



Evaluation unit *castxpert* LB 452

Operating Manual
47344BA2

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Embedded Software as of vers. 1.8.0 (CU) and 1.8.0 (MU)

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Operating Manual

1	About this Manual	6
1.1	Some Prior Remarks.....	6
1.2	Storage Place	6
1.3	Target Group	6
1.4	Validity of the Operating Manual.....	6
1.5	Structure of the Manual	7
1.6	Copyright	7
1.7	Representation	7
1.8	Warning Notes.....	8
1.9	Symbols Used on the Device	9
1.10	Conformity	9
2	Safety	10
2.1	Dangers and safety measures	10
2.2	Proper use	10
2.3	Improper Use	11
2.4	Qualification of the Personnel	12
2.5	Operator's Obligations.....	13
3	Product Description	14
3.1	Description of the System	14
3.2	Software.....	14
3.3	Power Supply	14
3.4	Overview	15
3.4.1	Front View.....	15
3.4.2	Control Unit Indicators.....	15
3.4.3	Back View.....	16
3.5	Radiometric Measurement System.....	18
3.5.1	Functional Principle	18
3.5.2	Measurement System Components/Measurement Setup.....	18
4	Start-Up	20
4.1	Installation of the Evaluation Unit (EVU)	20
4.2	The Use of a Terminal Box	23
4.3	Configuring the Current Output.....	24
4.3.1	Configuring the Current Output on the Basic Module.....	25
4.3.2	Configuring the Current Output on Extension Module	28
4.4	Data Definition Profibus DP	29
4.5	Installation/Removal of an SD Card.....	31
5	Operation of the Software	32
5.1	Overview of the Standard Display.....	33
6	The System Menu	36
6.1	Channel Setting	38
6.1.1	Channel Names.....	39
6.2	Calibration Rig.....	40
6.3	Settings.....	41
6.3.1	Setting the Date/Time	42
6.3.2	Applying Network Settings.....	45
6.3.3	Setting Language	49
6.3.4	Setting Dimensions and Temperature Unit	50
6.4	Data Log.....	51
6.4.1	Graph.....	51
6.4.2	Data Logger	52
6.4.3	Network Logger.....	54

6.4.4	Service Submenu.....	58
6.4.5	Remote Control Software	59
6.4.6	Export Complete Service Data	60
6.4.7	Software update.....	61
6.5	Access Level.....	67
7	Menu Channel Overview	69
7.1	Empty and Full Adjustment	73
7.2	Settings.....	76
7.2.1	Calibration	79
7.2.2	Filter	87
7.3	In / Outputs	91
7.3.1	Analog IO	92
7.3.2	Digital IO	97
7.3.3	Overview	103
7.4	Service	104
7.4.1	Exporting Service Data.....	105
7.4.2	Change Log	106
8	Troubleshooting	109
8.1	Verify Radiometric Mould Level System	109
8.1.1	Check System Stability.....	109
8.1.2	Check System Oscillation Stability.....	110
8.1.3	Check System Electromagnetic Stability	110
8.2	Error Search.....	111
8.3	Error Codes of the Evaluation Unit.....	112
8.3.1	System	112
8.3.2	Main board	113
8.3.3	Application.....	114
8.3.4	Application Extension	115
8.3.5	Detector Control.....	116
8.3.6	Process Connection.....	117
9	Maintenance	118
9.1	Installation / Exchange of Modules.....	118
9.1.1	Installation of the Basic Module/Extension Module	120
9.1.2	Installation of the Fieldbus Module	120
9.2	Replacing of Fuses	122
9.2.1	Replacing of Basic Module Fuse	123
9.2.2	Replacing of Extension Module Fuse	124
9.2.3	Cleaning	125
10	Decommissioning.....	126
10.1	Disposal of Measurement System.....	126

Technical Information

1.	Mould Level Measurement System	1
2.	Technical Data	2
2.1.	Evaluation Unit.....	2
2.2.	Electrical Data Basic Module.....	3
2.3.	Electrical Data Extension Module.....	4
2.4.	Electrical Data Bus Module	6
3.	Software	7
4.	LB 452 Parts	9
5.	Terminal Box	10
6.	LB 452 Connections	11
6.1.	Back View.....	11
6.2.	Measurement Channel Basic Module.....	12
6.3.	Channel Extension Module.....	13
6.4.	Data definition Profibus DP.....	14
6.5.	Cyclic Input Data (as of MU Software Version 1.6.0)	16
7.	Declaration of Conformity	18

1

About this Manual

1.1 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 manual demonstrates to you how to:

- Assemble/Install the EVU (evaluation unit)
- Establish the connections to the power supply
- Build the measurement connections
- Carry out the measurements
- Apply software settings
- Install the extension module (optional)
- Carry out maintenance
- Fix errors
- Disassemble
- Dispose of the device

You must read through the entire manual. We have tried to compile for you all information for safe and proper operation. However, should questions arise which are not answered in this manual, please refer to Berthold.

1.2 Storage Place

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

1.3 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.

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

1.5 Structure of the Manual

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

1.6 Copyright

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

1.7 Representation

Identifier	Meaning	Example
Quotation mark	Field in the software user 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.

1.8 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.

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 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 chapter 7 Declaration of Conformity in the appendix "Technical Information".

2 Safety

2.1 Dangers and safety measures

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

2.2 Proper use

The LB 452 evaluation unit (EVU) measures the fill level along with compatible detectors, a compatible radiation source and it 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!

2.3 Improper Use

Improper use to be prevented:

- If the EVU is used in a way which is not described in the present manual, the EVU's protection is compromised, and the guarantee claim becomes invalid.
- Berthold only accepts liability for / guarantees the correspondence of the EVU to its published specifications.

Avoid the following circumstances:

- Failing to observe the instructions on safety, operation, maintenance, and disposal given in the manual.
- Failure to observe the operating instructions for the EVU and the connected detectors.
- Applying conditions and requirements which do not conform to those stated in the technical documents, data sheets, operation and assembly instructions and other specific guidelines of the manufacturer.
- Use of the EVU if parts of it are damaged or corroded.
- Restructuring or changing the system components.
- The EVU 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.
- Operation without the safety precautions provided by the manufacturer.
- Manipulation or avoidance of existing safety equipment.

NOTICE



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

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

2.4 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 manual, reference is made to personnel with certain qualifications who can be entrusted with different tasks during the installation, usage, and maintenance.

These three groups of people are:

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

Those with a general knowledge are e.g. technicians or mechanics who can undertake different tasks during the transportation, assembly and installation of the shielding under the guidance of an authorised person. This can also refer to construction site personnel. The persons in question must have experience in the transportation and assembly of heavy component parts.

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 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.

2.5 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 Product Description

3.1 Description of the System

The evaluation unit (EVU) consists of a system board (CU Control Unit) with an ex-works pre-installed basic module (channel 1).

The EVU can be distributed with up to 4 basic modules (channels). This makes the simultaneous monitoring of 4 mould levels possible.

There is also the possibility of ordering the EVU customised with a pre-installed extension module or a fieldbus module or installing these modules yourself afterwards. Further information on the extension module can be found in chapt. 4.3.2 and on the fieldbus module in chapt. 4.4.

You can connect the EVU to both GAMMAcast and CONGAUGE detectors. When in doubt, please refer to instruction for the relevant detector type.

3.2 Software

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

In this manual, the software is described with effect from version 1.8.0 (CU - control unit, system board) and 1.8.0 (MU - channel).

3.3 Power Supply

The EVU does not have an on and off switch with which the power supply can be switched on or off. Ensure that the current of the EVU can be simply disconnected via the external power supply.

3.4 Overview

3.4.1 Front View

On the front view of the EVU there are LEDs for displaying each operation mode, a 7" touch display, and a USB port.

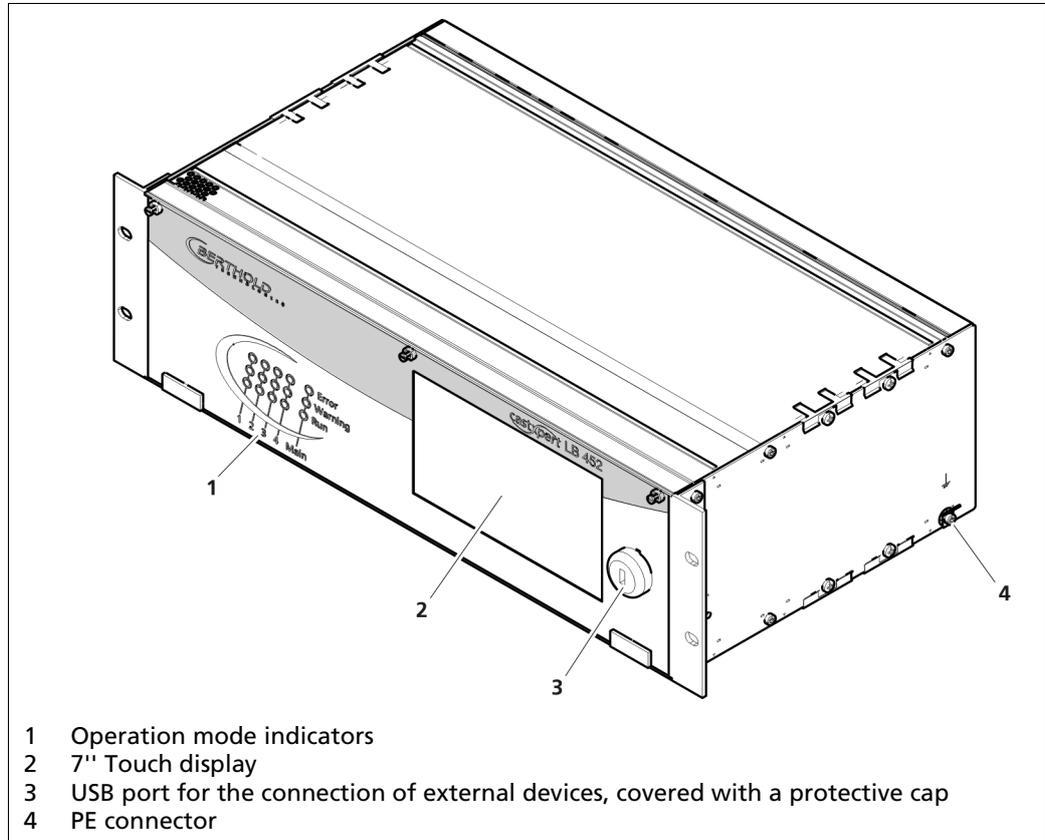


Fig.1 Front view of the EVU

3.4.2 Control Unit Indicators

The indicators in the "Main" section (control unit) indicate the operation mode of the EVU. The indicators "1 to 4" (Fig. 2) indicate the operation mode of each measurement channel. This shows which operation mode is active on each measurement channel.

If an error occurs at just one measurement channel (Error LED lights up), then the other measurement channels are not affected by this error. The measurement of other channels continues.

	Error	Lights up red in the event of a device error (see chapter 8 Troubleshooting).
	Warning	Lights up yellow if a warning is present.
	Run	Lights up green in error-free operation

Fig. 2 Control Unit Indicators

Error LED	This LED (Fig. 2, item 1) lights up if an error has occurred. The actual measurement is retained. Check the device settings. All possible error reports are described in chapt. 8 Troubleshooting.
Warning LED	This LED (Fig. 2, item 2) lights up if calibration is being carried out or if the device is in test mode or if any other warning message is present. The current measurement is retained. All possible warnings reports are described in chapt. 8 Troubleshooting .
Run LED	This LED (Fig. 2, item 3) lights up if the device is in operation and fault-free. The current measurement is carried out.

3.4.3 Back View

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

- EVU power supply
- Power supply of channels 1 to 4
- Measurement inputs and outputs from the detector for the channels 1 to 4
- Ethernet port for the data transmission and remote access via the LAN connection
- USB ports for external USB devices

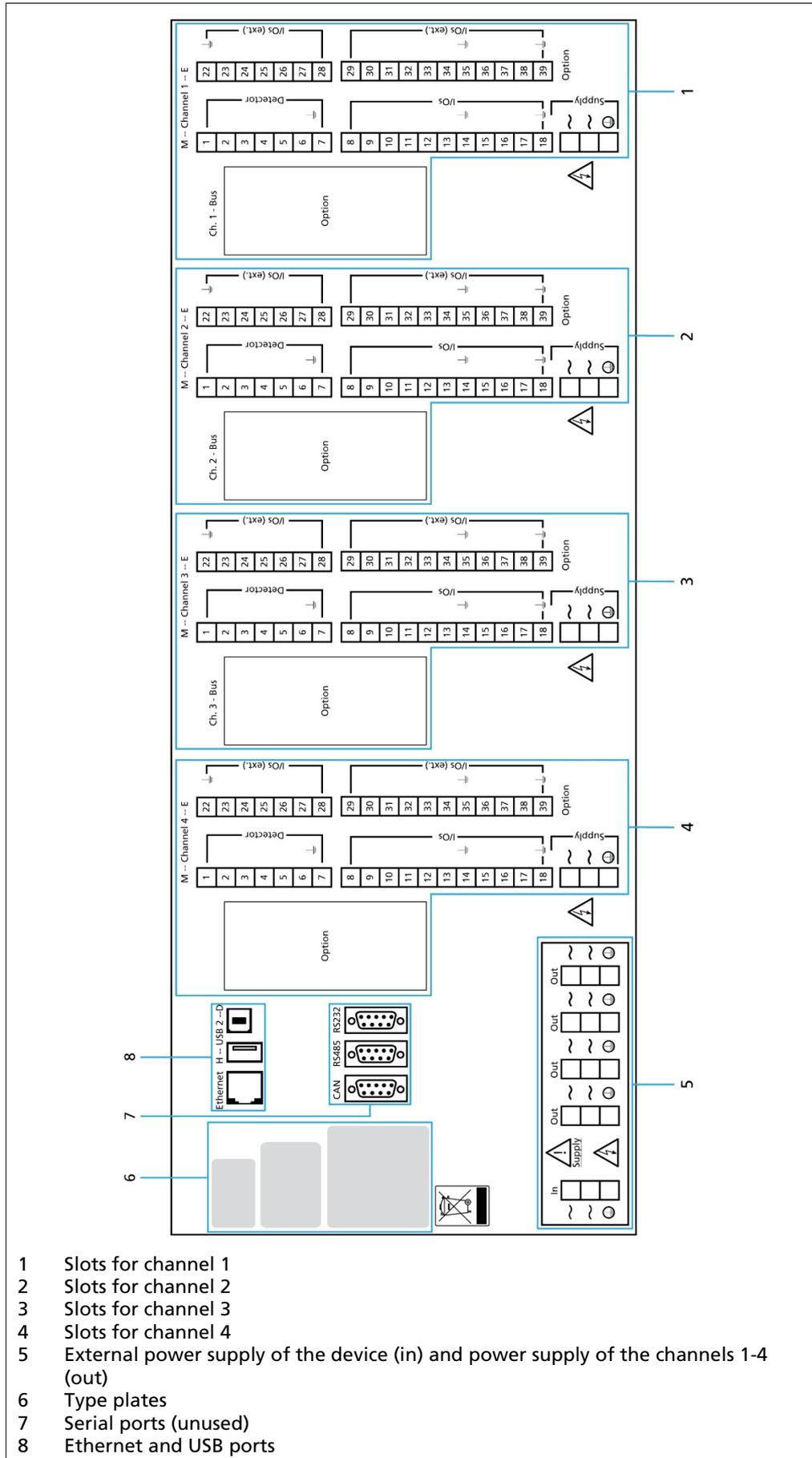


Fig. 3 Back view of the EVU

3.5 Radiometric Measurement System

3.5.1 Functional Principle

For the radiometric principle, the weakening of the gamma rays by fluid metal in the mould is used to (Fig. 4, No. 1) measure the fill level in the mould.

The EVU evaluates the electrical signal generated by the detector and continually measures the fill level of the mould in a continuous caster.

NOTICE



Note for casting powder when using GAMMAcast detector!

If casting powder is used for the casting process, note that the height of the casting powder layer is partially measured via the mould level of the measurement device. This means that the mould level appears to be somewhat higher than that corresponding to the actual mould level.

The magnitude of this deviation depends on the height of the casting powder layer, the bulk density of the casting powder (granulate has a lesser disruptive effect) and the casting format. The error is constant and is only a few millimetres for a desired uniform allocation of casting powder.

3.5.2 Measurement System Components/Measurement Setup

The measurement system is made up of the following components:

- castXpert LB 452 evaluation unit (EVU)
- A compatible detector
- Radiation Source/Mould Level Shielding

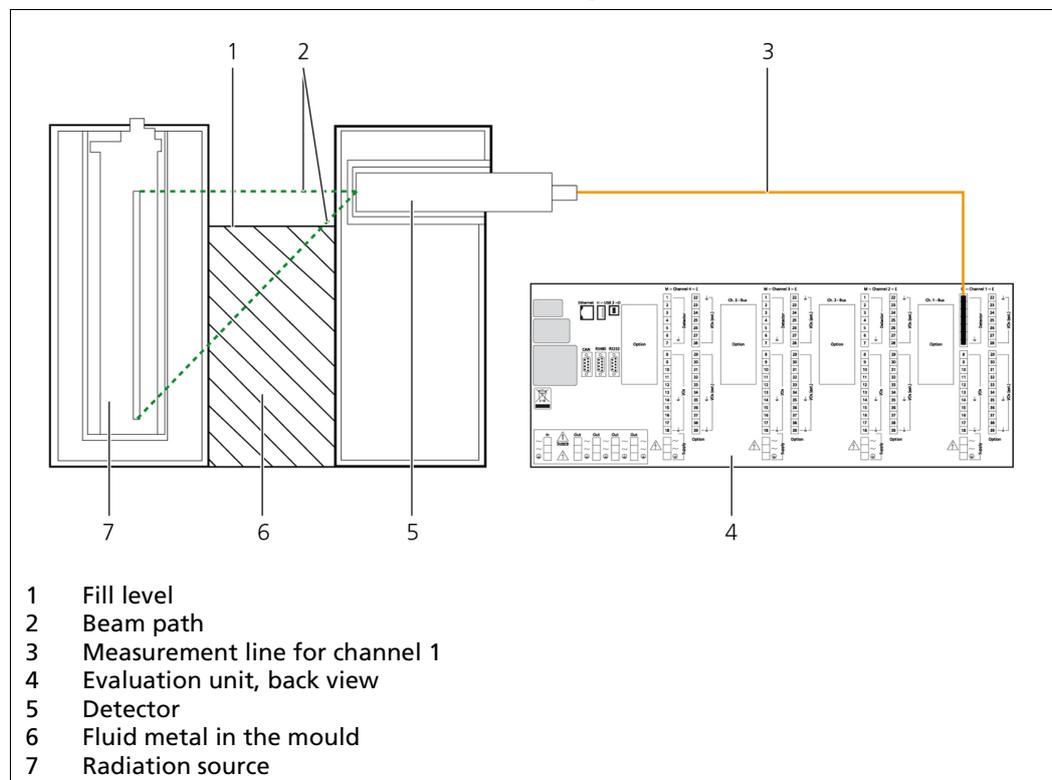


Fig. 4 Measurement Set-up

NOTICE

Further information on the functional principle of the detectors can be found in the manual for the corresponding detector type detectors.

Each active measurement channel consists of at least one basic module. This is indispensable for operating the EVU.

The following modules can also be installed in the EVU:

Extension Module	Offers an extra current output, a pulse output, two digital inputs, and 2 alarm relays.
Fieldbus Module	For transmitting measurement-related data via an RS-485 port (Profibus DP) or an RJ-45 Ethernet port (Profinet IO).

4 Start-Up

The Start-Up chapter explains how to:

- Install the device
- Use a terminal box
- Configure the current output on the basic module or on the extension module
- Communicate via the fieldbus module
- Install an SD Card

4.1 Installation of the Evaluation Unit (EVU)

DANGER



Danger to life from electric shock!

- ▶ Installation may only be carried out by a qualified electrician.
- ▶ Installation 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 or wrong measurement results!

Error in the calibration or in the setting of parameters.

- Wrong measurement results.
- Loss of production.
- Damage in the system.

In general, we would recommend that you have the start-up carried out by the service of the company Berthold.

IMPORTANT



When operating the EVU, you must adhere to the manual "Mould Level Shieldings".

Berthold recommends building a separate power connection for each measurement channel (Fig. 3).

The advantages of a separate power connection for each measurement channel are:

Functional reliability in the event of surges or short circuits

Each measurement channel is supplied by its own voltage source.

Redundancy

If there is a fault in the power supply for one strand, the other measurements can still be carried out without interference.

1. Install the EVU in a 19" rack (not included in delivery contents).
2. Ground the unit properly by connecting the prepared grounding point to ground. See Fig.1: Low on the side there is a grounding point.
3. Connect the external power supply to the EVU (Fig. 5).

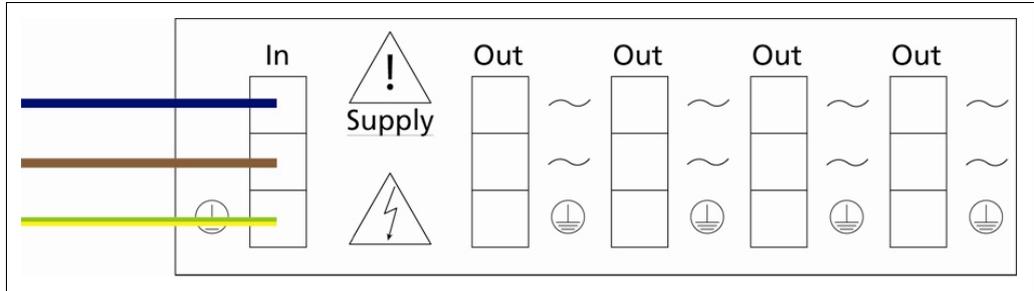


Fig. 5 External power supply for the EVU

4. Connect the power supply (Out) with the corresponding channel (Fig. 6) or connect the individual measurement channels with an external power supply (recommended) (Fig. 7).

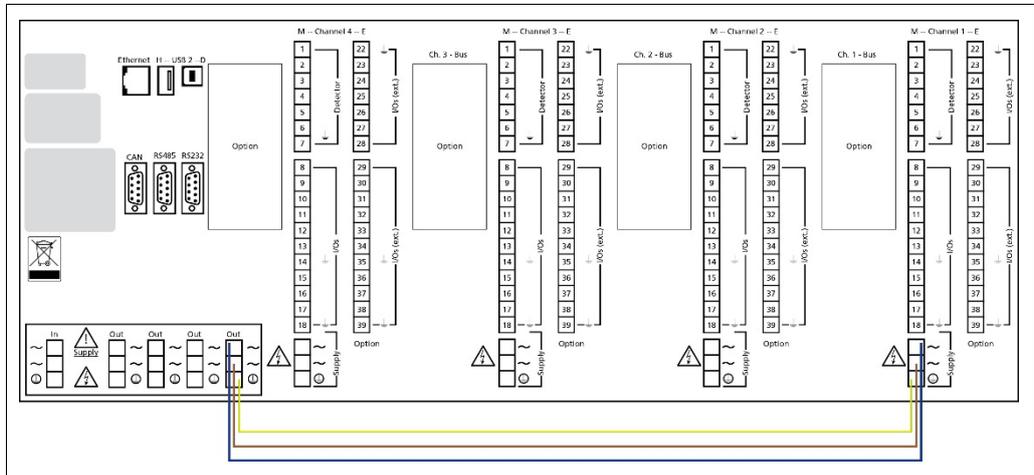


Fig. 6 Internal power supply of the measurement channel via the EVU, measurement channel 1 as example.

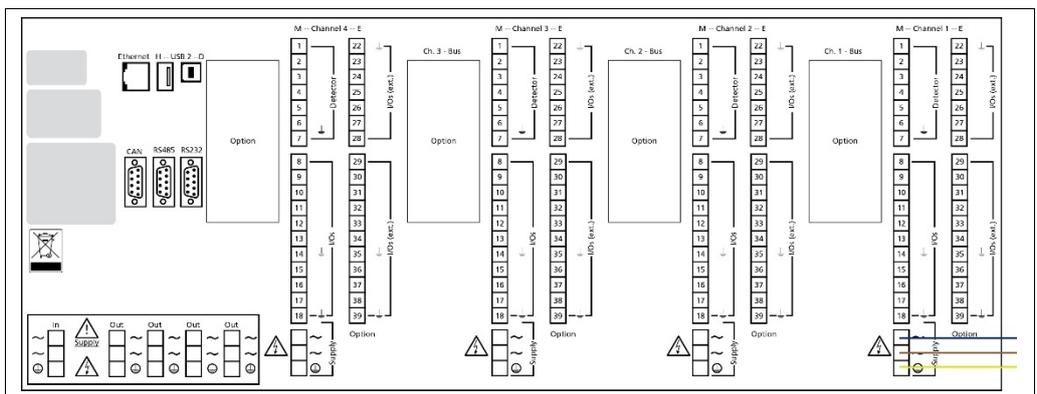


Fig. 7 External power supply of the measurement channel, measurement channel 1 as example.

5. Connect the detector to a terminal box or directly to the EVU with the special cable (in accordance with the local conditions). Connect the EVU to the terminal box if needed.
6. Configure the current output for the primary signal (chapt. 4.3) and connect

the current output loop (note chapter 6 LB 452 Connections under “Technical Information” in the appendix).

7. Connect the error relay (note chapter 6 LB 452 Connections under “Technical Information” in the appendix).
8. Connect the alarm relays (note chapter 6 LB 452 Connections under “Technical Information” in the appendix). if you have installed an extension module.
9. Connect the digital inputs (note chapter 6 LB 452 Connections under “Technical Information” in the appendix).
10. Insert the radiation source into the mould or into the casting shielding inside the mould.
11. Carry out calibration and set the required parameters for operation (chapt. 7.2). Configure the function of the outputs also (chapt. 7.3).

NOTICE



You can find the procedure for carrying out full calibration and setting the necessary parameters in chapter 7.2. The setting of inputs and outputs is explained in chapter 7.3 .

4.2 The Use of a Terminal Box

Install the terminal box near the mould in a protected but easily accessible place.

The detectors and the EVU are to be connected via the terminal box. This connection is to be made with a standard 6-wire shielded cable (6 x 0.5 mm²) with a maximum length of up to 1000 m.

As required, the terminal box can be ordered for open ends (Id. no. 07005, Fig. 8, item 1) or with a plug-in connector (Id. no. 34787, Fig. 8, item 2).

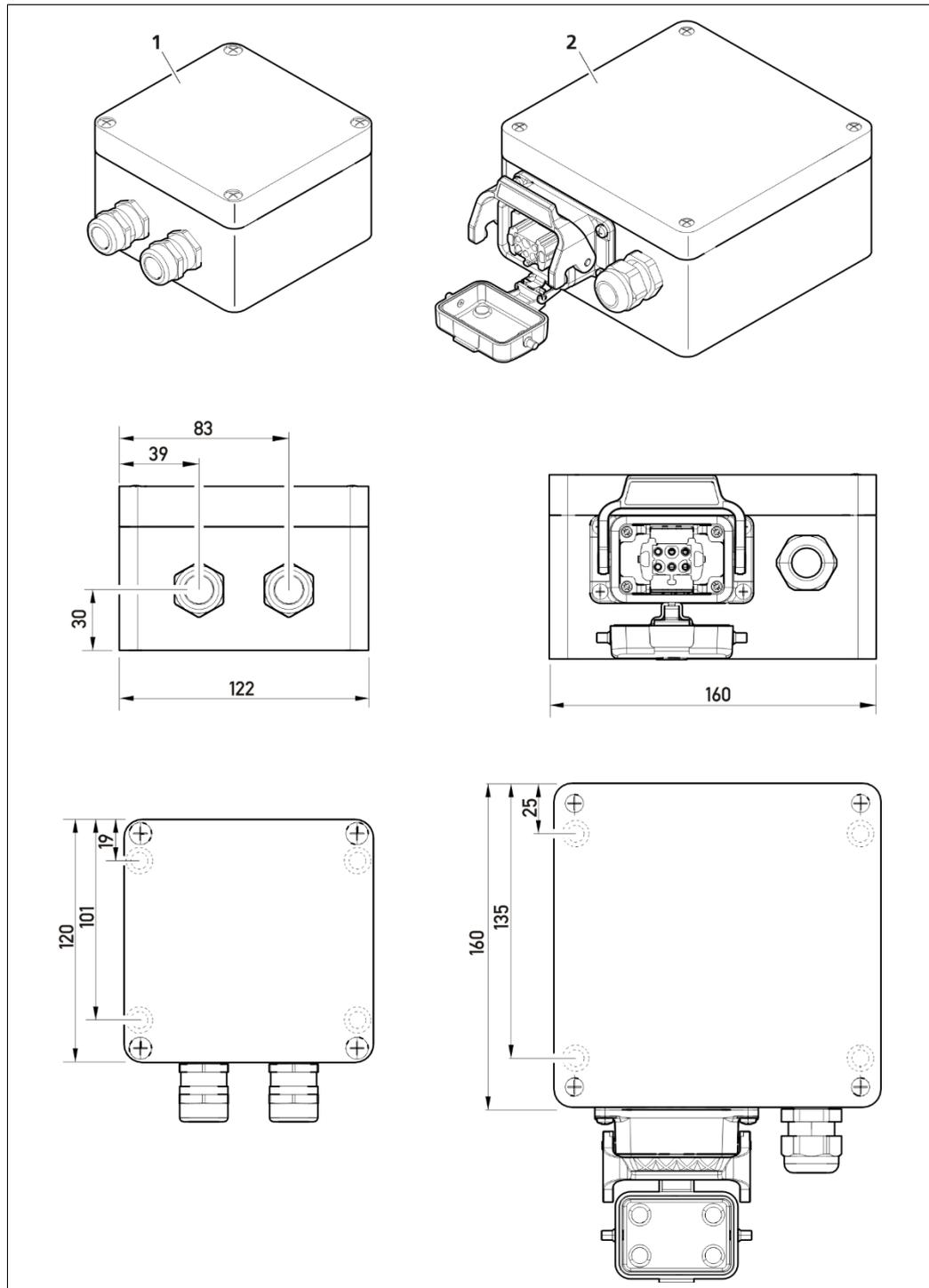


Fig. 8 Terminal Boxes for radiometric Detectors

4.3 Configuring the Current Output

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.
- ▶ Only carry out maintenance work when the device is free of voltage.

