Evaluation Unit

DUO XPERT LB 472 Bulk Flow

Operating Manual
56925-2BA2

Rev. No.: 03, 01/2020
Embedded software version as of vers. 1.4.0 (CU and MU)

BERTHOLD TECHNOLOGIES GmbH & Co. KG
Calmbacher Str. 22
75323 Bad Wildbad, Germany
www.berthold.com

Telephone +49 7081 177-0
Fax +49 7081 177-100
industry@berthold.com

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1 About this Operating Manual

1.1 Applicable Documents

This manual contains the following document:

- Informations sur la sécurité, 56925BA59 (see appendix)
- Technical Information, 56925TI1B (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
- Install the extension module (optional)
- 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
▶ 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.

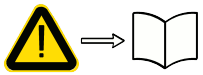
IMPORTANT

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 the document “Technical Information” in the appendix.

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 472 (EVU) measures the flow rate 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

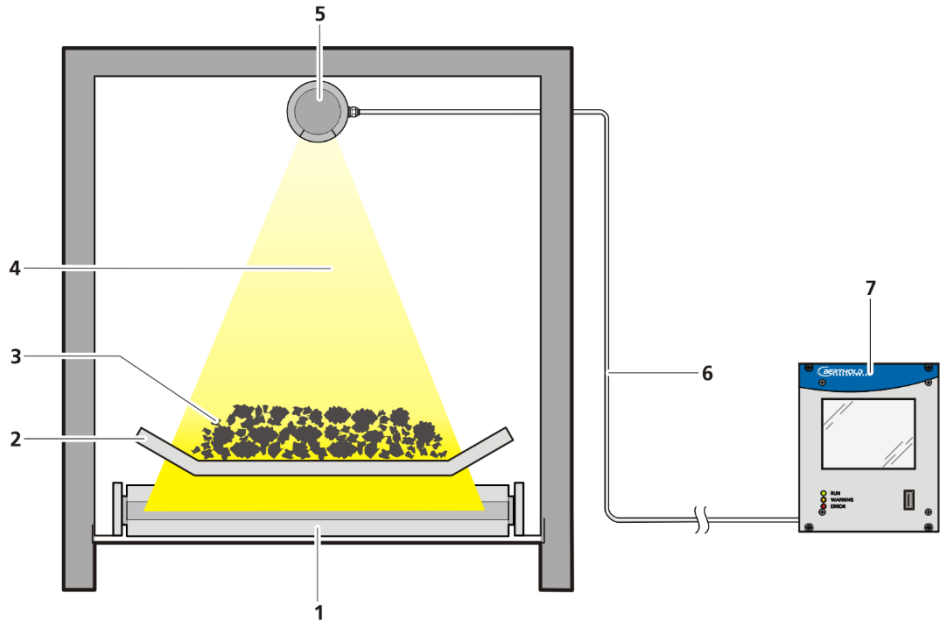
The radiometric bulk flow measurement LB 472 provides the opportunity of contactless measurement of flow rates on conveyor belts, screw conveyors and chain conveyors and in free fall.

A complete measuring system consists of the following components:

- Evaluation unit DuoXpert LB 472
- Source
- Shieldings
- Point detector(s) / rod detector

These instructions concern the operation of the evaluation unit DuoXpert LB 472 (Fig. 1, item 7). The operation of other system components is part of the independent instructions of the respective system components.

The EVUs are standard equipment in switch rooms with 19" subracks, switchboards or wall housings.



1 Rod source shielding
2 Conveyor belt
3 Bulk material
4 Radiation beam
5 Point detector
6 Measuring line (2 wire)
7 Master EVU

Fig. 1 Example measurement arrangement

The radiometric bulk flow measurement LB472 can measure the flow rate

- on conveyor belts
- on screw conveyors
- on chain conveyors
- on trough chain conveyors
- in free fall

Special equipment configurations and allocations make it possible to adapt the radiometric flow rate measurement to the local conditions and the requirements of the product to be measured.

Equipment configurations (operating modes)

- Measurement at constant belt speed
- Measurement with speedometer

Measurement value unit

- Flow rate
- Flow volume

Selection of measurement mode

- continuous measurement
- discontinuous measurement

Measurement value output

- Live display on the LCD of flow rate and flow volume
- Current output 0/4 - 20 mA for flow rate
- Pulse output for flow volume

3.2 Measuring Principle

The measuring system LB 472 uses the radiometric measuring method where the absorption of gamma radiation by the goods to be measured is exploited.

The measuring effect produced is the ratio of unweakened radiation and the radiation weakened by the goods to be measured. The radiation impinging on the detector (scintillation counter) provides a measure for the mass of the product to be measured.

In order to achieve an optimum measuring effect with minimal source activity, we determine the most favourable measurement geometry for the individual measuring point and the arrangement of the radioactive source is adapted to suit.

The intensity of the radiation depends on the height and density of the material. If the mass per unit area is multiplied by the occupation width we get the mass on a metre of the flow organ. Multiplication by the speed gives the desired result mass per unit time, e.g. in tonnes/hour.

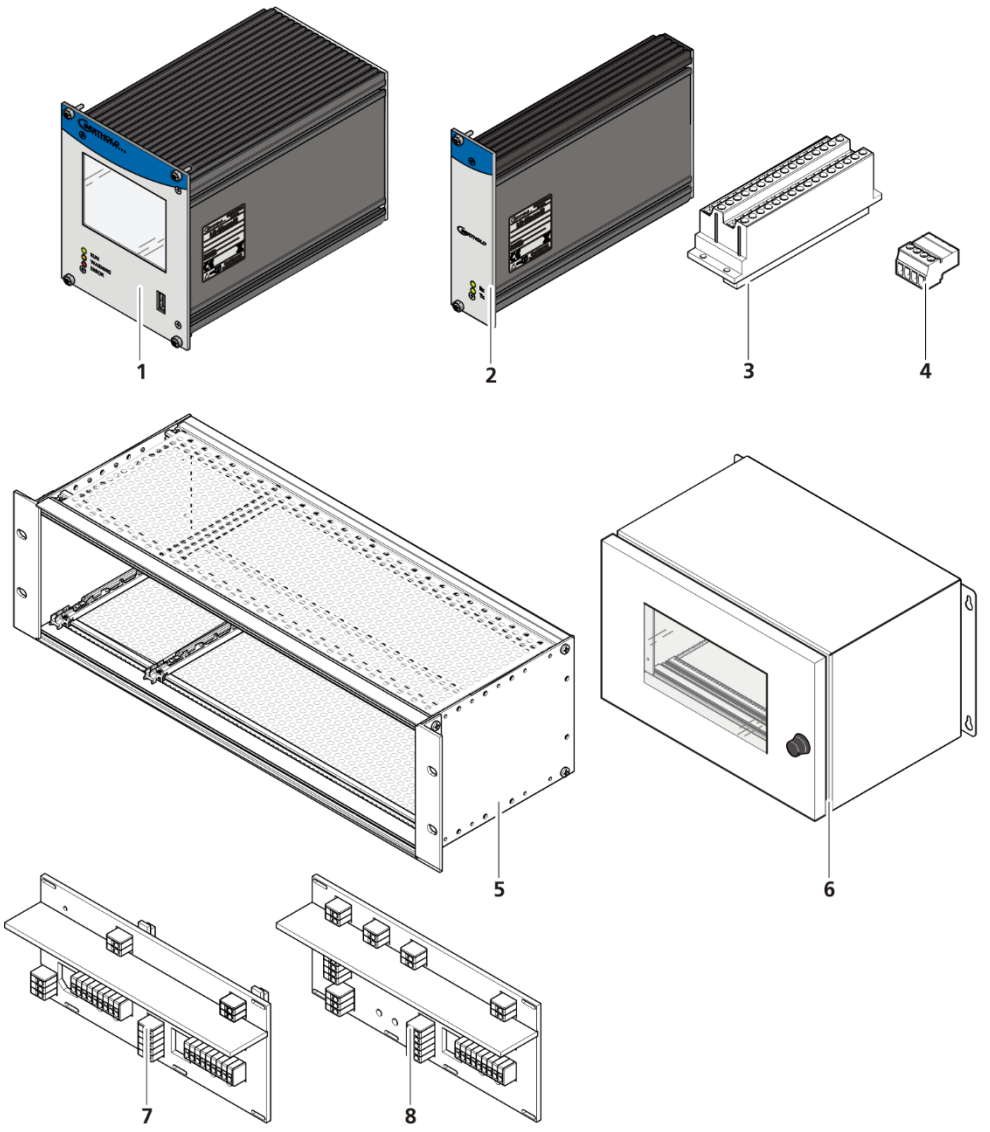
The evaluation DuoXpert LB 472 (master EVU) is used for the evaluation, transmission and visualisation of measured values which it receives from the connected detectors.

The EVU is an independent measurement channel. If several measurement channels are required, an independent EVU must be used for each channel.

Tip

Further information on the functional principle of the detectors and radiation source screening can be found in the associated operating manual.

3.3 System Components



1 Master-EVU with wide range supply (100-240 VAC, 50/60 Hz)
Alternatively: Master-EVU with 24V supply (18-32 VDC)
2 Slave module with wide range power supply (optional)
Alternatively: Slave module with 24V supply (optional)
3 Clamp block for electrical connections (optional)
only for installation in subrack)
4 Master/Slave connector
5 19" subrack (optional)
6 Wall housing (optional)
7 Master-master connection board with cover
8 Master-slave connection board with cover

Fig. 2 System components

3.3.1 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 (Fig. 3) the EVU or in the menu "Device information" (Chapt. 7.1.2).

In this operating manual we describe the software from Version 1.4.0 (Control Unit / CU) and 1.4.0 (Measurement Unit / MU).

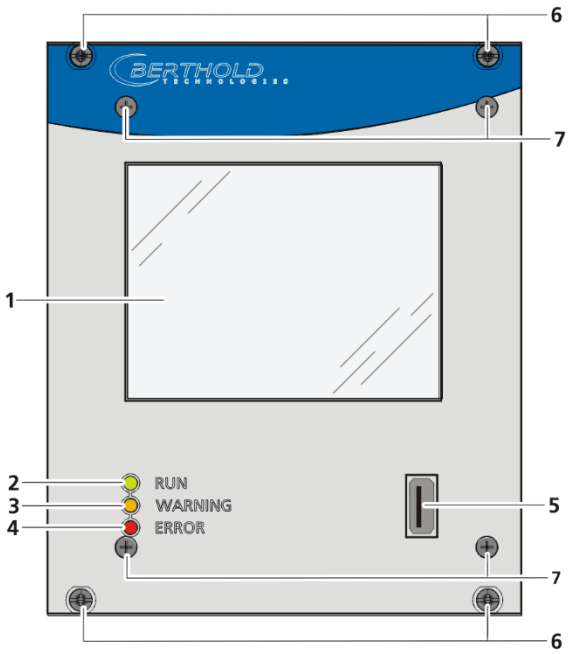
Fig. 3 View when starting up the EVU

3.3.2 Front/rear view master EVU

Front view master EVU

The following display and control elements are found on the front of the master EVU (transmitter):

- 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. 4 Back view of the master EVU

Display/Touch-Screen Operation

The EVU is operated using the Touch-Screen. As an alternative, the EVU can be connected to the USB connection with a mouse. The mouse pointer automatically becomes visible when a mouse is inserted into the USB port. The device can also be operated using a CE Remote (see Chap. 7.3.1).

NOTICE

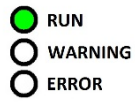
Damage to the Touch-Screen

Pointed and sharp objects can cause damage to the plastic surface of the Touch-Screen.

- Operate the Touch-Screen only using your finger or a Touch-Stylus or connect a mouse to the EVU.

Status displays of the master EVU

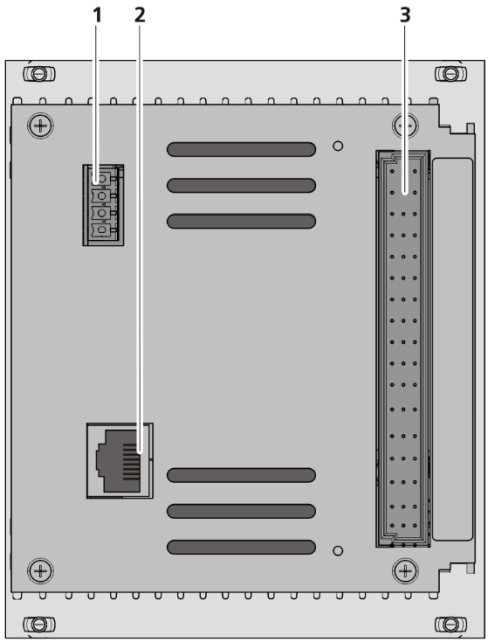
The LEDs (fig.1, items 2-4) below the touch display show the current operating status of the master EVU.

Display LED	Description
	**RUN** This LED lights up green if the device is in operation and fault-free.
	**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 8.
	**ERROR** This LED lights up red if a system event of the type "ERROR" is present. The current measurement is retained. Check the device settings. All system events are described in chapter 8
	**RUN / WARNING / ERROR flashing** All three LEDS flash during the system test which is performed as part of the start up process.

Rear view master 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



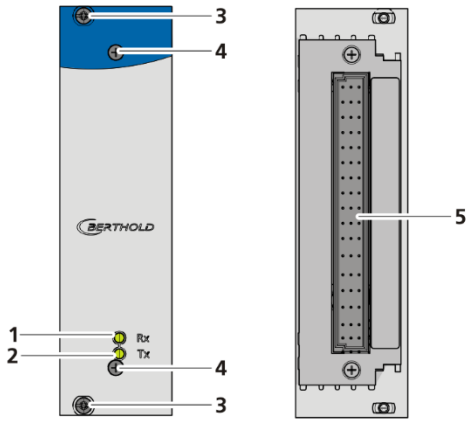
1 Master/slave 4-pin connector
2 RJ45 socket for Ethernet
3 32-pin plug connector

Fig. 5 Rear view Master EVU

3.3.1 Front/rear view slave module

The 32-pin plug connector is found on the back of the Slave Module. The "Rx" and "Tx" LEDs are on the front.

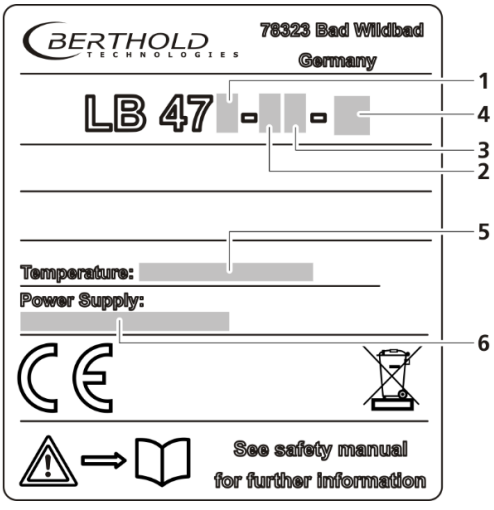
- The LED Rx flashes green when data is received.
- The LED Tx flashes green when data is sent.



1 LED Rx
2 LED Tx
3 Mounting screws
4 Screws front plate
5 32-pin plug connector

Fig. 6 Front/rear view slave module

3.3.2 Type plate



1 Application (2 = bulk flow)
2 Approval explosion protection (0 = no explosion approval)
3 Power supply (1 = 24 VDC; 2 = 100...240 VAC-10+10%)
4 Master (M) or slave (S)
5 permissible temperature range for operation (ambient temperature)
6 Power specifications

Fig. 7 Type plate

3.4 Measurement arrangements

A measurement arrangement must be realised in order to be able to assess continuously a specific measuring range, where the radioactive source and the detector form an optimum geometry for the detection of the goods to be measured.

The arrangement used depends on the feeder line. In addition, structural conditions and customer-specific requirements can have an influence on it. The relevant determinations are carried out at the project stage and must be particularly observed later in the installation and the commissioning for each measuring point.

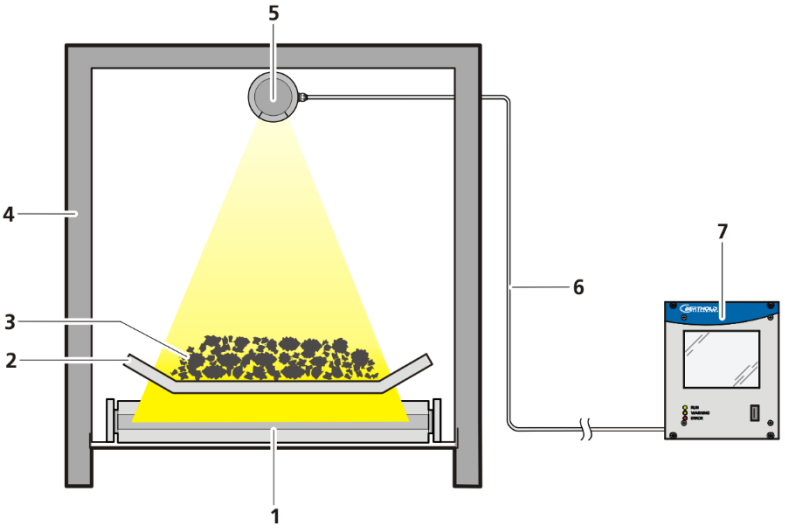
The measuring arrangement for the radiometric bulk flow measurement generally consists of the following components:

- radioactive source in a:
  - Shielding container with holding facility for the detector (measuring bracket with shielding container or holding device with shielding for free fall measurement)
- Detector
  - Cooling casing for detector (option)
- Transmitter LB 472
- 2-core cable
- Tachometer (option)

The power supply for the detector and the serial measuring signal from the detector is transferred via the 2-core cable between the detector and the transmitter.

Measurement set-up on the conveyor belt

Fig. 8 Shows a principle arrangement on a conveyor belt, and this applies in a similar way for screw conveyors and chain conveyors.



1	Shielding	5	Detector
2	Conveyor belt	6	Measurement line
3	Bulk material	7	EVU
4	Measurement bracket		

Fig. 8 Principle arrangement Conveyor belt

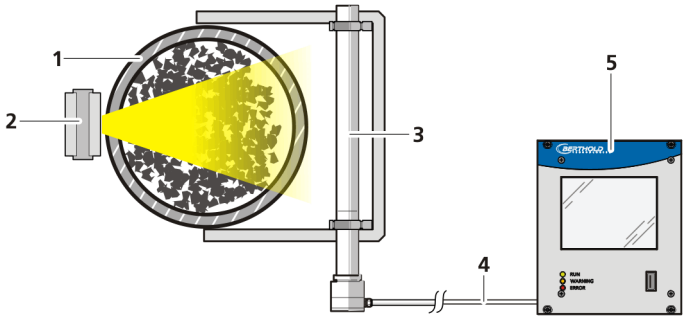
NOTICE

The measuring bracket should be installed as close as possible to a roller on the conveyor belt so that sagging of the conveyor belt cannot influence the measurement result.

On conveyor belts having thick reinforcements, the measuring bracket should be installed diagonally (e.g. 6°) in order to prevent severe effects caused by absorption fluctuations.

Measurement set-up for free fall measurement

A clamping facility is used to mount the radioactive source (source) with its shielding on one side of the fall pipe and the detector on the opposite side.



1 Pipe
2 Shielding
3 Detector
4 Measurement line
5 EVU

Fig. 9 Principle arrangement free fall measurement

IMPORTANT

Further measuring arrangements are shown in the document "Technical Information" (see appendix).

3.5 Storage

Store the devices in a dry area (no dew), in the dark (no direct sunlight) in a clean locked room. Bear in mind the permissible temperature range when storing.

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 variants

See document “Technical Information” in the appendix.

4.4 Mounting the wall housing

Observe the permitted ambient conditions (refer to document "Technical Information" in the appendix).

NOTICE

It is recommended that the wall housing be protected from direct sunlight in order to maintain maximum ambient temperature (refer to “Technical Information”).

The wall housing must not be walked on, used as a climbing aid or otherwise used for other purposes (storage, attachment point).

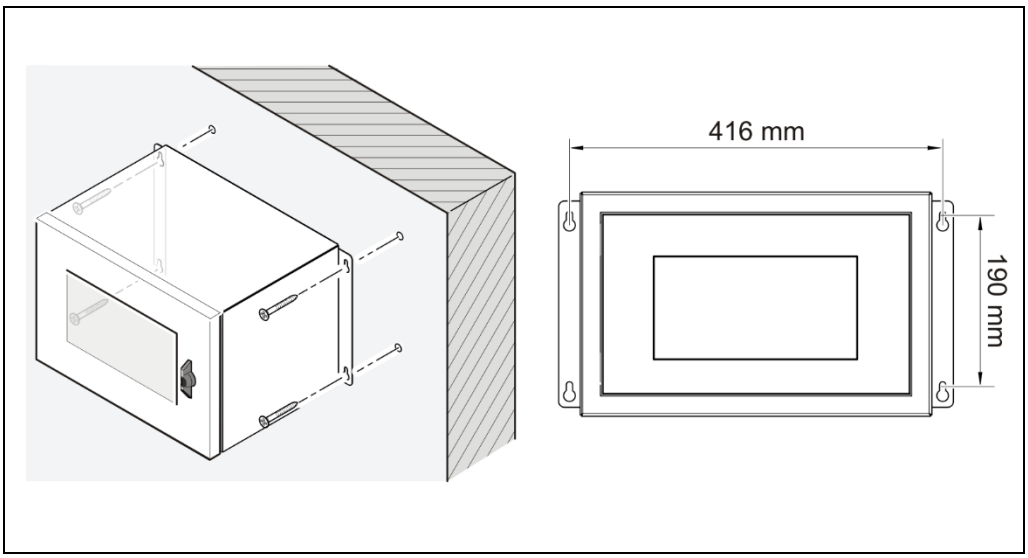


Fig. 10 Mounting the wall housing

1. Mount the wall housing horizontally, in user-friendly height.
2. Prepare the holes.
3. Use sufficient sized mounting material.
4. For the total weight of the wall housing, use adequately sized mounting hardware.
5. Screw the housing securely to the wall.

IMPORTANT

Make sure that only authorized personnel can open the wall housing.

- ▶ Keep the key of the wall housing in a place where only authorized persons have access.

- ▶ The wall housing is installed correctly.

4.5 Installation in the wall housing

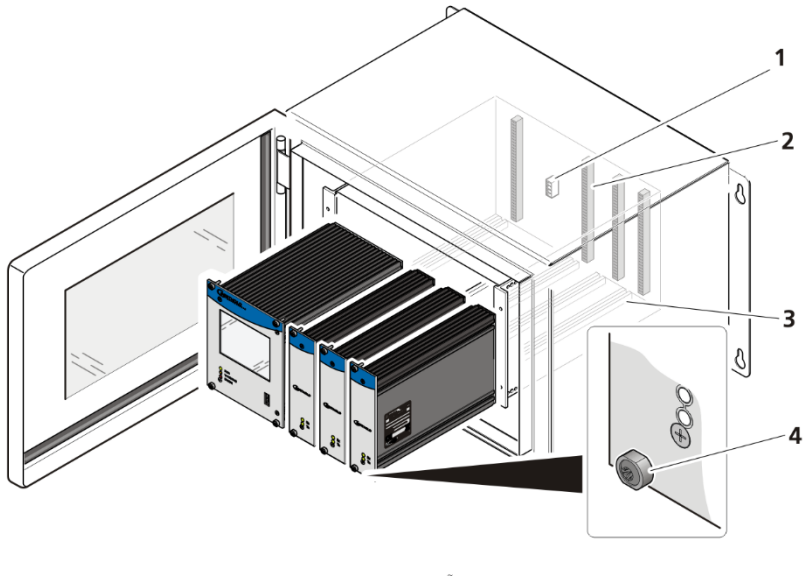
The wall housing may be equipped differently, depending on requirements (refer to document “Technical Information”). To do this, a corresponding terminal panel is located in the wall housing.

NOTICE

The master EVUs / slave modules must be secured against pulling out by fixing screws (Fig. 11, item 4).

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

Installation of the modules (master-slave)



1 **Master-slave connector**
2 **Socket board**
3 **Guide rails**
4 **Fixing screws**

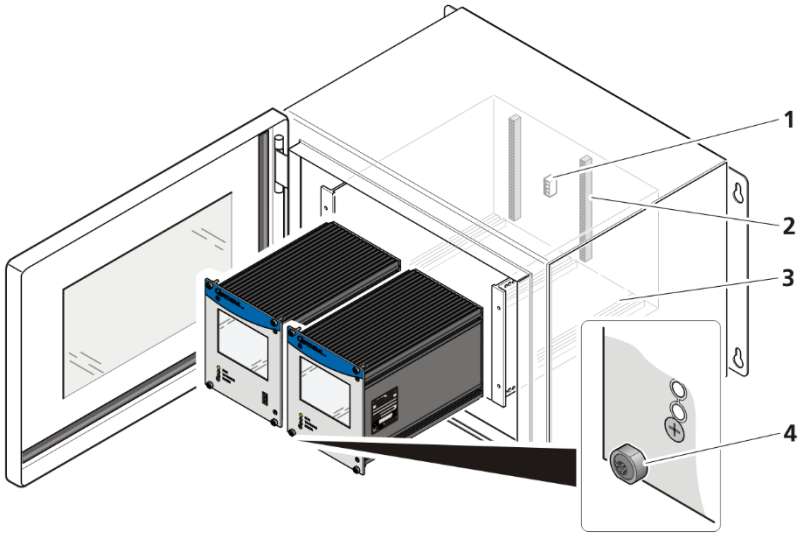
Fig. 11 Installation of the modules (Example: 1 master, 3 slave)

1. Set modules into the guide rails and push it gently until the plug connector of the module (Fig. 11, item 2) is inserted into the socket board.
2. Tighten all fixing screws (Fig. 11, item 4).

▶ The modules are installed correctly.

3. Unused slots must be covered with dummy panels.

Installation of the modules (master-master)



1 **Master-slave connector**
2 **Socket board**
3 **Guide rails**
4 **Fixing screws**

Fig. 12 Installation of the modules (master-master)

1. Set modules into the guide rails and push it gently until the plug connector of the module (Fig. 12, item 2) is inserted into the socket board.
2. Tighten all fixing screws (Fig. 12, item 4).

▶ The modules are installed correctly.

4.6 Installation in the 19" subrack

The 19" subrack can be equipped differently, depending on requirements (see chap. 4.3). The rear clamp blocks or terminal panels 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 (Fig. 14, item 4) 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

Installation with clamp blocks

⚠ DANGER

Danger to life from electric shock!

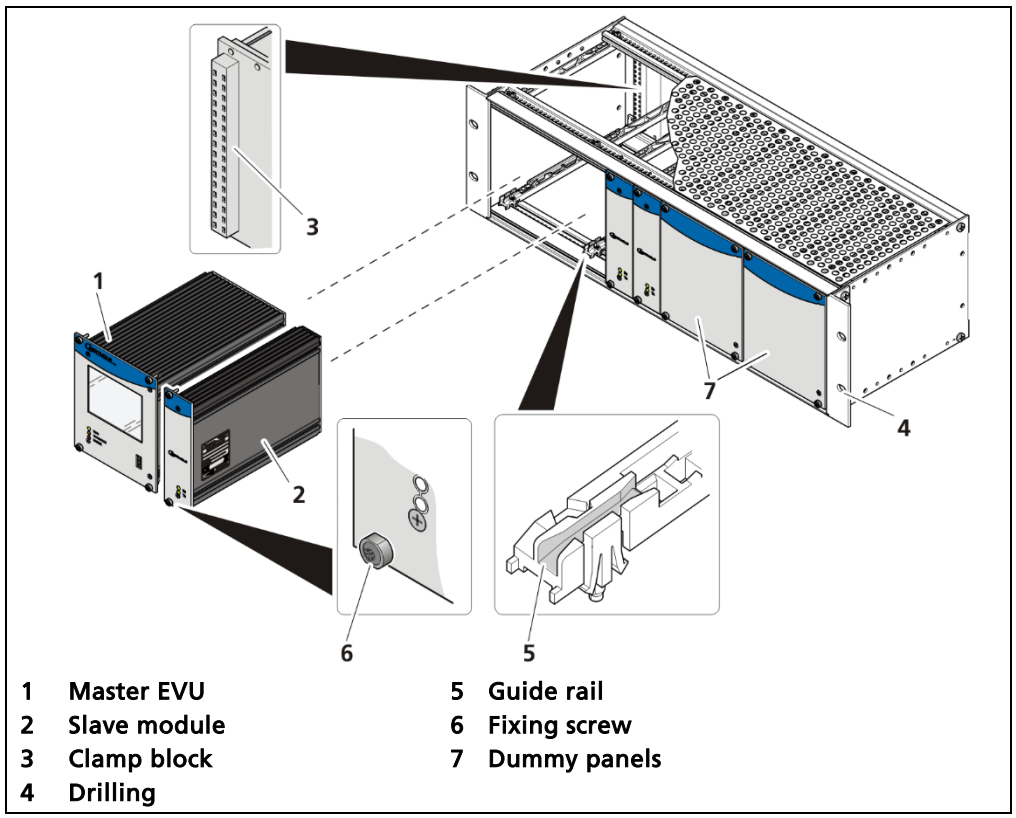
- Installation/maintenance may only be carried out if the device has been de-energised.
- If the front is open, make sure that the device is not live.

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

NOTICE

The Master EVUs / Slave modules must be secured by fixing screws (Fig. 13, item 6).

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



1	Master EVU	5	Guide rail
2	Slave module	6	Fixing screw
3	Clamp block	7	Dummy panels
4	Drilling		

Fig. 13 19" subrack with clamp blocks (Ex: 1x Master, 3x Slave)

1. Set master EVU / slave module (Fig. 13, item 1, item 2) in the guide rails (Fig. Fig. 13, item 5).
2. Carefully slide module into the subrack until the plug connector is inserted into the clamp block.
3. Tighten fixing screws (Fig. 13, item 6).

- The EVU is correctly inserted and can be connected.

4. Unused slots must be covered with dummy panels.

Installed with terminal panels

⚠ DANGER

Danger to life from electric shock!

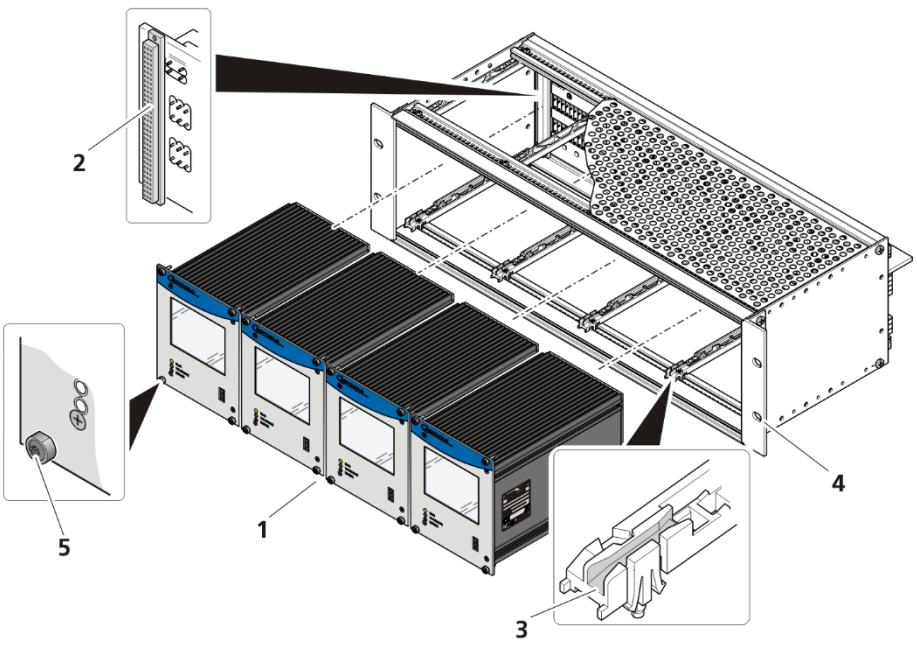
- Installation/maintenance may only be carried out if the device has been de-energised.
- Test of absence of harmful voltages when the front side is open.

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

NOTICE

The master's EVUs / slave modules must be secured against pulling out by fixing screws (Fig. 14, item 5).

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



1	**Modules (2 Master EVUs)**	4	**Drilling**
2	**Socket board terminal panel**	5	**Fixing screws**
3	**Guide rails**		

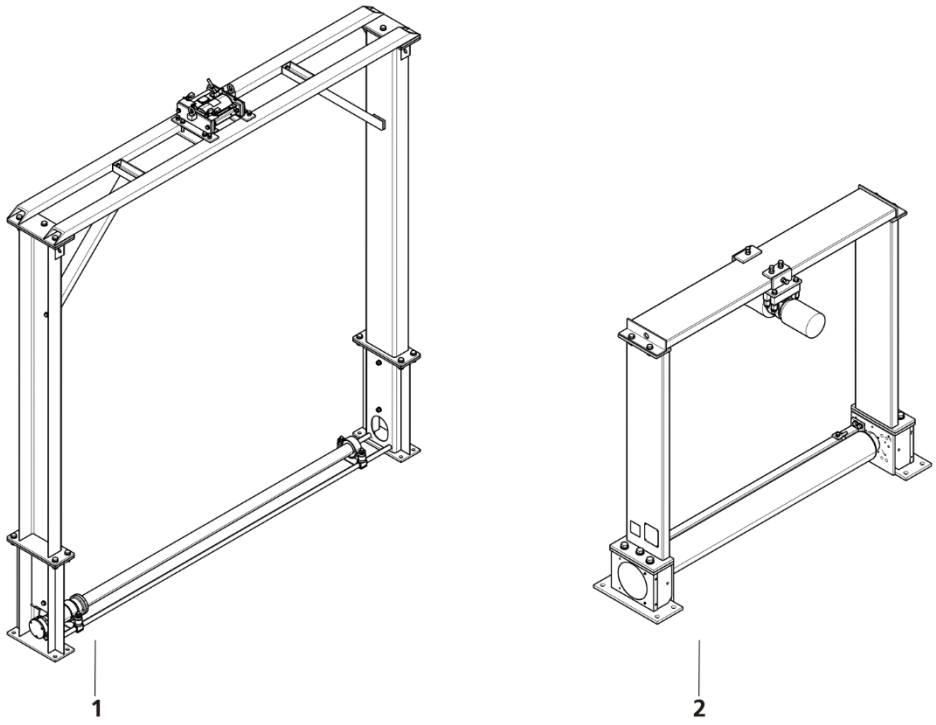
Fig. 14 19" subrack with connection boards (Ex.: 4x Master)

1. Insert the module (Fig. 14, item 1) into the guide rails (Fig. 14, item 4).
2. Slide the module carefully into the wall housing until the pin rail on the module is inserted in the socket rail (Fig. 14, item 2).
3. Tighten all the locking screws (Fig. 14, item 5).

- The EVU is correctly inserted and can be connected.

4.7 Measuring frame

Various measuring frames are available for the installation of detectors and shields. For the detailed description of the measuring frame and the associated dimension drawings, refer to the document “Technical Information” in the appendix.



1 **Variant Point source shield – Rod detector**
2 **Variant Rod source shield – Point detector**

Fig. 15 Measuring frames

IMPORTANT

The usage of the point source shield is described in the respective operating manual of the shield.

4.7.1 Usage rod source shield

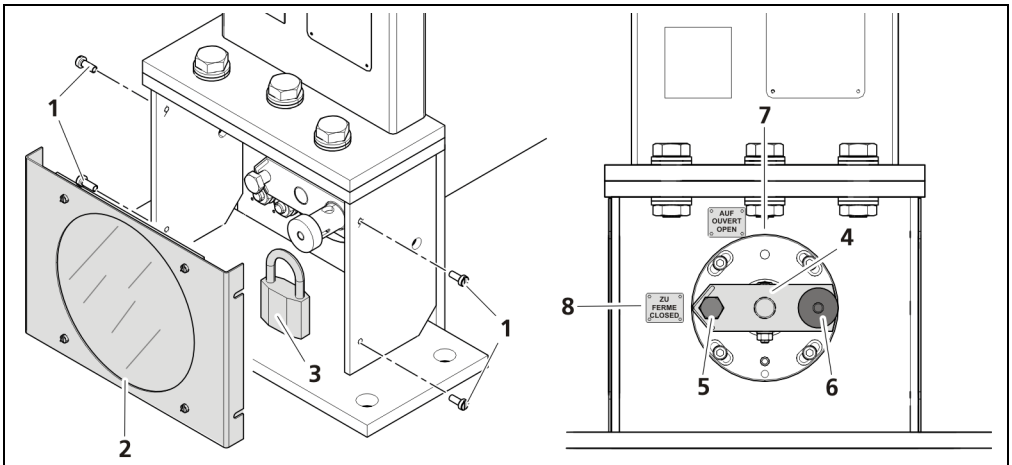
The locking mechanism secures the shielding containing the source against access by unauthorized persons and is used for opening and closing the beam path.

IMPORTANT

During transport and installation of the shielding, the locking lever must be set to CLOSED and be secured by a padlock.

IMPORTANT

The locking mechanism may only be operated by persons who are at least employees with general knowledge and were instructed by an expert or authorized person. If the shielding includes a radioactive source, the responsible radiation safety officer must be consulted.



1	Screw	5	Safety screw
2	Cover	6	Locking bolt
3	Padlock	7	Position OPEN
4	Locking lever	8	Position CLOSED

Fig. 16 Usage rod source shield

1. Loosen screws (Fig. 16, item 1) and remove the Cover (Fig. 16, item 2).
2. If applicable, remove the padlock (Fig. 16, item 3) and the safety screw (Fig. 16, item 5).
3. Pull the locking bolt (Fig. 16, item 6) and turn the locking lever (Fig. 16, item 4) to the required position (OPEN / CLOSED).
4. Lock the locking bolt (Fig. 16, item 6) into place in the new position.

▶ The radiation beam outlet channel is now open / closed.

4.7.2 Transport protection

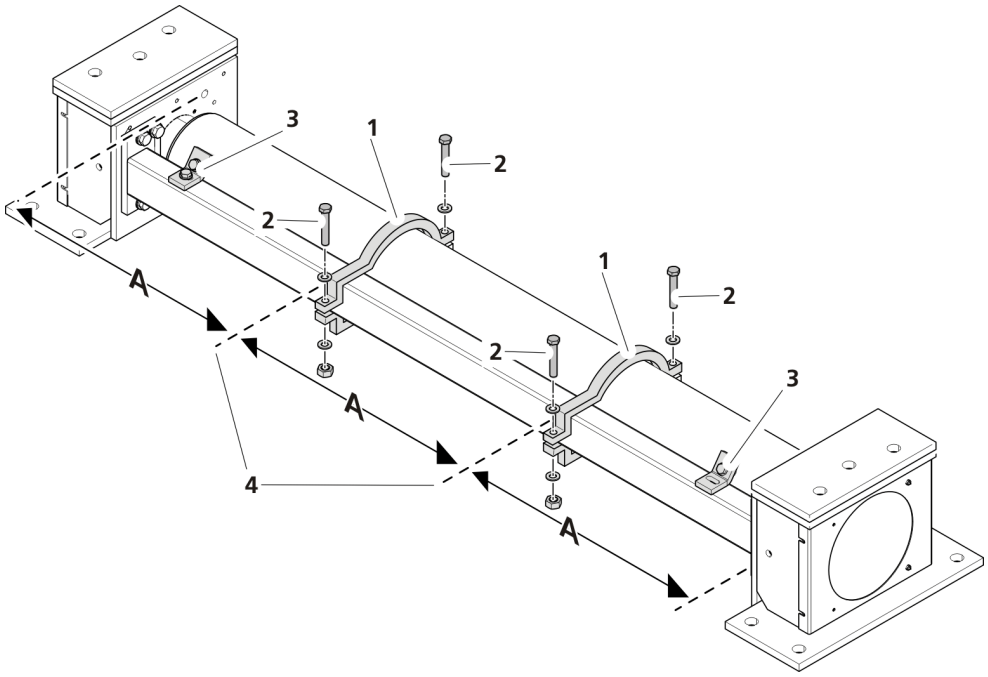
The transport protection brackets (Fig. 17, item 1) are used to secure the shield of the conveyor belt during transport. Only with these brackets does the belt weighing lower part fulfill the TYP A re-quirements according to IATA DGR and ADR transportation regulations.

NOTICE

The two transport protection brackets (Fig. 17, item 1) must be removed in addition to the two locking screws (Fig. 17, item 3) before commissioning the belt weigher and must be kept for possible return transport.

NOTICE

The transport protection brackets (Fig. 17, item 1, item 2) and the locking screws (Fig. 17, item 3) must be installed and screwed before transport.



1 **Transport protection brackets**
2 **Hex screw M8**
3 **Locking screws**
4 **Position transport protection brackets**
A **Distance**

Fig. 17 transport protection brackets

1. Attach the protection brackets at the same distance (Fig. 17, A).
   - For example: shield length 1800 mm, disctance (A) = 600 mm.
2. Tighten the hex screws with a tightening torque of 17 Nm.
3. Fasten all locking screws (Fig. 17, item 3).

- The shield can be transported.

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

Only power within the marked range must be applied!

NOTICE

The relay of the LB 472 can only switch low voltages. Please note the specifications in the document “Technical Information” (see Appendix).

The power source of the 24 VDC version of the product must meet the requirements of the Low Voltage Directive and be equipped with double or reinforced insulation.

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 / slave 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

- Lines are to be connected with special care.
- Connection lines and routing must comply with the applicable regulations.
- When routing the cables, make sure that the cable insulation cannot be mechanically damaged by sharp edges or movable metal parts.
- 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 capacity of the cable must be taken into account in addition to the maximum 40 ohms.

When routing the connection lines, make sure that

- no dirt or moisture reaches the connection room,
- the conductors are not damaged when the cable insulation is removed,
- the conductor insulation or the sleeve of the wire end ferrules reach into the housing of the terminal unit,
- blank, conductive segments of the lines (e.g. wires of a litz wire) do not reach outside the terminal unit,
- the wire end ferrule or the stripped wire have a length of 8 mm so that the wire is held securely in the clamp,

- the line insulation reaches into the sleeve of the wire end ferrule if these components are used,
- 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 suitable for a temperature that is at least 10°C above the maximum permissible 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, sealing plugs 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

In the configuration Master-Master, all participants must be connected one after the other for integration of the transmitter into a EIA-485 (RS-485) network. Connection in a star arrangement is not permitted.

The first and last participant (physically, independent of the position of the Master) in the network need a closing resistance of 121 Ω.

5.2 Exchange LB 44x to LB 47x

NOTICE

If you install a DuoSeries LB 47x transmitter, in order to replace a LB 44x, it is necessary to consider an incompatibility in the connecting terminals.

In the most unfavorable case a short circuit in the connected terminals can happen!

- ▶ Consider the following information.

When using the terminal blocks, the most important electrical connections are identical (detector connection, current output, voltage supply). Other terminals like the I/O connections are not compatible.

The following figure shows the terminal assignments of the DuoSeries LB 47x.

- Green: Identical connections LB 44x / DuoSeries LB 47x
- Red: Changed clamp assignment DuoSeries LB 47x in comparison to LB 44x

Signal	Pin	C	A	Pin	Signal
DETECTOR GND	C - 2			A - 2	DETECTOR +
not assigned	C - 4			A - 4	not assigned
not assigned	C - 6			A - 6	not assigned
not assigned	C - 8			A - 8	not assigned
RELAY 3 COM	C - 10			A - 10	RELAY 3 NO
RELAY 2 COM	C - 12			A - 12	RELAY 2 NO
RELAY 1 NC	C - 14			A - 14	RELAY 2 NC
RELAY 1 COM	C - 16			A - 16	RELAY 1 NO
DIGITAL IN 1	C - 18			A - 18	DIGITAL IN GND
DIGITAL IN 2	C - 20			A - 20	+ 24 V
CURRENT IN + (⎍)	C - 22			A - 22	CURRENT IN – (⏚)
RS 485 B	C - 24			A - 24	RS 485 A
CURRENT OUT –	C - 26			A - 26	CURRENT OUT +
not assigned	C - 28			A - 28	not assigned
100-240 V AC, 24 V DC –	C - 30			A - 30	100-240 V AC, 24 V DC +
Protective conductor PE	C - 32			A - 32	Protective conductor PE

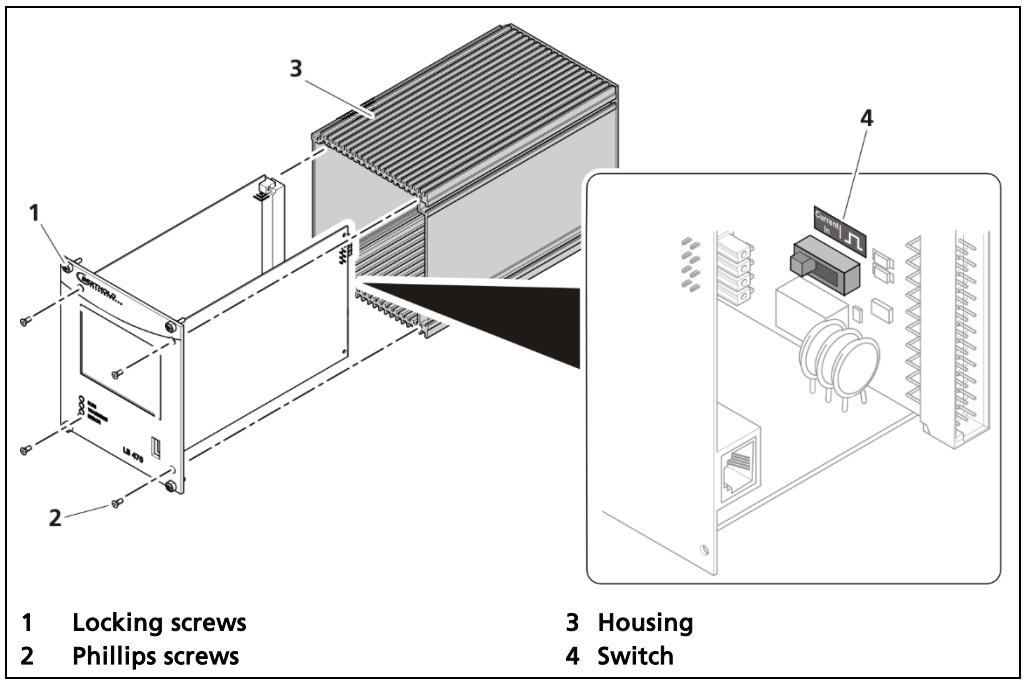
Fig. 18 Assignment clamp block at exchange LB 44x -> LB 47x

NOTICE

Together with an exchange unit a terminal sticker is delivered that must be placed on the terminal block.

5.3 Tacho Switch

The transmitter LB 472 can process tachometer with pulse signals and current signals (0/4 - 20mA) proportional to the speed. If the AI Assignment (Device Setup | Setup | Inputs | Analog inputs | AI Mapping) is set to “Tach Current Input”, the switch on the board must be set to "CURRENT IN".



1 Locking screws
2 Phillips screws
3 Housing
4 Switch

Fig. 19 Tacho switch on the board

1. Switch off the device.
2. Loosen the four locking screws (Fig. 19, item 1) and pull the EVU out of the wall housing or the subrack.
3. Remove the four recessed phillips screws (Fig. 19, item 2) on the front of the EVU.
4. Pull out the housing (Fig. 19, item 3) carefully.
5. Set the switch to "CURRENT IN" position (Fig. 19, item 4).
6. Carefully slide the board into the housing. Screw the front panel to the housing with the four screws.

▶ The tacho switch has been changed correctly.

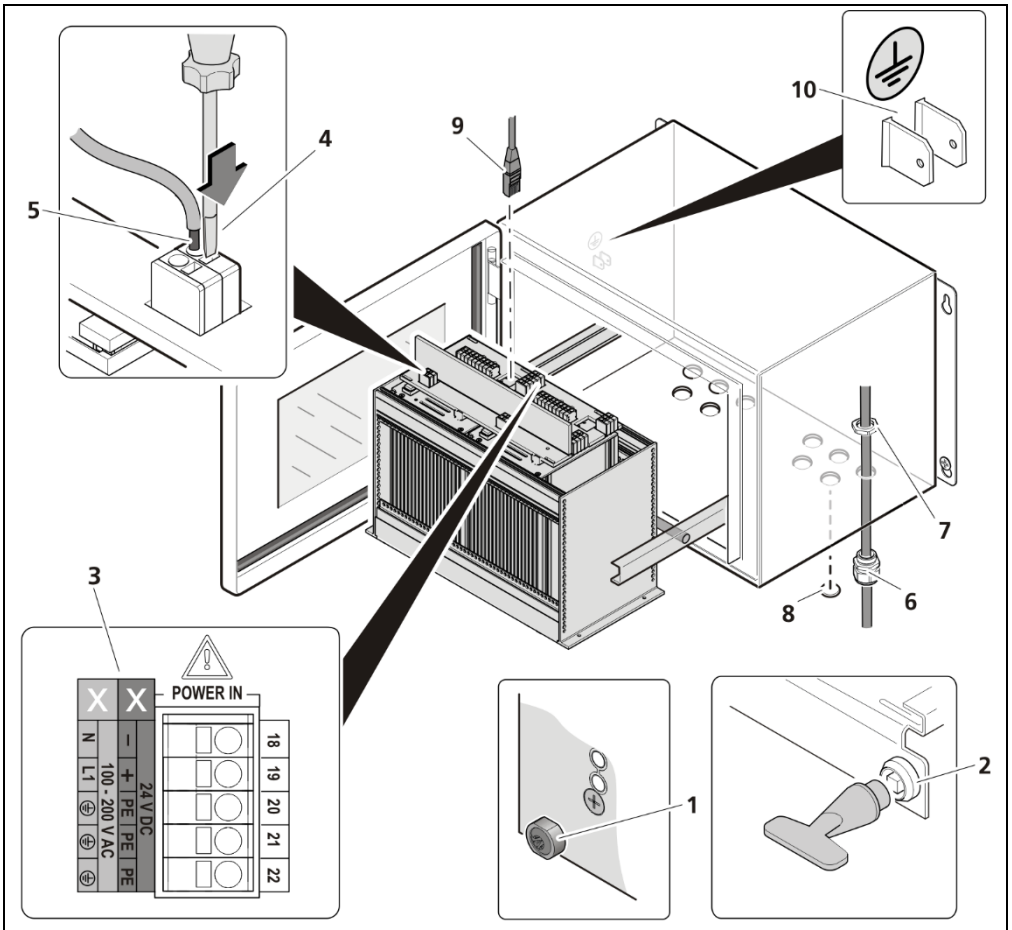
5.4 Electric connection in the wall housing

⚠ 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.
- Installation/maintenance may only be carried out if the device has been de-energised.
- 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	Fixing screws	6	Cable gland
2	Locking	7	Counternut cable gland
3	Marked voltage supply	8	Plugs
4	Opening terminal connection	9	RJ45 connector (network)
5	Stripped wire	10	Ground connection

Fig. 20 Electrical connection in the wall housing (Ex.: master-master)

1. Make sure that the fixing screws (Fig. 20, item 1) of all modules are tightened in order to prevent slipping.
2. Loosen the lock (Fig. 20, item 2) using the supplied square key and pull the subrack out.
3. Fold the subrack downward cautiously.

4. Run the cables through the cable glands (Fig. 20, item 6) through the openings of the wall housing and through the counternut cable glands (Fig. 20, item 7).
5. Screw the the cable glands (Fig. 20, item 6) with the counternut cable glands (Fig. 20, item 7).

NOTICE

Apply the voltage of the specified and marked (Fig. 20, item 3) range only!

NOTICE

Note the specification relating to cables, protective earth, equipotential bonding and EIA-485 (RS-485) in chapter 5.1.

6. Connect the lines according to assignment (see document “Technical Information”) to the terminal board.
7. Open the terminal connection (Fig. 20, item 4) with an operating tool (slotted screwdriver) and insert the stripped wire (min. 8 mm) (Fig. 20, item 5).
   The terminal connection closes by pulling out the operating tool.
   The terminal connections are designed for the flexible wires:
   - 0.2 mm² … 2.5 mm² or AWG 24 …12 without end sleeve
   - 0.25 mm² ... 2.5 mm² with end sleeve without plastic sleeve
   - 0.25 mm² ... 1.5 mm² with end sleeve with plastic sleeve.
8. Plug the network plug into the RJ45 socket (Fig. 20, item 9) (optional).
9. Check the correct connection of the ground connection (Fig. 20, item 10).
10. Tighten all cable glands (Fig. 20, item 6) to ensure optimal sealing and tension relief until the gasket insert closes between screw down nut and cable.
11. Check tension relief of all cable glands by pulling the cables smoothly.

▶ The cables must not move. If necessary tighten the cap nuts of the cable glands.

12. Slide the subrack into the wall housing and lock it with the square wrench.

▶ The connection was made correctly.

NOTICE

The wall enclosure is supplied with blanking elements in all cable glands. It must be ensured that there are blanking elements in all unused cable glands. Otherwise, the IP protection is not given.

NOTICE

Only use cable that is suitable for connection to the corresponding terminals may be used. Detailed specifications can be found in the chapter 5.1.2 Cables and Lines.

Tip

The master/slave connections of the installed devices are already manufactured above the circuit board in the wall housing. If additional slave modules (e.g. from other wall housings) are connected, the terminals appropriate for use on the terminal board should be used.

5.5 Electrical connection in a 19" subrack with terminal board

⚠ 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.
- Installation/maintenance may only be carried out if the device has been de-energised.
- 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

Prior to initial start-up, the voltage range (Fig. 21, item 8) must be marked with chemical resistance on all input and output terminals!

Only cable that is suitable for connection to the corresponding terminals may be used. Detailed specifications can be found in the chapter 5.1.2 Cables and Lines.

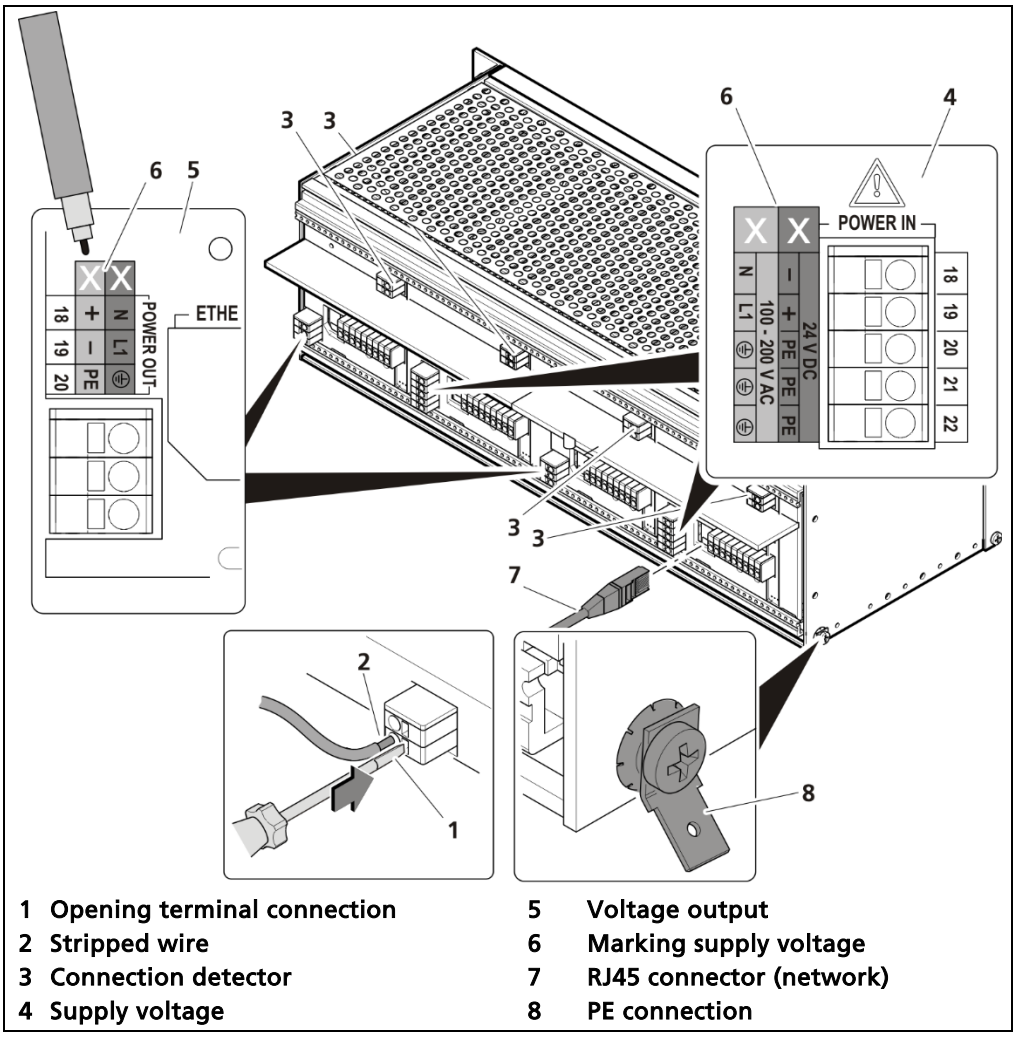
The 19" subrack must be accessible from the rear for the electrical installation.

