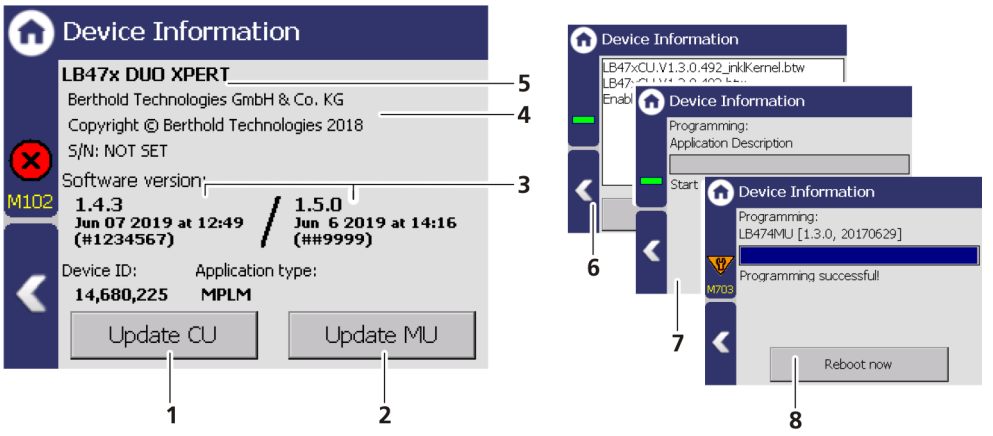
1. Click <Edit> (Fig. 20, item 2) to open the input field.
2. Enter a location name for the evaluation unit.
3. Confirm with the Enter key.

u The name has been changed.

7.1.2 Device Information

Device Setup | Identification | Device Information

Information about hardware and software of the evaluation unit are displayed in the window "Device Information".



1	CU update (Control Unit)	5	Device Information
2	MU update (Measurement Unit)	6	Selection window update file
3	Software versions	7	Process window
4	Manufacturer	8	Result window

Fig. 21 Device Information (example)

NOTICE

During an update where the first or second digit of the version changes, it is necessary to reset the EVU to factory settings.

NOTICE

Settings are deleted!

- u Carry out a backup of the measuring channel settings before resetting and the update of the EVU (10.3 Data backup).
- u The secured settings should then be imported after the successful software update.

Tip

The current software versions can be downloaded from the Berthold website (www.berthold.com).

Perform CU update

1. Save the current update file of the CU software on a USB storage device.

IMPORTANT

In order for the system to detect the update file it must not be located in an index in the USB storage device.

2. Connect a USB storage device to the device (Fig. 3, item 5).
3. The USB storage device is recognised by the system after a few seconds and the <CU Update> (Fig. 21, item 1) button can be clicked.
4. Click on the button <CU Update> (Fig. 21, item 1) and select the appropriate file.

u The update is performed.

5. Measurement is interrupted.
6. Click the Button <Restart> to reboot the EVU.

Perform MU update

1. Save the current update file of the MU software on a USB storage device.
2. Connect a USB storage device to the device (Fig. 3, item 5).
3. The USB storage device is recognised by the system after a few seconds and the <MU Update> (Fig. 21, item 1) button can be clicked.
4. Click on the button <MU Update> (Fig. 21, item 2) and select the appropriate file.

u The update is performed.

5. Measurement is interrupted.
6. Click the Button <Restart> to reboot the EVU.

NOTICE

Berthold recommends calibrating the current outputs whenever a module has been installed/replaced or if a software update has been carried out.

7.2 Menu Access

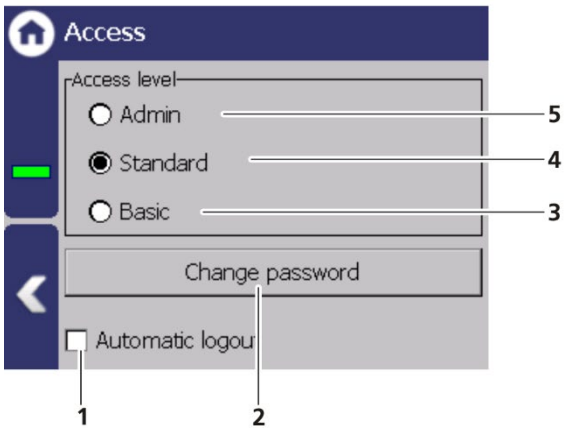
Device Setup | Access

You can set the user rights via the user levels and assign passwords in the submenu Access. After assigning a password the system is protected against unauthorized manipulation of the parameters.

IMPORTANT

Make sure that the password is known to you before you select the "Basic" access level and lock the device. The same applies if you set "Automatically log-out".

If you do not know the password, you will not be able to unlock the device! If in doubt, enter a new password with "Change Password".



1 Check box “Automatic logout”
2 Change <Change password>
3 User level “Basic”
4 User level “Standard”
5 User level "Admin“

Fig. 22 Access

Automatic logout Activating the selection box (Fig. 22 item 1) automatically resets the access level Standard to “Basic” when the system changes to the standard display after the timeout (chapter 7.3.1).

The following user levels are available to you:

User Level Basic Select "Basic" to lock the device against unwanted manipulation. After the device has been locked, it is still possible to read all data, but changes to the data are no longer possible.

If "Basic" is already set, then the device is already in the locked state.

To unlock the device, select the access level "Standard".

User Level Standard If the device is in the "Standard" access level, all parameters are accessible and can be changed.

	If the device is in the "Basic" access level (locked), you can unlock the device with the "Standard" access level. The password will be asked for. You can unlock the device only if you enter the correct password.
User Level Admin	This access level is only intended for the system management by Berthold.

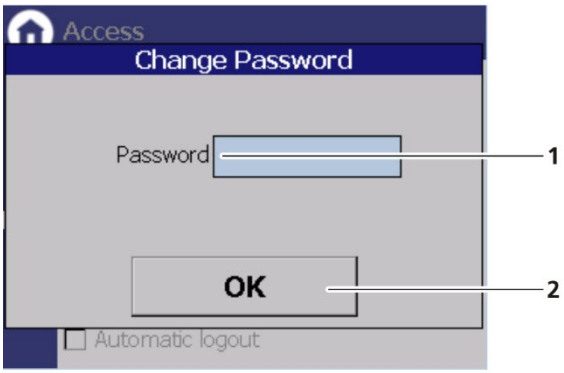
NOTICE

Incorrect measurement and calibration parameters can be set through unauthorised inputs. These can possibly lead to production losses and damage in the system.

u Protect the measuring system from unauthorised entries with a password and activate the function “Automatic logout”.

Assign / change password

To set or change a password, select “Standard” (Fig. 22, item 4) and click on <Change password> (Fig. 22, item 2) to open the input field.



1 Input field
2 Button <OK>

Fig. 23 Change Password

1. Click on the text field (Fig. 23, item 1.) to open the input field.
2. Enter a password (case-sensitive!).
3. Confirm with the Enter key.
4. Click <OK> (Fig. 23, item 2) to confirm.

u The password has been set / changed.

7.3 Menu Setup

Device Setup | Setup

Fig. 24 Menu “Setup“

7.3.1 System (Date / Time, Interfaces, Units, Network, Reset, Repair Det. Software)

Device Setup | Setup | System

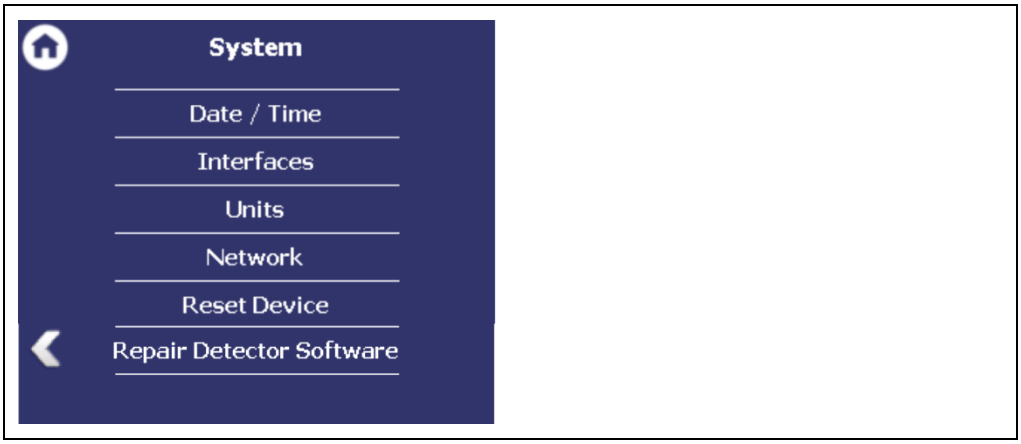


Fig. 25 Submenu "System"

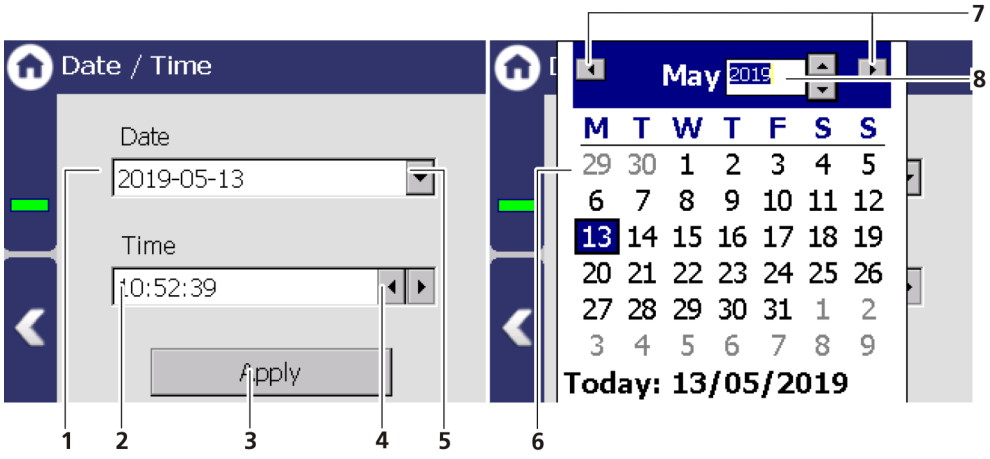
Set Date and Time

Device Setup | Setup | System | Date / Time

IMPORTANT

The date and time must always be set correctly so that all records (log files) have the correct metadata.

The correct date is also indispensable for the decay compensation.



1	Display date	5	Selection arrow Date
2	Display time	6	Calendar
3	Button <Apply>	7	Arrow keys Month
4	Arrow key Time	8	Input box Year

Fig. 26 Date / Time, calendar

1. Click on the arrow key (Fig. 26, item 5) in order to set the date.
   - u The calendar is opened (Fig. 26, item 6).
2. Click on the year number (Fig. 26, item 8) in order to enter the year.
3. Set the month (Fig. 26, item 7) by clicking on the arrow keys.
4. Set the day by clicking on a number in the calendar.
5. Change the time by clicking on the arrow keys (Fig. 26, item 4).
6. Click on <Apply> (Fig. 26, item 3), to accept the date and time settings.
   - u The date and time are set.

NOTICE

The real-time clock for date and time is buffered via a capacitor and continues to run for up to approx. 4 weeks even when the device is switched off.

- u If the device has been out of operation for more than 4 weeks, error M116 appears. The date and time must then be reset.

Interfaces

Device setup | Setup | System | Interfaces

You can adjust the following settings in the submenu “Interfaces” (Fig. 27):

- Local Display
  - o Brightness / Touch
  - o Input / Output
- Language
- CE Remote Control

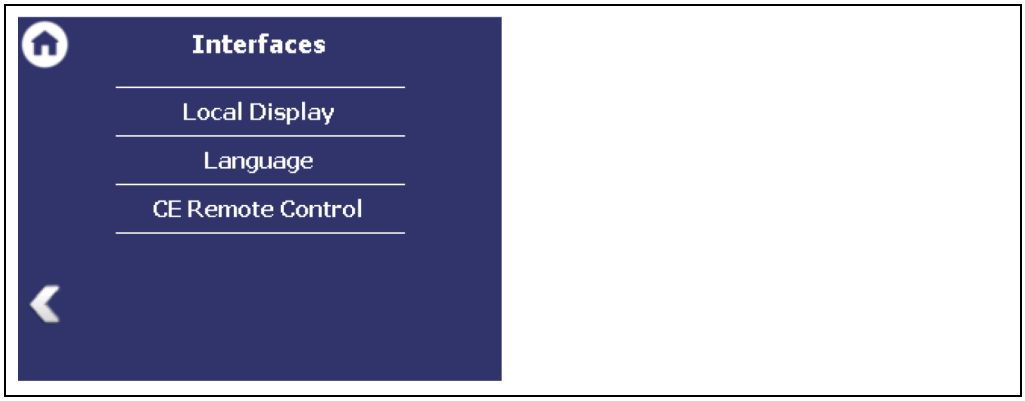


Fig. 27 Menu “Interfaces”

Local Display

Device setup | Setup | System | Interfaces | Local Display

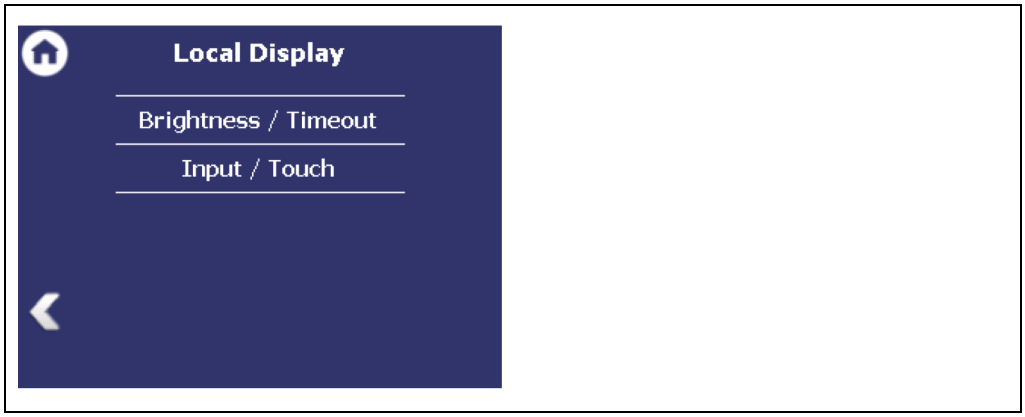
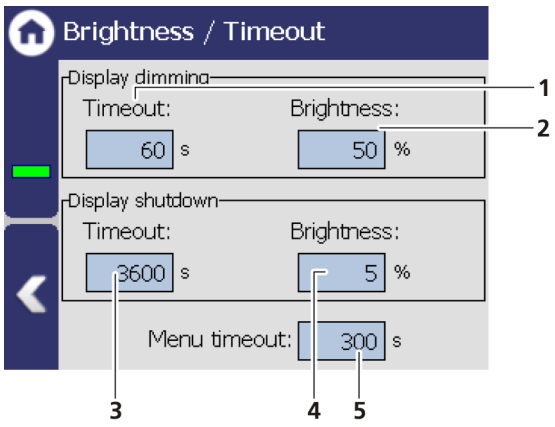


Fig. 28 Submenu "Local Display"

Brightness / Timeout

Device Setup | Setup | System | interfaces | Local Display | Brightness / Timeout



1 Input field “Time out”
2 Input field “Dimming”
3 Input field Display switch off “Time out”
4 Input field Display switch off “Dimming”
5 Input field menu time out

Fig. 29 Brightness / Time out settings

“Time out” refers to the period of time during which the display is not operated. The value “Time out display dimming” cannot be set greater than the value at “Time out display shutdown”.

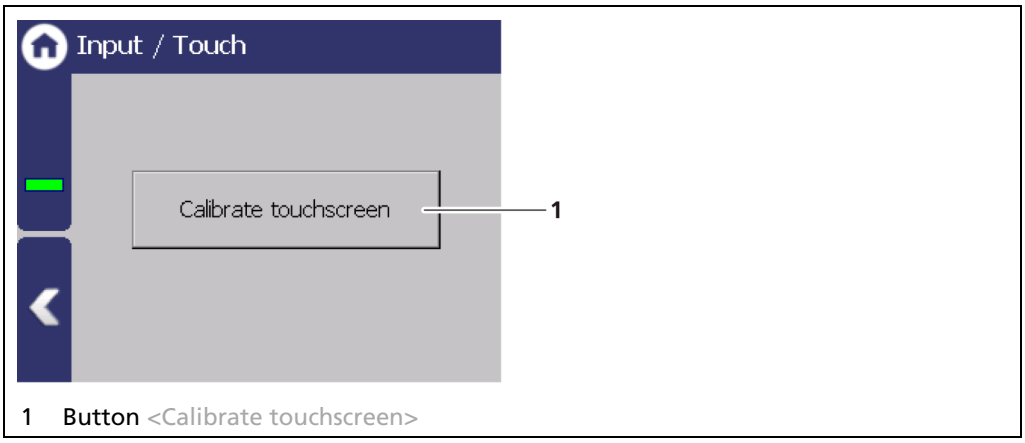
Display dimming In the field Display dimming, clicking the input fields allows the entering of the brightness (Fig. 29, item 2) in percent, that is set after expiry of the time (Fig. 29, item 1).

Display shutdown In the field Display shutdown, clicking the input fields allows the entering of the brightness (Fig. 29, item 4) in percent, that is set after expiry of the time (Fig. 29, item 3).

Menu Timeout Under "Menu Timeout" clicking on the input field (Fig. 29, item 5) changes the time period (seconds) in which the menu view changes to the standard view.

Input / Touch

Device Setup | Setup | System | Interfaces | Local Display | Input / Touch



1 Button <Calibrate touchscreen>

Fig. 30 Input/ Touch

Calibrate touch screen

The calibration may only be carried out with direct skin contact. Take gloves or any other protective equipment off your hands.

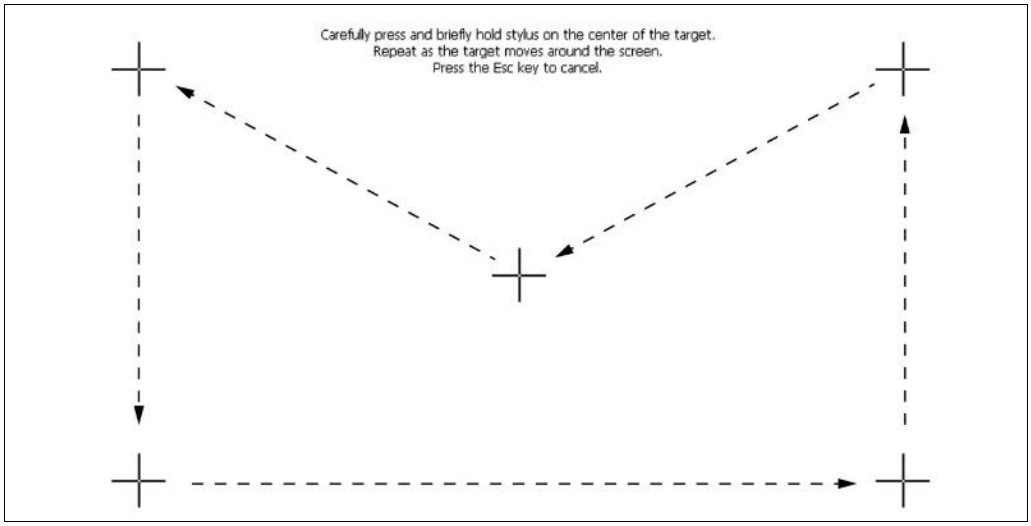


Fig. 31 System menu, Settings - Display (Calibrate touch display)

1. Click on <Calibrate touch screen>.

u The calibration screen opens.

2. Press the middle of the displayed cross with your finger.

u If you take your finger off the cross again, the cross jumps to the top left corner.