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

You can assign the current outputs to two different modes. To do so, you must configure the current outputs at the changeover switches on the basic and extension modules.

In source mode the current output is active and in sink mode, the current output is passive.

Source Mode (Active Current Output)	Sink Mode (Passive Current Output)
Meaning: The EVU supplies the current loop (factory setting)	Meaning: An external power supply supplies the current loop.
Max. Impedance: 500 Ω Min. Impedance: 120 Ω	Minimum impedance: 120 Ω Max. 24 VAC / Min. 12 VDC Max. Impedance at 12 V: 250 Ω Max. Impedance at 24 V: 500 Ω

4.3.1 Configuring the Current Output on the Basic Module

Before you start to configure the current outputs, get an overview of the installed modules.

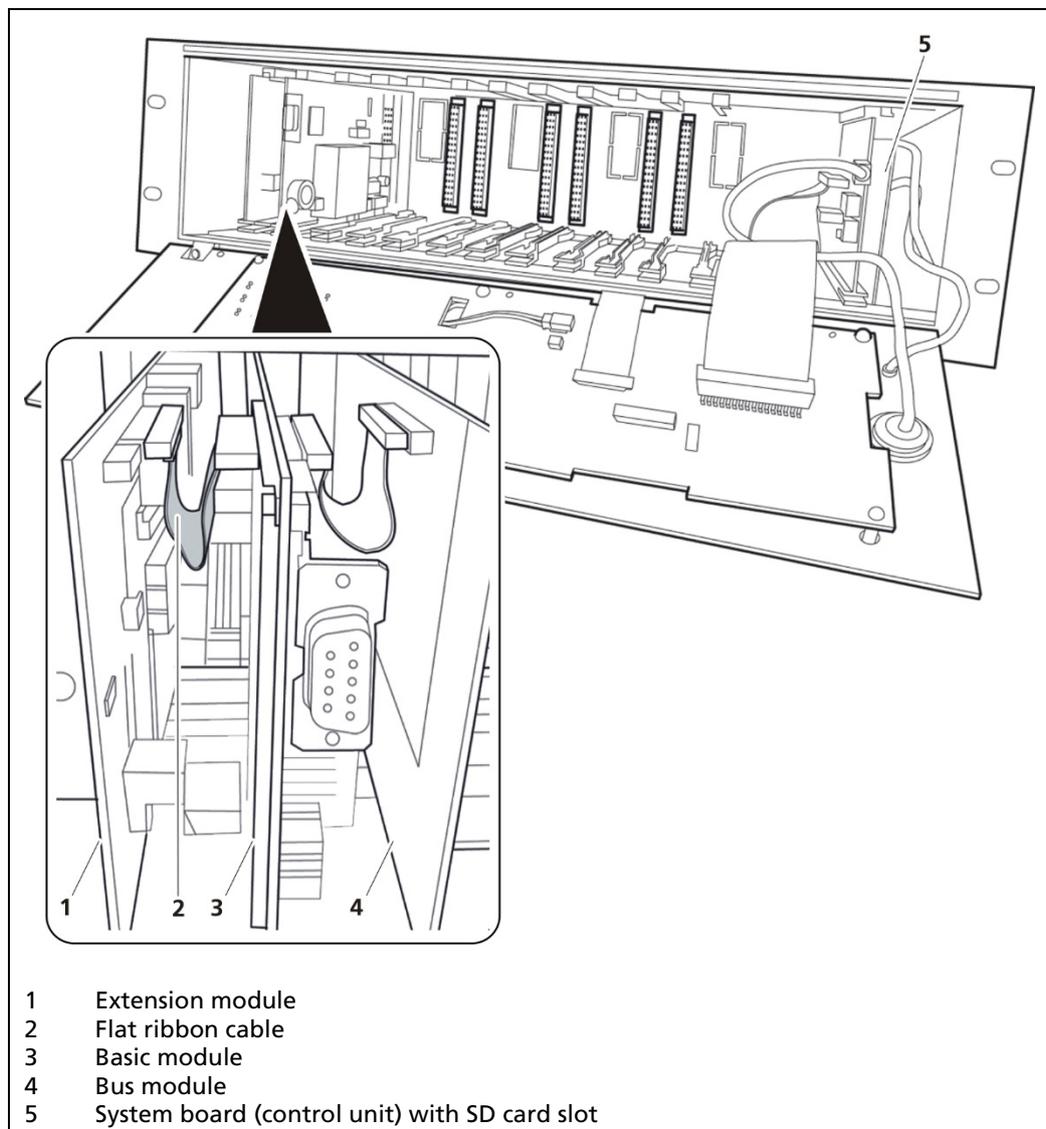


Fig. 9 Overview of the Installed Modules

Approach the configuration of the current output as follows:

DANGER



Danger to life from electric shock!

- ▶ The installation may only be carried out by a qualified electrician.
- ▶ 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. Disconnect the EVU voltage.
2. Loosen the three screws (Fig. 10, Item 2) on the front panel

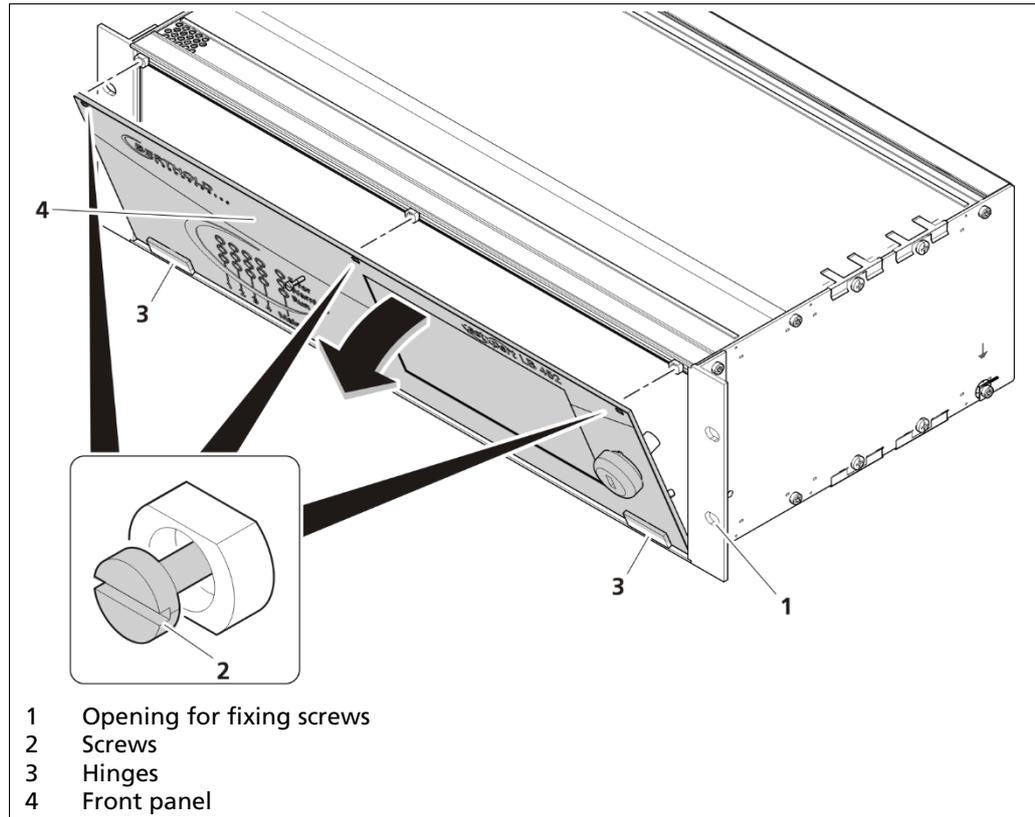


Fig. 10 Assembly Front View

3. Fold down the front panel.
4. Release all modules (Fig. 9, Item 3) and then pull out the measurement channel at the same time. Remove the flat ribbon cable(s) if needed (Fig. 9, Item 2).

- Set the desired position at the changeover switch (**Sink Mode** (Fig. 11, Item1) or Position **Source Mode** (Fig. 11, Item 2).

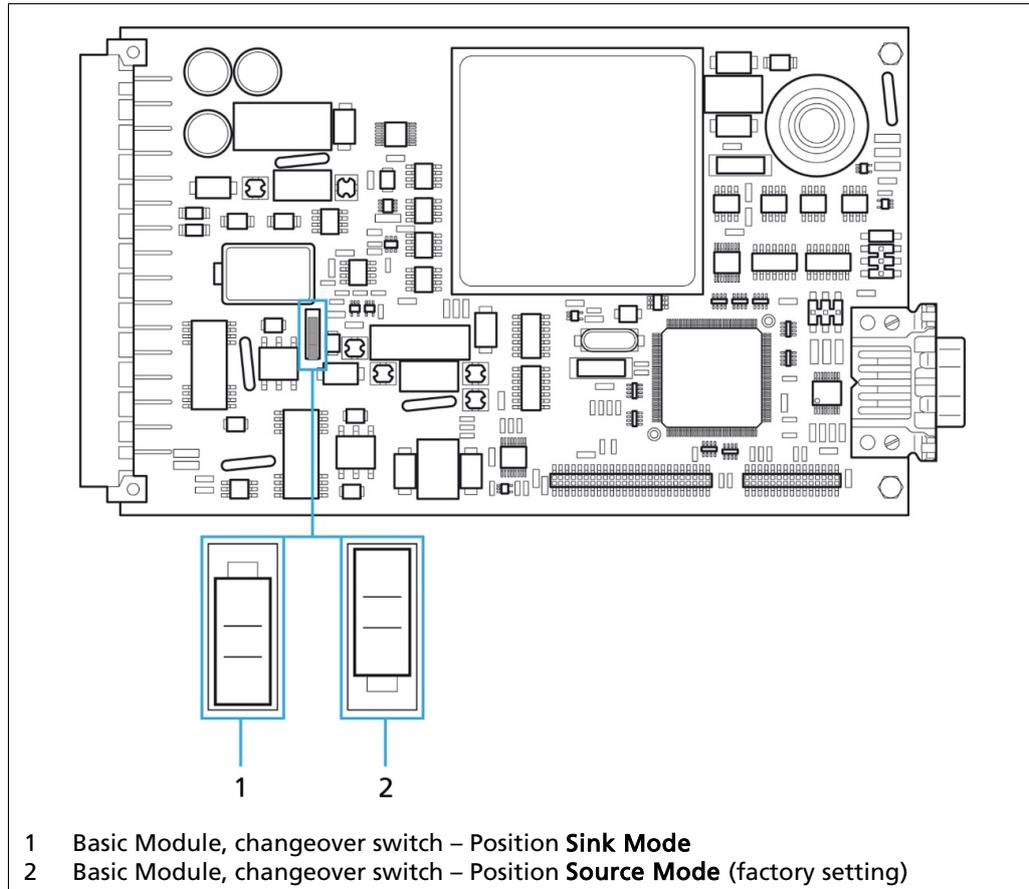


Fig. 11 Switching on the Basic Module Current Output at the Changeover Switch

- Connect the module with the flat ribbon cable again.
- Push all the modules (Fig. 9, Item 3) of the measurement channel in again **at the same time**.
- Fold the front panel up again.
- Tighten the screws again.

NOTICE



Ensure that the position at the changeover switch on the basic module and on the extension module is the same!

- ▶ Use **the same** current output configuration on the basic and extension modules.

4.3.2 Configuring the Current Output on Extension Module

1. Disconnect the EVU voltage.
2. Loosen the three screws on the front panel (Fig. 10, Item 2).
3. Fold down the front panel.
4. Release the modules (Fig. 9, Item 3) and pull out the measurement channel **at the same time**. Remove the flat ribbon cable(s) if need be (Fig. 9, Item 2).
5. Set the desired position at the changeover switch (**Sink Mode** (Fig. 12) or Position **Source Mode** (Fig. 12)).
6. Connect the module with the flat ribbon cable again if need be.
7. Push all the modules (Fig. 9, Item 3) of the measurement channel in again **at the same time**.

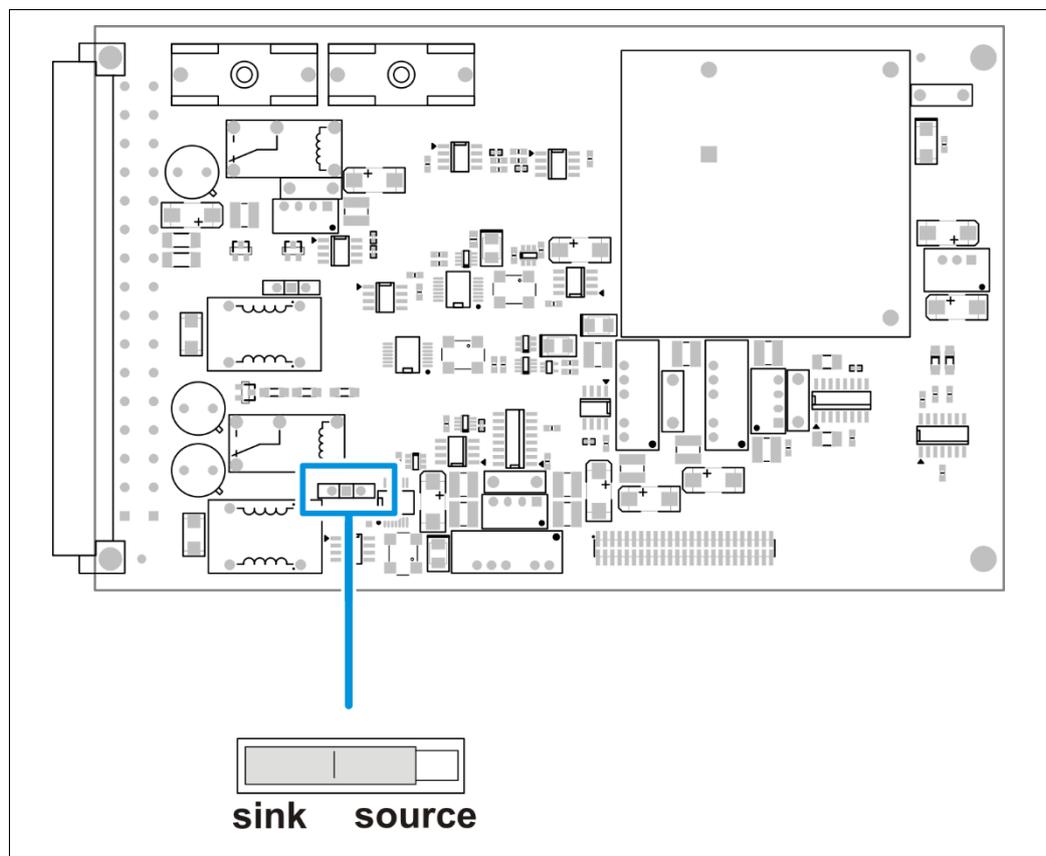


Fig. 12 Extension Module, Setting the Current Output at the Changeover Switch

4.4 Data Definition Profibus DP

Cyclic Output Data

Variable name	Description	Type	Size
Mould Level	Current Mould Level unit: %/mm/inch (selectable)	Float	32 Bit
Detector Raw Value	Current Detector Raw Value unit: GAMMAcast & CONGAUGE - Pulses per Second (CPS) ECcast – Millivolt (mV)	Float	32 Bit
Detector Temperature	Current Detector Temperature Unit: °C/°F (selectable)	Float	32 Bit
Calibration Index	Currently used calibration [0 ... 7] (decimal) (Calibration curve, alarm thresholds, time constant, etc.)	Byte	8 Bit
System Status	System Status. This field contains binary coded information: Bits 0-2: Main state of the system Bit 0; 0x1 (1): RUN/MEASUREMENT RUNNING Bit 1; 0x2 (2): STOP Bit 2; 0x4 (4): ERROR Bit 3: Warning Bit 3; 0x0 (0): NO WARNING Bit 3; 0x1 (1): WARNING Bits 4-11: Stop condition Bit 4-11; 0x00 (0): Not in STOP state Bit 4; 0x01 (1): No detector found Bit 5; 0x02 (2): Detector Offline Bit 6; 0x04 (4): Test Mode Bit 7; 0x08 (8): Calibration running Bit 8; 0x10 (16): Full Adjustment running Bit 9; 0x20 (32): Empty Adjustment running Bits 12-19: Alarms Bit 12-19; 0x00 (0) No alarm running Bit 12; 0x01 (1): Detector Over Temperature Bit 13; 0x02 (2): Min. Fill Level Bit 14; 0x04 (4): Max. Fill Level Bit 15; 0x08 (8): Gating mode (time constant) Bit 16; 0x10 (16): Trim Adjust Up running [only ECcast] Bit 17; 0x20 (32): Trim Adjust Down running [only ECcast] Bits 20-31: Error number A 12 Bit unsigned integer number representing the number of the actual error Error# < 1000: LB 452 error Error# > 1000: Detector error	Un-signed Integer	32 Bit
			136 Bit = 17 Bytes

Cyclical Input Data

Variable name	Description	Type	Size
Calibration Index	Currently used calibration [0 ... 7] (decimal) (Calibration curve, alarm thresholds, time constant, etc.)	Byte	8 Bit
Function Actuation	By writing a number in this field functions on the EVU can be actuated: 0x0 (0) Idle (do nothing) Bit 0; 0x1 (1): Empty Adjust Bit 1; 0x2 (2): Full Adjust Bit 2; 0x4 (4): Trim Adjust Up (One Step) [only EC-cast] Bit 3; 0x8 (8): Trim Adjust Down (One Step) [only EC-cast] Bit 4; 0x10 (16): Start Automatic Calibration [only EC-cast] Bit 7; 0x80 (128): Acknowledge Actual Error	Unsigned Integer	32 Bit
			40 Bit = 5 B

NOTICE



Device does not work correctly if the driver is not up to date!

Fieldbus Module Data is not being received.

- ▶ Install the driver (GSD file) into the control centre to be able to receive the fieldbus module data!
- ▶ Check the Profibus ID (Profinet IP address).

IMPORTANT



Only cyclic data will be transferred.

The fieldbus module can be distributed in the following versions:

Version 1: RS-485 port (Profibus DP) or

Version 2: RJ-45 Ethernet port (Profinet IO)

4.5 Installation/Removal of an SD Card

NOTICE



Material damage to the device or the system! System crashes!

- ▶ Never install or remove an SD card while in running operation.

The EVU is supplied with a pre-installed SD card with the possibility of saving data, error reports, and adopted settings. For the saving of data, see 6.4.2.

Approach the installation of the SD card as follows:

1. Disconnect the EVU voltage.
2. Loosen the screws on the front panel (Fig. 10, Item 2) and fold down the front panel.

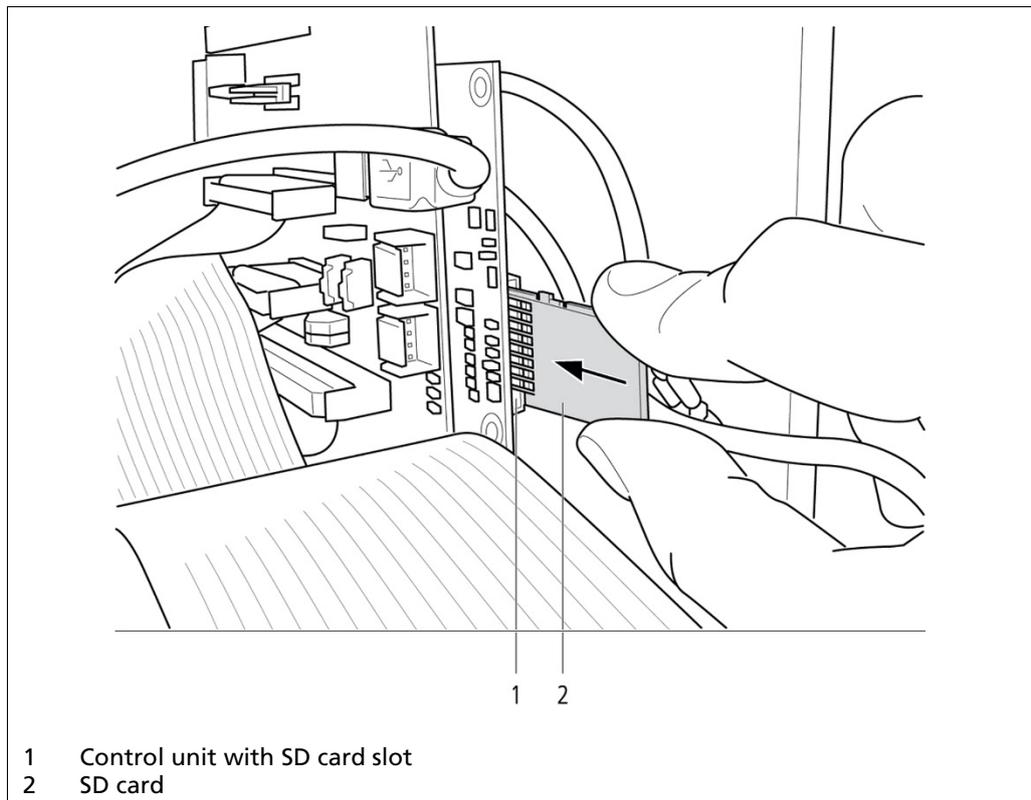


Fig. 13 Control Unit, Installation of the SD Card

3. Push the SD card (Fig. 13, Item 2) into the SD card slot (Fig. 13, Item 1) on the control unit until the SD card snaps into place.
4. Fold the front panel up again and tighten the three screws.

5 Operation of the Software

In this chapter, the operation of the software and the different setting options of the EVU are explained.

The EVU does not have a separate on and off switch. As soon as the power supply is connected, the system and the EVU start up.

During the start-up process, the start screen with the version number of the installed software is shown on the display (Fig. 14).



Fig. 14 Software Display Screen when switching on the EVU

5.1 Overview of the Standard Display

When the system is fully up and running, the start page of the measurement system is displayed (Fig. 15). The display varies depending on which measurement channels are installed. For example, two measurement channels are shown in Fig. 15.

NOTICE



As soon as a detector is connected to an individual measurement channel, it will automatically be represented on the standard display.

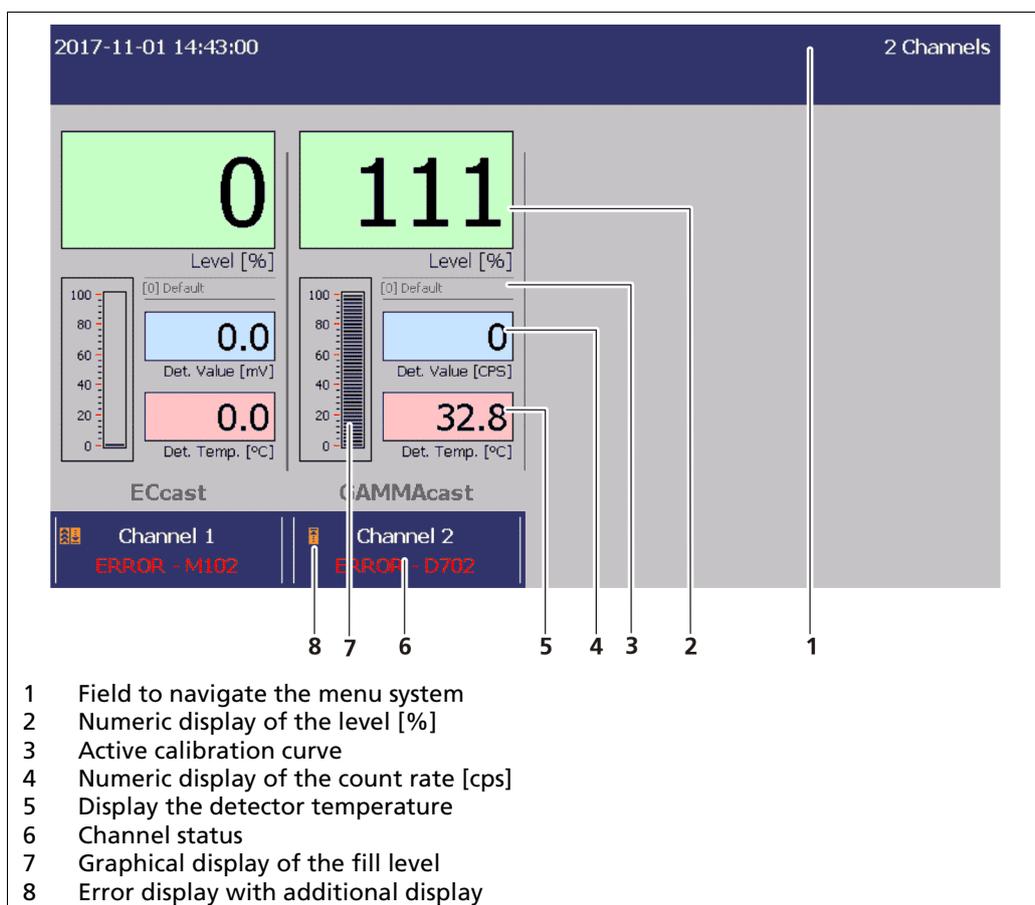


Fig. 15 Standard display of the EVU

Click on the top blue bar (Fig. 15, Item 1) to reach the system menu (chap. 6 „The System Menu“). Under the display for the measurement channels, there is a button that leads to its respective "Channel Overview" menu (see chap. 7 Main Menu).

Positions 2 to 8 provide graphical information about the fill level (Fig. 15, Item 2), the detector temperature (Fig. 15, Item 5), and the count rate (Fig. 15, Item 4).

In case of failure, the error or warning number is displayed (Fig. 15, Item 6). All castXpert LB 452 error messages have the prefix "M" and all detector error messages have the prefix "D". In addition, the following additional information is displayed:

- Identification of the measurement channel
- Identification of the calibration curve selected (Fig. 15, Item 3)
- Channel status (Fig. 15, Item 8)

Operation of the EVU

The graphical user interface of the EVU can be operated in multiple ways:

- Via the touch display.
- With a mouse and a keypad which are connected on the front panel and on the back panel (Fig.1, Item 3).
- With a computer if the EVU is operated via the remote-control software.

There is one USB port on the front panel and one on the back panel. If you would like to connect more than one USB device to the front panel, then use a USB hub.

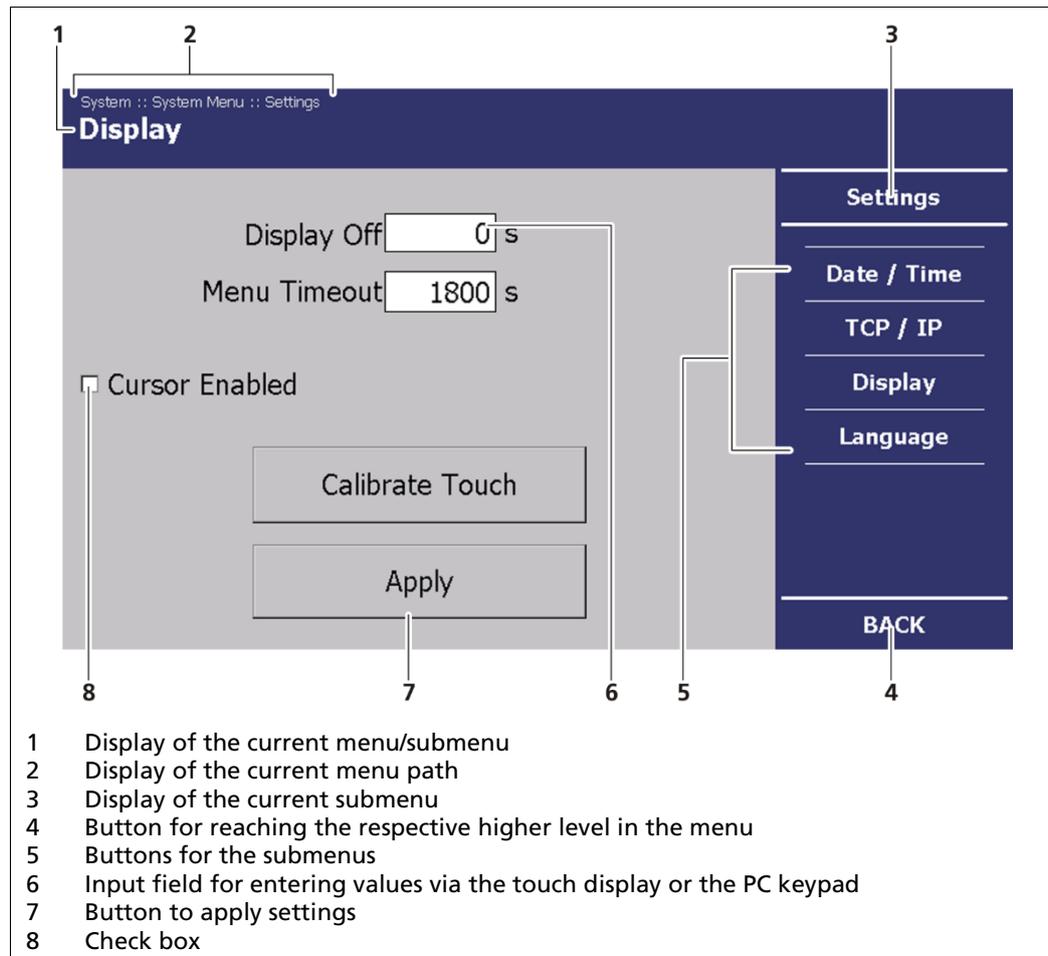


Fig. 16 Overview of a Menu with Buttons and Input Fields

As soon as you click on an input field, the numeric keypad or the keypad is automatically displayed on the touch display.