The terminal board master/slave is used twice (Fig. 21, item 2) for the variant to install 2 master EVUs and 6 slave modules.

The terminal board master/master (Fig. 21, item 1) is used twice for the variant to install 4 master EVUs.

master / master
CHANNEL A
CHANNEL B
CHANNEL C
CHANNEL D

master / 3x slave
CHANNEL A
CHANNEL B



1	Opening terminal connection	5	Voltage output
2	Stripped wire	6	Marking supply voltage
3	Connection detector	7	RJ45 connector (network)
4	Supply voltage	8	PE connection

Fig. 21 Electrical connection in the 19" subrack

NOTICE

Apply the voltage of the specified and marked (Fig. 21, item 6) range only!

- Note the specification relating to Cables, Protective earth, equipotential bonding and EIA-485 (RS-485) in chapter 5.1.

1. Unused slots must be closed with blinds.
2. Label the voltage range permanently and chemically (Fig. 21, item 6).
3. Connect the lines according to assignment (see document “Technical Information”) to the terminal board.
4. Open the terminal connection (Fig. 21, item 1) with an operating tool (slot-ted screwdriver) and insert the stripped wire (min. 8 mm) (Fig. 21, item 2). The terminal connection closes by pulling out the operating tool. The terminal connections are designed for the flexible wires:
   - 0.2 mm² … 2.5 mm² or AWG 24 …12 without end sleeve
   - 0.25 mm² ... 2.5 mm² with end sleeve without plastic sleeve
   - 0.25 mm² ... 1.5 mm² with end sleeve with plastic sleeve.
5. Plug the network plug into the RJ45 socket (Fig. 21, item 7) (optional).
6. Check the correct connection of the PE conductor (Fig. 21, item 8).

NOTICE

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

- The connection was made correctly.

5.6 Electrical connection in the 19” subrack with clamp block

⚠ 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.
- Installation/maintenance may only be carried out if the device has been de-energised.
- 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.

If the units are installed in the 19" subrack without terminal board, 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.

IMPORTANT

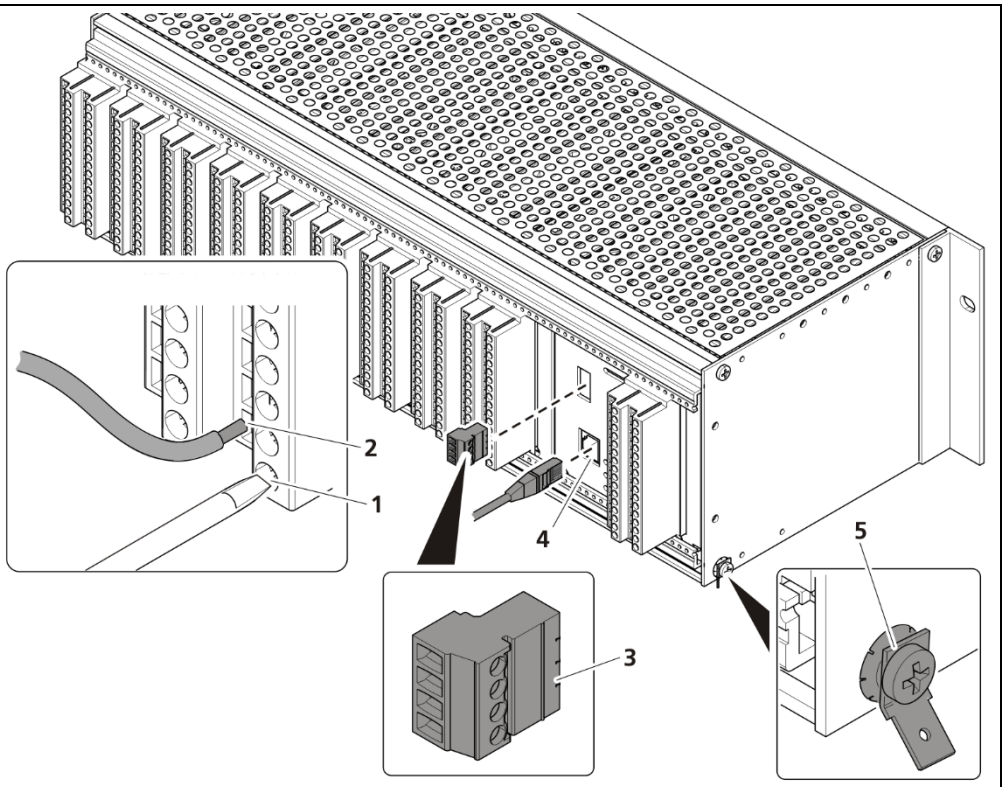
In the case of applications with clamp blocks a contact protection must be provided by the customer when voltage is applied. The cable connections of clamp blocks have to be in accordance with IEC 61010-1 (2010).

The connection between the master EVU and slave modules is made with a 4-pin master/slave plug (see chap. 5.6.1).

NOTICE

The LB 470 is restricted pin-compatible with the terminals of the LB 440. The pins for the power supply, the detector interface and the current output are at the same position. If only those ports are used, then a LB 440 can be replaced by a LB 470 without re-wiring.

- Note information in chapter 5.2 Exchange LB 44x to LB 47x.



1 **Clamping screw (M2.5)**
2 **Opening terminal connection**
3 **4-pin master/slave plug (only master EVU) terminals 41-44**
4 **RJ45 connector (network)**
5 **PE connection**

Fig. 22 Electrical connection in the 19" component rack (Ex.: 1x Master, 9xSlave)

1. Connect the lines to the clamp blocks according to assignment (see document "Technical Information"). To ensure protection against accidental contact in accordance with EN61010-1, the rear side with the terminals must be covered with a protective cover, e.g. with a door of a 19" cabinet.
2. Open the clamping screw (Fig. 22, item 1) and insert the stripped wire (min. 8 mm).

▶ The terminal connections are designed for wires with a conductor cross-section from 0.2 mm² to 2.5 mm².

3. Screw the terminal screws with a tightening torque of 0.4 - 0.5 Nm.
4. Plug in the master/slave plug and reconnect the lines in accordance with assignment (chap. 5.6.1).
5. Plug the network plug into the RJ45 socket (Fig. 22, item 4) (optional).
6. Check the correct connection of the PE conductor (Fig. 22, item 5).

NOTICE

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

NOTICE

Only cable that is suitable for connection to the corresponding terminals may be used. For further specifications, see appendix "Technical Information".

▶ The connection was made correctly.

5.6.1 Assignment terminals master/slave plug

Signal	Pin
TxD	41
RxD	42
RTS	43
GND	44

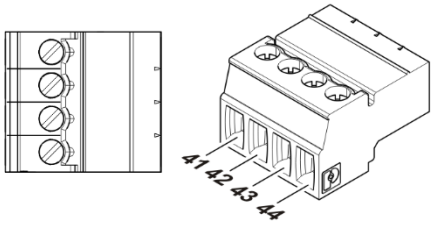


Fig. 23 Assignment Terminals master/slave plug

5.7 Switching current output

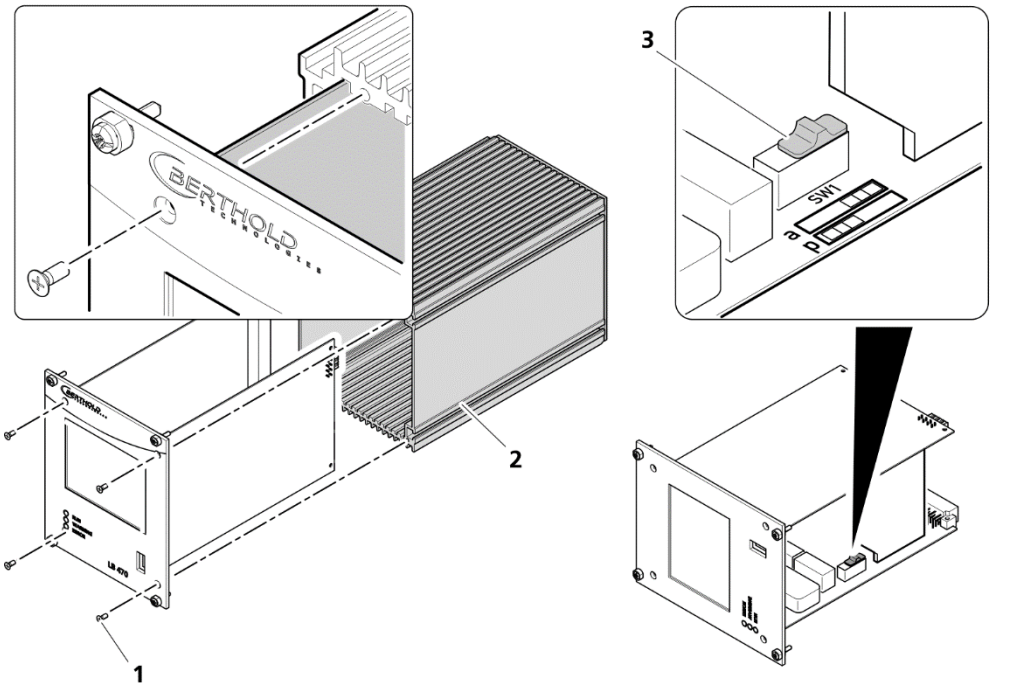
Switching between "SOURCE" (active) and "SINK" (passive) is possible using the slide switch on the I/O board. Factory setting EVU is delivered in "SOURCE" mode.

⚠ DANGER

Danger to life from electric shock!

- The switching may only be carried out by a qualified electrician.
- Please adhere to the relevant safety regulations.
- Switching may only be carried out if the device has been de-energised.
- 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 Screw
2 Housing
3 Slide switch (a=active "SOURCE"; p=passive "SINK")

Fig. 24 Switching of the current output

1. Loosen the four sunken screws on the front side of the EVU (Fig. 24, item 1).
2. Pull out the housing (Fig. 24, item 2) carefully.
3. Slide the switch (Fig. 24, item 3) to position a for "active" (SOURCE), to position p for "passive" (SINK).
4. Carefully insert the front panel into the housing. Pay attention to the correct guide rail!
5. Screw the front panel to the housing (Fig. 24, item 2) with the four screws (Fig. 24, item 1).

- The switching has been carried out correctly.

5.8 Tachometer connection diagram

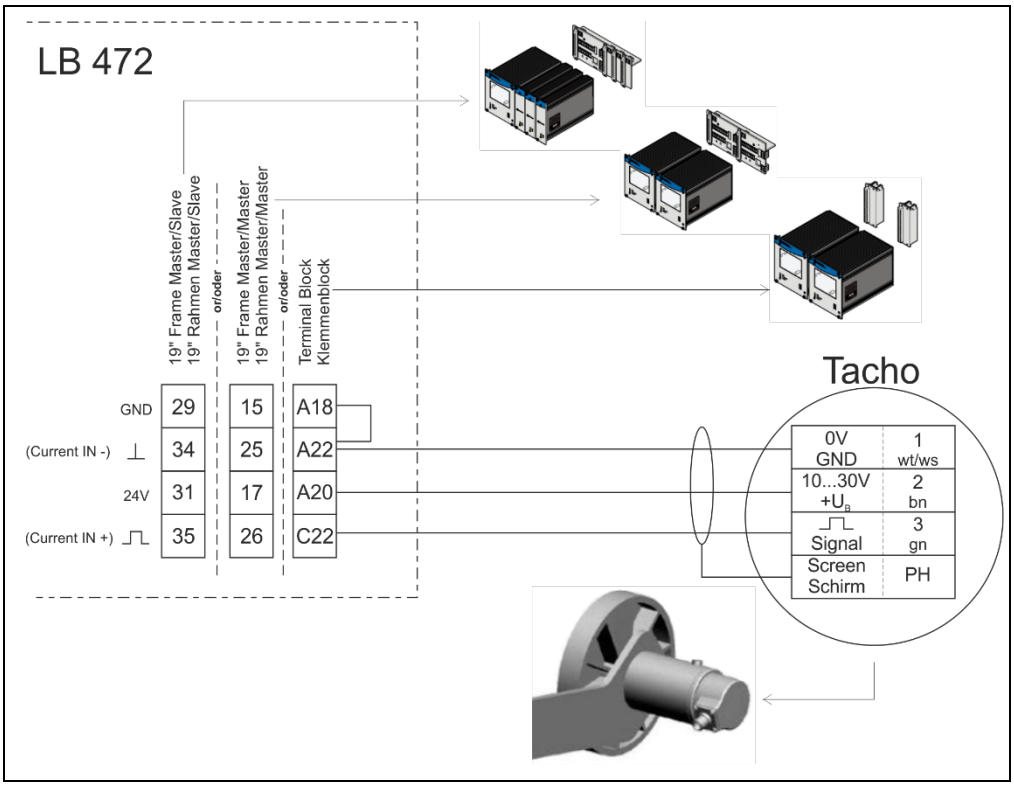


Abb. 25 Tachometer connection diagram

6 Operation of the Software

6.1 System start

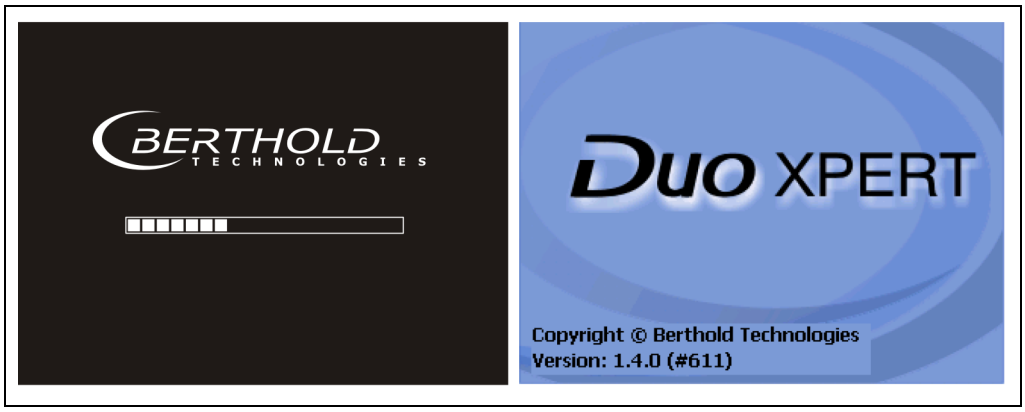


Fig. 26 Start screen with display of the software version

System start with invalid application software

A different menu structure is present in this mode.

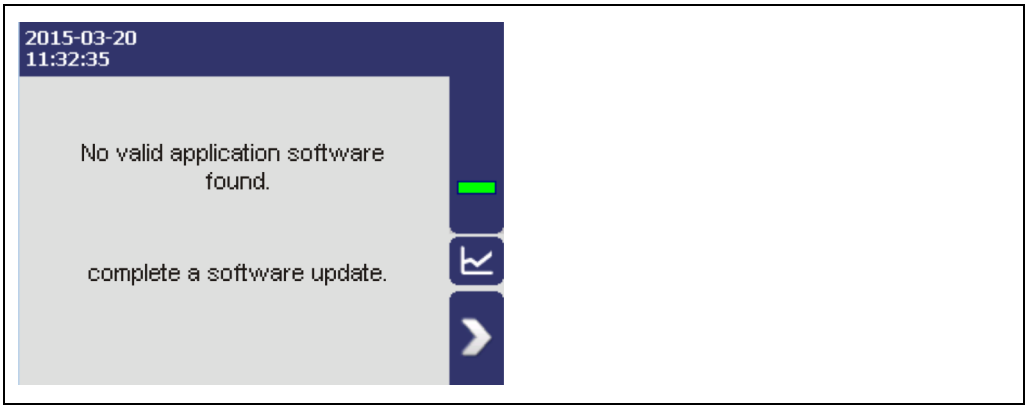


Fig. 27 Start screen (Invalid application software)

IMPORTANT

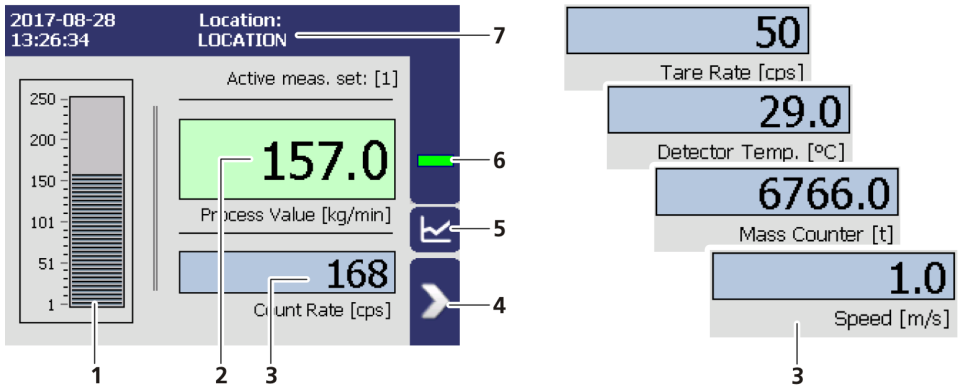
The communication between the detector and EVU is limited to 1200 baud. There is therefore a load time for data that are retrieved in the detector.

6.2 EVU standard display

IMPORTANT

Changing the language of the user interface is described in Chapter “7.3.1 System | Operating Interfaces”.

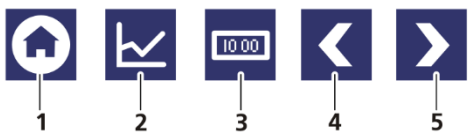
Clicking the blue box changes the display between Detector-Temperature- Count Rate – Mass Counter - Speed - Tare Rate (Fig. 28, item 4). The units can be changed in Chapter 7.3.1. The designation of the measuring point (Fig. 28, item 7) can be changed in Chapter 7.1.1.



1 **Scale process value [kg/s]**
2 **Process value [kg/s]**
3 **Detector temperature / Count rate [cps] / Tare Rate [cps] / Speed [m/s] / Mass counter [t]**
4 **Menu**
5 **Diagram display**
6 **Status information**
7 **Location of the measuring point**

Fig. 28 Standard display of the EVU

6.3 Navigation



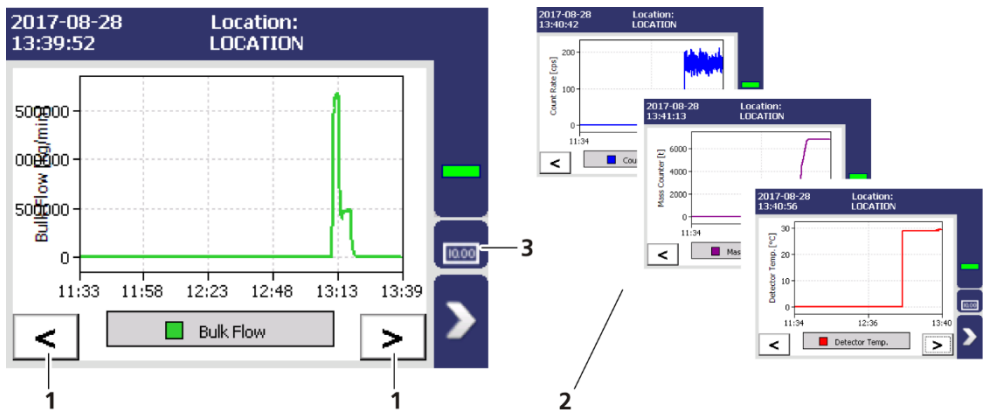
1 **Home (standard display)**
2 **Diagram display**
3 **Data**
4 **One menu level back**
5 **One menu level forward**

Fig. 29 Icons for navigation

6.3.1 Diagram display

Clicking the diagram symbol (Fig. 28, item 5) changes the view to the diagram display. The arrow keys (Fig. 30, item 1) are used to switch between the diagrams Process Value – Count Rate – Detector Temperature - Mass Counter.

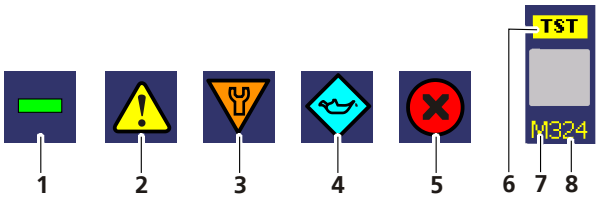
Clicking the display symbol (Fig. 30, item 3) changes the view to the standard display.



1 Arrow keys
2 Diagrams
3 Standard display

Fig. 30 Diagram display of the EVU

6.4 Status messages



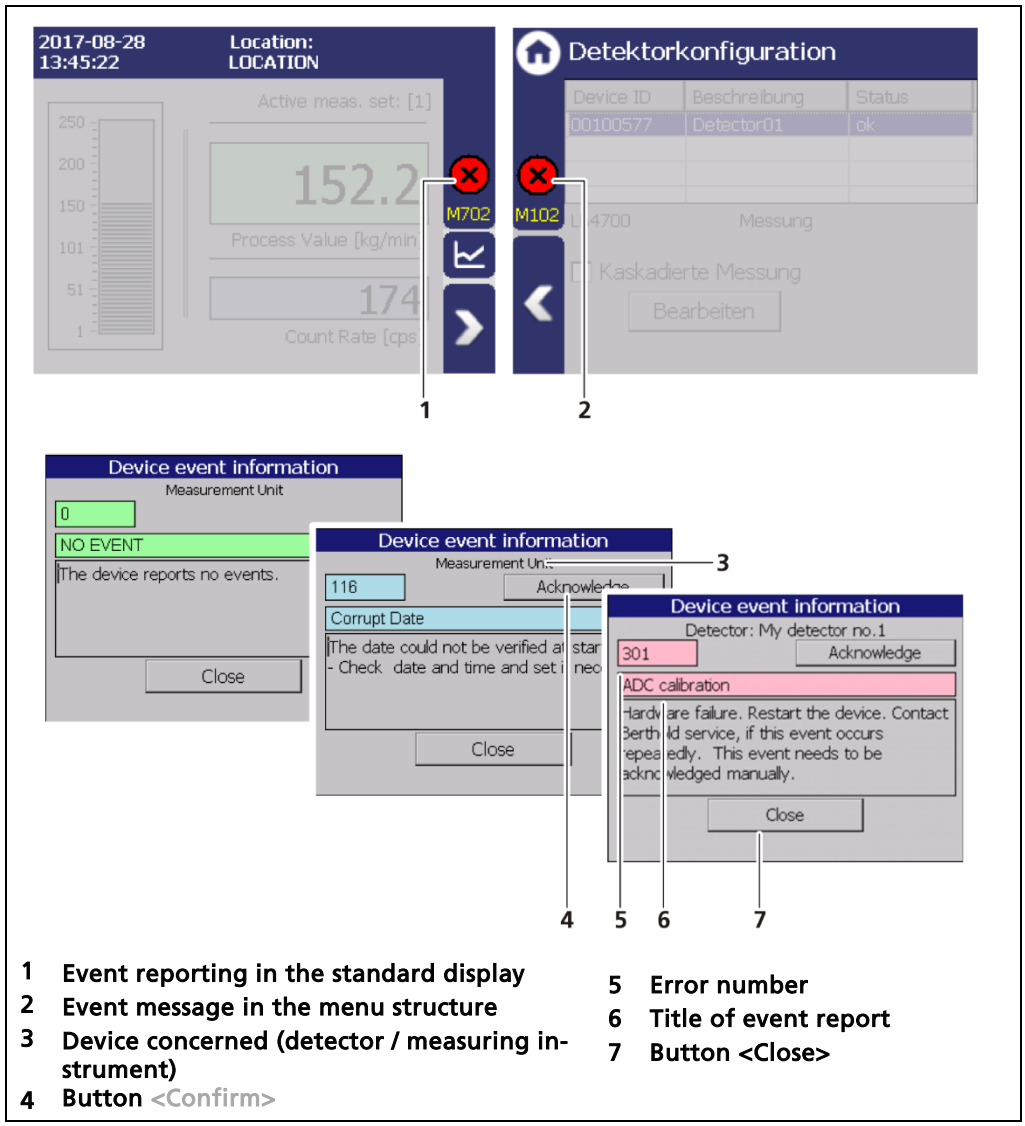
1 No event
2 Outside of specification
3 Function check
4 Maintenance required
5 Failure (error)
6 Information test (simulation)
7 Letter D (detector) or M (measuring instrument)
8 Event code

Fig. 31 Status information

6.4.1 Event reports

Events are displayed in the standard display and in the submenus as a symbol. All the events are shown on the standard display. The leading letter “D” (for detector) indicates that the detector is reporting an event. The letter “M” (for measuring instrument) indicates an event that refers to the transmitter LB 472, see Chapter11.2 Error Codes of the Evaluation Unit. In the event of a detector fault, the operating manual of the detector must be observed.

The event with the highest priority is displayed. Further information about event reports on the measuring instrument are listed in Chapter 11.2. Information about the event reporting of the detector can be displayed in the menus in Chapter 7.3.2 Detector Service.



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. 32 Event report (Example: Date faulty)

1. Click on the icon (Fig. 32, item 1, item 2) to display detailed information about the event.
2. Click the button <Confirm> to confirm an event that requires a manual confirmation.

▶ 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.

▶ The icon disappears from the status information.

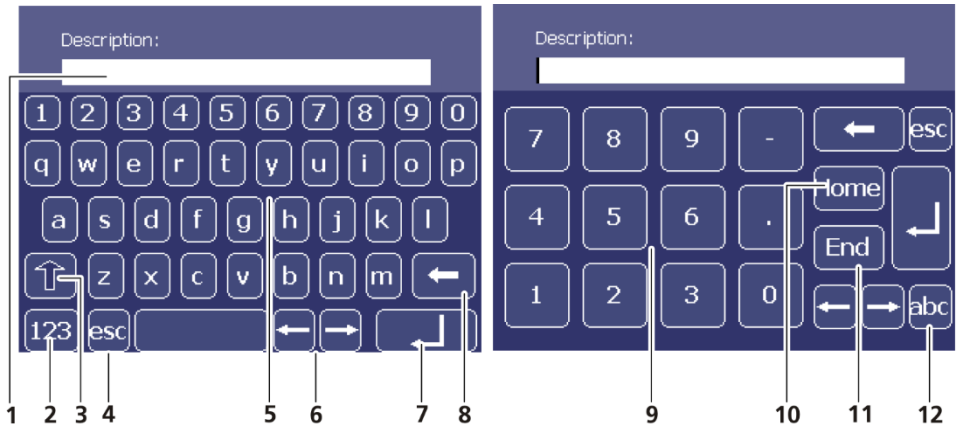
IMPORTANT

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

6.5 Input field

NOTICE

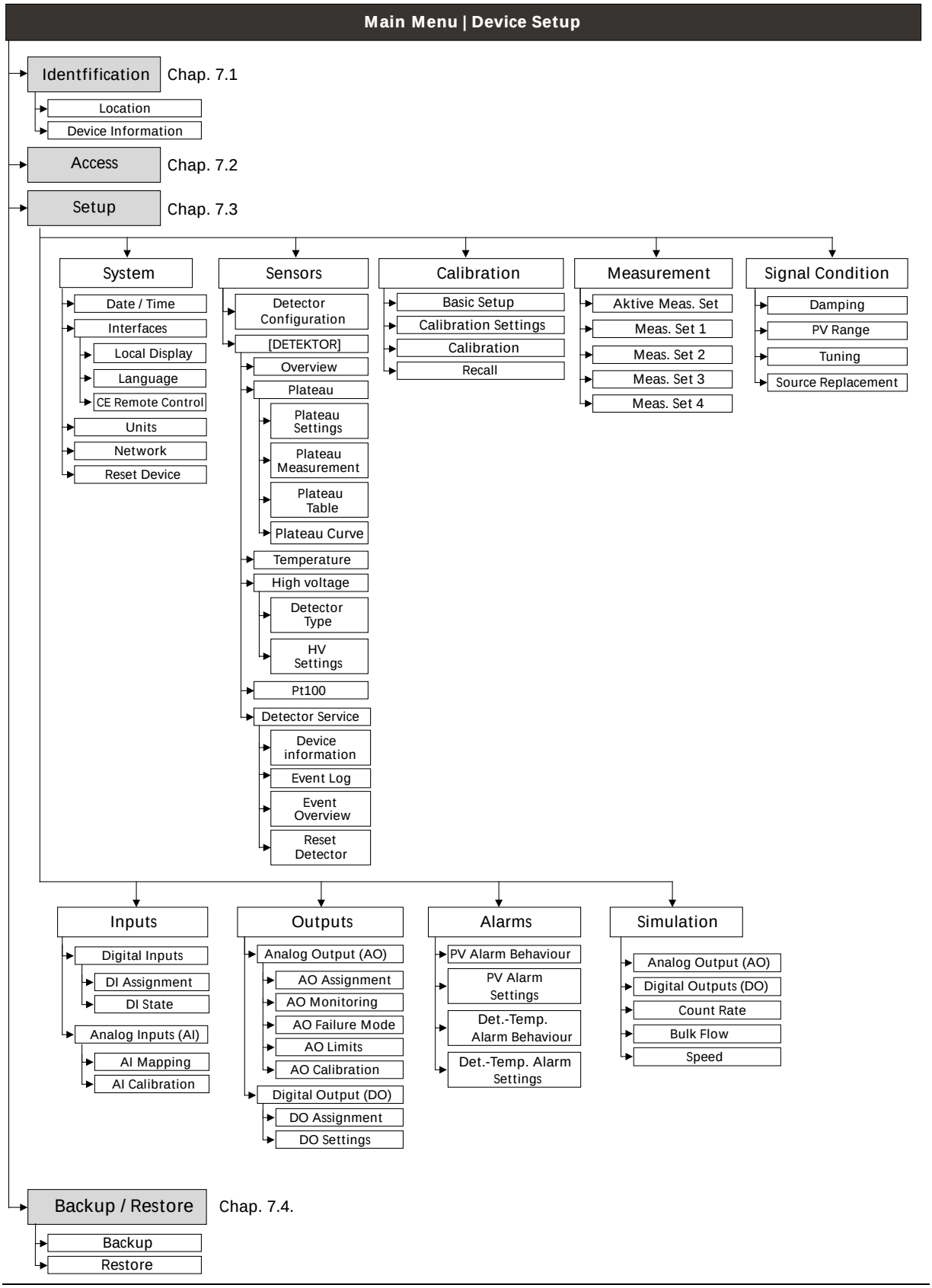
The input field appears by clicking on the blue display panels.



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. 33 Screen keyboard

7 Main Menu Device Setup



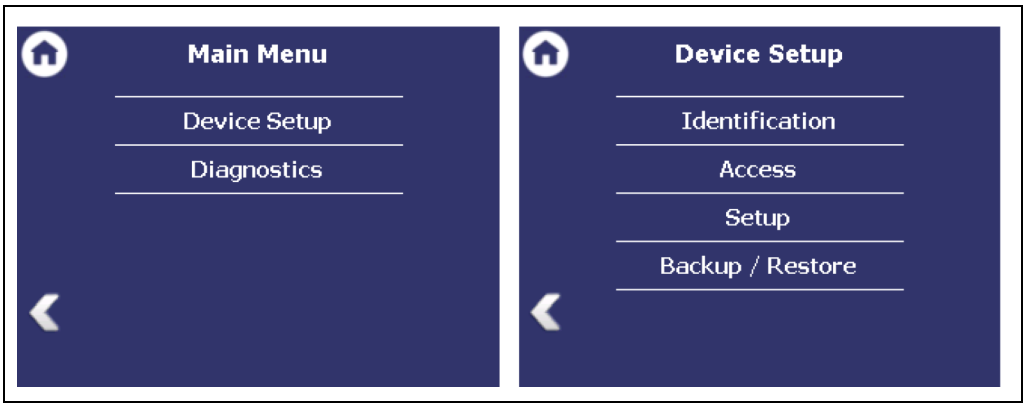


Fig. 34 Main Menu, Menu “Device Setup”

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

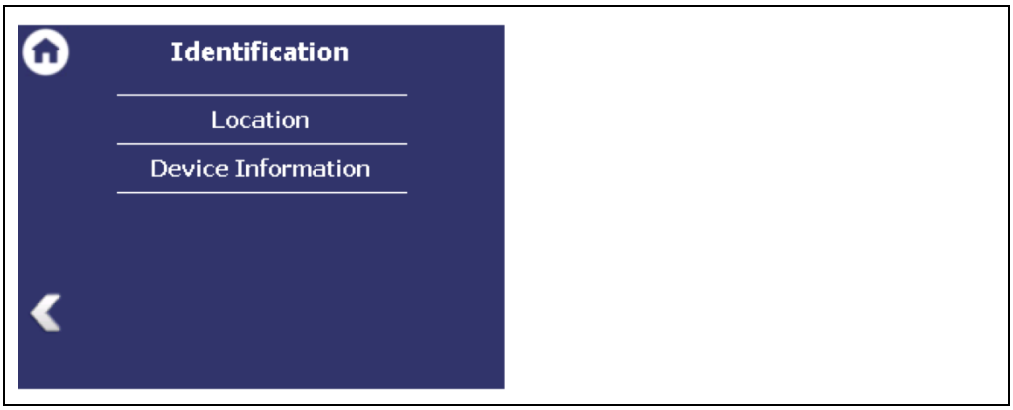
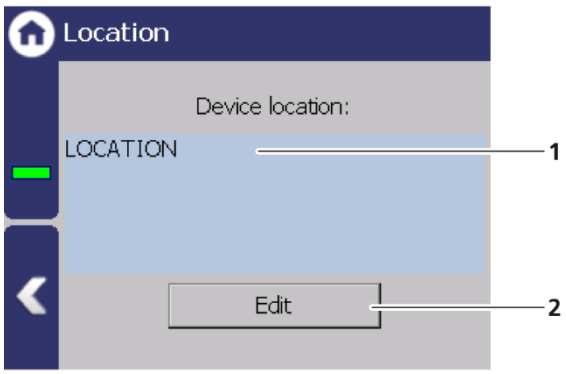


Fig. 35 Menu “Identification”

7.1.1 Location

Device setup | Identification | Location

The measuring point of the transmitter is displayed (Fig. 36, item 1) 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 standard display at “Measuring point” (Fig. 28, item 7).



1 **Name Device location**
2 **Button** <Edit>

Fig. 36 Device location

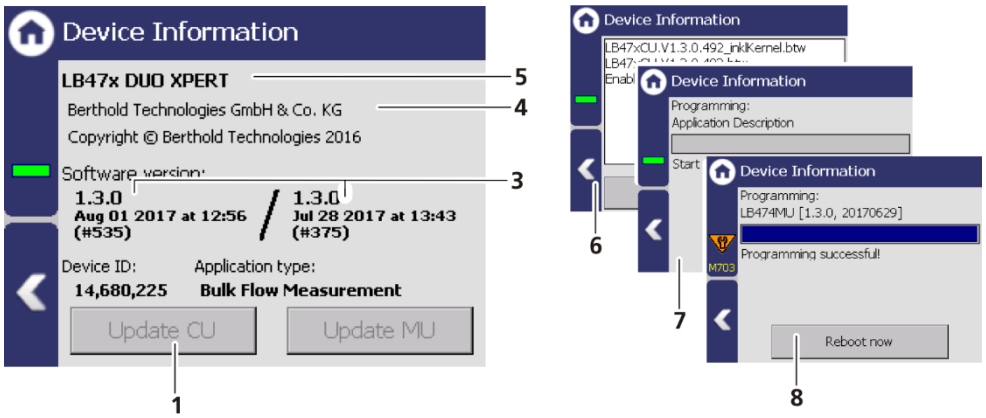
1. Click <Edit> (Fig. 36, item 2) to open the input field.
2. Enter a location name for the evaluation unit.
3. Confirm with the Enter key.

▶ 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 submenu "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. 37 Device information

NOTICE

Settings are deleted!

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

- Carry out a backup of the measuring channel settings before resetting and the update of the EVU (see 7.4.1 Backup).
- 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).

IMPORTANT

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

Perform CU update

1. Save the current update file of the CU software on a USB storage device.
2. Connect a USB storage device to the front of the device.
3. The USB storage device is recognised by the system after a few seconds and the <CU Update> (Fig. 37, item 1) button can be clicked.
4. Click on the button <CU Update> (Fig. 37, item 1).

- The selection window opens.

5. Select the CU file and click on <CU-Update>.

▶ The measurement is interrupted and the update is carried out.

6. Click on <Restart now>, to restart the EVU.

▶ The update was carried out.

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. 4, item 5).
3. The USB storage device is recognised by the system after a few seconds and the <MU Update> (Fig. 37, item 1) button can be clicked.
4. Click on the button <MU Update> (Fig. 37, item 1).

▶ The selection window opens.

5. Select the MU file and click on <MU-Update>.

▶ The measurement is interrupted and the update is carried out.

6. Click on <Restart now>, to restart the EVU.

▶ The update was carried out.

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

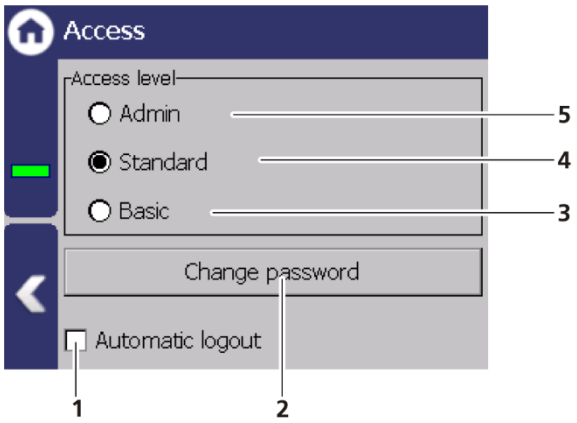
Device Setup | Access

You can set the user rights via the user levels and assign passwords in the submenu Access. After assigning a password the device 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 logout".

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 **Selection box "Automatic logout"**
2 **Change** <Change password>
3 **User level "Basic"**
4 **User level "Standard"**
5 **User level "Admin"**

Fig. 38 Menu Access

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.
Automatic logout	Activating the selection box (Fig. 39 item 1) automatically resets the access level Standard to “Basic” when the system changes to the standard display after the timeout (Chap. 7.3.1).

NOTICE

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

- 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. 38, item 4) and click on <Change password> (Fig. 39, item 2) to open the input field.

1 **Text field**
2 **Button** <OK>

Fig. 39 Change password

1. Click on the text field (Fig. 39, item 1.) to open the input field.
2. Enter a password (case-sensitive!).
3. Confirm with the Enter key.
4. Click <OK> (Fig. 39, item 2) to confirm.

- The password has been set / changed.

7.3 Menu Setup

Device Setup | Setup

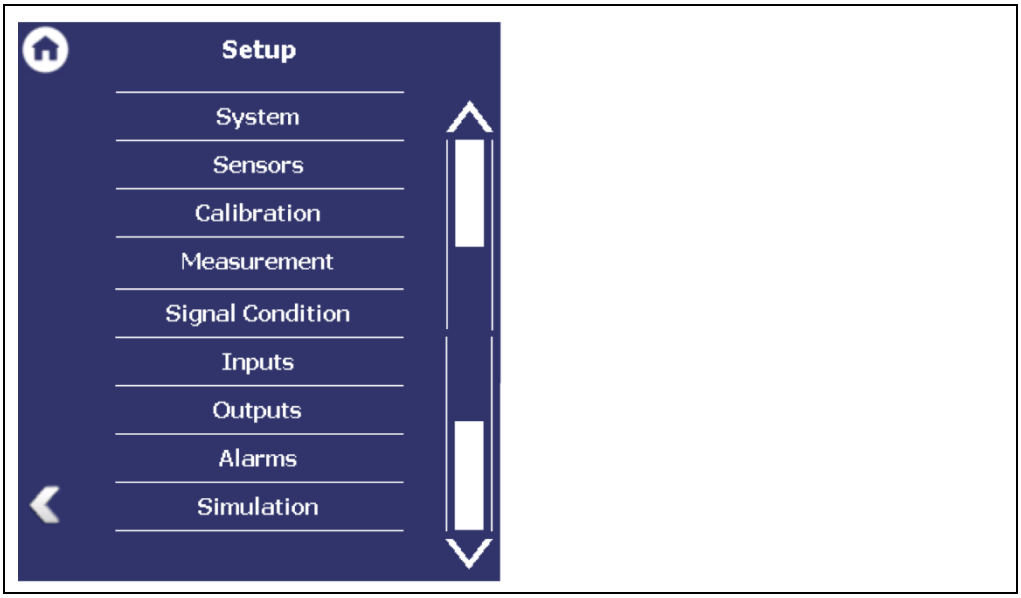


Fig. 40 Menu “Setup”

7.3.1 System (Date / Time, Interfaces, Units, Network, Reset Device, Repair Detector Software)

Device Setup | Setup | System

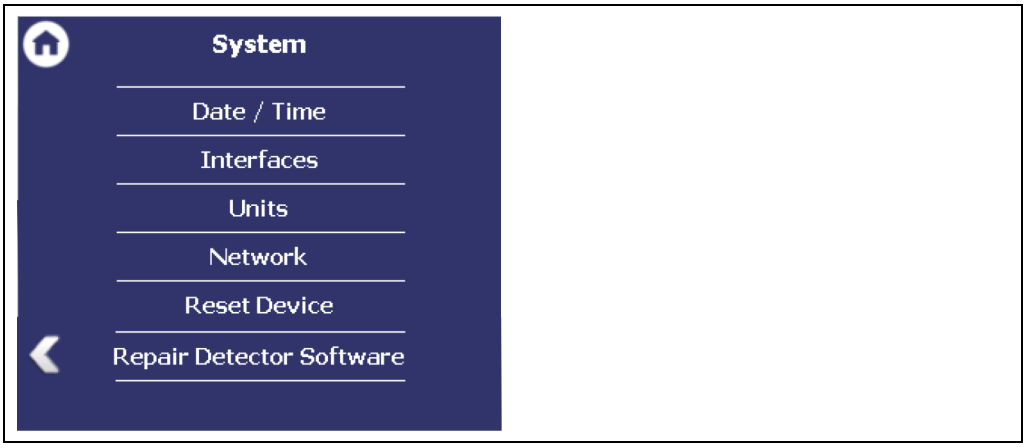


Fig. 41 Submenu “System”

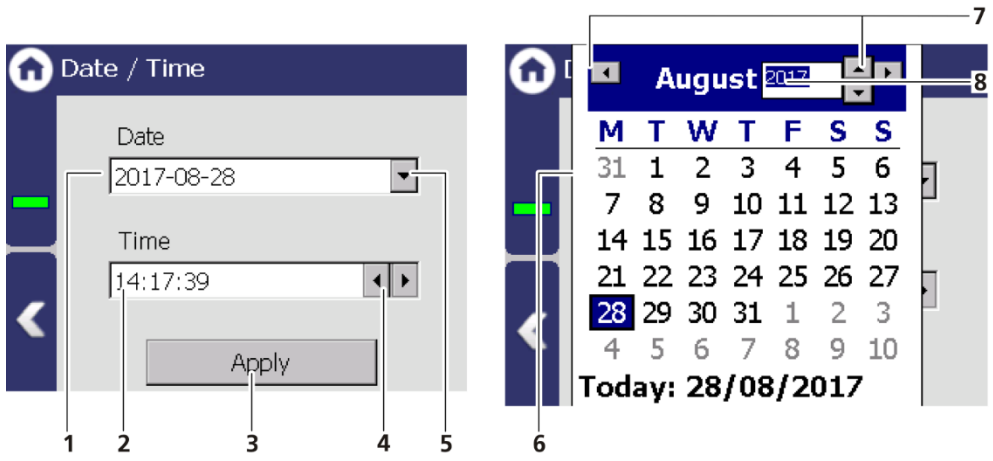
Set Date and Time

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. 42 Date / Time, calendar

1. Click on the arrow key (Fig. 42, item 5) in order to set the date.

▶ The calendar is opened (Fig. 42, item 6).

2. Click on the year number (Fig. 42, item 8) in order to enter the year.
3. Set the month (Fig. 42, 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. 42, item 4).
6. Click on <Apply> (Fig. 42, item 3), to accept the date and time settings.

▶ 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.

▶ 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. 43):

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

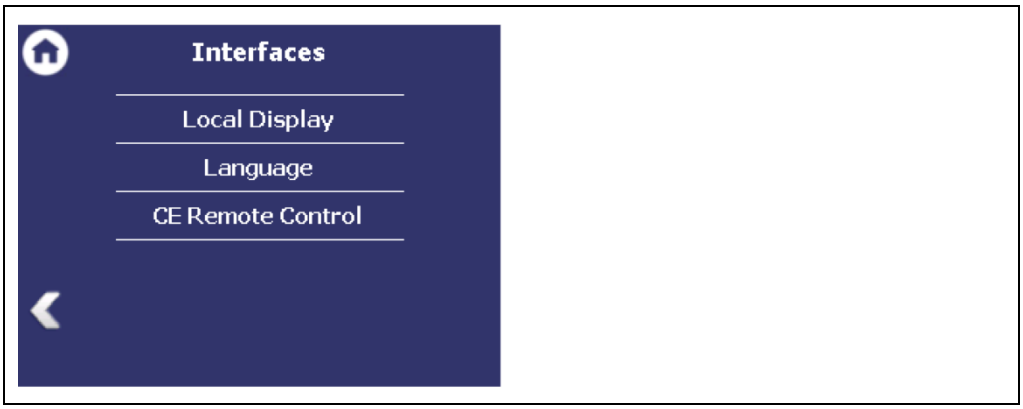


Fig. 43 Menu “interfaces”

Local Display

Device Setup | Setup | Alarms | Interfaces | Local Display

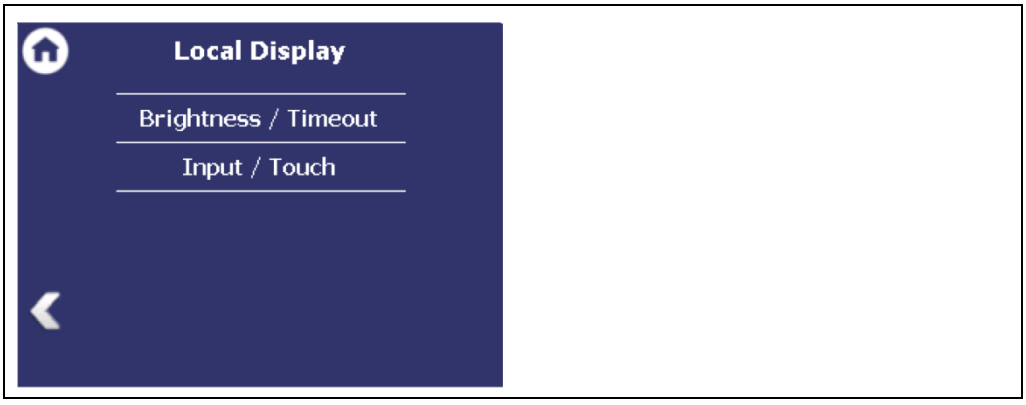
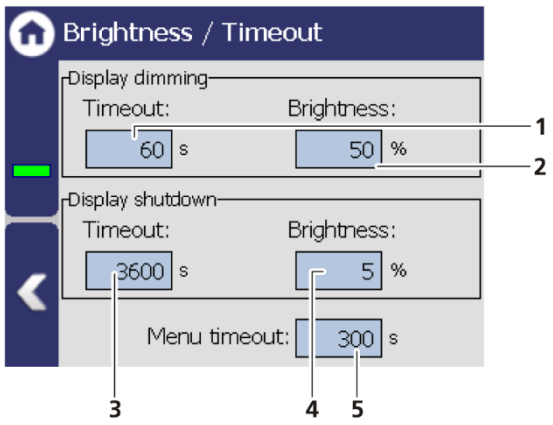


Fig. 44 Submenu “Local Display”

Brightness / Timeout

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



1 Input field "Time out"
2 Input field "Brightness"
3 Input field Display switch off "Time out"
4 Input field Display switch off "Brightness"
5 Input field menu time out

Fig. 45 Brightness / Time out settings

"Time out" refers to the period of time during which the display is not operated. The value "Time out display brightness" cannot be set greater than the value at "Time out display switch-off".

Display dimming In the field Display dimming, clicking the input fields allows the entering of the brightness (Fig. 45, item 2) in percent, that is set after expiry of the time (Fig. 45, item 1).

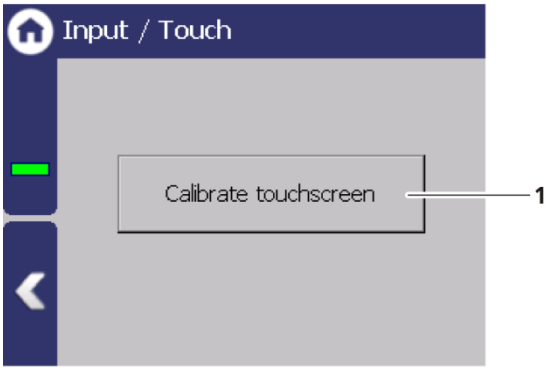
Display shutdown In the field Display shutdown, clicking the input fields allows the entering of the brightness (Fig. 45, item 4) in percent, that is set after expiry of the time (Fig. 45, item 3).

Menu Timeout Under "Menu Timeout" clicking on the input field (Fig. 45, item 5) changes the time period (seconds) in which the menu view changes to the standard view.

Input / Touch display

Device Setup | Setup | System | Operating interfaces | Local Display | Input / Touch

If the touch position deviates, a calibration of the touch screen must be performed.



1 **Button** <Calibrate touch screen>

Fig. 46 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. Calibration via the remote control software is not possible.

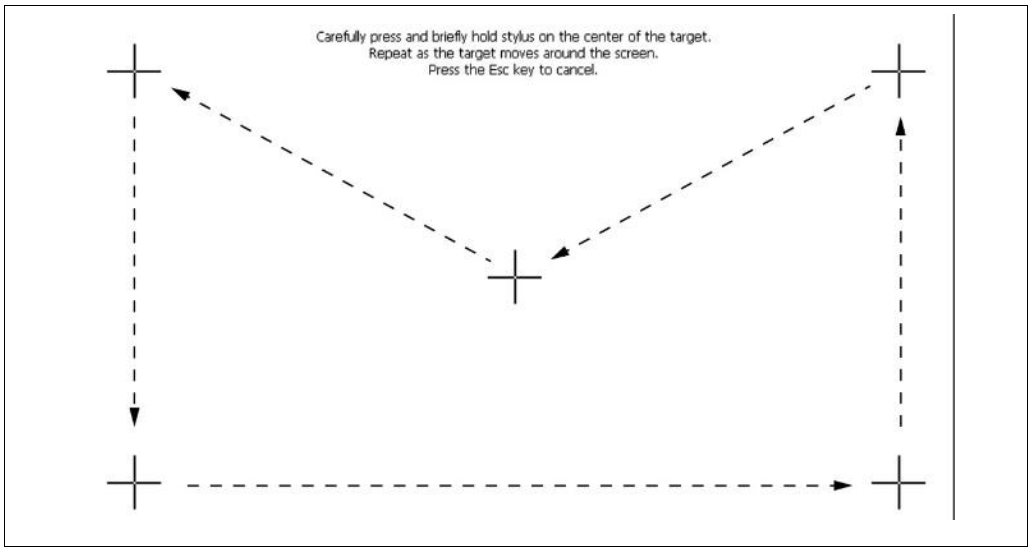


Fig. 47 Calibrate Touch screen

1. Click on <Calibrate touch screen>.

▶ The calibration screen opens.

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

▶ 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 empty field. The display changes to

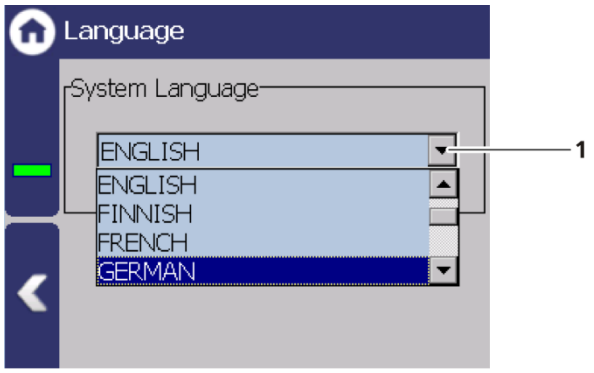
screen "**Calibrate Touch screen**".

5. Execute a restart of the EVU after prompting.

▶ The calibration of the touchscreen has been performed.

Language

Device Setup | Setup | System | Operator interfaces | Language



1 **Selection arrow**

Fig. 48 Language

Change language

1. Click on the selection arrow (Fig. 48, item 1) and select a language.

▶ A message window "Restart" appears.

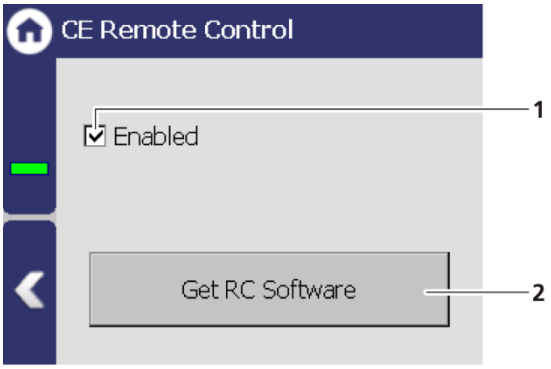
2. Confirm with <OK> to restart the device.

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

CE Remote Control

Device Setup | Setup | System | interfaces | Display | CE Remote Control

By activating (Fig. 49, item 1) on the CE Remote Control, the EVU 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. 49 CE Remote Control

Copy RC software

1. Connect a USB storage device to the device (Fig. 4, item 5).

▶ The USB storage device is recognised by the system after a few seconds and the button <Get RC software> (Fig. 49, item 2) can be clicked.

2. Click on the button <Get RC software> (Fig. 49, item 2).

▶ The software ("LB47xRemoteControl.exe") is copied to the USB storage device.

Information

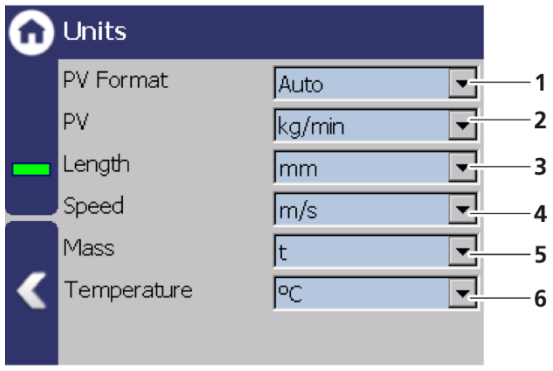
The RC software includes the file "LB47xRemoteControl.exe" and runs without installation.

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 shown in the standard display.



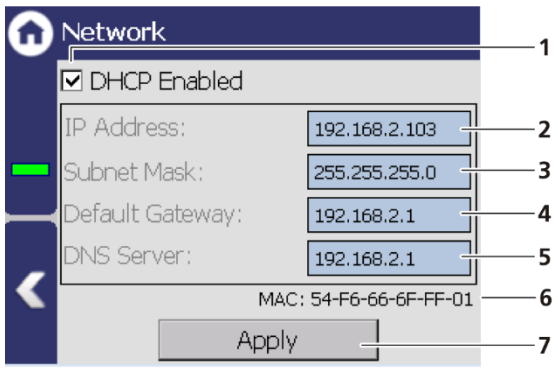
1 PV Format
2 PV
3 Length
4 Speed
5 Mass
6 Temperature

Fig. 50 Units

Network

Device Setup | Setup | System | Network

In the “Network settings” submenu, 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).



1 **Selection box “DHCP active”**
2 **IP address**
3 **Subnet mask**
4 **Standard gateway**
5 **DNS server**
6 **MAC address**
7 **Button** <Apply>

Fig. 51 Network settings

You can set the network address either manually or using DHCP (automatic assignment). To do this, check the "DHCP active" selection field (Fig. 51, item 1).

IMPORTANT

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. 51, item 6).

Changing the addresses

1. Click on the text field (Fig. 51, 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. 51, item 7) to adopt the network settings.

IMPORTANT

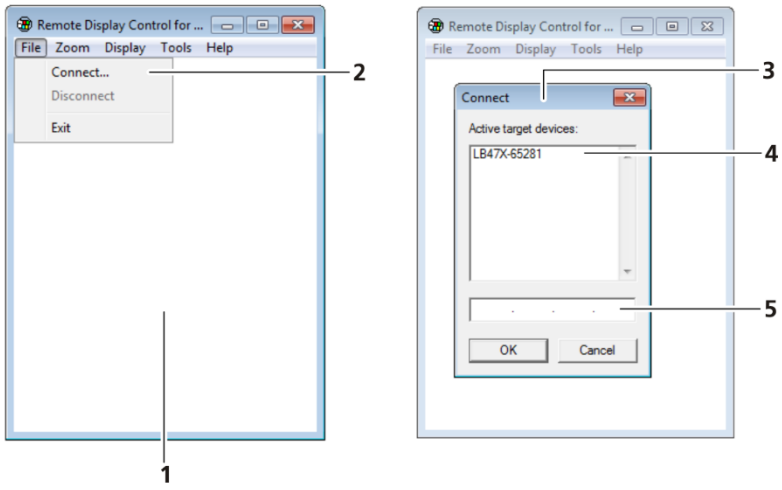
All settings applied must be confirmed by clicking on <Apply>, for the settings to become effective.