3. Repeat the process until the cross is no longer displayed and the calibration is finished.

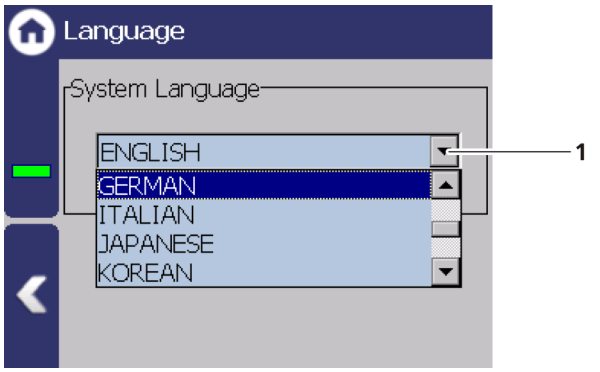
4. Confirm the calibration by clicking on the white screen to go back to "Input/Touch"

5. Execute a restart of the EVU after prompting.

u The screen calibration was performed.

Language

Device Setup | Setup | System | Interfaces | Language



1 Selection arrow

Fig. 32 Language

Change system language

1. Click on the selection arrow (Fig. 32, item 1) and select a language.

u A message window “Restart” appears.

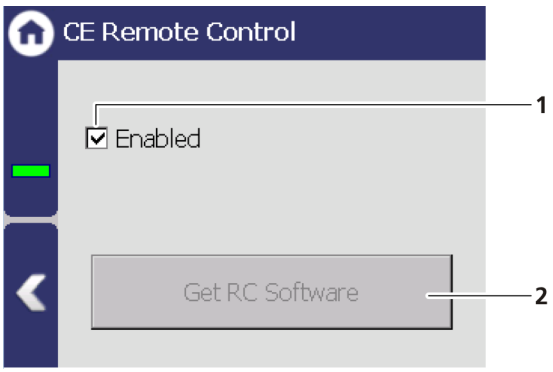
2. Confirm with “OK” to restart the device.

u The device is restarted and the language has been changed.

CE Remote Control

Device Setup | Setup | System | interfaces | Remote Control

By activating (Fig. 33, item 1) the CE Remote Control, the unit can be operated via the network connection. The software of the remote control (RC software) is stored on the device and can be copied to a USB storage device.



1 Check box remote control “Enabled”
2 Button <Copy RC software>

Fig. 33 Remote Control

Copy RC software

1. Connect a USB storage device to the device (Fig. 3, item 5).

u The USB storage device is recognised by the system after a few seconds and the button <Copy RC software> (Fig. 33, item 2) can be clicked.

2. Click on the button <Copy RC software> (Fig. 33, item 2).

u The software is copied to the USB storage device.

Information

The RC software includes the file “LB47xRemoteControl.exe” and runs without installation. Operation of the RC software is described in Chapter “Remote Control Software” (see next but one chapter).

Units

Device Setup | Setup | System | Units

Clicking on the individual selection arrow lists the available units for the measuring value. The selected unit is used in the output settings and is shown in the standard display.

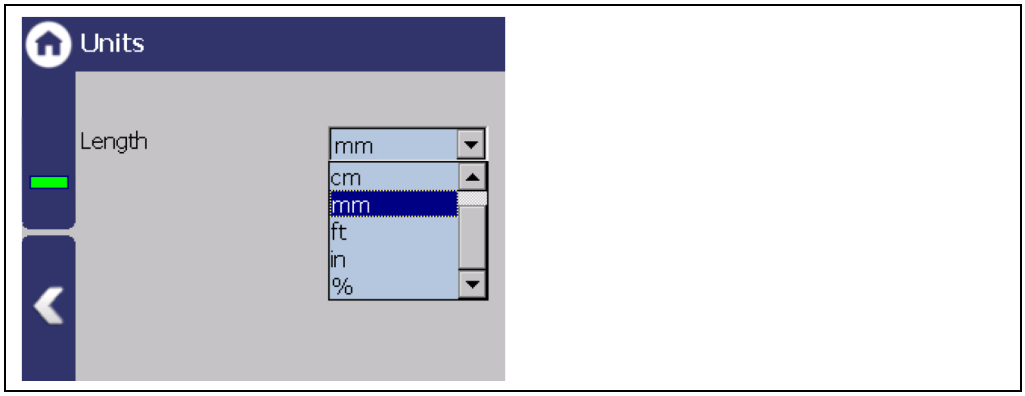
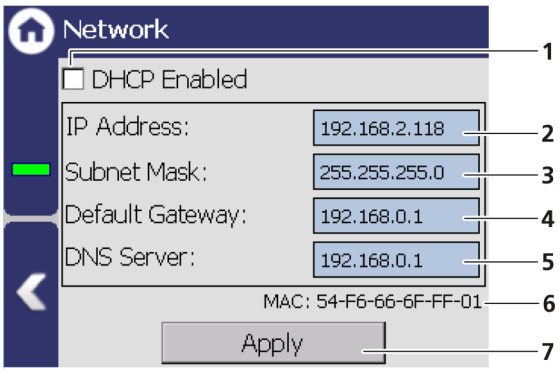


Fig. 34 Units

Network

Device Setup | Setup | System | Network

In the Network settings, you can make changes to the network settings. The information can only be edited in the access level "Standard" (see chap. 7.2 Menu Access). You can set the network address either manually or using DHCP (automatic assignment). To do this, check the "DHCP active" in the selection field (Fig. 35, item 1).



1	Check box "DHCP active"	5	DNS server
2	IP address	6	MAC address
3	Subnet mask	7	Button <Apply>
4	Standard gateway		

Fig. 35 Network Settings

IMPORTANT

The PC and the LB 478 have to be in the same IP subnet.

- u In the event of an automatic assignment of the IP address by a DHCP server, you can only look at the given IP address. A modification of the IP address is not possible. On this side, you can also read the MAC address of the device (Fig. 35, item 6).

Manual settings

1. Click on the text field (Fig. 35, item 2 - 5) to open the input field.
2. Enter the appropriate network addresses.
3. Confirm with the Enter key.
4. Click on <Apply> (Fig. 35, item 7) to adopt the network settings.

IMPORTANT

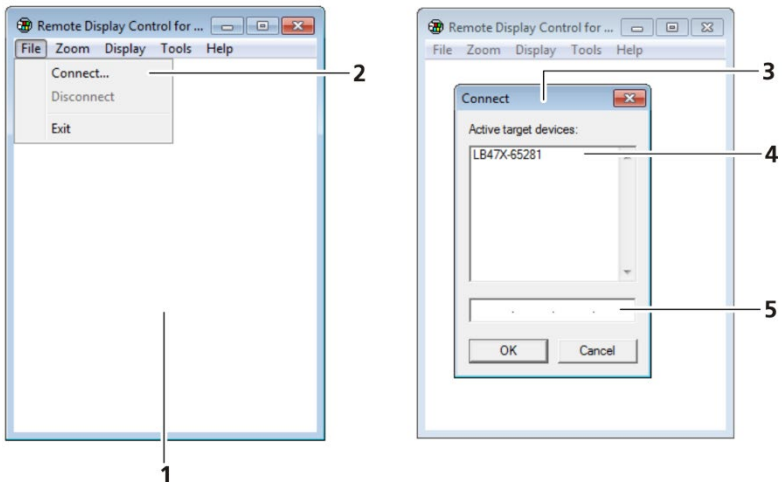
All settings performed must be confirmed by clicking on <Apply> so that the settings become real.

Remote Control Software

If the EVU is connected to a network at the RJ45 socket (Fig. 3, item 2), the EVU can be operated via a computer. The software can be loaded onto a USB storage device (see Chapter “CE Remote Control”).

IMPORTANT

In order for the Remote Control to function, the selection check mark in the menu “CE Remote Control” must be set to "Active" (Fig. 33, item 1).



1 Program Remote Control
2 Box <Connect…>
3 Window Connect
4 List of transmitters
5 Input box IP address

Fig. 36 Establishing connection to the EVU using the RC software

1. Click on **"LB47xRemoteControl.exe"**, to start the program.
   - u The program starts (Fig. 36, item 1).
2. Click on the <File> tab and then on <Connect…> (Fig. 36, item 2), to establish a connection to the EVU.
   - u A new window “Connect” is opened (Fig. 36, item 3) and the connected transmitters are listed.

IMPORTANT

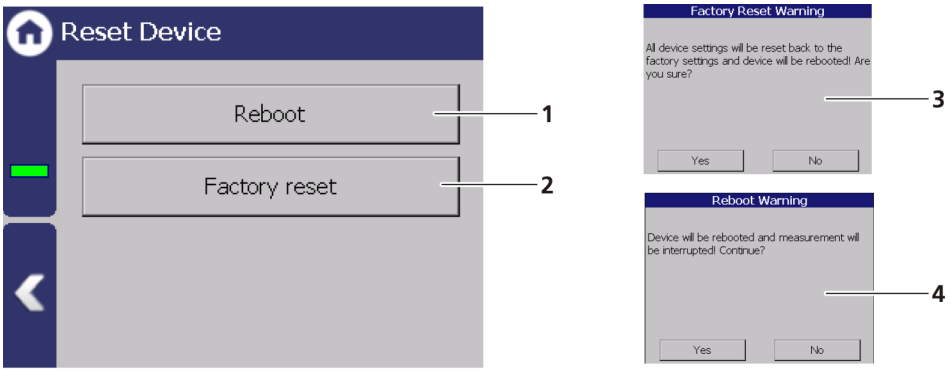
The IP address of the EVU must be in the same sub-network (Fig. 35, item 3) as the network adapter of the computer (see previous Chapter “Network”).

3. Click on the identifier of the transmitter (Fig. 36, item 4) or enter the IP address of the EVU in the input box (Fig. 36, item 5) (see Fig. 36, item 2).
4. Click on <OK>.
   - u The connection to the EVU is established.
   - u You can enlarge the view in the “Zoom” menu (2x, 3x).

Reset Device (evaluation unit)

Device Setup | Setup | System | Reset Device

The evaluation unit can be restarted and reset to factory settings in the window “Reset Device”.



1 Button Reboot
2 Button Factory settings
3 Window “Warning: Reboot”
4 Window “Warning: Factory Reset”

Fig. 37 Reset Device

Restart the device

IMPORTANT

The measurement is interrupted during a restart!

1. To restart the device, click the button <Restart> (Fig. 37, item 1).
   u A window with a warning "Restart" (Fig. 37, item 3) opens.
2. Click on <Yes> to confirm.
   u The device is restarted.

Reset device (Factory Reset)

IMPORTANT

u When there is a reset to factory settings, all data logs are deleted and all user-defined configuration settings are reset!
u If error M102 appear, the device possibly must be reset twice.

1. To reset the evaluation unit to the factory settings, click the button <Factory settings> (Fig. 37, item 2).
   u A window with the warning "Factory settings" (Fig. 37, item 4) opens.
2. Click on <Yes> to confirm.
   u The device is reset to factory settings and restarts.

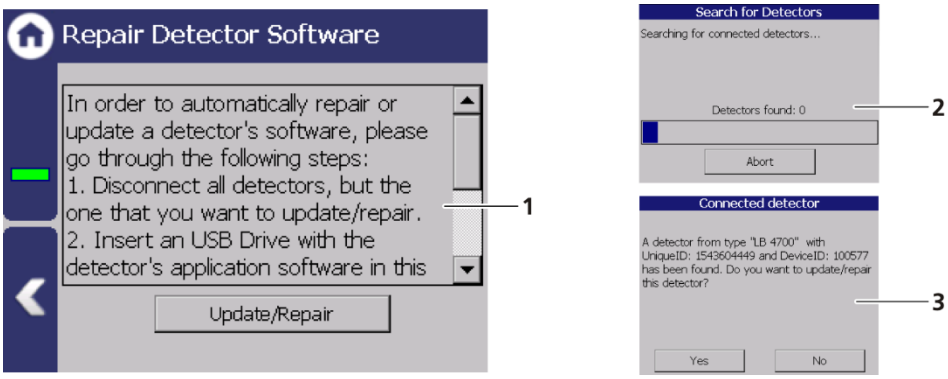
Repair Detector Software

Device Setup | Setup | System | Repair Detector Software

In the window "Repair Detector Software" detectors can be repaired and updated.

Tip

The current software versions for the detectors can be downloaded from the berthold website (www.berthold.com).



1 Description Update / Repair
2 Process "Search for Detectors"
3 Search result

Fig. 38 Repair Dtector Software

⚠ DANGER

Danger to life from electric shock!

- u The repair may only be carried out by a qualified electrician.
- u Please adhere to the relevant safety regulations.
- u During servicing on the hardware as well as during wiring of the detector, the measuring system, connected relay contacts and all inputs and outputs must be de-energised.

In case of an electric shock, carry out first aid measures and immediately call an emergency service.

1. Disconnect all detectors from the EVU except for the one you want to repair / update.
2. Insert a USB flash drive with the application software of the detector into the USB port of the EVU.
3. Click the <Update / Repair> button and follow the installation instructions.
4. After the update is complete, restart the detector by disconnecting and connecting its power supply.

u The update / repair was done.

7.3.2 Sensors (only master EVU)

Device Setup | Setup | Sensors

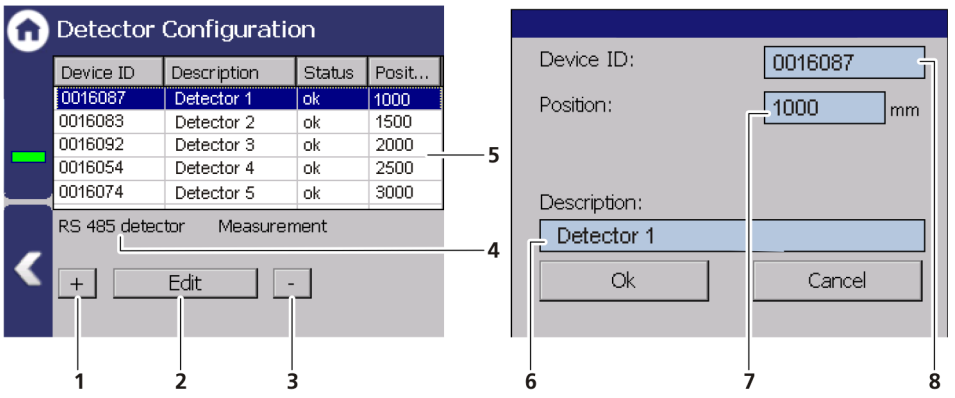
All settings of the sensors are carried out via the master EVU.

Fig. 39 Menu "Sensors"(only Master EVU)

Detector configuration

Device Setup | Setup | Sensors | Detector configuration

In the window “Detector configuration” the detectors for the measuring system are added and configured. By clicking the button <Edit> (Fig. 40, item 2) the device ID, the position and description can be changed.

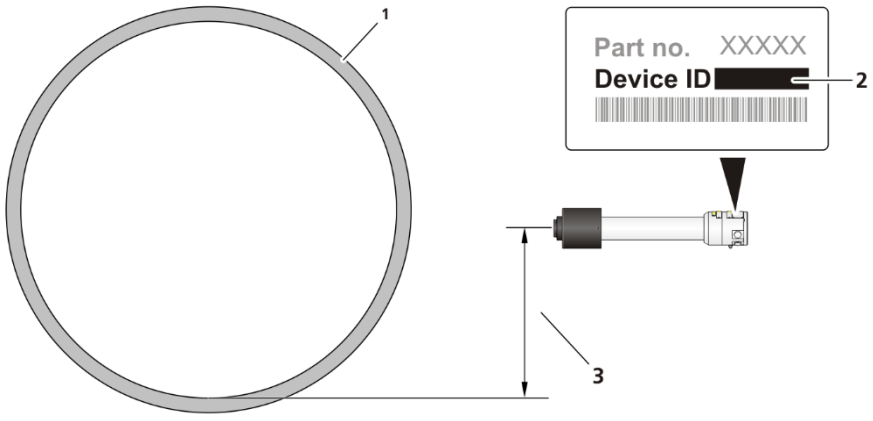


1 Button < + > to add Detector
2 Button < Edit >
3 Button < - > to remove Detector
4 Type of selected detector
5 List of the Detectors
6 Input field “Description”
7 Input field “Position”
8 Input field “Device ID of the detector”

Fig. 40 Detector configuration (only Master EVU)

1. Click on < + > to add a new detector.
2. Enter the Detector Device ID (Fig. 40, item 8), located at the socket of the detector (Fig. 41, item 2).
3. Enter the position of the detector (Fig. 40, item 7), depending on measurement arrangement (Fig. 41, item 3). This values must be agreed with an authorised person.
4. Enter a Description (Fig. 40, item 6) and click < OK >.

u The detector was added successfully.

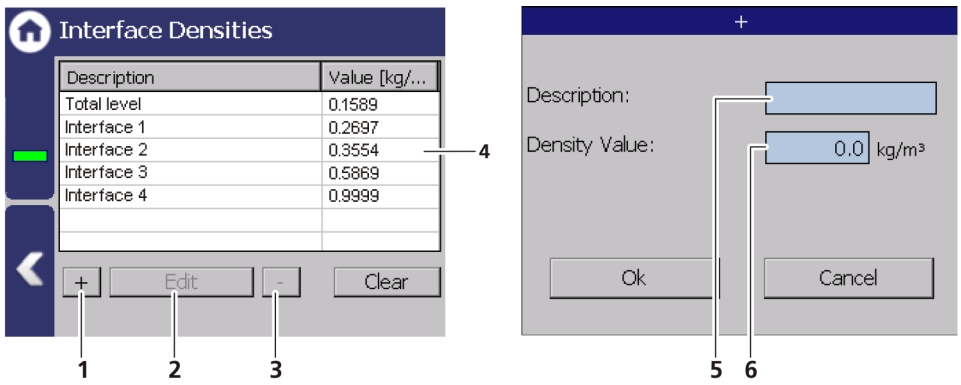


1 Vessel
2 Detector Device ID
3 Position (depending on measurement arrangement)

Fig. 41 Detector position / Device ID

7.3.3 Interphase Densities (only master EVU)

An interphase denotes the layer with the respective density. In this menu the interphases are defined and a density is assigned to each interphase. The entered density should be the upper limit value of the density for this interphase. In addition to the individual interfaces, it is possible to add a total level. The gas density should be specified as the value for the total level.



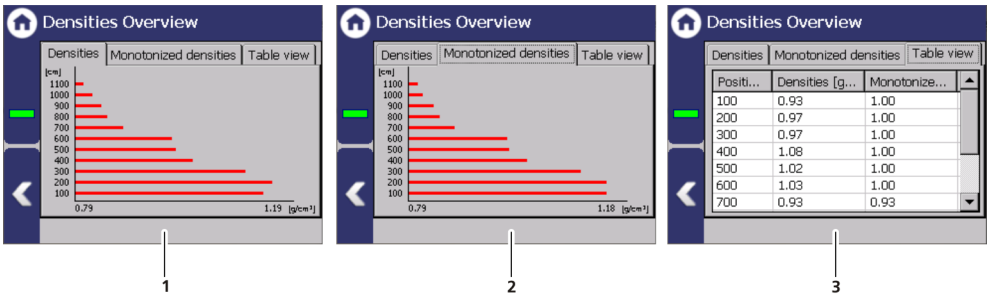
1 Button < + >
2 Button < Edit >
3 Button < - >
4 Table of added interfaces [kg/cm³]
5 Interface description
6 Densitiy Value

Fig. 42 Interphase settings

7.3.4 Densities Overview (only master EVU)

Device Setup | Setup | Densities Overview

The control unit reads the detectors' individual local densities in order to build a density profile of the vessel's content. This density profile might not be perfectly monotonous (see Fig. 43, item 1), due to statistics, noise and vortexes inside the vessel. Thus, the measurement algorithm uses mathematical techniques such as a special averaging / regression to monotonize and slightly smooth the local densities (see Fig. 43, item 2), before determining the interface positions between the different phases. As a result, interface positions calculated by LB 478 will never be ambiguous or inconsistent.