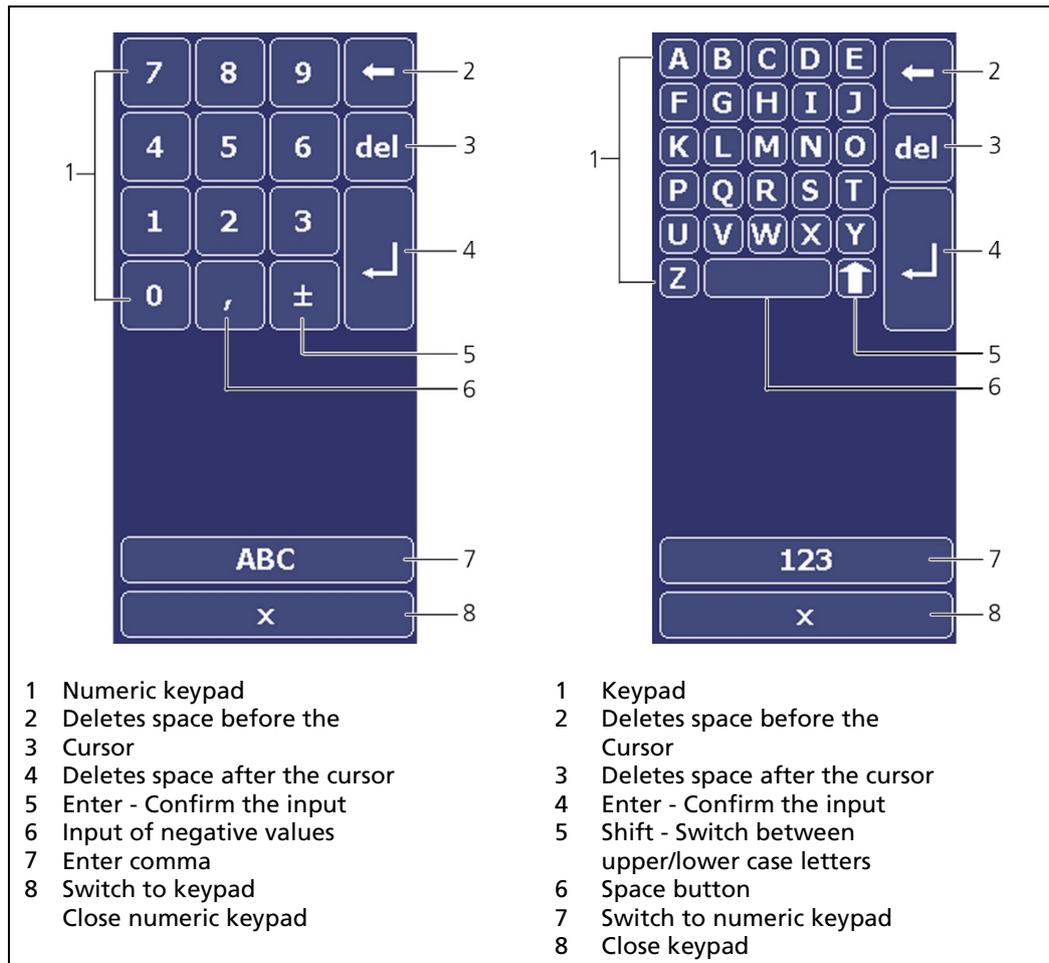


Fig. 17 Numeric Keypad and Keypad

6 The System Menu

In the system menu you can make system settings which apply to all measurement channels.

IMPORTANT



The system settings do not affect the measurement.

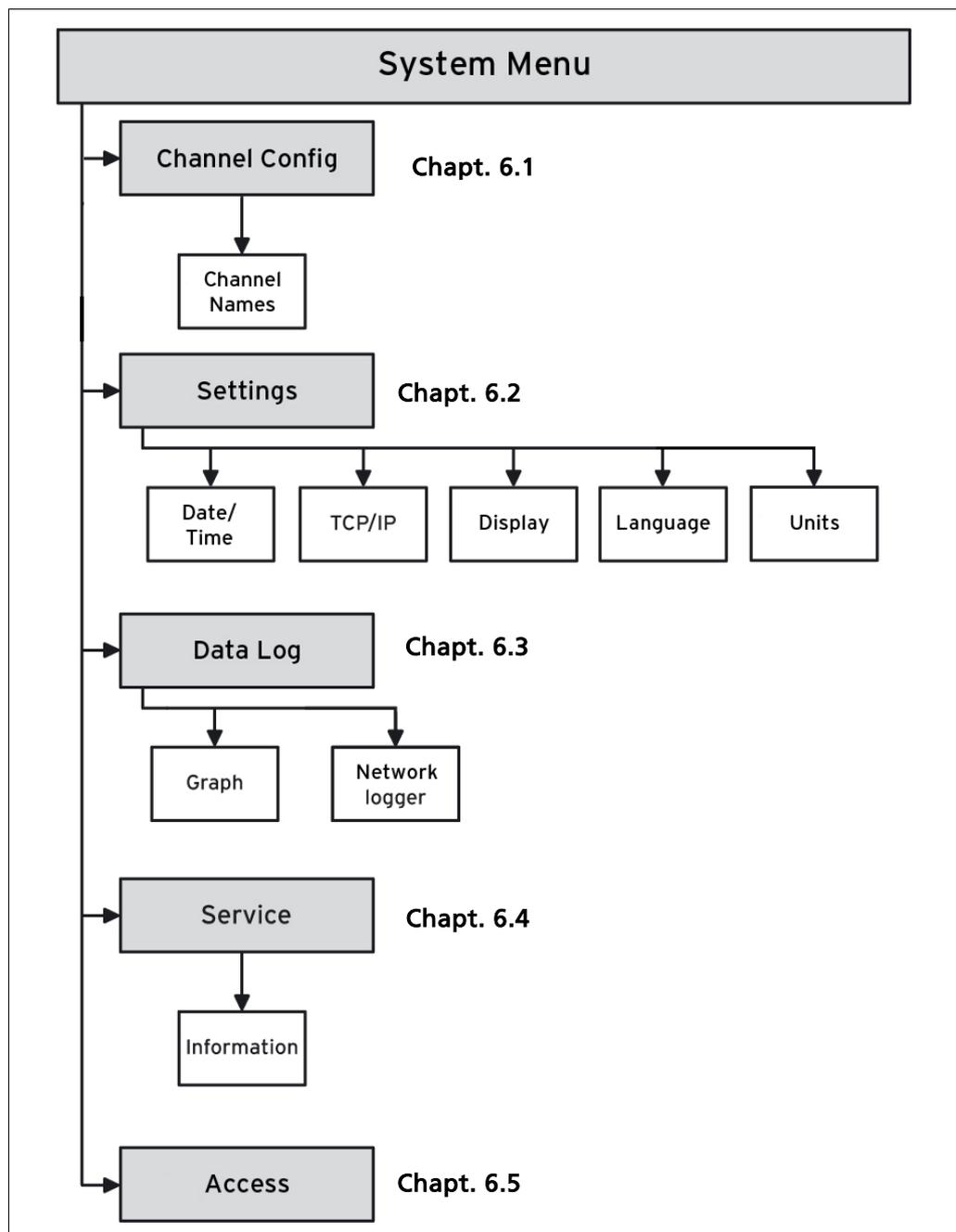


Fig. 18 Menu Structure of the System Menu

To reach the system menu, click on the top blue bar on the standard display (Fig. 15, Item 1).

- ▶ The System Menu (Fig. 19) is opened.

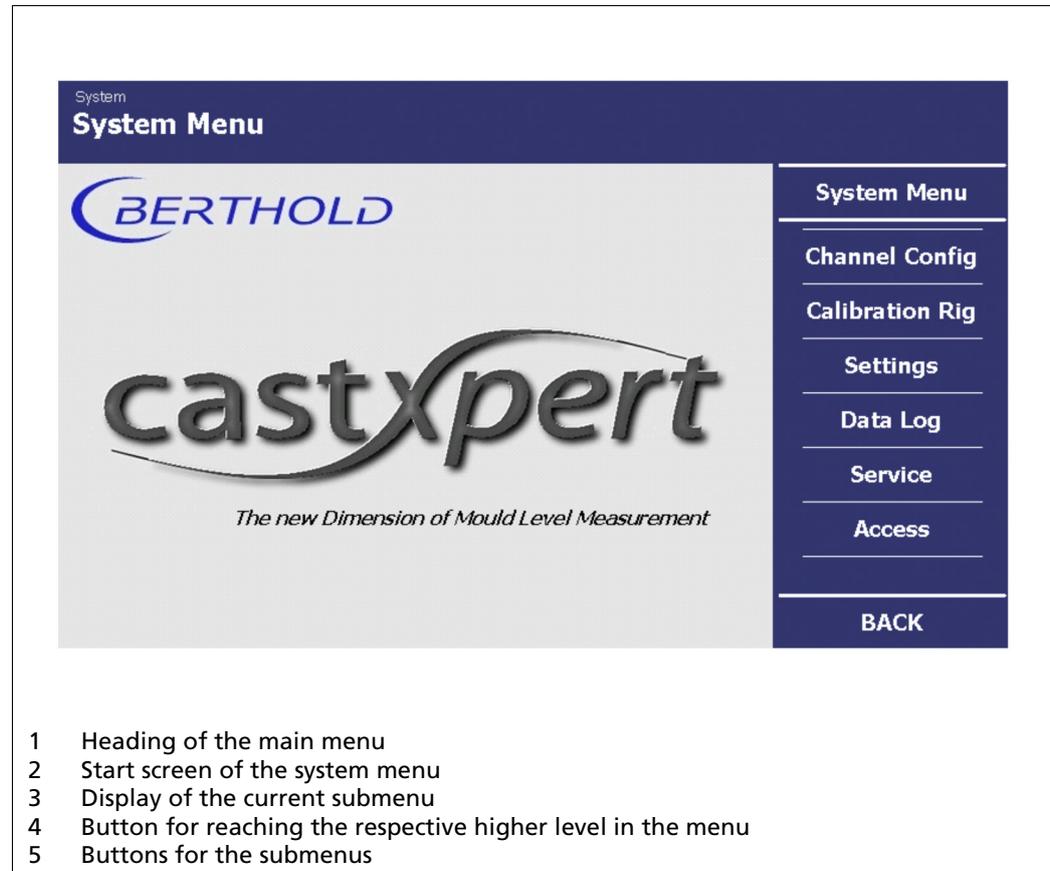


Fig. 19 System Menu, Start Page

In the system menu, you can make the following settings:

Channel settings	Setting of the channel assignment and the measuring method.
Calibration rig	Enable the use of a calibration rig.
Settings	General settings like time, date, and language.
Data Log	Setting of the log intervals and data export.
Service	Carrying out of updates for the evaluation unit, the basic modules, and the detectors.
Access Level	Allocation of user rights and passwords.

6.1 Channel Setting

In the channel setting submenu, you can set the channel assignment (Fig. 20, Item 4) and the measurement method (channel mode) for the different detectors.

NOTICE



Measurement not possible!

- ▶ There are three methods of measurement. Set the method according to the detectors you are using:
- ▶ Radiometric in conjunction with the GAMMAcast detectors, which is based on the radiometric method.
- ▶ Eddy Current in conjunction with the ECast detectors, which is based on the eddy current measurement method.
- ▶ Radiometric in conjunction with the CONGAUGE detectors, which is based on the CONGAUGE method.

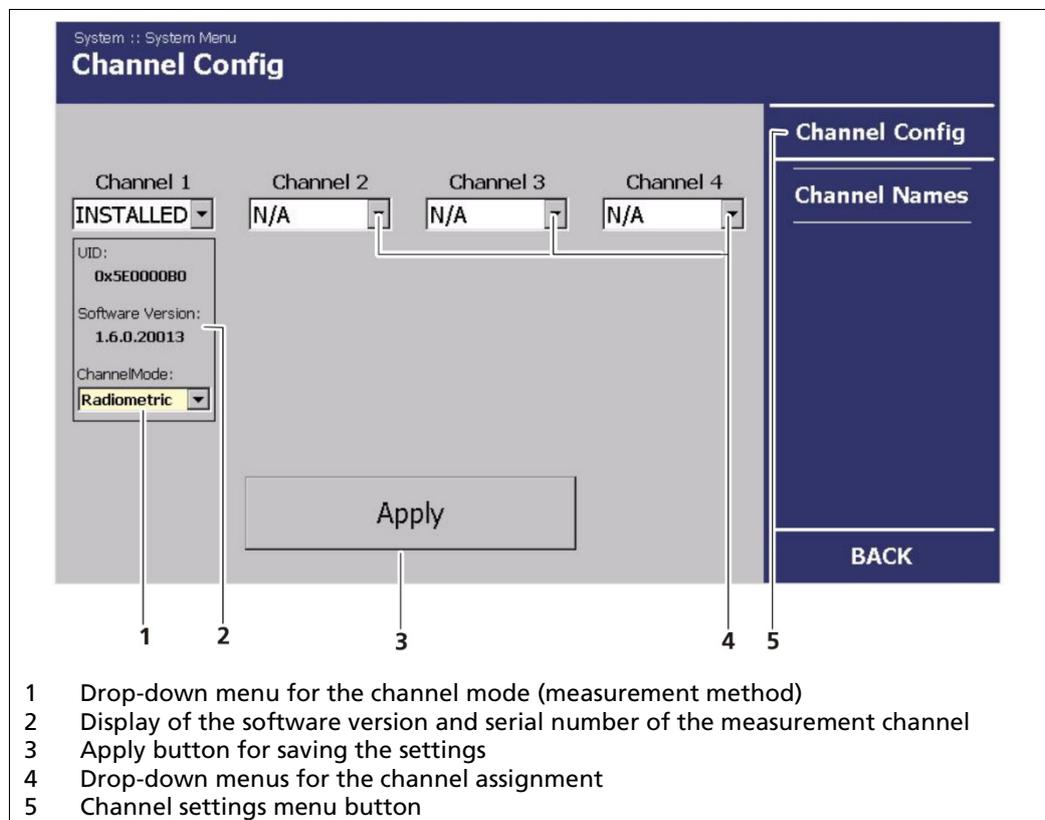


Fig. 20 System menu, Channel Config

In the menu <Channel Settings> in the drop-down menu "Channel Mode" set the measurement method for the detectors used to **Radiometric**, **Eddy Current**, or **CONGAUGE** (Fig. 20, Item 1).

6.1.1 Channel Names

A name can be assigned to each of the four measurement channels. These names are then used in the standard display and used for all service files when exported.

In the System menu, click on <Settings | Channel Settings | Channel Names> to assign a name to a channel.

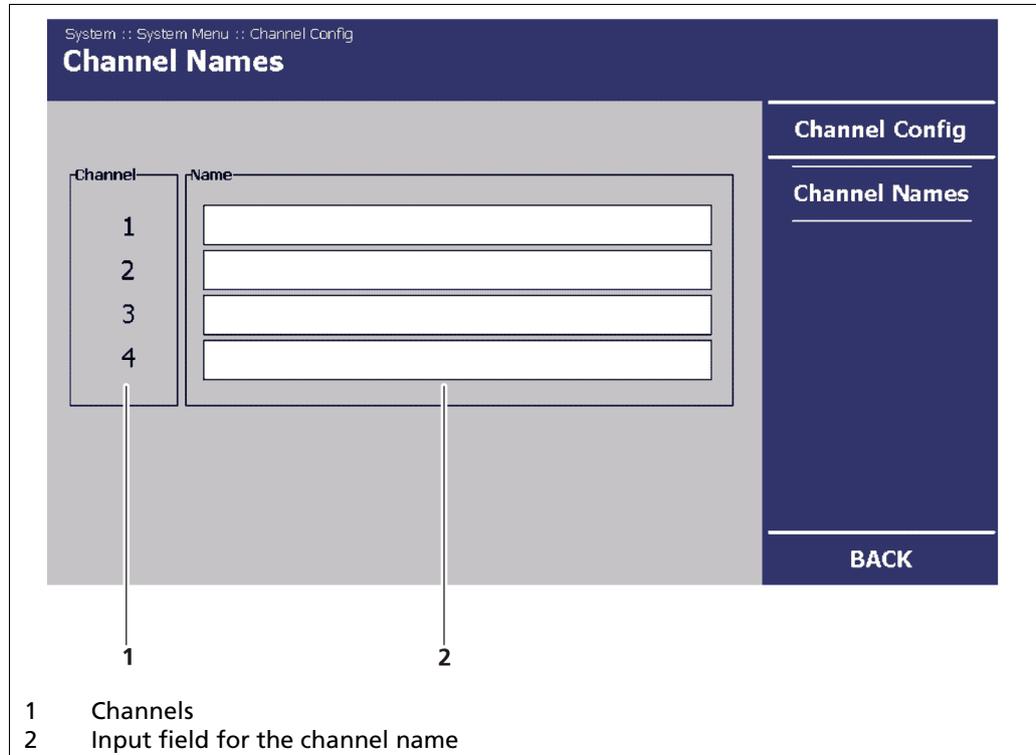


Fig. 21 System Menu, Channel Names

6.2 Calibration Rig

The use of a Calibration Rig can be enabled. Click in the System menu on <Calibration Rig> to enable the use for a calibration rig.

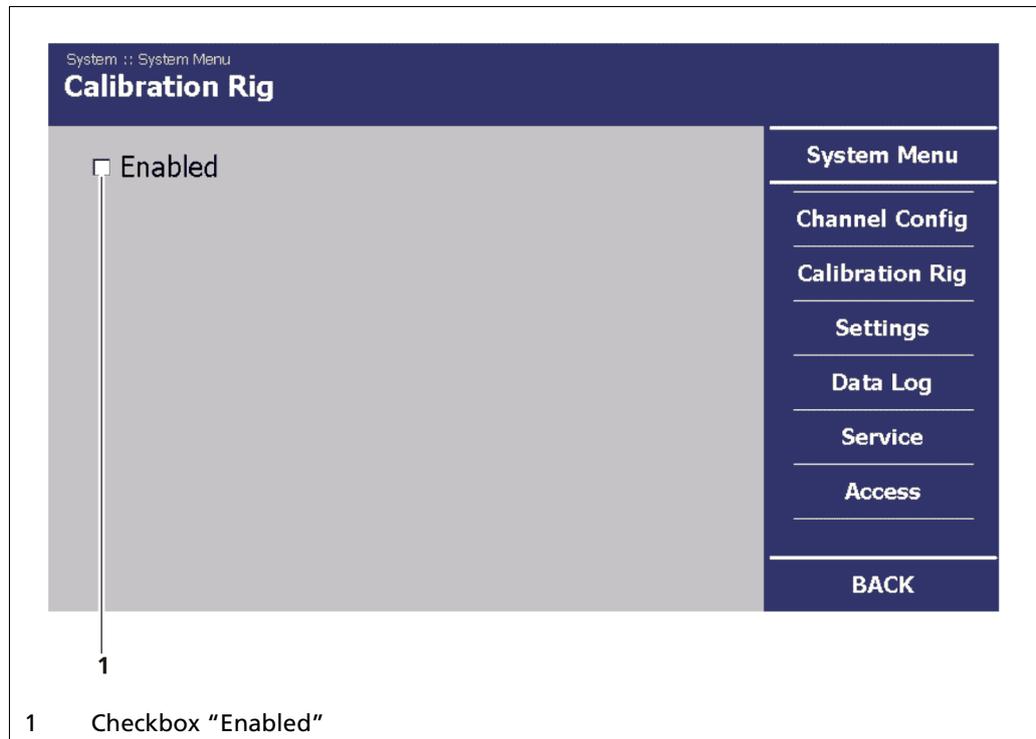


Fig. 22 System Menu, Calibration Rig

IMPORTANT



When Calibration Rig is enabled, the EVU will get have predefined static IP address.

This might affect the possibly for remote control of the EVU.

6.3 Settings

In the **System Menu**, click on **<Settings>** (Fig. 19, Item 5), to reach the **Settings** submenu.

- ▶ The submenu **Settings** is opened (Fig. 23).

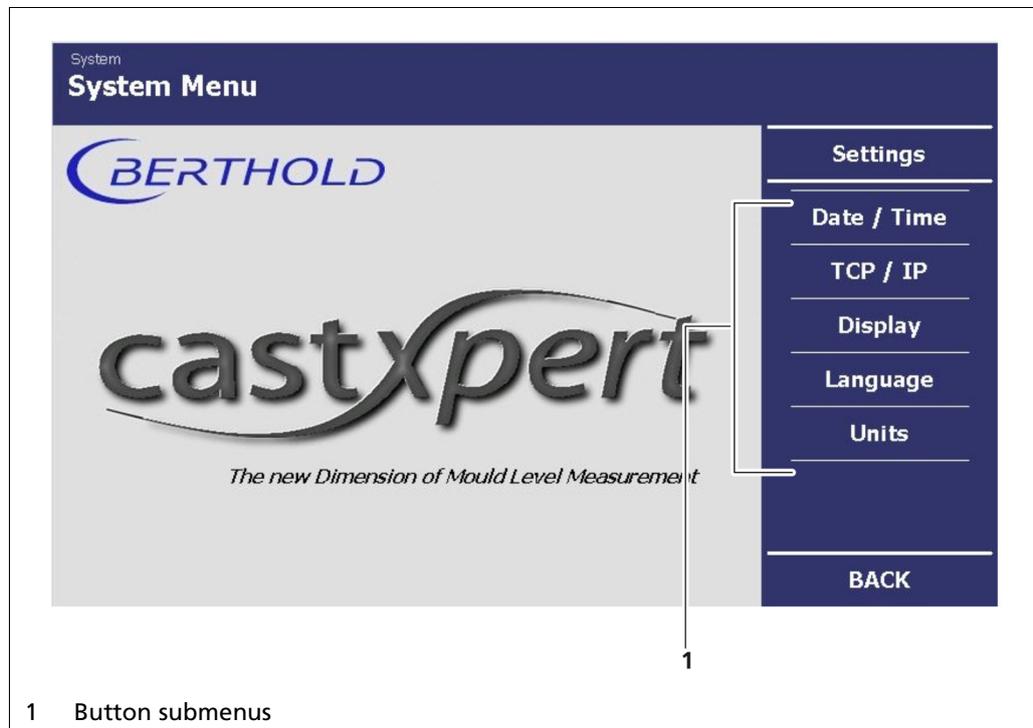


Fig. 23 System menu, Settings

In the **<Settings>** submenu, you have the following setting options:

- Setting the date/time
- Applying and viewing network settings
- Display Setting
- Setting the language
- Setting the units

6.3.1 Setting the Date/Time

IMPORTANT



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

1. In the **System Menu | Settings**, click on **<Date/Time>**, to reach the Date/Time submenu (Fig. 23, Item 1).

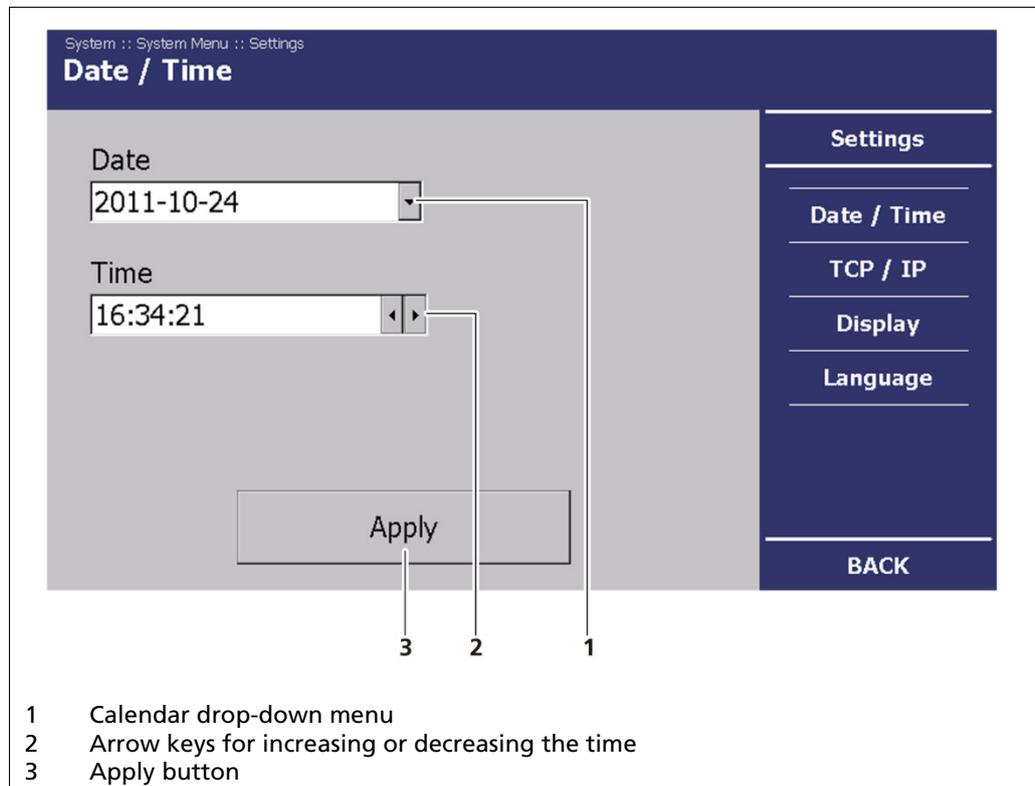


Fig. 24 System Menu, Settings - Date/Time

2. Click on the button drop-down menu (Fig. 24, Item 1), to change the date.
 - ▶ The calendar is "opened".

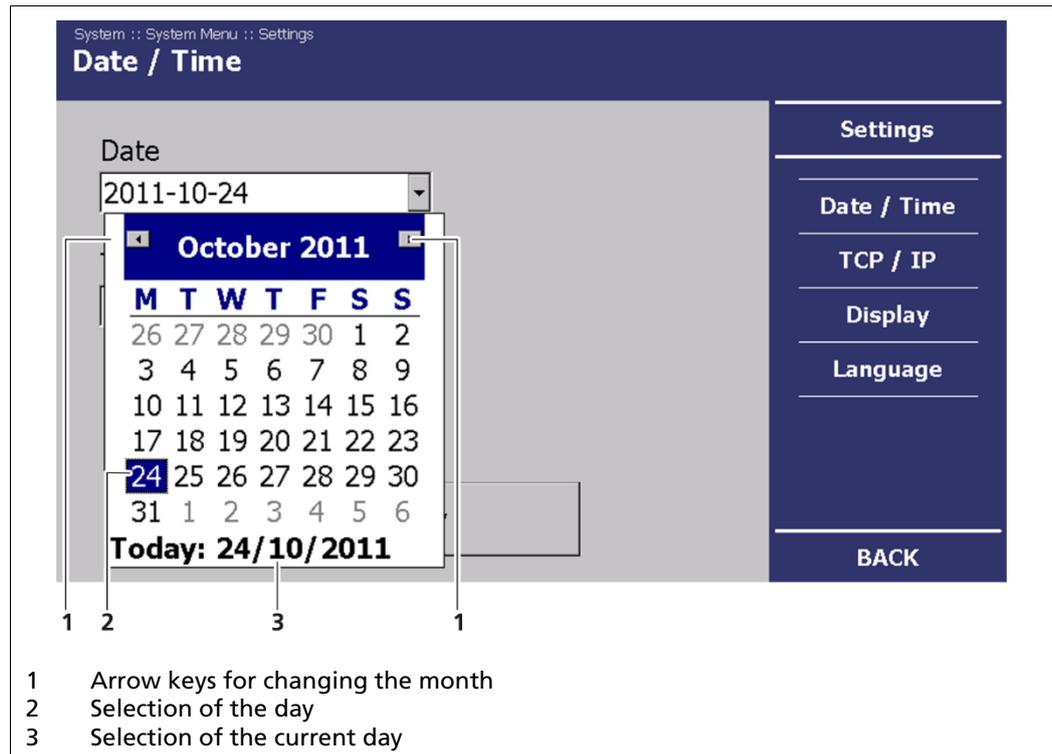


Fig. 25 System menu, Settings - Set Date

3. Set the month (Fig. 25, Item 1) by clicking on the arrow keys.
 4. Set the day (Fig. 25, Item 2) by clicking on a number in the calendar. Alternatively, you can also set the current day by clicking on "Today" (Fig. 25, Item 3).
- The date set is displayed (Fig. 25, Item 3).

Set Time

1. In the "Time" display field, click on (Fig. 26, Item 1) the time unit (hours, minutes, seconds), which you want to change.
2. Change the time by clicking on the arrow keys (Fig. 26, Item 1).

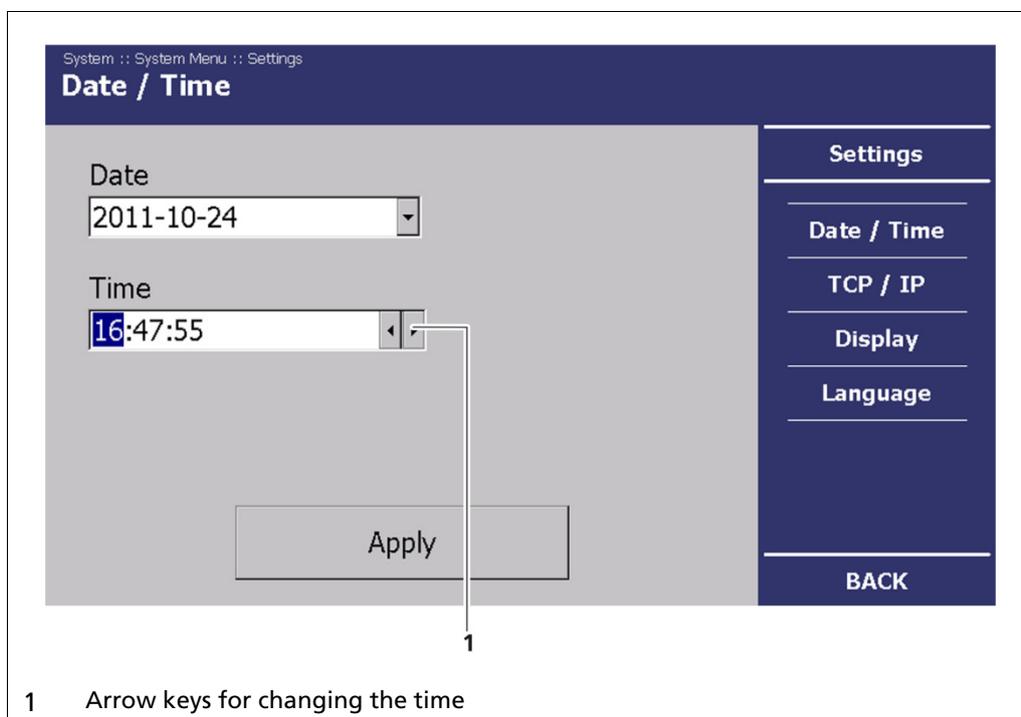


Fig. 26 System menu, Settings - Setting the Time

3. Click on <Apply>, to adopt the date and time settings.

IMPORTANT



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

6.3.2 Applying Network Settings

In the network settings submenu, you can make changes to the network settings.