Remote Control Software

If the EVU is connected to a network at the RJ45 socket (Fig. 5, 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. 49, item 1).



1 **Programme Remote Control**
2 **Box** <Connect...>
3 **Window Connect**
4 **List of transmitters**
5 **Input box IP address**

Fig. 52 Establishing connection to the EVU using the RC software

1. Click on **"LB47xRemoteControl.exe"**, to start the programme.

▶ The program starts (Fig. 52, item 1).

2. Click on the <File> tab and then on <Connect...> (Fig. 52, item 2), to establish a connection to the EVU.

▶ A new window “Connect” is opened (Fig. 52, item 3) and the connected transmitters are listed.

IMPORTANT

The IP address of the EVU must be in the same sub-network (Fig. 51, item 3) as the network adapter of the computer (see previous Chapter “Network”).

3. Click on the identifier of the transmitter (Fig. 52, item 4) or enter the IP address of the EVU in the input box (Fig. 52, item 5) (see Fig. 51, item 2).
4. Click on <OK>.

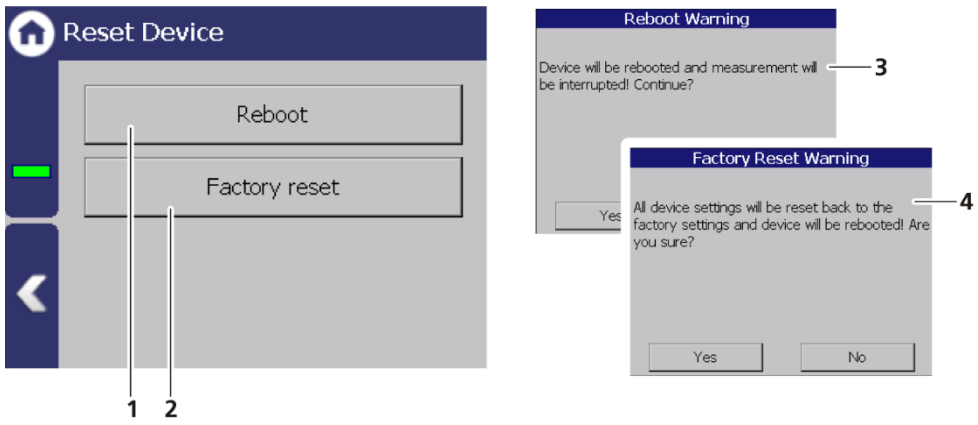
▶ The connection to the EVU is established.

5. You can enlarge the view in the “Zoom” menu (2x, 3x).

Reset device (EVU)

Device Setup | Setup | System | Device reset

The transmitter can be restarted and reset to factory settings in the submenu "Reset device".



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

Fig. 53 Reset device

Restart the device

IMPORTANT

The measurement is interrupted during a restart!

1. To restart the device, click the button <Reboot> (Fig. 53, item 1).
   - A window with a warning “Reboot” (Fig. 53, item 3) opens.
2. Click on <Yes> to confirm.
   - The device is restarted.

Resetting the device (factory settings)

IMPORTANT

When there is a reset to factory settings, all data logs are deleted and all user-defined configuration settings are reset!

1. To reset the evaluation unit to the factory settings, click the button <Factory settings> (Fig. 53, item 2).

▶ A window with the warning “Factory settings” (Fig. 53, item 4) opens.

2. Click on <Yes> to confirm.

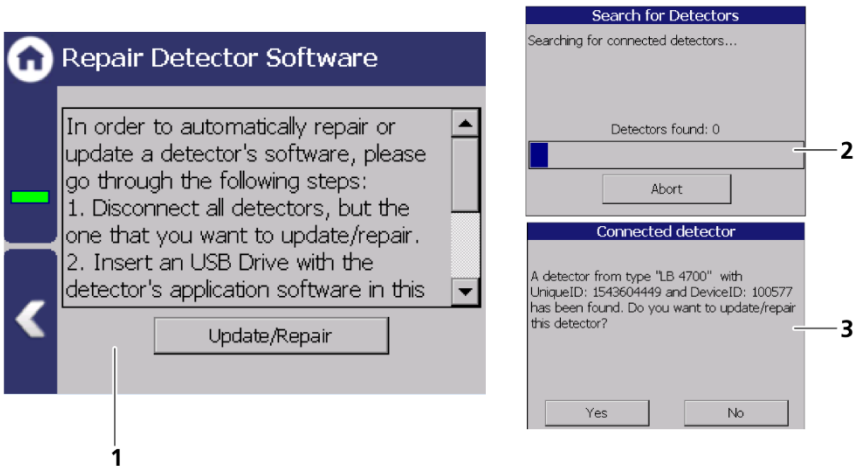
▶ The device is reset to factory settings and restarts.

IMPORTANT

In the event of the error code M102, the transmitter must be reset twice.

Repair Detector Software

Device settings | Setup | System | Repair Detector Software



1 **Description; Button Update / Repair**
2 **Process "Search Detectors"**
3 **Search result**

Fig. 54 Repair Detector Software

⚠ 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.
- 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.

If a communication interruption occurs during an update of the detector software, it is not possible to reinstall the software. With the "Repair detector software" function, the connection to the detector can be re-established and the update restarted. Corresponding information is displayed to the user in this menu.

Tip

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

7.3.2 Sensors

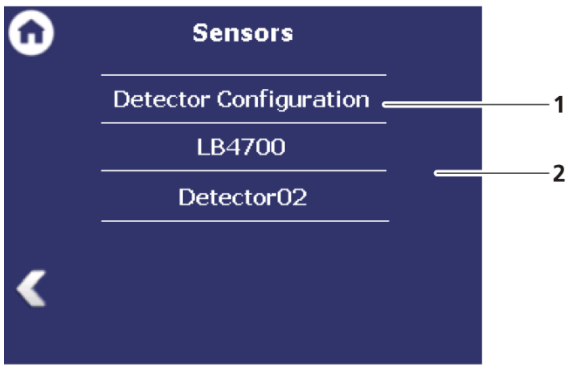
Device Setup | Setup | Sensors

You can perform the following settings and read information in the submenu Sensors:

- Detector configuration (Fig. 55, item 1)
  - Add / Remove detectors
  - Settings of the detectors
- Configuration of the respective detector (Fig. 55, item 2)
  - Overview
  - Plateau
  - Temperature
  - High voltage
  - Detector service

IMPORTANT

If the system does not detect a detector, then the sub-menu “Detector” (Fig. 55, item 2) cannot be selected.



1 Detector configuration
2 Configured detectors

Fig. 55 Menu “Sensors”

Detector configuration

Device Setup | Setup | Sensors | Detector configuration

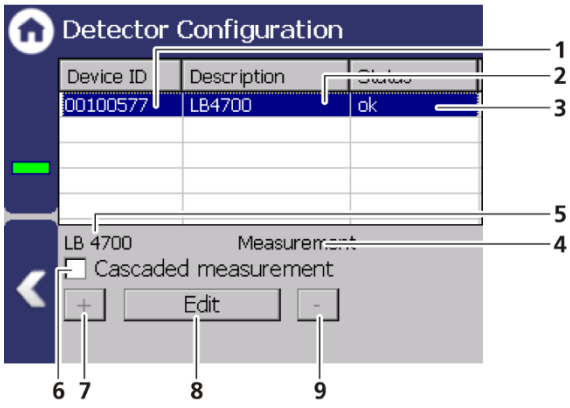
In the sub-menu “Detector configuration” the detectors for the measuring system are added and configured. Only configured detectors are listed and shown in the menu (Fig. 55). When a detector is selected, the detector type (Fig. 56, item 5) and measuring task (Fig. 56, item 4) are shown.

Clicking the box <Edit> (Fig. 56, item 8) selects the type of detector and changes the description. The boxes <+> and <-> can be used to add and remove detectors for cascading measurement.

Evaluation of the measurement data from detectors type LB44xx and LB54xx is only possible with Master units.

Information

Information and settings for the detector are in the individual detector menu (Fig. 62).



1	Device ID of the detector	6	Selection box “Cascaded measurement”
2	Description of the detector	7	Button < + > for adding a detector.
3	Detector status	8	Button <Edit>
4	Measuring task for the selected detector	9	Button < - > to remove the selected detector
5	Type of selected detector		

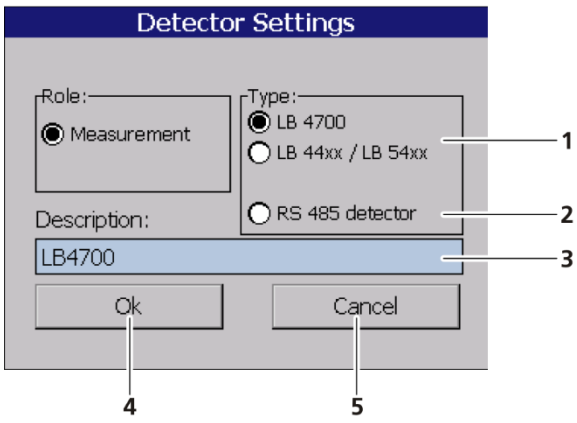
Fig. 56 Detector configuration

NOTICE

At least two detectors are required on wide conveyors to be able to cover the measuring range. The second detector must be connected to the Slave module. Please observe the instructions in the following chapters “Cascaded system configuration”.

Detector settings

The editing of the settings of a configured detector are edited by marking and clicking on <Edit> (Fig. 56, item 3).

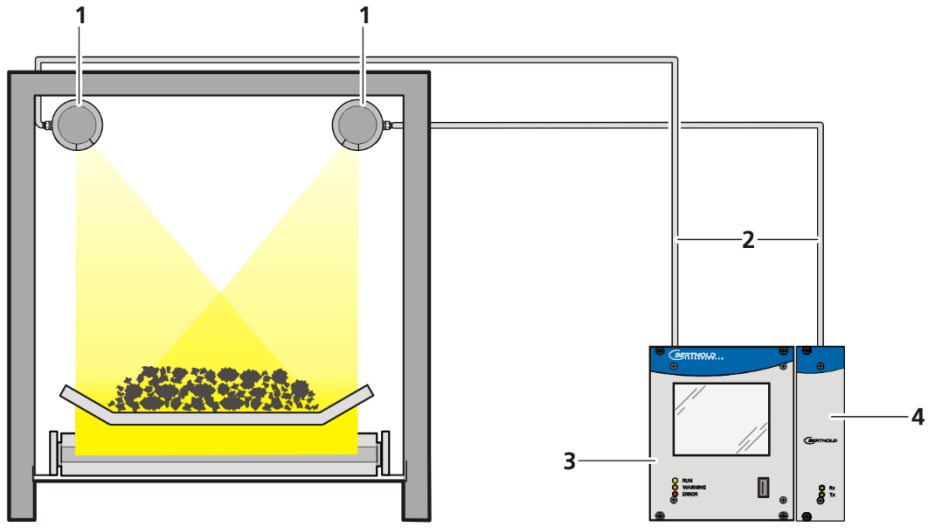


1 **Selection detector type LB4700 or LB 44xx / LB54xx**
2 **Selection RS 485 detector (for cascaded system)**
3 **Input field "Description"**
4 **Button** <OK>
5 **Button** <Cancel>

Fig. 57 Detector settings

LB47xx	Detector of type LB47xx. Can evaluate measured data with a Master unit and with a Slave unit.
LB44xx/LB54xx	Detector type LB44xx / LB54xx. Can evaluate measured data only with a Master EVU.
RS 485 detector	With the selection “RS 485 detector” it is possible to connect a specific detector via the RS 485 interface.
Description	Detector description. Is displayed in error messages, event logs and in the menu structure (Fig. 63).

Configuring a cascaded system with LB47xx detectors

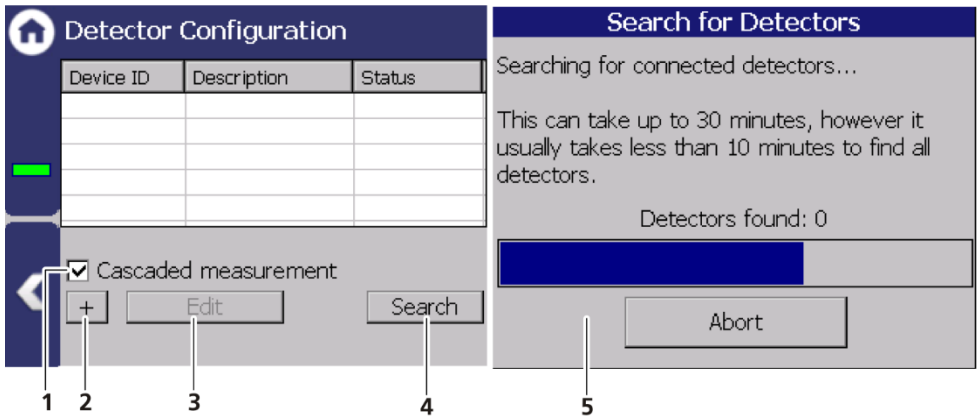


1 **LB47xx Detector**
2 **Measurement line**
3 **Master unit**
4 **Slave module**

Fig. 58 Cascaded measurement arrangement with LB47xx detectors

IMPORTANT

In the configuration “Cascaded measurement” observe the selection of the installed system components (see Chap. 3.2 measuring principle).



1 **Selection box “Cascaded measurement”**
2 **Button** < + >
3 **Button** <Edit>
4 **Button** <Search>
5 **Window “Search Detectors”**

Fig. 59 Example of detector configuration for cascaded measurement

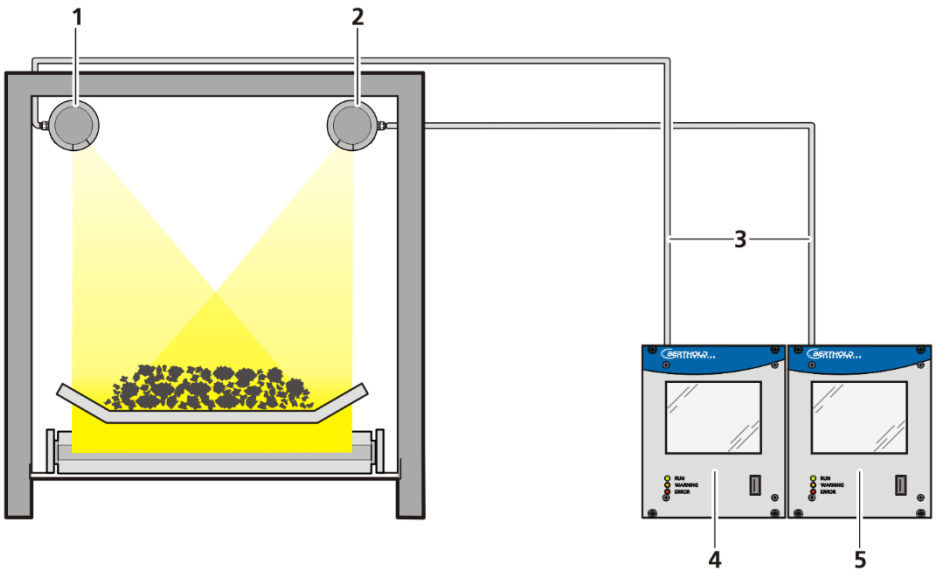
1. If the connection to the EVU (Master-Slave) is correct, the detectors type LB47xx are detected and incorporated automatically.
2. Activate the selection box “Cascaded measurement”.
3. Click on the button <Search> to incorporate connected detectors.

IMPORTANT

Both LED (Rx, Tx) indicators flash with proper installation and configuration of a detector on the slave module.

Configuring cascaded system with detectors type LB44xx/LB54xx

The transmitter of the first detector (Fig. 60, item 1) works as a Master in the function. The count rate and error messages of the Slave system (Fig. 60, item 2 and item 5) are transferred to the Master unit via the RS 485.

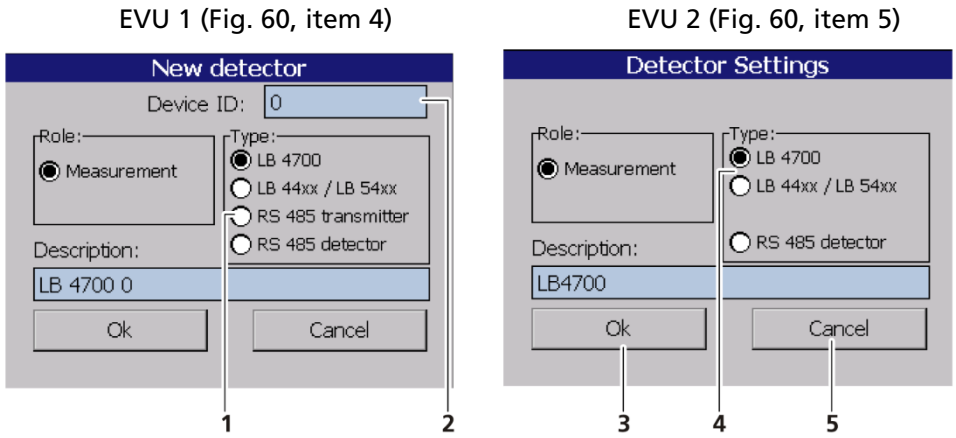


1 Detector 1 (LB44xx / LB54xx)
2 Detector 2 (LB44xx / LB54xx)
3 Measurement line
4 Master unit (EVU 1)
5 Slave module (EVU 2)

Fig. 60 Cascaded measurement arrangement with LB44xx / LB54xx detectors

IMPORTANT

In the configuration “Cascaded measurement” observe the selection of the installed system components (see Chap. 3.2 measuring principle).



1 Selection detector type EVU 1
2 Input field "Device ID"
3 Button <Ok>
4 Selection Detector type EVU2
5 Button <Cancel>

Fig. 61 Detector settings EVU 1 and EVU 2

IMPORTANT

Incorporate the detector 2 to the EVU 2 first, before activating the selection box “Cascading measurement” on the EVU 1.

Detector settings Master EVU 2

1. Click on the button <Search> (Fig. 59, item 4) on the EVU 2 to incorporate connected detectors.

▶ The connected devices will be displayed and listed latest after 30 minutes.

2. Click on the button <+> if no device is detected by the EVU.
3. Select "LB44xx / LB54xx" and click on the button <OK>.

▶ The detector has been incorporated and can now transmit count rates and error messages to the EVU 1.

Detector settings Master EVU 1

4. Activate the selection box “Cascaded measurement” on the EVU 1.
5. Click on the button <Search> to incorporate connected devices.

▶ The connected devices (detector 1 and EVU 2) are displayed and listed latest after 30 minutes.

6. Click on the button <+> if no device is detected by the EVU.
7. Select EVU under type RS 485.
8. Click on the input box Device ID (Fig. 61, item 2) and enter the device ID of the EVU 2.
9. Click on the button <OK>.

▶ The cascaded system has been configured and can be calibrated.

Detector settings

Device Setup | Setup | Sensors | [NAME DETECTOR]

You can adjust the following settings and read information in the submenu of the respective detector:

- Overview of count rate, HV value and temperature
- Plateau
  - Plateau settings
  - Plateau measurement
  - Plateau table
  - Plateau curve
- Current temperature and extreme values
- High voltage
  - Detector type
  - HV settings
- Pt100
- Detector service
  - Device information
  - Event Log
  - Event overview
  - Detector reset

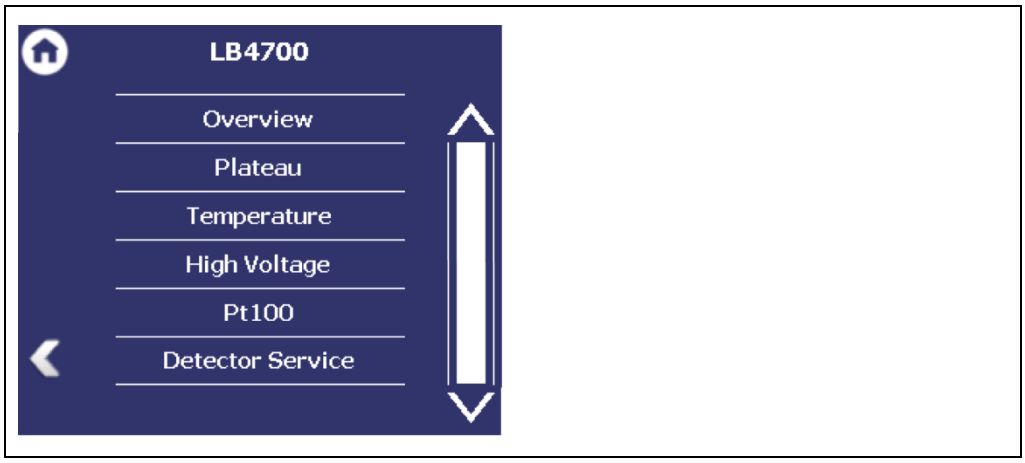
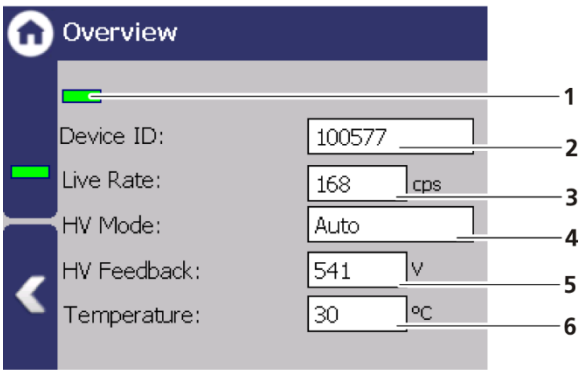


Fig. 62 Submenu “Detector”

Detector settings: Overview

Device Setup | Setup | Sensors | | NAME DETECTOR] | Overview

All important parameters and measured values of the detector are clearly displayed in the submenu “Overview”.



1 Status information of the detector
2 Device ID of the detector
3 Live count rate [cps]
4 HV mode
5 HV actual value [V]
6 Temperature [°C]

Fig. 63 Overview detector information

	A green bar appears with error-free status of the detector (Fig. 63, item 1).
Device ID	Shows the ID of the detector.
Live rate	The “Live rate” (Fig. 63, item 3) displays the current, unfiltered count rate.
HV mode	In the field “HV mode" (Fig. 63, item 4), the HV mode is displayed, which is chosen under Device Setup	Setup	Sensors		NAME DETECTOR]	High voltage	HV settings.
HV Feedback	The field “HV Feedback” (Fig. 63, item 5) displays the actual measured value in volts.
Temperature	The field “Temperature” (Fig. 63, item 6) indicates the current temperature of the detector in C°.

Detector settings: Plateau

Device Setup | Setup | Sensors | | NAME DETECTOR] | Plateau

The plateau provides information as to whether the detector is working in a stable condition. A plateau recording is therefore only carried out if the measured value drifts or if there are any other doubts about the function of the detector. The plateau recording can then assist in restricting the possible cause of the problem.

The high voltage necessary for the operation of the photomultipliers is increased stepwise for the plateau recording and the pulse rate measured after each increase.

The determined plateau curve is displayed on a diagram. The pulse rate increases with increasing voltage. This must form a unique plateau. If a too short or too steep plateau is detected, the detector is operating in an unstable manner. The submenu “Plateau” (Fig. 64) leads to the plateau measuring and the display of plateau values.

Contact your service or sales partner, or Berthold direct, to obtain a qualified assessment of the measured plateau.

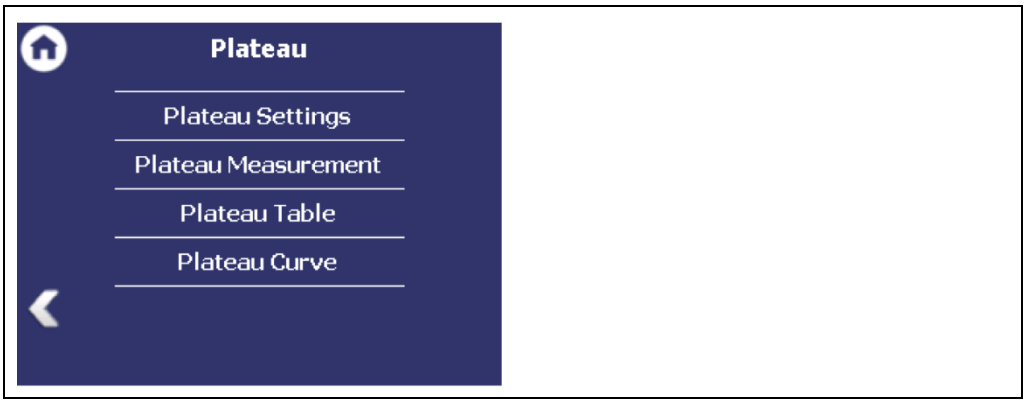


Fig. 64 Submenu “Plateau”

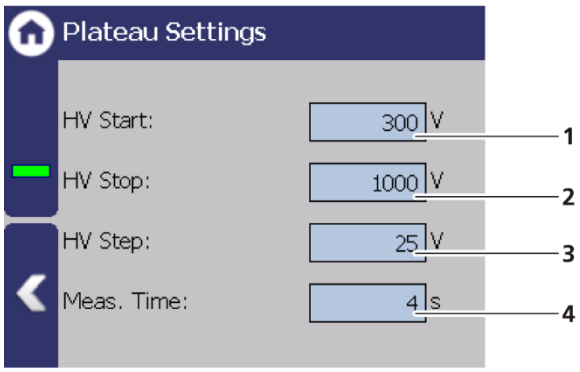
Plateau settings

Device Setup | Setup | Sensors | [NAME DETECTOR] | Plateau | Plateau settings

The values in the submenu "Plateau settings" are pre-set by Berthold on delivery and can be used in most situations.

You have the following settings options in the submenu "Plateau Settings":

HV start / HV stop	Defining the range of the plateau recording.
HV step	Specifies the step (interval) between two measuring points.
Measuring time	Identifies the time that is used per measuring point for the counting of the count rate.



1 Input field HV start value in volts
2 Input field HV end value in volts
3 Input field HV increment in volts
4 Input field measuring time in seconds

Fig. 65 Plateau settings

1. Click on the corresponding text field.

▶ The input field opens.

2. Change to the keypad and enter the value.
3. Confirm with the Enter key.

▶ The values for the recording plateau have been changed.

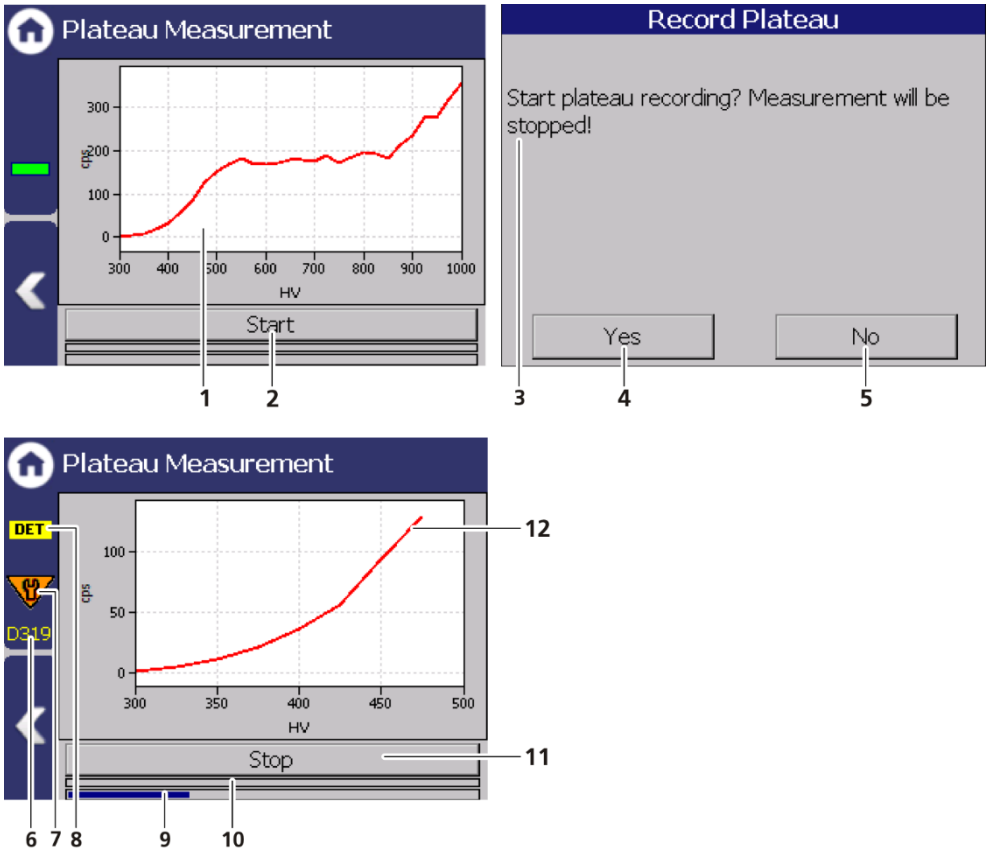
Perform plateau measurement

Device Setup | Setup | Sensors | [NAME DETECTOR] | Plateau | Plateau measurement

IMPORTANT

The environmental conditions and the dose rate must be constant during the plateau recording.

- Observe the operating manual of the detector!



1	**Plateau curve**	7	**Notice Maintenance**
2	**Button** <Start>	8	**Notice DET**
3	**Window "Record plateau"**	9	**Progress bar measuring process**
4	**Button** <Yes>	10	**Progress bar measuring step**
5	**Button** <No>	11	**Button** <Stop>
6	**Notice Code**	12	**New plateau curve**

Fig. 66 Recording a plateau curve

1. Click on <Start> (Fig. 66, item 2) to carry out a plateau measurement.

- The confirmation message "Record plateau" (Fig. 66, item 3) opens.

2. Confirm with <Yes> (Fig. 66, item 4).

- The EVU switches to mode “DET” (Fig. 66, item 8) and the current measurement is stopped.

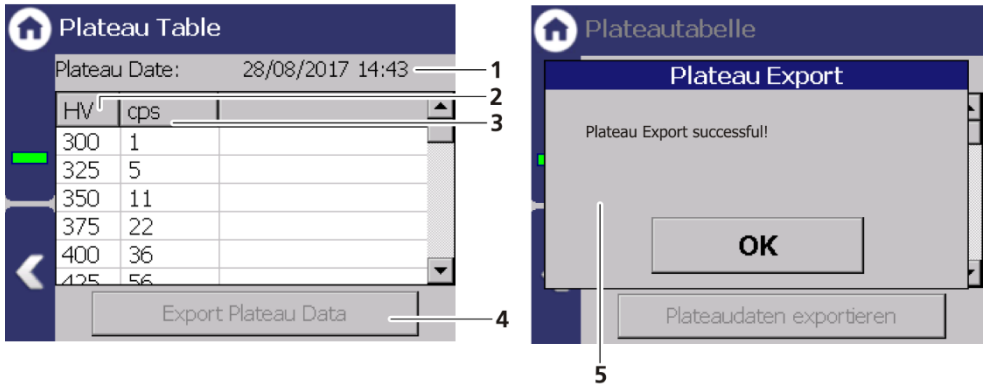
- The information (Fig. 66, item 6 - 8) from the plateau measurement are displayed in the status information. The LED Run flashes on the EVU during the plateau measurement. The LED “Warning” lights up at the same time.

- If you click on the <Stop> button during the measurement, the measuring process is interrupted. The measurement data are invalid and will be deleted.
- The recorded values are read and entered into the table (Fig. 67), the plateau curve (Fig. 68) is drawn and stored automatically.

Plateau table

Device Setup | Setup | Sensors | [NAME DETECTOR] | Plateau | Plateau table

The data from each measurement point are listed in the plateau table. The data from the plateau table can be exported to a USB memory device.



1 **Date and time of measurement recording**
2 **High voltage (HV) in volts**
3 **Count rate in the measurement channel (cps)**
4 **Button <Export plateau data>**
5 **Window "Export successful"**

Fig. 67 Plateau table

Export plateau data

1. Connect a USB storage device to the device (Fig. 4, item 5).

▶ The USB memory device is recognised by the system after a few seconds and the button <Export plateau data> can be clicked.

2. Click on the button <Export plateau data> (Fig. 67, item 5).

▶ The values of the plateau measurement have been stored in a .txt file.

3. Confirm the message with <OK>.

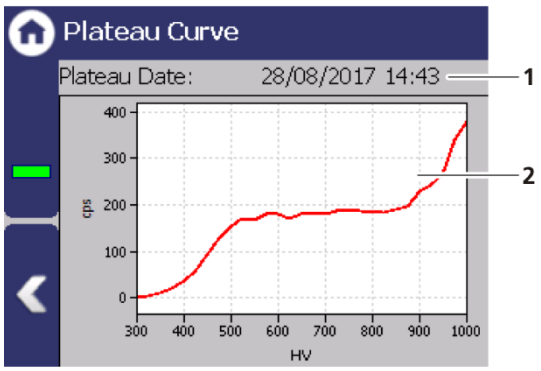
Information

The file name is derived from "Plateau", the date and time of the measurement process (PlateauYYYYMMDD_hr_min_sec.txt).

Plateau curve

Device Setup | Setup | Sensors | [NAME DETECTOR] | Plateau | Plateau curve

The mapped characteristic curve (Fig. 68, item 2) of the last complete plateau measurement is displayed in the submenu “Plateau curve”.



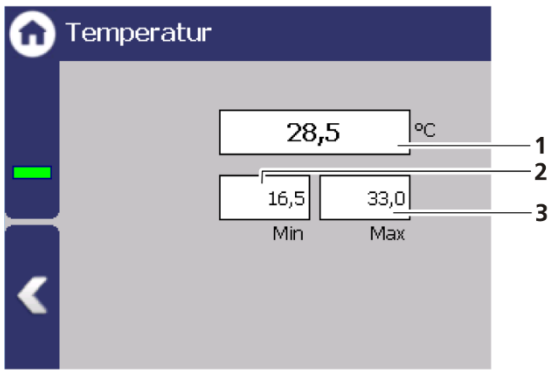
1 Date and time of measurement recording
2 Characteristic curve

Fig. 68 Plateau curve

Detector settings: Temperature

Device Setup | Setup | Sensors | | NAME DETECTOR] | Temperature

The current temperature (Fig. 69, item 1) and extreme values (Fig. 69, item 2, item 3) of the detector is displayed in the submenu “Temperature”.



1 Current temperature of the detector [°C]
2 Minimum measured temperature [°C]
3 Maximum measured temperature [°C]

Fig. 69Temperature display of the detector

Detector settings: High voltage

Device Setup | Setup | Sensors | | NAME DETECTOR] | High voltage

You can select the detector code and make settings for high-voltage regulation in the submenu “High voltage” of the respective detector.

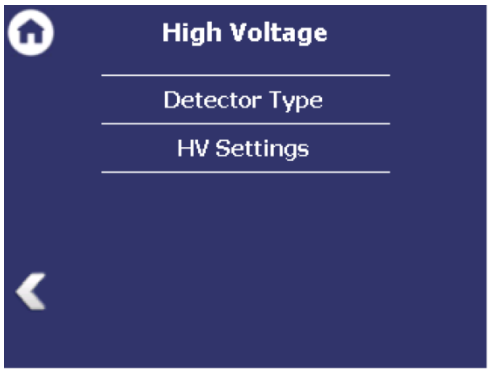


Fig. 70 Submenu “High voltage”

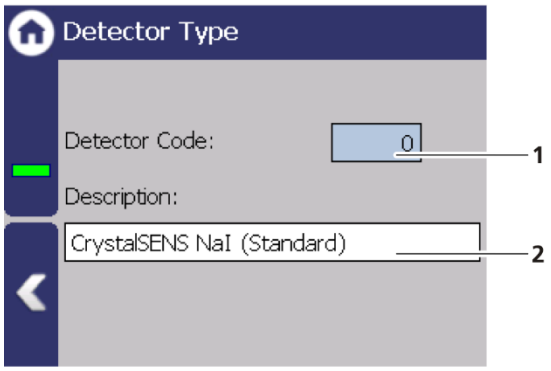
Detector settings: High Voltage | Detector Type

Device Setup | Setup | Sensors | [NAME DETECTOR] | High voltage | Detector Type

Internal device parameters are adjusted to suit the size of the used scintillator by setting the detector code. The correct detector code is already set at the factory and a change is not normally required.

IMPORTANT

A table with the detector codes to be used can be found in the operating manual of the detector.

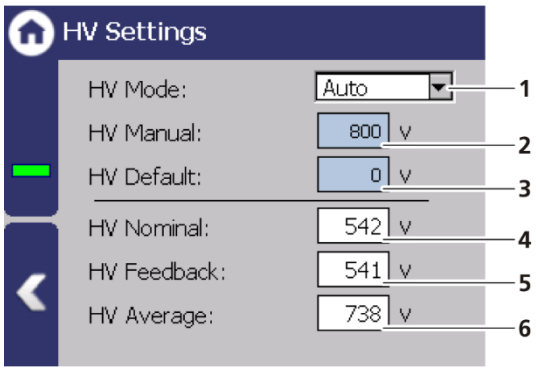


1 Input field Detector code
2 Description of the scintillator type

Fig. 71 Detector Type: Setting the scintillator type

Detector settings: High voltage | HV settings

Device Setup | Setup | Sensors | | NAME DETECTOR] | High voltage | HV settings



1 Selection High voltage mode "Auto" / "Manual"
2 Input field Manual high voltage
3 Input field HV Default (starting value of the high voltage regulation)
4 Display setting value high voltage
5 Display actual value high voltage
6 Display average high voltage

Fig. 72 Overview HV Settings

NOTICE

Default HV is preset by Berthold. A subsequent change is not usually necessary. The default value HV = 0 may only be set for testing purposes. An incorrect setting may cause malfunction.

NOTICE

The use of the "Manual" as a normal operating mode for high-voltage control is not recommended by Berthold. "Manual" should only be used for service purposes.

Make HV settings

1. Click on the selection arrow (Fig. 72, item 1) in order to set the desired HV mode (auto or manual).

- AUTO: The optimum high-voltage supply of the photomultiplier is automatically determined and set by the device.
- MANUAL: The high voltage is maintained at a fixed, user-entered value (Fig. 72, item 2).

2. Click in the input field "HV Default" (Fig. 72, item 3) to open the input field.
3. Enter the desired starting value for the high-voltage regulation.
4. Confirm with the Enter key.

Detector settings: Pt100

Device Setup | Setup | Sensors | | NAME DETECTOR] | Pt100

The current temperature of the measuring probe is displayed for the connected Pt 100 measuring probe. In this submenu. In addition, the Pt100 input can be calibrated.

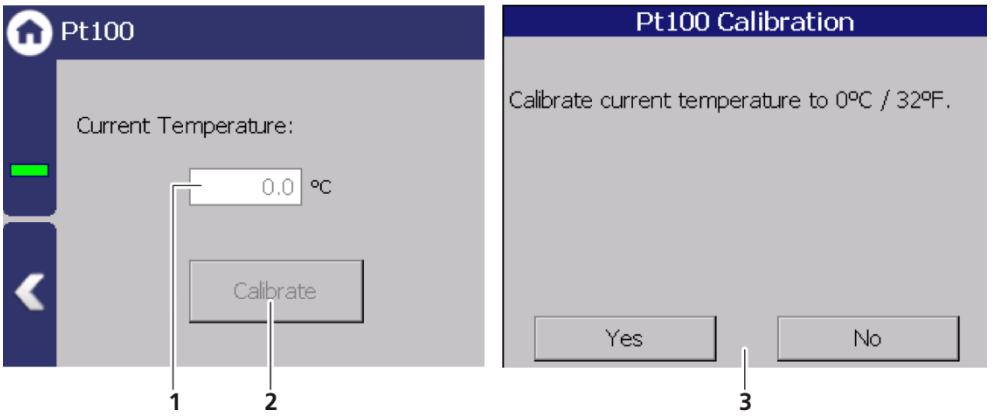
IMPORTANT

The product temperature must be recorded for temperature compensation. This is carried out either by the measuring probe (Pt100) or by the infeed of the product temperature as a current signal 0/4 - 20 mA.

- Further information about temperature compensation is in Chapter 7.3.3 Calibration (sub-chapter Temperature Compensation).

NOTICE

The temperature measurement must be carried out in such a way that the measured temperature is as similar as possible to the product temperature at the density measuring point. Observe the details for installation of the Pt100 in the detector operating manual.



1 **Display box current temperature °C**
2 **Button "Calibrate"**
3 **Window "Pt100 Calibration"**

Fig. 73 Pt100

Detector settings: Detector service

Device Setup | Setup | Sensors | | NAME DETECTOR] Service

You can adjust the following settings and read information in the submenu “Service” of the individual detector:

- Device information
- Event Log
- Event Overview
- Reset Detector

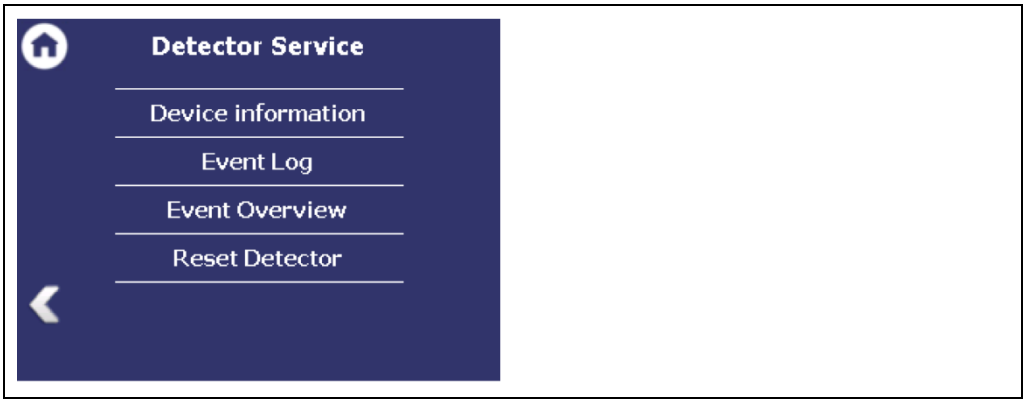
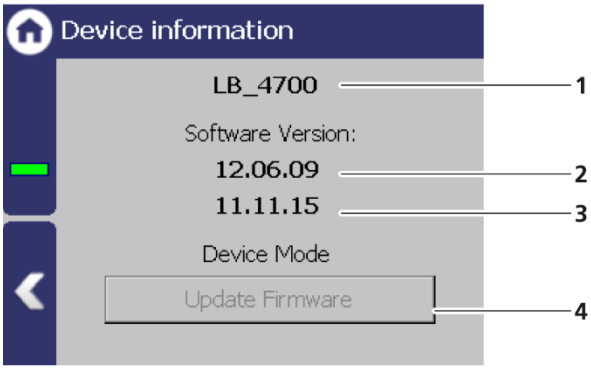


Fig. 74 Menu "Detector Service"

Detector settings: Detector Service | Device information

Device Setup | Setup | Sensors | | NAME DETECTOR] | Detector Service | Device Information

This submenu shows you the type of detector (Fig. 75, item 1) as well as an overview of the software version (Fig. 75, item 2, item 3) of the detector.



1 **Detector type**
2 **Software version x**
3 **Software version**
4 **Button** <Firmware Update>

Fig. 75 Device information

NOTICE

An update of the firmware of the detector may takes about an hour and may only be performed by qualified specialists.

Tipp

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

IMPORTANT

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

Perform firmware update

1. Save the current update file of the firmware of the detector on a USB storage device.
2. Connect a USB storage device to the device (Fig. 4, item 5).
3. The USB storage device is recognised by the system after a few seconds and the <Firmware Update> (Fig. 75, item 4) button can be clicked.
4. Click on the button <Firmware Update> (Fig. 75, item 4).
5. The update is performed.

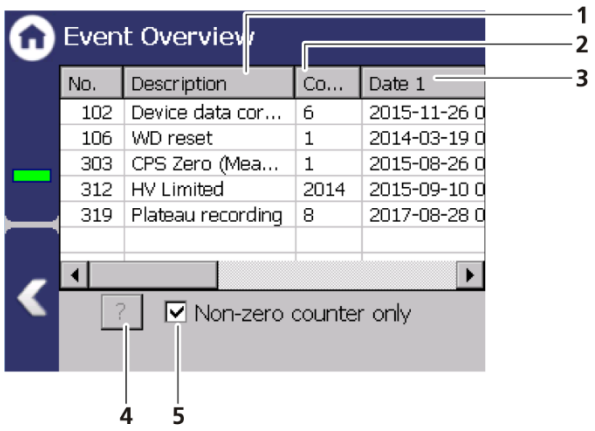
NOTICE

Berthold recommends a test or a calibrating the current outputs whenever if a software update has been carried out.

Detector settings: Service | Event log

Device Setup | Setup | Sensors | [NAME DETECTOR] Service | Event log

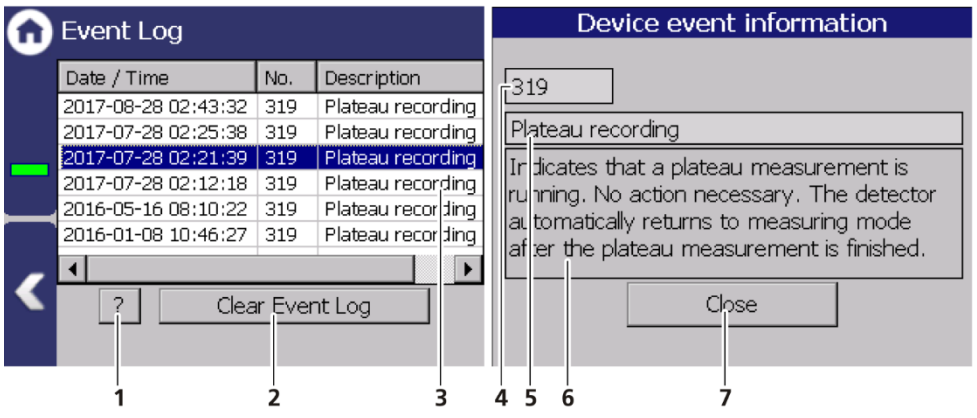
The last 25 events of the detector are displayed in the submenu “Event Log".



1 **Date / time of the event**
2 **Event no.**
3 **Info (event title)**
4 **Button <?> to display the detailed event description.**
5 **Button <Delete event log>**

Fig. 76 Event log

Display event description



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

Fig. 77 Event log

1. Click on a line in the list (Fig. 77, item 3).
2. Click on <?> (Fig. 77, item 1).

▶ The event description appears.

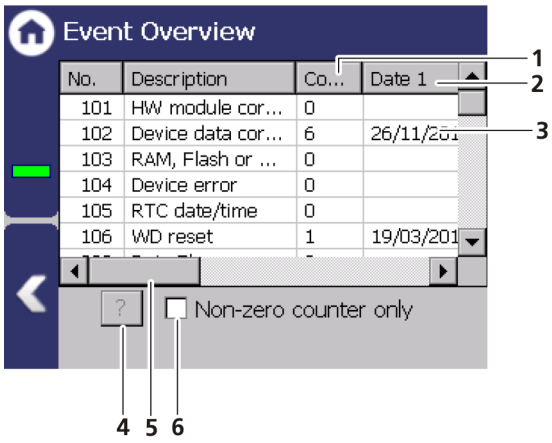
3. Close the event description (Fig. 77, item 7) with the button <Close>.

▶ With the button <Delete event log> (Fig. 77, item 2) all events are deleted.

Detector settings: Service | Event overview

Device Setup | Setup | Sensors | | NAME DETECTOR] | Detector Service | Event Overview

All events that can be logged are chronologically presented in tabular form in the submenu “Event overview”. Activate the check box “Non-zero counter only” (Fig. 78, item 5) in order to display events that have occurred.



1	"Number" column	4	Button < ? >
2	"Date" column	5	Horizontal scroll bar
3	Event line	6	Selection box ”Non-zero counter only ”

Fig. 78 Event overview

1. Click on a line in the list (Fig. 78, item 3).
2. Click on <? > (Fig. 78, item 47).

▶ The event description appears.

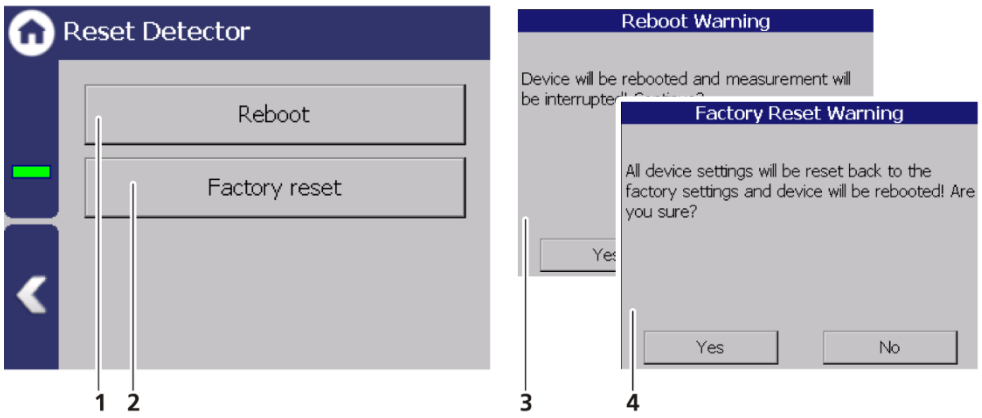
3. Close the event description with the button <Close>.
4. Slide the bar of the horizontal scroll bar to the right to see at what times (date, time) the event occurred.

▶ The last 5 times (dates 1 to 5) are displayed.

Detector settings: Service | Reset device (detector)

Device Setup | Setup | Sensors | | NAME DETECTOR] | Detector Service | Reset device

In “Reset detector”, the detector can be restarted and be reset to the factory settings.



1 **Button Restart**
2 **Button Factory settings**
3 **Window "Warning: Reboot"**
4 **Window "Warning: Factory Reset"**

Fig. 79 Reset Detector

IMPORTANT

The measurement is interrupted during a restart!

1. To restart the detector, click the button <Restart> (Fig. 79, item 1).
   - A window with a warning “Restart” (Fig. 79, item 3) opens.
2. Click on <Yes> to confirm.
   - The device is restarted.

IMPORTANT

All custom configuration settings will be lost with a reset to factory settings!

1. To reset the detector to the factory settings, click the button <Factory settings> (Fig. 79, item 2).
   - A window with the warning Factory settings (Fig. 79, item 4) opens.
2. Click on <Yes> to confirm.
   - The device is reset to factory settings and restarts.

7.3.3 Calibration

Device Setup | Setup | Calibration

The Calibration menu is used for the selection of the calibration and calculation method and for adaption of the measurement system to the respective environmental conditions, the actual radiation activity and the adaptation of the background radiation (background level).

If various different products or materials having different consistencies are conveyed, various different calibration settings can be saved in one of the four measurement parameter sets.

NOTICE

Material damage to the device or the system!

Errors in calibration or in the parameter setting can lead to incorrect measurement results. This may possibly lead to loss of production or to damage in the system.

- We encourage you to have the calibration and commissioning performed by Berthold service.

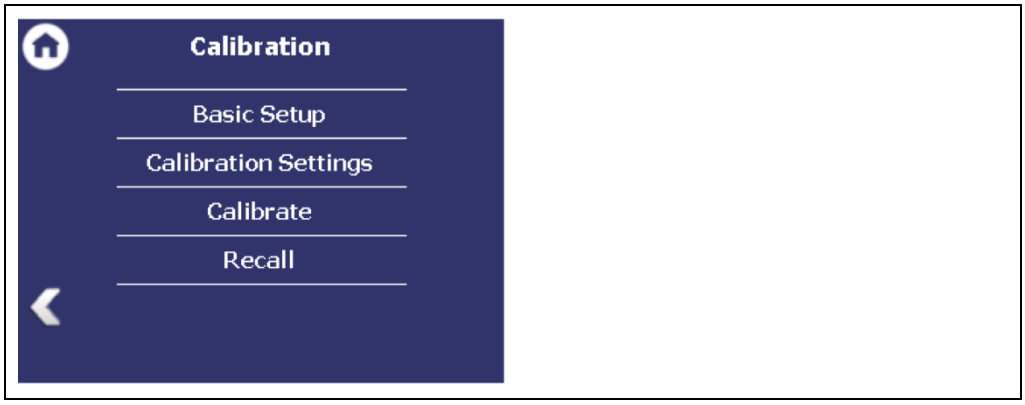
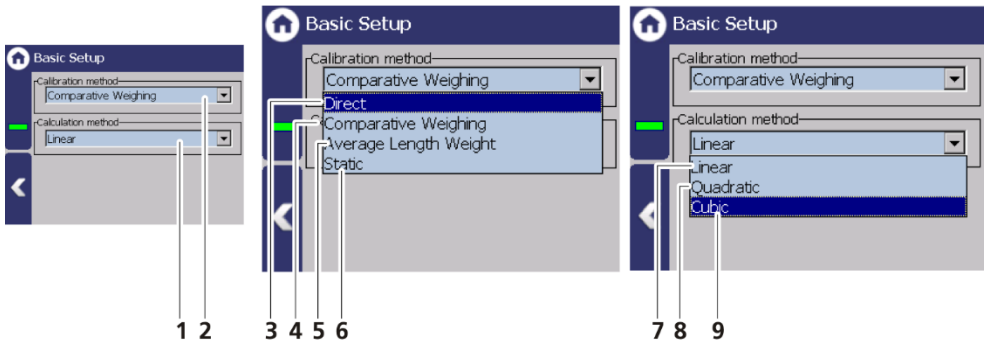


Fig. 80 Menu “Calibration”

Basic Setup

Device Setup | Setup | Calibration | Basic Setup

Under “Basic Settings” you can only change the settings of the active measurement parameter set.



1	Selection calibration method	6	Calibration method static
2	Selection calculation method	7	Calculation method linear
3	Calibration method direct	8	Calculation method quadr.
4	Calibration method Comparative weighing	9	Calculation method cubic
5	Calibration method average length weight		

Fig. 81 Basic Setup

Calibration method

Direct

This calibration method should only then selected if comparison weighing is not possible and the absorption coefficient of the material to be conveyed is known.

Comparative weighing

This method allows a high calibration accuracy. The material must be weighed using a different set of scales, in other words a comparison set of scales. Which comparison weighing can be carried out depends on the local possibilities (truck scales, storage container with weighing cells).

Average length weight

With endless products that need to be conveyed through the measuring bracket, plates can be cut out and weighed, for example. The comparison weight is calculated from the average value of several plates and entered in kg/m.

Static

In static calibration we just convey a small volume of material through the measuring bracket which is weighed before or after the calibration weighing on a comparison set of scales. However, this method can only be used as a vaguely precalibration.

Calculation methods

The calculation methods allow you to calibrate the measuring characteristic lines in such a way that the characteristic line lies as close as possible to the calibration points.

The quadratic or cubic methods should only be used in very rare cases. They should also only be used after consultation with a technician authorised by Berthold. In all other cases you should use the linear calculation method.

In order to find out whether a quadratic or cubic calculation method is to be used instead of a linear method, however, many calibration points (>5) are required that have been determined using various different occupation heights (weights per unit area). As far as possible, these points should be distributed over the entire measurement range. These points must then be displayed on a x/y graphic with LN (CPS) for visual assessment.

Linear	This is the standard method that is used in the majority of cases. The relationship between the flow capacity and count rate absorption (LN) is linear. At least one calibration point is required along with the tare measurement in order to carry out the calculation.
Quadratic	The relationship between the flow capacity and count rate absorption (LN) is a quadratic function. At least two calibration points are required along with the tare measurement in order to carry out the calculation.
Cubic	The relationship between the flow capacity and count rate absorption (LN) is a cubic function. At least three calibration points are required along with the tare measurement in order to carry out the calculation.

Calibration settings

Device Setup | Setup | Calibration | Calibration settings

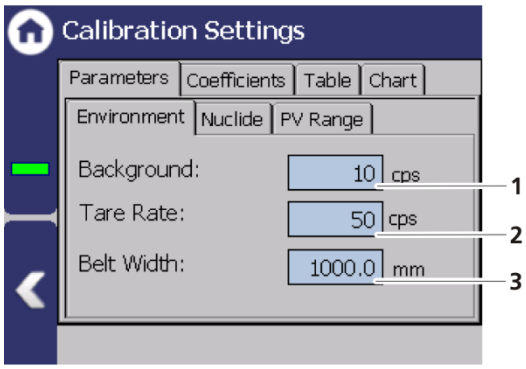
Under “Calibration Settings" you can only change the settings of the active measurement parameter set.