1 Densities
2 Monotonized densities
3 Table

Fig. 43 Densities Overview

7.3.5 Outputs

Device Setup | Setup | Outputs

You can make the following settings and read information in the window “Outputs”:

- Analog Output (AO)
  - AO Mapping
  - AO monitoring
  - Failure mode
  - Current limits
  - Calibrate
- Additional Outputs
  - Configuration
  - AO Mapping

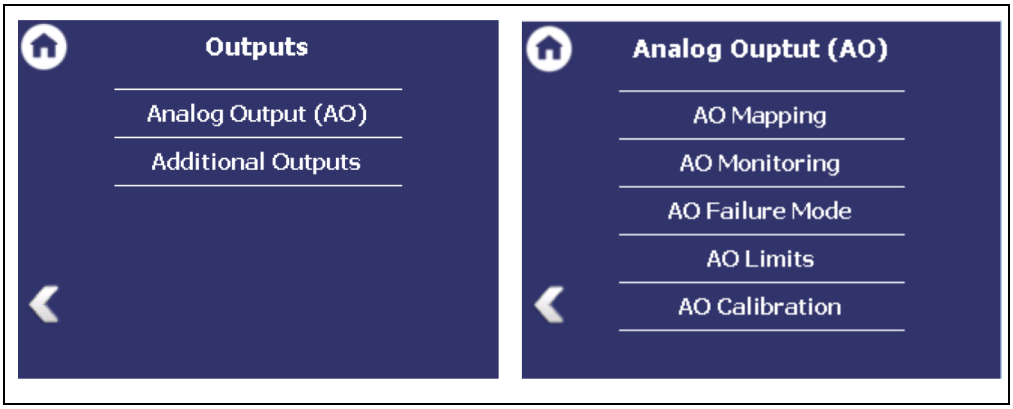


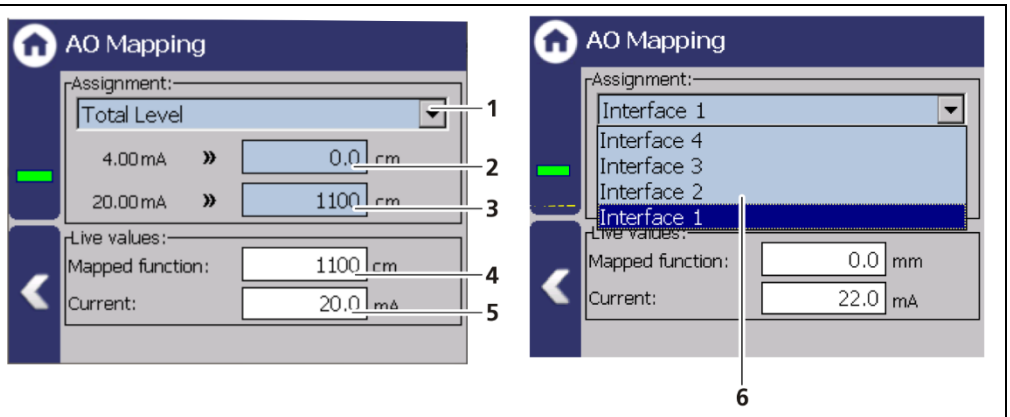
Fig. 44 Menu “Outputs” (only Master EVU), Menu “Analog Output (AO)”

7.3.5.1 Analog Output (AO)

AO Mapping (Master EVU)

Device Setup | Setup | Outputs | Analog Output (AO) | AO Mapping

An Interface can be assigned to the analog output of the master EVU in the window “AO Mapping”. The current output signal is between 4 mA and 20 mA. The corresponding level values can be freely assigned. The value which is assigned to a current output signal of 4 mA must be smaller than the value which is assigned to that of 20 mA.



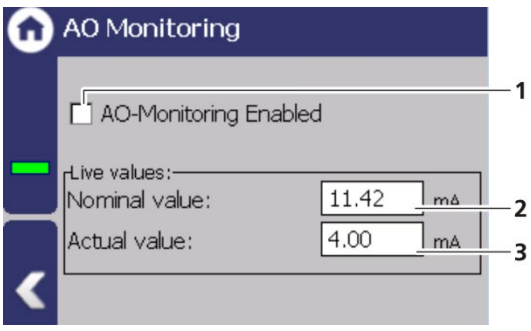
1 Selection arrow “Assignment”
2 Input field lower value [mm / cm / ft / in / %]
3 Input field upper value [mm / cm / ft / in / %]
4 Display field Mapped function [mm / cm / ft / in / %]
5 Display field Live value current [mA]
6 Selection Assignment

Fig. 45 Analog Output Mapping (Assignment)

AO Monitoring

Device Setup | Setup | Output | Analog Output (AO) | AO Monitoring

If “AO Monitoring” is activated (Fig. 46, item 1), the current output will be monitored. It is continuously monitored whether the current value flowing in the current loop is correct. In the event of a variation e.g. owing to an error in the hardware, too large a load or a disruption in the loop, an error message is triggered.



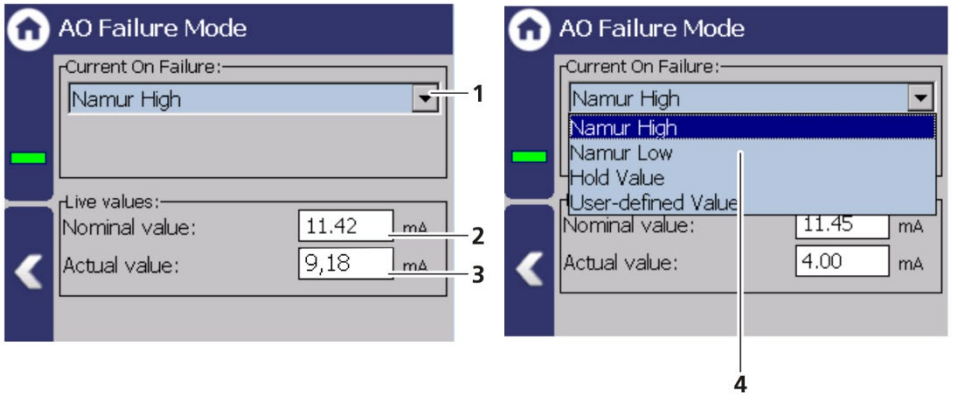
1 Activate check box “AO Monitoring Enabled”
2 Target value [mA]
3 Actual value [mA]

Fig. 46 Analog output monitoring

AO Failure Mode

Device Setup | Setup | Output | Analog Output (AO) | AO Failure Mode

The alarm function is set when an error is detected at the current output in the window “Error mode”.



1 Selection arrow Alarm function
2 Live target value [mA]
3 Live actual value [mA]
4 Selection of the alarm function

Fig. 47 Analog output (AO Failure Mode)

The following behaviour of the current output can be assigned in case of error:

Namur High	22 mA (in error mode).
Namur Low	2 mA (in error mode).
Hold Value	Last value before the error.
User-defined value	The value can be set manually.

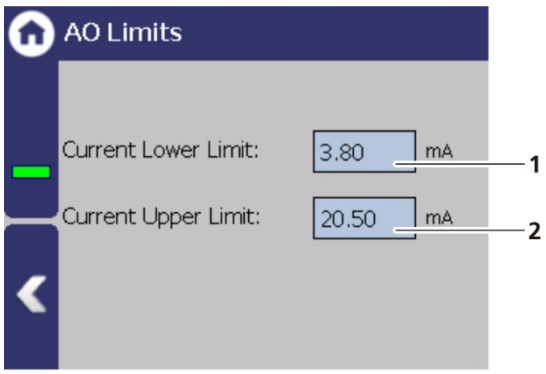
NOTICE

If the value "Hold Value" is set, it is recommended that the error relay is connected in order to allow device errors to be transmitted to the control system.

AO Limits

Device Setup | Setup | Output | Analog Output (AO) | AO Limits

By clicking on the input fields (Fig. 48, item 1, item 2), the values [mA] for the lower and upper current limit can be set. In addition to the default value of 3.8 mA, the lower current limit can be set to 0 mA in order to switch the current output from 4 ... 20 mA to 0 ... 20 mA.



1 Input field Lower current limit [mA]
2 Input field Upper current limit [mA]

Fig. 48 Analogue output (AO Limit)

NOTICE

If the measurement is operated according to Namur, the standard current values of 3.8 or 20.5 mA must be maintained.

Calibrate

Device Setup | Setup | Output | Analog Output (AO) | AO Calibration

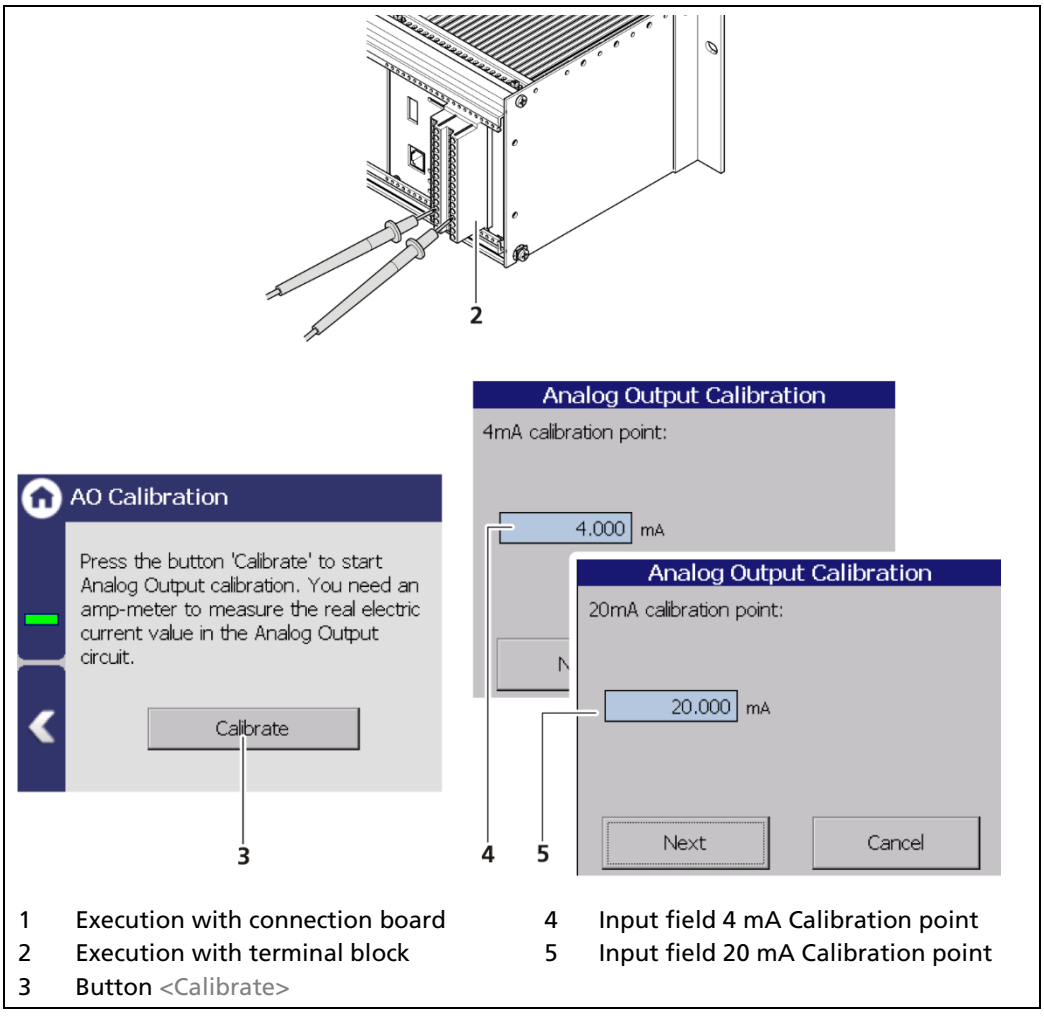
If there are any discrepancies between the target value and the actual value of the current signal, then the current output may be calibrated again.

NOTICE

For calibration of the current output, an ammeter (not included in the scope of delivery) is required, which is connected to the current output.

NOTICE

Berthold recommends calibrating the current outputs whenever a module has been installed/replaced or if a software update has been carried out.



1	Execution with connection board	4	Input field 4 mA Calibration point
2	Execution with terminal block	5	Input field 20 mA Calibration point
3	Button <Calibrate>		

Fig. 49 Analog Output (Calibration)

Perform calibration

⚠ DANGER

Danger to life from electric shock!

- The repair may only be carried out by a qualified electrician.
- Please adhere to the relevant safety regulations.
- During servicing on the hardware as well as during wiring of the detector, the measuring system, connected relay contacts and all inputs and outputs must be de-energised.

In case of an electric shock, carry out first aid measures and immediately call an emergency service.

1. Connect the measuring lines of the current measuring device on the back of the EVU to the analog output.
2. Observe the terminal allocation in the document “Technical information”.
3. Click on the button <Calibration>.

- The device switches to test mode and a new window (Analog output calibration) opens.
- The calibration point 4 mA is displayed and the current measuring instrument shows a value.

4. Enter the indicated value on the current measuring instrument in the input box (Fig. 49, item 4).
5. Click on the button <Continue>.

- The calibration point 20 mA is displayed and the current measuring instrument shows a value.

6. Enter the indicated value on the current measuring instrument in the input box (Fig. 49, item 5).
7. Click on the button <Continue>.

- A message appears “Calibration successful”.

8. Click on the button <Continue>.

- The calibration of the analog output is completed.

7.3.5.2 Additional Outputs (only master EVU)

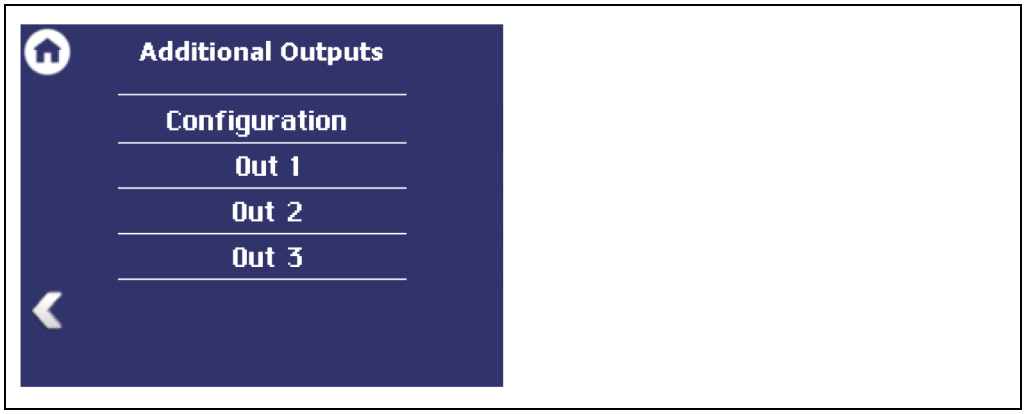


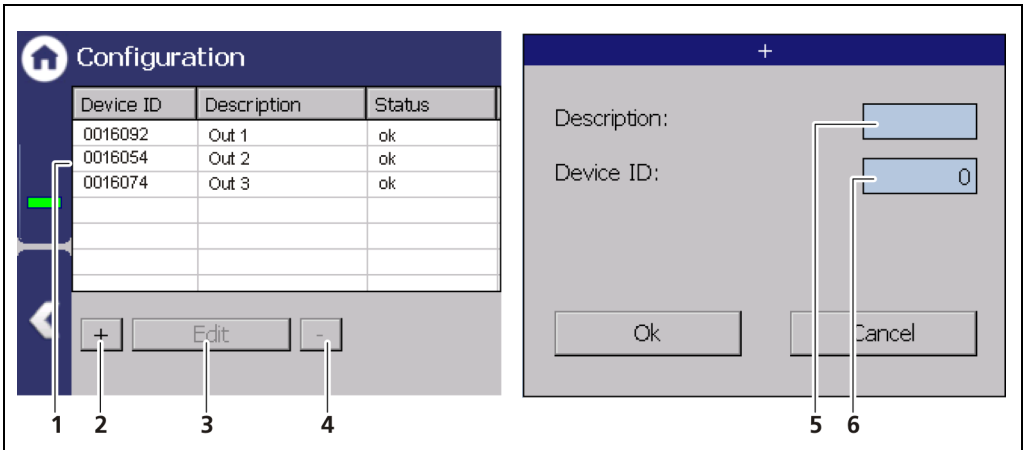
Fig. 50 Menu "Additional Outputs“

Already configured outputs are displayed, otherwise only the menu "Configuration" is displayed.

Configuration

Device Setup | Setup | Outputs | Analogue Output (AO) | Additional Outputs | Configuration

In this menu further outputs of extension modules are added.



1 Device ID extension module
2 Button < + >
3 Button < Edit >
4 Button < - >
5 Description of analog output
6 Input field Device ID extension module

Fig. 51 Additional Outputs configuration

1. Click on the button < + >.
2. Enter a Description (Fig. 51, item 5).
3. Add the Device ID of the extension module (Fig. 51, item 6).

u You can find the extension's Device ID in the menu Device Setup | Identification | Device Information of the respective extension module.

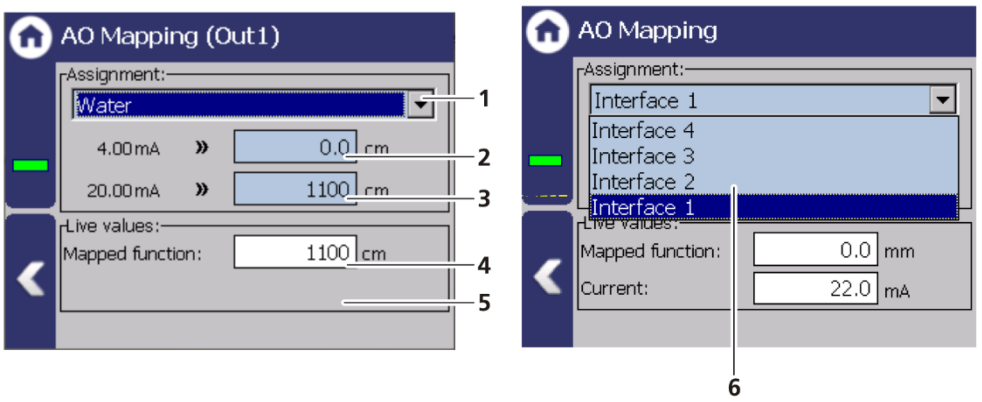
4. Click < OK >.

u "OK" is displayed in the status column and the analog output of the extension module was added successfully.

AO Mapping (additional outputs)

Device Setup | Setup | Outputs | Analog Output (AO) | *Out #* | AO Mapping

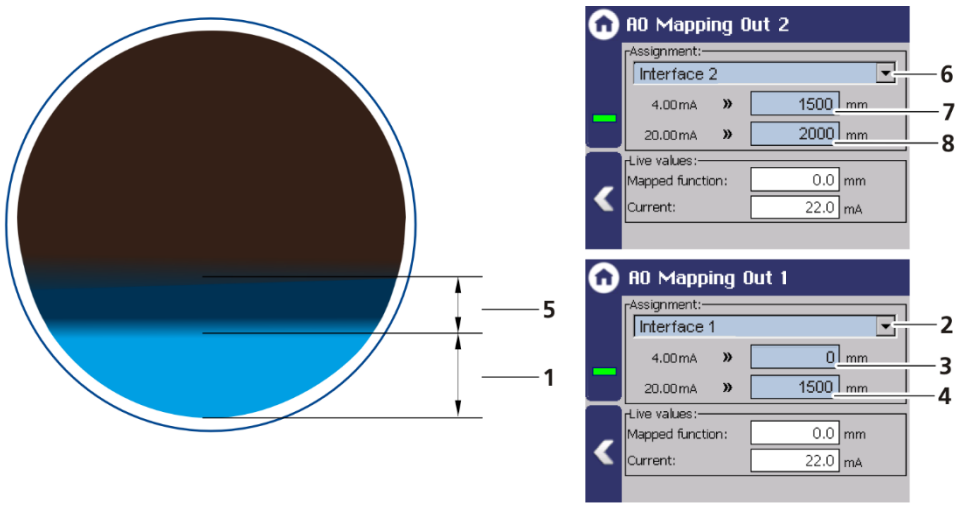
An Interface can be assigned to an analogue output of the extension module in the window “AO Mapping”. The current output signal is between 4 mA and 20 mA. The corresponding level values can be freely assigned. The value which is assigned to a current output signal of 4 mA must be smaller than the value which is assigned to that of 20 mA.