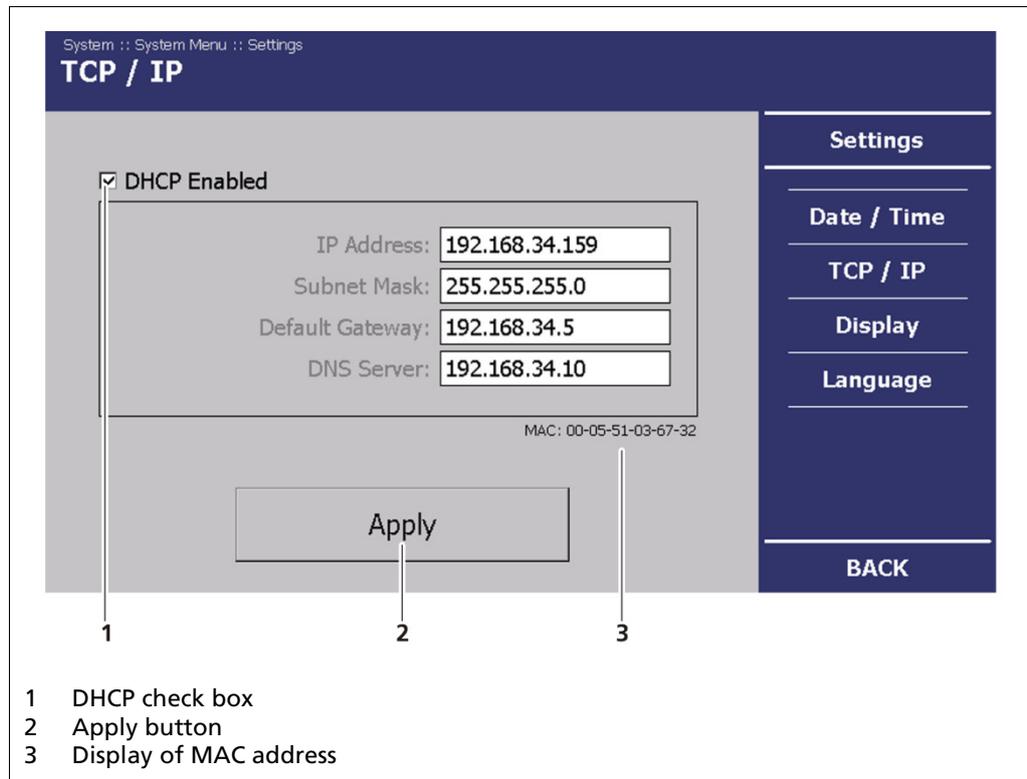


Fig. 27 System Menu, Settings - TCP/IP

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. Modification of the IP address is then blocked. On this menu, you can also read the MAC address of the device (Fig. 27, Item 3).

IMPORTANT



Communication via the remote-control software

The EVU can be accessed via the remote-control software.

- ▶ If you have put a tick next to <DHCP Enabled> (Fig. 27, Item 1), then check your applied network settings!

In the **System Menu | Settings** click on **<TCP/IP>** (Fig. 27, Item 4), to change the network settings.

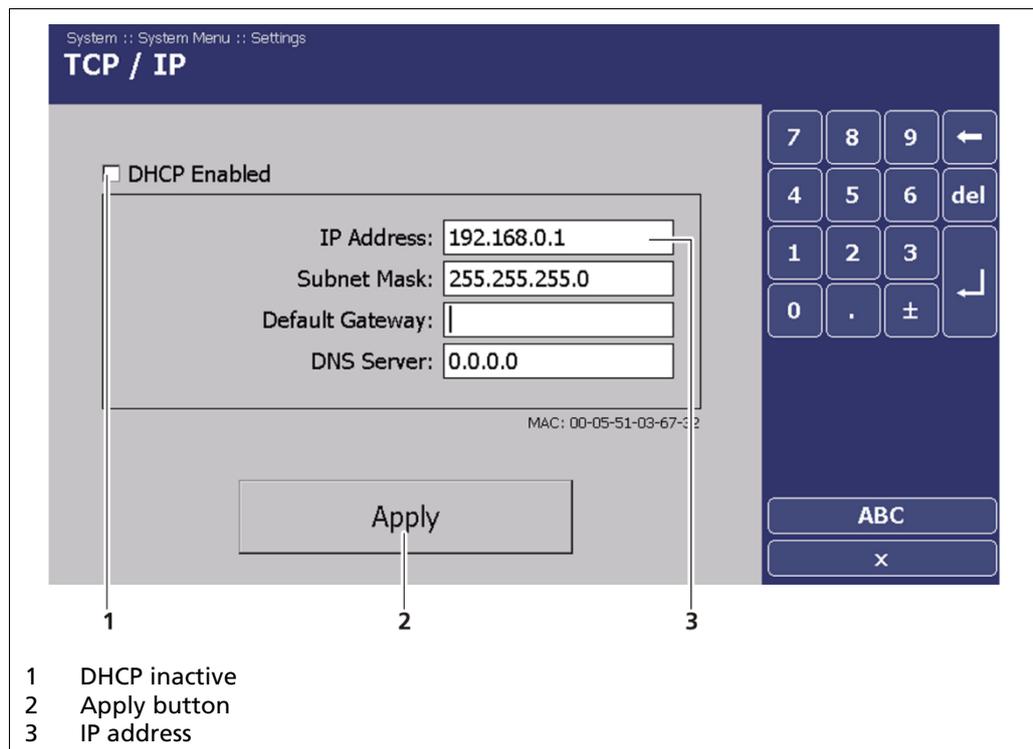


Fig. 28 System Menu, Settings - TCP/IP

You can set the network address either manually or using DHCP (automatic assignment). Put a tick next to **<DHCP Enabled>** in the check box (Fig. 28, Item 1).

Click on **<Apply>**, to adopt the changes (Fig. 28, Item 2).

Display

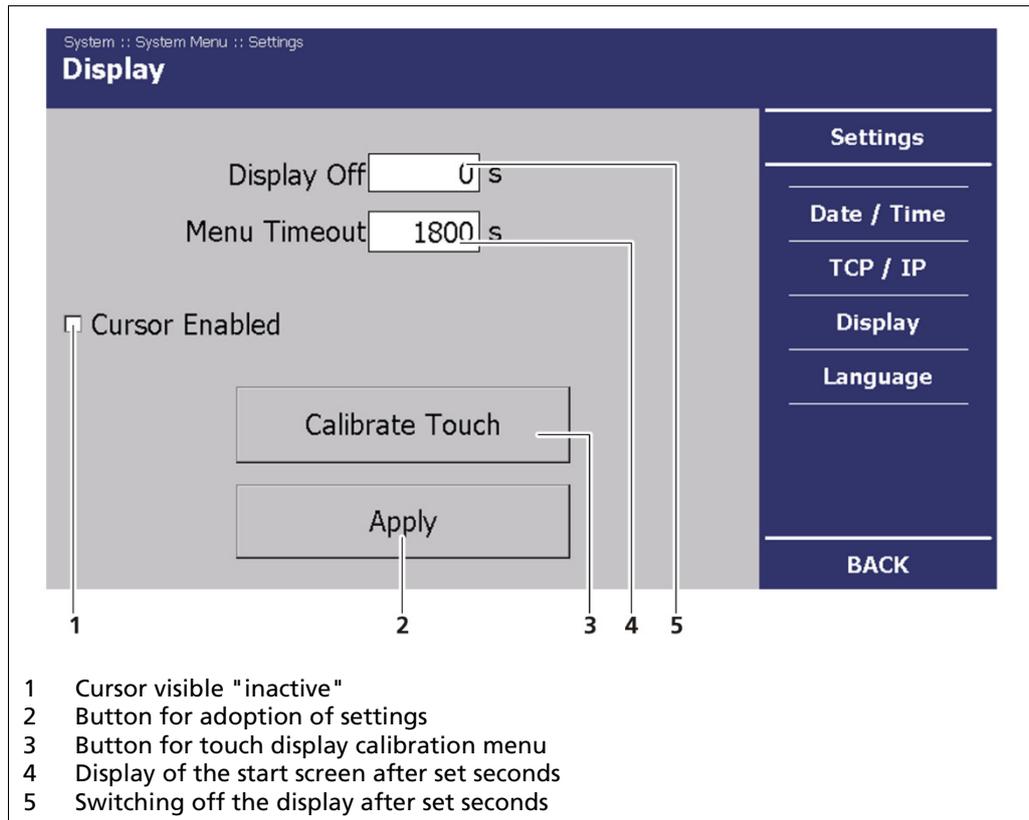


Fig. 29 System Menu. Settings - Display

In the **System menu | Settings** click on **<Display>**, to make changes to the display or to calibrate the touch display. In the **<Display>** submenu, you can make the following settings:

Display Off	Here, the turn-off time of the display can be entered. For a value of 0 s the display is always active.
Menu Timeout	Here, it is possible to enter the time after which the menu should be left if the user has not made an entry.
Cursor Enabled	If the EVU is to be operated with a mouse, a tick must be put in the "Cursor visible" check box (Fig. 29, Item 1). The cursor is visible even if there is no mouse connected and the EVU is operated via the touch display.
Calibrate Touch	When the <Calibrate Touch> button is clicked, a menu for touch display calibration is opened.

IMPORTANT



The following settings described "Switch off display", "Menu timeout" and "Cursor visible" can all be applied at the same time.

- ▶ This way, it is only necessary to restart the EVU once.

Calibrate Touch Display

NOTICE



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

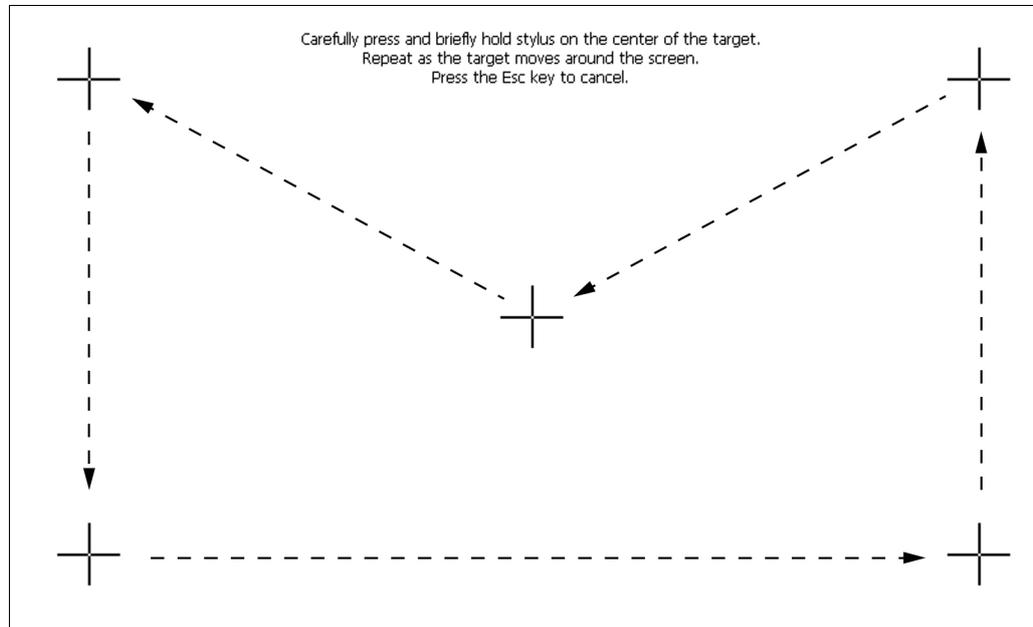


Fig. 30 System Menu. Settings - Display (Calibrate Touch Display)

1. Click on <Calibrate touch pad> (Fig. 29, Item 3).
 - ▶ The calibration screen opens (Fig. 30).
2. Press the middle of the displayed cross with your finger.
3. If you take your finger off the cross again, the cross jumps to the top left corner (Fig. 30).
4. Repeat the process until the cross is no longer displayed and the calibration is finished.
 - ▶ After successful calibration, the "Display" submenu is displayed.

6.3.3 Setting Language

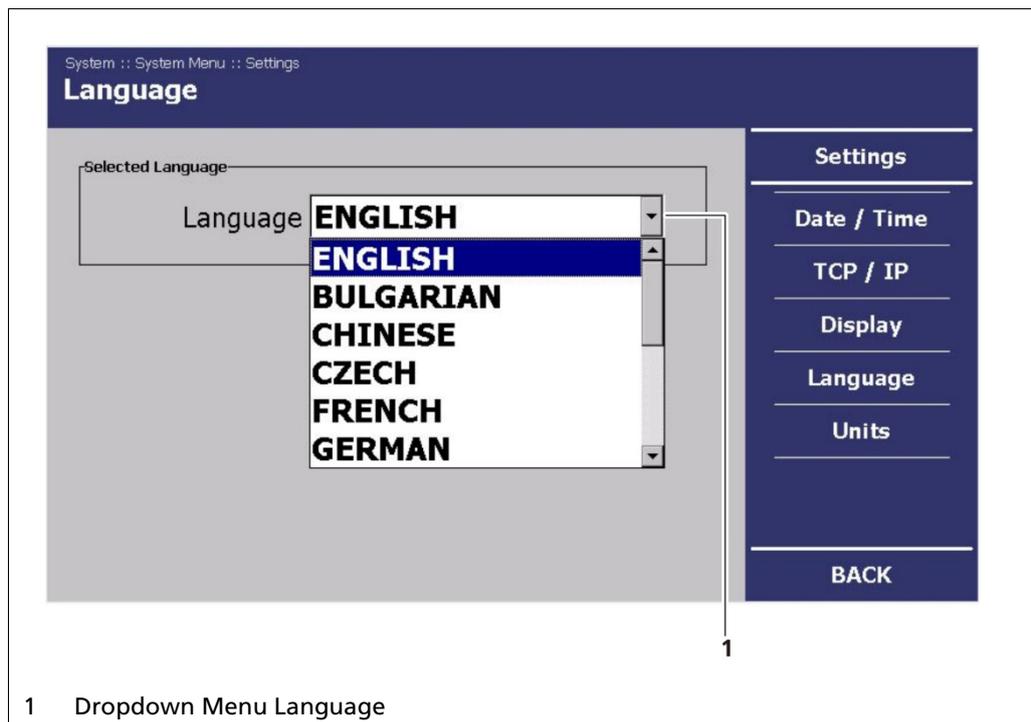


Fig. 31 System Menu. Settings - Language

1. In the **System Menu | Settings** click on **<Language>**, to change the menu language. (Fig. 23, Item 1).
2. Click on the drop-down menu "Language" (Fig. 31, Item 1), to select the desired language.
 - ▶ The drop-down menu opens.
3. Click on the desired language to select this as the user interface language.
 - ▶ A confirmation message is displayed.
4. Click on **<OK>**, to restart the EVU.
 - ▶ The EVU restarts. The measurement remains unaffected by this.

NOTICE



The standard languages Bulgarian, German, English, French, Italian, Portuguese, Romanian, Russian, Spanish, Czech, and Hungarian are always installed.

- ▶ These can be supplemented by the following languages: Korean or Chinese
- The installation of these language packages is carried out using the control unit software update. Language files have the ending **.btw**. (Ex: **LB452CU_FontUpdate_.btw**)
- ▶ See Control Unit Software Update (chapt. 6.4.7).

6.3.4 Setting Dimensions and Temperature Unit

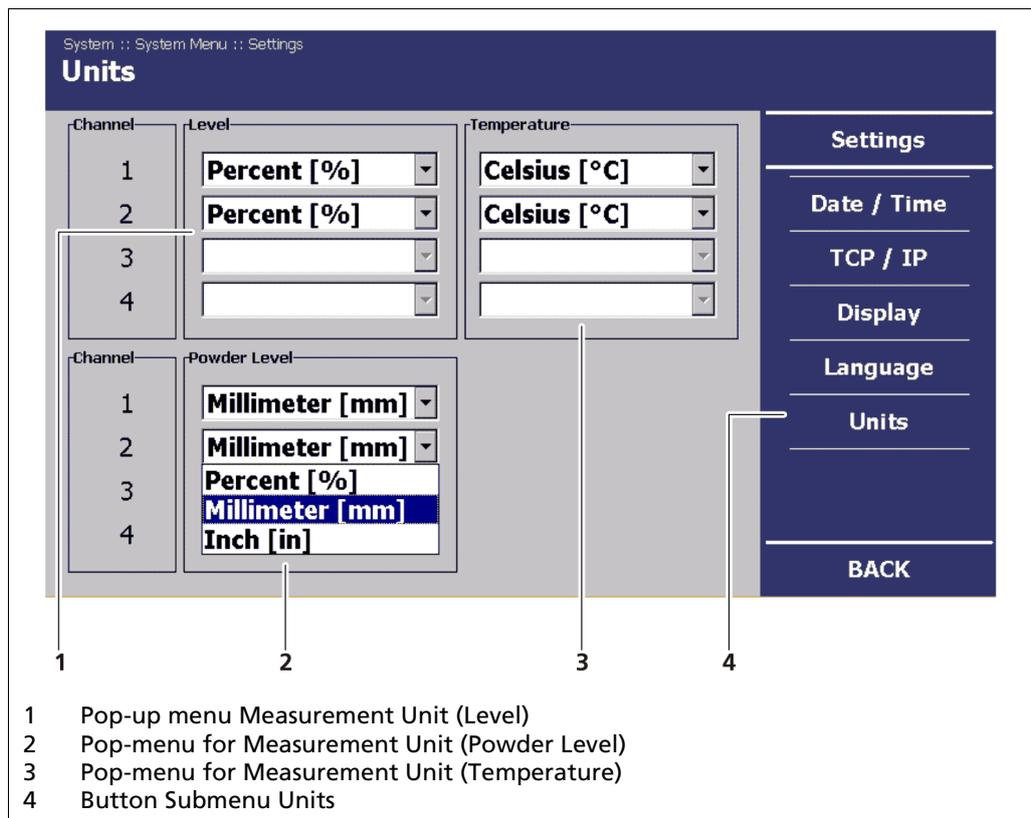


Fig. 32 System Menu, Settings - Units

1. In the **System Menu | Settings** click on <Units>, to change the measurement unit. (Fig. 32, item 3).
2. Click on the drop-down menu "Level" (Fig. 32, Item 1), to select the desired measurement unit.
 - ▶ The drop-down menu opens.
3. Click on the desired measurement unit to select it.
 - ▶ The measurement unit is set.
4. Carry out the selection similarly for the "Temperature" unit (Fig. 32, Item 3), and for the "Powder Level" unit if available. (Fig. 32, Item 2).

6.4 Data Log

In the **System Menu**, click on **<Data Log>** (Fig. 19, Item 5).

6.4.1 Graph

In the **Graph** submenu, the interval used for visualising the log data in the channel overview is set.

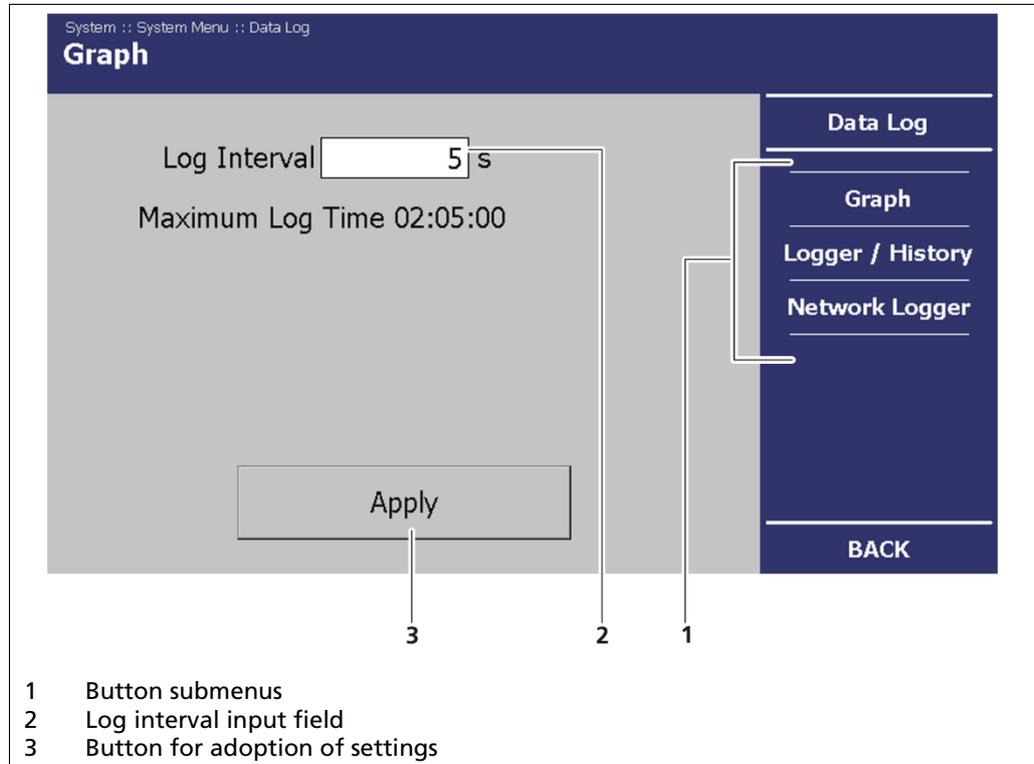


Fig. 33 System Menu. Settings - Data Log (Graph)

IMPORTANT



In the "log interval" input field, set the interval in which the data is to be displayed (Fig. 33, Item 2).

- ▶ The smallest log interval which can be set is 0.5 s.

1. In the **System Menu | Data Log**, click on **Graph** (Fig. 33, Item 1).
2. Click on the input field to set the log interval (Fig. 33, Item 2).
 - ▶ The numeric keypad opens (Fig. 17).
3. Set the desired log interval.
4. Click on the **<Apply>** button (Fig. 33, Item 3) to adopt the setting.
 - ▶ A confirmation message is displayed.
5. Click on **<OK>** to restart the EVU.
 - ▶ The EVU restarts.

6.4.2 Data Logger

IMPORTANT



The Data Logger submenu only appears if an SD card is installed in the control unit.

- ▶ To install or remove the SD card, see chapt. 4.5.

In the Data Logger submenu, you have the option of setting the log and to export or delete the measurement values (log data). In the "Data Logger" submenu, it is possible to save the log data on a SD Card.

The data logger records the following measured values:

- Date and time
- Fill level (mould level)
- Count rate
- Temperature of the detector(s)
- Active calibration curve
- System status

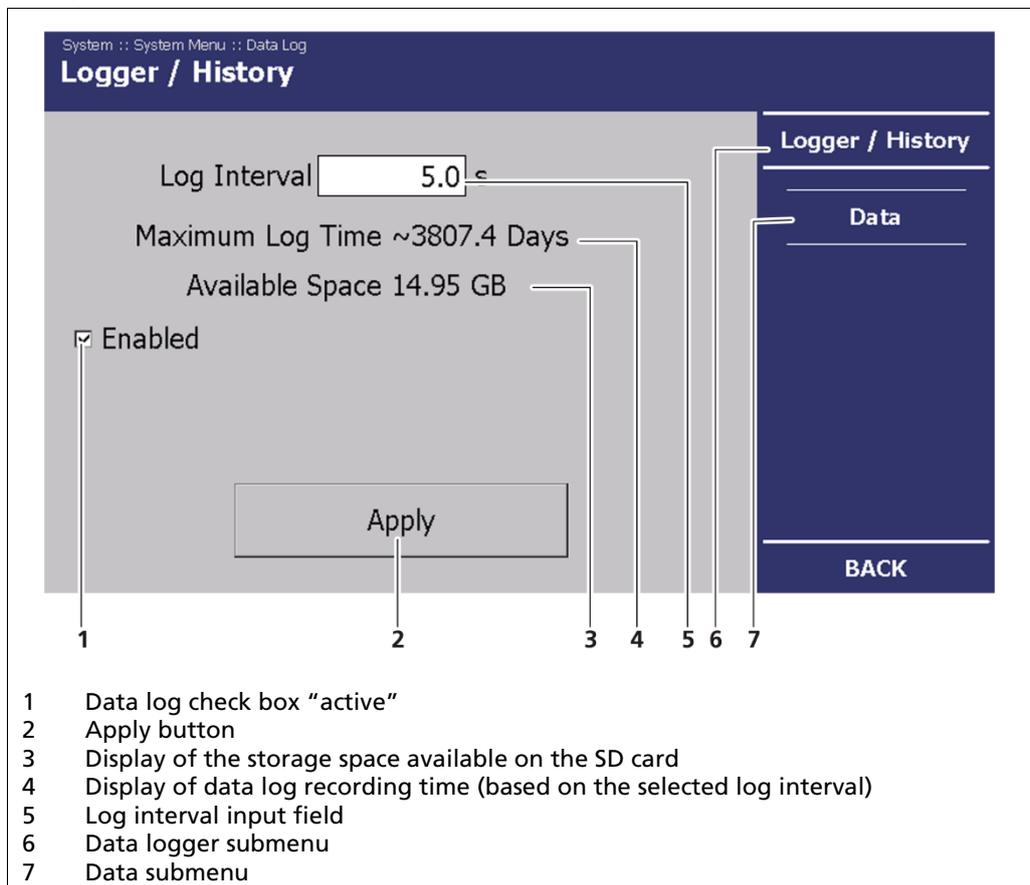


Fig. 34 System Menu, Data log - Data Logger

1. In the System Menu, click on Data Log | Data Logger (Fig. 33, Item 3) to reach the Data Logger submenu.
2. Activate the data log saving by putting a tick in the "Enable" check box (Fig. 34, Item 1).
3. Click on **<Apply>** to initiate the data log saving (Fig. 34, Item 2).
 - ▶ The data log is now activated and records the data on the SD card.

IMPORTANT



The data log is saved in the main directory of the SD card in the form of a .txt file.

- ▶ If the box (Fig. 34, Item 1) is not set at "Enable", no log data is saved on the SD card.

Data Logger

Log Interval	Shows the log data saving interval (Fig. 34, Item 5)
Maximum Log Time	Shows the maximum log data saving interval depending on the set log interval and the SD card storage capacity (Fig. 34, Item 4).
Available Space	Shows the free storage capacity of the SD card (Fig. 34, Item 3).

Exporting data

In the **System menu | Data log | Data**, click on **<Export All>** (Fig. 35, Item 4), to export the log data to a USB flash drive or to delete it from the SD card.

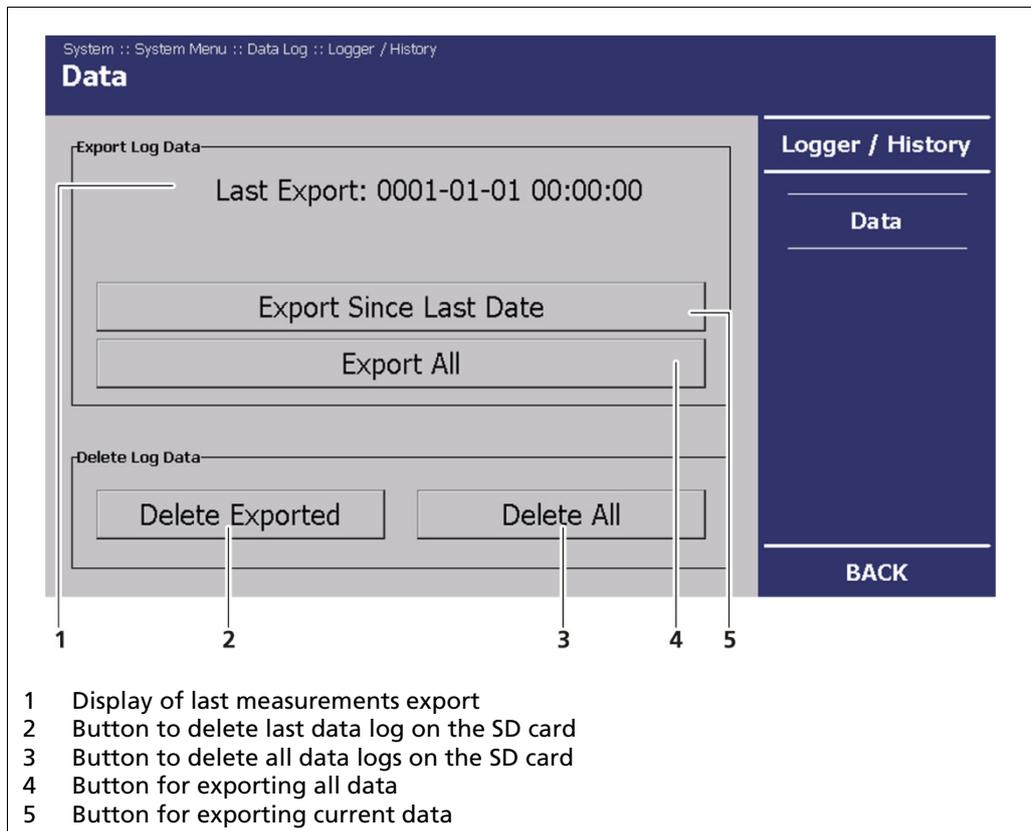


Fig. 35 System menu, Data log – Data

In the "Data" submenu you can adjust the following settings:

Last export	Displays the date and time of the last export (Fig. 35, Item 1).
Export from last time onwards	Export of the current data log (Fig. 35, Item 5).
Export all	Exports the entire data log (Fig. 35, Item 4).
Delete export	Deletes the data log last exported on the SD card (Fig. 35, Item 2).
Delete all data	Exports all data logs onto the SD card (Fig. 35, Item 3).

6.4.3 Network Logger

In the **System** menu, click on **Data log | Network logger** (Fig. 33, Item 3). In the "Network Logger" submenu, you can transmit log data to a host over Ethernet.