IMPORTANT

All inputs and changes to the settings only become effective when you click on the button < Calibrate > in the “Calibration” menu.

Calibration settings: Enviroment

Device Setup | Setup | Calibration | Calibration settings: Enviroment



1 Input field background [cps]
2 Input field tare rate [cps]
3 Input field belt width [mm]

Fig. 82 Calibration settings: Environment

Background

The background count rate (Fig. 82, item 1) is the natural background radiation of the detector and must be measured at least with rod detectors. Correct recording of the background radiation permits correct degradation compensation and thus has an effect on the long-term stability of the measured value.

Tare rate

The tare count rate is the average count rate at feed rate 0 t/h and needs to be read in. If the tare count rate changes as a result of baked-on deposits or material deposits on the detector, or on the emitter shield, then the tare must be repeated at regular intervals.

Belt width

Input of the average material occupation width on the conveyor organ. This is, in general, 80% of the belt width on belt conveyors. On box conveyors, this is the inside width of the box.

NOTICE

Previously read-in calibration points are deleted when reading in the background count rate. For this reason, entry of the background radiation is absolutely imperative before calibration.

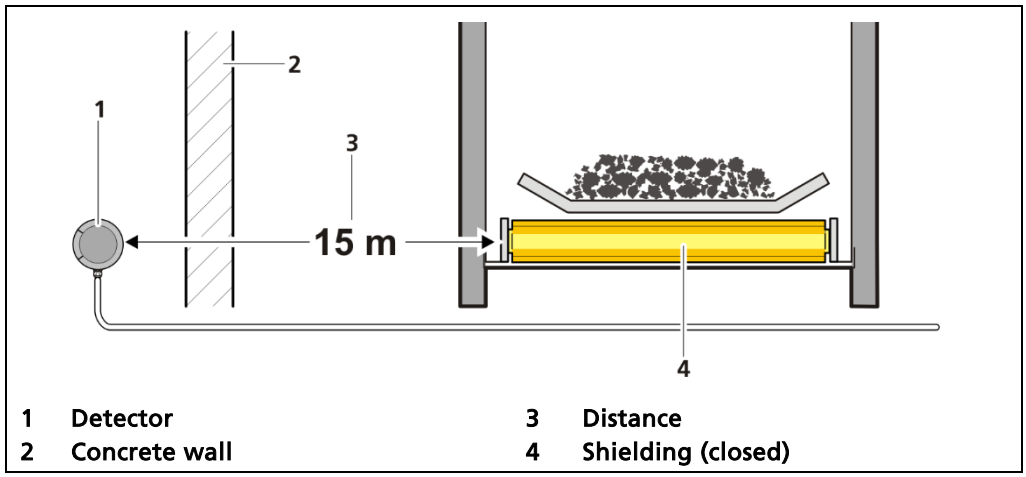
Enviroment: Determination of the background radiation

Device Setup | Setup | Calibration | Calibration settings: Enviroment

NOTICE

Even through closed shielding (Fig. 83, item 4) there will still be measurable residual radiation which can distort the measurement of the background radiation. We therefore recommend placing the detector (Fig. 83, item 1) at a suitable distance (approx. 10 m) or behind a thick concrete wall (Fig. 83, item 2) when determining the background count rate.

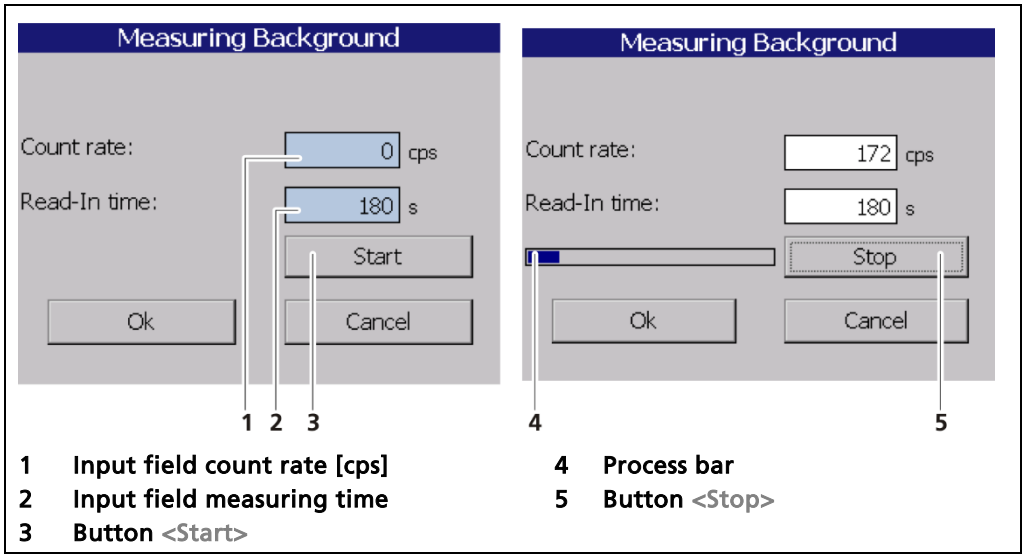
- With measurement arrangements with point radiation sources we recommend placing the shielding with the radioactive source at a suitable distance (approx. 15 m) or behind a thick concrete wall.



1	**Detector**	3	**Distance**
2	**Concrete wall**	4	**Shielding (closed)**

Fig. 83 Prerequisites for the determination of the background count rate

The background count rate (Fig. 82, item 1) is the natural background radiation of the detector and must be measured at least with rod detectors. Correct recording of the background radiation permits correct degradation compensation and thus has an effect on the long-term stability.



1	**Input field count rate [cps]**	4	**Process bar**
2	**Input field measuring time**	5	**Button** <Stop>
3	**Button** <Start>		

Fig. 84 Calibration settings: Measuring Background

1. Click on the text field "Background" (Fig. 82, item 1).

- A warning message appears “Changing the background count rate leads to a complete loss of the calibration data”.

2. Click on <OK> to confirm the execution of a new measurement.

- A new window "Background"(Fig. 84) opens to determine the background count rate.

NOTICE

Influences from neighbouring sources must be excluded in order to avoid errors in the measurement of natural background radiation.

3. Click on the “Measurement time” field (Fig. 84, item 2) and specify the duration of measurement in seconds. The higher you set the measurement time, the more accurate the result.
4. Confirm with the Enter key and click on the button <Start> to start the measurement.

- The measurement is performed.

5. Click on <OK> to accept the count rate.

Environment: Tare measurement

Device Setup | Setup | Calibration | Calibration settings: Environment

A tare measurement calibrates the measurement on an empty belt and thus to a feed rate of 0 t/h. Absorption fluctuations, caused by inhomogeneities in the conveyor belt or because of steel parts passing through (e.g. on chain conveyors) need to be centred out.

For this reason, the tare weight recording must be made with the conveying organ running and the average value is determined over several compete circuits. The greater the number of circuits, the more accurate the result will be.

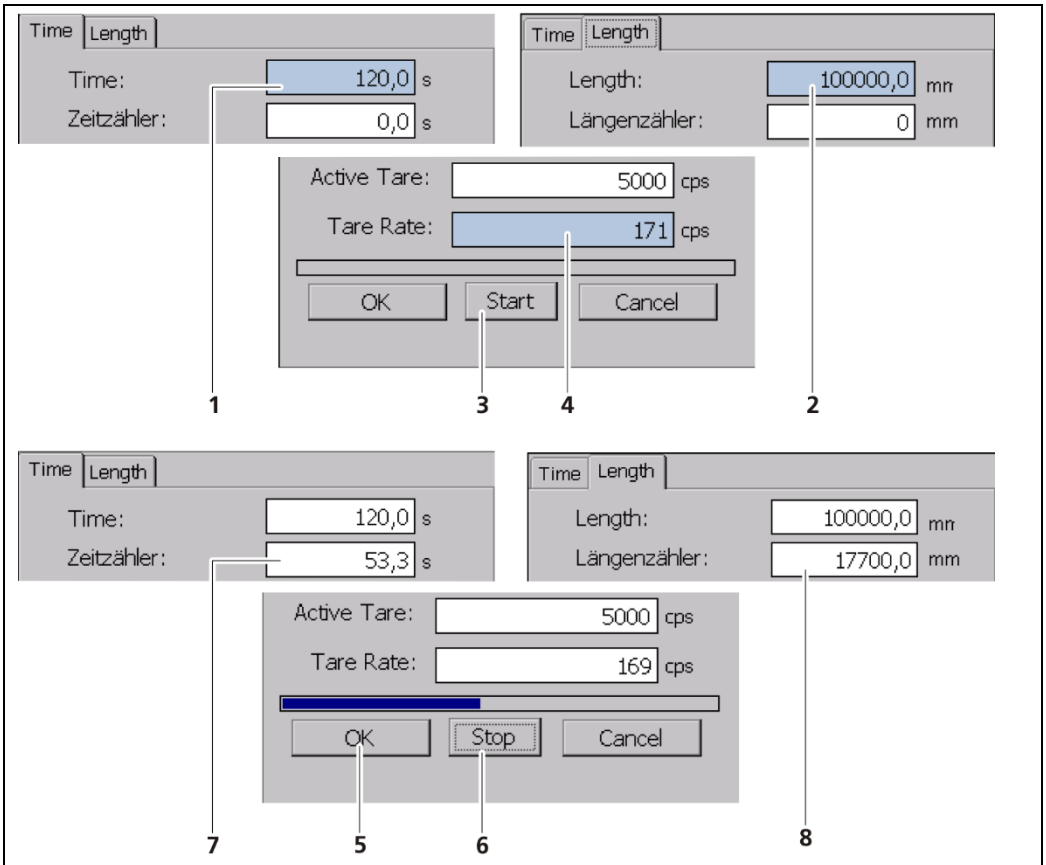
The tare determination can be checked with a subsequent test measurement of an empty belt. During the test measurement (approx. 10 minutes) there should be no, or just one negligible mass (t) integrated.

There are two possibilities for tare measurement:

- Tare measurement by time stipulation (Fig. 86, item 1)
- Tare measurement by belt length stipulation (Fig. 86, item 2)

NOTICE

The tare measurement must take place with an empty conveying organ. The result will be distorted if material is suddenly conveyed during the tare measurement process. In such a case, the tare measurement must be restarted.



1	**Input field Time [s]**	5	**Button <OK>**
2	**Input field Length [mm]**	6	**Button <Stop>**
3	**Button <Start>**	7	**Display of measured time**
4	**Input field current tare count rate [cps]**	8	**Display of measured length**

Fig. 85 Calibration settings: Environment

The measurement can be interrupted using the button <Stop> (Fig. 85, item 6). The values determined up to the point of interruption can be accepted provided that the count rate had been centred out for an adequate period and that a complete belt circulation had been carried out.

The value of the tare measurement may be entered manually (Fig. 85, item 4), if the count rate of the tare measurement is known.

Tare measurement with time stipulation

1. Mark the belt at one point and thus determine the time taken for a circuit.
2. Enter a multiple of the time for a circuit in the input box (Fig. 85, item 1).
   Example: 1 circuit measured = 56 s
   15 circuits = 840 s
3. Click on the button <Start> (Fig. 86, item 3) to start the tare measurement.

▶ The tare measurement is carried out and the measured time (Fig. 85, item 7) is displayed.

4. Click on the button <OK> (Fig. 85, item 5) to save the tare measurement.

▶ You move back to the submenu “Calibration Settings: Enviroment” and the determined value is taken over.

Tare measurement with belt length stipulation

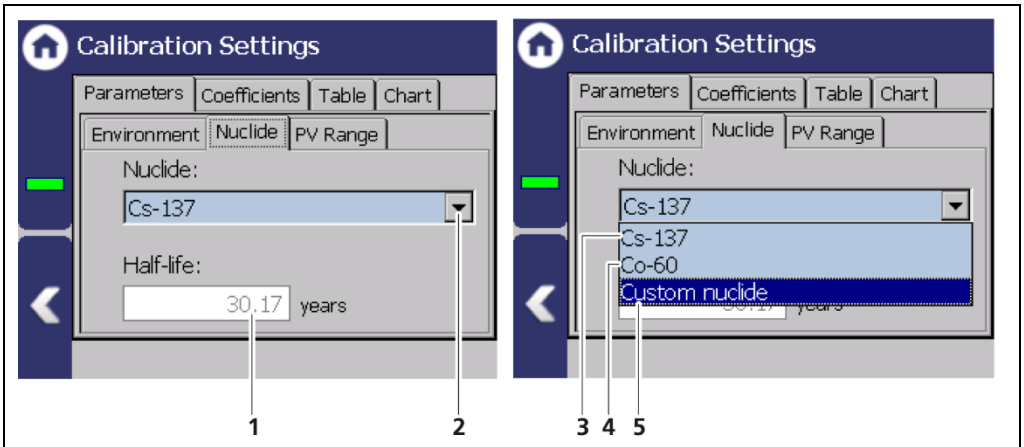
1. Enter the total length of the belt (top and bottom runs) into the input box (Fig. 85, item 2).
2. Click on the button <Start> (Fig. 85, item 3) to start the tare measurement.
3. The tare measurement is carried out and the measured length (Fig. 85, item 8 “Length Counter”) is displayed.
4. Click on the button <OK> (Fig. 85, item 5) to save the tare measurement.

▶ You move back to the submenu “Calibration Settings: Enviroment” and the determined value is taken over.

Calibration settings: Nuclide

Device Setup | Setup | Calibration | Calibration settings: Nuclide

The isotope used can be selected in the “Nuclide” tab. The half-life of the isotope is shown on the display field (Fig. 86, item 1).



1 Display field half-life [years]
2 Selection arrow Nuclide
3 Selection Caesium-137
4 Selection Cobalt-60
5 User-defined nuclide

Fig. 86 Calibration settings: Nuclide

Changing the nuclide

1. Click on the selection arrow (Fig. 86, item 2).
2. Select the isotope used Cs-137 (Fig. 86, item 3) or Co-60 (Fig. 86, item 4). The isotope of the source is on the type plate of the screen (Fig. 87).
3. When selecting “Custom nuclide” (Fig. 86, item 5), the half-life of the isotope must be entered.

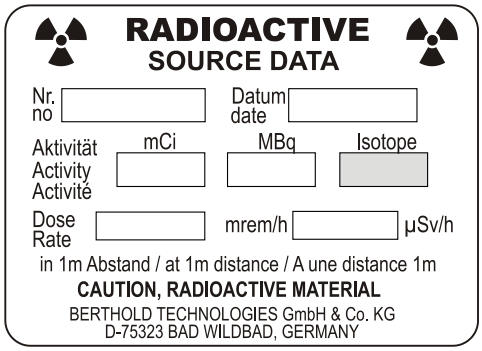
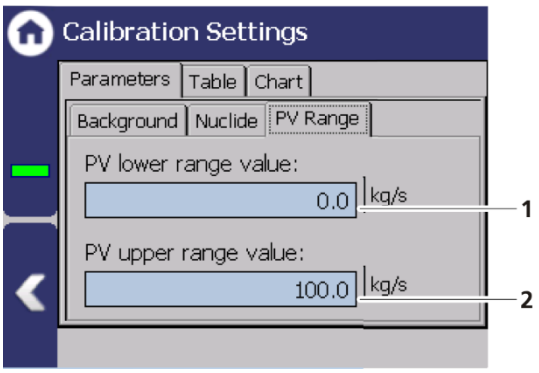


Fig. 87 Type plate source

Calibration settings: PV Range

Device Setup | Setup | Calibration | Calibration settings: PV range

The lower and upper limit of the measuring range is set in the tab “PV Range” (Process Value Range).



1 Input box PV Lower Range Value
2 Input box PV Upper Range Value

Fig. 88 Calibration settings: PV Range

Calibration settings: Coefficients

Device Setup | Setup | Calibration | Calibration settings: Coefficients

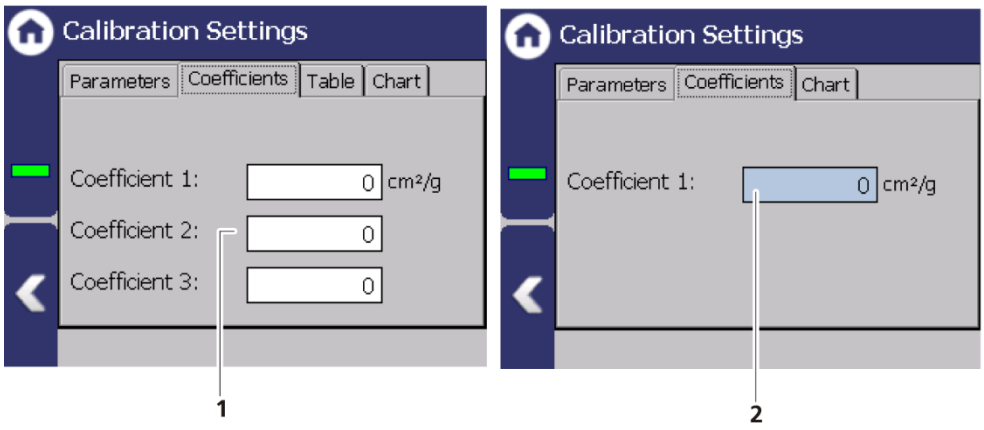
The calibration curve (absorption coefficient) is calculated by the EVU from the determined measured values and displayed in the tab “Coefficients” (Fig. 89).

For this calculation we use all calibration points where the parameters count rate, speed, measuring time and comparison weight have valid values (> zero).

The number of calculated coefficients depends on the selection of the calculation method.

- Linear = Coefficient 1
- Square = Coefficient 1, 2
- Cubic = Coefficient 1, 2, 3

When selecting the calibration method “Direct” (Fig. 81, item 3) the table tab is hidden and valid coefficients (Fig. 89, item 2) need to be entered.



1 Display box Coefficients (example: Cubic)
2 Input box (calibration method “Direct”, calculation method “Linear”)

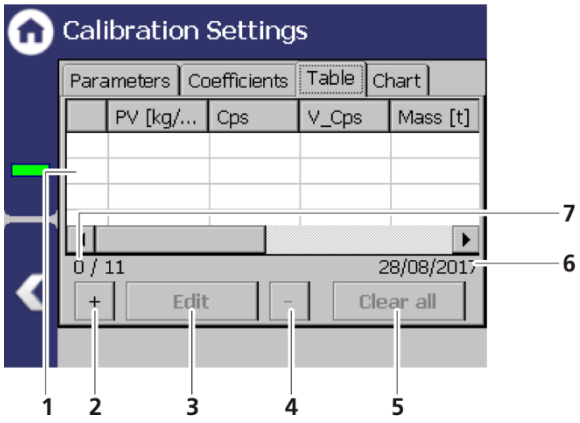
Fig. 89 Calibration settings: Coefficients

Calibration settings: Table

Device Setup | Setup | Calibration | Calibration settings

The first calibration is already set by the tare measurement: The zero point. The run of the calibration curve is determined by the position of the calibration points and the calibration method.

In order to eliminate measuring error, you should determine several different points. At each measuring point, if possible, a different average conveying rate should be run. The more the load, or the basis weight differs from one calibration point to the other, the better the calibration.



1 **Table calibration**
2 **Button** <Edit>
3 **Button Add measuring point** < + >
4 **Button Completely delete points** <Clear all>
5 **Button Delete point** < - >
6 **Date of the last editing**
7 **Number of the calibration points (max. 11)**

Fig. 90 Calibration settings (Table)

Calibration methods

After calibration, the device can be used for measurement. In the following, different calibration methods are presented. The standard method is the comparison weighing with the truck weighbridge or weighing cells.

Properly prepared and executed correctly, it enables the highest accuracy of measurement in addition to the “PV factor” measurement. Although in some cases these methods are not possible. Calibration methods 3 to 5 are still presented alternative methods.

Calibration method 1: Comparison weighing using a truck weighbridge

- Basic Settings "Comparative weighing" (Fig. 81, item 4).

The material conveyed through the measuring bracket is collected in a truck and then driven to a truck weighbridge. The truck weighbridge is thus the comparison scales. Another possibility is weighing the material before calibration and then putting it aside for calibration to charge it onto the conveyor for calibration weighing.

Required quantity of material

At least 20% material of the maximum conveying capacity is required for calibration weighing. Example: If the measuring range is 0 - 200t/h, at least 40t material must be available for this calibration weighing. For a four-point calibration, four times the value applies: 160t

It is generally applicable that the longer a calibration weighing runs, the more accurate will be the result of the calibration. For this reason, calibration weighing processes are often carried out at maximum conveying speed, 200t/h in the above example. This is, however, generally dependent on the local capability of carrying out the comparison weighing.

Imponderables

Since the calibration weighing is normally carried out outside the normal production process, we must take account of the fact that calibration weighing can fail, for technical and other reasons. More material should therefore be made available for such an eventuality.

Calibration method 2: Comparison weighing storage container with weighing cells

- Basic Settings "Comparative weighing" (Fig. 81, item 4).

The material measured by the measuring bracket is conveyed to a storage container that is standing on weighing cells.

As an alternative, the material can also be conveyed out of a storage container. The information under comparison weighing using truck scales applies with regard to material quantity and imponderables.

Calibration method 3: Weighing average weight per unit length

- Basic Settings "Average length weight" (Fig. 81, item 5).

For a material that is conveyed through the measuring bracket as an "Endless plate", plates having a length of 1m can be cut out and weighed, for example. All the plates (reference samples) must have the same width.

The EVU averages the count rate as the material is conveyed through the measuring bracket. At the same time, the reference samples need to be cut out.

The duration of comparative weighing should be at least 5 minutes. The comparison weight is calculated from the average value of several plates and entered in kg/m.

Calibration method 4: Static calibration

- Basic Settings “Static” (Fig. 81, item 6).

This involves in each case just feeding a small amount of material through the measuring bracket which is weighed before or after the calibration weighing on separate scales. This material is fed through the measuring bracket very slowly or in small steps. If the material is light it can, in certain cases, be pulled slowly through the measuring bracket on a foil film. If the weight of the foil film is not negligible, its weight must be added to the weight of the material.

The LB 472 averages the count rate as the material is pulled through the measuring bracket. Pulling the material through the measuring bracket should take at least 5 minutes to ensure that the statistical error is minimised during count rate averaging and that inhomogeneities in material occupation are centred out. The comparison weight is entered in kg/m.

NOTICE

Static calibration must be carried out very carefully since otherwise the expected precision is not that high. Here again, the longer the calibration process, the more accurate the result.

Calibration method 5: Direct input

- Basic Settings “Direct” (Fig. 81, item 3)

This method can be used if the accuracy requirements are not that strict. It can, however, be used as an initial calibration at least, so that the measurement initially produces meaningful values.

An important factor is that the input for the belt width should correspond to the actual width of the material being conveyed. An additional parameter is then just the absorption coefficient. For Co-60 you need to enter -0.044 and for Cs-137 you need to enter the value -0.066. The measurement can then be started directly with these settings. If necessary, the measurement accuracy can then be optimised using one of the methods named above.

Calibration method 6: Measured value comparison using the PV factor

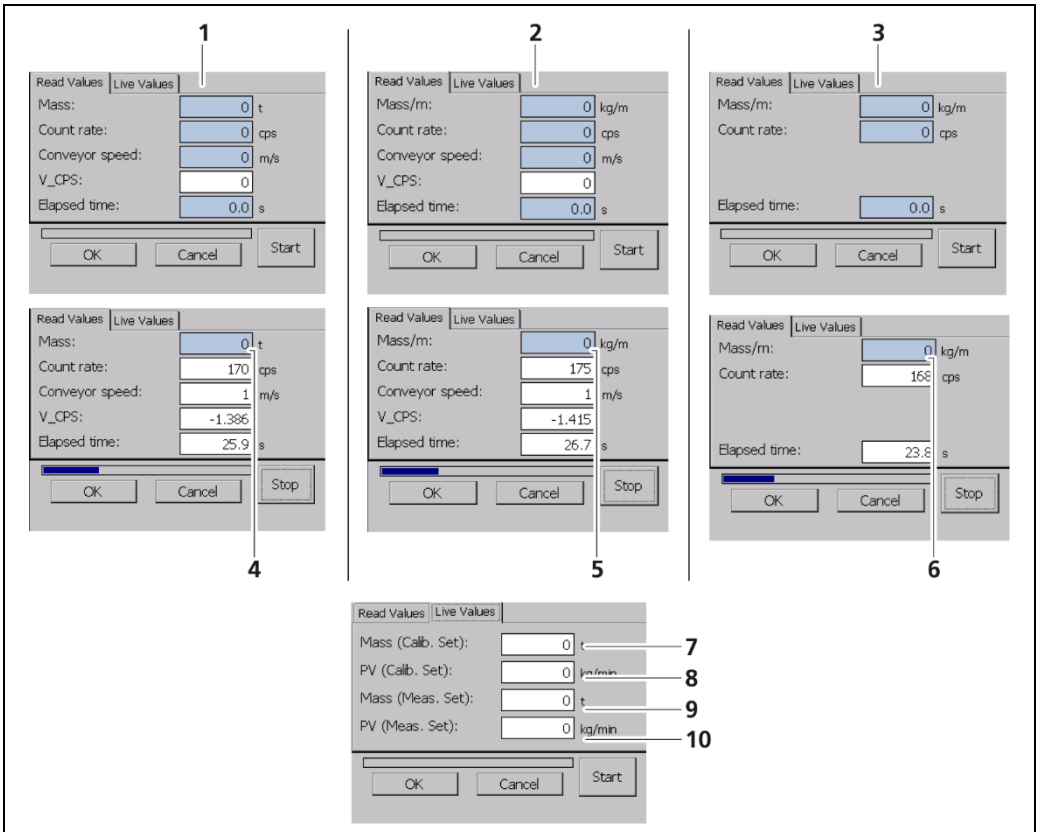
- Measurement Set: Tuning (Fig. 100)

If comparison weighing is not possible then the measured value can be optimised by balancing that runs for several days or weeks. Here it is adequate to set the measurement initially via the direct input method described above.

The measurement is then run with this setting. From this point onwards, the total mass of material delivered by the conveying organ must then be gathered. At the same time, the tonnage (t) must be monitored by the measuring equipment. This is carried out either using the internal measuring counter in the LB 472, or via an external counter connected to the LB 472.

After a period of several days, the determined total mass of the LB 472 can be compared with the total mass of the balancing. If there is a deviation present then this can be adjusted using the “PV Factor” in the Tuning menu (Device Setup | Setup | Signal Condition | Tuning). In the cases where this is possible, it often presents the best accuracy with the least effort.

Add new calibration point



1	**Window Comparison weighing**	6	**Input box Mass [kg/m]**
2	**Window Average Weight per unit length**	7	**Mass in calibration parameter set**
3	**Window Static**	8	**PV range in calibration parameter set**
4	**Input box Mass [t]**	9	**Mass in active measuring parameter set**
5	**Input box Mass [kg/m]**	10	**PV range in active measuring parameter set**

Fig. 91 Calibration points (read-in value / measured value)

NOTICE

Observe the selected calibration and calculation method in the basic settings (Fig. 81).

1. Click on the button <+> (Fig. 90, item 2).

▶ The window “read-in value | Measured value” (Fig. 90) opens.

2. Apply material when conveyor belt is running.
3. Press the button <Start> when the material reaches the measuring bracket.

▶ The EVU automatically starts time recording and the averaging of pulse rate and speed during the measurement.

▶ The mass and the PV range of the calibration parameter set (current determination of the values) and the active measuring parameter set is displayed in the tab “measured values”.

4. Click on the button <Stop> when the material for the weighing comparison has passed through the measuring bracket.

- ▶ The average pulse rate and belt speed and the measuring time are displayed.

5. Weigh the measured material conveyed through the measuring bracket (if not already done).
6. Enter the measured result of the comparison set of scales in the input box “Mass”, “Mass/m” (Fig. 91, item 4, item 5 or item 6).
7. Click on the button <OK> to save the calibration point.

- ▶ You move back to the menu “Calibration Settings: Table” and the determined calibration point is listed.

8. If another comparison weighing process is to be carried out, proceed as described in Steps 1 to 6. An additional calibration point may need to be recorded with different material allocation.

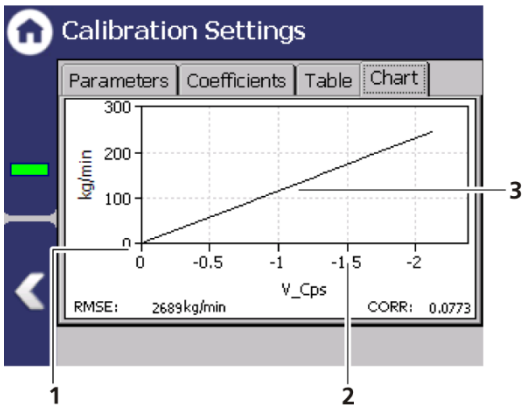
NOTICE

All inputs and changes to the settings only become effective when you click on the button <Calibrate> in the “Calibration” menu (see next chapter but one).

Calibration settings: Chart

Device Setup | Setup | Calibration | Calibration settings: Chart

The characteristic curve of the calibration performed is shown in the tab "Graphics".



1 **Axis conveying volume [kg/s]**
2 **Axis count rate [V_cps]**
3 **Characteristic curve**

Fig. 92 Calibration settings (Chart)

Calibrate

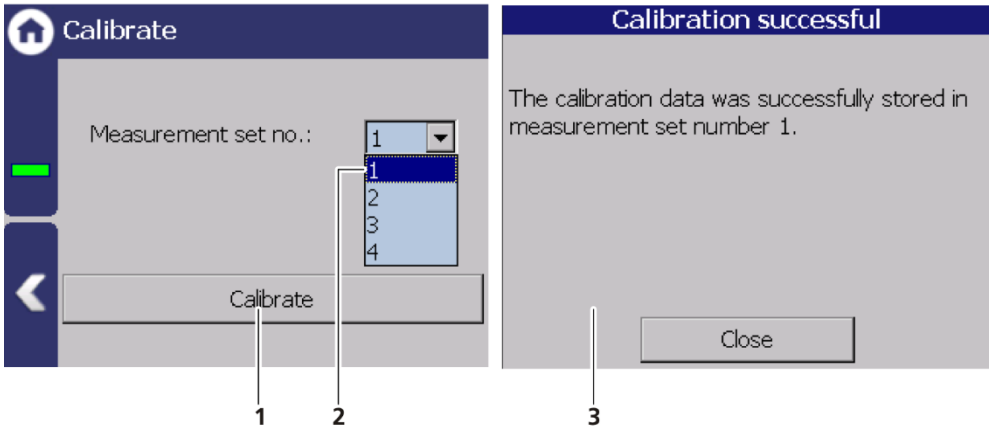
Device Setup | Setup | Calibration | Calibrate

Data that are necessary for a complete measurement are found in the calibration parameter set. All the data of the calibration parameter set are transferred to the measurement parameter set when the button "Calibrate" is clicked. Only after this are they can be used for measurement value calculation.

In order to activate a different measuring parameter set, select the relevant measuring parameter set (1 - 4) in the menu “Call up measuring parameter set”.

Other measuring parameter sets are only required in a few cases where various different products are conveyed using the same conveying organ, where it is also not possible to measure using the calibration setting. However, it is mostly the same product that is conveyed so that only the first measuring parameter set needs to be calibrated.

The active measuring parameter set is displayed in the selection box Measuring parameter set No. (Fig. 93, item 2).



1 Button <Calibrate>
2 Selection box Measuring parameter set No.
3 Window “Calibration parameter set”

Fig. 93 Calibration

1. Click on the button <Calibrate> (Fig. 93, item 1) in order to take over the current calibration settings in the selected measuring parameter set (Fig. 93, item 2).

▶ A new window appears with the message "Calibration successful” (Fig. 93, item 3).

2. Click on the button <Close>.

▶ The calibration has been carried out.

IMPORTANT

The PV factor of the individual measuring parameter set is reset to 1.0 during calibration.

NOTICE

Check your calibration by simulating a detector count rate. Use the test count rate in the simulation menu for this purpose.

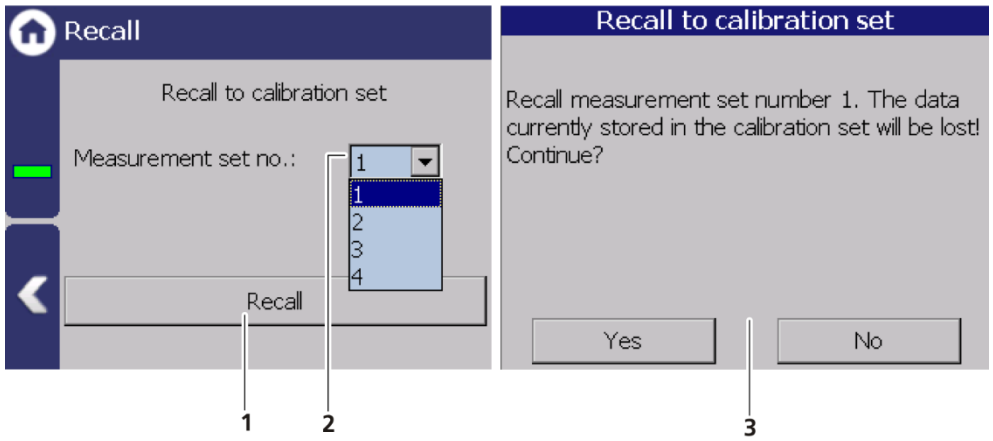
The count rates from the calibration points can be used, for example, as the value for the test count rates. Check that the correct measured value is displayed for the specific test count rate.

Please note when simulating that, if there is more than one calibration point, the calibration line is determined over a regression, so that we do not expect to get exactly the measured value that was entered at the specific calibration point.

If a tachometer is used, the speed of the tachometer must be simulated in this menu.

Recalling the measuring parameter set

Device Setup | Setup | Calibration | Recall



1 **Button <Recall>**
2 **Selection box Measuring parameter set No.**
3 **Window "Recall to calibration set"**

Fig. 94 Recalling the measuring parameter set

1. Select the measuring parameter set (Fig. 94, item 2) that needs to be activated.
2. Click on the button <Recall>.
3. The window with the message "Recall to calibration set" appears.
4. Click on <Yes> to confirm.

▶ The measuring parameter set has been over-written in the calibration parameter set and the active measuring parameter set No. is displayed in the standard display under "active parameter set".

7.3.4 Measurement

Device Setup | Setup | Measurement

The “Measurement” sub-menu provides an overview of the available measuring sets and their settings. The measuring sets 1 ... 4 show the parameter settings that were perhaps previously calibrated. The currently activated measuring set depends on the setting in the menu “Active Measuring Set”. Use of the measuring parameter sets 2 ... 4 is only required in a few cases where various different products are conveyed using the same conveying organ, where it is also not possible to measure using a calibration setting.

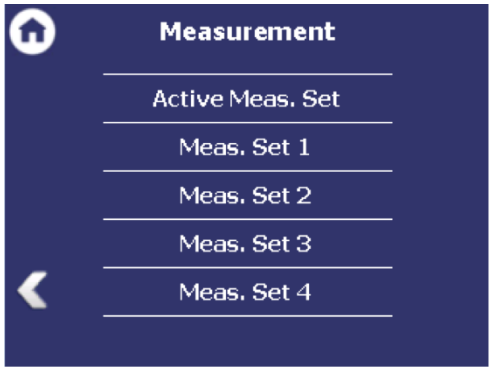


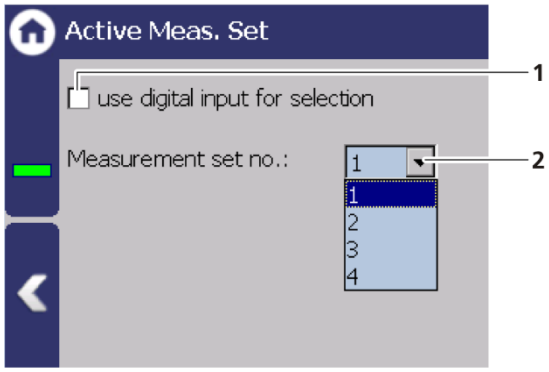
Fig. 95 Submenu “Measurement”

Measurement: Active measurement set

Device Setup | Setup | Measurement | Active Measurement set

In the submenu “Active measuring set, the measuring parameter set can be activated using the digital input or also by selecting in this menu.

In the majority of cases we only use measuring parameter set 1. However, in the cases where various different products are conveyed using the same conveying organ we can change over to a different measuring parameter set with a different product, which also needs to be calibrated before doing so. It is also possible to change to other measuring sets using digital inputs.



1 Selection box “Use digital input for selection”
2 Selection box Measuring parameter set no.

Fig. 96 Active Measuring set

1. Select the measuring parameter set (Fig. 96, item 2) that needs to be activated by the digital input.
2. Activate the selection box “Use digital input for selection” (Fig. 96, item 1).

▶ The selected measuring parameter set is activated in the allocation "Active measuring parameter set" in the menu Inputs | Digital Inputs | DI Assignment.

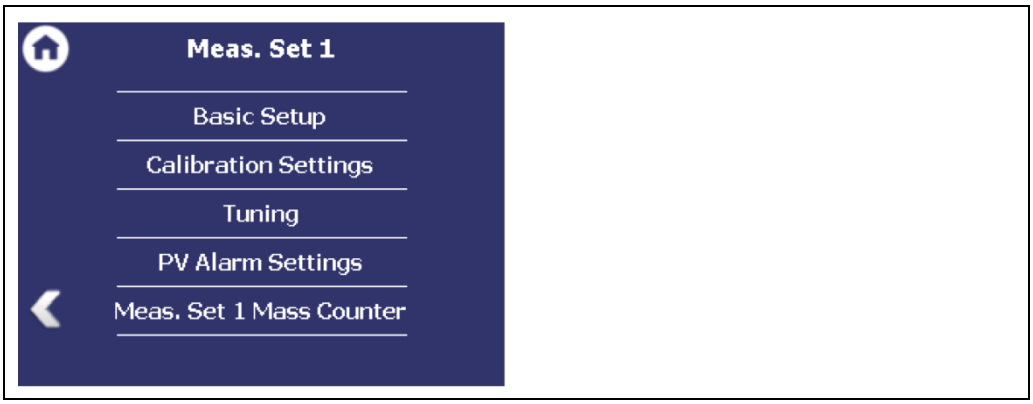


Fig. 97 Submenu “Measuring Set”

Measuring Set 1 - 4 : Basic Setup

Device Setup | Setup | Measurement | Measuring set 1 - 4 | Basic Setup

In the submenu “Basic Setup” of the individual measuring set, the selected calibration method and the calculation method is displayed.

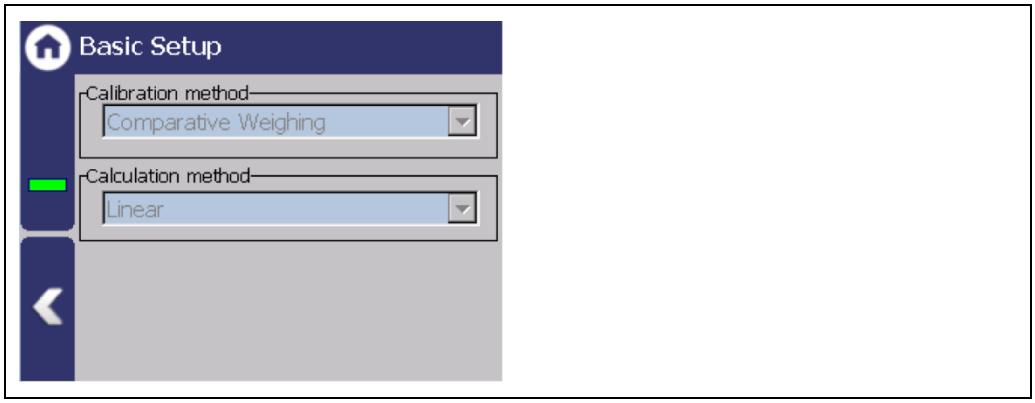


Fig. 98 Measuring set: Basic Setup

Measuring Set 1 - 4 : Calibration settings

Device Setup | Setup | Measurement | Measuring set 1 - 4 | Calibration Settings

In the submenu “Calibration Settings” of the individual measuring set all the settings are displayed that have been carried out in the menu “Calibration”.

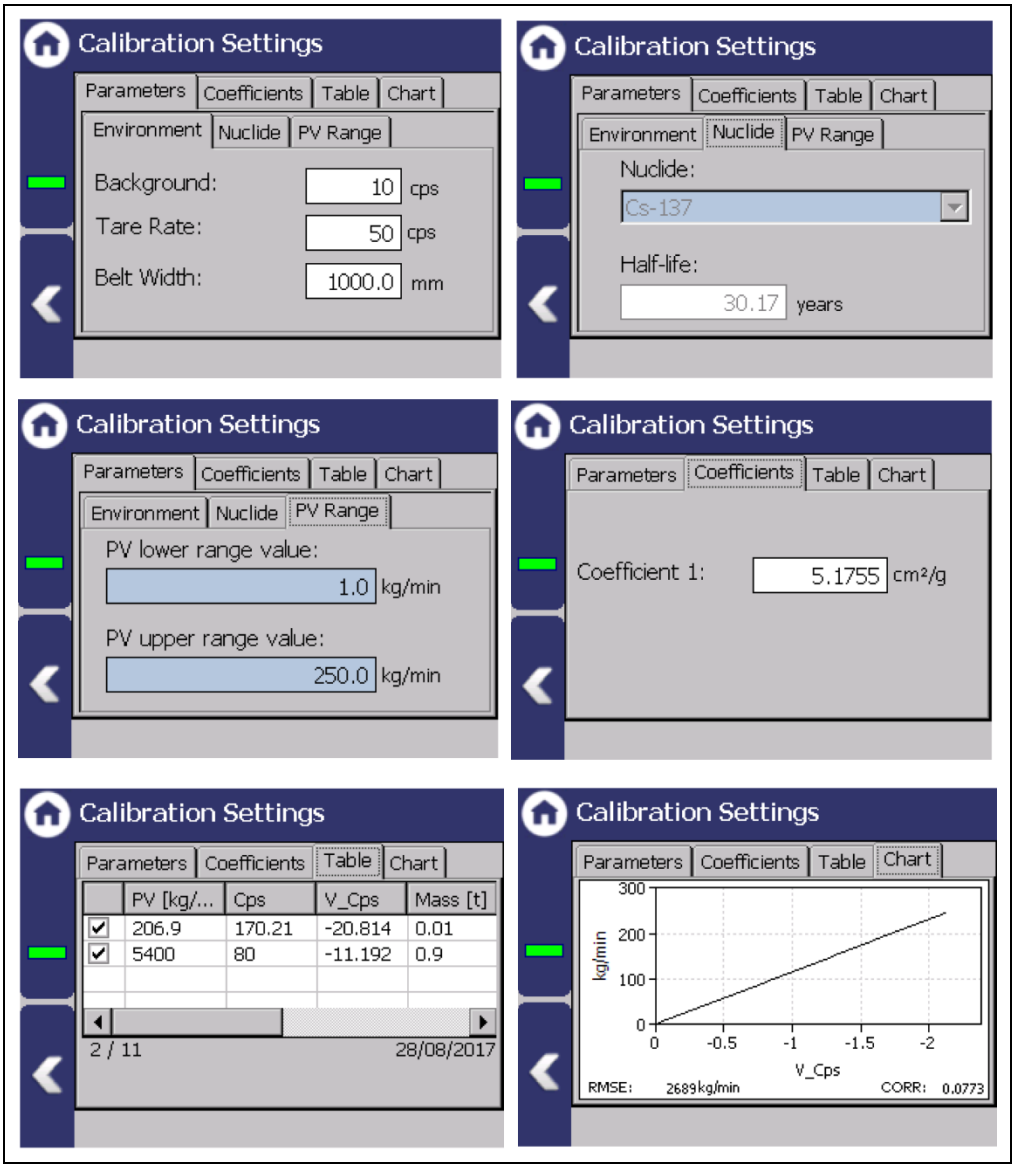
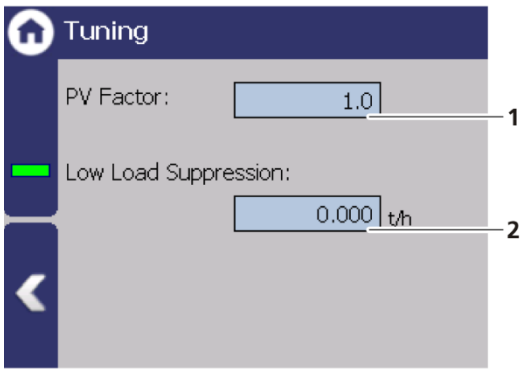


Fig. 99 Measuring set: Calibration settings

Measuring Set 1 - 4 : Tuning

Device Setup | Setup | Measurement | Measuring set 1 - 4 | Tuning

In the submenu Tuning, we can carry out fine adjustment of the individual measuring set.



1 Input field “PV Factor”
2 Input box “Low flow suppression”

Fig. 100 Measuring set submenu "Tuning"

PV Factor	Here you can enter a multiplication factor for correction of the conveying output. The conveying output is multiplied by this value. At a new calibration, the value is automatically set to “1”.
Low Load Suppression	The low flow entered here is suppressed and a bulk flow of 0 appears in the display as long as the output is not exceeded.

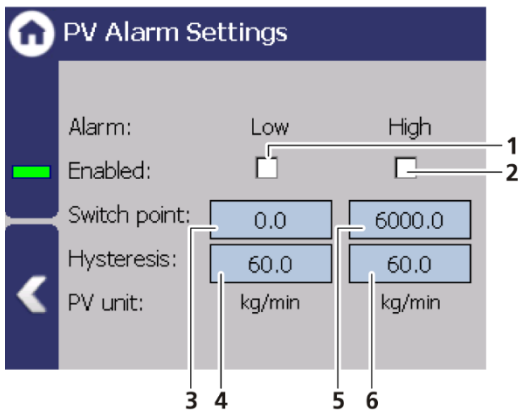
Measuring Set 1 - 4 : PV alarm settings

Device Setup | Setup | Measurement | Measuring set 1 - 4 | PV Alarm Settings

You can activate the alarms and the values for the alarms (max. and min.) and the hysteresis of these in the submenu “PV alarm settings”.

When exceeding or falling below the switching point, an event message appears in the status display if a NE 107 Status is selected under Alarms | PV Alarm Behaviour.

If, in the menu Outputs | Digital Output | DO Allocation “Lower PV Alarm” or “Upper PV Alarm” is allocated the relay switches.



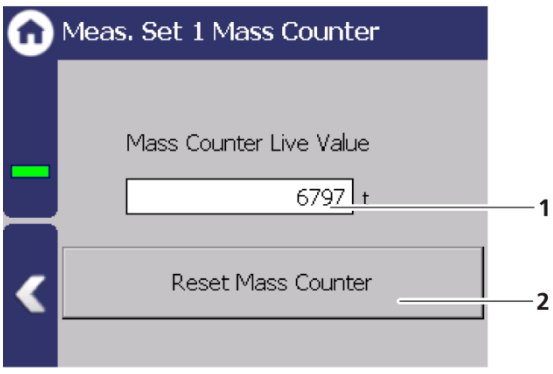
1 **Selection box “Low Enabled”**
2 **Selection box “High Enabled”**
3 **Input box “Switch point lower value”**
4 **Input box “Hysteresis lower value”**
5 **Input box “Switching point upper value”**
6 **Input box “Hysteresis upper value”**

Fig. 101 Measuring set submenu “PV Alarm Settings”

Measuring Set 1 - 4 : Mass counter

Device Setup | Setup | Measurement | Measuring set 1 - 4 | Mass Counter

In the submenu mass counter of the individual measuring set, the live value of the mass counter is displayed (Fig. 102, item 1). With the button <Reset Mass counter> (Fig. 102, item 2) the counter can be reset to 0.



1 **Display box live values mass counter**
2 **Button** <Mass counter reset>

Fig. 102 Measuring set submenu "Mass counter” Example: Measuring Set 1

7.3.5 Signal Condition

Device Setup | Setup | Signal Condition

You can perform the following settings and read information in the "Signal processing" submenu:

- Damping (time constant)
- PV Eange
- Tuning
- Source Replacement

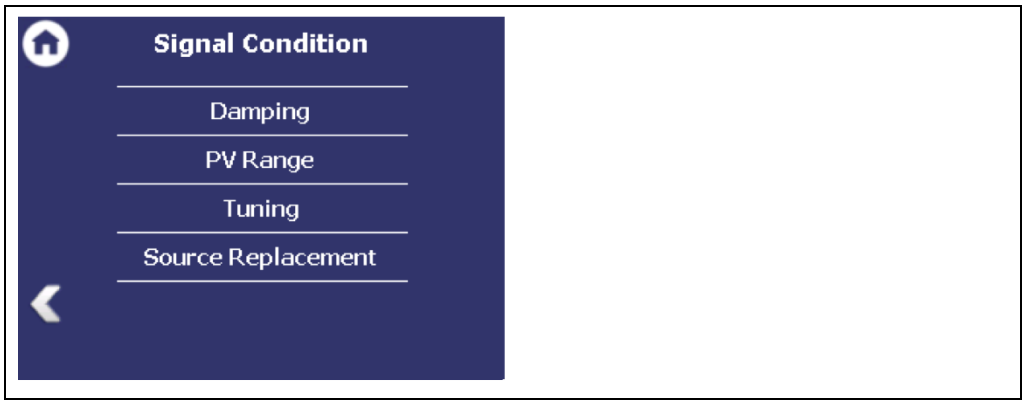


Fig. 103 Signal Condition

Signal processing: Damping

Device Setup | Setup | Signal Condition | Damping

The reaction time of the measured value display (standard display) can be set in the “Damping” sub-menu. The measurement reacts quickly to rapid process changes at a small time constant (min. 1 second). The measurement reacts correspondingly slower with a large time constant. The stronger filtering reduces the statistical error at a larger time constant and thus smooths the fluctuations in the measuring signal. We often use a time constant of approx. 30s with radiometric conveying volume measurement.

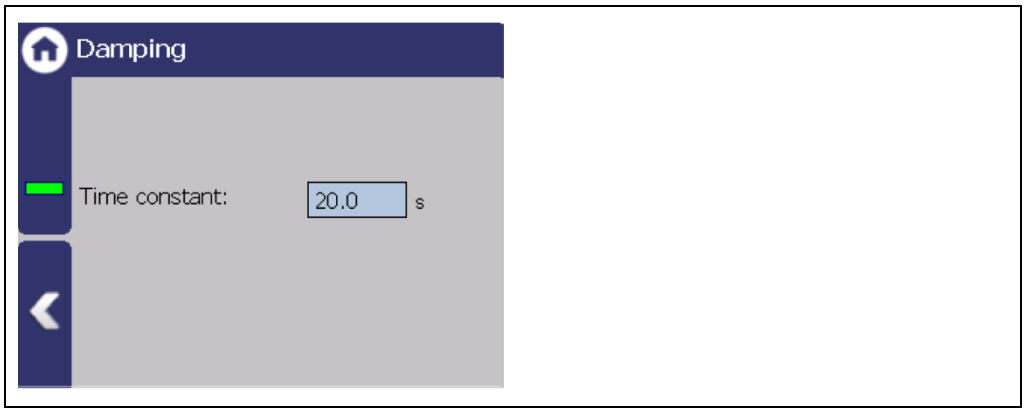


Fig. 104 Signal processing (Damping)

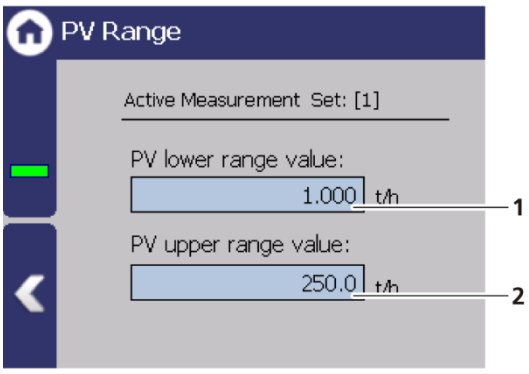
1. Click on the input field to change the time constant.
2. Confirm the value with the Enter key.

▶ The time constant has been changed.

Signal Condition: PV Range

Device Setup | Setup | Signal Condition | PV range

The lower and upper limit of the process range of the active measuring parameter set can be set in the tab “PV Range” (Process Value Range). These limits define the signal range of the analog current output (4 ... 20 mA bzw. 0 ... 20 mA). The unit is displayed that is selected in the menu System | Units in the box "PV".



1 Input field min. process value
2 Input field max. process value

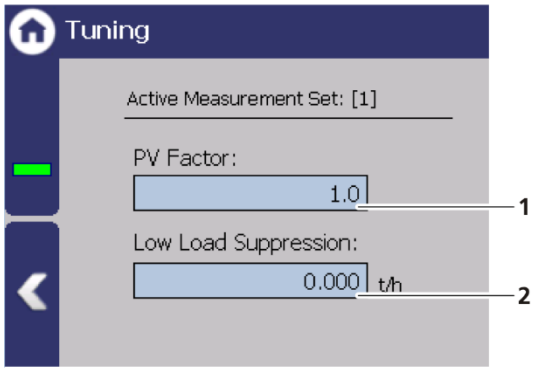
Fig. 105 Signal processing (PV range) Example: Meas.-Set:1; Unit: t/h

1. Click on the input box (Fig. 105, item 1) to enter the process value that is intended to correspond to an output current of 4mA.
2. Confirm with the Enter key.
3. Click on the input box (Fig. 105, item 2) to enter the process value that is intended to correspond to an output current of 20mA.
4. Confirm with the Enter key.

Signal Condition: Tuning

Device Setup | Setup | Signal Condition | Tuning

In the submenu Tuning, we can carry out fine adjustment of the active measuring set.



1 Input field “PV Factor”
2 Input box “Low Load suppression”

Fig. 106 Measuring set submenu "Tuning" Example: Meas.-Set: 1; Unit:t/h

PV Factor	Here you can enter a multiplication factor for correction of the conveying output. The conveying output is multiplied by this value. At a new calibration, the value is automatically set to “1”.
Low Load Suppression	The low flow entered here is suppressed and 0 appears in the display as long as the the selected unit of the conveying output is not exceeded.

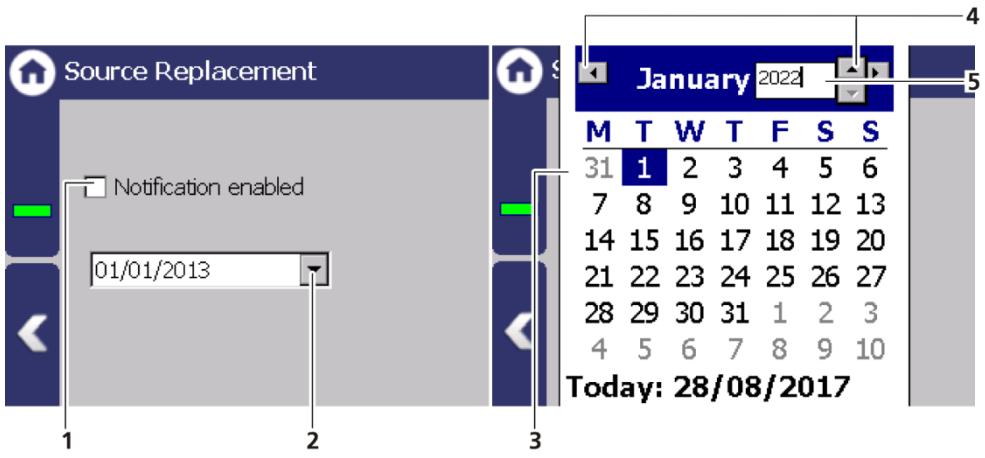
Signal Condition: Source replacement

Device Setup | Setup | Signal Condition | Radioactive source replacement

Notification for a source replacement can be activated in this submenu. The maintenance message “Replace source” when this date is reached.

NOTICE

For Radiation protection reasons, a source replacement is recommended after 15 years.



1 **Selection box “Notification enabled”**
2 **Selection arrow Calendar**
3 **Month view Calendar**
4 **Selection arrow Month**
5 **Input Year number**

Fig. 107 Date radioactive source replacement

Setting source replacement date

1. Activate the selection box (Fig. 107, item 1).
2. Click on the arrow key (Fig. 107, item 2) in order to set the date.

▶ The calendar is opened.

3. Click on the year (Fig. 107, item 5) to select the year with the arrow keys, or enter the year in the input box.
4. Set the month (Fig. 107, item 4) and select a day.

▶ The calendar retracts and the notification has been established.

7.3.6 Inputs

Device Setup | Setup | Inputs

The function of the two inputs can be set and displayed in the submenu Inputs.