1 Selection arrow “Assignment”
2 Input field lower value [mm / cm / ft / in / %]
3 Input field upper value [mm / cm / ft / in / %]
4 Display field Mapped function [mm / cm / ft / in / %]
5 Display field Live value current [mA]
6 Selection Assignment

Fig. 52 Analog Output Mapping (Assignment)

Example



1 Interface 1
2 Selection
3 Approx. lowest point
4 Approx. highest point
5 Interface 2
6 Selection
7 Approx. lowest point
8 Approx. highest point

Fig. 53

7.4 Menu Backup/Restore

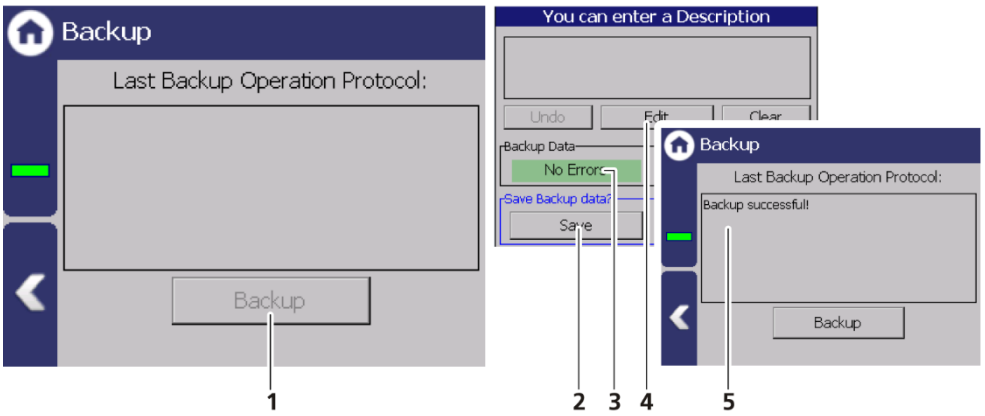
Device Settings | Backup/Restore

You can make a backup copy of the configuration data, and perform a recovery in the submenu “Backup/Restore”.

Fig. 54 Menu „Backup/Restore“

7.4.1 Backup

Device Settings | Backup/Restore | Backup



1 Button <Backup>
2 Button <Save>
3 Information about the backup data (error / error free)
4 Button <Edit>
5 Button <Clear> to delete all logs
6 Note “Backup successful!”

Fig. 55 Backup

Perform Backup

1. Connect a USB storage device to the device (Fig. 3, item 5).
2. The USB storage device is recognised by the system after a few seconds and the button <Backup> (Fig. 55, item 1) can be clicked.
3. Click on the button <Backup> (Fig. 55, item 1).

u The window “Enter description” appears.

u The message “Error free” (Fig. 55, item 3) appears in the field “Backup data” for error-free backup files.

4. Click the button <Edit>, enter a description, and confirm with the Enter key.
5. Click on the button <Save>.

u The backup files are copied to the USB storage device.

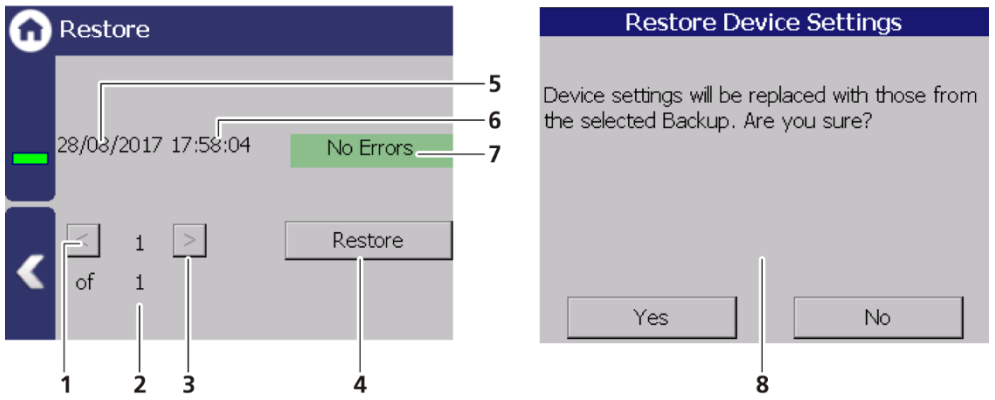
u The message “Backup successful!” appears after a successful copy process (Fig. 55, item 6).

Information

The backup includes an XML file that is created in the folder “Backup_LB47x”. The file name is derived from “Backup”, the date and time (Backup_YYYYMMDD_ hr-min-sec).

7.4.2 Restore

Device settings | Backup/Restore | Restore



1 Button < "previous"
2 Number of recovery files on the USB storage device
3 Button > "next"
4 Button <Restore>
5 Recording date of the backup file
6 Time of backup file recording
7 Information about the backup data (error / error free)
8 Confirmation window

Fig. 56 Restore

Executing restore

1. Connect a USB storage device to the device (Fig. 3, item 5).
2. Select the backup file with the buttons (Fig. 56, item 1,3)

u The date and time of the backup is displayed (Fig. 56, item 5, 6). Only error-free (Fig. 56, item 7) backup files can be loaded.

3. Click on the button "Restore" (Fig. 56, item 4).
4. A confirmation message (Fig. 56, item 8) appears.
5. Click on < Yes > to confirm, click on < No > to cancel.

u The restore of data is carried out.

8 Main Menu Diagnostics

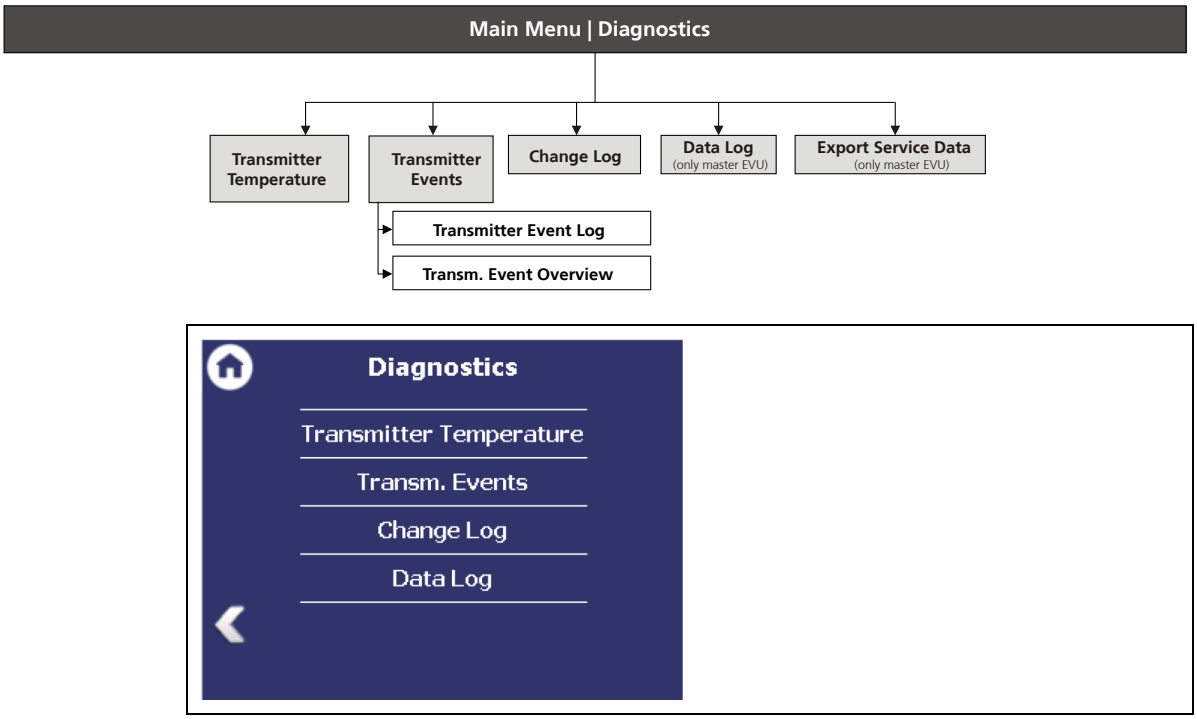
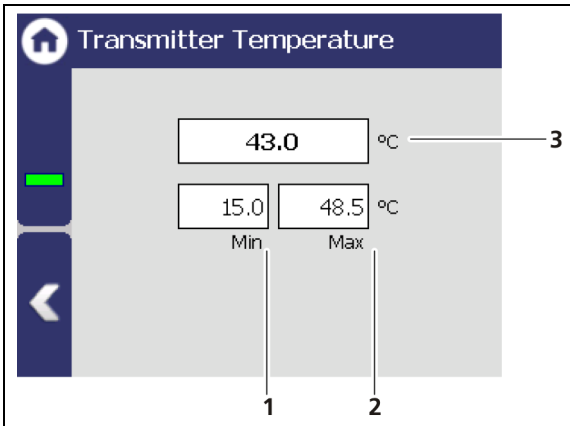


Fig. 57 Menu “Diagnostics“

8.1 Transmitter Temperature

Diagnostics | Transmitter Temperature

Temperature values from the evaluation unit (processor) are displayed in the menu item “Transmitter Temperature”.



1 Minimal extreme value [°C]
2 Maximum extreme value [°C]
3 Current value [°C]

Fig. 58 Transmitter Temperature

8.2 Transmitter Events

Diagnostics | Transm. Events

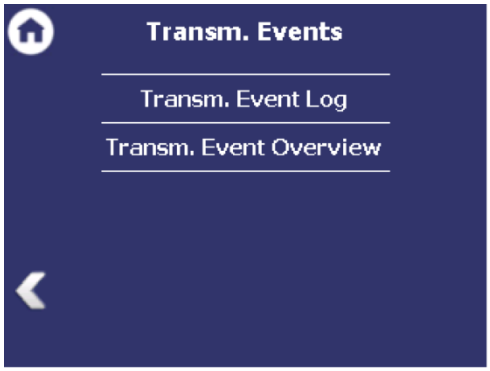


Fig. 59 Menuu „Transm. Events“

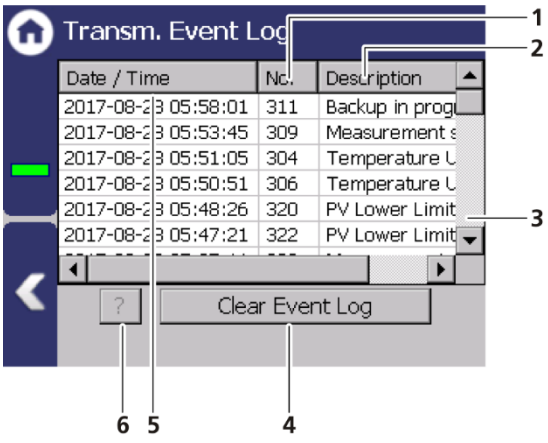
Information

Events of the respective detector can be seen at Device Setup | Setup | Sensors | [NAME OF DETECTOR] | Detector Service.

8.2.1 Trasnmitter Event Log

Diagnostics | Transmitter Events | Transmitter Event Log

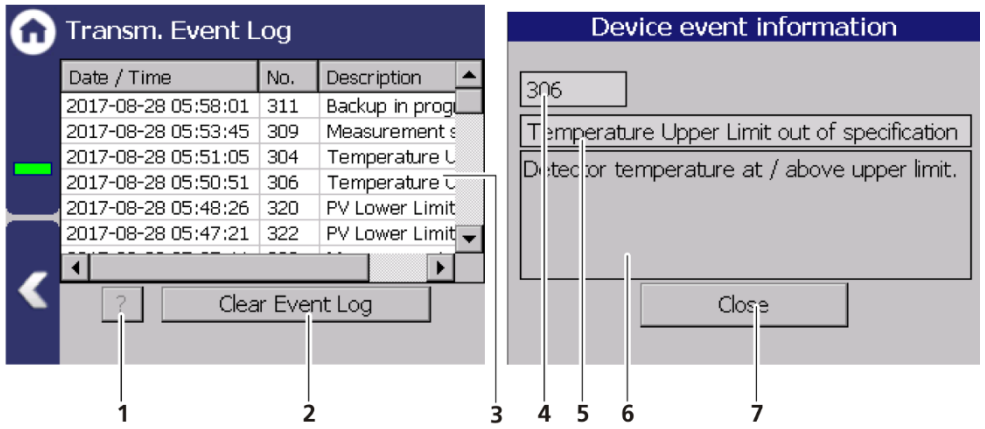
The last 25 events of the detector are displayed in the window “Event Log”.



1 Event no.
2 Description (event title)
3 Scrollbar
4 Button <Clear event log>
5 Date / time of the event
6 Button <?> (to display the detailed event description)

Fig. 60 Event log (Transmitter)

Display Event Description



1 Button <?>
2 Button <Clear event log>
3 Highlighted event
4 Event no.
5 Event title
6 Event description
7 Button <Close>

Fig. 61 display an event log

1. Click on a line in the list (Fig. 61, item 3).
2. Click on <?> (Fig. 61, item 1).

u The event description appears.

3. With the button <Close>, close the event description (Fig. 61, item 7).

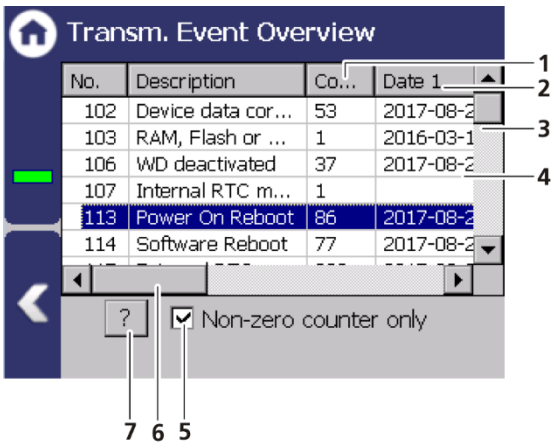
NOTICE

With the button <Clear event log> (Fig. 61, item 2) all events are deleted irrevocable.

8.2.2 Transm. Event Overview

Diagnostics | Transm. Events | Transm. Event Overview

All events that can be logged are chronologically presented in tabular form in the window “Event overview”. Activate the check box “Non-zero Counter only” (Fig. 62, item 5) in order to display events that have occurred.



1 “Number” column
2 “Date” column
3 Vertical scroll bar
4 Event line
5 check box “Non Zero counter only”
6 Horizontal scroll bar
7 Button < ? >

Fig. 62 Transmitter Event Overview

1. Click on a line in the list (Fig. 62, item 4).
2. Click on <? > (Fig. 62, item 7).

u The event description appears.

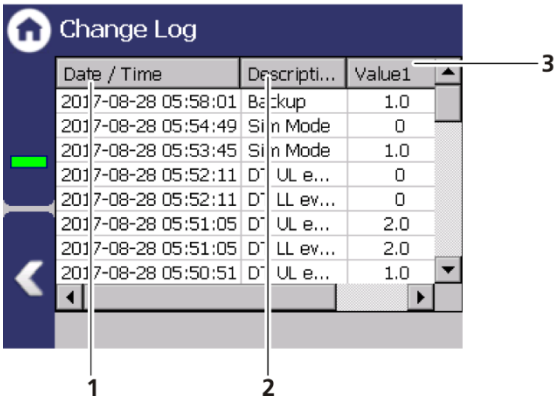
3. Close the event description with the button <Close>.
4. Slide the bar of the horizontal scroll bar (Fig. 62, item 6) to the right to see at what times (date, time) the event occurred.

u The last 5 time points are displayed.

8.3 Change Log

Diagnostics | Change Log

You can track changes that were performed on the device in the window “Change log”.



1 Time of the change
2 Short info of the change
3 Value 1

Fig. 63 Change Log (Transmitter)

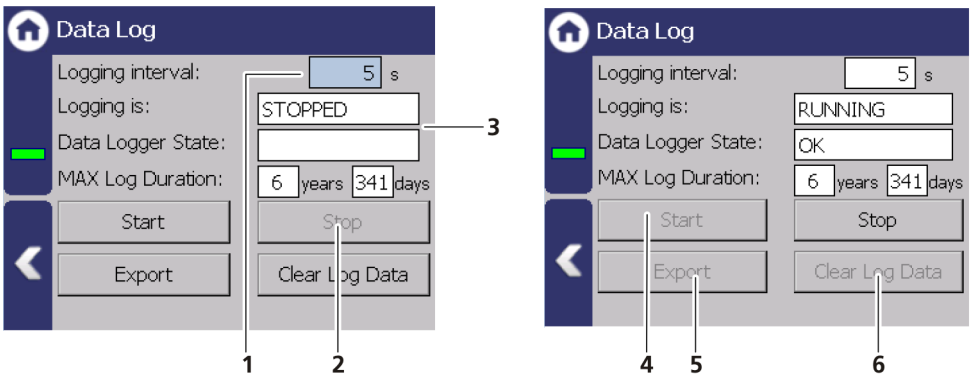
8.4 Data Log (only master EVU)

Diagnostics | Data Log

You can set the log interval as well as delete and export the log data in the sub-menu “Data log”.

IMPORTANT

The data cannot be viewed on the EVU Display or via Ethernet. The data must be exported to a USB storage device to view it on a PC.



1 Input field Log interval [s]
2 Button <Stop>
3 Display field
4 Button <Start>
5 Button <Export>
6 Button <Clear log data>

Fig. 64 Data Log

Change log interval

1. Click on the button <Stop> (Fig. 64, item 2) to stop the data log process.
2. Click on the input field “Log interval” (Fig. 64, item 1) and enter the time in seconds.
3. Confirm with the Enter key.

u The interval was accepted

4. Click on the button <Start> (Fig. 64, item 4) to start the data log process.

Export log data

1. Click on the button <Stop> (Fig. 64, item 2) to stop the data log process.
2. Connect a USB storage device to the device (Fig. 3, item 5).
3. Click on the button <Export> (Fig. 64, item 5).

u The export process is started and can take several minutes to complete under certain circumstances.

u The message window ”Export successful!” appears with a successful export.

Information

The export includes a zip file that is created in the folder “ExtendedLogExport”. The file name is derived from “ExtendedLogExport", the date and time (ExtendedLogExport_YYYYMMDD_hr-min-sec).

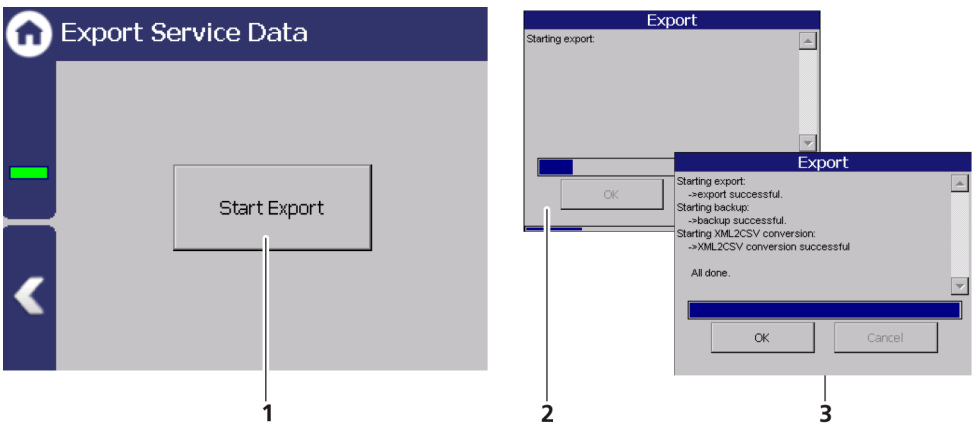
Exported data structure

1 Zip file
2 Folder year
3 Folder month
4 File Day

Fig. 65 Data structure

8.5 Export service data (only master EVU)

Diagnostics | Export Service Data



1 **Button** <Export service data>
2 **Process window**
3 **Confirmation message**

Fig. 66 Export Service Data

1. Connect a USB storage device to the device (Fig. 3, item 5).
2. The USB storage is recognised by the system after a few seconds and the button <Export service data> (Fig. 66, item 1) can be clicked.
3. Click on the button <Export service data> (Fig. 66, item 1).

u The process window is displayed and the export of service data will be carried out (Fig. 66, item 2).

u After successful export a confirmation message Fig. 66, item 3) is displayed.