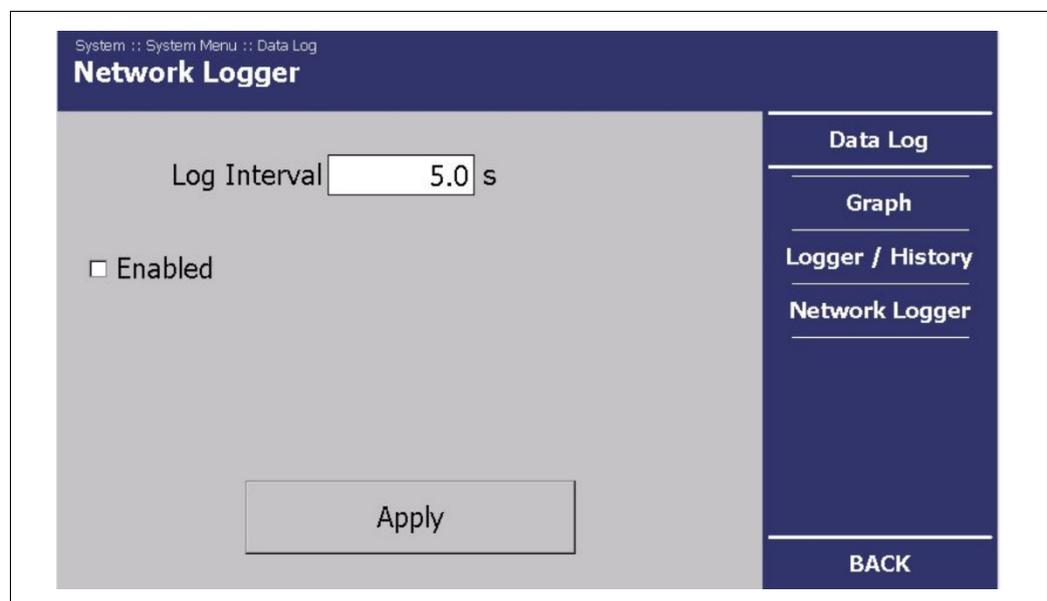


Fig. 36 System Menu, Data Log – Network Logger

IMPORTANT



The fill level signal transmitted via the Ethernet is intended only for quality assurance purposes. Process regulation is not possible with this signal.

1. Set the desired log interval.
2. Activate the transmission of data via Ethernet, by placing a check mark in the selection box "Active".
3. Click on the **<Apply>** button to send the data via Ethernet.
 - ▶ The data can be received on the network by a computer.

IMPORTANT



The computer must be on the same network as the EVU. If the data are to be read out directly via TCP/IP, please contact Berthold.

Use of the Software "Data Log Viewer"

With the separately delivered software "Data Log Viewer" from Berthold, the visualisation and saving of the log data on a computer is possible.

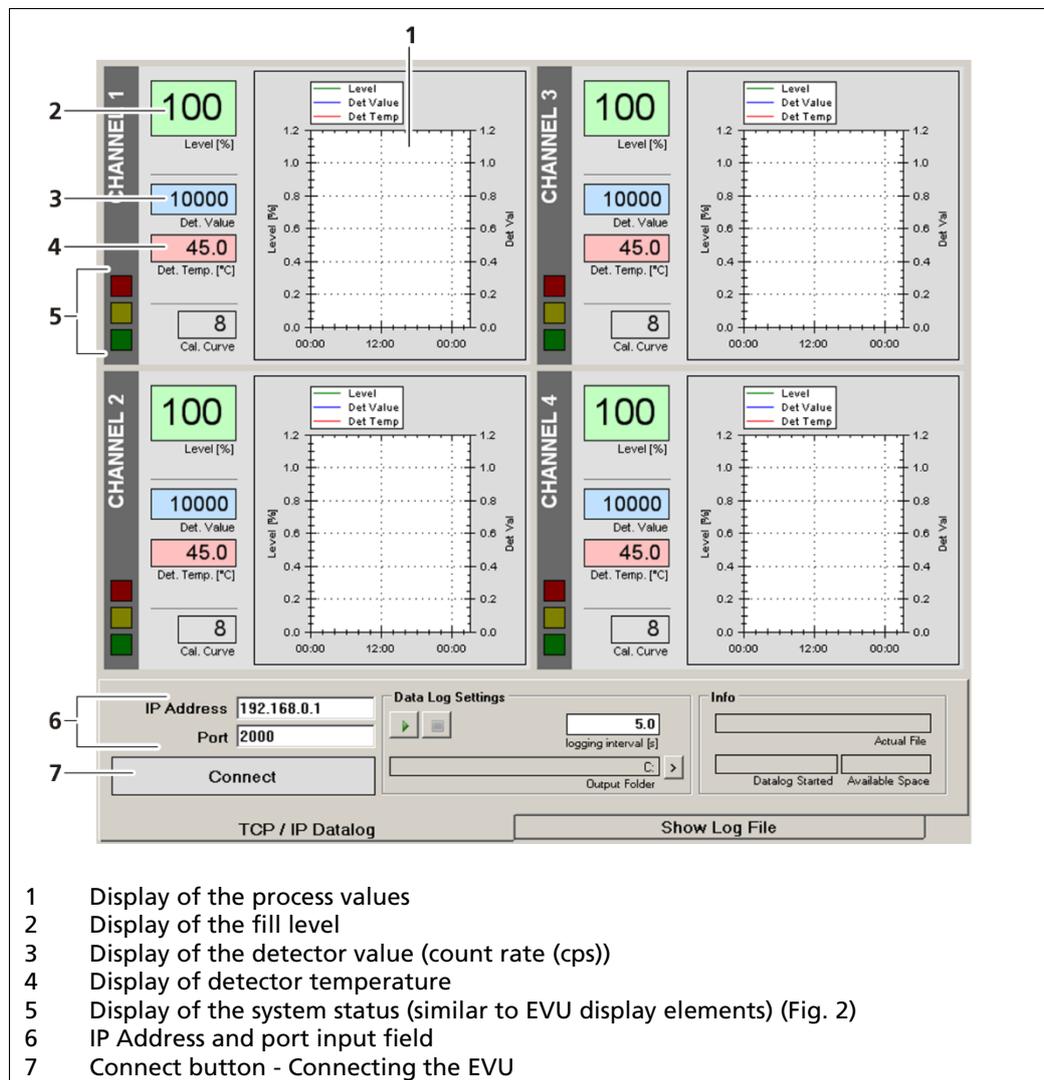
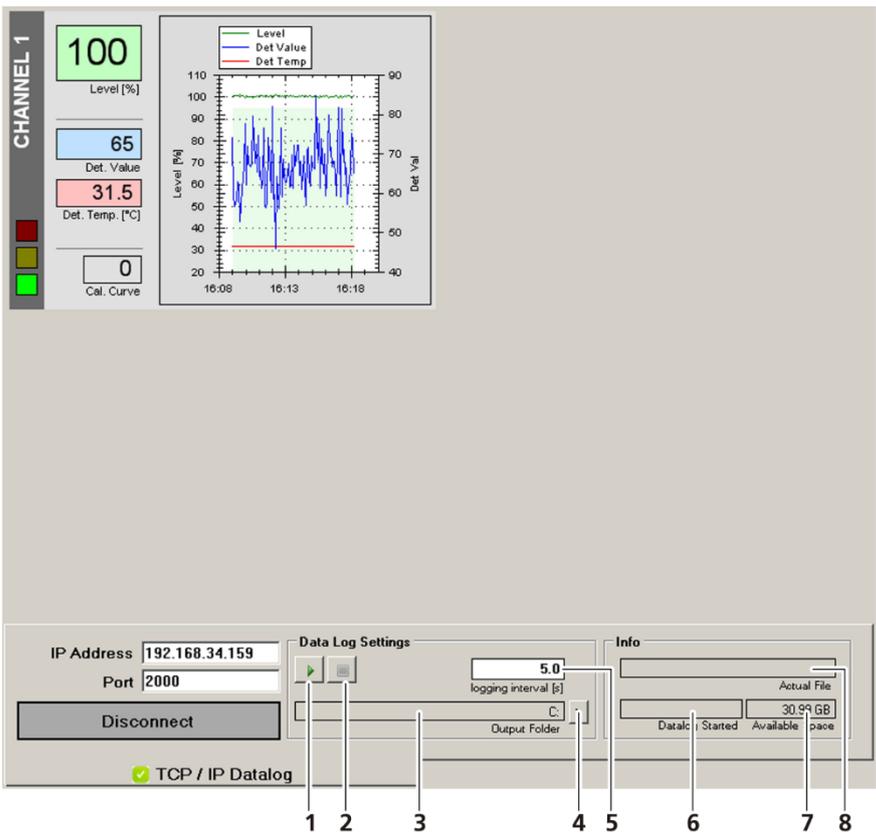


Fig. 37 Start Page, Data Log Viewer Software

Establishing Connection and Saving Data Log



- 1 Button for starting data log recording
- 2 Button for stopping data log recording
- 3 Display of log data storage location
- 4 Button for selecting storage location
- 5 Display of the log interval
- 6 Display of the time of the last save
- 7 Display of the storage space available on the hard drive
- 8 Display of the data log file name

Fig. 38 Start Page, Data Log Viewer Software

1. Enter the EVU IP address in the input field (Fig. 37, Item 6).
2. Click on <Connect> to establish a connection (Fig. 37, Item 7).
3. Click on the <Select Saving Location> (Fig. 38, Item 4) to specify a storage location.
4. Click on the <Start Data Log Recording> button (Fig. 38, Item 1) to record the data log.
 - ▶ The data log starts.

IMPORTANT



In order to be able to use the data log viewer, the tick in the check box in the "Network Logger" submenu (chapt. 6.4.3) must be set to "active". Otherwise, the visualisation and saving of the measurement data is not possible.

IMPORTANT

The Data Log Viewer software is not suitable for parameterising the device. The use of this software is intended for quality assurance purposes. Process regulation is not possible with this signal.

6.4.4 Service Submenu

In the submenu "Service" you can adjust the following settings and read information:

- Downloading of the **Remote-Control Software (RC Software)**
- Carrying out **Updates** for:
 - the control unit
 - the channels
 - the detectors
- Exporting the **complete service data**

In the **System menu**, click on <Service> (Fig. 19, Item 1), to reach the <Service> submenu.

- ▶ The Service submenu opens.

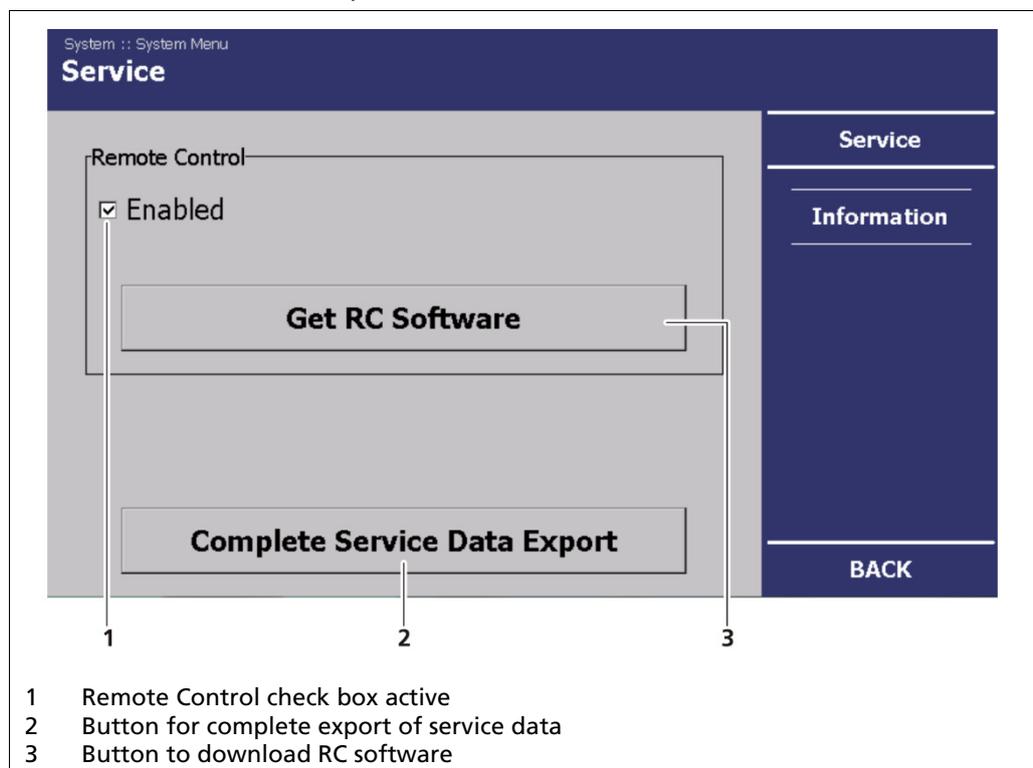


Fig. 39 System Menu, Service

Stick the USB flash drive into the USB port of the front panel (Fig.1, Item 1).

- ▶ The two buttons appear with black lettering and are active.

6.4.5 Remote Control Software

IMPORTANT



The check mark must be set to "Enable" for the Remote Control to function (Fig. 39, Item 1).

The IP address of the EVU must be in the same sub-network as the network adapter of the computer (see previous chapter).

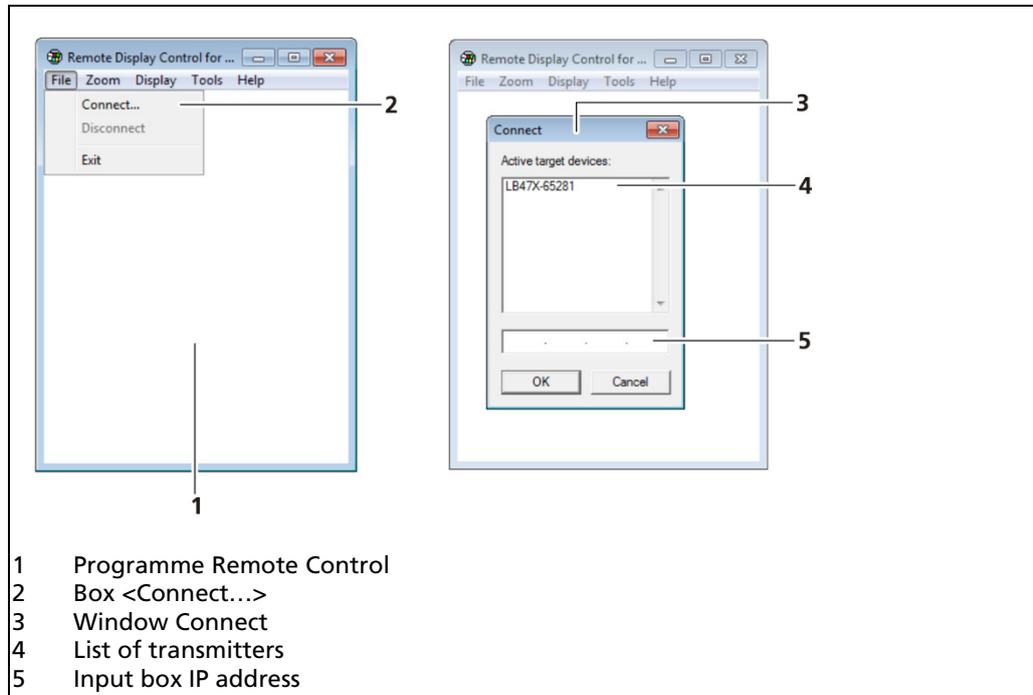


Fig. 40 Establish connection to the EVU using the RC software

1. Click on "Download RC Software" in order to download the RC software from the EVU to the USB flash drive (Fig. 39, Item 3).
 - ▶ The file **LB452RemoteControl.exe** is downloaded from the EVU and saved in the main directory of the USB flash drive.
2. Take the USB flash drive from the USB port and stick the USB flash drive into a USB port of the computer on which you would like to install the RC software.
3. Summon the main directory of the connected USB flash drive.
4. Click on "**LB452RemoteControl.exe**" to start the program.
 - ▶ The program starts (Fig. 40).
5. Click on the <File> tab then on <Connect...> to establish a connection to the EVU.
 - ▶ A new window "Connect" opens (Fig. 40).
6. Enter the EVU IP address into the input field. You can find out where you can read the IP address in chapt. 6.3.2.
7. Click on <OK>.
 - ▶ The connection to the EVU is established.

6.4.6 Export Complete Service Data

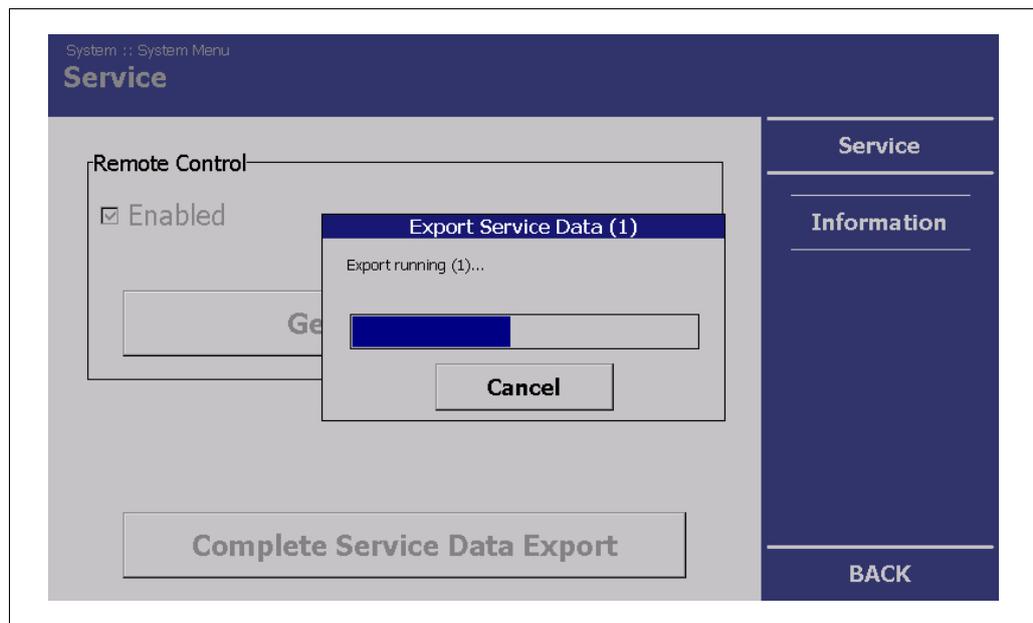


Fig. 41 System Menu, Service - Export of the service data

Click on "Complete Service Data Export" to save the service data on the USB flash drive (Fig. 39, Item 2).

- ▶ The service data of all installed measurement channels and connected detectors are downloaded from the EVU and saved in the main directory of the USB flash drive.

6.4.7 Software update

In the "Information" submenu, information about the installed modules and the software installed is given. All updates are carried out via this page.

NOTICE



Data loss during the measurement!

The measurement is interrupted during a software update.

- ▶ Only carry out software updates when the measurement is not currently being used for process control.

NOTICE



Malfunction! Devices are not recognised!

The software versions of the LB 452 control unit, the LB 452 measurement channels (measurement unit) and the detectors must be compatible with one another; otherwise, the components might not be recognised by the system.

- ▶ Please adhere to the prescribed sequence of the updates:
 1. Detectors
 2. Control Unit (CU)
 3. Measurement Channels
- ▶ Control unit (CU) and measurement channels (MU) must have the same software version.

NOTICE



Malfunction!

- ▶ Before an EVU can be upgraded to a software number greater than 1.0.2, the software version 1.0.2 must first be installed.

IMPORTANT



Settings are deleted!

If the first or second figure of the version of an update changes (e.g. from version 1.0.1 to version 1.1.0), the settings are lost.

- ▶ Before the update, carry out a back-up of the measurement channel settings (chapt. 6.4.6, Fig. 41) and then import the backed-up settings after a successful software update.

IMPORTANT



The update files must be located in the main directory of the USB flash drive.

The following information is also visible:

Software version	The software version and publication date of the update.
UID	Serial number of the measurement channels and the detector(s)

Software Update Control Unit

IMPORTANT



Update files for the control unit begin with **LB452CU** and end with **.btw**.

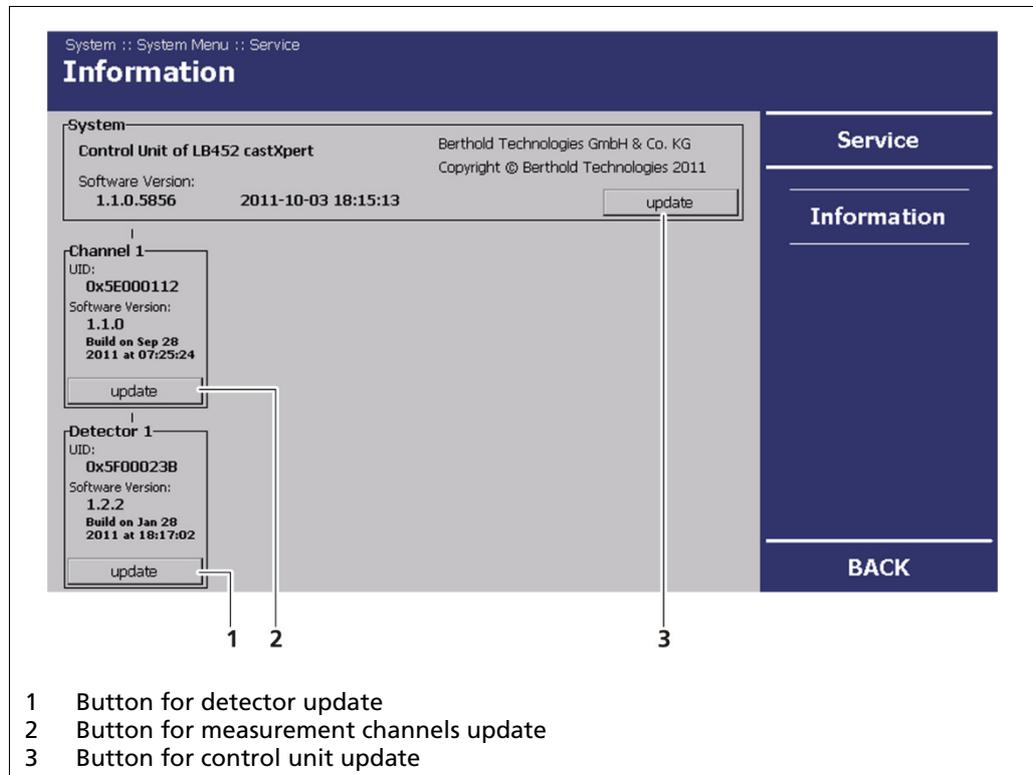


Fig. 42 System menu, Service – Information

1. Connect the USB flash drive with files to be installed to the USB port of the front panel (Fig.1, Item 3).
2. In the **System menu** click on **Service | Information**.
3. Click on **<update>** (Fig. 42, Item 3), to carry out a control unit update.
 - ▶ Update files on the USB flash drive are displayed.

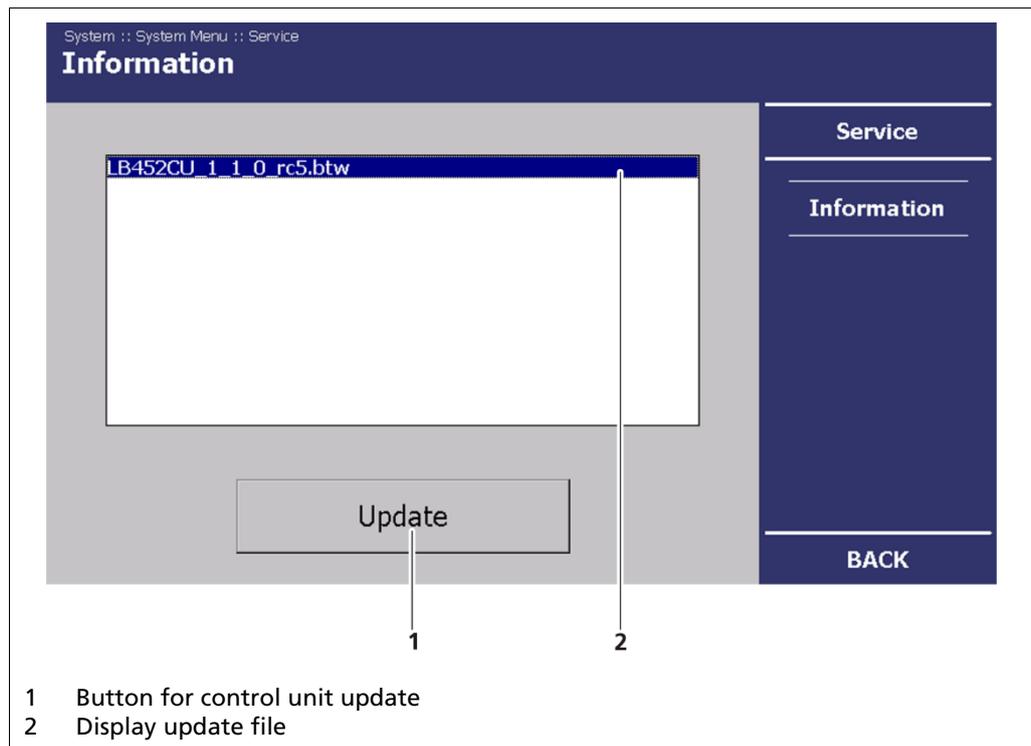


Fig. 43 System Menu, Service - Information (Control unit update)

4. Select the appropriate update file (Fig. 43, Item 2).
5. Click on <Update> (Fig. 43, Item 1).
 - ▶ A confirmation message opens.
6. Click on <OK> in the confirmation message.
 - ▶ The software update is carried out.
 - ▶ The EVU is then restarted.

Measurement Channels Software Update

IMPORTANT



Update files for the measurement channels start with **LB452MU** and end with **.bta**.

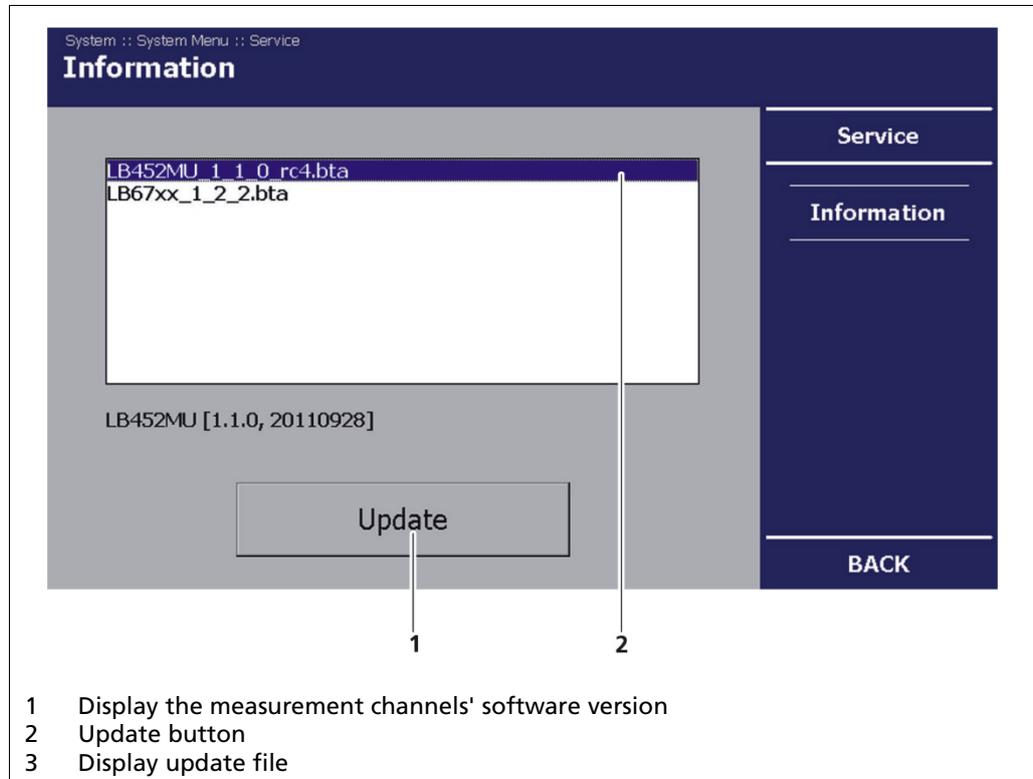


Fig. 44 System Menu, Service - Information (Measurement channels update)

1. In the **System** menu click on **Service | Information**.
2. Click on **<Update>** (Fig. 42, Item 2), to carry out a measurement channel.
 - ▶ Update files on the USB flash drive are displayed.
3. Select the appropriate update file (Fig. 44, Item 2).
4. Click on **<Update>** (Fig. 44, Item 1).
 - ▶ A confirmation message opens.
5. Click on **<OK>** in the confirmation message.

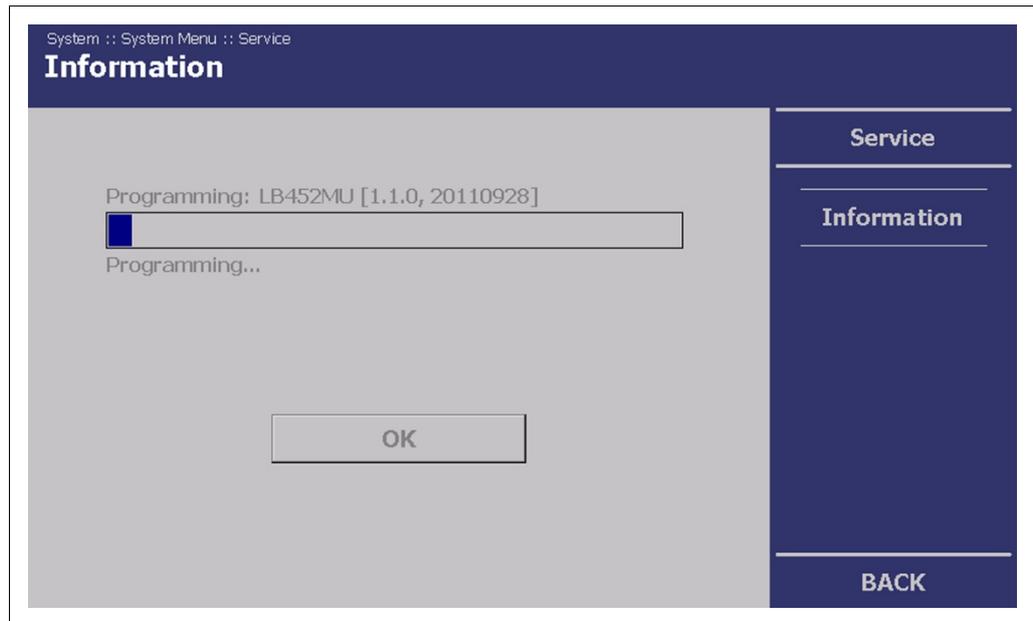


Fig. 45 System Menu, Service - Information (Measurement channels update)

- ▶ The software update is carried out.
 - ▶ After a successful update, the message "Programming finished" appears.
6. Click on <OK> to finish the update process.
- ▶ The measuring channel then restarts afterwards.