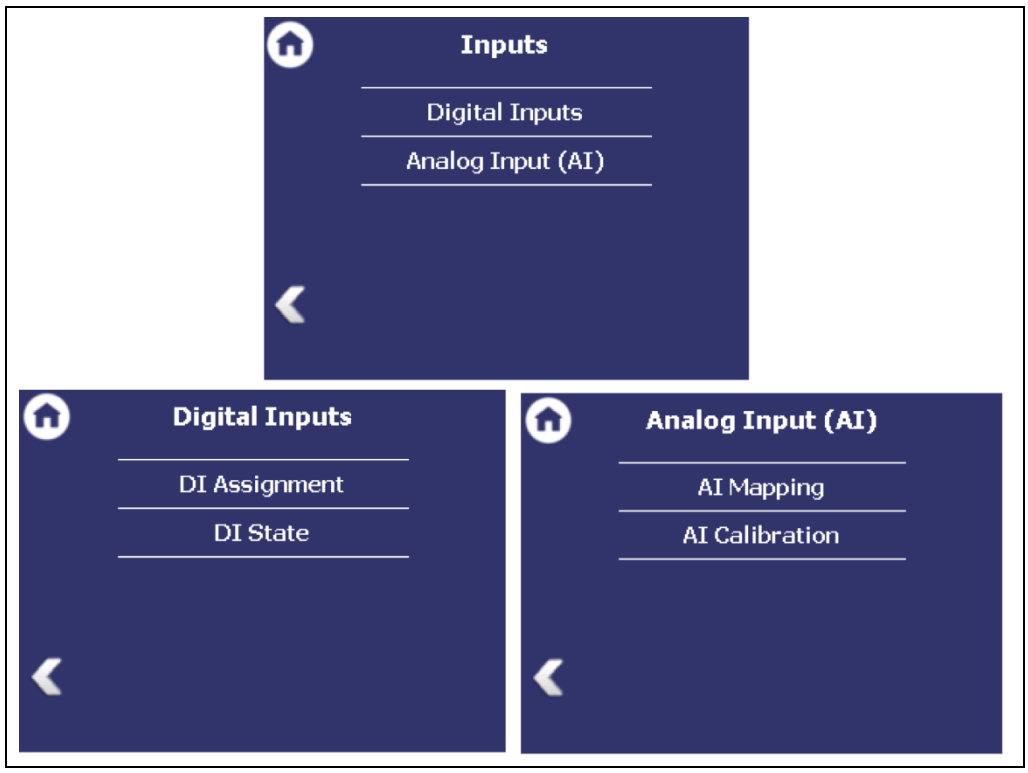
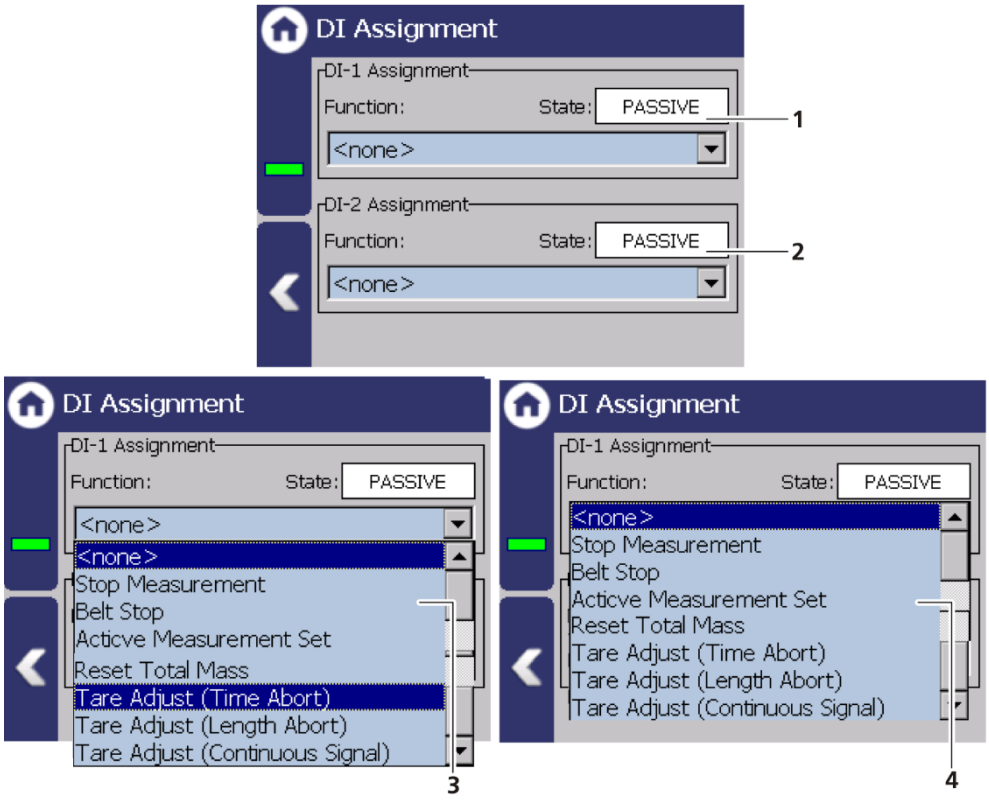


Fig. 108 Menu “Inputs”, submenu “Digital inputs, submenu “Analogue inputs”

Digital inputs: DI Assignment

Device Setup | Setup | Inputs | Digital inputs | DI Assignment

The menu Assignment determines which function is executed when the digital input is switched.



1 DI-1 assignment state
2 DI-2 assignment state
3 DI-1 assignment: Selection of function
4 DI-2 assignment: Selection of function

Fig. 109 DI inputs assignment

In the condition “ACTIVE" (Fig. 109, item 1, item 2) the selected function is carried out. The active condition is created by closing the digital input.

Stop Measurement	The measurement is stopped with a closed contact. The last measurement is frozen. If the contact is opened then the measurement continues from the last measured value.
Belt stop	The measurement is stopped with a closed contact. The measured value of the conveying output (e.g. t/h) is set to 0. If the contact is opened, then the measurement continues from the measured value displayed before the contact was closed. This function should be used with a constant belt speed to prevent weight accumulation when the belt is stationary.

Active measuring set

When the selection box “Use digital input for selection” is activated, we change to the selected measuring parameter set (1 – 4).

4 combined possibilities can be configured using the second digital input.

Dig In 1	Dig In 2	
open	open	Meas.-Set 1
open	closed	Meas.-Set 2
closed	open	Meas.-Set 3
closed	closed	Meas.-Set 4

Reset Total mass

The mass counter of the active measuring set is reset to 0.

Tare Adjust (time abort)

The function “Tare Adjust (time abort)” is used for an external control of the tare process. The measuring time depends on the tare measuring time entered.

Tare Adjust (length abort)

The function “Tare Adjust (length abort)” is used for an external control of the tare process. The measuring time depends on the belt length entered.

Tare Adjust (continous Signal)

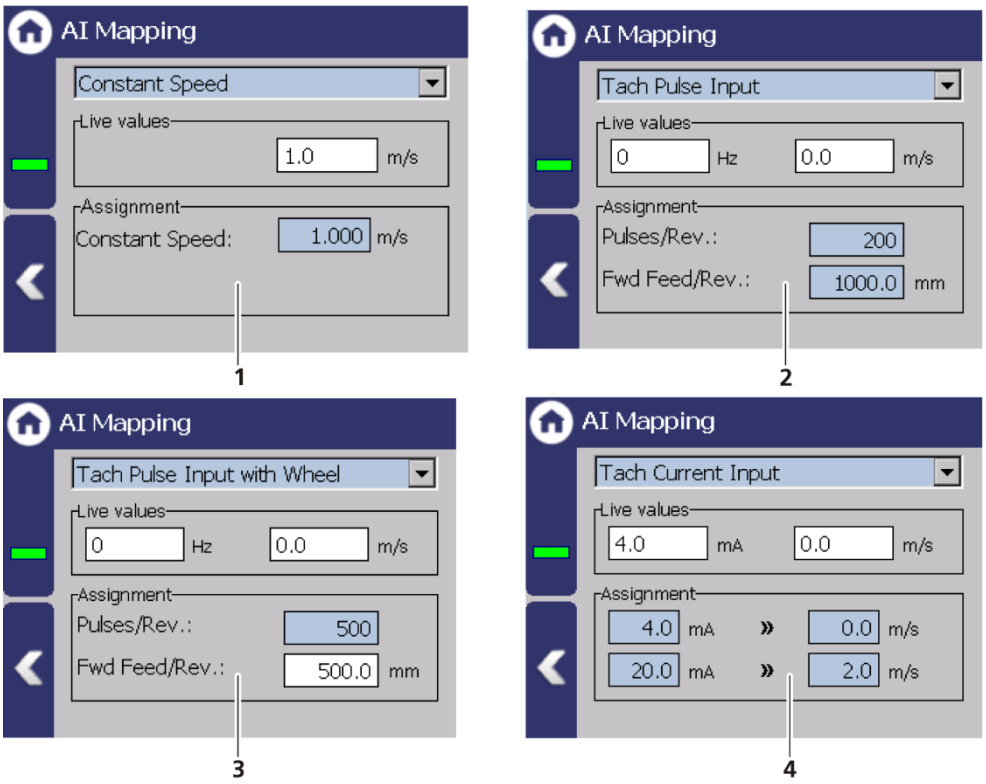
The function “Tare Adjust (continous Signal)” is used for an external control of the tare process. The tare measurement takes as long as the contact is closed.

Analog input: AI Mapping

Device Setup | Setup | Inputs | Analog input | AI Mapping

In the submenu “AI Assignment" we set the method for determining the belt speed. The analogue input can be used as a pulse input (tacho) or as a current input.

The tachometer serves to evaluate the conveying speed. The power supply to the tachometer takes place from the 24VDC voltage output at the terminal block (a20, a18) of the LB 472 or through or from a separate power adapter. The EVU can process signals and current signals (0/4 - 20mA) proportional to the speed.



1 **Fixed value**
2 **Tacho with pulse input**
3 **Tacho with pulse input and running wheel**
4 **Tacho current input**

Fig. 110 Analog input: Mapping

Constant Speed

Measuring with constant belt speed. Measurement at constant belt speed. The speed is entered as a fixed value.

Tacho pulse input

This setting is normally used if a tachometer with pulse output is connected to a shaft of the conveyor drive. Two inputs are required:

1. Pulses/revolution

We need to enter the number of pulses that the tachometer emits per revolution. This value is normally read off from the tachometer nameplate.

2. Feed/revolution

We need to enter the feed distance of the belt that is caused by one rotation of the tachometer.

Tacho pulse input with wheel

This setting is normally used if a tachometer with pulse output and a running wheel is placed on a conveyor belt (normally on the bottom belt). If the tachometer is supplied by Berthold, the circumference of the running wheel is 500 mm. This stipulates the input for the feed/revolution.

Pulses/revolution

We need to enter the number of pulses that the tachometer emits per revolution. This value is normally read off from the tachometer nameplate.

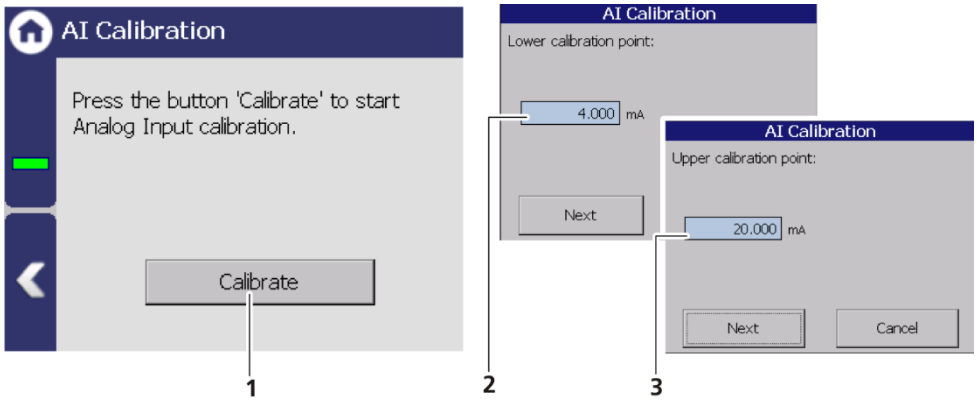
Tacho current input

This setting is used if the speed signal is entered into the LB 472 as a current signal. An internal switch, inside the electronic of the LB 472, must be set from pulse input to current input (see chapter 5.3).

Analog input: AI Calibration

Device Setup | Setup | Inputs | Analog input | AI Calibration

If the measuring signal for the speed is entered via a current signal 0/4 - 20 mA, the current for the minimum (lower calibration point) and maximum speed (upper calibration point) is set. For a device that comes directly from the factory, the current input is already set.



1 Button <Calibrate>
2 Input field "Lower calibration point"
3 Input field "Upper calibration point"

Fig. 111 Analog input: calibration

NOTICE

Berthold recommends a check or calibration the current outputs whenever a software update has been carried out.

Analog input calibration

1. Click on the button <Calibrate> (Fig. 111, item 1) to start the calibration process.
2. Make sure that the conveying organ is at a standstill and that the measuring signal of the speed is taken over.

▶ The lower calibration point is displayed (Fig. 111, item 2).

3. Click on <Continue>.
4. Start the conveying organ and set the desired maximum speed.

▶ The upper calibration point is displayed (Fig. 111, item 3).

5. Click on <Continue>.

▶ The message appears “Calibration carried out”.

6. Click on <Continue>.

▶ The calibration has been carried out.

7.3.7 Outputs

Device Setup | Setup | Outputs

You can make the following settings and read information in the submenu "Outputs":

- Analog output (AO)
  - AO assignment
  - AO monitoring
  - AO Failure mode
  - AO limits
  - AO calibration
- Digital output (DO)
  - DO assignment
  - DO settings

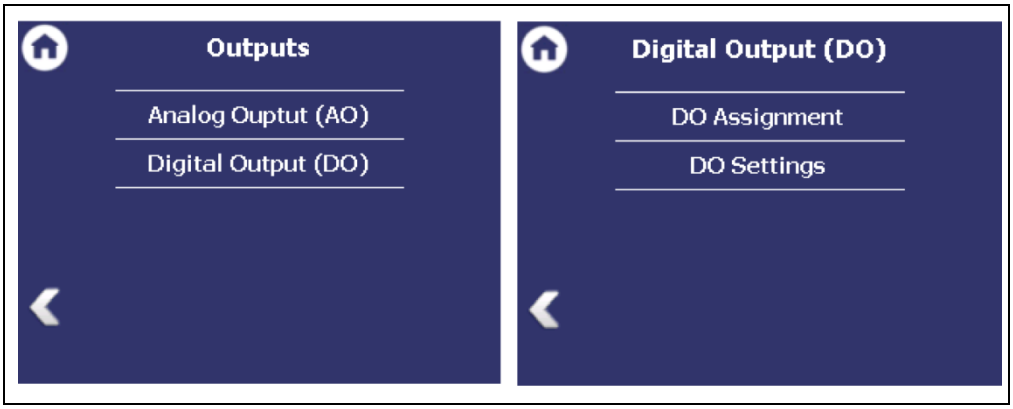
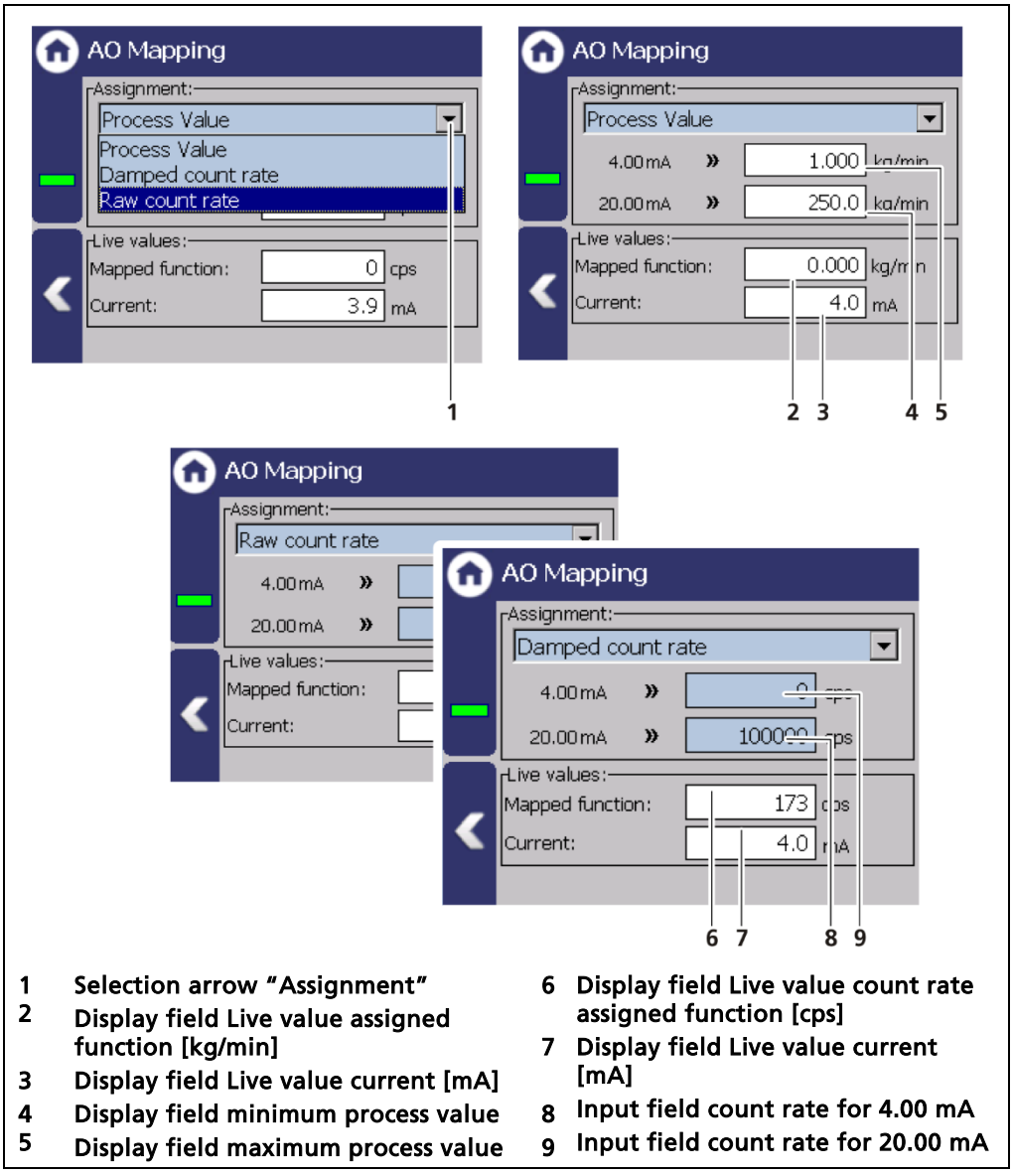


Fig. 112 Menu “Outputs”; Submenu “Analog output”

Analog output: Mapping

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

A function can be assigned to an analogue output in the submenu "AO Mapping". The current output signal is between 0/4 mA and 20 mA.



1	**Selection arrow "Assignment"**	**6**	**Display field Live value count rate assigned function [cps]**
2	**Display field Live value assigned function [kg/min]**	**7**	**Display field Live value current [mA]**
3	**Display field Live value current [mA]**	**8**	**Input field count rate for 4.00 mA**
4	**Display field minimum process value**	**9**	**Input field count rate for 20.00 mA**
5	**Display field maximum process value**		

Fig. 113 Analog output (Mapping)

The value which is assigned to a current output signal of 0/4 mA must be less than the value which is assigned to 20 mA.

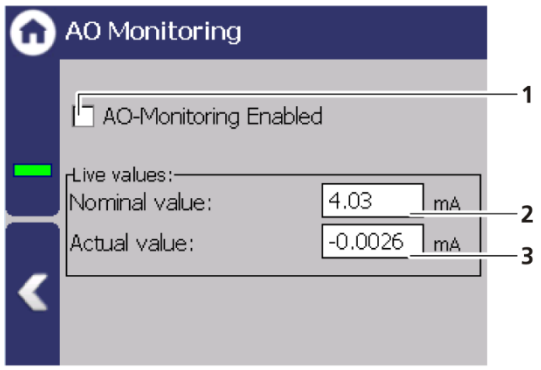
Process value	The values of the process value can be assigned in the menu Signal Condition | PV Range or in the calibration settings.
Damped count rate	Input of a count rate range which outputs the averaged counting rate at the current output.
Raw count rate	Input of of a count rate range which outputs the live count rate at the current output.

Analog output: Monitoring

Device Setup | Setup | Outputs | Analog output (AO) | AO monitoring

If “AO monitoring enabled” is activated (Fig.102, 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.



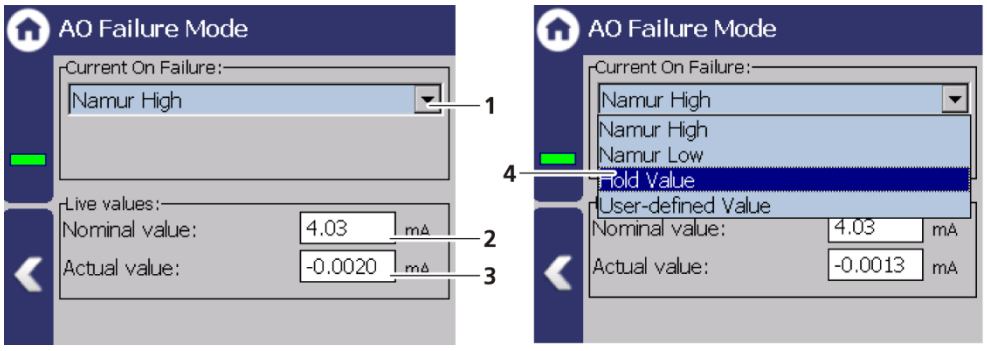
1 Activate selection box AO monitoring enabled
2 Target value [mA]
3 Actual value [mA]

Fig. 114 Analog output monitoring

Analog output: Failure mode

Device Setup | Setup | Outputs | Analog output (AO) | AO Failure Mode

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



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

Fig. 115 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.

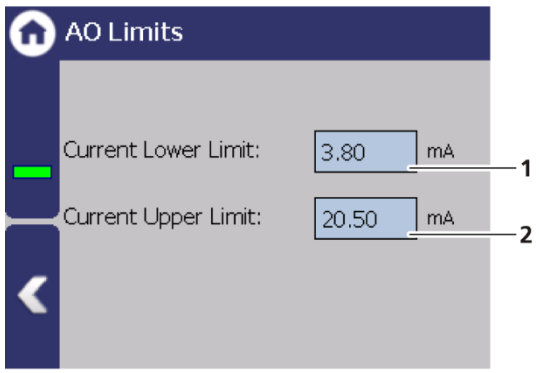
NOTICE

In the setting “Hold Value” we recommend that the error relay is connected to allow equipment errors to be transferred to the control system

Analog output: AO limits

Device Setup | Setup | Output | Analog Output (AO) | Current limits

The values [mA] for the lower and upper current limit can be set by clicking on the entry fields (Fig. 116, item 1, item 2). Alongside the default value 3.8 A, the lower current limit can be set to 0mA to switch the current output from 4 ... 20mA to 0... 20mA.



1 Input field Current lower limit [mA]
2 Input field Current upper limit [mA]

Fig. 116 Analog output (AO limits)

NOTICE

If the measurement is operated in accordance with Namur, the standard current values 3.8 or 20.5mA must be retained.

Analog output: Calibrate

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

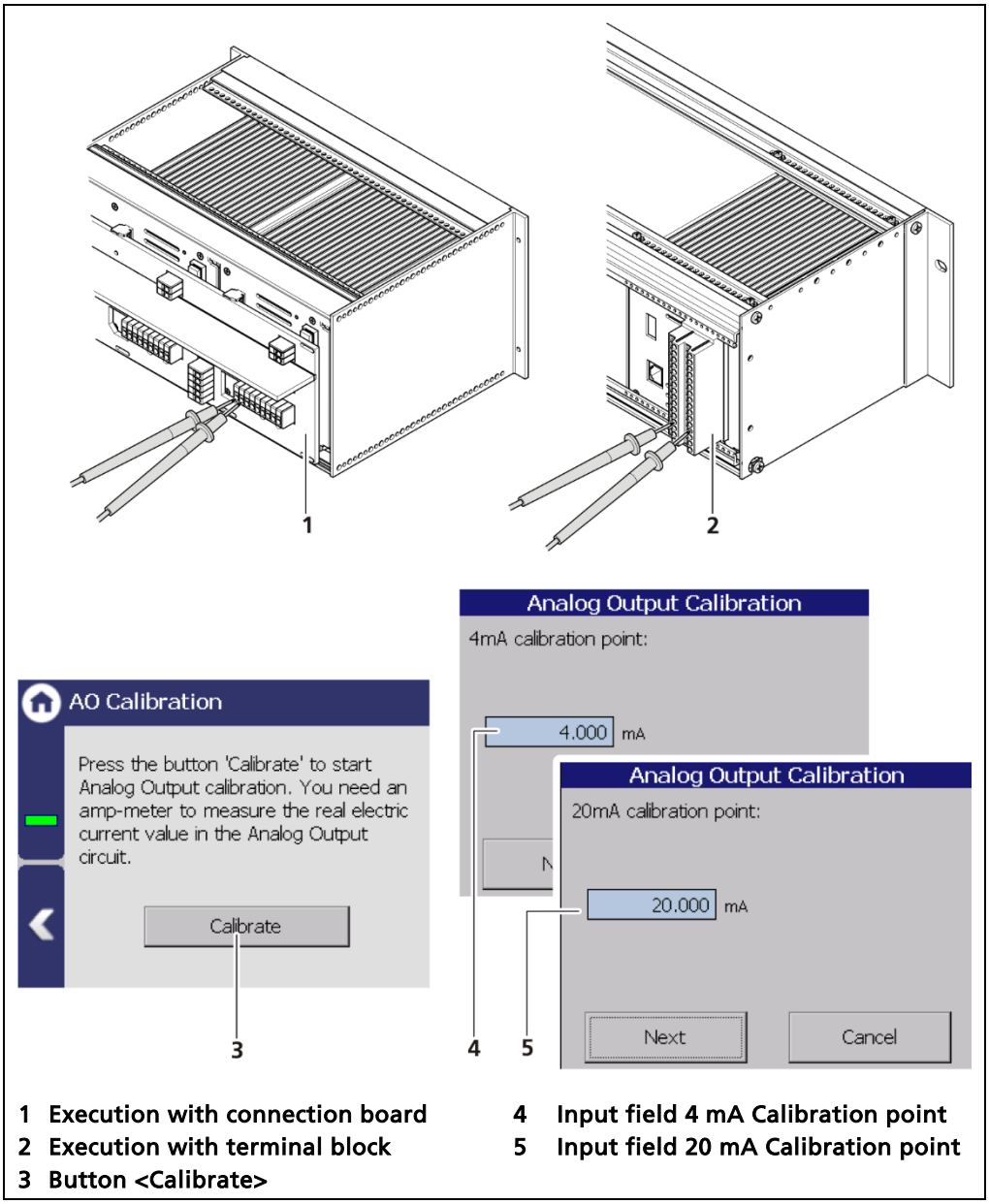
If there are any discrepancies between the target value and the actual value of the current signal, then the current output may be calibrated again.

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 a check or calibration the current outputs whenever a software update has been carried out.



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

Fig. 117 Analog output (calibration)

Performing AO calibration

⚠ DANGER

Danger to life from electric shock!

- The calibration must only be carried out by qualified electricians.
- Please adhere to the relevant safety regulations.
- Open the housing only in a dry environment and for installation, maintenance and servicing.
- 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.

1. Connect the test leads of the ammeter to the analog current output terminals on the rear of the EVU.
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. 117, 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. 117, 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 concluded.

Digital outputs (DO)

Device Setup | Setup | Output | Digital output (DO)

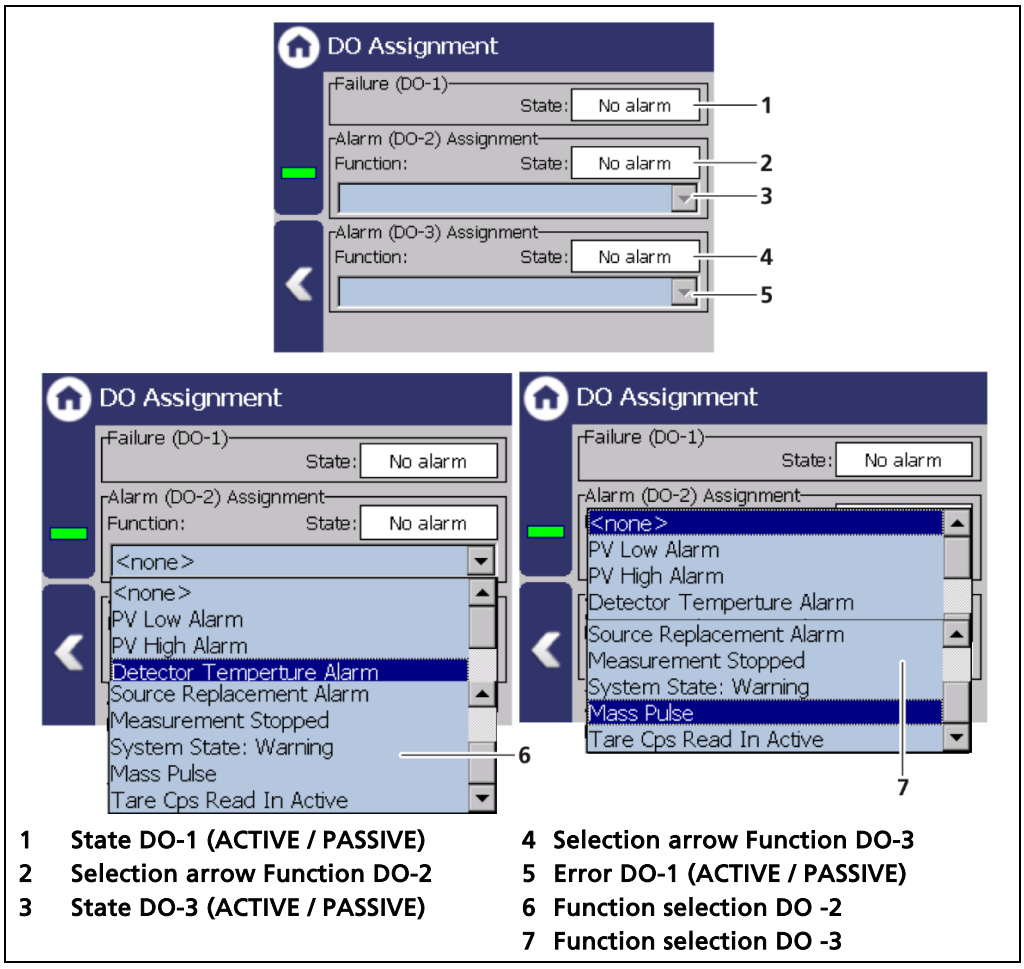
The signals of the digital outputs are switched via potential-free relay contacts. The contacts are controlled "fail safe", ie, in the event of an alarm, the current at the relay coil drops and the NO contact (normally open) is opened. The wiring diagrams in chapter 5 show the relay contacts in the de-energized state.

Fig. 118 Menu "Digital Output (DO)"

DO assignment

Device Setup | Setup | Outputs | Digital output (DO) | Assignment

You can set the two different alarm signals for the alarm relays in the submenu Digital outputs (DO).



1 State DO-1 (ACTIVE / PASSIVE)
2 Selection arrow Function DO-2
3 State DO-3 (ACTIVE / PASSIVE)
4 Selection arrow Function DO-3
5 Error DO-1 (ACTIVE / PASSIVE)
6 Function selection DO -2
7 Function selection DO -3

Fig. 119 DO assignment

The alarm relays 1 and 2 can be assigned to the following functions in the event of an alarm:

PV Low alarm
The relay switches when the value at Device Setup | Setup | Alarms | PV alarm settings is underrun.

PV High alarm
The relay switches if the value under Device Setup | Setup | Alarms | PV Alarm Settings is exceeded.

Detector temperature Alarm
The relay switches when values set at Device Setup | Setup | Alarms | Det.-Temp. Alarm function are exceeded or underrun.

Source replacement Alarm
The relay switches when notification at Device Setup | Setup | Signal processing | Radioactive source replacement is activated and the date is exceeded.

Measurement stopped	The relay switches in tests or other states where the measurement is stopped. For example, Simulation, plateau measurement, and detector update.
System state: Warning	The relay switches if the event message "Warning" is displayed.
Mass pulse	The relay delivers pulses (250 ms long) for external electronic mass counter.
Tare CPS Read in Active	The relay switches when a tare measurement is started and stays on until the tare is finished.

DO settings

Device Setup | Setup | Outputs | Digital output (DO) | DO settings

If the function "Mass pulse" is selected in menu DO Assignment, a pulse is emitted as soon as the tonnage quoted here is reached.

Example: At a setting of *1.000 t* a pulse is emitted after each integrated tonne.

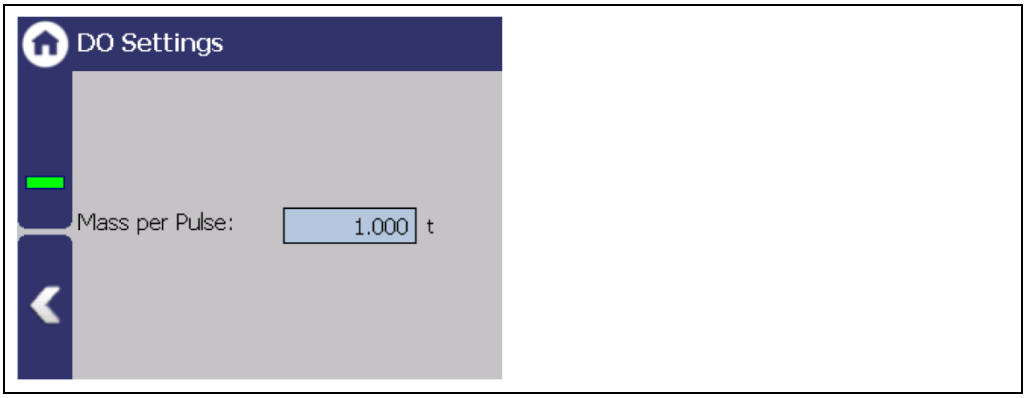


Fig. 120 DO Settings

7.3.8 Alarms

Device Setup | Setup | Alarms

You can make the following settings and read information in the submenu "Alarms":

- PV alarm behaviour
- PV alarm settings
- Det.-Temp. alarm behaviour
- Det.-Temp. alarm settings

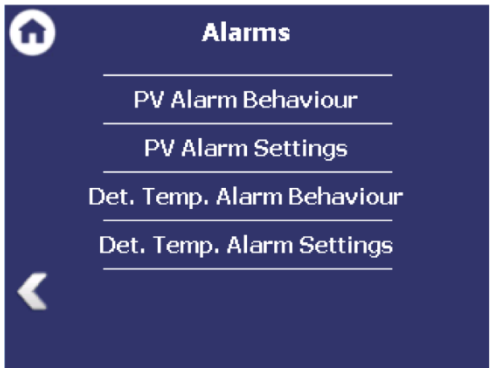
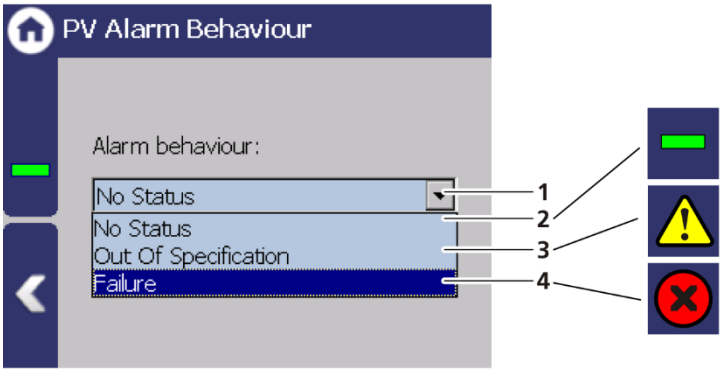


Fig. 121 Menu "Alarms"

PV Alarm Behaviour

Device Setup | Setup | Alarms | PV Alarm Behaviour

The behaviour in case of alarm (NE107 status) for the process value can be set in the submenu “PV alarm Behaviour”.



1 Selection arrow NE107 Status
2 Selection ”No Status” (no Event Viewer, relay switching)
3 Selecting ”Out of specification” (Event Viewer, relay switching)
4 Selection ”Failure” (Event Viewer, relay switching)

Fig. 122 Submenu “PV Alarm Behaviour”

NOTICE

If the PV alarm function is set to "Failure", the measurement for the occurrence of a PV alarm is switched to the error current. Monitoring of the PV in the master display is therefore no longer possible.

PV alarm settings

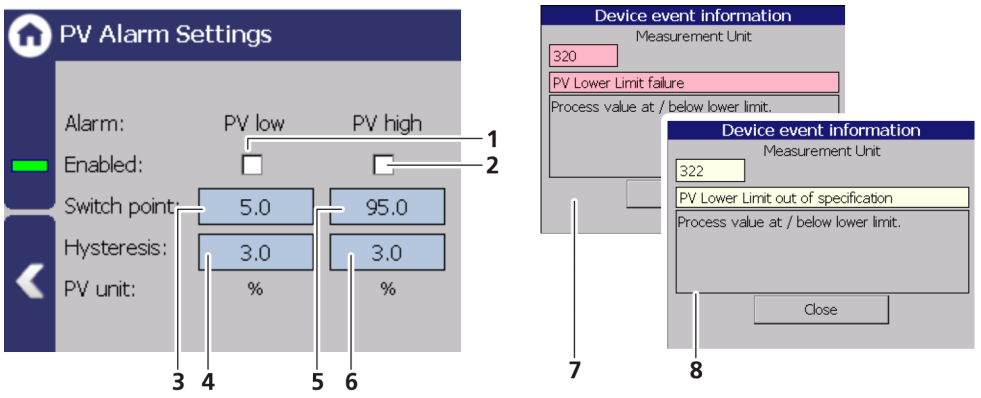
Device Setup | Setup | Alarms | PV alarm settings

In the submenu "PV Alarm Settings" you can set the values for the Process Range alarm thresholds (max. and min.) and their hysteresis.

If a status is selected in the menu PV Alarm Behaviour, a corresponding event message appears if the switching point is exceeded or if it falls below this point (Fig. 123 item 7, item 8).

If, under "Function" (Fig. 119, item 6, item 7) of a digital output the "Upper PV range" or "Lower PV range" is selected, the relay switches.

Hysteresis is defined as the tolerance range of the alarm trigger which occurs at a predefined threshold of the process range.



1 **Selection box "PV low"**
2 **Selection box "PV high"**
3 **Input box "Switch point Low"**
4 **Input box "Hysteresis Low"**
5 **Input box "Switch point High"**
6 **Input box "Hysteresis Low"**
7 **Event message "Error"**
8 **Event message "Outside the specification"**

Fig. 123 Measuring set submenu "PV Alarm Settings"

Example: Tolerance range = 5%, Process range = 20% and 85%

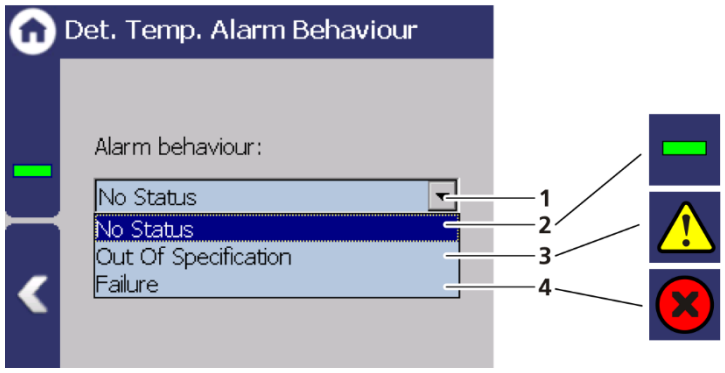
In the event of a rising process range, the max. alarm is triggered when a process range of 85% is exceeded. When the process range falls again, then the alarm does not switch off again until the process range falls below 85% - 5% = 80%.

In the event of a falling process range, the min. alarm is triggered when a process range falls below 20%. When the process range rises again, then the alarm does not switch off again until the process range rises above 20% + 5% = 25%.

Det.-Temp. Alarm Behaviour

Device Setup | Setup | Alarms | Det.-Temp. Alarm Behaviour

The behaviour in case of alarm (NE107 status) can be set for the detector temperature in the submenu “Det.-Temp. Alarm behaviour”.



1 Selection arrow NE107 Status
2 Selection “No Status” (no Event Viewer, relay switching)
3 Selecting “Out of specification” (Event Viewer, relay switching)
4 Selection “Failure” (Event Viewer, the relay circuit)

Fig. 124 Submenu “Det.-Temp. Alarm Behaviour“

NOTICE

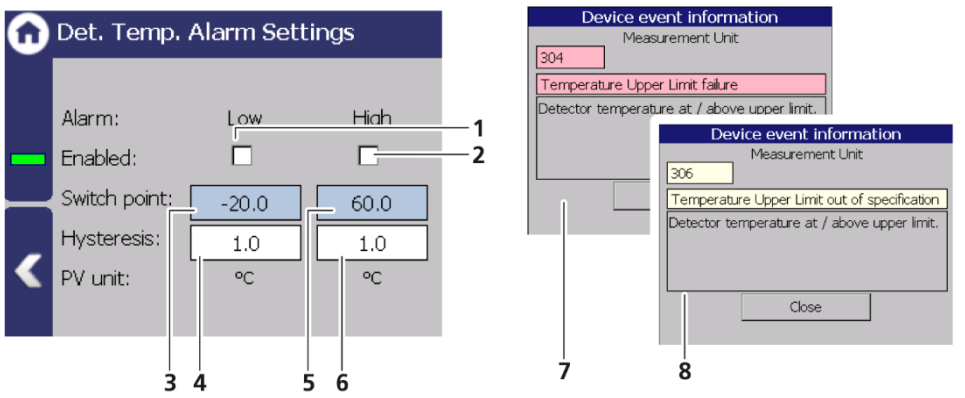
If the detector alarm behaviour is set to “Failure”, the measurement is switched in the error current during the occurrence of a temperature alarm. Monitoring of the PV in the master display is therefore no longer possible.

Detector Temperature Alarm Settings

Device Setup | Setup | Alarms | Det.-Temp. Alarm Settings

The values for the detector temperature (max. and min.) can be set in the submenu "PV Det.-Temp. Alarm Settings".

When there is exceeding or falling below the switching point, an event message appears in the status display. If a digital output "Detector temperature alarm" is assigned under "Function", the relay switches.



1 **Selection box "Min. Active"**
2 **Selection box "Max. Active"**
3 **Input box "Switch point Min."**
4 **Input box "Hysteresis Min."**
5 **Input box "Switching point Max."**
6 **Input box "Hysteresis Max."**
7 **Event message "Error"**
8 **Event message "Outside the specification"**

Fig. 125 Submenu "Det.-Temp Alarm Settings"

7.3.9 Simulation

Device Setup | Setup | Simulation

A check for the following functions can be performed in the submenu “Simulation”:

- Analog output (AO)
- Digital output (DO)
- Count rate
- Bulk Flow
- Speed

NOTICE

When starting a simulation, the measurement is stopped and a status message TST appears.

The simulation mode is automatically terminated after about 5 minutes. If the simulation is to be reactivated, you must enter the value again in the input field.

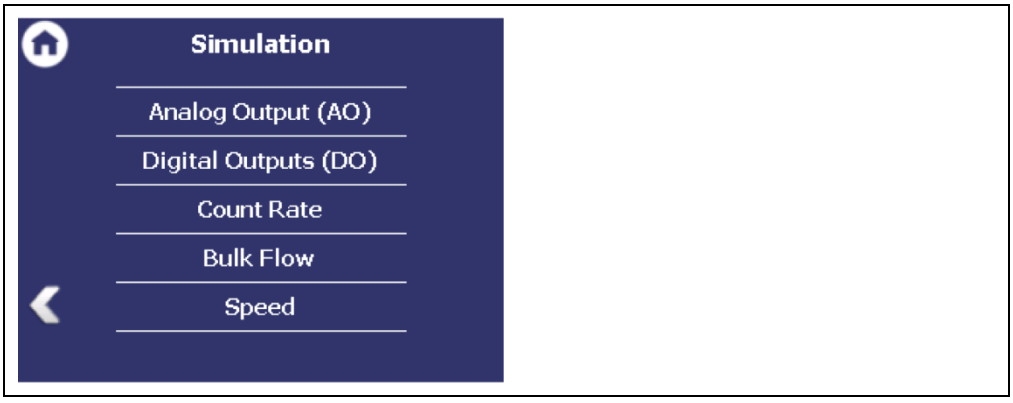
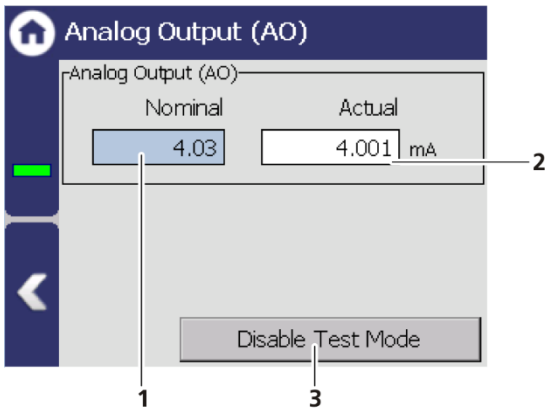


Fig. 126 Menu “Simulation”

Analog output simulation

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



1 **Input field "Target value"**
2 **Display field "Actual value" [mA]**
3 **Button** <Disable Test Mode>

Fig. 127 Analog output simulation

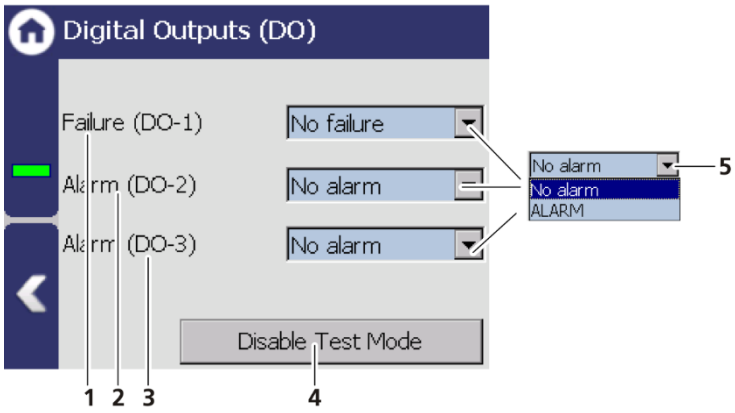
1. Click on the input field (Fig. 127, item 1) and enter the target value for the simulation.
2. Confirm with the Enter key.

▶ The test is performed, and a system event is displayed.

3. Click on the <Disable Test Mode> button (Fig. 127, item 3) to stop the simulation.

Simulation Digital Output

Device Setup | Setup | Simulation | Digital output (DO)



1 **ERROR (DO-1)**
2 **ALARM (DO-2)**
3 **ALARM (DO-3)**
4 **Button** <Disable Test Mode>
5 **Selection box**

Fig. 128 Simulation Digital Output

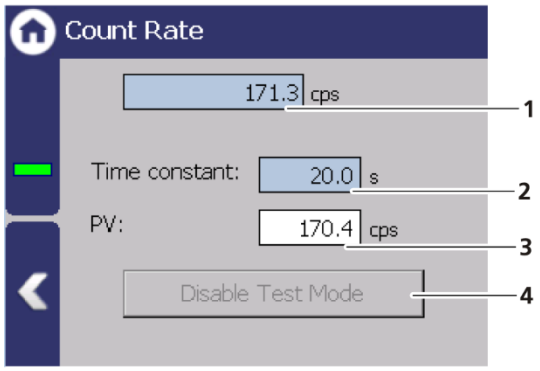
1. Click on the selection field (Fig. 128, item 5) and select “No Alarm” or “ALARM” for the simulation.

▶ The test is performed and a system event is displayed.

2. Click on the <Disable Test Mode> button (Fig. 128, item 2) to stop the simulation.

Simulation count rate

Device Setup | Setup | Simulation | Count rate



1 **Input field count rate [cps]**
2 **Input field count rate [s]**
3 **Display field [cps]**
4 **Button** <Disable Test Mode>

Fig. 129 Simulation count rate

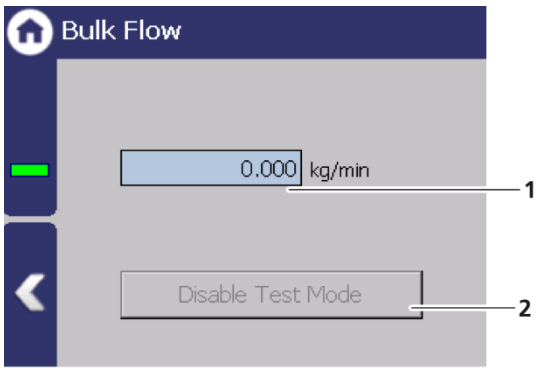
1. Click on the input field (Fig. 129, item 2) and enter the time constant for the simulation.
2. Click on the input field (Fig. 129, item 1) and enter count rate for the simulation.

▶ The test is performed, and a system event is displayed. The entered count rate is displayed in the display box (Fig. 129, item 3).

3. Click on the <Disable Test Mode> button (Fig. 129, item 4) to stop the simulation.

Simulation Bulk Flow

Device Setup | Setup | Simulation | Bulk Flow



1 Input field Conveying volume
2 Button <Disable Test Mode>

Fig. 130 Simulation Bulk Flow

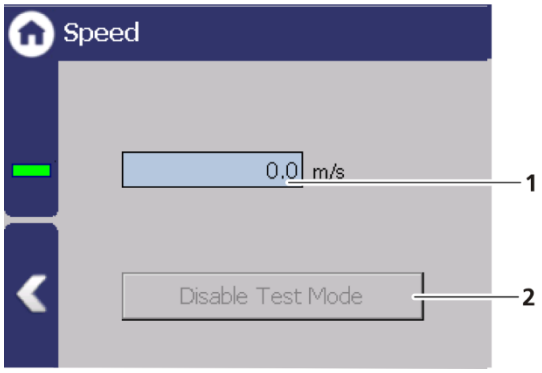
1. Click on the input field (Fig. 131, item 1) and enter the value for the simulation.
2. Confirm with the Enter key.

▶ The test is performed, and a system event is displayed.

3. Click on the <Disable Test Mode> button (Fig. 131, item 2) to stop the simulation.

Simulation speed

Device Setup | Setup | Simulation | Speed



1 **Input field Speed**
2 **Button** <Disable Test Mode>

Fig. 131 Simulation speed

1. Click on the input field (Fig. 131, item 1) and enter the value for the simulation.
2. Confirm with the Enter key.

▶ The test is performed, and a system event is displayed.

3. Click on the <Disable Test Mode> button (Fig. 131, item 2) to stop the simulation.

7.4 Menu Backup/Restore

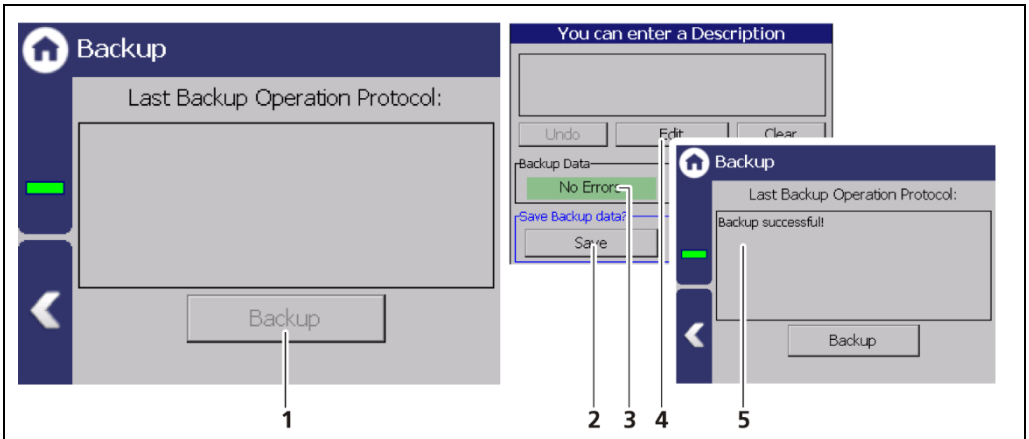
Device Setup | Backup/Restore

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

Fig. 132 Menu Backup/Restore

7.4.1 Backup

Device Setup | Backup/Restore | Backup



1 **Button <Backup>**
2 **Button <Save>**
3 **Information about the backup data (error / error free)**
4 **Button <Edit>**
5 **Note "Backup successful !"**

Fig. 133 Backup

Perform backup

1. Connect a USB storage device to the device (Fig. 4, item 5).
2. The USB storage device is recognised by the system after a few seconds and the button <Backup> (Fig. 133, item 1) can be clicked.
3. Click on the button <Backup> (Fig. 133, item 1).

▶ The window "Enter description" appears.

- The message "Error free" (Fig. 133, item 3) appears in the field "Backup data" for present and error-free backup files.

4. Click the button <Edit>, enter a description, and confirm with the Enter key.
5. Click on the button <Save> (Fig. 133, item 4).

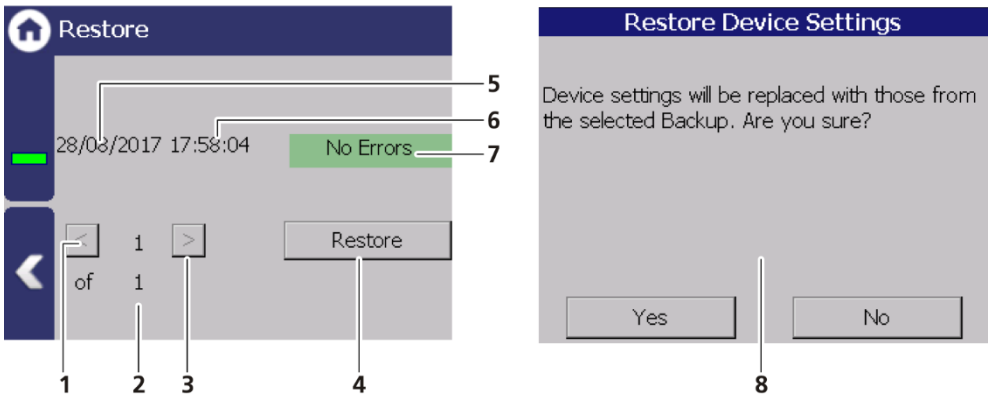
- The backup files are copied to the USB storage device.
- The message "Backup successful!" appears after a successful copy process (Fig. 133, item 5).

Information

The backup includes an XML file that is created in the folder "Backup_LB47xx". The file name is derived from "Backup", the date and time (Backup_YYYYMMDD_ hr-min-sec).

7.4.2 Restore

Device Setup | 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. 134 Restore

Executing restore

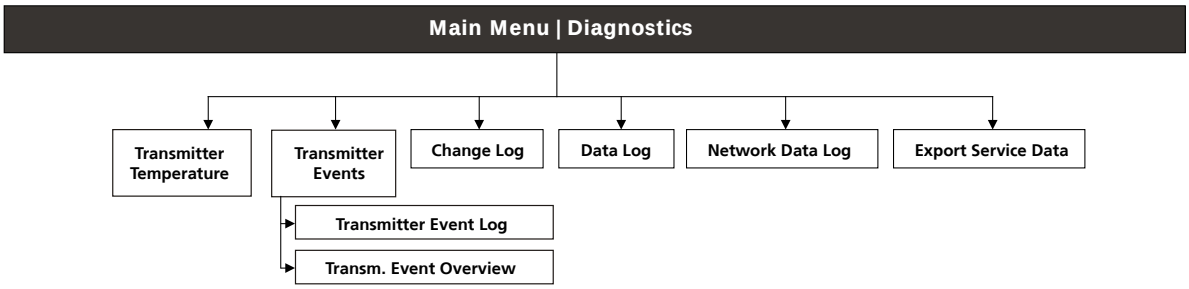
1. Connect a USB storage device to the device (Fig. 4, item 5).
2. Select the backup file with the buttons (Fig. 134, item 1, 3).

▶ The date and time of the backup is displayed (Fig. 134, item 5, 6). Only error-free (Fig. 134, item 7) backup files can be loaded.

3. Click on the button "Restore" (Fig. 134, item 4).
4. A confirmation message (Fig. 134, item 8) appears.
5. Click on < Yes > to confirm, click on < No > to cancel.