Information

Four .txt files are copied to the USB drive when exporting:
- ChangeLog
- ErrorHistory
- ErrorSummary
- SystemInfo

Information

A new folder “Backup_LB47x" is created and the Backup-File (.xml) is copied when exporting.

9 Troubleshooting

9.1 Error Search

Problem	Cause	Measure
Master unit: Screen black; LEDs are not illuminated	EVU does not work	u Check power supply and fuses
Extension module: LEDs are not illuminated	Extension module not clamped properly	u Check cabling, contact sockets
Extension module: is not detected	Incorrect device ID	u Check Device ID in the menu Identification of the extension module
No signal	Detector does not work	u Check the functioning of the detector
Count rate too low	Shield not opened or not opened correctly	u Check lock and ensure it is in OPEN position
	Incorrect focus of the effective radiation on the detector	u Correct and optimise the alignment
	Objects in the beam path	u Offset irradiation level
	Source at the end of its usable life span	u Replace source
The display deviates	Defect in detector	u Check detector
	Count rate too low (see above)	u Check source age and irradiation level, replace detector
	Incorrect Calibration	u Check calibration values
Detector is not detected (software)	Terminals / wiring	u Check terminal connection; check terminal assignment
	Damaged line	u Check cable; examine with measurement device.
	Incorrect ID in the configuration	u Check ID of the detector (see type plate on the detector)
Touch panel does not respond	Error in operating system	u Restart EVU
Buttons are missed when you click	Incorrect screen calibration	u Calibrate screen again

9.2 Error Codes of the Evaluation Unit

In the following tables you can find the EVU and detector error codes which give you exact information on how to fix them. The error codes of the detectors can be found in the operating instructions of the respective detectors.

System events are classified in

- FAILURE (F)
- OUT OF SPECIFICATION (S)
- FUNCTION CHECK (C)
- MAINTENANCE REQUIRED (M)

Failure (F)

Severe device error. The current output emits an error current. The error relay gives alarm (contact opens).

Out of specification (S)

The detector, one of its components or the process itself, are out of normal specification.

Function Check (C)

Indicates that entries are made at the detector or a function check/simulation is being performed.

9.2.1 System

Code	Message	NAMUR107	Help Text
M101	HW Module	F	Hardware electronics module corrupt. Restart the device. Contact Berthold service, if this event occurs repeatedly.
M102	Device data-set	F	Failure of the permanent memory. No parameter set found. Factory reset and / or restart the device. Contact Berthold service, if this event occurs repeatedly. The device possibly must be reset twice.
M103	RAM, Flash or CPU	F	Internal hardware failure. Restart the device. Contact Berthold service, if this event occurs repeatedly.
M104	WD Reboot	M	The Watchdog has caused the device to restart. Contact Berthold service, if this event occurs repeatedly. Check, if massive electromagnetic interferences have caused this event.
M105	WD Failure	F	Watchdog malfunction. Contact Berthold service, if this event occurs repeatedly.
M106	WD Off	M	Watchdog is inactive. Activate Watchdog

M107	Error in the internal real time clock	M	Malfunction of the real-time clock. Check Date and Time. If the event occurs frequently, contact Berthold Service.
M108	CPU temperature sensor	M	The temperature sensor of the device is defective. Contact Berthold Service. The hardware is defective and, if necessary, must be checked and replaced.
M109	Lower temperature limit: Maintenance required	M	The internal temperature of the device is close to the lower threshold value of the permissible operating temperature.
M110	Temp LL OOS	S	The internal temperature of the device is below the lower limit. The correct function of the device can not be guaranteed. It is recommend to have the device checked by Berthold Service, even if it seems to work normally.
M111	Temp UL maintenace	M	The internal temperature of the device is close to the upper limit.
M112	Temp UL OOS	S	The internal temperature of the device is above the upper limit. The correct function of the device can not be guaranteed. It is recommend to have the device checked by Berthold Service, even if it seems to work normally.
M113	Power On Reboot	C	The device was restarted due to unknown reasons.
M114	Software Reboot	C	The device was restarted by user input.
M115	Extern RTC malfunction	M	Failure of the external real time clock. Contact Berthold service, if this event occurs repeatedly.
M116	Corrupt Date	M	The date could not be verified at startup. Check date and time and set if necessary.

9.2.2 Application

Code	Message	NAMUR107	Help Text
M310	PV calc not possible	F	Process value could not be calculated.
M311	Backup process	C	Backup in process.
M312	Restore process	C	Restore in process.
M399	Internal program error	F	Internal software failure. Restart the device. Contact Berthold service, if this event occurs repeatedly.

9.2.3 Detector

Code	Message	NAMUR107	Help Text
D501	Detector not found	S	Connection to at least one detector lost. Check detector configuration and / or detector connection. Contact Berthold service, if this event persists.
D502	Detector comm error	M	Communication to at least one detector interrupted. Check detector connection. Contact Berthold service, if this event occurs repeatedly.
D503	Detector failure	S	At least one detector signals "failure". Check detector events.
D504	Detector out of spec	S	At least one detector signals "out of specification". Check detector events.
D505	Detector func check	C	At least one detector signals "function check". Check detector events.
D506	Detector maintenance	M	At least one detector signals "maintenance required". Check detector events.
D507	Ex-i Board failure	S	
D599	Internal program err	F	Internal software failure. Restart the device. Contact Berthold service, if this event occurs repeatedly.

9.2.4 RS 458 Interface

Code	Message	NAMUR107	Help Text
D601	Detector not found	S	Connection to at least one "additional output" lost. Check configuration and / or connection. Contact Berthold service, if this event persists.
D602	Detector comm error	M	Communication to at least one "additional output" interrupted. Check connection. Contact Berthold service, if this event occurs repeatedly.
D699	Internal program err	F	Internal software failure. Restart the device. Contact Berthold service, if this event occurs repeatedly.

9.2.5 Process Connection

Code	Message	NAMUR107	Help Text
M701	Current output	F	Deviation of analog output value from feeback value is too high. Calibrate analog output. Contact Berthold service, if this event occurs repeatedly.
M702	Current loop open	F	Current output loop open. Check cable connection.
M703	Software update	C	Indicates that a software update is running. No action necessary. The device automatically returns to measuring mode after the software update is finished.
M799	Internal program error	F	Internal software failure. Restart the device. Contact Berthold service, if this event occurs repeatedly.

10 Maintenance and Repair

The replacing of fuses, the cleaning and data storage of the EVU are described in the maintenance and repair chapter.

IMPORTANT

- The applicable national regulations of the respective country of use have to be observed!
- Repair and servicing on the EVU may only be carried out by experts. In case of doubt, the complete EVU is to be sent to Berthold.

NOTICE

- Repair on electronic circuits on the circuit boards of a field device may only be carried out in the manufacturer's factory.
- When working at electronic components, the relevant safety regulations must always be observed. Particularly observe the safety instructions in the chapter 2 Safety.
- De-energise the detector and potentially connected relay contacts as well as all inputs and outputs.

IMPORTANT

To achieve optimum measuring accuracy, we recommend recalibrating the measuring system after a repair (not after changing the housing).

10.1 Replacing of Fuses

⚠ DANGER

Danger to life from electric shock!

Replacing of fuses may only be carried out by a qualified electrician.

- u Please adhere to the relevant safety regulations.
- u Installation/maintenance may only be carried out if the device has been de-energised.
- u Only open the device when free of voltage.

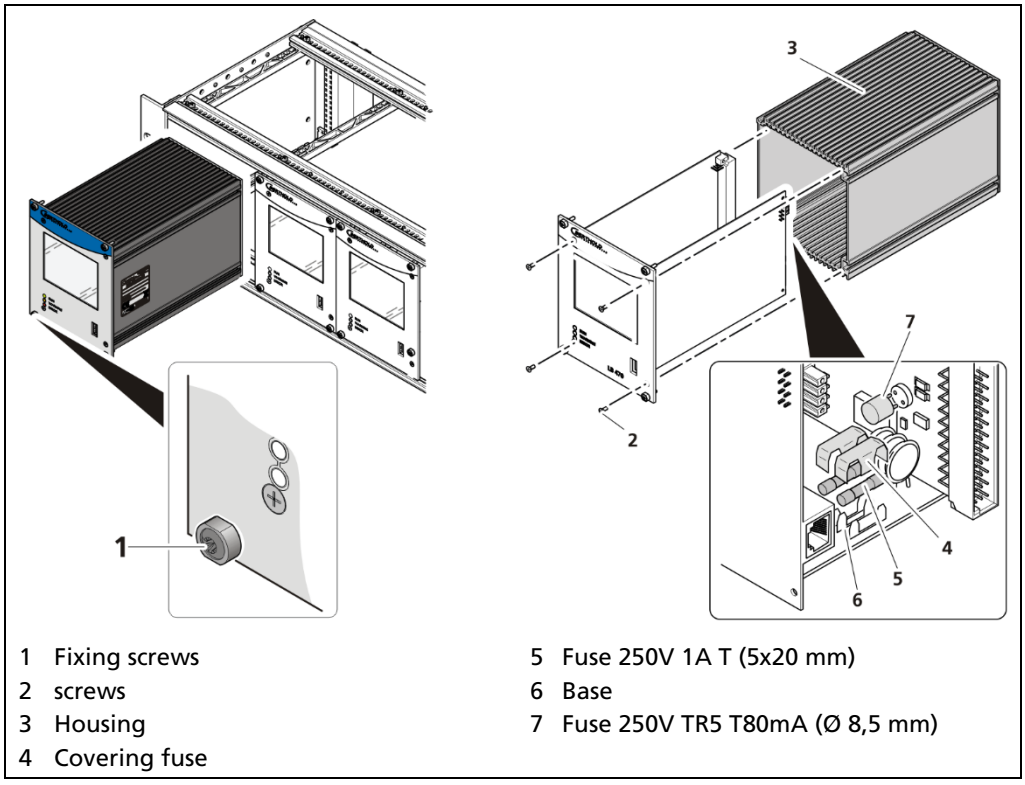
In case of an electric shock, carry out first aid measures and immediately call an emergency service.

NOTICE

Damage to the device! Short circuit!

The EVU can be damaged if incorrect fuses are used.

- u Only use fuses which correspond to the fuses on the circuit board of the module. Fuses:
  - · EVU: 250V 1A T (5x20 mm)
  - · EVU: 250V TR5 T80mA (Ø 8,5 mm)



1 Fixing screws
2 screws
3 Housing
4 Covering fuse
5 Fuse 250V 1A T (5x20 mm)
6 Base
7 Fuse 250V TR5 T80mA (Ø 8,5 mm)

Fig. 67 Replacing fuses master EVU

1. De-energise the device.
2. Loosen the four fixing screws (Fig. 67, item 1) and remove the EVU from the wall housing or subrack.
3. Loosen the four sunken screws on the front side of the EVU (Fig. 67, item 2).
4. Pull out the housing (Fig. 67, item 3) carefully.

5. Remove the protective covering of the fuse (Fig. 67, item 4)
6. Remove the fuse (Fig. 67, item 5, item 7).
7. Insert the new fuses and attach the protective covering again.
8. Carefully slide the circuit board into the housing.
9. Screw the front panel to the housing with the four screws (Fig. 67, item 2).
10. Set module into the guide rails and push it gently until the plug connector of the module is inserted into the socket board.
11. Tighten all fixing screws (Fig. 67, item 1).

u The fuse change was carried out correctly.

10.2 Cleaning

The display is designed for maintenance-free operation. Make sure you keep the touch screen clean. Use a cleaning cloth dampened with a cleaning agent to clean the equipment. Only use water with a little liquid soap or a screen cleaning foam.

NOTICE

Unintentional reaction!

When cleaning the touchscreen, touching keys can trigger an unintentional reaction in the EVU.

u When cleaning, make sure that no unintentional reactions are triggered.

NOTE

Damage caused by unauthorized cleaning products!

The display may be damaged if compressed air, steam jet blowers, aggressive solvents or scouring powders are used for cleaning purposes.

u Do not clean the EVU with compressed air or steam jet blowers. Do not use aggressive solvents or scouring powder.

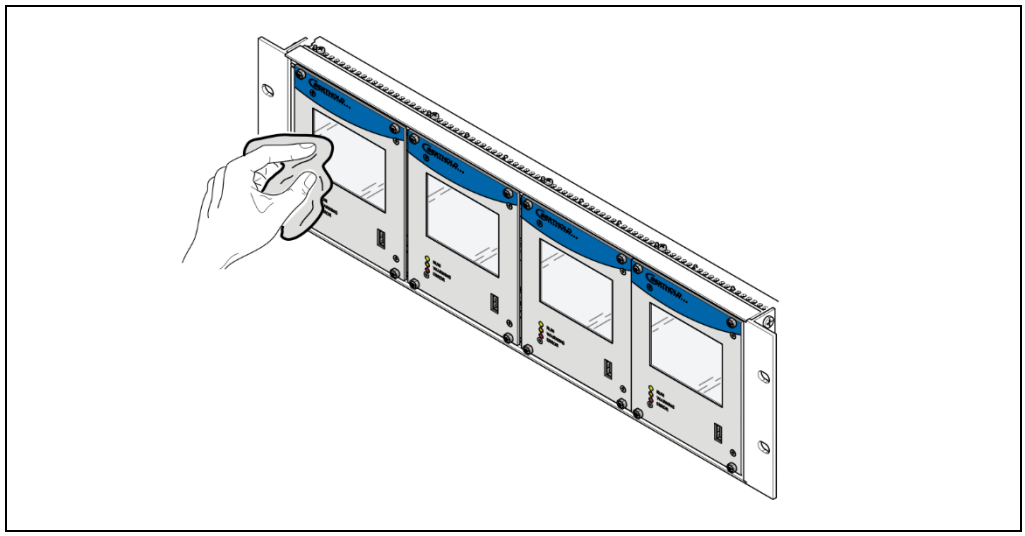


Fig. 68 Cleaning the display

1. Shut down the device.
2. Spray the cleaning solution onto a cleaning cloth. Do not spray directly onto the display.
3. Clean the display.
4. When cleaning the display wipe from the screen edge inwards.
5. Let the display dry out.

u The cleaning of the display was performed correctly.

10.3 Data backup

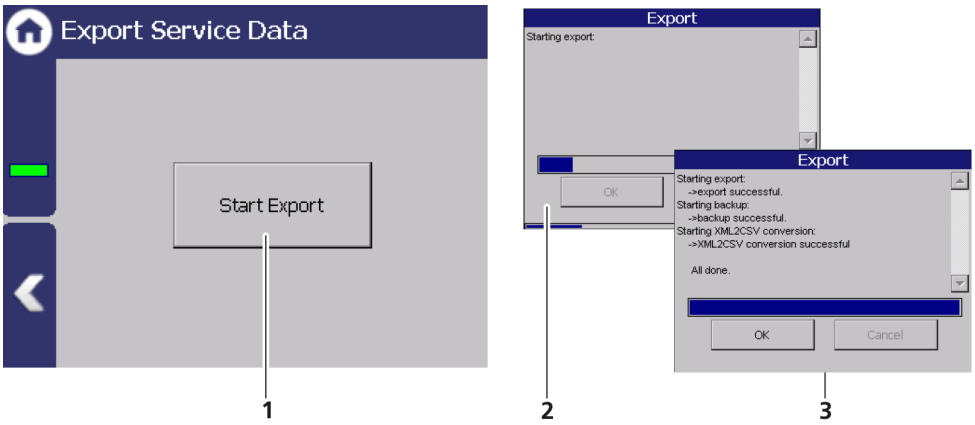
Activate the data log (see chapter 8.4) so that all data are recorded. Perform a log data and service data backup at regular intervals.

Export service data

Diagnostics | Export Service Data

Four .txt files are copied to the USB drive when exporting service data:

- ChangeLog
- ErrorHistory
- ErrorSummary
- SystemInfo



1 **Button** <Export service data>
2 **Process window**
3 **Confirmation message**

Fig. 69 Export Service Data

6. Connect a USB storage device to the device (Fig. 3, item 5).
7. The USB storage is recognised by the system after a few seconds and the button <Export service data> (Fig. 66, item 1) can be clicked.
8. Click on the button <Export service data> (Fig. 66, item 1).

u The process window is displayed and the export of service data will be carried out (Fig. 66, item 2).

u After successful export a confirmation message Fig. 66, item 3) is displayed.

Information

A new folder "Backup_LB474" is created and the Backup-File (.xml) is copied when exporting.

11 Decommissioning

⚠ DANGER

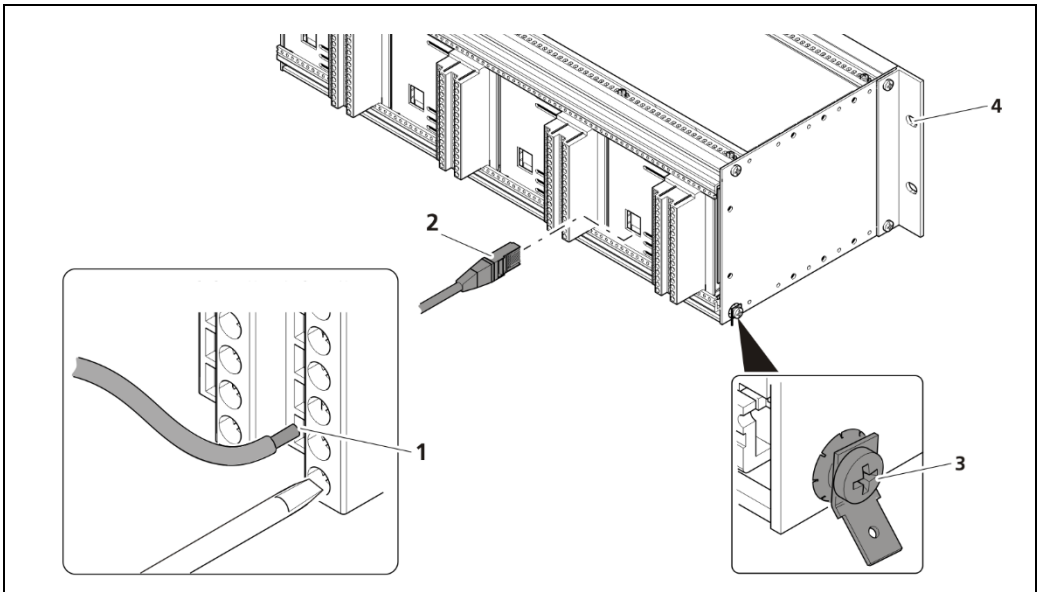
Danger to life from electric shock!

Decommissioning may only be carried out by qualified electricians.

- u Please adhere to the relevant safety regulations.
- u Decommissioning may only be carried out if the device has been de-energised.
- u Only open the device when free of voltage.

In case of an electric shock, carry out first aid measures and immediately call an emergency service.

11.1 Decommissioning 19" subrack



1	Lines	3	PE cable
2	RJ45 connector (network)	4	Screw Connections

Fig. 70 Decommissioning wall housing

1. De-energise the device.
2. Remove all lines (Fig. 70, item 1) from the clamp blocks.
3. Remove the network plug (Fig. 70, item 2).
4. Remove the PE cable (Fig. 70, item 3).
5. Remove the connections (Fig. 70, item 4) and pull the subrack from the 19" rack.

- u The decommissioning is completed.

11.2 Disposal of Measurement System

⚠ CAUTION

Toxic!

The product contains electronic components containing toxic substances that are harmful to health.

- u Disposal is to be carried out in accordance with the disposal regulations via a disposal expert.

If the device is to be decommissioned, have it disposed of according to legal regulations (e.g. RL 2002/96/EC) by a specialised waste management company.

12 Appendix

12.1 Commissioning Guide

This guide is intended to support and document the installation and commissioning of Multiphase Level Measurement (MPLM) systems. The document is divided into the following sections:

- Underlying data
- Implementation on site
- Setup protocol

IMPORTANT

This guide does not replace the instructions for installation, electrical installation and setup in the corresponding operating instructions.

- u Detailed descriptions of the procedures can be found in the respective operating instructions of the detector or the evaluation unit.
- u The safety instructions of the corresponding user manuals must be observed!