IMPORTANT



During an update where the first or second digit of the version changes, it is necessary to reset the measurement channel to factory settings (chapt. 7.4).

Detector Software Update

IMPORTANT



Update files for the detectors start with **LB67XX** and end with **.bta**.

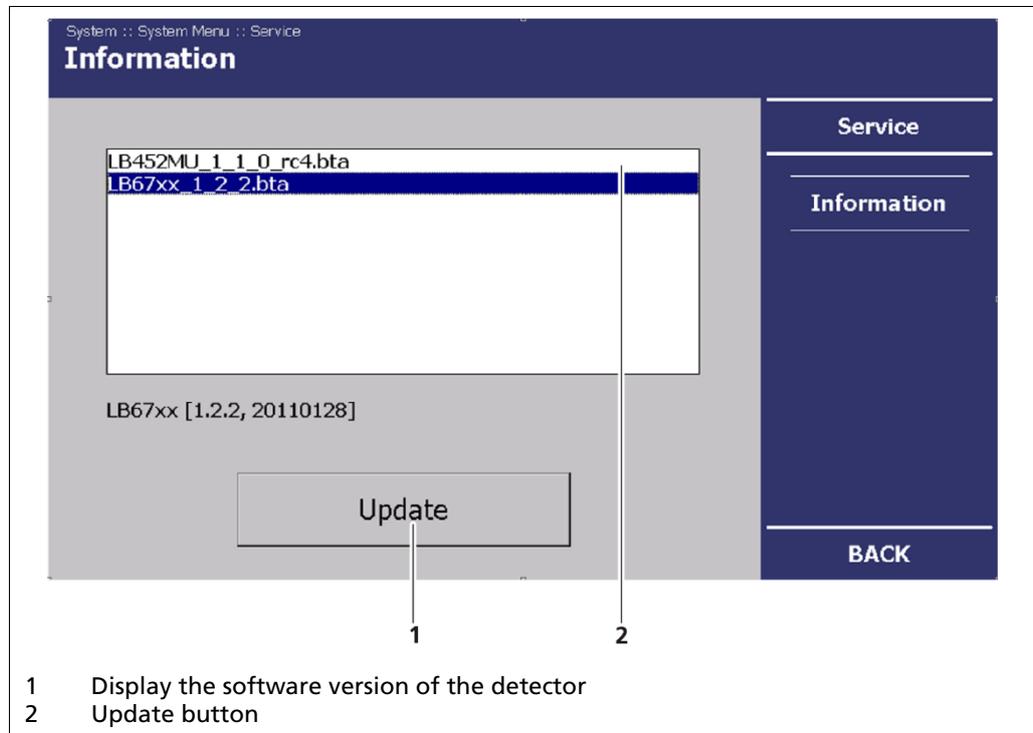


Fig. 46 System Menu, Service - Information (detector update)

1. Click on **Service | Information**.
2. Click on **<Update>** (Fig. 42, Item 1), to carry out the detector update.
 - ▶ The update files of the USB flash drive are displayed.
3. Select the appropriate update file (Fig. 46, Item 2).
4. Click on **<Update>**.
 - ▶ A confirmation message opens.
5. Click on **<OK>** in the confirmation message.
 - ▶ The software update is carried out (Fig. 45).
 - ▶ After a successful update, the message "Programming finished" appears.
6. Click on **<OK>** to finish the update process.

NOTICE



After software update, the detector must be reset to its factory factory settings (please refer to the manual of the detector).

6.5 Access Level

In the Access submenu, you can set the user rights via the user levels and assign passwords. The system can be protected by a password against unauthorised changes. Password entry takes place via the <Access Levels>submenu. The following user levels are available to you:

User Level Basic	You can see all important data but cannot make any changes.
User Level Standard	You can change all data necessary for operation (e.g. filter, calibration).
User Level Admin	This user level is only intended for system administrators of Berthold.
Automatic log out	The access level Standard is automatically reset to Basic if the system jumps back to the start screen or the display switches off (see times in the menu "System menu Settings Display).

NOTICE



Damage to the device! Damage due to incorrect operation!

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

- ▶ Protect the measurement system against unauthorised inputs with a password.

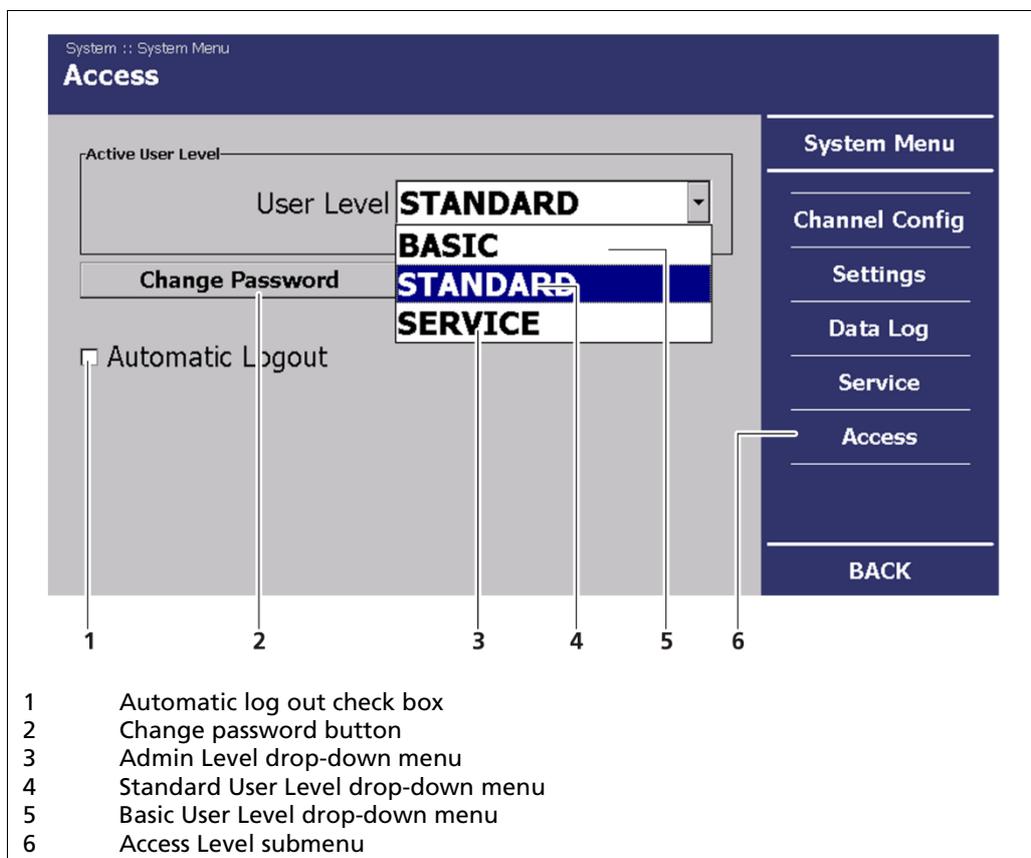


Fig. 47 System Menu, Access Level

1. In the **System Menu**, click on <Access Level> (Fig. 19, Item 5).

2. Select Standard in the drop-down menu of the "User Level" field (Fig. 47, Item 5).
3. Click on **<Change Password>** (Fig. 47, Item 2).
4. Click in the "Password" input field to create a password or to change it.
 - ▶ The keypad opens.
5. Enter a password and confirm your entry with **ENTER**. (Fig. 17, Item 4).
6. Click on **<OK>** to finish the password entry.

7 Menu Channel Overview

In the channel menu, you can set values relating to the measurement task. In Fig. 48, the menu structure of the "Channel Overview" menu is represented.

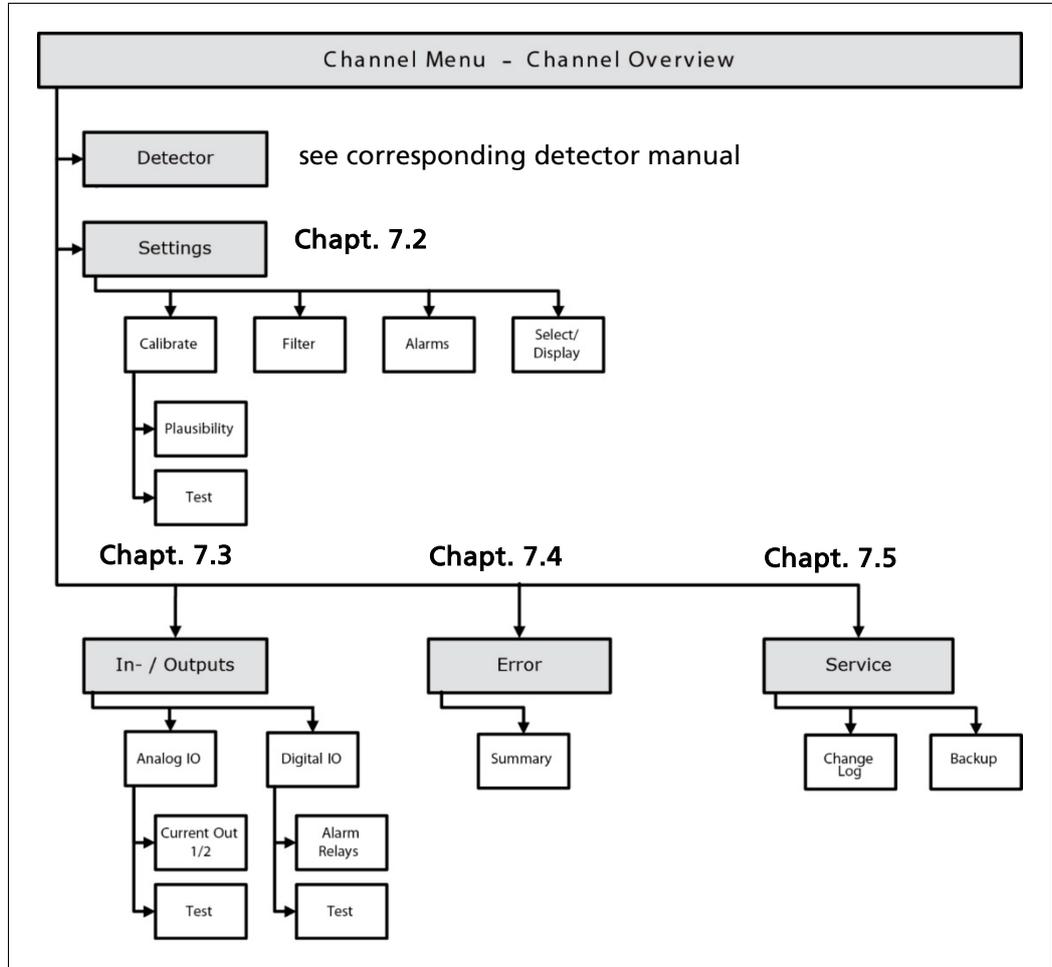


Fig. 48 "Channel Overview" menu structure

Click on <Channel XY> in the standard display (Fig. 15, Item 1) to reach the "Channel Overview" menu.

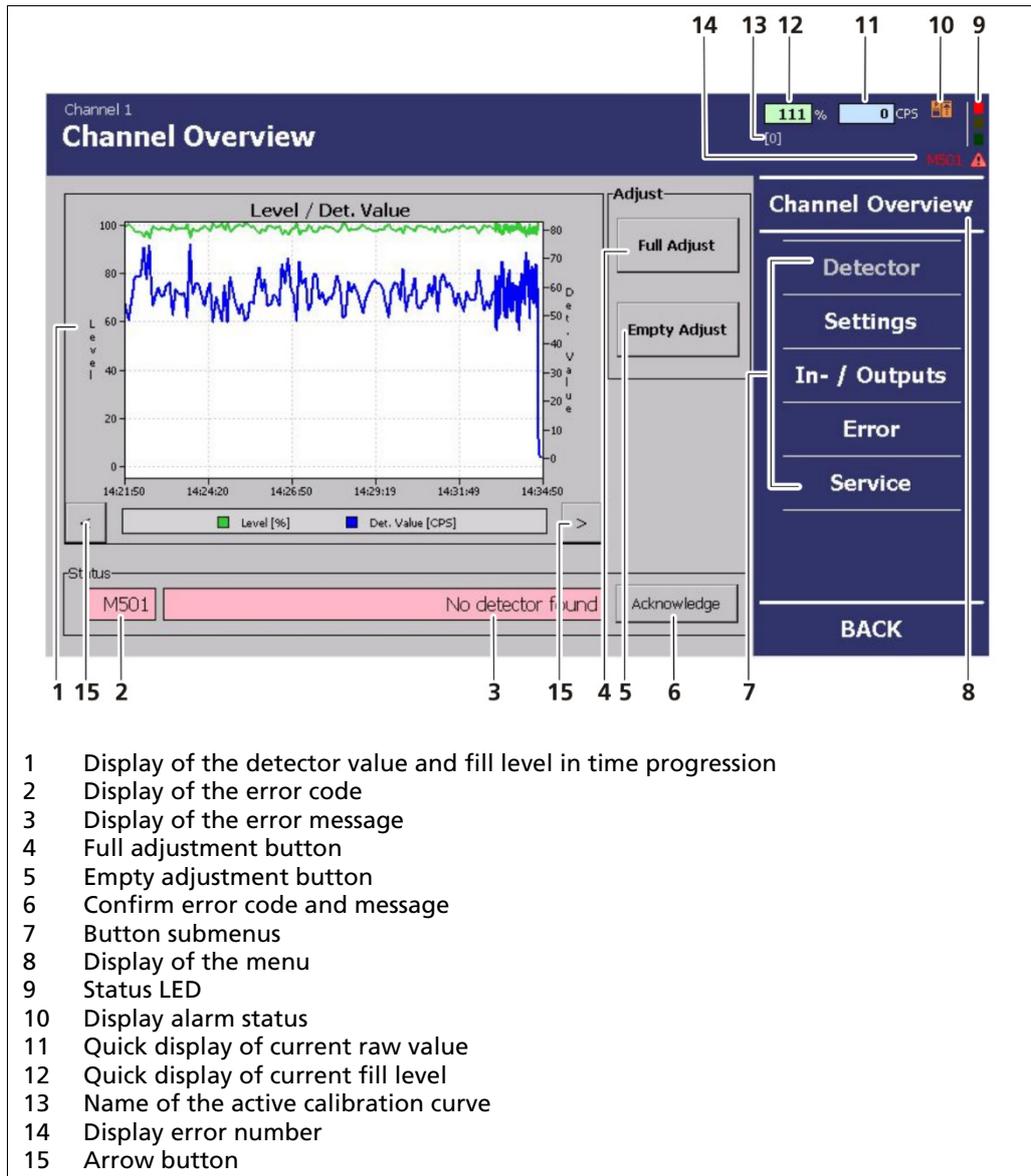


Fig. 49 Menu "Channel Overview"

"System Status" Display Field

The "System Status" display field shows you the status of the EVU. All castXpert LB 452 errors have the prefix "M", all detector errors the prefix "D". The error code (Fig. 49, Pos 2) and error text (Fig. 49. Item 3) are displayed here. For troubleshooting of M errors, see chap. 8 and for troubleshooting of D errors refer to the corresponding detector manual.

- Display field highlighted in red = an error has occurred
- Display field highlighted in yellow = a warning has occurred
- Display field highlighted in green = no error

Fill Level/Detector Value or Fill Level/Detector Temperature

The measured count rate (detector value - CPS) and the fill level are represented in the graph. By pressing the arrow buttons (Fig. 49, Item 15), the detector temperature is displayed.

Display Field "Alarm Status"

Start-up		Indicates that the start-up time constant is used.
Max. Alarm		Indicates that a max. fill level alarm is triggered.
Min. Alarm		Indicates that a min. fill level alarm is triggered.
Temperature		Indicates that a temperature alarm is triggered when the set alarm threshold in the Menu Detector Temperature is exceeded (see detector manual).

Troubleshooting

The error number (or warning) is displayed on each channel menu under the status indicator (red/orange).

If you click on the error number, a pop-up message appears. Here you can confirm/acknowledge the error.

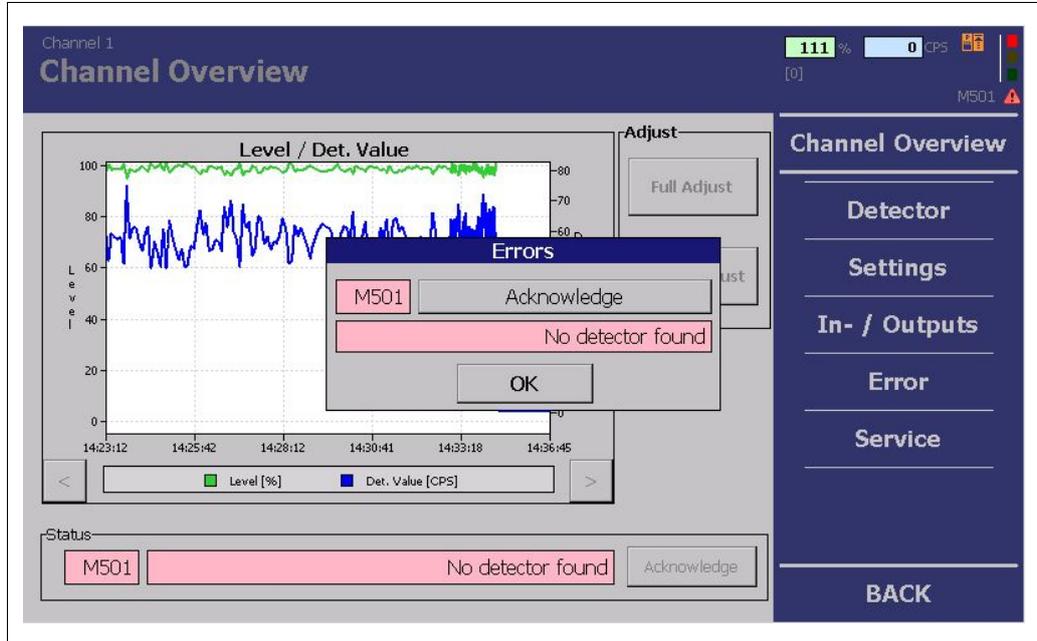


Fig. 50 Error display

The "Channel Overview" submenu offers the following setting options:

Detector	Settings for the detector (see detector manual)
Settings	General measurement-related settings
In/Outputs	Settings for the analog and digital outputs
Error	View and confirm error codes and error messages
Service	Export of service data and reset of the settings

7.1 Empty and Full Adjustment

The measuring system must be adapted to the specific environmental conditions before the start of casting. This is done via an empty and full adjustment. Follow this sequence before the start of every casting:

- Empty adjustment (always necessary)
- Full adjustment with cold block (recommended)

NOTICE



Berthold recommends that the adjustment mode be set to **"dynamic"** (Fig. 55, Item 5) if only an empty adjustment is carried out before casting.

- ▶ If both an empty and a full adjustment are carried out, the recommended mode is **"fixed"**.

For the full calibration, the mould filled with liquid metal must be simulated. This is done by inserting a cold block into the mould, made from steel.

To avoid measurement errors, the cold block must fill the beam path exactly (as would be the case with liquid metal). If the cold block is inserted in such a way that it does not cover the entire beam path, radiation which was not weakened by the steel can sometimes reach the detector through the gap. This will cause a too high count rate to be measured for the 100% point. In such case, a too low steel level value would be measured during casting.

For the empty adjustment, it is recommended that the count rate from the detector is measured when the mould is empty.

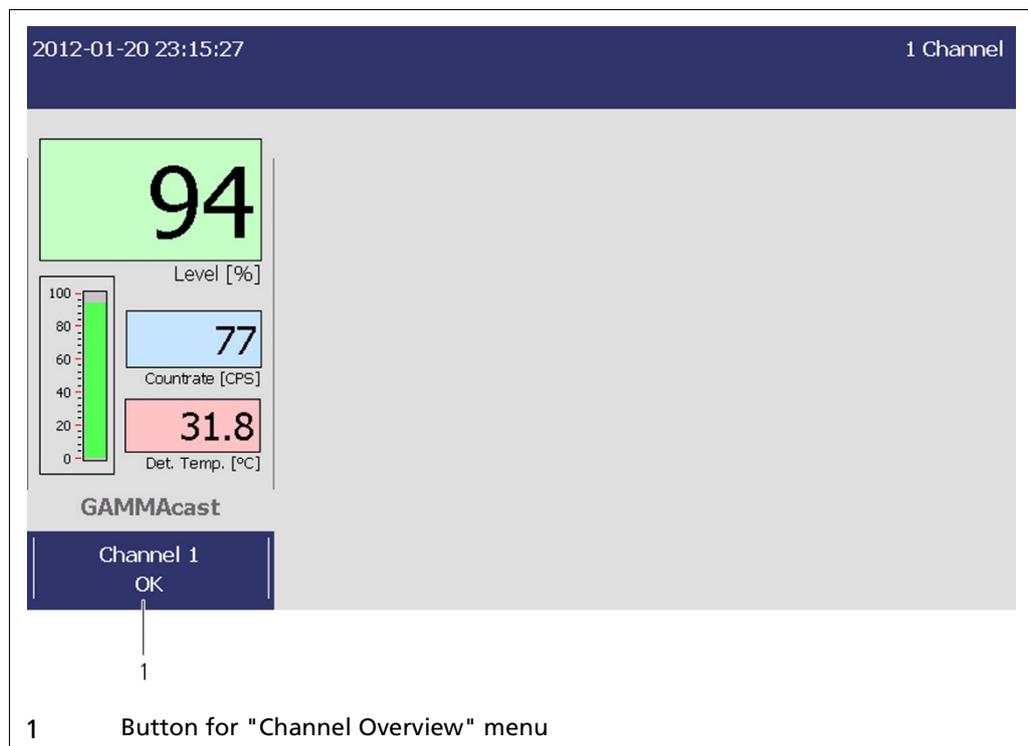


Fig. 51 Start page with a channel

1. Click on the button **<Channel XY>** in the standard display (Fig. 51, Item 1) to reach the "Channel Overview" menu.
 - ▶ The "Channel Overview" menu (Fig. 52) opens.

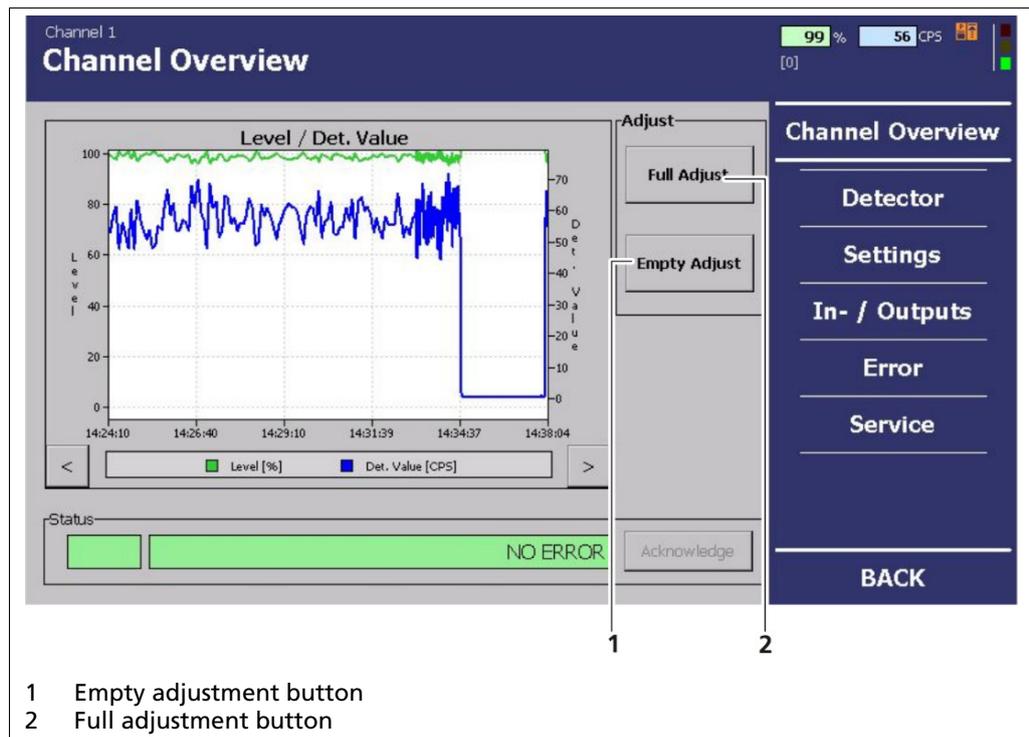


Fig. 52 Menu "Channel Overview", Adjust

2. Click on **<Empty Adjustment>** to carry out an empty adjustment (reading in the 0% value) (Fig. 52, Item 1). Alternatively, you can close digital input 1. In this case, no confirmation message opens, and the empty adjustment can be started directly from the casting platform.
 3. If a full adjustment (100% value) is carried out, click on **<Full Adjustment>** (Fig. 52, Item 2). Alternatively, you can close digital input 2. In this case, no confirmation message opens, and the empty adjustment can be started directly from the casting platform.
 4. Click on **<OK>** in the confirmation message.
- ▶ The current count rate is read in (Fig. 53, Item 2). The duration of the full adjustment depends on the settings applied in the menu **Settings | Calibration | Plausibility**. Further information on the settings can be found in chapt. 7.2.1 Calibration in the "Plausibility" submenu. You can cancel the full adjustment and the reading of values by clicking on the **<Cancel>** button (Fig. 53 Item 3). Manual cancelling is not recommended.

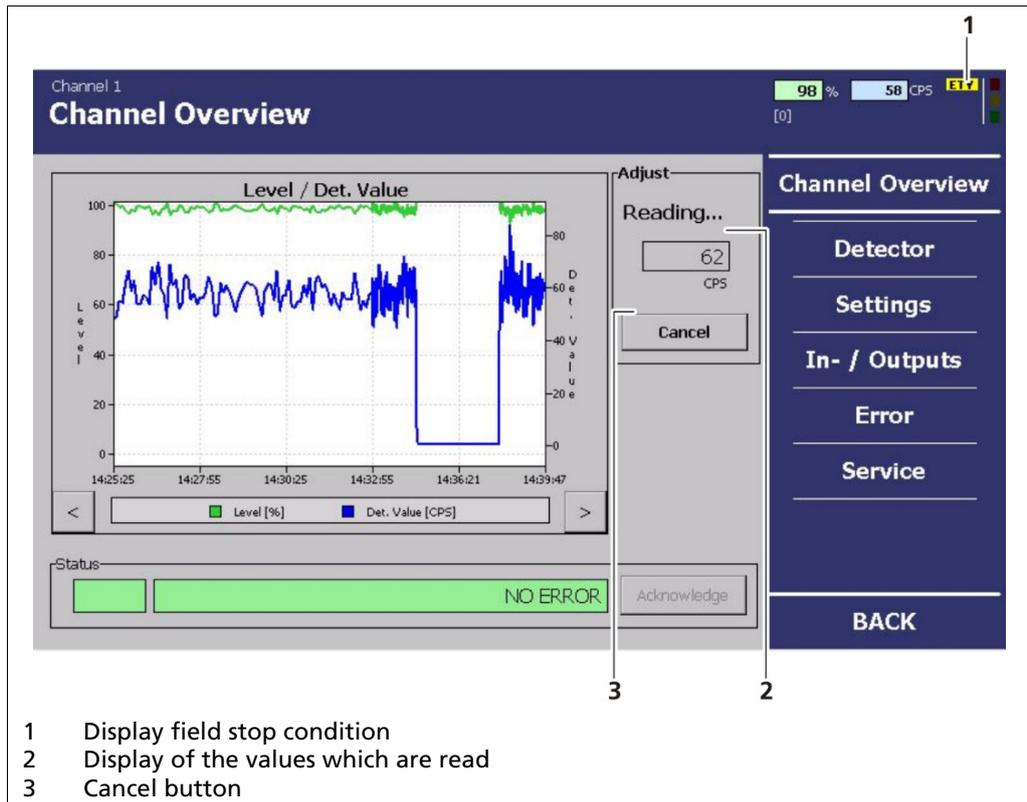


Fig. 53 Menu "Channel Overview", Adjustment - Reading in the values

Display field "Stop Condition"

TST The device is in test mode

FUL/ETY A calibration routine is running in the device:
 FUL: Full adjustment
 ETY: Empty adjustment

IMPORTANT



The evaluation unit is in the "empty adjustment" mode as long as the abbreviation "ETY" is displayed and is in "full adjustment mode" as long as the abbreviation "FUL" is displayed (Fig. 53, Item 1).

- ▶ Do not adjust any EVU settings while the empty adjustment is taking place.

IMPORTANT



While the device is in test mode or in a calibration routine, the current output is switched to the error mode.

- ▶ The behaviour in error mode can be set under "In/Outputs | Analogue IO | Current Output".

7.2 Settings

The following information can be seen in the "Settings" submenu:

Active Settings	Display of the selected calibration curve and settings (Fig. 54, Item 9)
Calibration	Display of adjustment mode (Fig. 54, Item 1) Display of the latest change to the calibration settings (Fig. 54, Item 2) Display of the calibration curve (Fig. 54, Item 3)
Fill level alarm	Fill level alarm display (Min.) (Fig. 54, Item 8) Fill level alarm display (Max.) (Fig. 54, Item 7)
Filter	Display of the time constant (Fig. 54, Item 4) Display of the start-up time constant (Fig. 54, Item 5) Display of the start-up threshold (Fig. 54, Item 6) Display of the applied mould oscillation filter (Fig. 54, Item 10)

In the "Settings" submenu, you can adjust the following settings:

Calibration	Changing of the calibration curve(s)
Filter	Changing of the filter settings (time constant and start-up time constant) and the start mode (start threshold and start hysteresis) Set and enable mould oscillation filter
Alarms	Setting of the alarm threshold before the minimal fill level of the mould is reached (Low Alarm) Setting of the alarm threshold before the maximum fill level of the mould is reached (High Alarm)
Option/Display	Selection of the calibration curves (in case several have been created) and display of the settings (fill level alarm and filter settings)

In the "**Channel Overview**" menu, click on **<Settings>** (Fig. 49, Item 7), to reach the "Settings" submenu.