▶ The restore of data is carried out

8 Main Menu Diagnostics



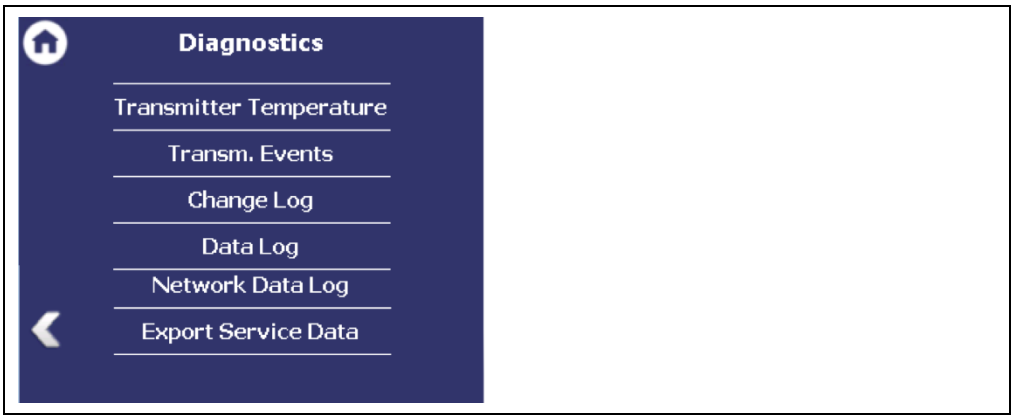
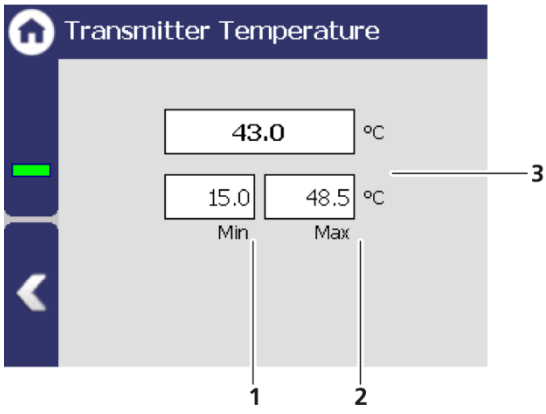


Fig. 135 Menu "Diagnostics"

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 **Feedback [°C]**

Fig. 136 Transmitter Temperature

8.2 Events

Diagnostics | Transm. Events

Fig. 137 Menu "Transm. Events"

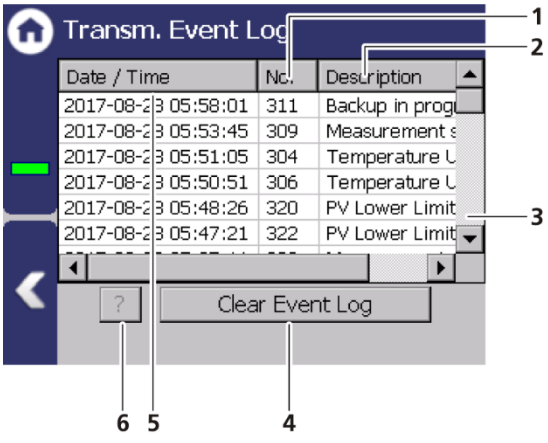
Information

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

8.2.1 EVU event Log

Diagnostics | Transmitter Events | Transmitter Event Log

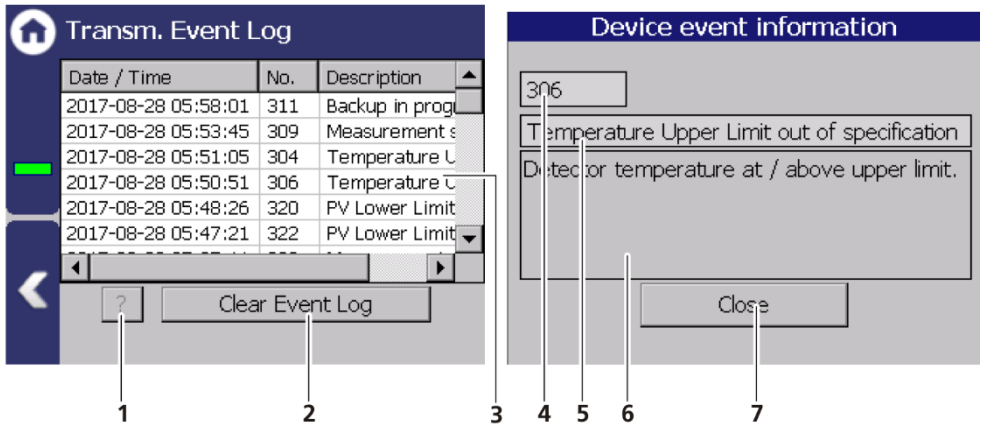
The last 25 events of the detector are displayed in the submenu "Event Log".



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. 138 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. 139 display an event log

1. Click on a line in the list (Fig. 139, item 3).
2. Click on <? > (Fig. 139, item 1).

▶ The event description appears.

3. With the button <Close>, close the event description (Fig. 139, item 7).

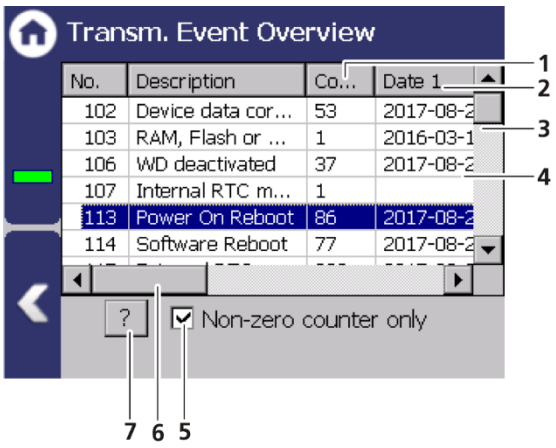
NOTICE

With the button <Clear event log> (Fig. 139, 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 submenu “Event overview”. Activate the check box “Non-zero Counter only 0” **(**Fig. 140**, 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. 140 Transmitter Event Overview

1. Click on a line in the list (Fig. 140, item 4).
2. Click on <? > (Fig. 140, item 7).

▶ The event description appears.

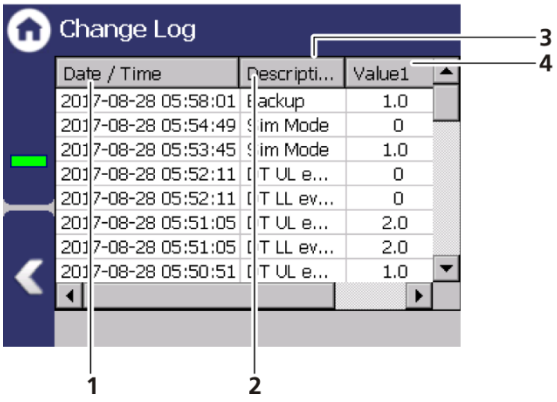
3. Close the event description (Fig. 140, item 7) with the button <Close>.
4. Slide the bar of the horizontal scroll bar (Fig. 140, item 6) to the right to see at what times (date, time) the event occurred.

▶ 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 submenu “Change log”.



1 **Time of the change**
2 **Short info of the change**
3 **Old state**
4 **New state**

Fig. 141 Change Log (Transmitter)

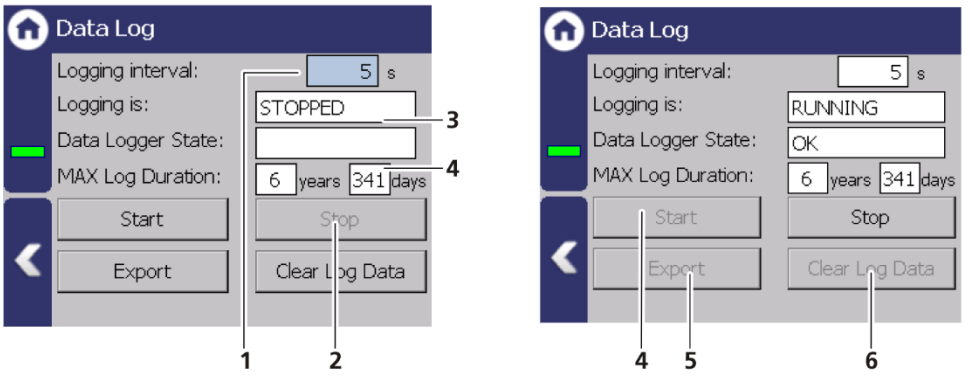
8.4 Menu Data Log

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. 142 Data Log

Change log interval

1. Click on the button <Stop> (Fig. 142, item 2) to stop the data log process.
2. Click on the input field “Log interval” (Fig. 142, item 1) and enter the time in seconds.
3. Confirm with the Enter key.

▶ The interval was accepted

4. Click on the button <Start> (Fig. 142, item 4) to start the data log process.

Export log data

1. Click on the button <Stop> (Fig. 142, 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. 142, item 5).

- The export process is started and can take several minutes to complete under certain circumstances.
- 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. 143 Data structure

8.5 Network Data Log

Diagnostics | Network Datalog

In the submenu “Network data log”, the transmission of log data via the ethernet network can be started. With a log program, the data can be displayed on the PC.

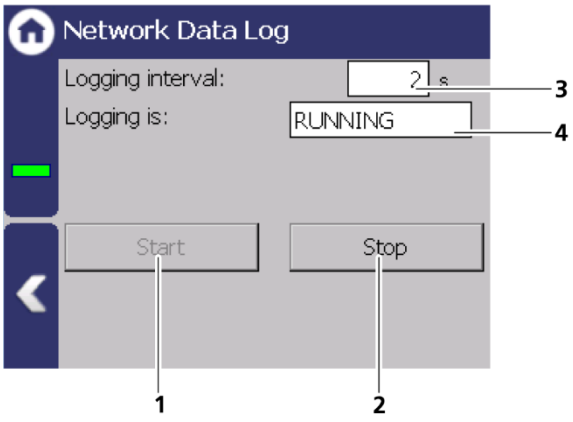
IMPORTANT

The PC and the LB 47x have to be in the same IP subnet.

- Observe the notes in chapter 7.3.1 – Network.

The network logger utilizes the Telnet protocol to send data over the local network. There are terminal emulator programs that can read this data and save it in a log file. Note the following links:

- https://support.microsoft.com/help/2801292
- https://social.technet.microsoft.com/wiki/contents/articles/38433.windows-10-enabling-telnet-client.aspx



1 **Button <Start>**
2 **Button <Stop>**
3 **Input field „Interval“**
4 **Display field „State“**

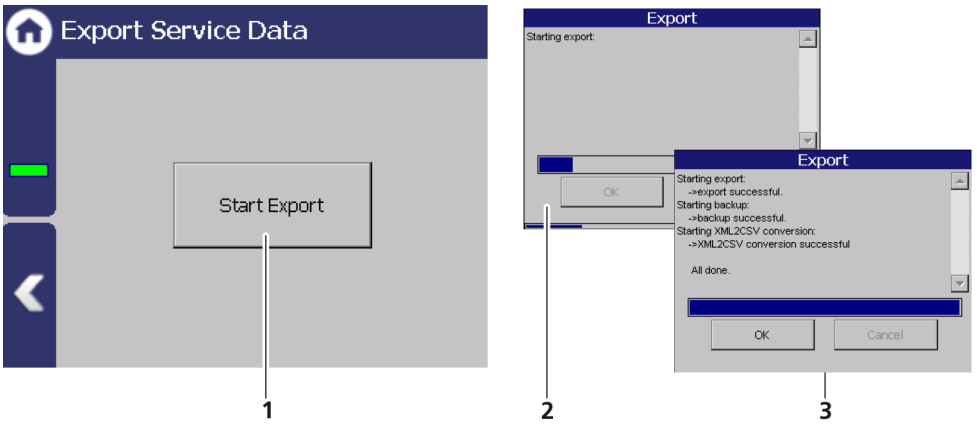
Fig. 144 Network Data Log (started)

1. Click on the entry field “Logging interval” (Fig. 145, item 3) and enter an interval.
2. Start the network data log (Fig. 145, item 1).
3. Make a note of the EVUs IP address (Device Settings | Settings | System | Network).
4. Enter the following input in the command line:
   > telnet "IP Address" "Port-Num" -f "LogFileName"

- The log data is displayed and saved in the created log file.

8.6 Export service data

Diagnostics | Export Service Data



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

Fig. 145 Export Service Data

5. Connect a USB storage device to the device (Fig. 3, item 5).
6. The USB storage is recognised by the system after a few seconds and the button <Export service data> (Fig. 145, item 1) can be clicked.
7. Click on the button <Export service data> (Fig. 145, item 1).

▶ The process window is displayed and the export of service data will be carried out (Fig. 145, item 2).

▶ After successful export a confirmation message Fig. 145, 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_LB472" is created and the Backup-File (.xml) is copied when exporting.

9 Tare Adjust

The tare count rate is the average count rate at feed rate 0 t/h and needs to be read in. Absorption fluctuations, caused by inhomogeneities in the conveyor belt or because of steel parts passing through (eg. on chain conveyors) need to be centred out. In tare measurement, the conveying organ must be running for this reason and the average value of the count rate is determined over several complete revolutions. The higher the number of revolutions, the more accurate the result.

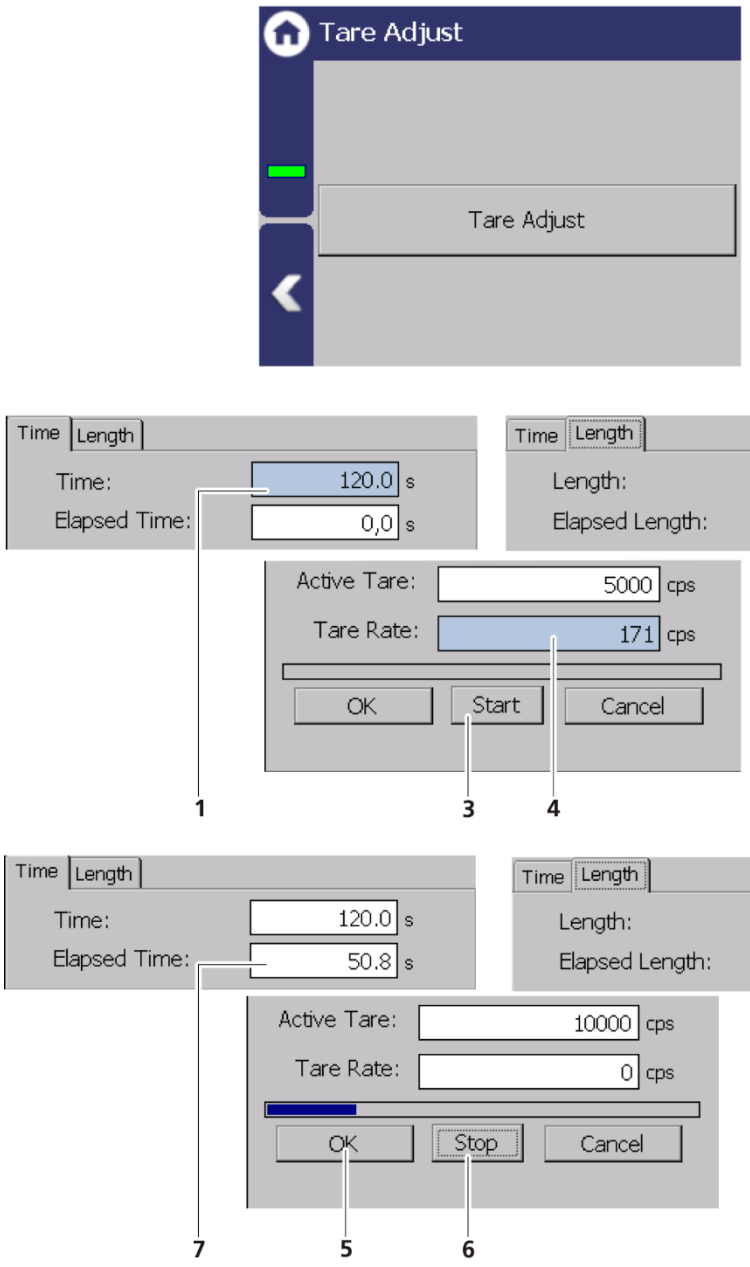
The tare determination can be checked with a subsequent test measurement of an empty belt. During the test measurement (approx. 10 minutes) there should be no, or just one negligible mass (t) integrated.

There are two possibilities for tare measurement:

- Tare measurement by time stipulation (Fig. 146, item 1)
- Tare measurement by belt length stipulation (Fig. 146, item 2)

NOTICE

The tare measurement must take place with an empty conveying organ. The result will be distorted if material is suddenly conveyed during the tare measurement process. In such a case, the tare measurement must be restarted.



1	**Input field Time [s]**	5	**Button <OK>**
2	**Input field Length [mm]**	6	**Button <Stop>**
3	**Button <Start>**	7	**Display of measured time**
4	**Input field current tare count rate [cps]**	8	**Display of measured length**

Fig. 146 Tare Adjust

The measurement can be cancelled using the button <Stop> (Fig. 146, item 6). The values established up to the point of cancellation can be taken over.

The value of the tare measurement may be entered manually (Fig. 146, item 4), if the count rate of the tare measurement is known.

Tare measurement with time stipulation

1. Click on the button <Tare comparison>.
2. Mark the belt at one point and thus determine the time taken for a circuit.
3. Enter a multiple of the time for a circuit in the input box (Fig. 146, item 1).
   Example: 1 circuit measured = 56 s
   15 circuits = 840 s
4. Click on the button <Start> (Fig. 86, item 3) to start the tare measurement.

▶ The tare measurement is carried out and the measured time (Fig. 146, item 7) is displayed.

5. Click on the button <OK> (Fig. 146, item 5) to save the tare measurement.

▶ The tare comparison was carried out.

Tare measurement with belt length stipulation

1. Click on the button <Tare comparison>.
2. Enter a multiplicity of total length of the belt (top and bottom runs) into the input box (Fig. 86, item 2). The entered length should be selected in such a way that the tare time lasts at least 10 minutes.
3. Click on the button <Start> (Fig. 146, item 3) to start the tare measurement.

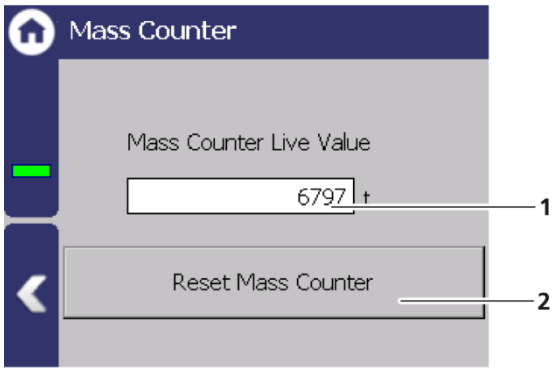
▶ The tare measurement is carried out and the already measured length (Fig. 86, item 8 “Length Counter”) is displayed.

4. Click on the button <OK> (Fig. 146, item 5) to save the tare measurement.

▶ The tare comparison was carried out.

10 Mass counter

In the submenu mass counter of the individual measuring set, the live value of the mass counter is displayed (Fig. 147, item 1). With the button <Reset Mass counter > (Fig. 147, item 2) the counter can be reset to 0.



1 **Display box live values mass counter**
2 **Button** <Mass counter reset>

Fig. 147 Submenu "Mass counter"

11 Troubleshooting

11.1 Error Search

Problem	Cause	Measure
Master unit: Screen black; LEDs are not illuminated	EVU does not work	▶ Check power supply and fuses
Slave module: LEDs are not illuminated	Slave module not clamped properly	▶ Check cabling, contact sockets
No signal	Detector does not work	▶ Check the functioning of the detector
Count rate too low	Shielding not opened or not opened correctly	▶ Check lock and ensure it is in OPEN position
	Incorrect focus of the effective radiation on the detector	▶ Correct and optimise the alignment
	Objects in the beam path	▶ Offset irradiation level
	Source at the end of its usable life span	▶ Replace source
no or incorrect process value display	Process values entry incorrect	▶ Check the calibration values and the process value ranges
Process value display fluctuates	Defect in detector	▶ Check detector
	Incorrect calibration	▶ Check calibration values
	Count rate too low (see above)	▶ Check source age and irradiation level, replace detector
Detector is not detected (software)	Terminals / wiring	▶ Check terminal connection; check terminal assignment
	Damaged line	▶ Check cable; examine with measurement device.
	Incorrect type 44xx / 47xx in the configuration	▶ Check type of detector (see type plate on the detector)
Detector is not detected (software)	Incorrect ID in the configuration	▶ Check ID of the detector (see type plate on the detector)
Touch panel does not respond	Error in operating system	▶ Restart EVU
Buttons are missed when you click	Incorrect screen calibration	▶ Calibrate screen again

11.2 Error Codes of the Evaluation Unit

In the following tables you can find the event messages and the error codes of the EVU which give you exact information on how to fix them in the event of an error.

The detector error codes can be seen in the operating manual of the respective detector.

The event messages are subdivided into

- ERROR (F)
- OUTSIDE OF SPECIFICATION (S)
- FUNCTION CHECK (C)
- MAINTENANCE REQUIREMENT (M)

Error (F)

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

Outside of specification (S)

The detector, one of the detector components or the process itself is outside the specification.

Function check (C)

On the detector the parameters are entered or a function check/simulation is carried out.

11.2.1 Error codes system

Code	Text	NAMUR 107	Correction
M101	Hardware module defective	F	Corrupt hardware electronics module. Restart the device. If the event occurs frequently, contact Berthold Service.
M102	Device data defective	F	Permanent memory error, no parameter set was found. Perform a factory reset and/or
M103	RAM error	F	Internal hardware error. Restart the device. If the event occurs frequently, contact Berthold Service.
M104	WD reset	M	The Watchdog has triggered a restart of the device. If the event occurs frequently, contact Berthold Service. Verify whether massive electromagnetic disturbances have triggered the event.
M105	WD error	F	Watchdog is faulty. If the event occurs frequently, contact Berthold Service.
M106	WD deactivated	M	Watchdog is deactivated. 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	Lower temperature limit: outside of the specification	S	The internal temperature of the device is below the lower threshold value. Proper function of the device can no longer be guaranteed. It is recommended to have the device checked by Berthold Technologies, even if it still seems to work properly.
M111	Upper temperature limit: Maintenance required	M	The internal temperature of the device is close to the upper threshold value of the permissible operating temperature.

M112	Upper temperature limit: outside of the specification	S	The internal temperature of the device is above the upper threshold value. Proper function of the device can no longer be guaranteed. It is recommended to have the device checked by Berthold Technologies, even if it still seems to work properly.
M113	Device restart	C	The device was restarted for an unknown reason, e.g. after a power failure.
M114	Software restart	C	The device was restarted by a user input.
M115	Error of the external real time clock	M	Malfunction of the external real time clock. If the event occurs frequently, contact Berthold Service.
M116	Date faulty	M	The date could not be verified during starting. Check date and time and set if required.

11.2.2 Application

Code	Text	NAMUR 107	Correction
M301	Device not calibrated	M	Device not calibrated. Measurement with standard parameters. Calibrate the device
M302	Decay compensation	S	Decay compensation failed. If the event occurs frequently, contact Berthold Service.
M303	Lower temperature limit: Failure	F	Min. threshold value of the detector temperature achieved / not reached.
M304	Upper temperature limit: Failure	F	Min. threshold value of the detector temperature achieved / exceeded.
M305	Lower temperature limit: outside of the specification	S	Min. threshold value of the detector temperature achieved / not reached.
M306	Upper temperature limit: outside of the specification	S	Min. threshold value of the detector temperature achieved / exceeded.
M307	Remote radiation	S	Remote radiation detected. Stopped measurement.
M308	Radioactive source replacement	M	Radioactive source date reached. Radioactive source replacement to be instigated.
M309	Stopped measurement	C	Stopped measurement
M310	Process value calculation failed	S	Process value could not be calculated. Check measuring range and calibration.
M311	Backup is running	C	Backup carried out.
M312	Restore is running	C	Restore is carried out.
M320	Lower PV limit: Failure	F	Min. threshold value of the process value achieved / not reached.
M321	Upper PV limit: Failure	F	Min. threshold value of the process value achieved / exceeded.
M322	Lower PV limit: outside of the specification	S	Min. threshold value of the process value achieved / not reached.
M323	Upper PV limit: outside of the specification	S	Min. threshold value of the process value achieved / exceeded.
M324	Process value less than 0	S	Process value less than 0. Check measuring range and calibration.
M325	Process value above upper threshold	S	Process value above upper limit. Check process value range and calibration.

M399	Internal program error	F	Internal software error. Restart the device. If the event occurs frequently, contact Berthold Service.

11.2.3 Detector

Code	Text	NAMUR 107	Correction
D501	Detector separated	F	Connection to at least one detector lost. Check detector configuration and / or detector connection. If the event remains, contact Berthold Service.
D502	Detector communication error	M	Communication with at least one detector temporarily interrupted. Check detector connection. If the event occurs frequently, contact Berthold Service.
D503	Detector failure	F	At least one detector signals “Failure”. Check detector events.
D504	Detector outside of specification	S	At least one detector signals “Outside the specification”. Check detector events.
D505	Detector function control	C	At least one detector signals “Function check”. Check detector events.
D506	Detector maintenance required	M	At least one detector signals “Maintenance requirement”. Check detector events.
D599	Internal program error	F	Internal software error. Restart the device. If the event occurs frequently, contact Berthold Service.

11.2.4 RS 458 Interface

Code	Text	NAMUR 107	Correction
M699	Internal program error	F	Internal software error. Restart the device. If the event occurs frequently, contact Berthold Service.

11.2.5 Process Connection

Code	Text	NAMUR 107	Correction
M701	AO error	F	Current outlet value deviates more than permitted from the feedback measured value. Calibrate current output. If the event occurs frequently, contact Berthold Service.
M702	AO circuit open	F	Current circuit on current outlet not closed. Check cabling
M703	Software update is running	C	Indicates that a software update is running. No action is required. The detector returns automatically to measurement mode after software update.
M799	Internal program error	F	Internal software error. Restart the device. If the event occurs frequently, contact Berthold Service.

12 Maintenance and Repair

The replacing of fuses and the cleaning of the EVU are described in the maintenance 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 (see chapter 2.3). 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).

12.1 Replacing of Fuses

⚠ DANGER

Danger to life from electric shock!

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

- Please adhere to the relevant safety regulations.
- Installation/maintenance may only be carried out if the device has been de-energised.
- 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!

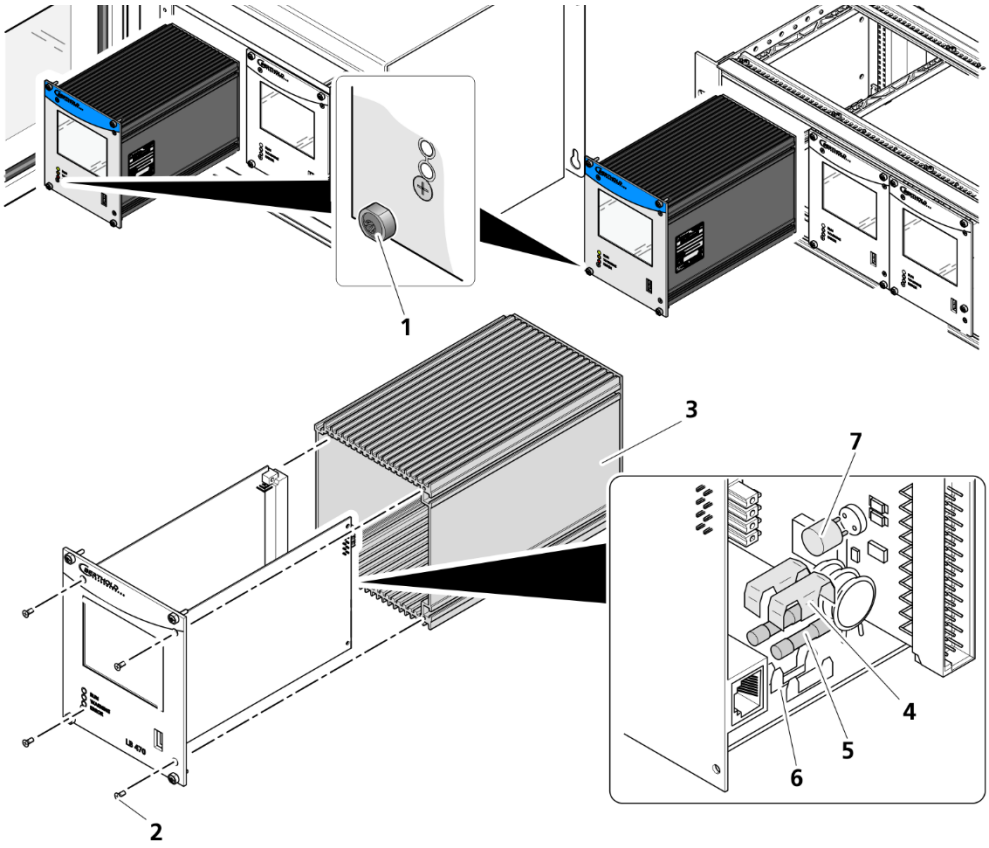
The EVU can be damaged if incorrect fuses are used.

- Only use fuses which correspond to the fuses on the circuit board of the module.

Fuses:

- Master EVU: 250V 1A T (5x20 mm)
- Master EVU: 250V TR5 T80mA (Ø 8,5 mm)
- Slave module: 250V 315mA T (5x20 mm)

Replacing fuse in the master module



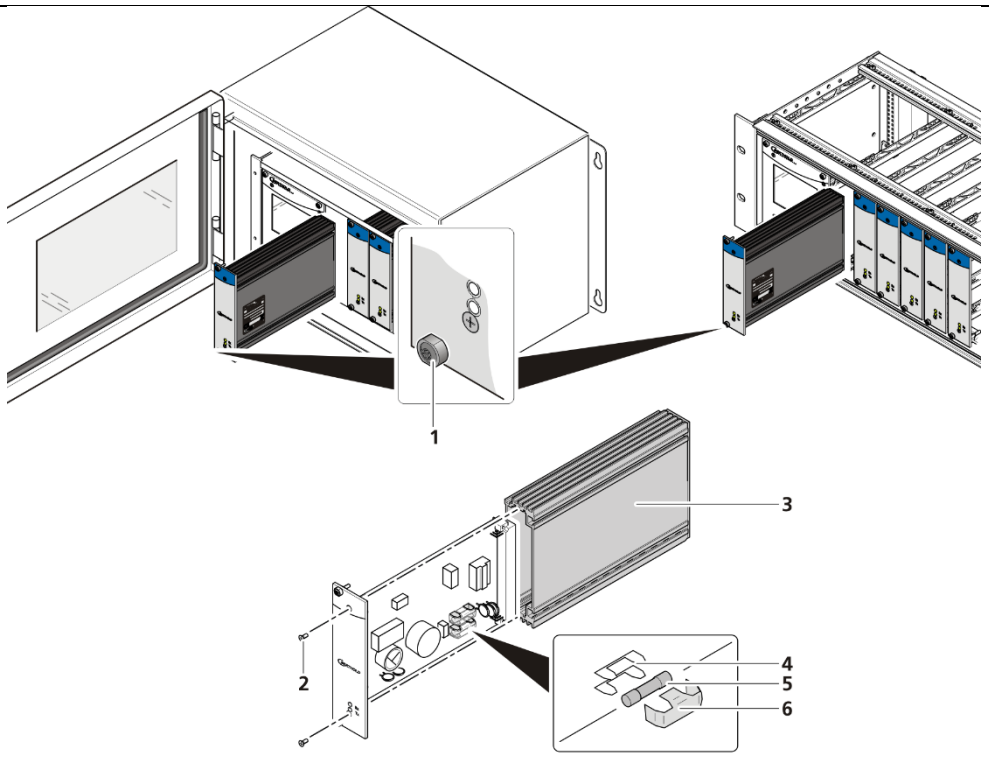
1	Fixing screws	5	Fuse 250V 1A T (5x20 mm)
2	screws	6	Base
3	Housing	7	Fuse 250V TR5 T80mA (Ø 8,5 mm)
4	Covering fuse		

Fig. 148 Replacing fuses master EVU

1. De-energise the device.
2. Loosen the four fixing screws (Fig. 148, 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. 148, item 2).
4. Pull out the housing (Fig. 148, item 3) carefully.
5. Remove the protective covering of the fuse (Fig. 148, item 4)
6. Remove the fuse (Fig. 148, 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. 148, 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. 148, item 1).

▶ The replacement of the fuses has been carried out correctly.

Replacing fuse in the slave module



1 **Fixing screws**
2 **Screws**
3 **Housing**
4 **Base**
5 **Fuse**
6 **Covering fuse**

Fig. 149 Exchange fuses slave EVU

1. De-energise the device.
2. Loosen the four fixing screws (Fig. 149, item 1) and remove the slave module from the wall housing or subrack.
3. Loosen the two sunken screws on the front side of the slave module (Fig. 149, item 2).
4. Pull out the housing (Fig. 149, item 3) carefully.
5. Remove the protective covering of the fuse (Fig. 149, item 6)
6. Remove the fuse (Fig. 149, item 5).
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 two screws.
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. 149, item 1).

▶ The replacement of the fuses has been carried out correctly.

12.2 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.

- Switch off the EVU before cleaning to avoid unintentional reactions.

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.

- Do not clean the display with compressed air or steam jet blowers. Do not use aggressive solvents or scouring powder. Clean touch display with a damp cloth only.

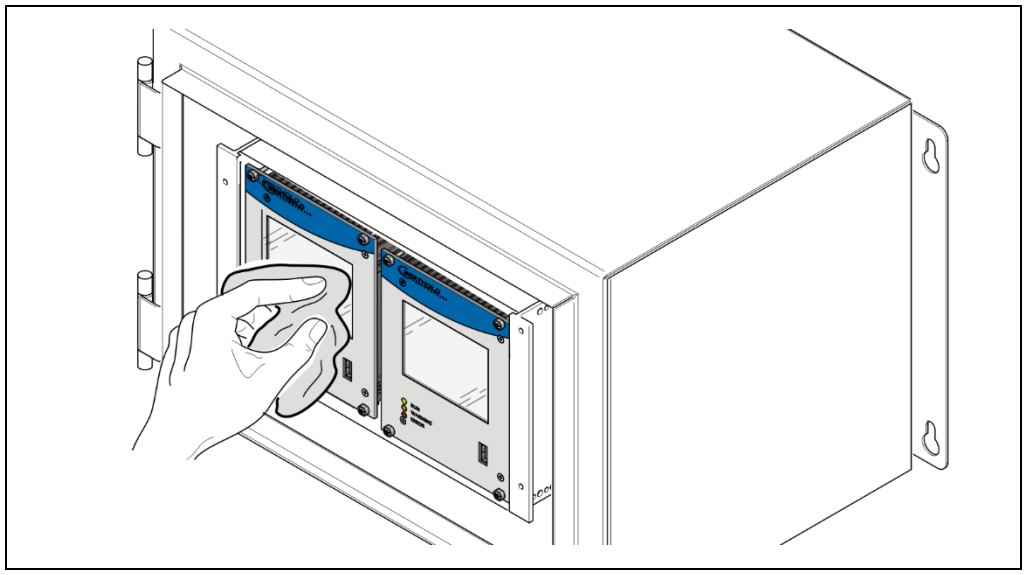


Fig. 150 Cleaning the display

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

- The cleaning is completed.

12.3 Data backup

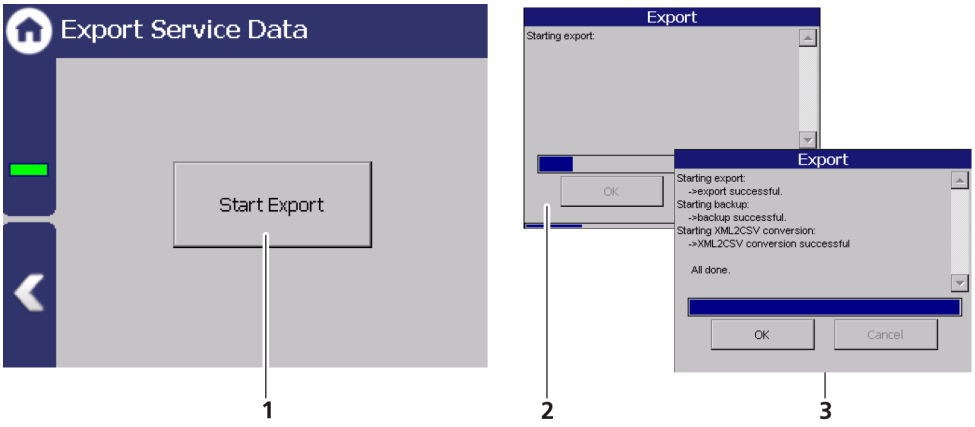
Activate the data log (see chapter 8.4) or the network data log (see chapter 8.5) so that all data are recorded. Perform a log data and service data backup at regular intervals.

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. 151 Export Service Data

1. Connect a USB storage device to the device (Fig. 4, item 5).
2. The USB storage is recognised by the system after a few seconds and the button <Export service data> (Fig. 145, item 1) can be clicked.
3. Click on the button <Export service data> (Fig. 145, item 1).

▶ The process window is displayed and the export of service data will be carried out (Fig. 145, item 2).

▶ After successful export a confirmation message Fig. 145, item 3) is displayed.

Information

A new folder "Backup_LB472" is created and the Backup-File (.xml) is copied when exporting.

13 Decommissioning

⚠ DANGER

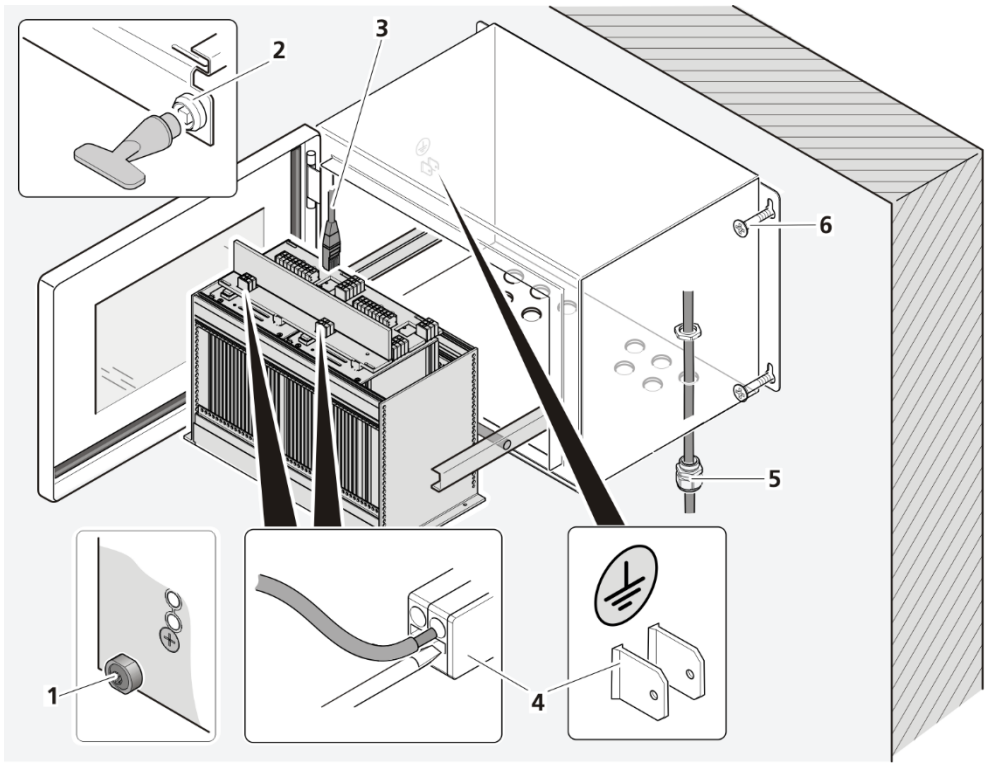
Danger to life from electric shock!

Decommissioning may only be carried out by qualified electricians.

- Please adhere to the relevant safety regulations.
- Decommissioning may only be carried out if the device has been de-energised.
- 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.

13.1 Decommissioning wall housing

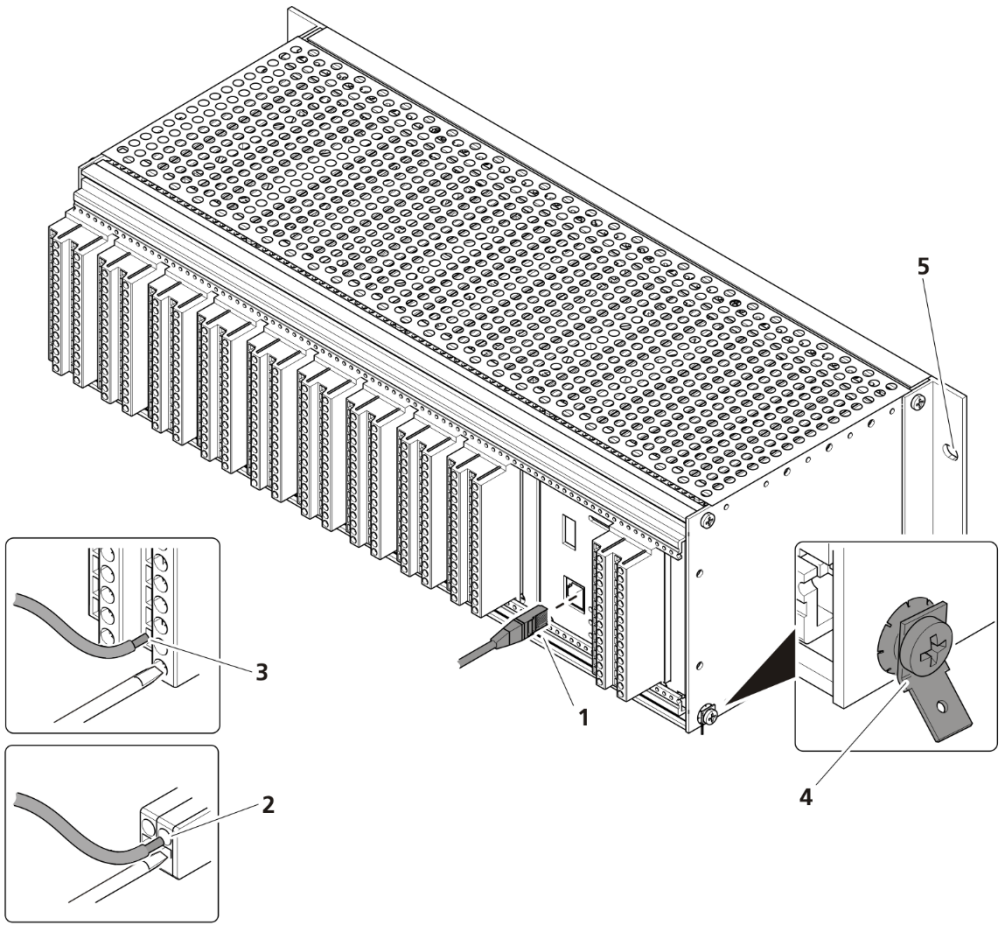


1	Fixing screws	4	Connecting Terminals / Ground connection
2	Locking	5	Cable gland
3	RJ45 connector (network)	6	Mounting screws

Fig. 152 Decommissioning wall housing

1. Make sure that the locking bolts (Fig. 152, item 1) of all modules are tightened in order to prevent slipping.
2. Loosen the lock (Fig. 152, item 2) using the supplied square key and pull the subrack out.
3. The subrack can be folded down by the folding mechanism.
4. Fold the subrack downward cautiously.
5. Remove the network plug (Fig. 152, item 3).
6. Remove all lines from the terminal board and the ground connection (Fig. 146, item 4).
7. Loosen the cable gland (Fig. 152, item 5) on the bottom side of the wall housing and pull all cables from the wall housing.
8. Slide the subrack into the wall housing and close the housing doors.
9. Loosen the mounting screws (Fig. 152, item 6) and remove the wall housing.

13.2 Decommissioning 19" subrack



1 RJ45 connector (network)
2 Clamps terminal board
3 Clamp blocks
4 PE cable
5 Screw Connections

Fig. 153 Decommissioning 19" subrack

1. De-energise the device.
2. Remove the network plug (Fig. 153, item 1).
3. Remove all lines from the terminal board (Fig. 153, item 2) or the clamp blocks (Fig. 153, item 3).
4. Remove the PE cable (Fig. 153, item 4).
5. Remove the connections (Fig. 153, item 5) and pull the subrack from the 19" rack.

13.3 Disposal of Measurement System

⚠ CAUTION

Toxic!

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

- 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.

14 Appendix

14.1 Commissioning report

General data	
Date	
Measuring point	
Radioactive source No.	
Number of detectors	_____ LB44x _____ LB47x _____ LB54x
Activity	
Isotope	☐ Cs-137 ☐ Co-60
Conveying organ	
Product	
Cascaded measurement	☐ YES ☐ NO

Device configuration	
Model	
Installation variant	☐ Wall housing ☐ Subrack
Connection	☐ Board ☐ Terminal block
Voltage supply	☐ 100-240 VAC ☐ 21-32 VDC
Number Master EVU	
Number Slave modules	
Device ID	
Software version	

Commissioning report (continued)

Parameter	
Password	_____
Language	☐ DE ☐ EN ☐ _____
CE Remote Control	☐ Activated
Network	☐ DHCP active IP Address _____ • _____ • _____ • _____ Subnet mask _____ • _____ • _____ • _____ Standard gateway _____ • _____ • _____ • _____ DNS server _____ • _____ • _____ • _____ MAC Address _____
Calibration method	☐ Direct ☐ Compar. weighing ☐ Static ☐ Average weight per unit length
Calculation method	☐ Linear ☐ Square ☐ Cubic
Process Value Range	min. value 0 / 4.00 mA _____ max. value 20.00 mA _____
Emitter change notification	☐ Activated
Digital inputs	Function DI-1 ☐ None ☐ Measur. stop ☐ Belt stop ☐ Active measure. set ☐ Mass counter reset ☐ Tare rate comparison Function DI-2 ☐ None ☐ Measur. stop ☐ Belt stop ☐ Active measur. set ☐ Mass counter Reset ☐ Tare rate comparison
Analog output	AO assignment ☐ Process value ☐ Damped count rate ☐ Raw count rate AO error mode ☐ Namur high ☐ Namur low ☐ Hold value ☐ AO monitoring activated
Analog input	☐ Fixed value _____ m/s ☐ Tacho pulse input _____ Pulses/rev. _____ mm ☐ Tacho pulse. Running wheel _____ Pulses/rev. ☐ Tacho current input 0 / 4.00 mA _____ m/s 20.00 mA _____ m/s

Commissioning report (continued)

Parameter	
Digital outputs	Function DO-2 ☐ none ☐ Lower PV Alarm ☐ Upper PV Alarm ☐ Det. Temperature alarm ☐ Alarm source replacement ☐ Measurement stopped ☐ System state: Warning ☐ Mass pulse ☐ Tare rate is read in Function DO-3 ☐ None ☐ Lower PV Alarm ☐ Upper PV Alarm ☐ Det. Temperature alarm ☐ Alarm source replacement ☐ Measurement stopped ☐ System state: Warning ☐ Mass pulse ☐ Tare rate is read in
Mass per pulse	_____ t
PV alarm behaviour	NE 107 Status when alarm ☐ No Status ☐ Outside of specification ☐ Error
Detector temperature alarm behaviour	NE 107 Status when alarm ☐ No Status ☐ Outside of specification ☐ Error

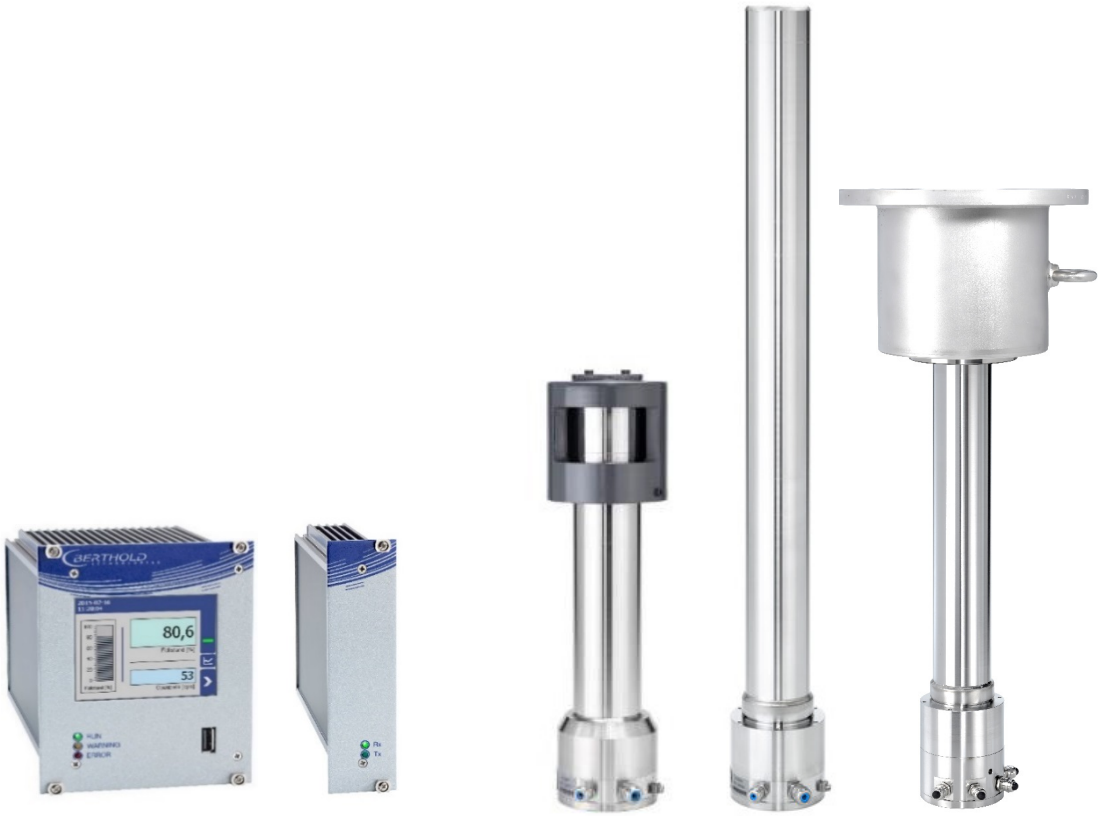
Modifications due to technical advancement reserved.

01/2020
Language: English
Rev. No.: 03
Printed in Germany

BERTHOLD TECHNOLOGIES GmbH & Co. KG

Calmbacher Str. 22
75323 Bad Wildbad
Germany
www.Berthold.com

Id. No. 56925-2BA2



Unité d'évaluation

DUO SERIES

LB 47x

Détecteurs

DUO XPERT

LB 4700

Informations sur la sécurité

56925BA59

Rev. No.: 04, 09/2019

1 A propos de ce manuel d'utilisation

1.8 Avertissement

Les avertissements sont identifiés comme suit :

Signalement

Source et conséquence
Explication si requise
- ▶ 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

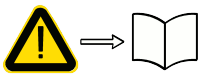
Les sections identifiées avec ce symbole signalent des informations importantes du produit ou de son fonctionnement.

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.

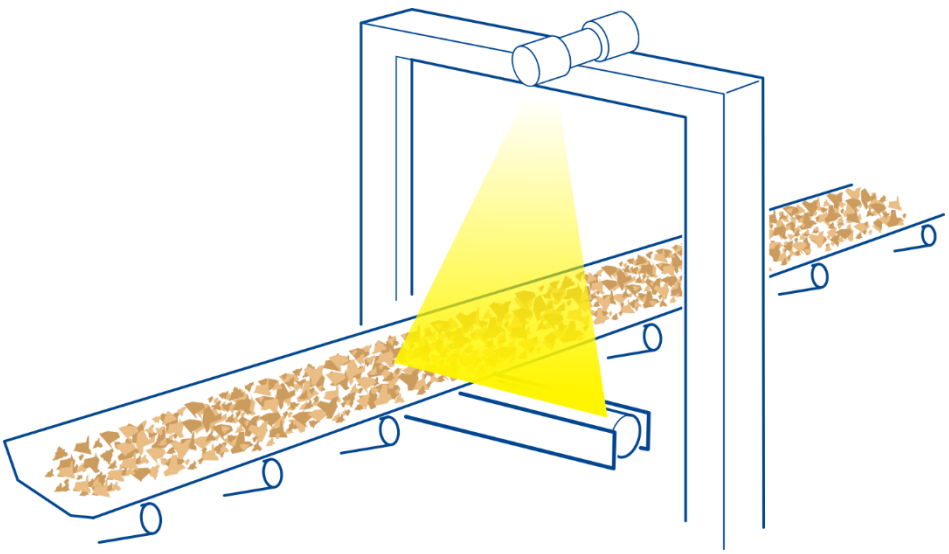
Sous réserve de modifications dans le cadre du progrès technique.

langue: Français
Imprimé en Allemagne
09/2019
Rev.-Nr.: 04

BERTHOLD TECHNOLOGIES GmbH & Co. KG

Calmbacher Str. 22
75323 Bad Wildbad
Germany
www.Berthold.com

Id.-Nr. 56925BA59



Bulk Flow
Fördermenge

Technical Information
Technische Information

56926TI1B
Rev. No.: 01, 01/2020

2 Wire Technology

The DuoSeries/DuoXPERT measuring system consists of a scintillation detector – CrystalSENS point detector, UniSENS rod detector or SuperSENS detector – and a sophisticated evaluation unit (DuoXPERT) for display and operation.
The evaluation unit is a state-of-the-art control unit with robust 3.5" TFT touch panel, powerful Dual Core CPU and diverse operator interfaces. Advanced self diagnostics and monitoring features ensure a safe function of the system. Furthermore the data logging functionality allows operators to analyze their processes in depth, e.g. develop trends, track process changes etc.

Sophisticated measuring system in 2 wire technology

- Unique: Radiometric system with intrinsically safe power supply (Full Ex-i)
- Real 2-wire technology, only 2 wires in the field
- Advanced self diagnostics and monitoring features
- Easy to use touch screen panel for local display and operation
- Integrated gas density compensation feature
- Direct replacement of predecessor model LB 440
- Interfaces with all 2-wire detectors LB 44xx, LB 54xx and LB 47xx

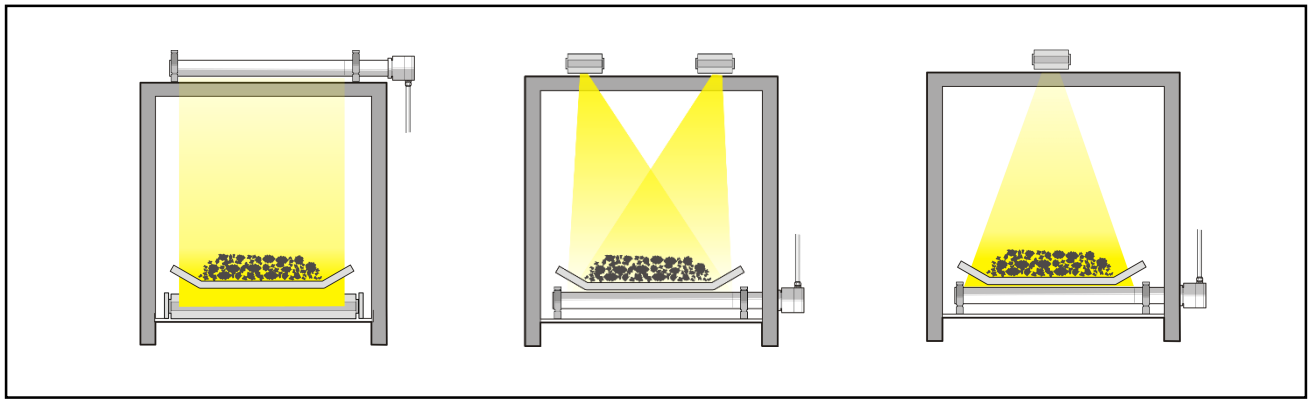
2-Leiter Technologie

Das DuoSeries/DuoXpert Messsystem besteht aus einem Detektor mit Szintillator-Technolgie – CrystalSENS Punktdetektor, UniSENS Stabdetektor oder SuperSENS Detektor – sowie einer separaten Auswerteeinheit zur Anzeige und Bedienung.
Die moderne Auswerteeinheit verfügt über ein 3,5" Touch Panel, eine starke Dual Core CPU und verschiedenen Bedien-Optionen. Erweiterte Funktionen zur Selbstdiagnose und Überwachung sorgen zudem für höchste funktionale Sicherheit der Messung im Betrieb. Darüber hinaus können die Betreiber die Daten-Log Funktionen für eine detaillierte Prozessanalyse nutzen und so zum Beispiel Trends entwickeln oder Prozessänderungen nachvollziehen.