12.1.1 Underlying data

The data required for an installation of the MPLM system are listed here. Some data have already been defined in Berthold's factory or clarified with the customer in advance. All information must be agreed with the customer or the responsible process engineer.

Information about the system

Customer	
Measuring point	

Detectors

#	Detector-ID	Position in ____	Process path in ___
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

Sources

Total number of sources installed in the dip tube: _____
Nuclide: _____

#	Number of sources per wave core	Length of the wave core	Source numbers (activities)
1			
2			
3			
4			
5			

Interfaces

Interface	Density limit value in _____ [1]	Expected position ranges in _____ [1]
Total Level (Gas Density)		

Evaluation Unit

Device-ID Master	Location

Extension Module

#	Device-ID Extension	Description

[1] The selected units must be consistent with the settings of the evaluation unit!

12.1.2 Implementation on site

At this point, the steps to be carried out on site are listed. A detailed description of the installation, electrical installation, etc. can be found in the respective operating instructions. Safety instructions must be observed!

Detector Positioning

In most cases, the detectors are installed by the customer. Prerequisite: Mounting for the detectors is provided. Fix detectors to the mounting using appropriate clamps. Positioning of the detectors according to specifications (see Table “Detectors” in chapter 12.1.1). During commissioning, only a fine adjustment of the detectors is usually necessary.

Evaluation Unit

The evaluation unit is usually preconfigured in the factory. Commissioning is documented by means of a commissioning protocol (see 12.2 Setup Protocol LB 478).

The following settings on the Master Control Unit must be checked:

1. Are all detectors incl. position applied? See Table “Detectors” in chapter 12.1.1

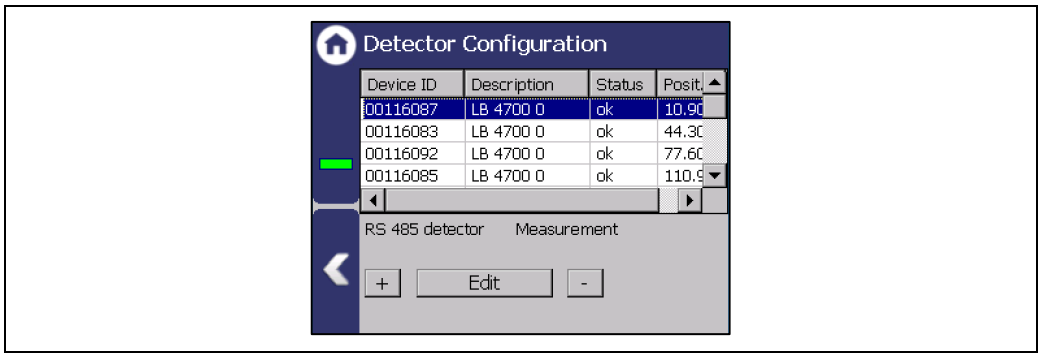


Fig. 71 Example Detector Configuration

2. Are all required interfaces created? See Table “Interfaces” in chapter 12.1.1

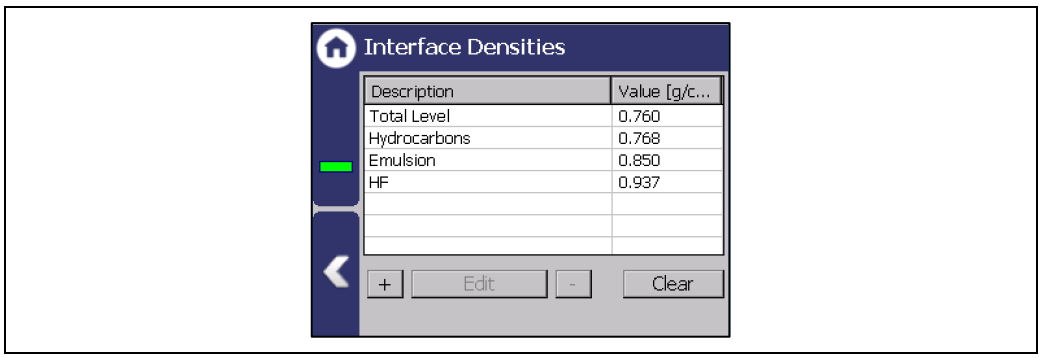


Fig. 72 Example Interface Densities

3. Are all additional outputs created? An analog output must be created for each additional evaluation unit (extension module).

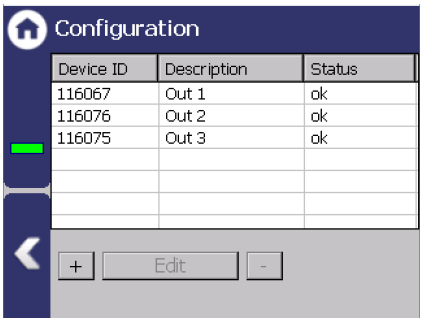


Fig. 73 Example extension module (outputs) configuration

4. Scaling of analog outputs according to the specifications for position ranges (see Table “Interfaces” in chapter 12.1.1.). Note: This data must be agreed with the relevant process engineer.

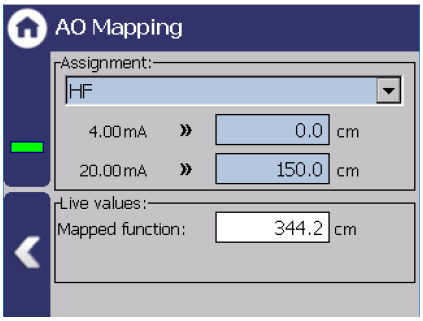


Fig. 74 Example extension module (outputs) configuration

Calibration of detectors

NOTE

- Each detector must be calibrated individually!
- As part of the calibration procedure, the container must be emptied or filled, time must be allowed for this.

For the detectors of a MPLM system, a two-point calibration is performed, i.e. first the calibration of all detectors is carried out at density A and then at density B. In individual cases, a 1-point calibration may suffice. The calibration of the detectors is described in detail in the corresponding operating instructions, at this point only assistance is given. Calibration is documented individually for each detector in the form of a commissioning protocol (template see 12.2 Setup Protocol LB 478).

1. Connect the HART communicator to detector #1
   Note: LB480 Evaluation Units are passive, 24 V auxillary voltage in series to 4 - 20 mA output required.
2. Set the basic parameters.
3. Calibrate first density.
4. Repeat Step 2 and 3 for the remaining detectors.
5. Calibrate the second density at all detectors and trigger calibrate.

12.2 Setup Protocol LB 478

The commissioning is carried out by means of setup protocols for the evaluation units and the detectors. Note: A separate protocol must be completed for each detector!

General data	
Date	
Measuring point	
Number of dectors	_____ LB480
Number of sources	
Isotope	☐ Cs-137 ☐ Co-60
Container	
Products	

Device configuration	
Model	
Installation variant	☐ Wall housing ☐ Subrack
Power supply	☐ 100-240 V AC ☐ 18-32 V DC
Number of master EVU	
Device ID master EVU	
Number of extension modules	
Device ID's extension modules	
Software Version	

Setup Protocol (Continued)

Parameters	
Password	____________________
Language	☐ DE ☐ EN ☐ ____________
CE Remote Control	☐ enabled
Network	☐ DHCP active IP Adress ____ . ____ . ____ . ____ Subnet ____ . ____ . ____ . ____ Ggateway ____ . ____ . ____ . ____ DNS-Server ____ . ____ . ____ . ____ MAC Adress ____________________
Process Value Range (Master)	min. Value 0 / 4,00 mA ________ max. Value 20,00 mA ________
Process Value Range (Extension ID ______)	min. Value 0 / 4,00 mA ________ max. Value 20,00 mA ________
Process Value Range (Extension ID ______)	min. Value 0 / 4,00 mA ________ max. Value 20,00 mA ________
Process Value Range (Extension ID ______)	min. Value 0 / 4,00 mA ________ max. Value 20,00 mA ________
Process Value Range (Extension ID ______)	min. Value 0 / 4,00 mA ________ max. Value 20,00 mA ________
Process Value Range (Extension ID ______)	min. Value 0 / 4,00 mA ________ max. Value 20,00 mA ________
Process Value Range (Extension ID ______)	min. Value 0 / 4,00 mA ________ max. Value 20,00 mA ________
AO Assignment Master	Interface: ______________
AO Assignment Extension ID ________	Interface: ______________
AO Assignment Extension ID ________	Interface: ______________
AO Assignment Extension ID ________	Interface: ______________
AO Assignment Extension ID ________	Interface: ______________
AO Assignment Extension ID ________	Interface: ______________
AO Assignment Extension ID ________	Interface: ______________

12.3 Setup Protocol LB480 MPLM

Measuring point		**Date**	
Isotope		**Detector Position (Height)**	
Detector		**HV**	

Path	Parameters	Unit	Standard	Setup
Device Config u Meas Parameter u Meas Data				
	Background	cps	50	
Device Config u Meas Parameter u Meas Data u Meas Table				
Point	Density	Rate		
1				
2				
3				
4				
Meas Parameter u Meas Settings				
	Nuclide	Cs-137 / Co-60	Cs-137	
	Cal Method	1-POINT LIN MULTIPOINT 1-POINT EXP 2-POINT EXP	MULTIPOINT	
	Cal Curve Type	STANDARD / REVERSED	STANDARD	
	Meas. Path			
	Unit Family			
	Unit			
	ReadIn Time	s	60	
Device Config u Setup u Sensor Configuration u Date - Time				
	Date	MM/DD/YYYY		
	Time	hh:mm:ss		

Device Config u Setup u Sensor Configuration u Sensor Settings				
	Detector Code	0 ... 50	0	
	HV Mode	AUTO / MANUAL		
	HV Live	V		
	HV Average	V		
	HV Manual	V		
	HV Default	V		
Device Config u Setup u Signal Condition u Signal Parameter				
	Time Const	s	20	
	Error Handling	NORMAL / SENSITIVE	NORMAL	
	Signal Unlocked	OFF / ON	OFF	
Device Config u Setup u Signal Condition u Reading Range				
	Lower Range Value	SPG	0	
	Upper Range Value	SPG		
	Factor			
	Offset	SPG		
Device Config u Setup u Signal Condition u Signal Dependency				
	Response Mode	DISABLED RAPID SWITCH RAD INTERFERENCE	DISABLED	
	Io Factor		1,5	
	Waiting Time	s	60	
	RI Sigma		10	
	Meas Delay Time	s	4	

Device Config u Setup u I/O Setup u Current Output				
	Current Loop Montitoring	DISABLED ENABLED	ENABLED	
	Loop Alarm Type	HIGH LOW HOLD LAST VALUE VALUE	HIGH	
	Error Current Value	mA	22,00	
	Current Lower Limit	mA	3,80	
	Current Upper Limit	mA	20,50	

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Unité d'évaluation

DUO XPERT

LB 47x

Détecteurs

DUO SERIES

LB 4700

Informations sur la sécurité
56925BA59

Rev. No.: 03, 05/2019

1 A propos de ce manuel d’utilisation

1.8 Avertissement

Les avertissements sont identifiés comme suit :

Signalement

Source et conséquence

Explication si requise

- u Prévention

En cas de danger

- **Symboles d’alerte :** (triangle d’alerte) attire l’attention sur le risque.
- **Signalement :** Indique la sévérité du danger.
- **Source :** Précise le type ou la source de danger.
- **Conséquence :** Décrit les conséquences d’un non respect.
- **Prévention :** Précise comment le risque peut être écarté.
- **En cas de danger :** Précise quelles actions sont requises en cas d’occurrence du risque

1.8.1 Symboles employés dans le manuel d’utilisation

Dans ce manuel, les avertissements indiqués avant les instructions d’utilisation se réfèrent aux risques de blessures ou de dégâts matériels. Les mesures de prévention de danger décrites doivent être respectées.

DANGER

Indique un danger majeur imminent, qui entraînera certainement des blessures sérieuses ou la mort s’il n’est pas évité.

AVERTISSEMENT

Indique un danger potentiel qui peut entraîner des blessures sérieuses ou la mort s’il n’est pas évité.

PRUDENCE

Se réfère à une situation potentiellement dangereuse qui peut entraîner des blessures physiques mineures ou graves, ou des dégâts matériels si elle n’est pas évitée.

RECOMMANDATION

Si cette information n'est pas appliquée, un dysfonctionnement et/ou un dégât matériel peuvent apparaître.

IMPORTANT

Les sections identifiées avec ce symbole signalent des informations importantes du produit ou de son fonctionnement.

Tip

Fournit des conseils sur l'application ou d'autres informations utiles.

1.8.2 Symboles utilisés sur l'appareil

Lire le manuel d'utilisation

Veuillez suivre les instructions dans ce manuel d'utilisation.

Décharge électrostatique

Veuillez noter les instructions de manipulation. Composants sensibles aux décharges électrostatiques. Veuillez suivre les instructions de ce manuel d'utilisation.

Connexion de mise à la terre

Raccorder le conducteur de mise à la terre à cet endroit.

Raccordement equipotentiel

Raccorder le conducteur d'équipotentialité à cet endroit

Tension continue

L'appareil fonctionne en tension continue et ne doit être raccordé qu'à une source de tension continue.

Tension alternative

L'appareil fonctionne en tension alternative et ne doit être raccordé qu'à une source de tension alternative.

Déchet non domestique

Cet appareil électrique ne doit pas être éliminé avec les déchets domestiques

1.9 Conformité

La société BERTHOLD déclare par la présente, sous son entière responsabilité, que la conception de ce produit mis sur le marché par BERTHOLD est conforme aux directives EU indiquées dans la déclaration de conformité originale.

Cette disposition devient nulle en cas de modifications non autorisées par Berthold ou dans le cas d'une utilisation impropre.

Pour la déclaration de conformité originale, se «Technical information».

2 Sécurité

2.1 Dangers et mesures de sécurité

- Lire ces instructions entièrement et avec attention avant d'utiliser l'appareil.
- Stocker ces instructions dans un endroit accessible à tous les utilisateurs en permanence.

2.2 Utilisation appropriée

Ce qui suit constitue une utilisation appropriée :

- Se conformer strictement aux instructions et séquences d'utilisation mentionnées. Ne pas procéder à des pratiques différentes non autorisées qui pourraient engager votre sécurité et la fiabilité fonctionnelle de l'EVU !
- Suivre les instructions de sécurité mentionnées !
- Effectuer les opérations de maintenance prescrites ou les faire réaliser pour vous !
- Utiliser uniquement les accessoires et pièces de rechange BERTHOLD.

Utilisation inappropriée à éviter:

- Ne pas suivre les instructions de sécurité et les instructions pour l'utilisation, la maintenance et la mise au déchet indiquées dans le manuel.
- Un non respect quelconque avec le présent manuel d'utilisation pour le produit délivré.
- *Appliquer des dispositions et conditions non conformes à celles mentionnées dans les documents techniques, feuilles de spécifications, manuels d'utilisation et instructions de montage, ou tout autre document spécifique* du constructeur.
- Utiliser l'appareil si des éléments sont endommagés ou corrodés. Ceci s'applique aussi aux joints et aux câbles.
- Modification ou changement des **éléments** du système.
- L'appareil ne doit pas être installé en atmosphère explosive et de ce fait, ne peut pas être utilisé dans une telle atmosphère. Il n'est pas antidéflagrant.
- Utilisation...
  - où les éléments sous tension sont accessibles.
  - dans un boîtier mural avec presse-étoupes insuffisamment étanches et/ou non adaptés pour le passage des câbles.
- Utilisation sans les précautions de sécurité recommandées par le constructeur.
- Manoeuvre inappropriée ou oubli des équipements de sécurité présents.

BERTHOLD assume la responsabilité de la garantie seulement dans le cadre de ses spécifications publiées.

Si le produit est utilisé dans des conditions autres que celles décrites dans le présent manuel, la sécurité du produit est compromise et la garantie devient nulle.

RECOMMANDATION

L'appareil n'est pas conforme à IEC 61508 « Sureté de fonctionnement des systèmes comportant des composants électriques, électroniques ou électroniques programmables »

2.3 Qualification du personnel

RECOMMANDATION

Le minimum requis pour intervenir sur nos appareils ou pour les utiliser est un personnel avec des connaissances générales complétées par une formation d'un expert ou d'une personne autorisée.

A plusieurs endroits dans ce manuel d'utilisation, il est fait références à des groupes de personnes avec des qualifications particulières et à qui différentes tâches peuvent être confiées pendant l'installation, l'utilisation et la maintenance.

Les trois groupes de personnes sont :

- *Employés avec des connaissances générales*
- *Experts*
- *Personnes autorisées*

Employés avec connaissances générales

RECOMMANDATION

Les employés avec des connaissances générales doivent être guidés par un expert pour le moins. Lors de la mise en œuvre de matières radioactives, la personne compétente en radioprotection doit être consultée.

Les employés avec connaissances générales sont, par exemple, des techniciens, des soudeurs, qui vont assurer différentes tâches lors du transport, de l'assemblage et de l'installation de l'appareil sous l'encadrement d'une personne autorisée. Il peut s'agir aussi de personnel de montage du site. Les personnes concernées doivent posséder une expérience dans la manipulation du produit.

Experts

Les experts sont des personnes avec des compétences suffisantes dans le domaine requis, dues à leur formation spécialisée et qui sont familiers avec les lois nationales relatives à la santé et la sécurité, les règlements concernant la prévention des accidents, et les usages techniques applicables.

Le personnel expert doit être capable de déterminer et d'évaluer le résultat de ses tâches et doit être très familier avec le contenu de ce manuel d'utilisation.

Personnes autorisées

Les personnes autorisées sont celles désignées pour les tâches correspondantes dans le cadre de dispositions réglementaires, ou celles dûment autorisées par BERTHOLD pour des tâches particulières. Lors de la mise en œuvre de matières radioactives, la personne compétente en radioprotection doit être consultée

2.4 Les obligations de l'opérateur

L'opérateur de ces appareils doit régulièrement former son personnel sur les sujets suivants :

- Connaissance et utilisation **du manuel d'utilisation et des clauses légales**.
- Utilisation prévue de l'appareil.
- Respect des instructions de sécurité du site et des conditions d'utilisation de l'opérateur.
- Gestion régulière de la maintenance du produit.

Sous réserve de modifications dans le cadre du progrès technique.