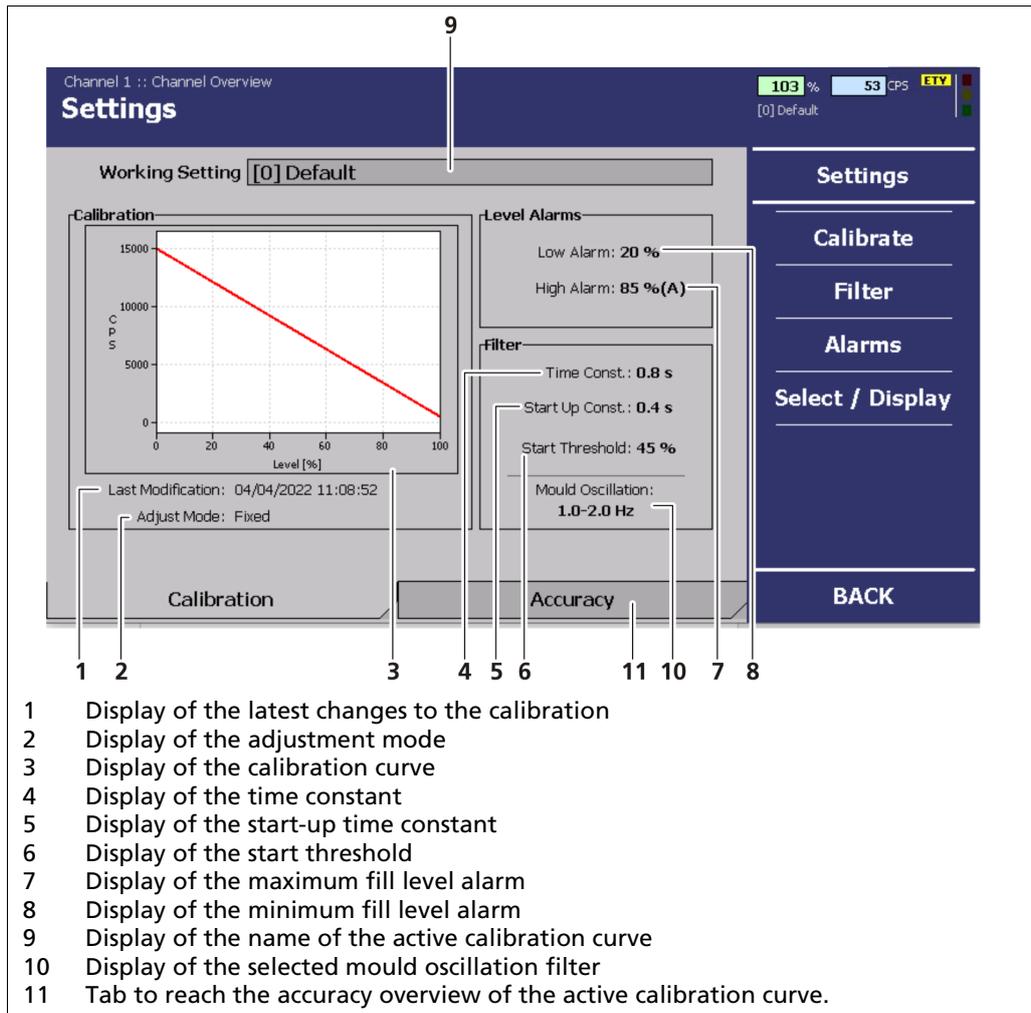


Fig. 54 "Channel Overview" Menu, Settings

Accuracy

In the "Channel Overview" menu, click on the accuracy tab to reach the "accuracy overview". Based on the active calibration curve, the accuracy menu shows the expected theoretical error over the whole measuring range, for 1, 2, and 3 sigmas.



Fig. 55 "Channel Overview" Accuracy

7.2.1 Calibration

In the "Channel Overview" menu, click on Settings | Calibration (Fig. 54) to reach the "Calibration" submenu.

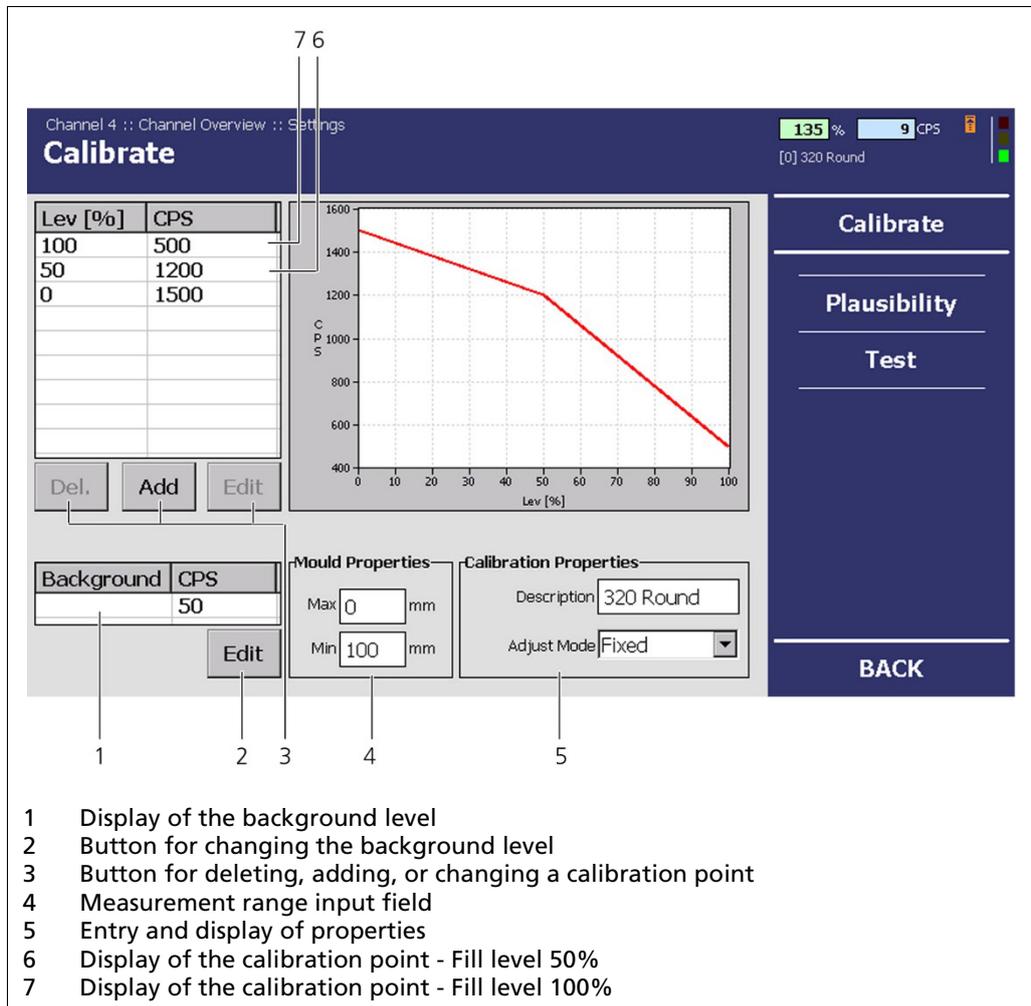


Fig. 56 "Channel Overview" Menu, Settings - Calibration

The calibration submenu serves for the adaptation of the measurement system to the relevant environmental conditions like e.g. the thickness of the mould, the actual radiation activity or the adaptation of the background radiation (background level). The background radiation can vary from location to location.

You can also carry out a multi-point calibration. This is indispensable for operation with an activity-optimised radiation source (AOS) for factoring in the varying rises of the calibration profile between 0% - 50% and 50% - 100%, also leading to increased accuracy with commonly designed sources of radiation.

The following information can also be seen:

Display of the calibration points	Fig. 55, Item 6 and 7
Curve description	Display of calibration curve description (Fig. 55, Item 4):
Adjustment mode	The adjustment mode adjusts the calibration to the changed environmental conditions (e.g. change of the mould or the source). Two different modes are available for calculating the new calibration curve (Fig. 55, Item 5):

NOTICE



Berthold recommends that the calibration mode be set to **"dynamic"** (Fig. 55, Item 5) if only an empty calibration is carried out before casting.

- ▶ If both an empty and a full calibration are performed, the recommended mode is **"fixed"**.

Dynamic	Fixed
In the dynamic adjustment mode, the 100% value is mathematically interpolated using the newly read 0% value during an empty adjustment and the whole calibration is adjusted accordingly.	In the fixed adjustment mode, the 0% value is read anew during an empty adjustment. However, the 100% value remains unaltered. The points in between are adjusted accordingly.

Background Level	The background level indicates the natural background radiation if no radiation source is installed.
Measurement Range	Assignment of the 0% and 100% values for the fill level measurement, if the unit for measuring the fill level is a unit length (mm or inch). The setting can be performed under <System menu Settings Units> .

Adding and Changing Calibration Points

For correct calibration, at least two points (usually 0% and 100%) are required.

An empty mould and a mould with a cold steel block are usually used to determine the count rate at 0% or 100% fill level.

To increase the accuracy of the measurements, the natural background radiation (background level) can be offset.

A multi-point calibration is always possible for increasing the accuracy of measurements and for factoring in any profile non-linearities if needed. When using an activity-optimised radiation source (AOS), this is **indispensable**. In this case, you must also acquire a calibration point at a fill level of 50%.

The activity-optimised radiation source (AOS) enables the increasing of accuracy in the upper part of the measurement range - where a higher level of accuracy contributes to an improvement in quality.

An increase in accuracy can be achieved through optimised-activity distribution without an increase in radiation activity being necessary for this. On the other hand, if the current measurement accuracy is retained, the radiation activity can be significantly reduced.

IMPORTANT



If it is not possible to use a cold steel block which simulates a fill level of 50%, then use the count rate which was used in the reading of the AOS. You can find this in your documents.

1. In the "Channel Overview" menu click on Settings | Calibration (Fig. 54).
2. Mark the pair of values to be changed (calibration point) by clicking on the corresponding field (Fig. 55, Item 7).
3. Click on <Change> (Fig. 55, Item 2) or on <New> (Fig. 55, Item 3) if an additional point should be added.
 - ▶ The input field "Edit Calibration Point" opens (Fig. 56).

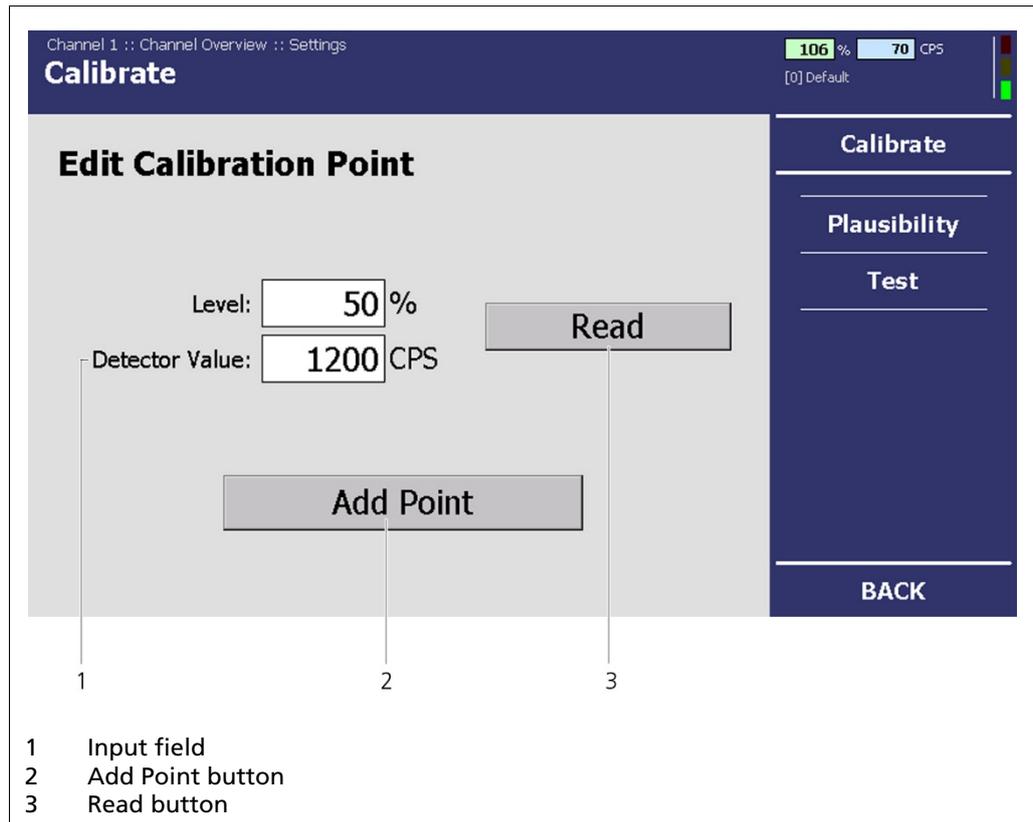


Fig. 57 System Menu, Settings - Calibration (Adapt Calibration Point)

4. When you add a new point, click on the input field "Detector Value" (Fig. 56, Item 1) and enter the corresponding fill level (e.g. 50% or 100 mm).
5. Click on <Read in> (Fig. 56, Item 3) to read in a new calibration point or enter the count rate into the "Detector Value" input field manually (Fig. 56, Item 1).
 - ▶ By clicking on <Read in>, the calibration point is automatically read in (Fig. 57). The duration of the read-in process depends on the settings applied in the menu **Settings | Calibration | Plausibility**. Further information on the settings can be found in **chapt. 7.2.1 Calibration** in the "Plausibility" sub-menu.

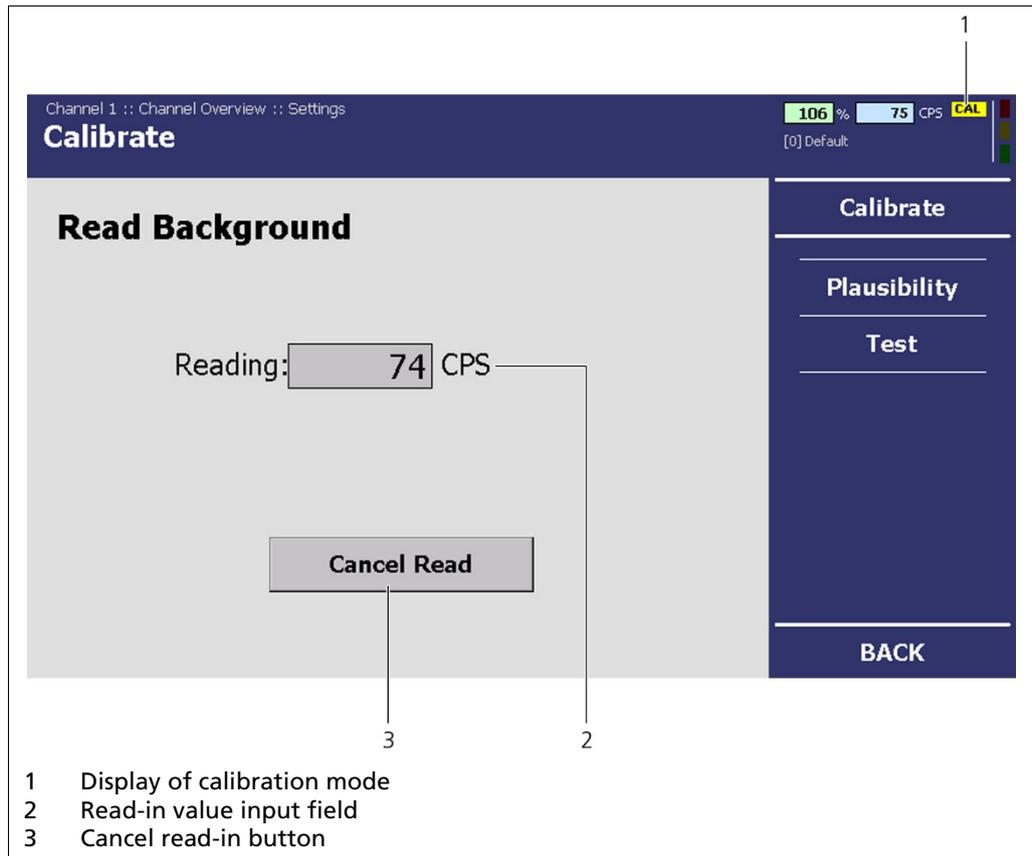


Fig. 58 System Menu, Settings - Calibration (reading in calibration point)

- ▶ The EVU is in "Calibration (CAL)" mode (Display in Fig. 57, Item 1), as long as calibration is being carried out.
- ▶ The calibration point is automatically created and the current calibration curve displayed.

NOTICE



Ensure that the calibration curve is strictly monotonically increasing.

- ▶ If not, correct the points or delete them by clicking on the button (Fig. 55, Item 3). Up to 21 calibration value pairs can be entered.

Setting of the Background Level

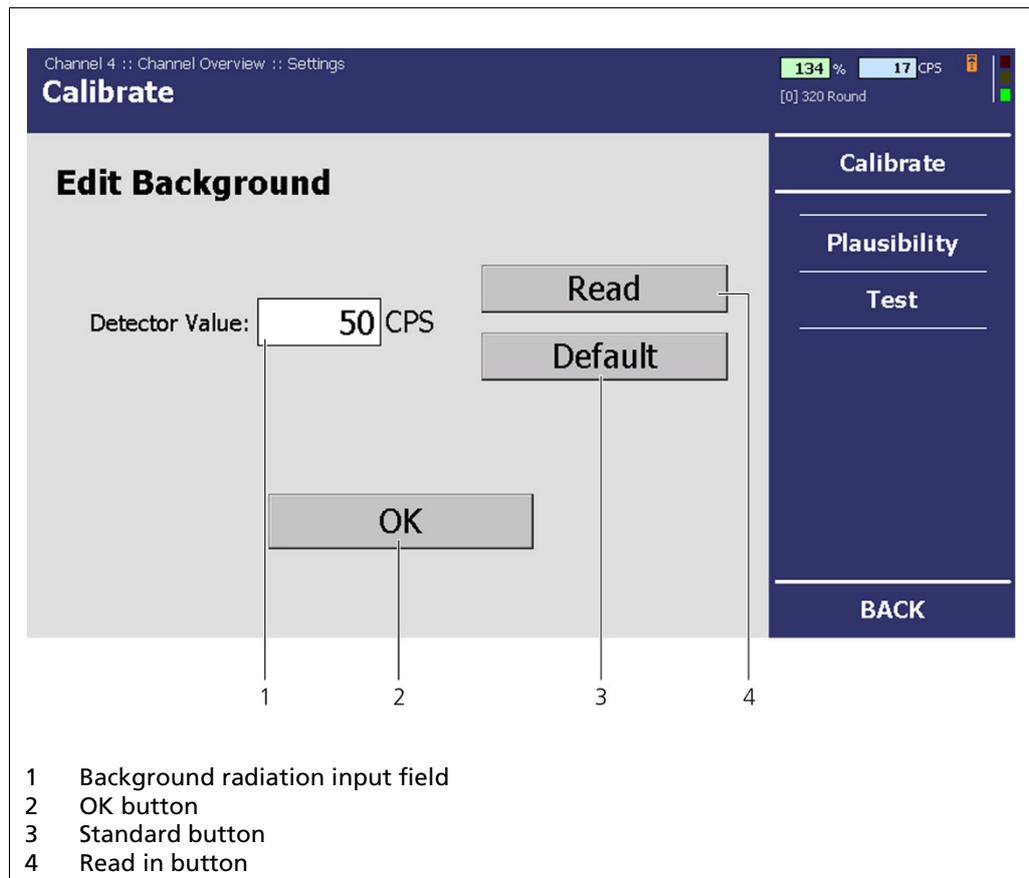


Fig. 59 "Channel Overview" Menu, Settings - Calibration (Background Level)

1. Click in the "Channel Overview" menu | Settings | Calibration (Fig. 54, Item 2).
2. The "Background Level" menu opens (Fig. 58). Close and remove the radiation source from the detector. Otherwise, the measuring of the background radiation is disrupted.
3. Click on <Read in> (Fig. 58, Item 4) to read in the background level or click on <Default> (Fig. 58, Item 3), to use the standard value of 50 cps (preset).
4. Confirm your entry by clicking on <OK> (Fig. 58, Item 2).

Plausibility

In the "Channel Overview" menu click on Calibration | Plausibility (Fig. 59, Item 1).

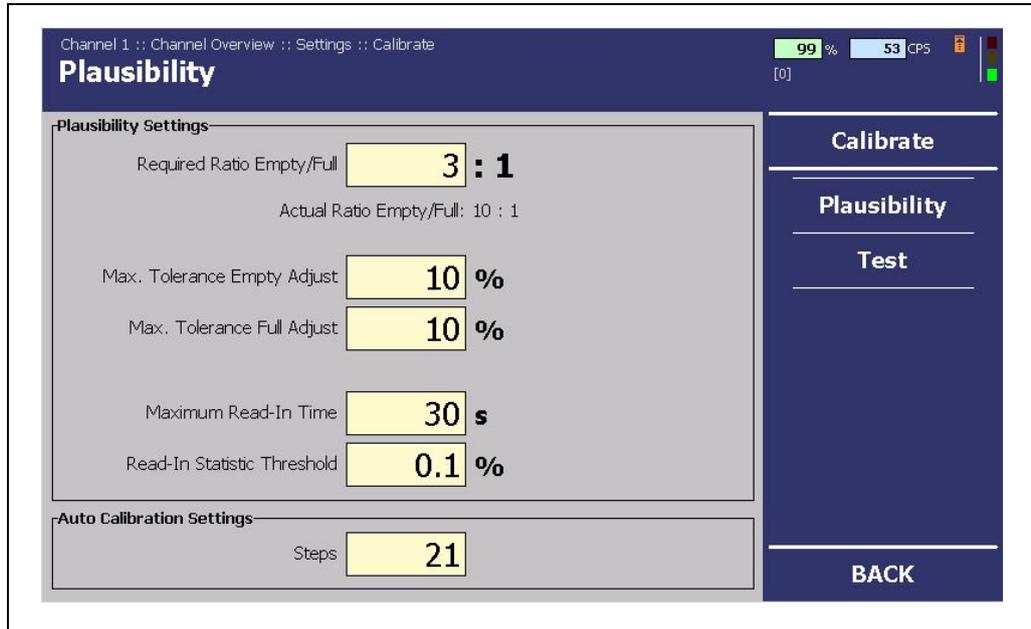


Fig. 60 "Channel Overview" Menu, Settings - Calibration (Plausibility)

In the "Plausibility" menu, the applied settings can be seen. If the settings are not plausible, an error is triggered. You have the following setting options:

Min. empty/full ratio	If the ratio of the empty count rate to the full count rate is smaller than the ratio entered, an error is triggered.
Maximal Tolerance Empty Adjust	If the newly read in count rate for 0% fill level differs from the value of the last adjustment by more than the percentage given, an error is triggered.
Maximal Tolerance Full Adjust	If the newly read in count rate for 100% fill level differs from the value of the last adjustment by more than the percentage given, an error is triggered.
Maximum Read-in time	Maximum time waited when reading in a count rate during calibration or an adjustment. If the set "Read-in statistic Threshold" is not reached within the time set, an error is triggered.
Read-in Statistic Threshold	The minimum statics variation value to be reached during an adjustment. When this value is reached, reading be ended.

Test

In the "Channel Overview" menu click on Settings | Calibration | Test (Fig. 59, Item 1).

In the "Test" submenu, you can enter a test count rate (Fig. 60, Item 3) which is used instead of the count rate of the detector to calculate the fill level. As long as this test count rate is in effect, the background of the input field will be shown in red. The calculated fill level is displayed (Fig. 60, Item 3).

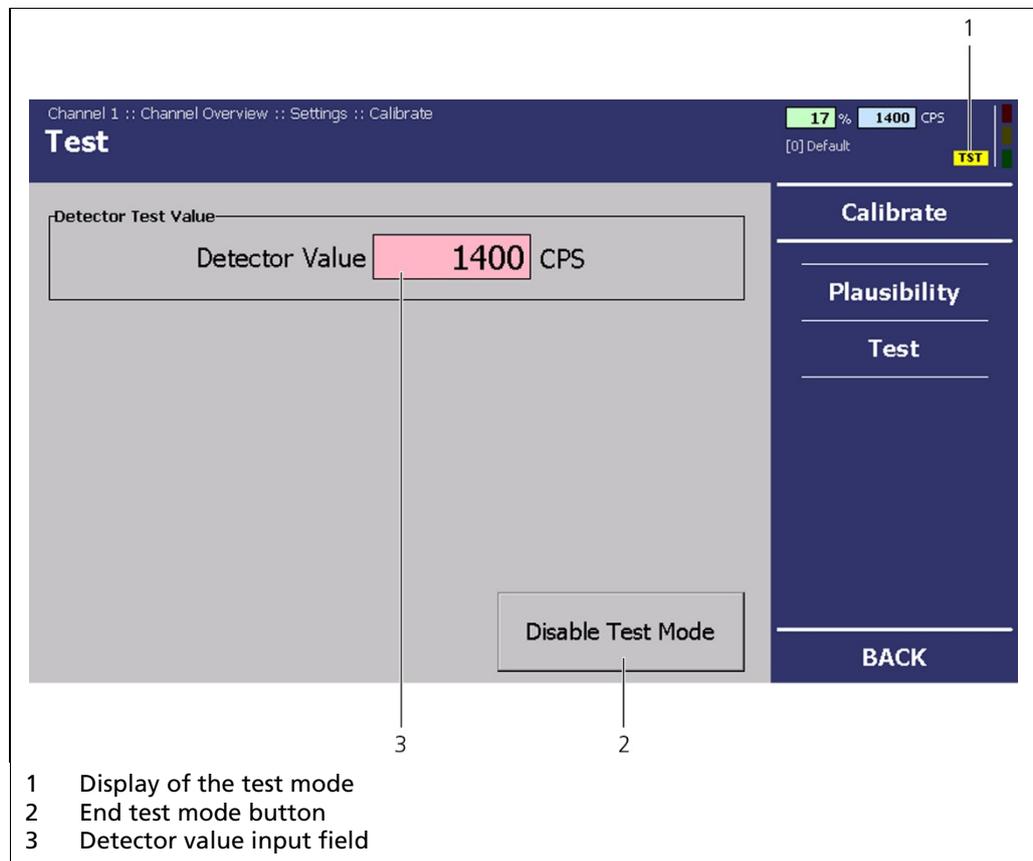


Fig. 61 "Channel Overview" Menu, Settings - Calibration (Test)

1. Click in the input field (Fig. 60, Item 3).
 - ▶ The numeric keypad opens (Fig. 17).
2. Enter a test count rate.
3. Confirm your entry by clicking on "Enter".
 - ▶ The test mode is started (Fig. 60, Item 1).
4. Click on <End test mode> to end the test.

IMPORTANT



The current output switches to the error current (see chapt. 7.3.1).

The test count rate ends automatically after 5 minutes. If the test count rate is to be activated again, the value must be entered in the input field again.

7.2.2 Filter

In the "Channel Overview" menu, click on Settings | Filter (Fig. 54, Item 4).

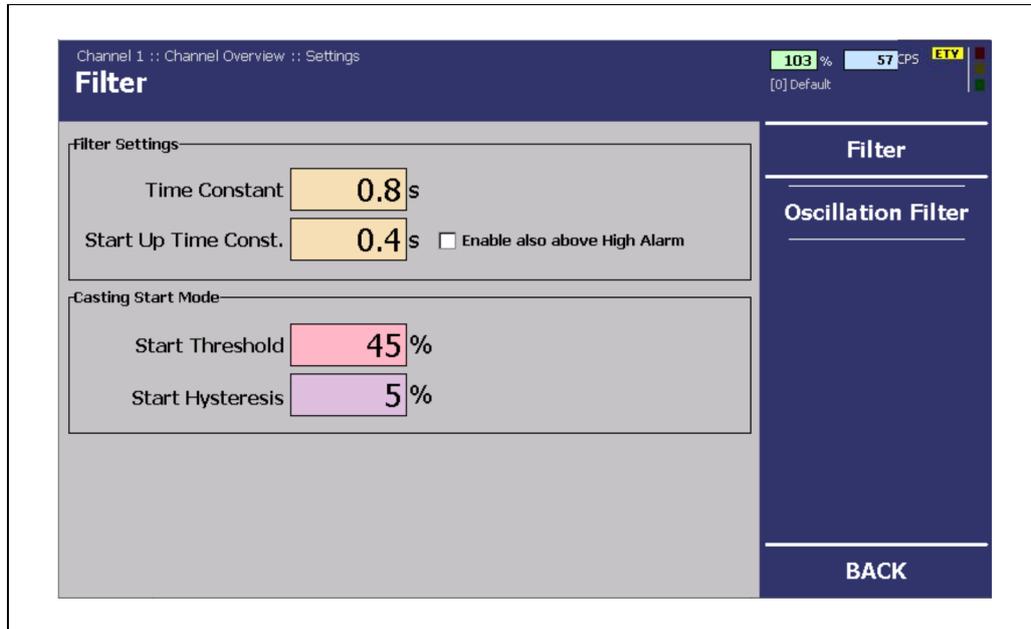


Fig. 62 "Channel Overview" Menu, Settings - Filter

In the "Filter" submenu, you can set the time constants for filtering the gross count rate and settings for the start mode.

The Setting of Two Different Time Constants

The setting of the time constant helps to balance out statistical variations, mainly from the statistical nuclear decay of the radionuclide. A large filter time leads to a calmer signal but also to a slower reaction of the fill level signal to physical fill level changes.

The time constant entered as start-up time constant works within the fill level range of 0% to the "start threshold" (here 45%). This switch-over point has a hysteresis which can also be adjusted freely.