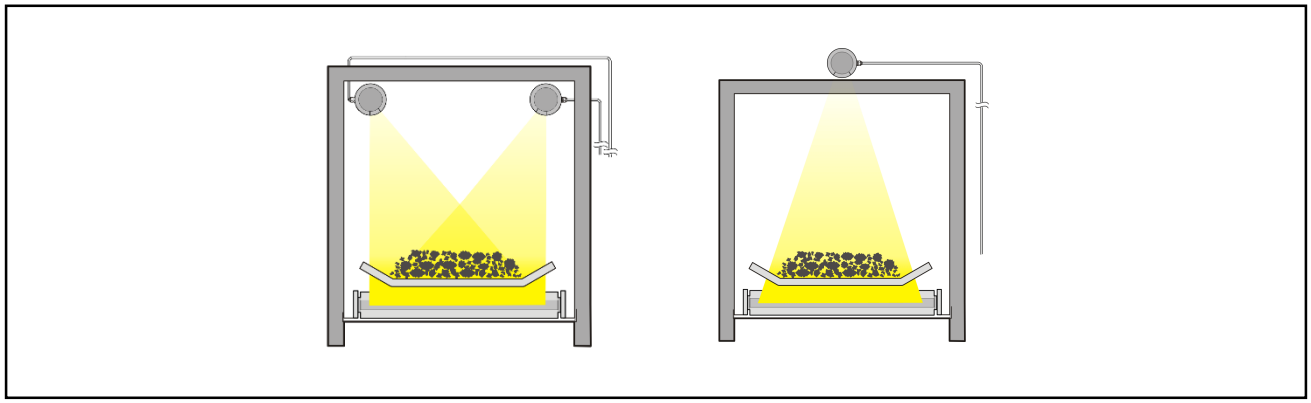
Hochentwickeltes Messsystem in 2-Leiter Technologie

- *Einzigartig: Radiometrische Messung mit eigensicherer Spannungsversorgung (Voll Ex-i)*
- *Echte 2-Leiter Technik, nur 2 Adern im Feld*
- *Verbesserte Diagnosefunktionen und Selbstüberwachung*
- *Einfache, intuitive Bedienung über Touch-Screen*
- *Integriertes Feature zur Kompensation von Gas-Phasen Schwankungen*
- *Volle Kompatibilität zum Vorgängermodell LB 440*
- *Kompatibel zu alle 2-Leiter Detektoren LB 44xx, LB54xx und LB 47xx*

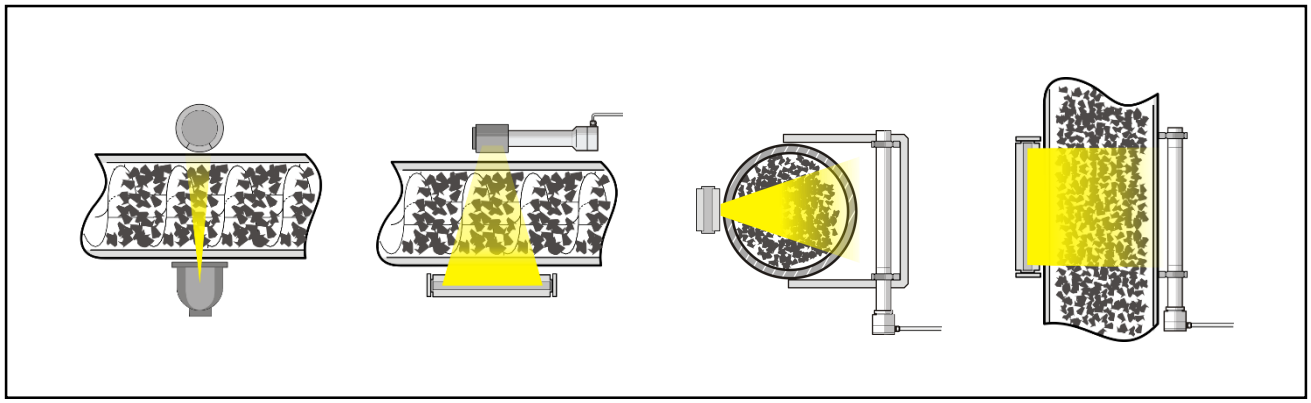
Measurement Arragements Bulk Flow
Messanordnungen Fördermenge



Measurement arrangements with rod detector
Messanordnungen mit Stabdetektor



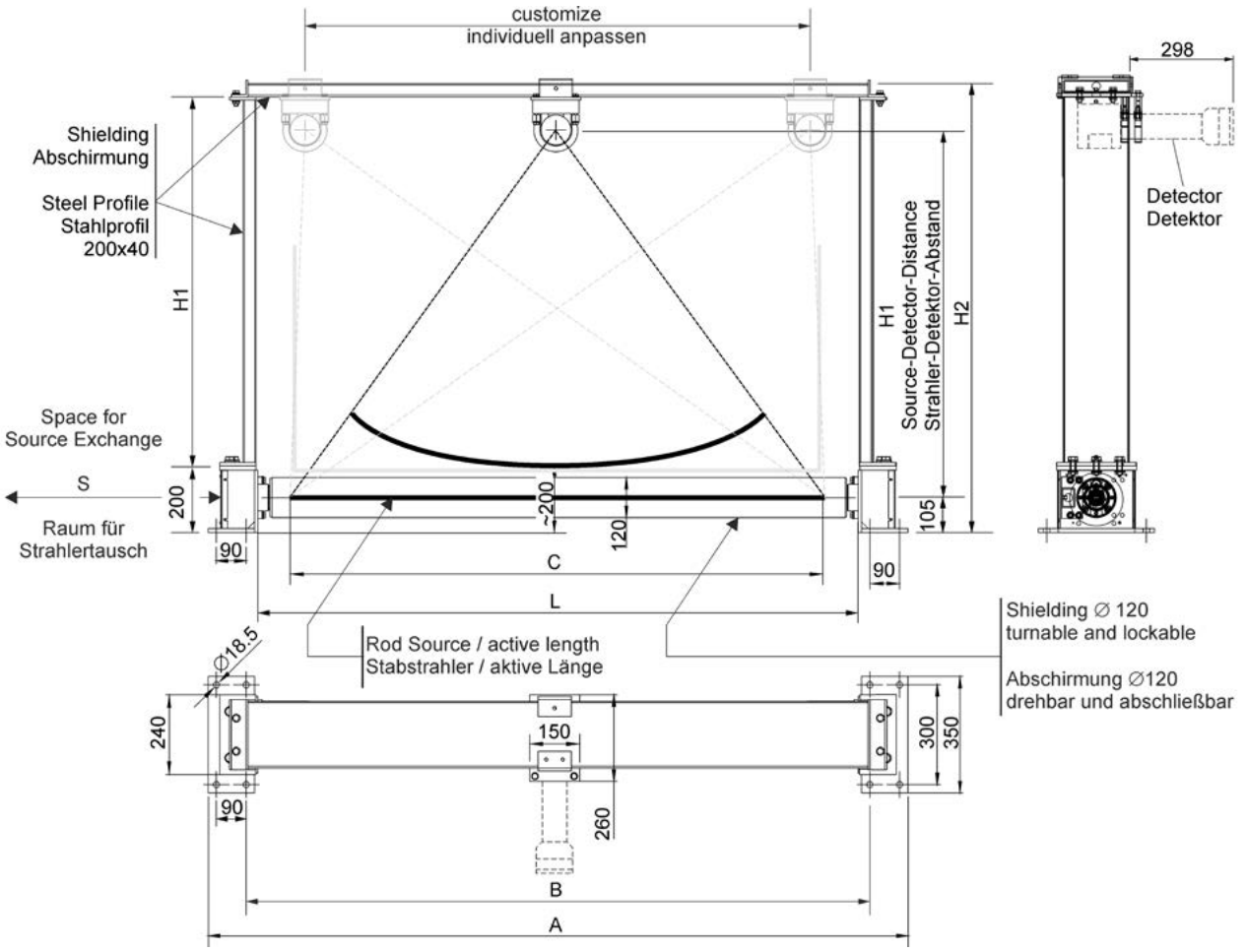
Measurement arrangements with pointdetector
Messanordnungen mit Punktdetektor



Measurement arrangements at pipes
Messanordnungen an Rohren

Measuring Frame Rod Source LB 4426 / LB 4427 (V2A)

Messbügel für Stabstrahler LB 4426 / LB 4427 (V2A)



Dimensions in mm
Abmessungen in mm

LB 4426 Part No. *Id Nr.*	C belt width *Bandbreite*	A	B	H1 sidepart length *Seitenteil Länge*	H2 total height *Gesamt höhe*	L inside width *lichte Weite*	Weight *Gewicht* (kg)	S
30846-0111	500	1006	776	700	955	706	309	1000
30846-1111	650	1156	926	700	955	856	341	1150
30846-2111	800	1306	1076	700	955	1006	373	1300
30846-3121	1000	1506	1276	1000	1255	1206	470	1500
30846-4121	1200	1706	1476	1000	1255	1406	514	1700
30846-6121	1600	2106	1876	1000	1255	1806	558	2100

Nomenclature LB 4426 / LB 4427 (V2A)
Nomenklatur LB 4426 / LB 4427 (V2A)

LB-Number Key
LB-Nummernschlüssel

30846 – x – x – x – x

Detectors *Detektoren*	
1	1
2	2

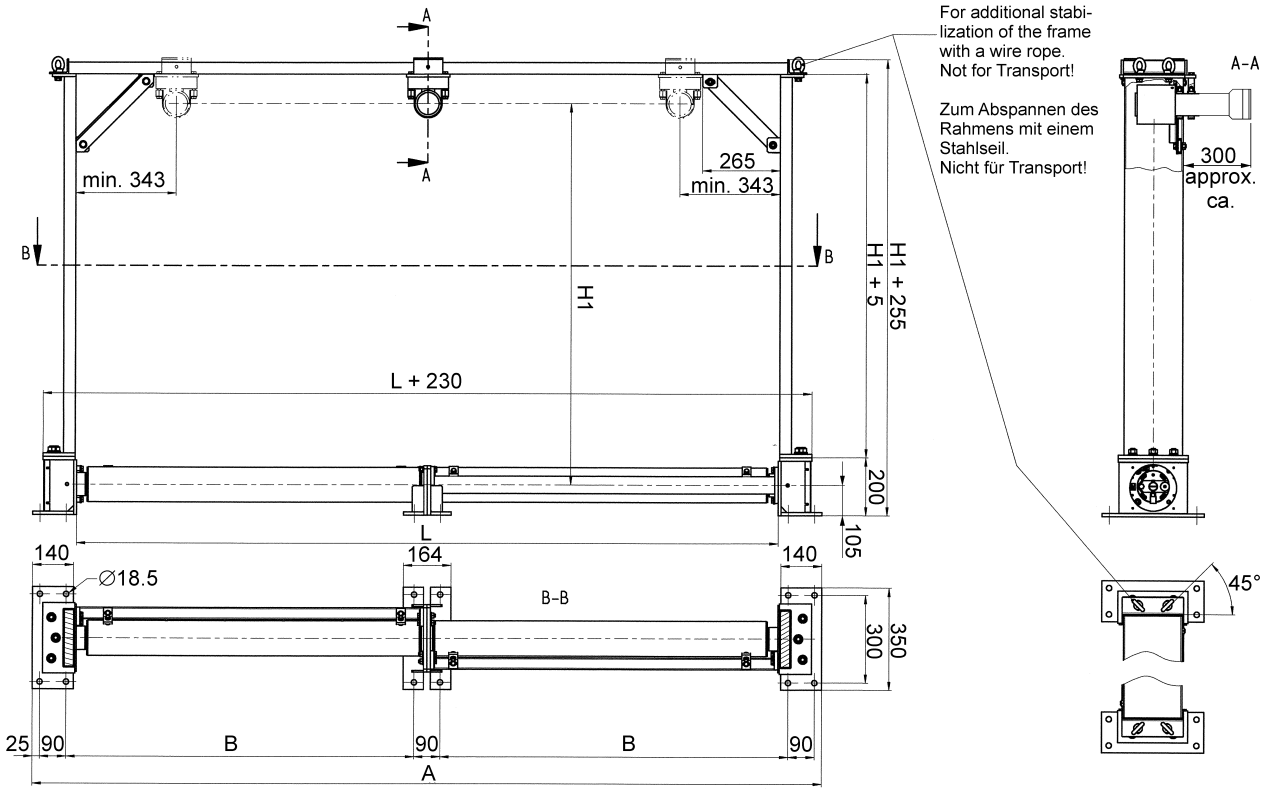
	Material
1	Carbon Steel / *Stahl*
2	Stainless Steel / *Edelstahl* 304/1.4301

	Belt Width *Bandbreite*
00	500
01	650
02	800
03	1000
04	1200
06	1600

	Height *Höhe*
01	700
02	1000
03	1300
04	1600
05	2000

Measuring Frame Rod Source LB 4452

Messbügel für Stabstrahler LB 4452



Dimensions in mm
Abmessungen in mm

Belt Width *Bandbreite*	A	B	L
1800	2496	1088	2196
2000	2696	1188	2396
2200	2896	1288	2596
2400	3096	1388	2796
2800	3496	1588	3196

Nomenclature LB 4452
Nomenklatur LB 4452

LB-Number Key
LB-Nummernschlüssel

45727 – x – x – x – x – x

Options *Varianten*	
1	Standard
2	Limit Switch
3	Pneumatic

Detectors *Detektoren*	
1	1
2	2

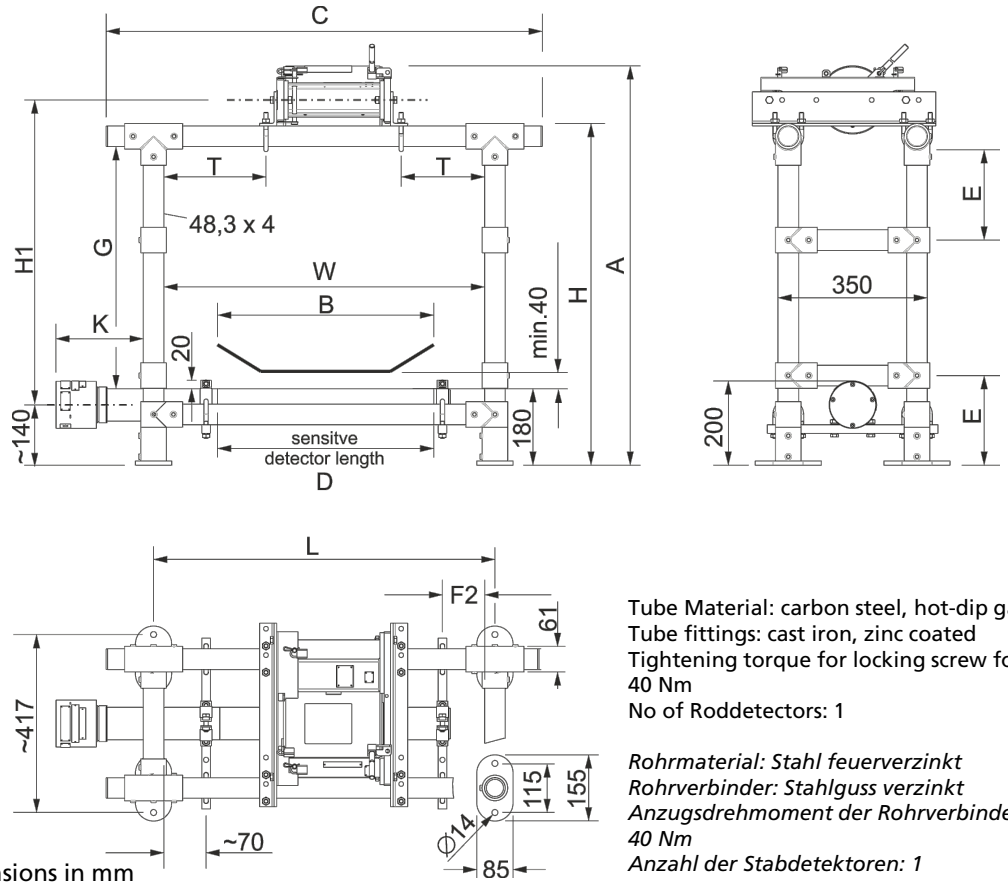
Material	
1	Carbon Steel / *Stahl*
2	Stainless Steel / *Edelstahl* 304/1.4301

Belt Width *Bandbreite*	
00	1800
01	2000
02	2200
03	2400
04	2600
05	
06	2800

Height *Höhe*	
01	700
02	1000
03	1300
04	1600
05	1800
06	2000
07	2300
08	2600
09	2800
00	2500

Measuring Frame for Rod Detector (500 ... 2200 mm)

Messbügel für Stabdetektor (500 ... 2200 mm)



Dimensions in mm
Abmessungen in mm

Tube Material: carbon steel, hot-dip galvanised
Tube fittings: cast iron, zinc coated
Tightening torque for locking screw for the tube fittings: 40 Nm
No of Roddetectors: 1

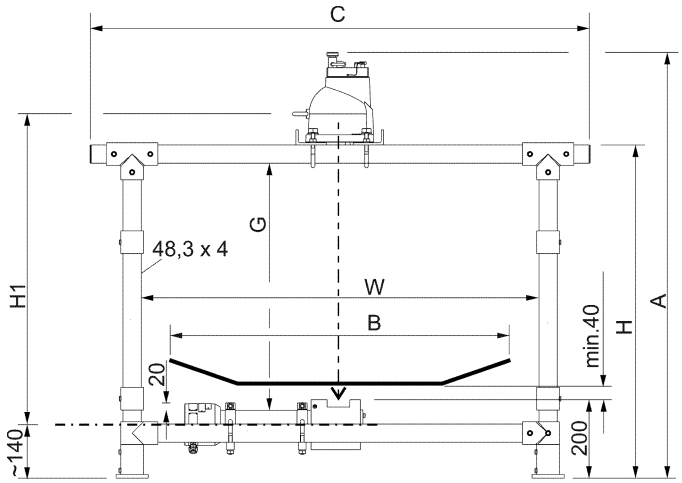
Rohrmaterial: Stahl feuerverzinkt
Rohrverbinder: Stahlguss verzinkt
Anzugsdrehmoment der Rohrverbinder-Stellschrauben: 40 Nm
Anzahl der Stabdetektoren: 1

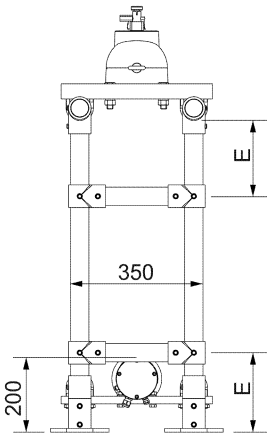
Part No. *Id. Nr*	Width Dimensions *Abmessungen Breite*						
	B	W	D	C	F2	L	K
70179-**05**XX11	500	750	500	1020	100	800	250
70179-**08**XX11	800	1050	750	1320	125	1100	230
70179-**10**XX11	1000	1250	1000	1520	100	1300	250
70179-**12**XX11	1200	1450	1250	1720	75	1500	280
70179-**16**XX11	1600	1850	1500	2120	150	1900	200
70179-**20**XX11	2000	2250	2000	2520	100	2300	250

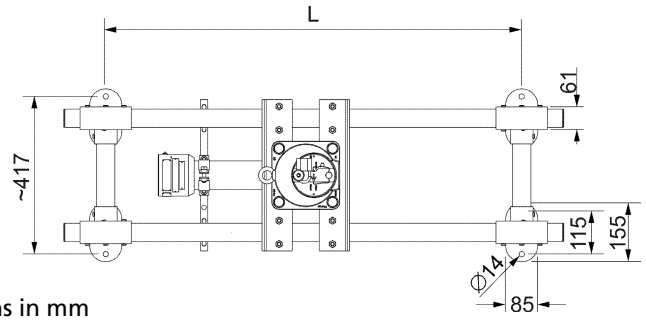
Part No. *Id. Nr.*	Height Dimensions *Abmessungen Höhe*					
	H	H1	E	A		G
				Typ 100	Typ 150	
70179-XX**08**11	800	720	190	910	940	570
70179-XX**10**11	1000	920	240	1110	1140	770
70179-XX**12**11	1200	1120	290	1310	1340	970
70179-XX**14**11	1400	1320	340	1510	1540	1170
70179-XX**16**11	1600	1520	390	1710	1740	1370
70179-XX**18**11	1800	1720	440	1910	1940	1570
70179-XX**20**11	2000	1920	490	2110	2140	1770
70179-XX**22**11	2200	2120	540	2310	2340	1970
70179-XX**24**11	2400	2320	580	2510	2540	2170
70179-XX**26**11	2600	2520	570	2710	2740	2370
70179-XX**28**11	2800	2720	680	2910	2940	2570

Measuring Frame for Point Detector + LB 7440 (500 ... 2200 mm)

Messbügel für Punktdetektor + LB 7440 (500 ... 2200 mm)







Tube Material: carbon steel, hot-dip galvanised
Tube fittings: cast iron, zinc coated
Tightening torque for locking screw for the tube fittings: 40 Nm

Rohrmaterial: Stahl feuerverzinkt
Rohrverbinder: Stahlguss verzinkt
Anzugsdrehmoment der Rohrverbinder-Stellschrauben: 40 Nm

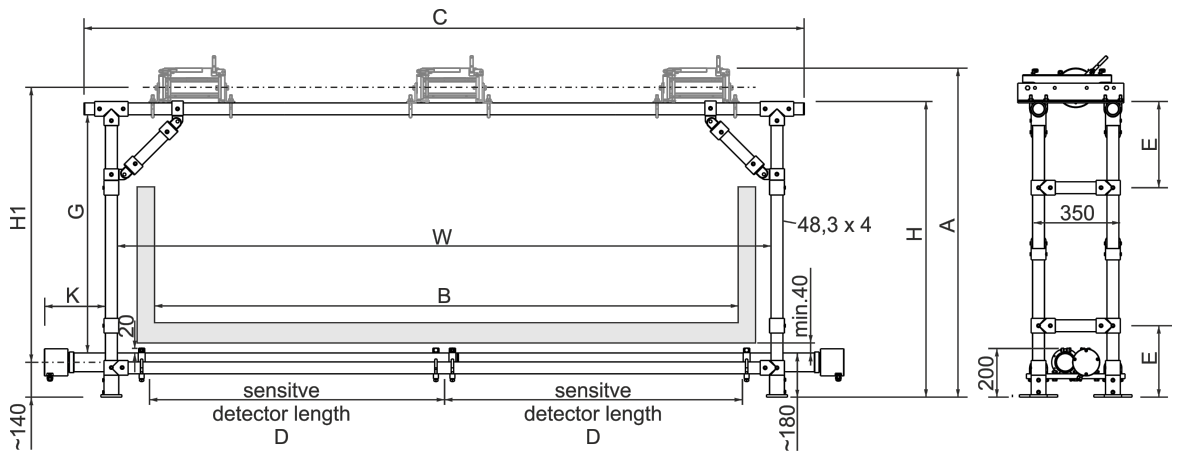
Dimensions in mm
Abmessungen in mm

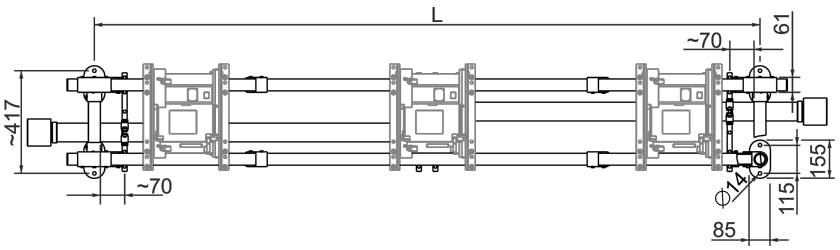
Part No. *Id. Nr*	Width Dimensions *Abmessungen Breite*			
	B	W	C	L
70179-**05**XX11	500	750	1020	800
70179-**08**XX11	800	1050	1320	1100
70179-**10**XX11	1000	1250	1520	1300
70179-**12**XX11	1200	1450	1720	1500
70179-**16**XX11	1600	1850	2120	1900
70179-**20**XX11	2000	2250	2520	2300

Part No. *Id. Nr.*	Height Dimensions *Abmessungen Höhe*				
	H	H1	E	A	G
70179-XX**08**11	800	840	190	1010	570
70179-XX**10**11	1000	940	240	1210	770
70179-XX**12**11	1200	1140	290	1410	970
70179-XX**14**11	1400	1340	340	1610	1170
70179-XX**16**11	1600	1540	390	1810	1370
70179-XX**18**11	1800	1740	440	2010	1570
70179-XX**20**11	2000	1940	490	2210	1770
70179-XX**22**11	2200	2140	540	2410	1970
70179-XX**24**11	2400	2340	580	2610	2170
70179-XX**26**11	2600	2540	570	2810	2370
70179-XX**28**11	2800	2740	680	3010	2570

Measuring Frame for Rod Detector (2400 ... 3200 mm)

Messbügel für Stabdetektor (2400 ... 3200 mm)





Tube Material: carbon steel, hot-dip galvanised
Tube fittings: cast iron, zinc coated
Tightening torque for locking screw for the tube fittings: 40 Nm
No of Roddetectors: 2

Rohrmaterial: Stahl feuerverzinkt
Rohrverbinder: Stahlguss verzinkt
Anzugsdrehmoment der Rohrverbinder-Stellschrauben:
40 NmAnzahl der Stabdetektoren: 2

Dimensions in mm
Abmessungen in mm

Part No. *Id. Nr*	Width Dimensions *Abmessungen Breite*					
	B	W	D	C	L	K
70179-**24**XX12	2400	2650	1250	2920	2700	250
70179-**28**XX12	2800	3050	1500	3320	3100	300
70179-**30**XX12	3000	3250	1500	3520	3300	200

ATTENTION:
If the measuring frame cannot be built rigid enough due to its size and/or local conditions, it is recommended to fix the upper measuring frame corners, either upwards or downwards. Stainless steel cables can be used for fixing, which are attached directly to the upper corners by means of loops

HINWEIS:
Können die Messbügel, aufgrund ihrer Größe und / oder den örtlichen Gegebenheiten, nicht steif genug aufgebaut werden, dann wird empfohlen, die oberen Messbügel-Ecken, nach oben oder unten, abzuspannen. Zum Abspannen können Edelstahlseile verwendet werden, die mit Hilfe von Schlaufen direkt an den oberen Ecken befestigt werden.

Part No. *Id. Nr.*	Height Dimensions *Abmessungen Höhe*					
	H	H1	E	A		G
				Typ 100	Typ 150	
70179-XX**12**12	1200	1120	290	1310	1340	970
70179-XX**14**12	1400	1320	340	1510	1540	1170
70179-XX**16**12	1600	1520	390	1710	1740	1370
70179-XX**18**12	1800	1720	440	1910	1940	1570
70179-XX**20**12	2000	1920	490	2110	2140	1770
70179-XX**22**12	2200	2120	540	2310	2340	1970
70179-XX**24**12	2400	2320	580	2510	2540	2170
70179-XX**26**12	2600	2520	620	2710	2740	2370
70179-XX**28**12	2800	2720	680	2910	2940	2570

Measuring Frame for Rod Detector
Messbügel für Stabdetektor

LB-Number Key
LB-Nummernschlüssel

70179 - 0 5 0 8 1 1

Detectors *Detektoren*	
1	1
2	2

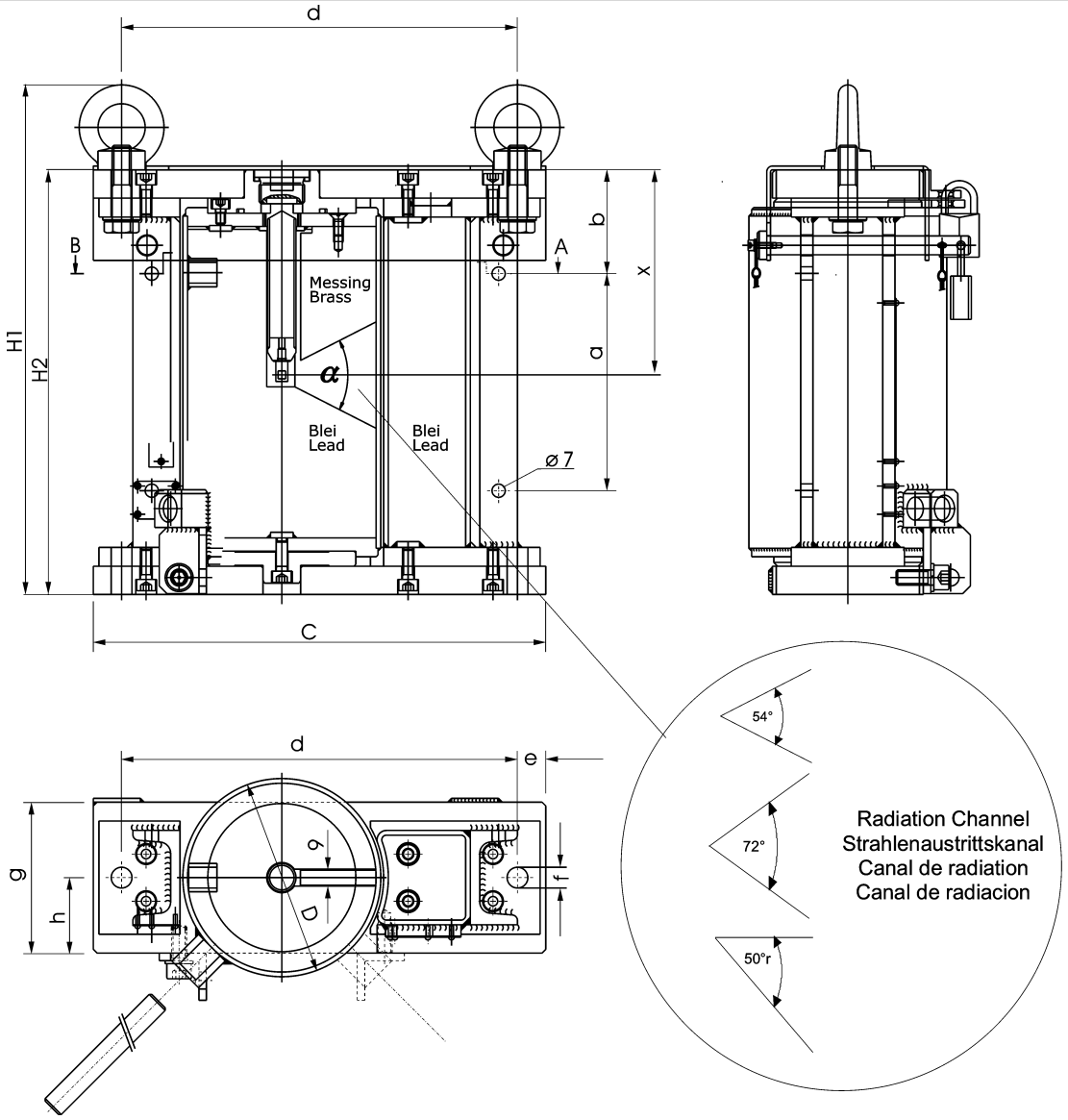
Material	
1	Steel zinc coated

	Belt Width *Bandbreite*	Usable Scintillator Length *Nutzbare Szintillatorlänge*
05	500	500
08	800	750
10	1000	1000 (750)
12	1200	1250 (1000)
14	1400	1250
16	1600	1500
18	1800	1500
20	2000	2000
22	2200	2000
24	2400	1250 + 1250
28	2800	1250 + 1250
32	3200	1500 + 1500

	Height *Höhe*
06	600
08	800
10	1000
12	1200
14	1400
16	1600
18	1800
20	2000
24	2400
26	2600
28	2800

Shield for Rod Detector Frame

Abschirmung für Stabdetektormessbügel



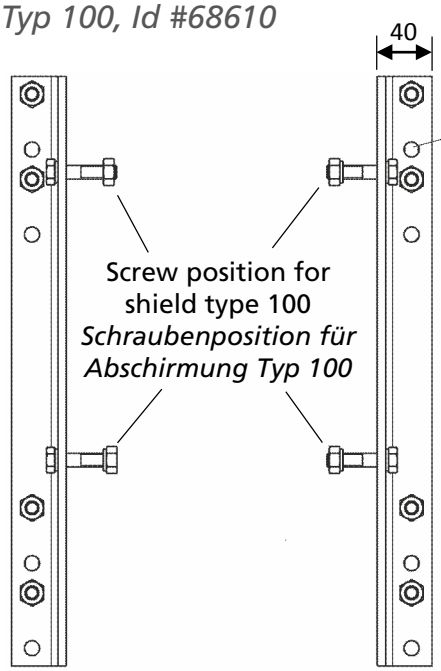
Dimensions in mm
Abmessungen in mm

Material: carbon steel, painted
Material: Stahl lackiert

Part # Id. #	Type *Typ*	α	a	b	C	d	H1	H2	x	f	e	g	h	D	kg
36857-01	100	72°	115	55	240	210	270	225	109	11	15	80	40	150	32
36857-21		54°													
36857-31		50°r													
37280-01	150	72°	135	65	360	320	327	265	114	18	20	90	45	159	70
37280-21		54°													
37280-31		50°r													

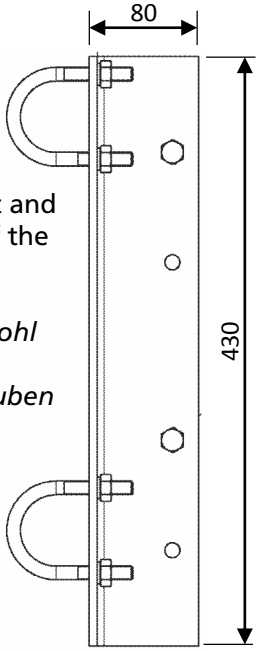
Shield Holder for Rod Detector Frame
Abschirmungshalter für Stabdetektormessbügel

for Type 100, Part #68610
für Typ 100, Id #68610

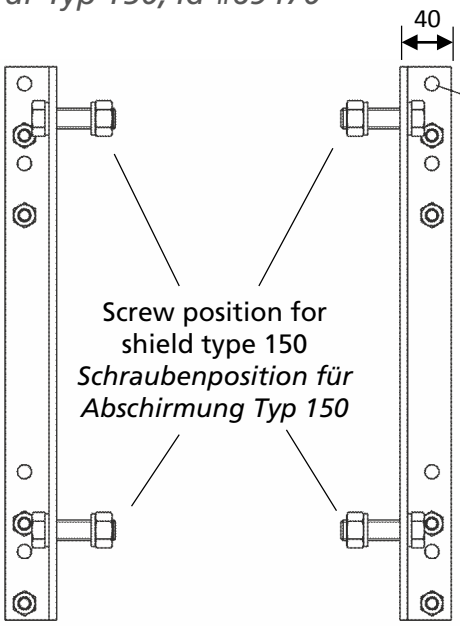


Both brackets are universal, both right and left usable. Note different positions of the screws and U-bolt pipe hangers.

Beide Haltewinkel sind universell, sowohl rechts als auch links verwendbar. Unterschiedliche Positionen der Schrauben und Rundstahlbügel beachten.

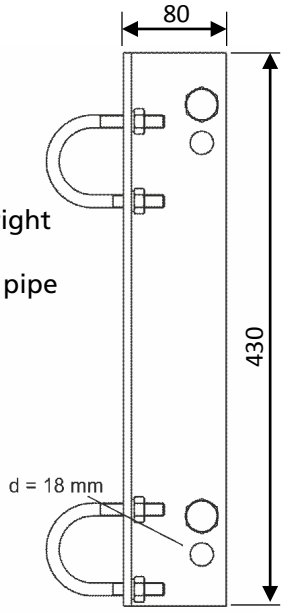


for Type 150, Part #69470
für Typ 150, Id #69470



Both brackets are universal, both right and left usable. Note different positions of the screws and U-bolt pipe hangers.

Beide Haltewinkel sind universell, sowohl rechts als auch links verwendbar. Unterschiedliche Positionen der Schrauben und Rundstahlbügel beachten.

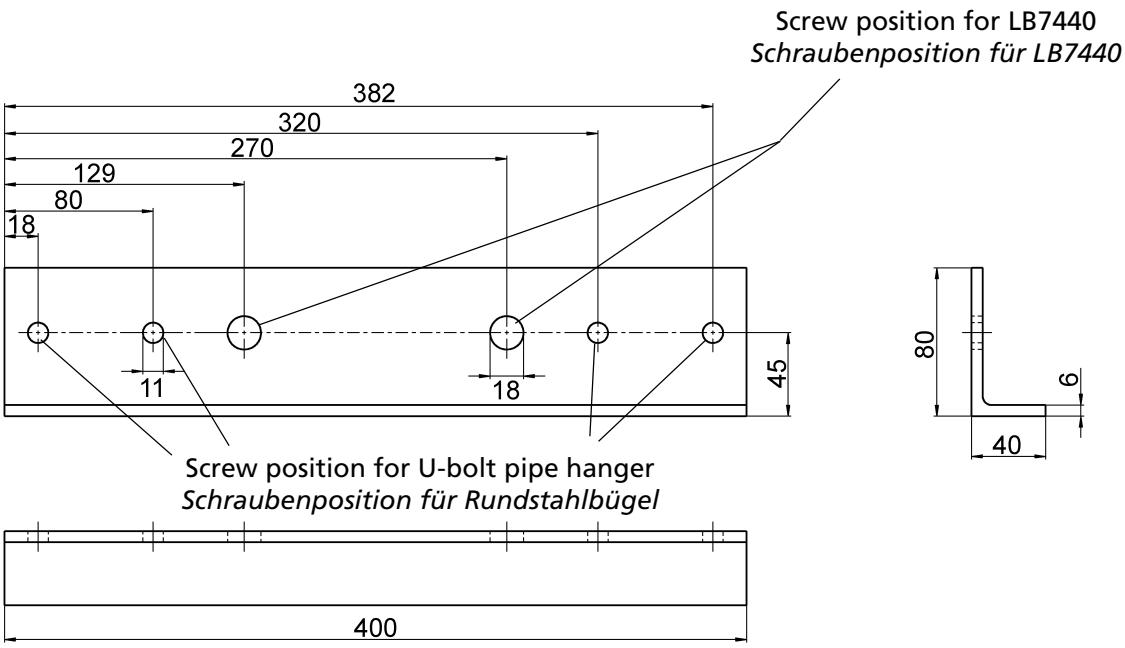


Dimensions in mm
Abmessungen in mm

Material: carbon steel hot-dip galvanised
Material: Stahl feuerverzinkt

Shield Holder for Point Source
Abschirmungshalter für Punktstrahler

for LB 7440, Part #69472
für LB 7440, Id #69472



Both brackets are universal, both right and left usable.
Beide Haltewinkel sind universell, sowohl rechts als auch links verwendbar.

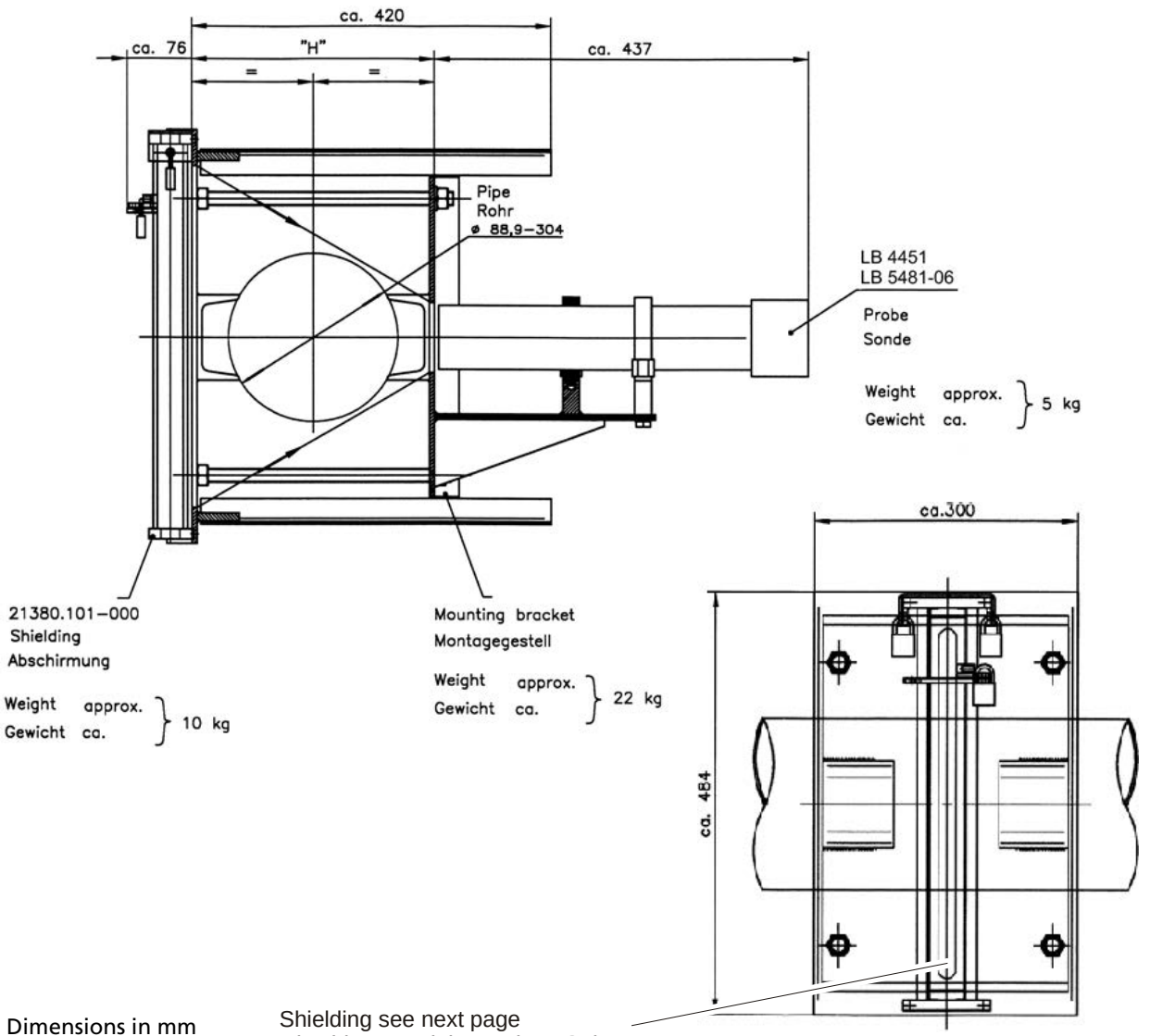
Accessories (Installation Kit):
- 4 U-bolt pipe hanger with nuts and spring washer
- 4 screws with nuts for LB 7440

Zubehör (Montagesatz):
- 4 Rundstahlbügel mit Muttern und Federscheiben
- 4 Schrauben mit Muttern für LB 7440

Dimensions in mm
Abmessungen in mm

Material: carbon steel hot-dip galvanised
Material: Stahl feuerverzinkt

Device for Am-241 Shield
Montagevorrichtung für Am-241 Abschirmung

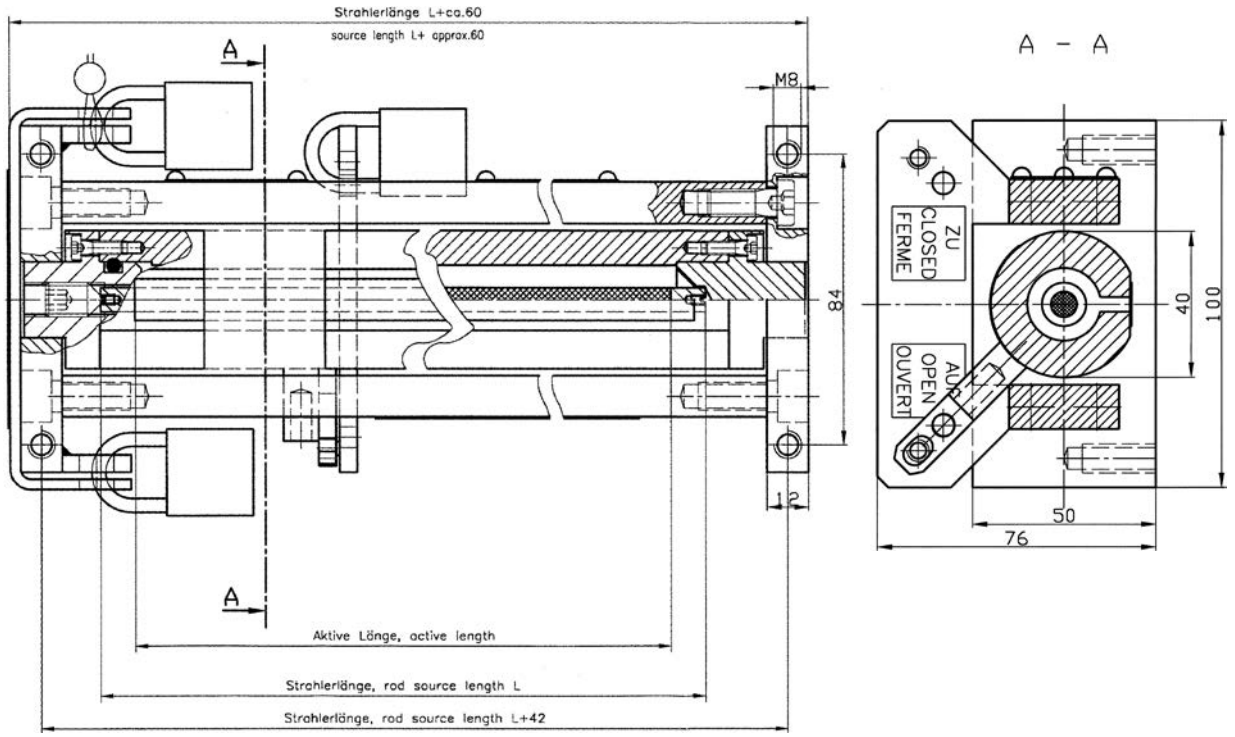


Dimensions in mm
Abmessungen in mm

Shielding see next page
Abschirmung siehe nächste Seite

Pipe Ø *Rohr Ø*		H
88.9	3 °	120
101.6	3.5 °	156
114.3	4 °	180
141.3	5 °	218
168.3	6 °	250
219.1	8 °	310
273	10 °	368
304		402

Shield for Am-241 Rod Source
Abschirmung für Am-241 Stabstrahler

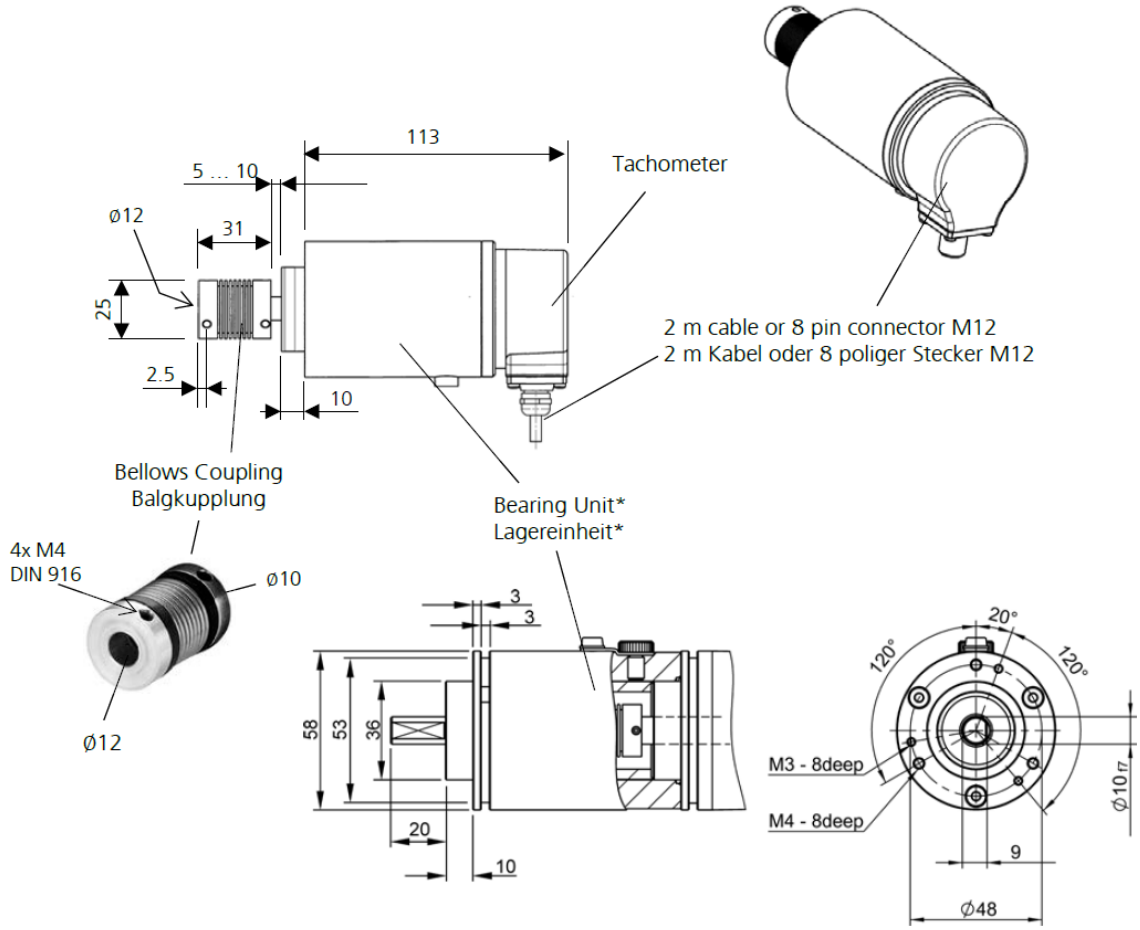


Dimensions in mm
Abmessungen in mm

Source Length *Strahlerlänge*	H
420	ca./approx. 480
820	ca./approx. 880
1220	ca./approx. 1280

Tachometer
Tachometer

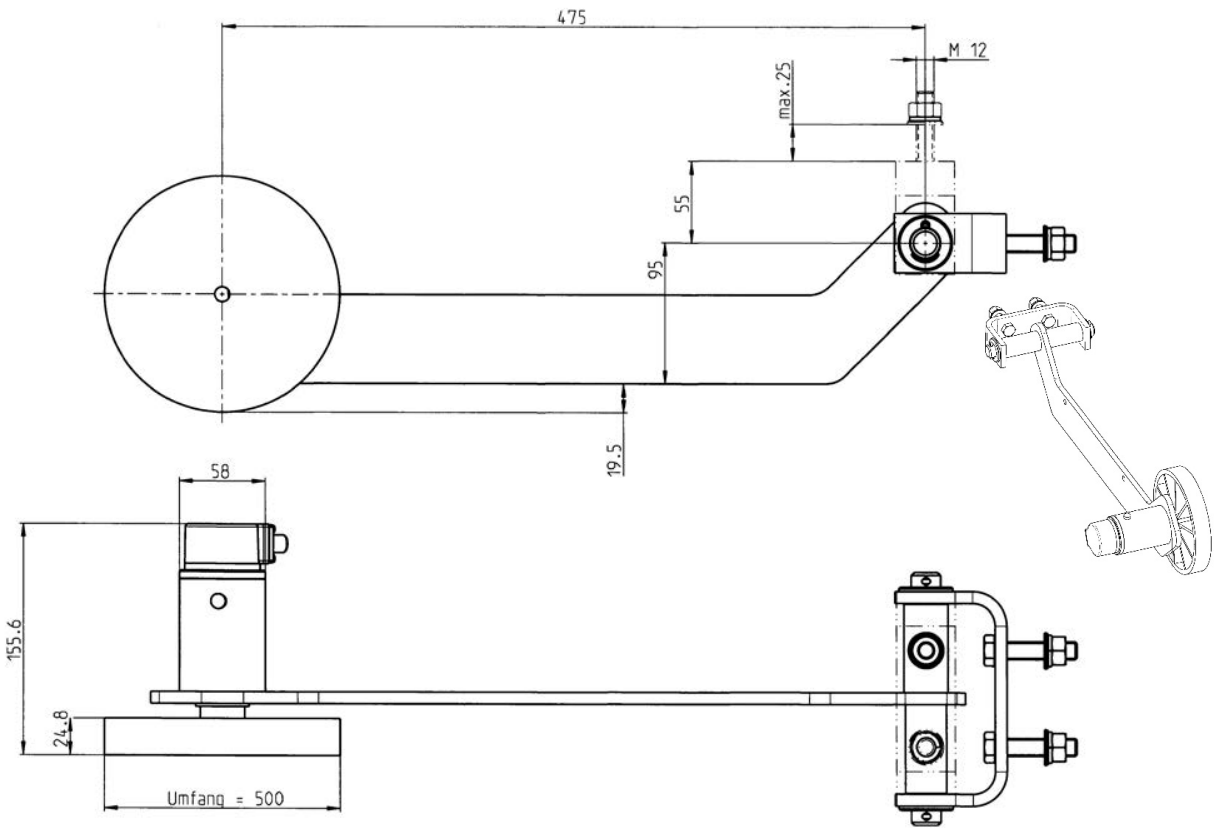
with Bellows Coupling
mit Kupplung



Dimensions in mm
Abmessungen in mm

Tacho part no *Tacho Id-Nr.*	pulse / revolution *Imp. / U*	Stainless Steel *Edelstahl*	2 m cable radial with open ends *2 m Kabel radial mit offenen Enden*	8 pin connector M12 radial, additional with 2 m tailored cable *8-poliger Stecker M12 radial, zusätzlich mit 2 m vorkonfektioniertem Kabel*
58659	500		X	
58660	5000		X	
58661	500	X		X
58662	5000	X		X

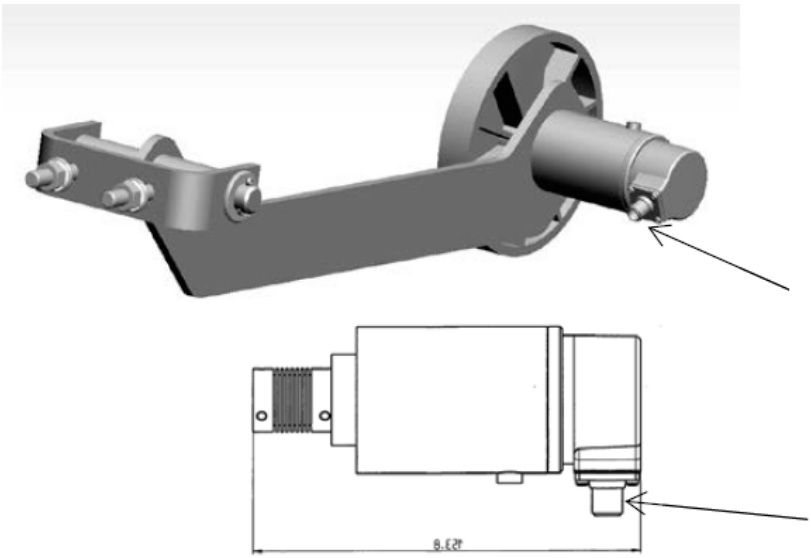
with Frictional Weel
mit Schwinge

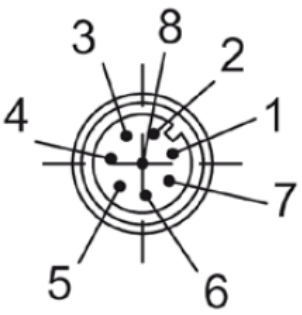


Dimensions in mm
Abmessungen in mm

Tacho part no *Tacho Id-Nr.*	pulse / revolution *Imp. / U*	Stainless Steel *Edelstahl*	2 m cable radial with open ends *2 m Kabel radial mit offenen Enden*	8 pin connector M12 radial, additional with 2 m tailored cable (see next pages) *8-poliger Stecker M12 radial, zusätzlich mit 2 m vorkonfektioniertem Kabel (siehe nächste Seiten)*
58539	500		X	
58656	5000		X	
58657	500	X		X
58658	5000	X		X

Electrical Connection at Tachometer
Elektrischer Anschluss am Tachometer





M12-Stecker, 8-polig
M12 connector ,8 pin

Dimensions in mm
Abmessungen in mm

Tacho part no *Tacho Id-Nr.*	Signal Connection *Signalanschluss*	0V GND	10 ... 30V +U_B	Signal	Screen *Schirm*
58539 58656 58659 58660 60904 60906	with cable *mit Kabelabgang*	white *weiß*	brown *braun*	green *grün*	Screen *Schirm*
58657 58658 58661 58662 60907 60908	8 Pin connector 8-poliger Stecker	1	2	3	PH[1]
	LB 472 [2] Connecting Terminals *Anschlussklemmen*	Current IN - Digital IN GND (both terminals must be bridged) *(beide Anschlüsse müssen überbrückt werden)*	+ 24V	Current IN +	PE

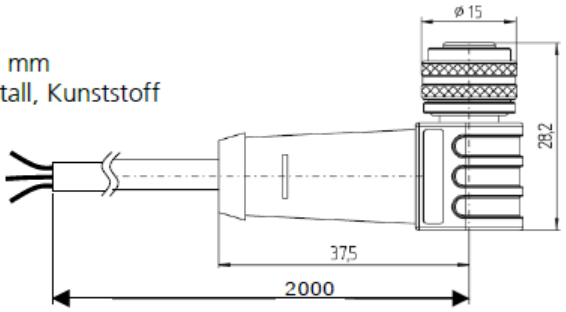
Contacts 4 ... 8 are unused
Kontakte 4 ... 8 unbenutzt

PH = Screen is connected to the connector housing.
PH = Schirm liegt am Steckergehäuse an.
see connection diagram respectively terminal block
siehe Anschlussplan bzw. Klemmenblock

Tailored Cable with Connector M12 for Tachometer with 8 Pin Connector

Vorkonfektioniertes Kabel mit Stecker M12 für Tachometer mit 8-poligem Stecker

IP 67
Cable/Kabel: PVC, 8 x 0,25 mm², Ø 6 mm
Housing/Gehäuse: metal, plastic / Metall, Kunststoff

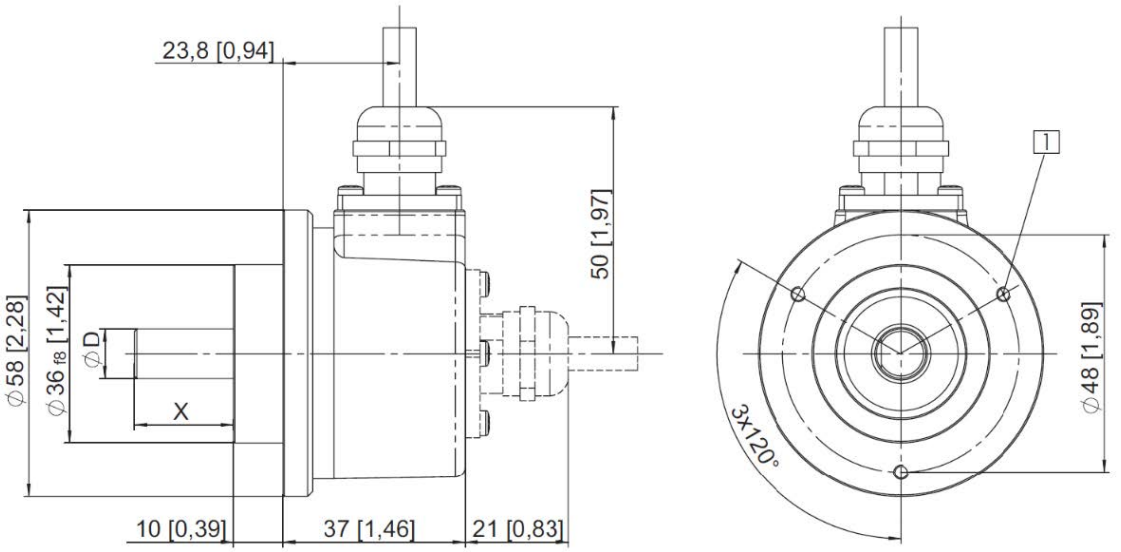


Dimensions in mm
Abmessungen in mm

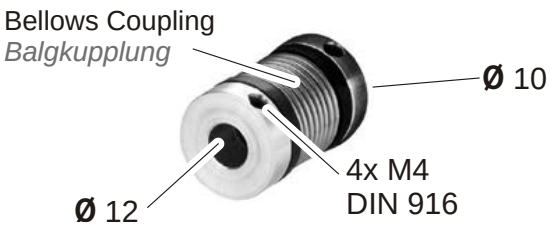
cable is used in following Tachometer: *Kabel ist in folgenden Tachometer enthalten:*	58657 58658 58661 58662 60907 60908

	0V GND	10 … 30V +U_B	Signal	Screen *Schirm*
Pin:	1	2	3	PH
Lead *Ader*:	white *weiß*	brown *braun*	green *grün*	Screen *Schirm*

Tachometer Ex Zone 2/22 with Bellows Coupling
mit Kupplung



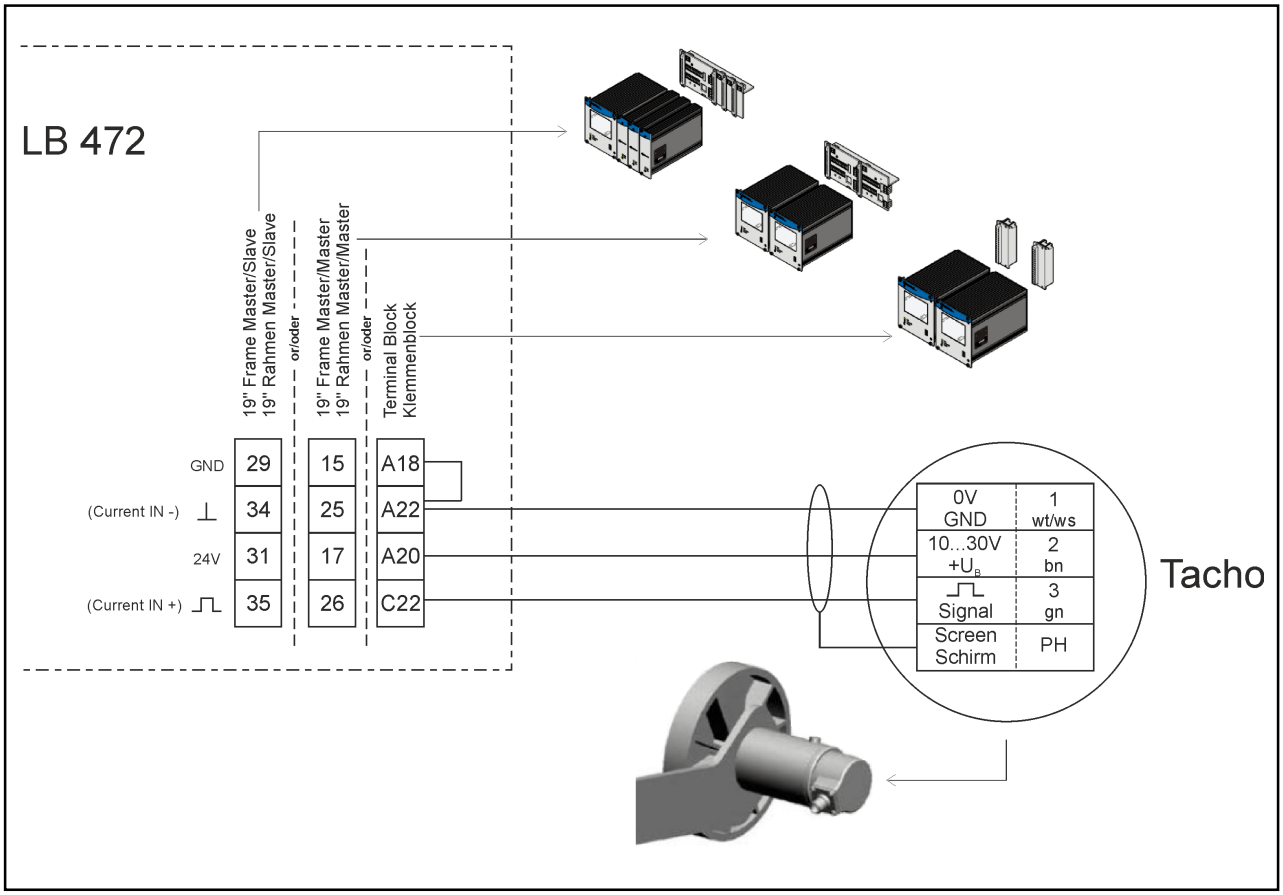
1 M3, 6 [0,24] tief



Dimensions in mm
Abmessungen in mm

part no Tacho Id-Nr.	pulse / revolution Imp. / U	Stainless Steel Edelstahl	2 m cable radial with open ends 2 m Kabel radial mit offenen Enden	8 pin connector M12 radial, additional with 2 m tailored cable 8-poliger Stecker M12 radial, zusätzlich mit 2 m vorkonfektioniertem Kabel
60904	500		x	
60906	5000		x	
60907	500	x		x
60908	5000	x		x

Connection
Anschlussplan



Evaluation Unit
Auswerteeinheit

Evaluation unit

The modules can be installed either in wall housings or 19" subracks. It can be equipped differently, depending on requirements. The rear clamp blocks or terminal panels are used for the electrical connection. The connection between the master EVU and slave modules (level measurement only) is made with a 4-pin master/slave plug.