05/2019
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Germany
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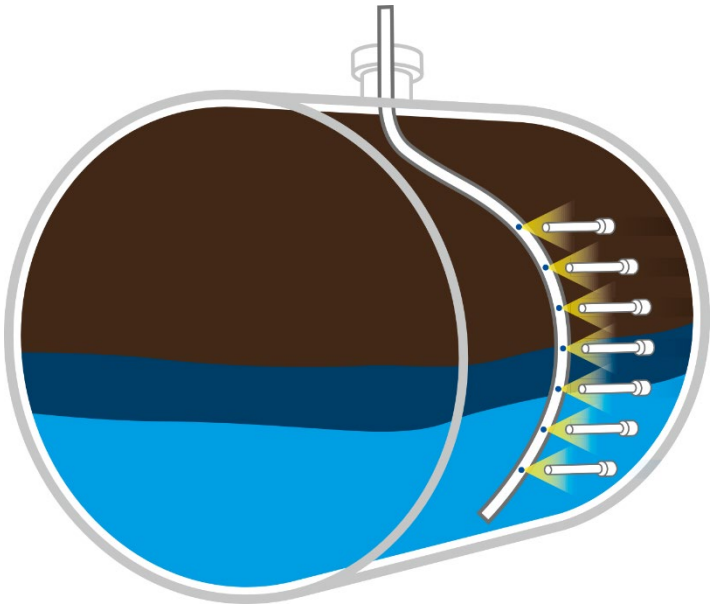
Id.-Nr. 56925BA59



EmulsionSENS

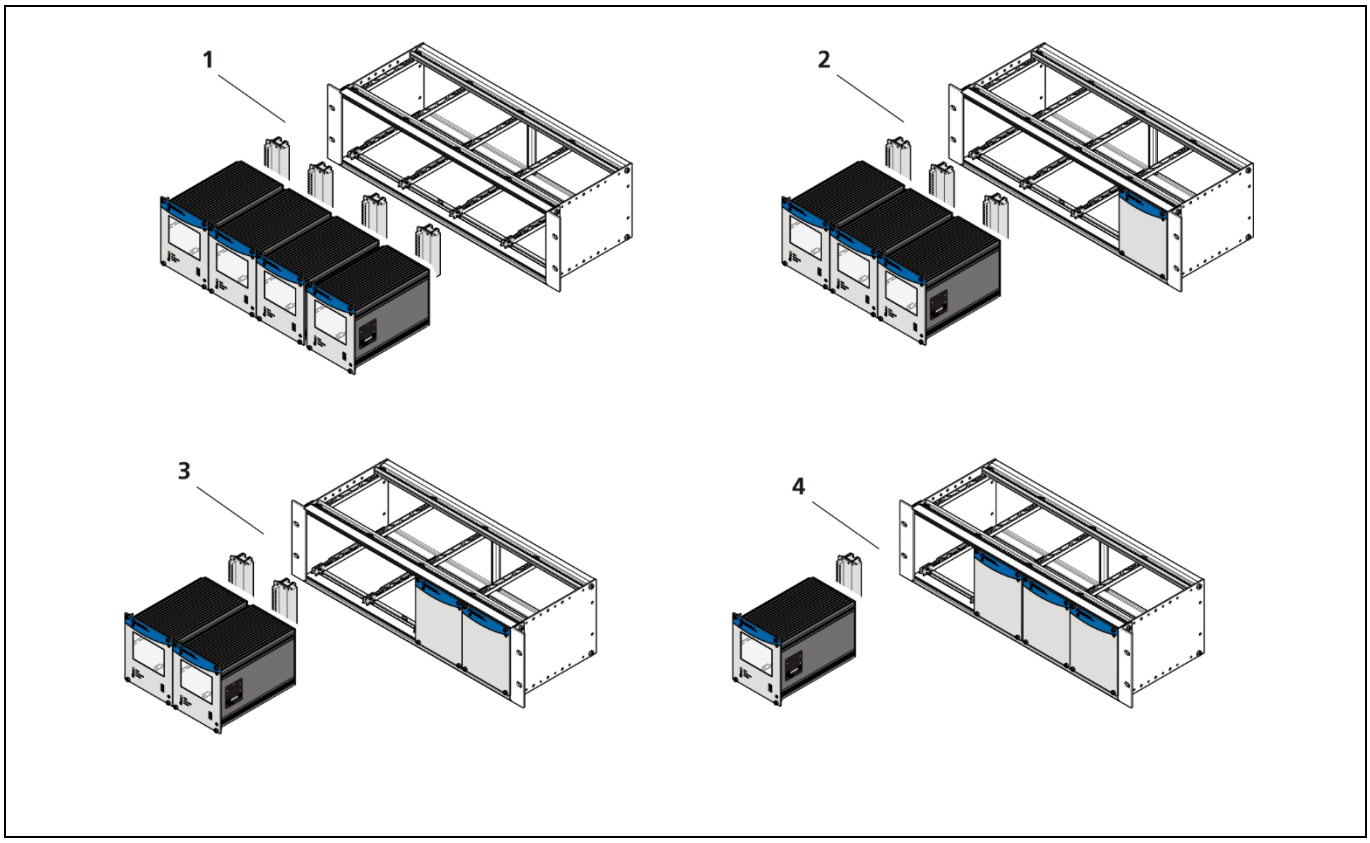
Technical Information

Technische Information

56925TI1M
Rev. No.: 00, 07/2019

Evaluation unit
Auswerteeinheit

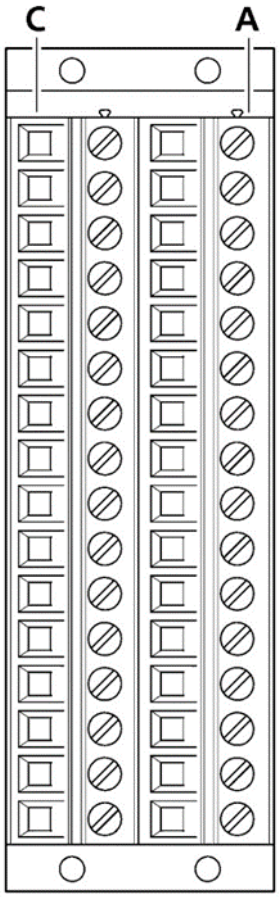
Installation variants 19" subrack
Einbauvarianten 19" Baugruppenträger



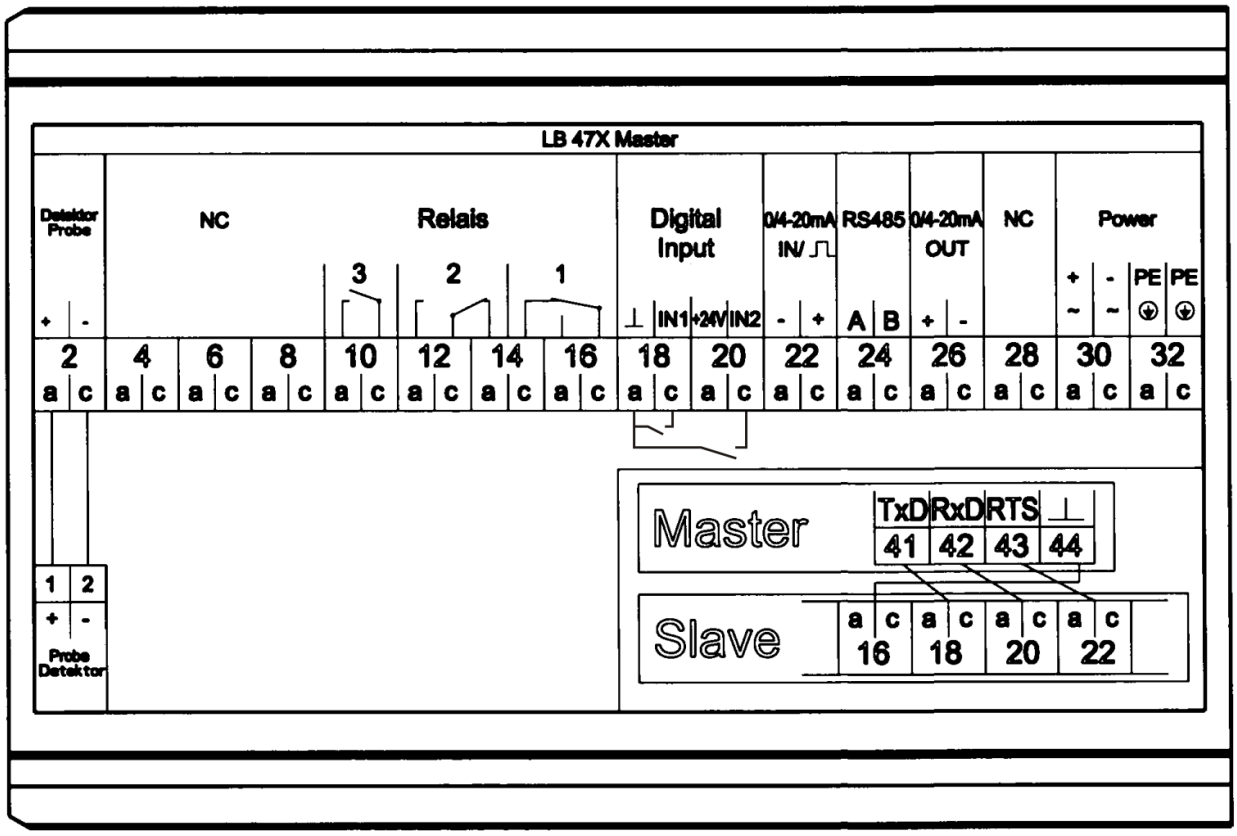
Item *Pos.*	Compontens *Komponenten*	Connection *Anschluss*
1	4x EVU (1 Master, 3 extension modules)	4 Terminal blocks *4 Klemmenblöcke*
2	3x EVU, 1x blanking panel (1 Master, 2 extension modules)	3 Terminal blocks *3 Klemmenblöcke*
3	2x EVU, 2x blanking panel (1 Master, 1 extension module)	2 Terminal blocks *2 Klemmenblöcke*
4	1x Master EVU, 3x blanking panel	1 Terminal block *1 Klemmenblock*

Assignment terminal block master EVU
Belegung Klemmenblock Master AWE

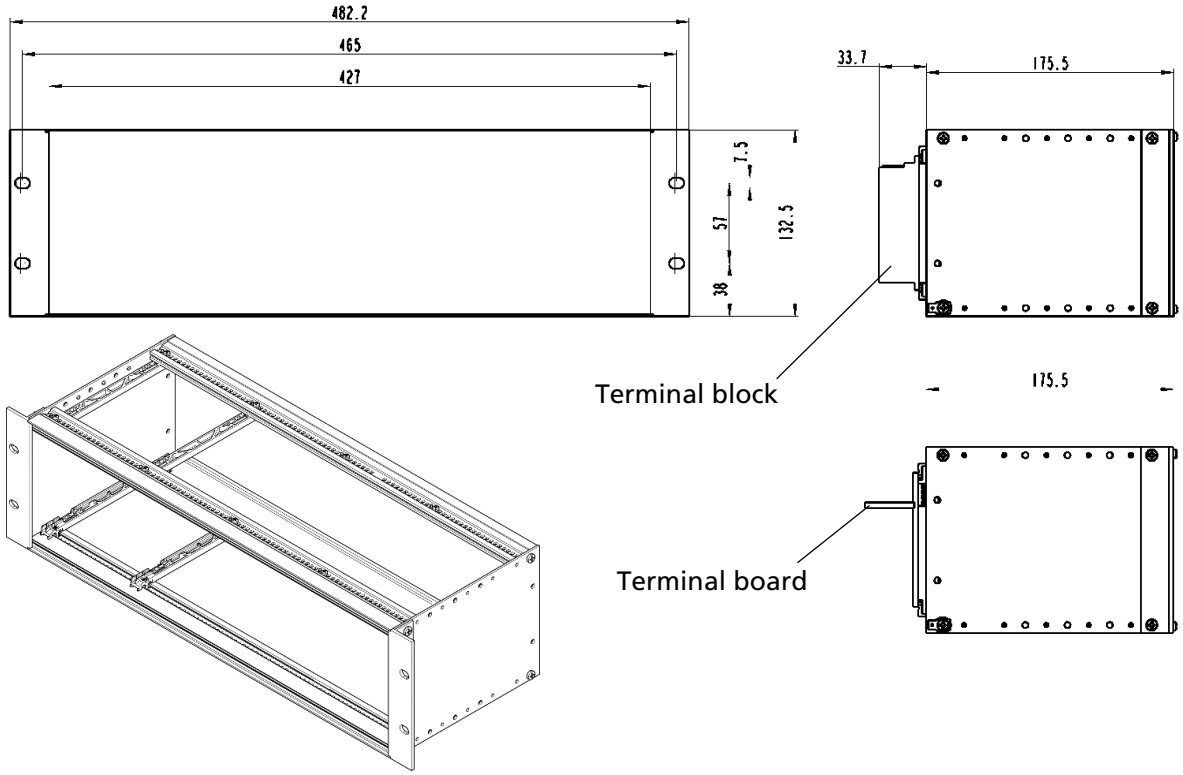
Signal	Pin
not assigned *nicht belegt*	C - 2
not assigned *nicht belegt*	C - 4
not assigned *nicht belegt*	C - 6
not assigned *nicht belegt*	C - 8
RELAY *RELAIS* 3 COM	C - 10
RELAY *RELAIS* 2 COM	C - 12
RELAY *RELAIS* 1 NC	C - 14
RELAY *RELAIS* 1 COM	C - 16
DIGITAL IN 1	C - 18
DIGITAL IN 2	C - 20
CURRENT IN +	C - 22
RS 485 B (Detector LB 480)	C - 24
CURRENT OUT –	C - 26
not assigned *nicht belegt*	C - 28
Main *Netz* N, DC 24 V –	C - 30
Protective conductor PE *Schutzleiter PE*	C - 32



Pin	Signal
A - 2	not assigned *nicht belegt*
A - 4	not assigned *nicht belegt*
A - 6	not assigned *nicht belegt*
A - 8	not assigned *nicht belegt*
A - 10	RELAY *RELAIS* 3 NO
A - 12	RELAY *RELAIS* 2 NO
A - 14	RELAY *RELAIS* 2 NC
A - 16	RELAY *RELAIS* 1 NO
A - 18	DIGITAL IN 1 GND
A - 20	+ 24 V
A - 22	CURRENT IN –
A - 24	RS 485 A (Detector LB 480)
A - 26	CURRENT OUT +
A - 28	not assigned *nicht belegt*
A - 30	Main *Netz* L1, 24 V DC +
A - 32	Protective conductor PE *Schutzleiter PE*



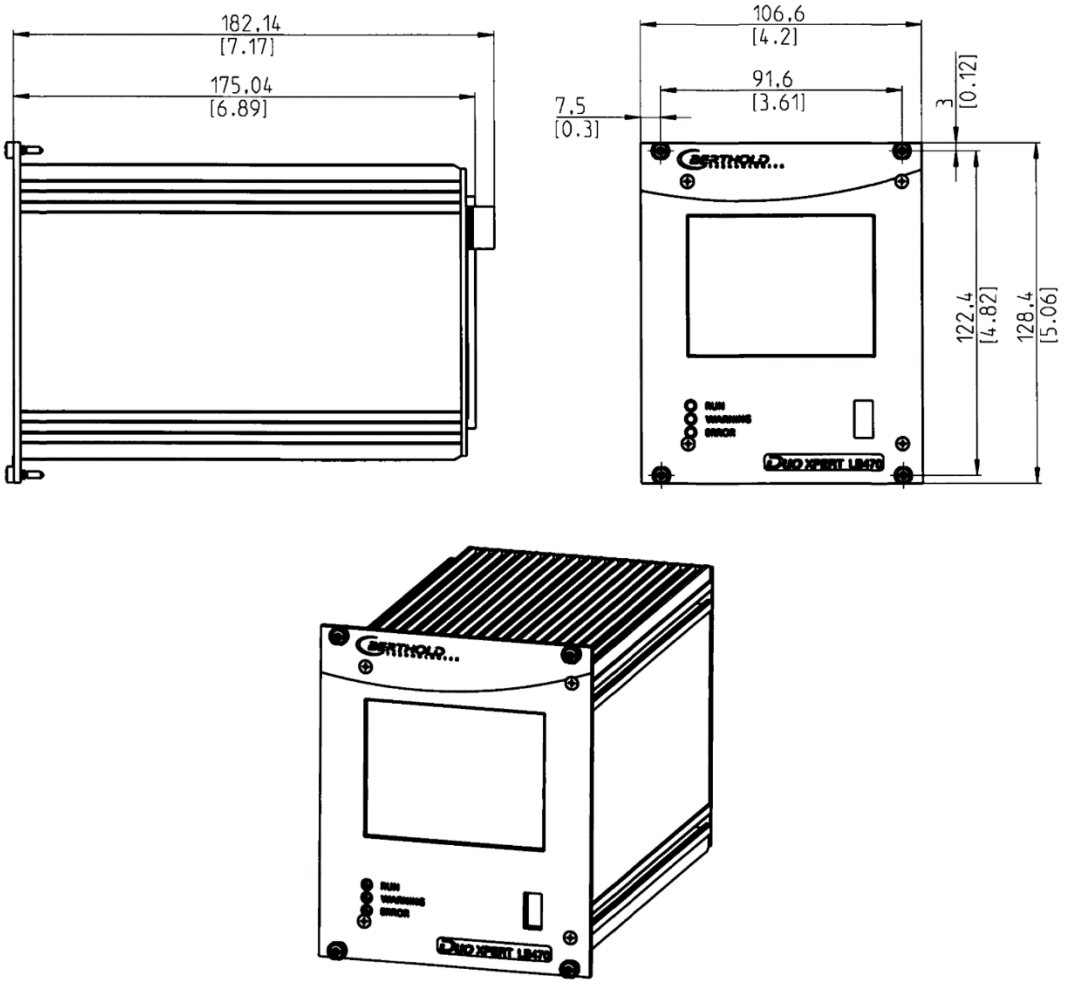
19" subrack
19" Baugruppenträger



Dimensions in mm
Abmessungen in mm

Technical Data *Technische Daten*	
Dimensions *Abmessungen*	3HE/84TE/5T, 482x132x172mm (WxHxD)
Max. Assembly *Max. Bestückung*	- 4 Master
Weight (with circuit board, without modules) *Gewicht (mit Anschlussplatine, ohne Module)*	1.4 kg
Weight terminal block *Gewicht Klemmenblock*	220 g
Operational temperature *Betriebstemperatur*	-20°C … +50°C, not condensing *nicht kondensierend*
Storage temperature *Lagerungstemperatur*	-30°C … +60°C
Degree of protection *Schutzklasse*	IP20

EVU
AWE



Dimensions in mm
Abmessungen in mm

Technical Data *Technische Daten*	
Dimensions *Abmessungen*	117/128/172mm (WxHxD)
Weight *Gewicht*	1200 g
Operational temperature *Betriebstemperatur*	-20°C … +50°C, not condensing. Avoid direct sunlight. Unobstructed air circulation must be provided to the subrack. *-20°C … +50°C nicht kondensierend. Direkte Sonneneinstrahlung ist zu vermeiden. Für eine ungehinderte Luftzirkulation um den Baugruppenträger ist zu sorgen.*
Storage temperature *Lagerungstemperatur*	-20°C … +85°C
Degree of protection *Schutzgrad*	IP20

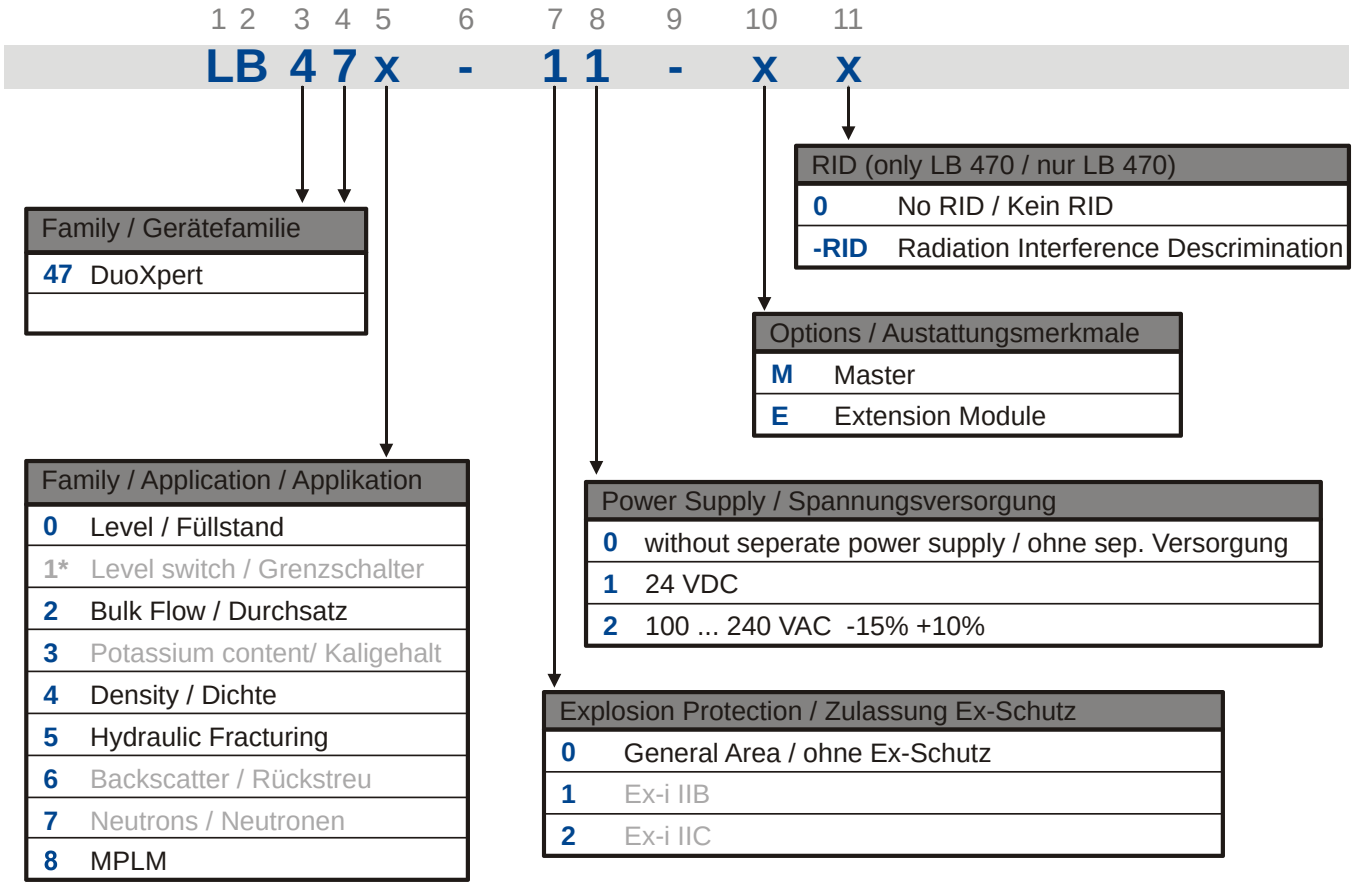
Connections *Anschlüsse*	- USB port for the connection to the USB storage medium - Master/slave connection (4-pin) and plug - RJ45 connection for Ethernet (on back wall) - 32-pin plug connector according to DIN 19465 Series C *- USB-Port zum Anschluss von USB-Speichermedium* *- Master/Slave Buchse (4-polig) und Stecker* *- RJ45-Buchse für Ethernet (an Rückwand)* *- 32 polige Stiftleiste nach DIN 19465 Baureihe C*
Display	- graphical LCD display - 320 x 240 points, 262,000 colours - Dimmable LED background lighting - Touch screen *- graphisches LCD-Display* *- 320 x 240 Punkte, 262.000 Farben* *- Dimmbare LED Hintergrundbeleuchtung* *- Touchscreen*
Computer core *Rechnerkern*	- Processor: Dual Core DSP/ARM Controller - clock frequency: 300 MHz internal (20 MHz external quartz) - ROM: 512 KByte - RAM: 64 MByte ext. SDRAM, 128 KByte int. shared RAM - FLASH: 8 MByte external serial *- Prozessor: Dual Core DSP/ARM Controller* *- Taktfrequenz: 300 MHz intern (20 MHz externer Quarz)* *- ROM: 512 KByte* *- RAM: 64 MByte ext. SDRAM, 128 KByte int. shared RAM* *- FLASH: 8 MByte extern seriell*