Auswerteinheit

Die Module können entweder in Wandgehäusen oder 19"-Baugruppenträgern eingebaut und kann je nach Bedarf unterschiedlich bestückt werden. Zum elektrischen Anschluss werden die rückwärtigen Klemmenblöcke oder Anschlussplatinen verwendet. Die Verbindung zwischen Master-AWE und Slave-Modulen erfolgt mit einem 4-poligen Master/Slave-Stecker.

NOTICE / HINWEIS

Detector of the type LB44xx and LB54xx can capture measurement data only with master EVU.

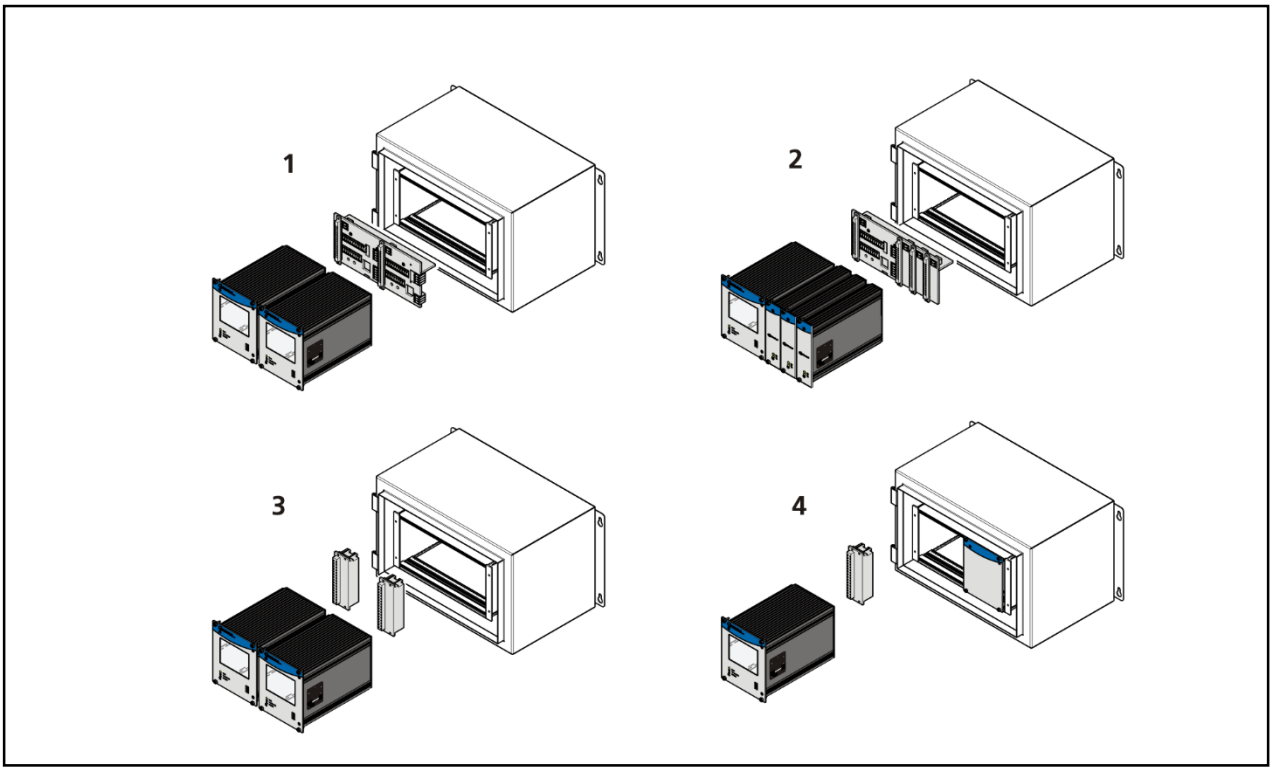
Messdaten der Detektoren vom Typ LB44xx und LB54xx können nur mit einem Master-Modul erfasst werden.

NOTICE / HINWEIS

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

Diese Auswerteinheit ist nicht ex-geschützt ausgeführt und darf nicht in explosionsgefährdete Bereiche verwendet werden.

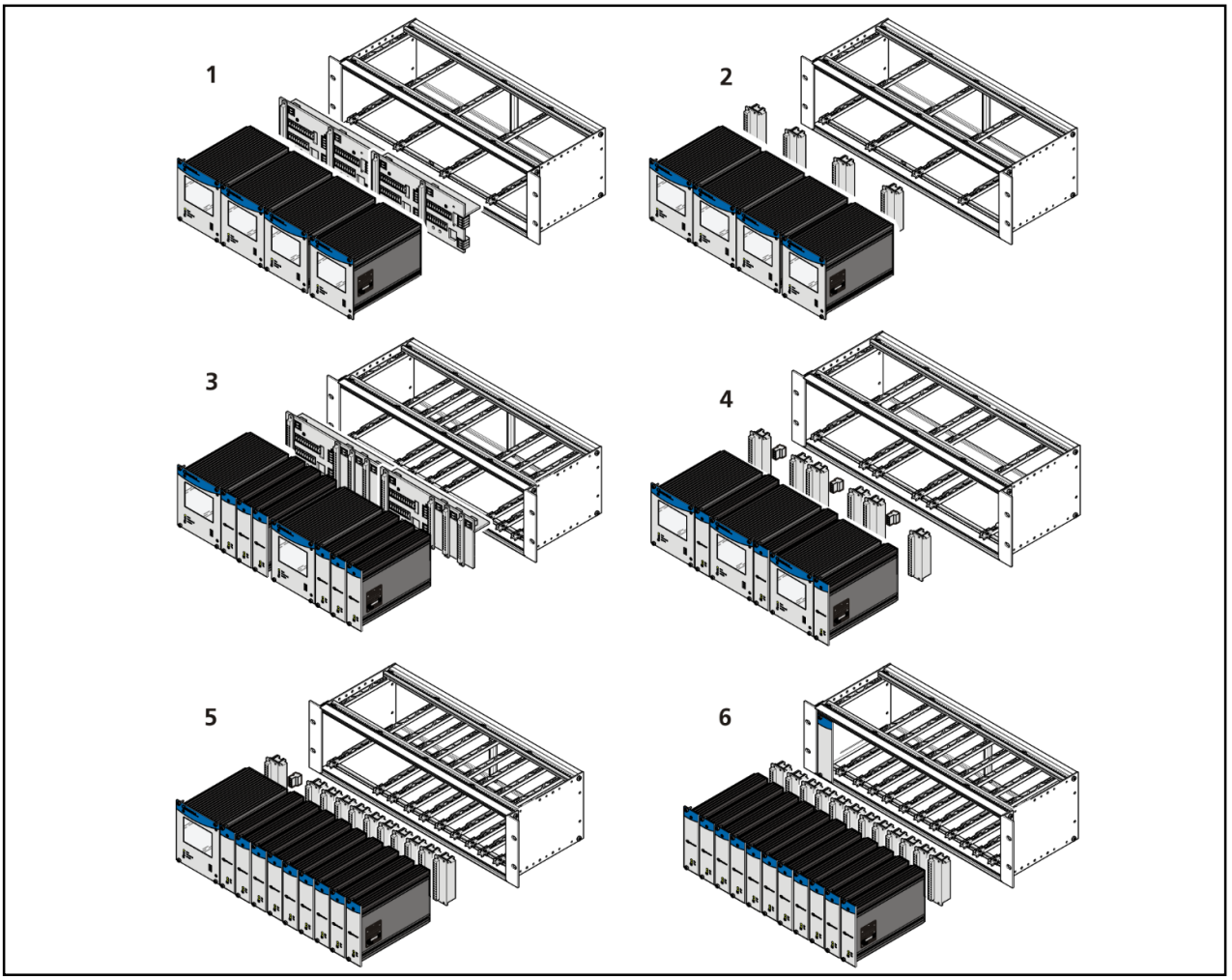
Installation variants wall housing
Einbauvarianten Wandgehäuse



Item *Pos.*	Compontens *Komponenten*	Connection *Anschluss*
1	2 Master	1 Terminal panel master/master[1] 1 Anschlussplatine Master/Master[1]
2	1 Master, 3 Slaves	1 Terminal panel master/slave[1] 1 Anschlussplatine Master/Slave[1]
3	2 Master	2 Terminal blocks 2 Klemmenblöcke
4	1 Master, 0 – 3 Slaves	1 Terminal block for master, 0 – 3 Terminal block for slave module 1 Klemmenblock für Master, 0 – 3 Klemmenblöcke für Slave Modul

[1] NRTL certification US/CAN
NTRL Zertifikat US/CAN

Installation variants 19”-subrack
Einbauvarianten 19“-Baugruppenträger

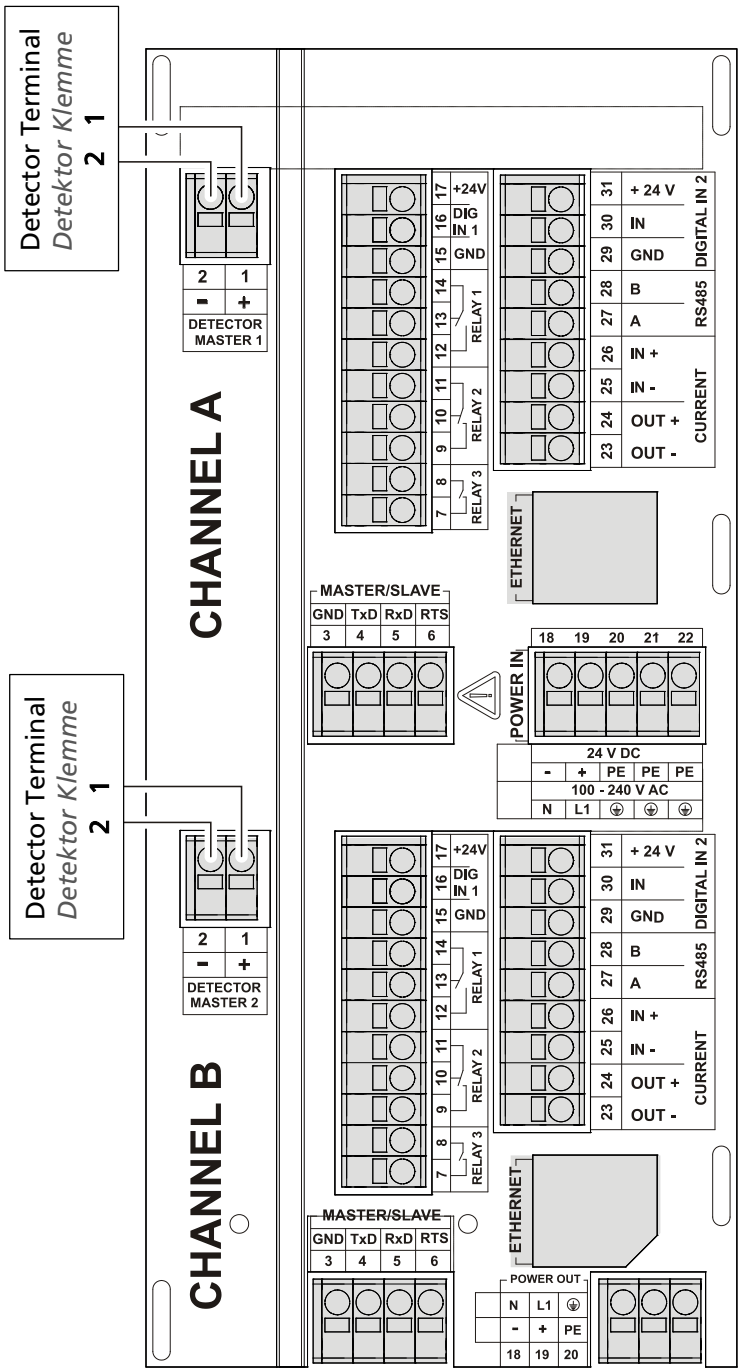


Item *Pos.*	Compontens *Komponenten*	Connection *Anschluss*
1	4 Master	2 Terminal panel master *2 Anschlussplatine Master*
2	4 Master [2]	4 Terminal blocks *4 Klemmenblöcke*
3	2x (1 Master, 3 Slaves)	2 Terminal panel master/slave *2 Anschlussplatinen Master/Slave*
4	4x (1 Master, 1 Slave) [2]	6 Terminal blocks; master/slave plugs *6 Klemmenblöcke; Master/Slave Stecker*
5	1 Master, 9 Slaves [2]	10 Terminal blocks; master/slave plug *10 Klemmenblöcke; Master/Slave Stecker*
6	11 Slaves [2]	11 Terminal blocks *11 Klemmenblöcke*

[2]Application example. The modules can be arranged arbitrarily with terminal blocks.
Anwendungsbeispiele. Mit Klemmenblöcken können Module frei zusammengestellt werden.

Connection diagram terminal board master/master

Anschlussplan Anschlussplatine Master/Master



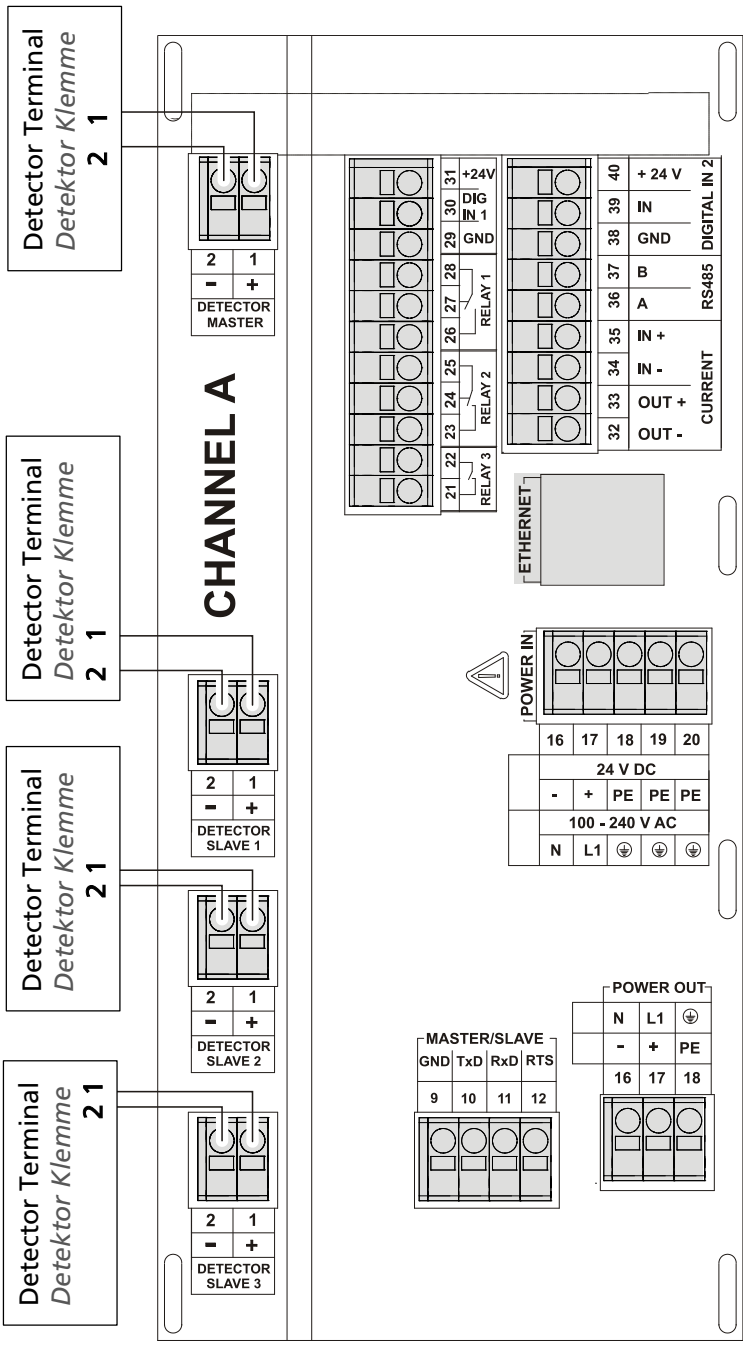
#	Connector *Anschluss*	Function *Funktion*
1	DETECTOR MASTER +	Connection Detector *Verbindung Detektor LB 4700 / LB 44xx*
2	DETECTOR MASTER -	
3	MASTER/SLAVE GND	Connection of additional slave units *Anschluss von weiteren Slave-Einheiten*
4	MASTER/SLAVE TxD	
5	MASTER/SLAVE RxD	
6	MASTER/SLAVE RTS	
7	RELAIS 3 NC	DIGITAL OUT
8	RELAIS 3 COM	
9	RELAIS 2 NC	DIGITAL OUT
10	RELAIS 2 NO	
11	RELAIS 2 COM	
12	RELAIS 1 NC	Error DIGITAL OUT *Fehler DIGITAL OUT*
13	RELAIS 1 NO	
14	RELAIS 1 COM	
15	DIGITAL IN 1 GND	GND
16	DIGITAL IN 1 IN	Logic Input
17	+ 24 V (GND --> 15)	24 V out (max. 200 mA)
18	POWER DC 24 V – / AC N	24 VDC / 100-240 VAC
19	POWER DC 24 V + / AC L1	
20	PE	
21	PE	
22	PE	
23	CURRENT OUT –	4 mA … 20 mA
24	CURRENT OUT +	
25	CURRENT IN – (⊥)	conveyor speed *Fördergeschwindigkeit*
26	CURRENT IN + (⊓)	
27	RS 485 A	Communication and service interface (Master-Master) *Kommunikations- und Service-Schnittstelle (Master-Master)*
28	RS 485 B	
29	DIGITAL IN 2 GND	GND
30	DIGITAL IN 2 IN	Logic Input
31	+ 24 V (GND --> 29)	24 V out (max. 200 mA)

In a 19 "subrack for 4 masters (Id 59484), there is another one with Channel C / D next to the connector board for Channel A / B. The channel assignment of Channel C / D is identical to that of Channel A / B.

In einem 19" Baugruppenträger für 4 Master (Id.59484), ist neben der oben gezeigten Anschlussplatine für Channel A/B, eine weitere mit Channel C/D enthalten. Die Klemmenbelegung von Channel C/D ist identisch mit der von Channel A/B.

Connection diagram terminal board master/slave

Anschlussplan Anschlussplatine Master/Slave

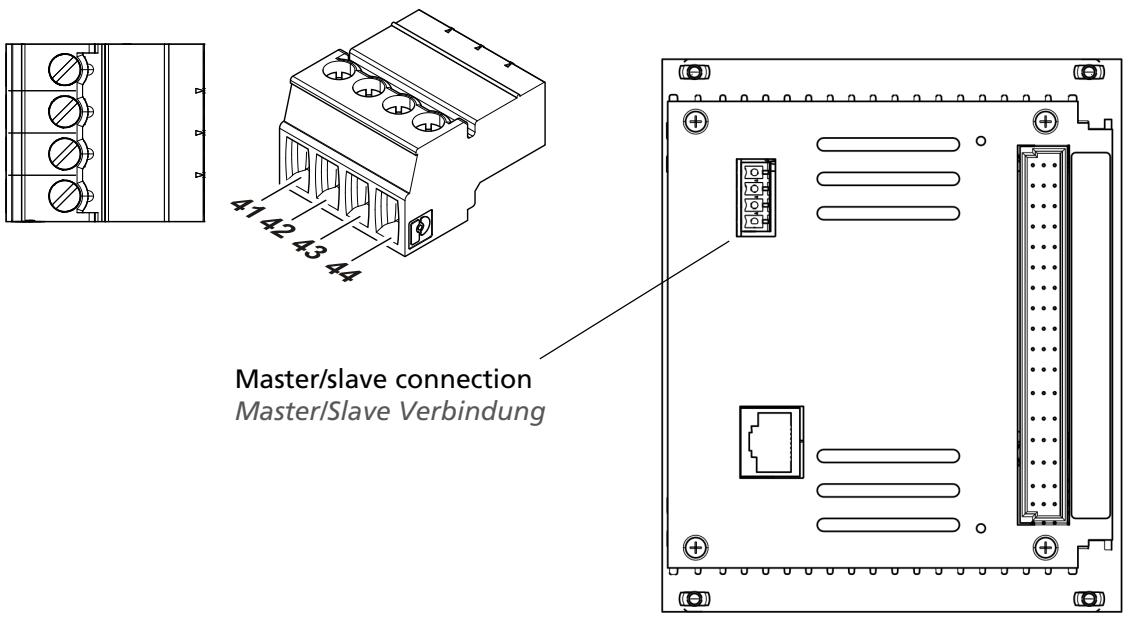


The connections master/slave A and master/slave B are identical.

Die Anschlüsse Master/Slave A und Master/Slave B sind identisch.

#	Connector *Anschluss*	Function *Funktion*
1	DETECTOR MASTER +	Connection Detector *Verbindung Detektor* LB 4700 / LB 44xx
2	DETECTOR MASTER -	
1	DETECTOR SLAVE 1 +	Connection Detector *Verbindung Detektor* LB 4700 / LB 44xx
2	DETECTOR SLAVE 1 -	
1	DETECTOR SLAVE 2 +	
2	DETECTOR SLAVE 2 -	
1	DETECTOR SLAVE 3 +	
2	DETECTOR SLAVE 3 -	
9	MASTER/SLAVE GND	Connection of additional slave units *Anschluss von weiteren Slave-Einheiten*
10	MASTER/SLAVE TxD	
11	MASTER/SLAVE RxD	
12	MASTER/SLAVE RTS	
16	POWER DC 24 V – / AC N	24 V DC / 100-240 V AC
17	POWER DC 24 V + / AC L1	
18	PE	
19	PE	
20	PE	
21	RELAIS 3 NC	DIGITAL OUT
22	RELAIS 3 COM	
23	RELAIS 2 NC	DIGITAL OUT
24	RELAIS 2 NO	
25	RELAIS 2 COM	
26	RELAIS 1 NC	Error DIGITAL OUT *Fehler DIGITAL OUT*
27	RELAIS 1 NO	
28	RELAIS 1 COM	
29	DIGITAL IN 1 GND	GND
30	DIGITAL IN 1 IN	Logic Input
31	+ 24 V (GND --> 29)	24 V out (max. 200 mA)
32	CURRENT OUT –	4 mA … 20 mA
33	CURRENT OUT +	
34	CURRENT IN – (⊥)	conveyor speed *Fördergeschwindigkeit*
35	CURRENT IN + (⊓)	
36	RS 485 A	Communication and service interface (Master-Master)
37	RS 485 B	
38	DIGITAL IN 2 GND	GND
39	DIGITAL IN 2 IN	Logic Input
40	+ 24 V (GND --> 38)	24 V out (max. 200 mA)

Assignment terminals master/slave plug
Klemmenbelegung Master/Slave Stecker



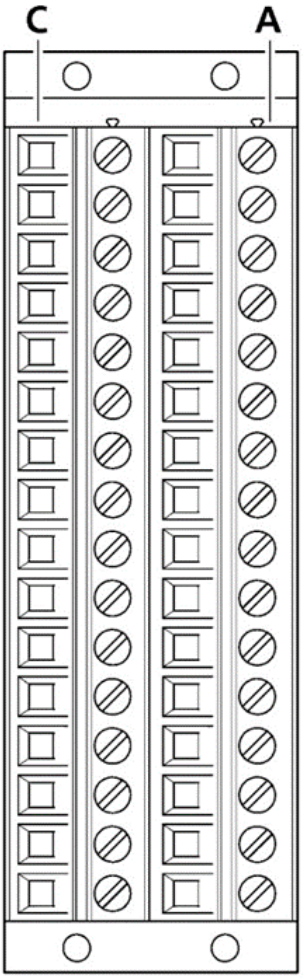
Signal	Pin
TxD	41
RxD	42
RTS	43
GND	44

The master/slave plug is not used by applications with terminal panels. The master/slave plug is contained in the purchase order terminal block (Part No. 59477). In the case of existing 19" subrack and retrofitting to LB472, the master-slave plug (Part No. 64608) must ordered separately.

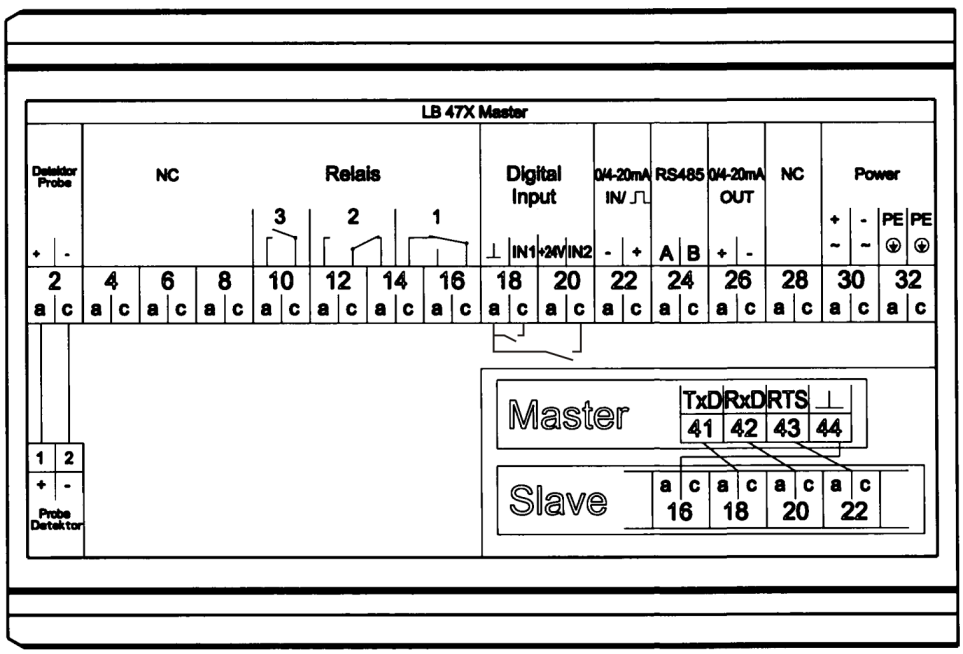
Der Master/Slave Stecker wird bei Einbauvarianten mit Anschlussplatinen nicht benötigt. Der Master/Slave Stecker ist im Lieferumfang des Klemmenblocks (Id. Nr. 59477) enthalten. Bei der Nachrüstung eines 19"Baugruppenträgers mit LB472 Modulen muss der Master-Slave Stecker (Id. Nr. 64608) gesondert bestellt werden

Assignment terminal block master EVU
Belegung Klemmenblock Master AWE

Signal	Pin
DETECTOR GND	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	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

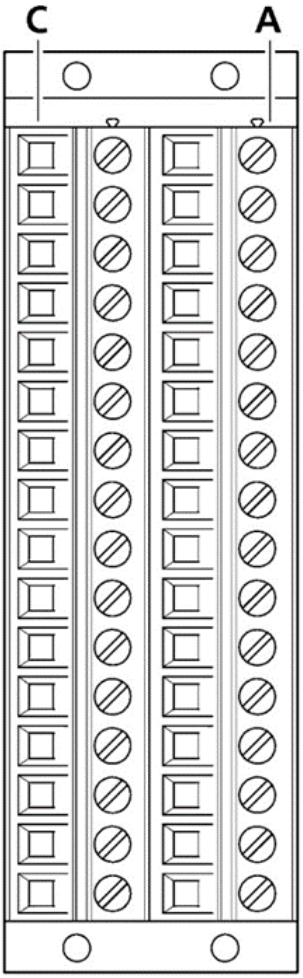


Pin	Signal
A - 2	DETECTOR +
A - 4	not assigned *nicht belegt*
A - 6	not assigned *nicht belegt*
A - 8	not assigned *nicht belegt*
A - 10	RELAY RELAIS 3 NO
A - 12	RELAY RELAIS 2 NO
A - 14	RELAY RELAIS 2 NC
A - 16	RELAY RELAIS 1 NO
A - 18	DIGITAL IN 1 GND
A - 20	+ 24 V (GND --> A-18)
A - 22	CURRENT IN –
A - 24	RS 485 A
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*

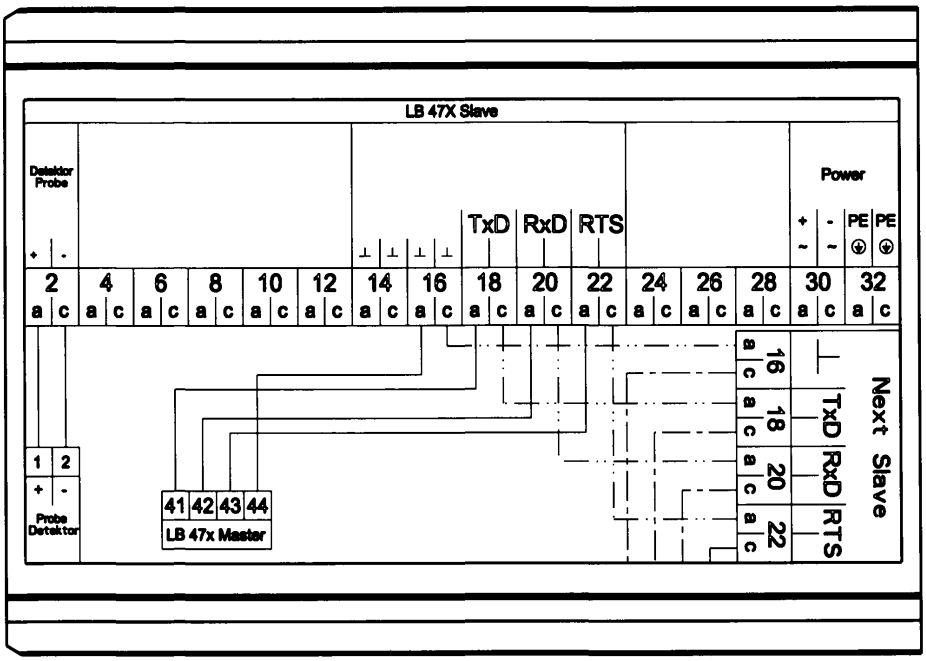


Assignment terminal block slave module
Belegung Klemmenblock Slave Modul

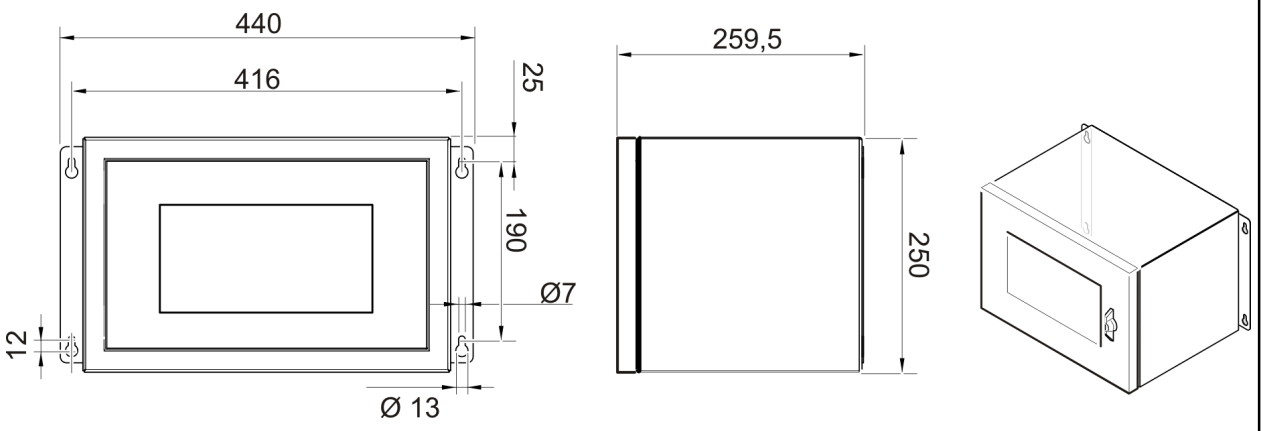
Signal	Pin
DETECTOR SLAVE GND	C - 2
not assigned *nicht belegt*	C - 4
not assigned *nicht belegt*	C - 6
not assigned *nicht belegt*	C - 8
not assigned *nicht belegt*	C - 10
not assigned *nicht belegt*	C - 12
GND	C - 14
GND	C - 16
TxD to the SLAVE	C - 18
RxD to the SLAVE	C - 20
RTS to the SLAVE	C - 22
not assigned *nicht belegt*	C - 24
not assigned *nicht belegt*	C - 26
not assigned *nicht belegt*	C - 28
Main *Netz* N AC, DC 24 V –	C - 30
Protective conductor PE *Schutzleiter PE*	C - 32



Pin	Signal
A - 2	DETECTOR SLAVE +15 V
A - 4	not assigned *nicht belegt*
A - 6	not assigned *nicht belegt*
A - 8	not assigned *nicht belegt*
A - 10	not assigned *nicht belegt*
A - 12	not assigned *nicht belegt*
A - 14	GND
A - 16	GND
A - 18	TxD to MASTER/SLAVE *
A - 20	RxD to the MASTER/SLAVE
A - 22	RTS to the MASTER/SLAVE
A - 24	not assigned *nicht belegt*
A - 26	not assigned *nicht belegt*
A - 28	not assigned *nicht belegt*
A - 30	Main *Netz* L1 AC, DC 24 V +
A - 32	Protective conductor PE *Schutzleiter PE*



Wall housing
Wandgehäuse



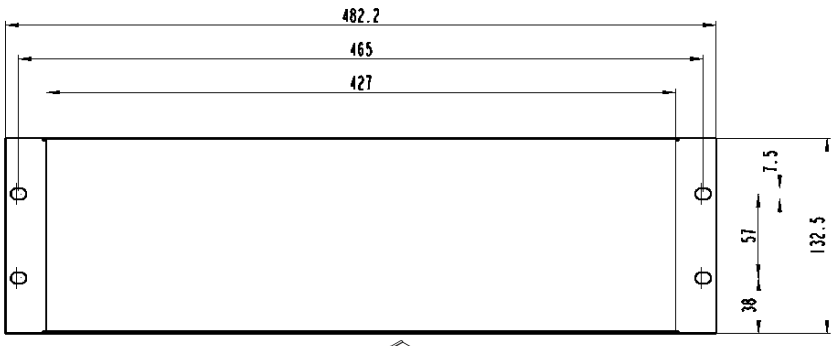
Dimensions in mm
Abmessungen in mm

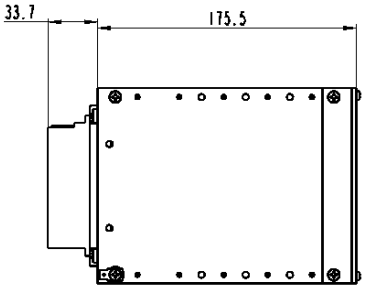
Technical Data ***Technische Daten***	
Dimensions *Abmessungen*	440x250x257 mm (WxHxD)
Max. Assembly *Max. Bestückung*	- 2 Master with terminal board (master/master) [1] - 2 Master mit Anschlussplatine (Master/Master) [1] - 1 Master, 3 Slave with terminal board (master/slave) *- 1 Master, 3 Slave mit Anschlussplatine (Master/Slave)* *- 2 Master with calmp blocks [2]* *- 2 Master mit Klemmenblöcken [2]*
Weight (with circuit board, without modules) *Gewicht (mit Anschlussplatine, ohne Module)*	8.8 kg
Degree of protection Schutzgrad	IP65
Operational temperature *Betriebstemperatur*	-20°C … +40°C
User interface, colours *Oberfläche, Farbe*	powder coated, grey *pulverbeschichtet, grau*
Cable entry *Kabeleinführung*	8 x M16 (f. cable 4.5 - 10.00 mm/L = Long thread) 2 x M32 (f. cable 11.0 - 21.00 mm/L = Long thread) *8 x M16 (f. Kabel 4,5 – 10,00 mm/L = Langgewinde)* *2 x M32 (f. Kabel 11,0 – 21,00 mm/L = Langgewinde)*

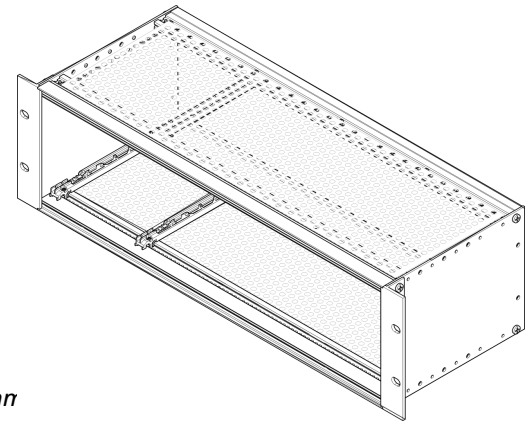
[1] NRTL certification US/CAN
NRTL Zertifikat US/CAN

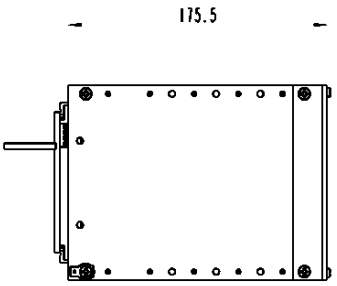
[2] Kein Zertifikat
No certification

19" subrack
19” Baugruppenträger





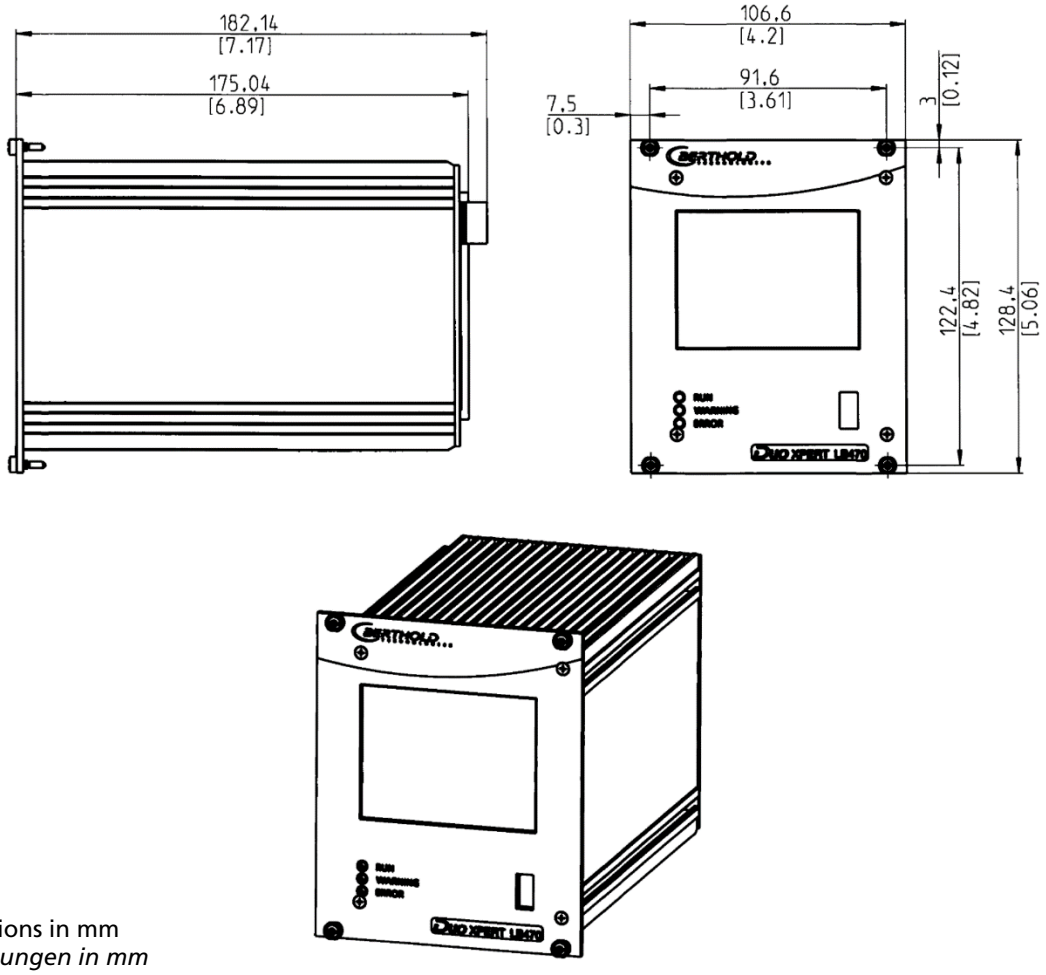




Dimensions in mm
Abmessungen in mm

Technical Data *Technische Daten*	
Dimensions *Abmessungen*	3HE/84TE/5T, 482x132x172 mm (WxHxD)
Max. Assembly *Max. Bestückung*	- 3 Master, 3 Slave - 2 Master, 6 Slave - 4 Master - 1 Master, 9 Slave - 12 Slave
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

Master EVU
Master AWE



Dimensions in mm
Abmessungen in mm

Technical Data *Technische Daten*	
Dimensions *Abmessungen*	117/128/172 mm (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

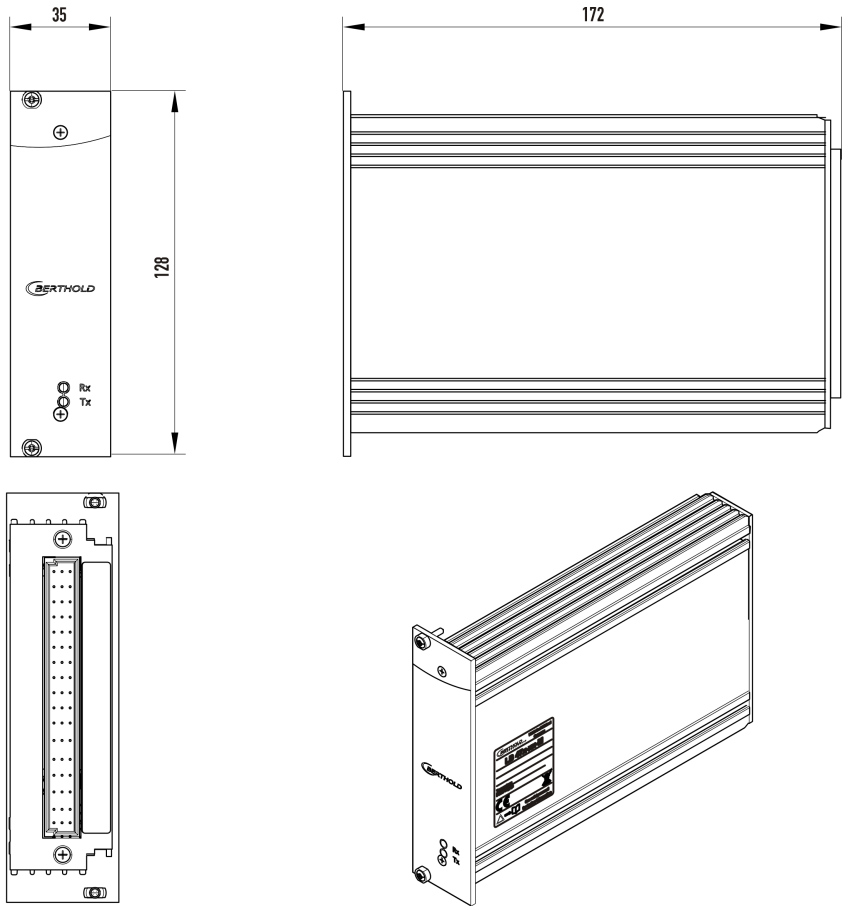
Connections *Anschlüsse*	- USB port for the connection to the USB storage medium - Master/slave connection (4-pin) and plug - RJ45 connection for Ethernet (on back wall) - 32-pin plug connector according to DIN 19465 Series C *- USB-Port zum Anschluss von USB-Speichermedium* *- Master/Slave Buchse (4-polig) 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*
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*

Power Supply ***Stromversorgung***	
Voltage *Spannung*	100-240 V AC 50/60 Hz (wide range input) +/- 10% 21-32 V DC (24V DC power input)
Power consumption *Leistungsaufnahme*	22 VA, 15 W
Fuses *Sicherungen*	Internal, 2 x 250 V, 1A delayed, 5x20mm, 1500 A breaking capacity IEC 60127-2, 1x 250 V TR5 T80mA (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 (500V). 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*	4-20mA (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 VDC *4-20mA (nach Namur-Empfehlung NE 006 und NE 043) per Software umschaltbar auf Frequenzeingang, potentialgetrennt (500 V). Innenwiderstand ca. 300 Ohm max. Eingangsspannung: 24 VDC*
Impulse input *Impulseingang*	Frequency 0-100kHz, Umax = 28 V, right angle signal form, low <1.5V; high 4 – 28 V. Switchable to current input *Frequenz 0-100kHz, Umax = 28V,* *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 = 33V ACeff, 46 V 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 Versorgung*	Output voltage: 24 VDC Output current: max. 150 mA *Ausgangsspannung: 24 VDC* *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*

Slave Module
Slave Modul



Dimensions in mm
Abmessungen in mm

Technical Data ***Technische Daten***	
Dimensions *Abmessungen*	35/128/172 mm (WxHxD)
Weight *Gewicht*	600 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 *Lagertemperatur*	-20°C … +60°C
Degree of protection *Schutzgrad*	IP20

Electrical Data ***Elektrische Daten***	
Power consumption *Leistungsaufnahme*	6 VA, 5 W
Fuses *Sicherungen*	Internal, 2 x 250 V, 1A delayed, 5x20mm, 1500 A breaking capacity IEC 60127-2 *Intern, 2 x 250 V, 1A träge, 5x20mm, 1500 A Abschaltvermögen IEC 60127-2*
Connections *Anschlüsse*	- 32-pin plug connector *- 32 polige Stiftleiste*

Number Key LB 47x
Nummernschlüssel LB 47x

LB 47x – 11 – x x

Device family / *Gerätefamilie*	
47	DuoXpert

RID (only LB470 / *nur LB470*)	
0	No RID / *Kein RID*
-RID	Radiation Interference Descriminination

Options *Ausstattungsmerkmale*	
M	Master
S	Slave Module

Power supply *Spannungsversorgung*	
0	Without seperatr power supply / *ohne sep. Versorgung*
1	24 VDC
2	100 .. 240 VAC -15% +10%

Family / Application	
0	Level / *Füllstand*
1*	Level switch / *Grenzschalter*
2	Bulk Flow / *Durchsatz*
3	Pottasium content / *Kaligehalt*
4	Density / *Dichte*
5	Hydraulic Fractuing
6	Backscatter / *Rückstreu*
7	Neutrons / *Neutronen*

Explosion Protection *Zulassung Ex-Schutz*	
0	General Area / *ohne Ex Schutz*
1	Ex-i IIB
2	Ex-i IIC

* Used by other hardware / *belegt durch andere Hardware*

Declaration of Conformity

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

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-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
Registergericht / Court of Registration: Stuttgart HRB 331520
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 — 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

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

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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

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 2

Parts overview
Übersicht Zubehör

ID. No. *Id. Nr.*	Description *Beschreibung*
64578	LB 472-02-M Bulk Flow Transmitter (Master, 24 VDC) *LB 472-02-M Fördermengenmessgerät (Master, 24 VDC)*
64577	LB 472-02-M Bulk Flow Transmitter (Master, 100...240 VAC) *LB 472-02-M Fördermengenmessgerät (Master, 100...240 VAC)*
63286	LB 470 Slave (24 VDC) *LB 470 Slave (24 VDC)*
63285	LB 470 Slave (100...240 VAC) *LB 470 Slave (100...240 VAC)*
56925-2BA1	Operating manual DuoSeries LB 472 Bulk Flow, German *Betriebsanleitung Fördermenge (deutsch)*
56925-2BA2	Operating manual DuoSeries LB 472 Bulk Flow, English *Betriebsanleitung Fördermenge (englisch)*
63781	Wall-mounted Housing for LB 47x 1x Master / 3x Slave (24 VDC) *Wandgehäuse für LB 47x, 1x Master / 3x Slave (24 VDC)*
63782	Wall-mounted Housing for LB 47x 1x Master / 3x Slave (110...240 VAC) *Wandgehäuse für LB 47x, 1x Master / 3x Slave (110...240 VAC)*
63783	Wall-mounted Housing for 2x LB 47x Master (24 VDC) *Wandgehäuse für LB 47x, 2x Master (24 VDC)*
63784	Wall-mounted Housing for 2x LB 47x Master (110...240 VAC) *Wandgehäuse für LB 47x, 2x Master (110...240 VAC)*
64402	Wall-mounted Housing for 2x LB 47x Master (terminal blocks) *Wandgehäuse für LB 47x, 2x Master (Klemmblöcke)*
59484	19" rack for LB 47x, 4 x Master *19"-Baugruppenträger für LB 47x, 4 x Master*
59481	19" rack for LB 47x, 3x (1x Master & 1x Slave) *19"-Baugruppenträger für LB 47x, 3x (je 1x Master & 1x Slave)*
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*
59478	Terminal block for LB 47x, Slave *Klemmenblock für LB 47x, Slave (mit Führungsschienen)*
37526	Front Cover Plate 21 HP / 3 RU (Master) *Blindplatte 21TE / 3 HE (Master)*
59501	Front Cover Plate 7 HP / 3 RU (Slave) *Blindplatte 7TE / 3 HE (Slave)*
64608	Connector for LB 47x slaves when changing from LB 44x to LB 47x slaves *Stecker für LB 47x Slaves bei Umrüstung von LB44x auf LB47x Slaves*