Power Supply *Stromversorgung*	
Voltage *Spannung*	100-240 V AC 50/60 Hz (wide range input) +/- 10% 21-32 V DC (24 V DC power input)
Power consumption *Leistungsaufnahme*	22 VA, 15 W
Fuses *Sicherungen*	Internal, 2 x 250 V, 1A delayed, 5x20 mm, 1500 A breaking capacity IEC 60127-2, 1x 250 V TR5 T80 mA (Ø 8,5 mm)

Interfaces *Schnittstellen*	
Current output *Stromausgang*	4-20mA internally switched from power source to sink current (according to NAMUR recommendation NE 006 and NE 043). Continuous short circuit proof and isolated (500 V). Internal resistance about 105 ohms max. Burden when operating as a power source: 850 ohm. Internal monitoring of the loop current and additional error signalling by hardware on detection of a fault condition. *4-20mA (nach Namur-Empfehlung NE 006 und NE 043) intern von Stromquelle auf Stromsenke umschaltbar.* *Dauerhaft kurzschlussfest und potentialgetrennt (500 V).* *Innenwiderstand ca. 105 Ohm max.* *Bürde bei Betrieb als Stromquelle: 850 Ohm.* *Interne Überwachung des Schleifenstroms und zusätzliche Fehlersignalisierung durch Hardware bei Erkennung eines Fehlerzustands.*
Current input *Stromeingang*	4-20 mA (according to NAMUR recommendation NE 006 and NE 043) switchable via software on frequency input, electrically isolated (500 V). Internal resistance approx. 300 ohm max. input voltage: 24 V DC *4-20 mA (nach Namur-Empfehlung NE 006 und NE 043) per Software umschaltbar auf Frequenzeingang, potentialgetrennt (500 V). Innenwiderstand ca. 300 Ohm max. Eingangsspannung: 24 V DC*
Impulse input *Impuls-eingang*	Frequency 0-100 kHz, Umax = 28 V, right angle signal form, low <1,5 V; high 4 – 28 V. Switchable to current input *Frequenz 0-100 kHz, Umax = 28 V,* *Rechteck-Signalform, Low <1,5V; High 4 – 28 V.* *Umschaltbar auf Stromeingang*
Digital outputs *Digitale Ausgänge*	3 relays, Umax = 33 V ACeff, 46 V DC; Imax = 1 A functions: Relay 1: SPDT for error signalling Relay 2: SPDT assignable by software Relay 3: SPST assignable by software *3 Relais, Umax = 33 V ACeff, 46V DC; Imax = 1 A* *Funktionen: Relais 1: SPDT zur Fehlersignalisierung* *Relais 2: SPDT über Software zuweisbar* *Relais 3: SPST über Software zuweisbar*
Digital inputs *Digitale Eingänge*	2 x together electrically isolated (500 V) Switch between DigIn and GND, Uoutmax approx. 24 V Function configurable via software *2 x gemeinsam potentialgetrennt (500 V),* *Schalter zwischen DigIn und GND, Uoutmax ca. 24 V* *Funktion über Software konfigurierbar*
External supply Externe ersorgung	Output voltage: 24 V DC Output current: max. 150 mA *Ausgangsspannung: 24 V DC* *Ausgangsstrom: max. 150 mA*
RS485	for master/master communication, and testing and evaluation purposes. not isolated from main electronics and USB port electrically isolated from remaining I/Os (500 V) *für Master/Master Kommunikation und Prüf-und Testzwecke. Nicht potentialgetrennt von Hauptelektronik und USB-Anschluss potentialgetrennt von restlichen I/Os (500 V)*

USB port	1 x USB 2.0 Type A (Host) via front plate to the connection of an ext. mouse, keyboard or storage medium Uout = 5 V, Ioutmax = 0.5 A *1 x USB 2.0 Typ A (Host) über Frontplatte zum Anschluss einer ext. Maus, Tastatur oder Speichermedium* *Uout = 5 V, Ioutmax = 0,5 A*
Ethernet	RJ45 connection via back wall, 10 Mbit, DHCP supported, max. 3 m *RJ45-Buchse über Rückwand, 10 Mbit,* *DHCP unterstützt, max. 3 m*

Number Key LB 47x
Nummernschlüssel LB 47x



* used by othe hardware

Declaration of Conformity
Konformitätserklärung

BERTHOLD TECHNOLOGIES GmbH & Co. KG
Calmbacher Straße 22
75323 Bad Wildbad, Germany
Phone +49 7081 177-0
Fax +49 7081 177-100
info@Berthold.com
www.Berthold.com

EG-Declaration of Conformity (ORIGINAL) File.No.: CE20028-2

We, hereby declare under our sole responsibility that the design of the following products / systems / units / machines brought into circulation by us comply with the relevant harmonized rules of the EU.

This declaration loses its validity should modifications or unsuitable and improper use take place without our authorisation.

Product name: ***radiomatric evaluation system DuoXpert***

Type / model: ***LB 47x***

	directive	**applied standards**	
LVD	2014/35/EU	EN 61010-1	2010
RoHS	2011/65/EG		
EMC	2014/30/EU	EN 61326-1	2013
		EN 61000-4-2	
		EN 61000-4-3	
		EN 61000-4-4	
		EN 61000-4-5	
		EN 61000-4-6	
		EN 61000-4-11	
		EN 61000-3-2	
		Namur NE21	2012

This declaration is issued by the manufacturer

BERTHOLD TECHNOLOGIES GmbH & Co. KG
Calmbacher Str. 22, D-75323 Bad Wildbad, Germany

released by

Dr. Jürgen Briggmann

Head of R&D
Bad Wildbad, 1st of September, 2015

Registergericht / Court of Registration: Stuttgart HRA 330991
Persönlich haftende Gesellschafterin / Fully liable Associates: BERTHOLD TECHNOLOGIES Verwaltungs-GmbH
Registergericht / Court of Registration: Stuttgart HRB 331520
Geschäftsführung / Management: Horst Knauff, Dr. Dirk Mörmann
USt.-Id-Nr. / VAT Reg. No.: DE813050511
Deutsche Steuernummer / German Tax No.: 49038/08038
WEEE-Reg. No.: DE99468690

Sparkasse PF-CW	75323 Bad Wildbad	Konto/Account No. 8 045 003 (BLZ 666 500 85)	SWIFT-BIC PZHSDE66	IBAN: DE37 6665 0085 0008 0450 03
Volksbank	75119 Pforzheim	Konto/Account No. 957 004 (BLZ 666 900 00)	SWIFT-BIC VBPFDE66	IBAN: DE85 6669 0000 0000 9570 04
Commerzbank	75105 Pforzheim	Konto/Account No. 6 511 120 (BLZ 666 800 13)	SWIFT-BIC DRES DEFF 666	IBAN: DE05 6668 0013 0651 1120 00

BERTHOLD TECHNOLOGIES GmbH & Co. KG
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75323 Bad Wildbad, Germany
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Fax +49 7081 177-100
info@Berthold.com
www.Berthold.com

EG-Konformitätserklärung (ORIGINAL)

Dok.Nr.: CE20028-1

Hiermit erklären wir in alleiniger Verantwortung, dass die Bauart des(r) nachfolgend bezeichneten Geräte / Systems / Anlage / Maschine in der von uns in den Verkehr gebrachten Ausführung den unten genannten einschlägigen Harmonisierungsvorschriften der EU entsprechen.

Durch nicht mit uns abgestimmte Änderungen oder nicht bestimmungsgemäßen Gebrauch verliert diese Erklärung ihre Gültigkeit.

Produktbezeichnung: ***radiometrisches Auswertesystem DuoXpert***

Typenbezeichnung / Modell: ***LB 47x***

	Richtlinie (Fundstelle)	**angewendete Normen und weitere Spezifikationen**	
NSR	2014/35/EU	EN 61010-1	2010
RoHS	2011/65/EG		
EMV	2014/30/EU	EN 61326-1	2013
		EN 61000-4-2	
		EN 61000-4-3	
		EN 61000-4-4	
		EN 61000-4-5	
		EN 61000-4-6	
		EN 61000-4-11	
		EN 61000-3-2	
		Namur NE21	2012

Diese Erklärung wird verantwortlich für den Hersteller

BERTHOLD TECHNOLOGIES GmbH & Co. KG
Calmbacher Str. 22, D-75323 Bad Wildbad

abgegeben durch

Dr. Jürgen Briggmann

Leiter Entwicklung
Bad Wildbad, den 1. September 2015

Registergericht / Court of Registration: Stuttgart HRA 330991
Persönlich haftende Gesellschafterin / Fully liable Associates: BERTHOLD TECHNOLOGIES Verwaltungs-GmbH
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Geschäftsführung / Management: Horst Knauff, Dr. Dirk Mörmann
USt.-Id-Nr. / VAT Reg. No.: DE813050511
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WEEE-Reg. No.: DE99468690

Sparkasse PF-CW	75323 Bad Wildbad	Konto/Account No. 8 045 003 (BLZ 666 500 85)	SWIFT-BIC PZHSDE66	IBAN: DE37 6665 0085 0008 0450 03
Volksbank	75119 Pforzheim	Konto/Account No. 957 004 (BLZ 666 900 00)	SWIFT-BIC VBPFDE66	IBAN: DE85 6669 0000 0000 9570 04
Commerzbank	75105 Pforzheim	Konto/Account No. 6 511 120 (BLZ 666 800 13)	SWIFT-BIC DRES DEFF 666	IBAN: DE05 6668 0013 0651 1120 00

Certificates
Zertifikate

NRTL certification US/CAN wall-mounted housing
NTRL Zertifikat US/CAN Wandgehäuse

Nemko

Certificate of Compliance

Nemko-CCL, Inc.

Certificate: NA201610530 **Date Issued:** January 20, 2016

Project: 257087-7.1

Issued to: Berthold Technologies GmbH & Co. KG
Calmbacher Straße 22
75323 Bad Wildbad
Germany

The products listed below have been certified as being compliant with all applicable requirements of the specifications listed and are eligible to bear the following certification mark

c Nemko US

Issued by: Robert Keller, Senior Engineer/Safety Supervisor

Authorized by: Thomas Jackson, Certification Manager

PRODUCTS

MEASUREMENT, CONTROL, OR LABORATORY EQUIPMENT – Certified to US and Canada Standards

Product: Process measurement unit
Model: Wall-mounted LB 47x, 1M/3S; Wall-mounted LB 47x, 2M (x can be 0 to 8 and describes different software versions for the master and slave modules not affecting safety).
Ratings: Wall-mounted LB 47x, 1M/3S: 40VA 100-240V, 50/60Hz, Class I; Wall-mounted LB 47x, 2M: 44VA 100-240V, 50/60Hz, Class I

The certification system, as described in ISO/IEC Guide 67 (Conformity Assessment – Fundamentals of Product Certification), most closely resembles System 3

Nemko-CCL, Inc. 1940 West Alexander Street Salt Lake City, Utah 84119-2039 Tel (801) 972-6146 Fax (801) 972-8432

NFCC-002 Issue 2 May 2014 Page 1 of 3

NRTL certification US/CAN wall-mounted housing (continued)
NTRL Zertifikat US/CAN Wandgehäuse (Fortsetzung)

APPLICABLE REQUIREMENTS

UL Std. No. 61010-1 2nd Edition - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements

CAN/CSA-C22.2 No. 61010-1-04 Second Edition - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements

This certificate is issued on condition that the holder complies and will continue to comply with the requirements of the above mentioned specifications and pursuant to the terms and conditions specified in the Certification Agreement.

The certification system, as described in ISO/IEC Guide 67 (Conformity Assessment – Fundamentals of Product Certification), most closely resembles System 3

Nemko-CCL, Inc. 1940 West Alexander Street Salt Lake City, Utah 84119-2039 Tel (801) 972-6146 Fax (801) 972-8432

NFCC-002 Issue 2 May 2014 Page 2 of 3

1

NRTL certification US/CAN wall-mounted housing (continued)
NTRL Zertifikat US/CAN Wandgehäuse (Fortsetzung)

Supplement to Certificate of Compliance

Certificate: **NA201610530** **Project:** **257087-7.1**

Nemko-CCL grants a license to the applicant to apply the Certification Mark to the certified products and that the mark shall only be affixed at the following factory locations

Factory Information

Factory Name	Location
Berthold Technologies GmbH & Co. KG	Calmbacher Straße 22 75323 Bad Wildbad Germany

The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.

Product Certification History

Project	Date	Description
257087-7.1	January 20, 2016	**Original Certification:** **Model:** Wall-mounted LB 47x, 1M/3S; Wall-mounted LB 47x, 2M (x can be 0 to 8 and describes different software versions for the master and slave modules not affecting safety). **Ratings:** Wall-mounted LB 47x, 1M/3S: 40VA 100-240V, 50/60Hz, Class I; Wall-mounted LB 47x, 2M: 44VA 100-240V, 50/60Hz, Class I

This Supplement forms an integral part of the Certificate of Compliance

The certification system, as described in ISO/IEC Guide 67 (Conformity Assessment – Fundamentals of Product Certification), most closely resembles System 3

Nemko-CCL, Inc. 1940 West Alexander Street Salt Lake City, Utah 84119-2039 Tel (801) 972-6146 Fax (801) 972-8432

NFCC-002 Issue 2 May 2014 Page 3 of 3

NRTL certification US/CAN DuoXpert LB 47x
NTRL Zertifikat US/CAN DuoXpert LB 47x

Nemko

Certificate of Compliance

Nemko-CCL, Inc.

Certificate: NA201510498 **Date Issued:** September 17, 2015

Project: 235982-14.1

Issued to: Berthold Technologies GmbH & Co. KG
Calmbacher Straße 22
75323 Bad Wildbad
Germany

The products listed below have been certified as being compliant with all applicable requirements of the specifications listed and are eligible to bear the following certification mark

c Nemko US

Issued by: Robert Keller, Senior Engineer/Safety Supervisor

Authorized by: Thomas Jackson, Certification Manager

PRODUCTS

MEASUREMENT, CONTROL, OR LABORATORY EQUIPMENT – Certified to US and Canada Standards

Product: Process measurement unit for building-in
Model: DuoXpert LB47x-02-M; DuoXpert LB47x-02-S (x can be 0 to 8 and describes different software versions for the master and slave modules not affecting safety)
Ratings: LB47x-02-M: 100-240V AC 22VA 50/60Hz; LB47x-02-S: 100-240V AC 6VA 50/60Hz

APPLICABLE REQUIREMENTS

UL Std. No. 61010-1 3rd Edition - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements

CAN/CSA-C22.2 No. 61010-1-12 Third Edition – Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements

This certificate is issued on condition that the holder complies and will continue to comply with the requirements of the above mentioned specifications and pursuant to the terms and conditions specified in the Certification Agreement.

The certification system, as described in ISO/IEC Guide 67 (Conformity Assessment – Fundamentals of Product Certification), most closely resembles System 3

Nemko-CCL, Inc. 1940 West Alexander Street Salt Lake City, Utah 84119-2039 Tel (801) 972-6146 Fax (801) 972-8432

NFCC-002 Issue 2 May 2014 Page 1 of 2

NRTL certification US/CAN DuoXpert LB 47x (continued)
NTRL Zertifikat US/CAN DuoXpert LB 47x (Fortsetzung)

Supplement to Certificate of Compliance

Certificate: **NA201510498** **Project:** **235982-14.1**

Nemko-CCL grants a license to the applicant to apply the Certification Mark to the certified products and that the mark shall only be affixed at the following factory locations

Factory Information

Factory Name	Location
Berthold Technologies GmbH & Co. KG	Calmbacher Straße 22 75323 Bad Wildbad Germany

The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.

Product Certification History

Project	Date	Description
235982-14.1	September 17, 2015	**Original Certification:** **Model:** DuoXpert LB47x-02-M; DuoXpert LB47x-02-S (x can be 0 to 8 and describes different software versions for the master and slave modules not affecting safety) **Ratings:** LB47x-02-M: 100-240V AC 22VA 50/60Hz; LB47x-02-S: 100-240V AC 6VA 50/60Hz

This Supplement forms an integral part of the Certificate of Compliance

The certification system, as described in ISO/IEC Guide 67 (Conformity Assessment – Fundamentals of Product Certification), most closely resembles System 3

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Parts overview
Übersicht Zubehör

ID. No. *Id. Nr.*	Description *Beschreibung*
68867	LB 478-01-M MPLMTransmitter (Master, 24 VDC) *LB 478-01-M MPLM-Messgerät (Master, 24 VDC)*
68866	LB 478-02-M MPLM Transmitter (Master, 100...240 VAC) *LB 478-02-M MPLM-Messgerät (Master, 100...240 VAC)*
68869	LB 478-01-E Transmitter (Extension, 24 VDC) *LB 478-02-E Messgerät (Erweiterung, 100...240 VAC)*
68868	LB 47x-02-E Transmitter (Extension, 100...240 VAC) *LB 47x-02-E -Messgerät (Erweiterung, 100...240 VAC)*
56925-8BA1	Operating manual DuoSeries LB 478 MPLM, German *Betriebsanleitung DuoSeries LB 478 MPLM, Deutsch*
56925-8BA2	Operating manual DuoSeries LB 478 MPLM, English *Betriebsanleitung DuoSeries LB 478 MPLM, Englisch*
64607	19" rack, 84 HP / 3 RU for use with terminal blocks *19"-Baugruppenträger für den Einsatz mit Klemmblöcken*
59477	Terminal block for LB 47x, Master *Klemmenblock für LB 47x, Master*
37526	Front Cover Plate 21 HP / 3 RU *Blindplatte 21TE / 3 HE*

Modifications due to technical advancement reserved.
Änderungen im Zuge technischer Weiterentwicklung vorbehalten.