Unless "Enable also above High level" is selected, the value entered as "time constant" is used in the remaining range. If "Enable also above High level" is selected, also the "Start Up Time constant" will be active above set high level.

Oscillation Filter

In the "Channel Overview" menu, click on Settings | Filter and then Oscillation Filter (Fig. 54, Item 4) to reach the Oscillation Filter menu.

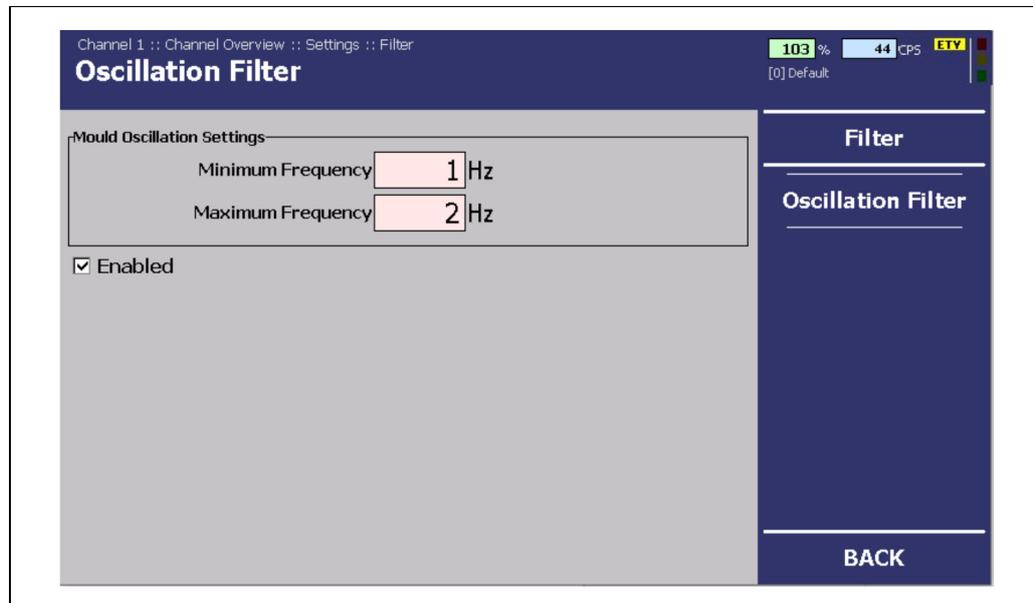


Fig. 63 "Channel Overview" Menu, Oscillation Filter

This filter allows for filtering out the mould oscillation from the mould level signal, providing an improved mould level signal. This function is most useful for formats with a mould oscillation below 3 Hz. Simply enters the minimum and maximum frequencies for the mould oscillation, enables the filter, and then software will calculate and deploy an optimal oscillation filter.

This feature will not reduce the system response time, but simply filter out the mould oscillation frequency in real time.

IMPORTANT



Do not set a large oscillation range than needed, since a too wide range will reduce the effectiveness of the filter.

Alarms

IMPORTANT



The submenu "Alarms" is only displayed if an extension module is installed.

In the "Channel Overview" menu click on **Settings | Alarms** (Fig. 54).

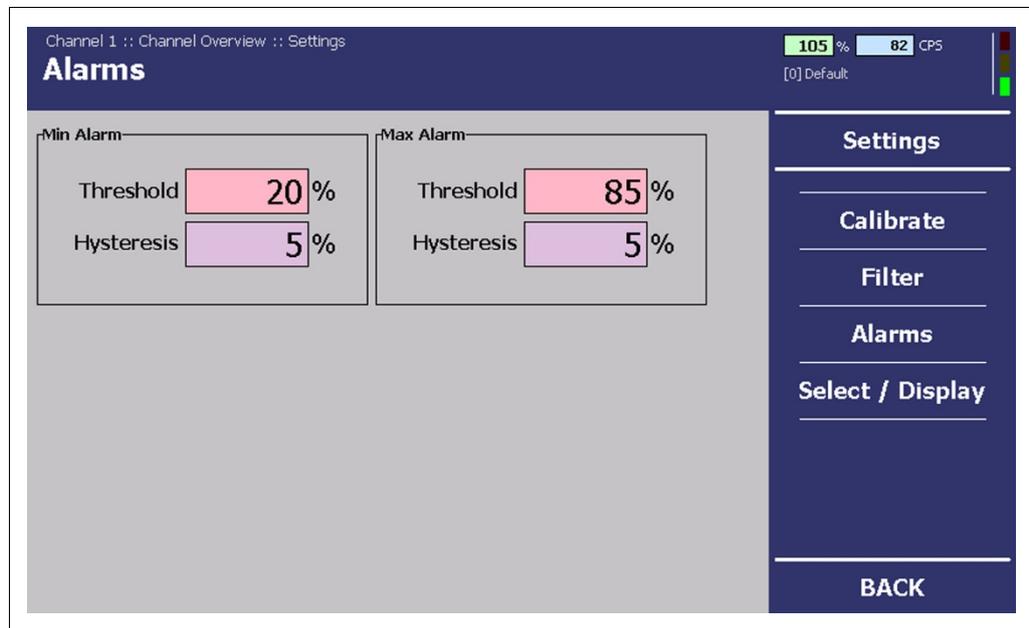


Fig. 64 "Channel Overview" Menu, Settings - Alarms

In the "Alarms" submenu, you can change the values for the fill level alarms (max. and min.) and the hysteresis of these. These values are required for the alarm relays on the extension module.

Hysteresis

Hysteresis is defined as the tolerance range of the alarm trigger which occurs at a predefined threshold of the fill level (e.g.: 20% and 85%).

- In the event of a **rising fill level**, the high alarm is triggered when a fill level of (here) 85% is exceeded. If the fill level falls again, then the alarm does not switch off again until the fill level falls below (here) $85\% - 5\% = 80\%$.
- In the event of a **falling fill level**, the low alarm is triggered when the fill level falls below (here) 20%. If the fill level rises again, then the alarm does not switch off again until the fill level exceeds (here) $20\% + 5\% = 25\%$.

Select / Display

In the "Channel Overview" menu click on Settings | Select / Display (Fig. 54).

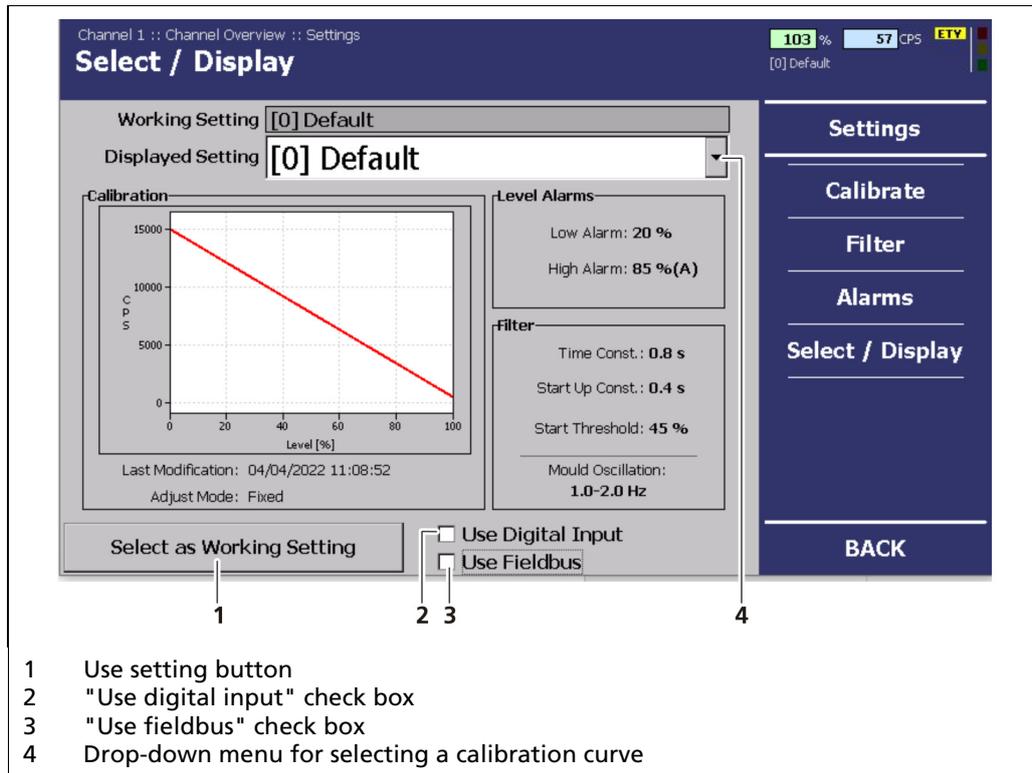


Fig. 65 "Channel Overview" Menu, Settings- Select/Display

In the "Select/Display" submenu, you can view the applied calibration, fill level alarms and filter settings. You can also select calibration curves in the drop-down menu (Fig. 63, Item 4) if additional ones have been created.

1. Click on the button drop-down menu (Fig. 63, Item 4).
2. Select a calibration curve.
3. Confirm your entry by clicking on <Use Settings> (Fig. 63, Item 1).

Use Digital Input: If there is a tick, then the selection of the calibration curves is done by digital inputs.

Use fieldbus: If there is a tick, then the selection of the calibration curves is done by input from fieldbus.

The selection works through two digital inputs as is described in the following:

Select Calibration curve	Digital Input 3	Digital Input 4
0	open	open
1	closed	open
2	open	closed
3	closed	closed

7.3 In / Outputs

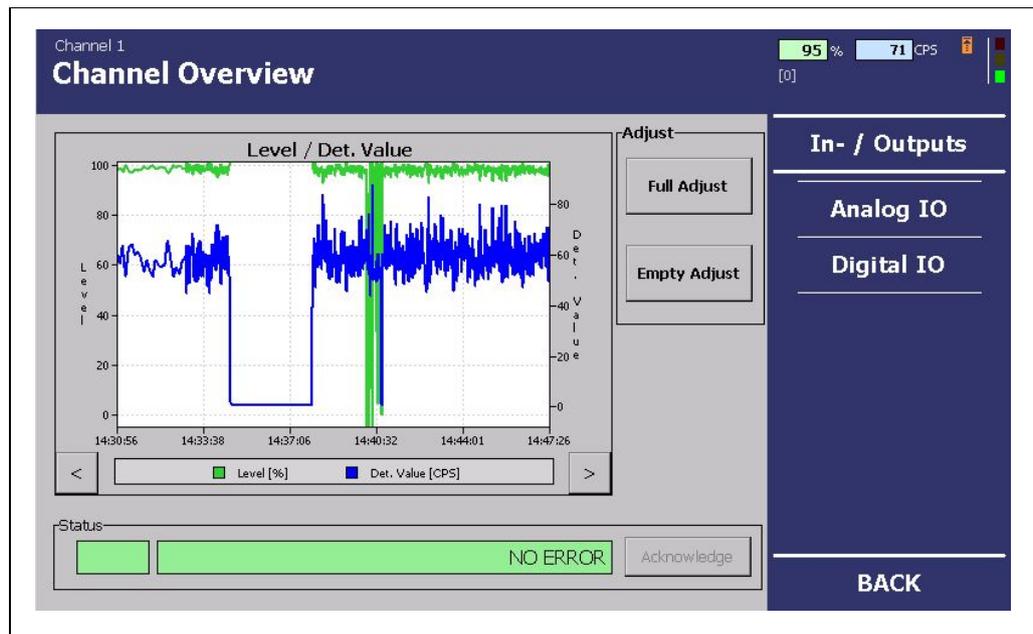


Fig. 66 "Channel Overview" Menu, Settings - In/Outputs

1. In the "Channel Overview" menu click on <In/Outputs> (Fig. 49, Item 8).
2. Click on <Analogue IO> or <Digital IO> (Fig. 49, Item 1).

In the "In/Output" submenu, you can configure the analogue current outputs, the digital inputs, the alarm relays (only with the extension module) and the fieldbus module (if installed).

The current output itself is continually monitored and reports malfunction via a redundant current path at a constant current of 24 mA.

7.3.1 Analog IO

You have the following setting options:

4 mA	Output value (e.g. fill level) at 4 mA
20 mA	Output value (e.g. fill level) at 20 mA
Error mode	The error mode defines the behaviour of the error relays in the event of an error.
Calibration of the Current Output/Current Outputs	If you find any discrepancies between the set-point and the actual value of the current signal, then you can calibrate the current output again.

NOTICE



To calibrate the current outputs, you will need an ammeter (not included in the delivery contents), which is to be connected to the relevant current output.

NOTICE



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

Setting of the Current Outputs

Channel 1 :: Channel Overview :: In- / Outputs :: Analog IO

Current Out 2 105 % 81 CPS
[0] Default

Range

Lower Value [= 4 mA]

Upper Value [= 20 mA]

Behaviour

Error Mode

Monitoring

Assignment

Additional Filter

Time Constant s

- 1 Lower value input field
- 2 Upper value input field
- 3 Time constant input field
- 4 Error mode drop-down menu
- 5 Current monitoring drop-down menu
- 6 Assignment drop-down menu
- 7 Calibration button

Fig. 67 "Channel Overview" menu, In/Outputs - Analog IO (Current Output 2)

In the "Channel Overview" menu, click on e.g. In/Outputs | Analogue IO | Current Output 2 (Fig. 65, Item 8).

You have the following options for configuring the current outputs:

- Range** The current output signal is between 4 mA and 20 mA. The corresponding values (e.g. fill level) can be freely assigned.
- Lower value:**
The lower value is the value at a current output signal of 4 mA.
- Upper value:**
The upper value is the value at a current output signal of 20 mA.

NOTICE



The value which is assigned to a current output signal of 4 mA must be smaller than the value which is assigned to that of 20 mA.

Error Mode Here, settings can be made concerning the way the current output is to behave if the EVU or the detector reports an error. In the event of an error, the error relay is de-energised (see there), a message appears in the channel menu and the red measurement channel LED lights up. The current output also switches to error mode.

There are three different choices:

- Constant 2 mA
- Constant 22 mA
- Freezing the last measured value

NOTICE



If the last measured value is frozen, a measurement system error cannot be seen in the process control system on the current output signal.

NOTICE



As long as the device is in test mode or in a calibration routine, the current output is switched to the error mode.

NOTICE



Do not activate the "monitoring" (Fig. 65, Item 5) until the measurement has been fully wired. By doing so you will avoid the error alarm.

Monitoring

If the "monitoring" is activated, the current output will be monitored. Here, the output current is compared with the current which has run right through the conductor loop. 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. The error relay is de-energised.

Additional settings options in an installed extension module for current output 2 are:

Assignment
(only for current output 2)

Fill Level:

The second current output also transmits the fill level. An additional time constant can be set (see below).

Detector Value:

The second current output also transmits the measured count rate (CPS value).

Detector temperature:

The second current output transmits the temperature measured in the detector.

IMPORTANT



The Current Output 2 submenu is only displayed when an extension module is installed.

NOTICE

If the second current output is assigned to the detector temperature or the detector value (CPS), it is particularly important to adhere to an appropriate setting of the current output values for 4 or 20 mA.

Additional filter
(only for current
output 2)

An additional filter time constant can be applied to the second current output. This is added to the time constant set under "Filter" in case fill level is selected. The signal is thereby smoother but slower as a result.

Calibration of the Current Outputs

1. Before calibrating the current outputs, connect an ammeter (not included in the delivery contents) to the relevant current output.
2. Click on **<Calibration>** (Fig. 65, Item 7).
 - ▶ A confirmation message opens.
3. Click on **<Next>** in the confirmation message.
 - ▶ The device switches to test mode.
 - ▶ A command prompt opens.
4. Click on the input field to enter a value for the 4 mA calibration point.
 - ▶ The numeric keypad opens (Fig. 17).
5. Enter the value transmitted by the ammeter.
6. Click on **<Next>** in the confirmation message.
7. Carry out the calibration for 20 mA calibration point in the same way.
 - ▶ A confirmation message with the notification "Calibration finished" opens.
8. Click on **<Next>** to finish the calibration.

Test

In the "Test" submenu, you can enter your own current value for the sake of the test (Fig. 66, Item 4). As long as this test current is in effect, the background of the input field will be shown in red. In the "Actual" display field, the actual current is displayed. This value cannot be changed.

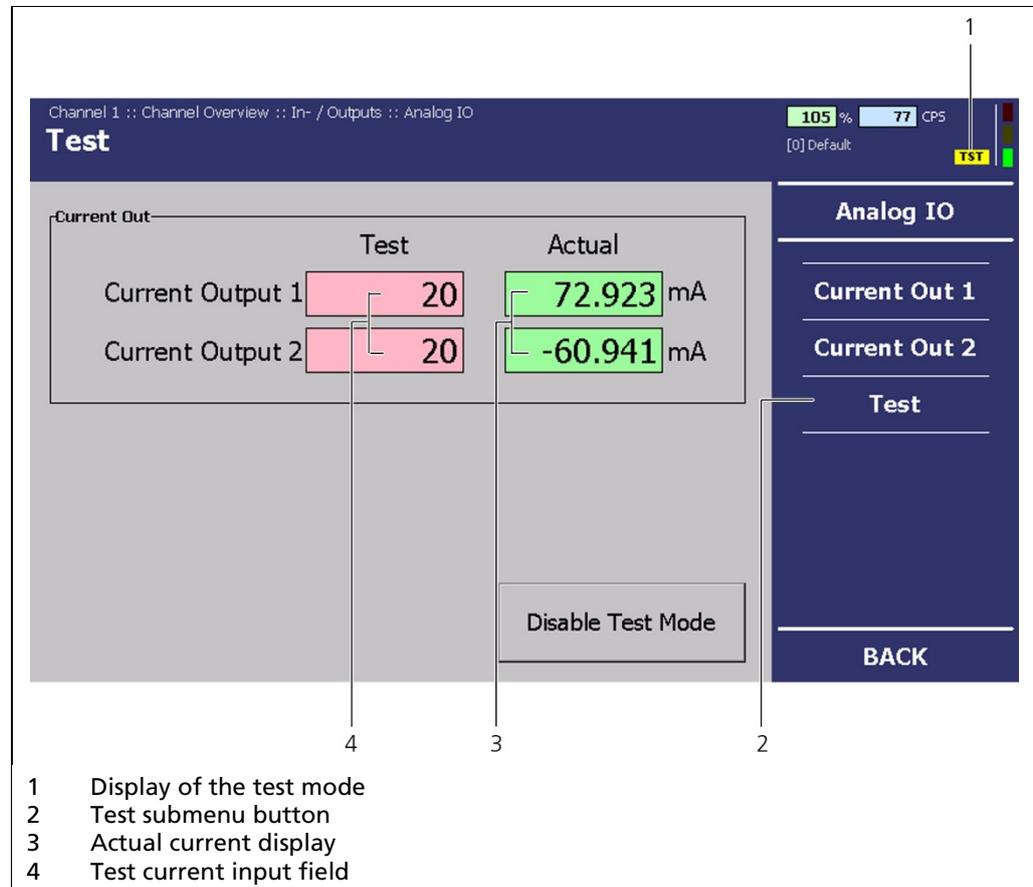


Fig. 68 "Channel Overview" menu, In/Outputs - Analogue IO (Test)

1. In the "Channel Overview" menu click on In/Outputs | Analogue IO | Test (Fig. 66, Item 2).
2. Click in the input field (Fig. 66, Item 4).
 - ▶ The numeric keypad opens (Fig. 17).
3. Enter a test current and confirm your entry by clicking on "Enter".

If the entered value is accepted, the background of the input field will be shown in red. In the "Actual" field, the read-back current which is also used for the current output monitoring is displayed. If the conductor loop is not closed, no real measured value will be displayed.

- ▶ The test mode is started (Fig. 66, Item 1).
4. Click on <End test mode> if you would like to end the test current.

NOTICE



The test function ends automatically after about 5 minutes. If the test function is to be reactivated, the value must be re-entered.

If only one current output is being tested, the other current output switches automatically to error mode.

7.3.2 Digital IO

In the Digital IO submenu, you can set the two different alarm signals for the alarm relays.

Alarm Relay

IMPORTANT



The Alarm Relay submenu is only displayed if an extension module is installed.

In the "Channel Overview" menu click on In/Outputs | Digital IO | Alarm Relay (Fig. 67, Item 2), to reach the Alarm Relay submenu.

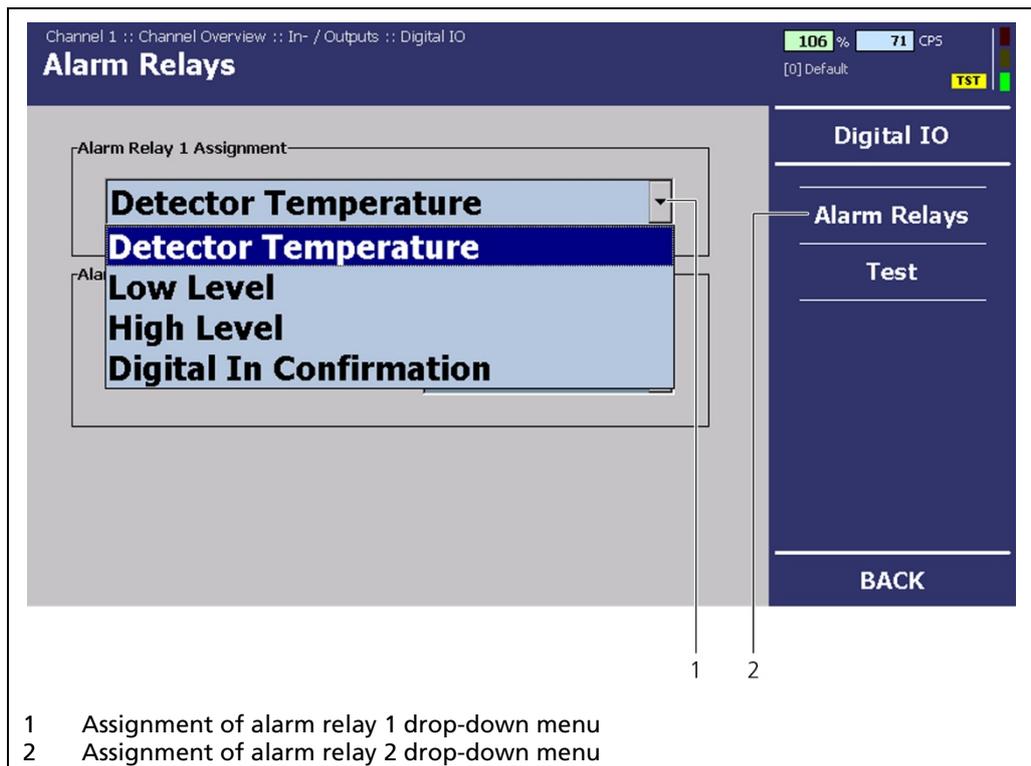


Fig. 69 "Channel Overview" Menu, In-/Outputs - Digital IO (Alarm Relay)

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

Detector temperature	The relay switches if the alarm threshold set in the Menu Detector Temperature is exceeded (see detector manual).
Low level	The relay switches if the value set under Channel Overview Settings Alarms is fallen short of .
High level	The relay switches if the value set under Channel Overview Settings Alarms is exceeded .
Digital in confirmation	This relay switches if the digital input is switched.

NOTICE

The alarm relay 1 is a contact (SPDT). The behaviour of alarm relay 1 can be freely configured ("CLOSED", i.e. switching to the normally-open contact or "OPEN", i.e. the normally-closed contact, in the case of an alarm).

Behavior for software versions earlier than 1.2.0:

- ▶ The relay always closes in the event of an alarm, i.e. it switches on the normally open contact.

NOTICE

Alarm relay 2 is a simple switch (SPST NO). The behaviour in the event of an alarm can be freely configured ("CLOSED" or "OPEN" in the case of an alarm).

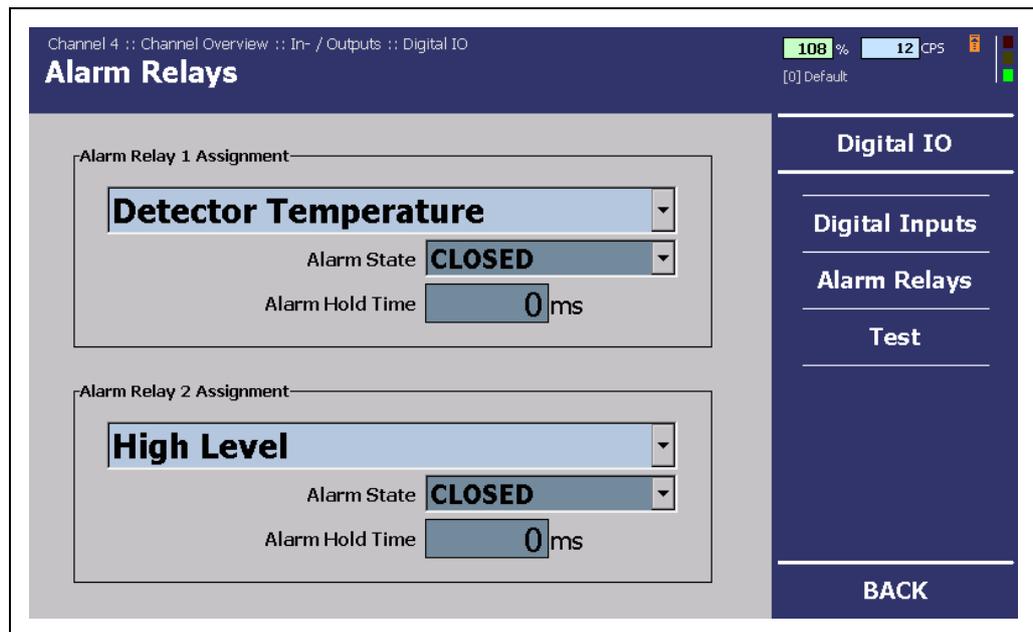


Fig. 70 "Channel Overview" Menu, In/Outputs - Digital IO (Alarm Relay)

Alarm Hold Time

An alarm always lasts as long as the reason for the alarm is present, but not less than the specified time.

NOTICE

If the EVU is disconnected from voltage, then both relays are de-energised, moving to their normally closed contact.

NOTICE

The error relay cannot be configured. It always switches on during normal operation and switches off in the event of an error. To get the same behaviour for the alarm relays, both must be configured as "OPEN".

Test

In the "Test" submenu, you can change the states of the relay outputs for the sake of the test.

Green background area current state

Red background area manually switched state (test mode)

IMPORTANT



The digital inputs cannot be configured. Fig. 69 only informs of the switched state.

In the "Channel Overview" menu, click on **In/Outputs | Digital IO | Test** (Fig. 69, Item 3).

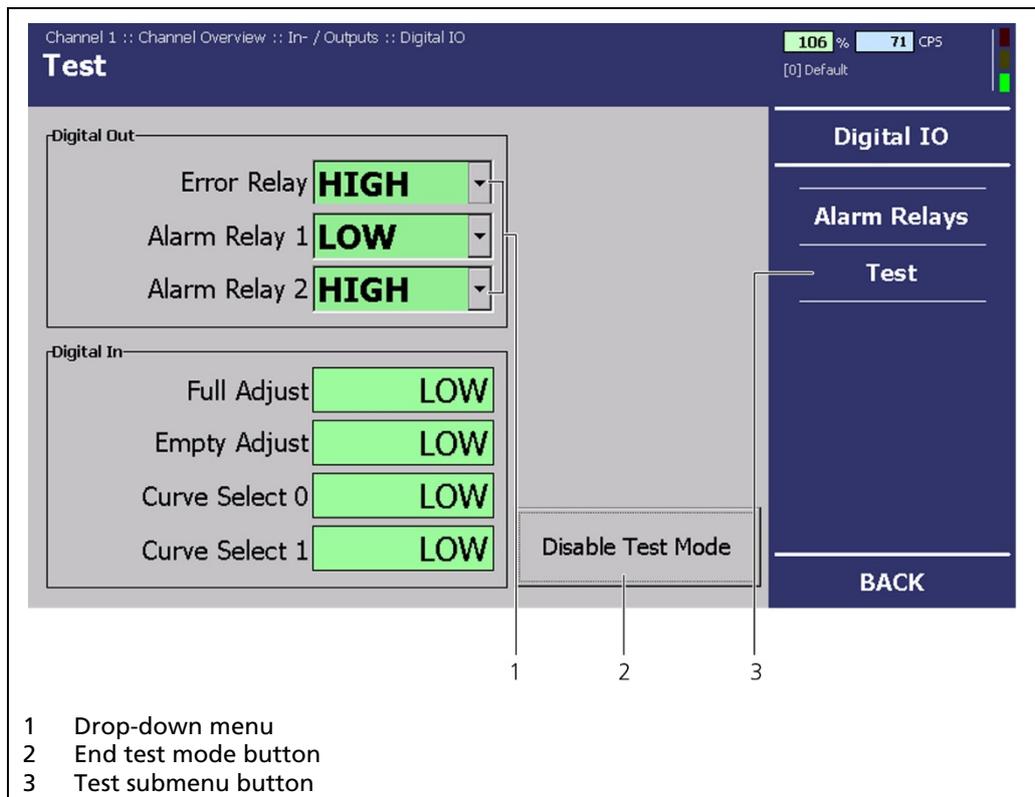


Fig. 71 "Channel Overview" menu, In/Outputs - Digital IO (Test)

Digital Outputs

CLOSED= Relay energised
OPEN= Relay de-energised

Digital inputs

CLOSED= Terminals connected
OPEN = Terminals not connected

1. Click on the **"Error Relay" drop-down menu**, to switch the error relay manually (Fig. 69, Item 1).
2. Click on the **"Alarm Relay 1" drop-down menu** menu to switch the alarm relay manually (Fig. 69, Item 1).
3. Click on the **"Alarm Relay 2" drop-down menu** menu to switch the alarm relay manually (Fig. 69, Item 1).
4. Click on **<End Test Mode>** (Fig. 69, Item 2) if you would like to end the test mode.

IMPORTANT

The test function ends automatically after around 5 minutes. If the test should be re-enabled, the value must be re-entered.

Fieldbus

The "Fieldbus" submenu only appears if a Fieldbus module has been installed. For the installation of a Fieldbus module, see chapt. 9.1.2.

IMPORTANT



To be able to use the Fieldbus module, you must install the provided GSD file in the process control system.

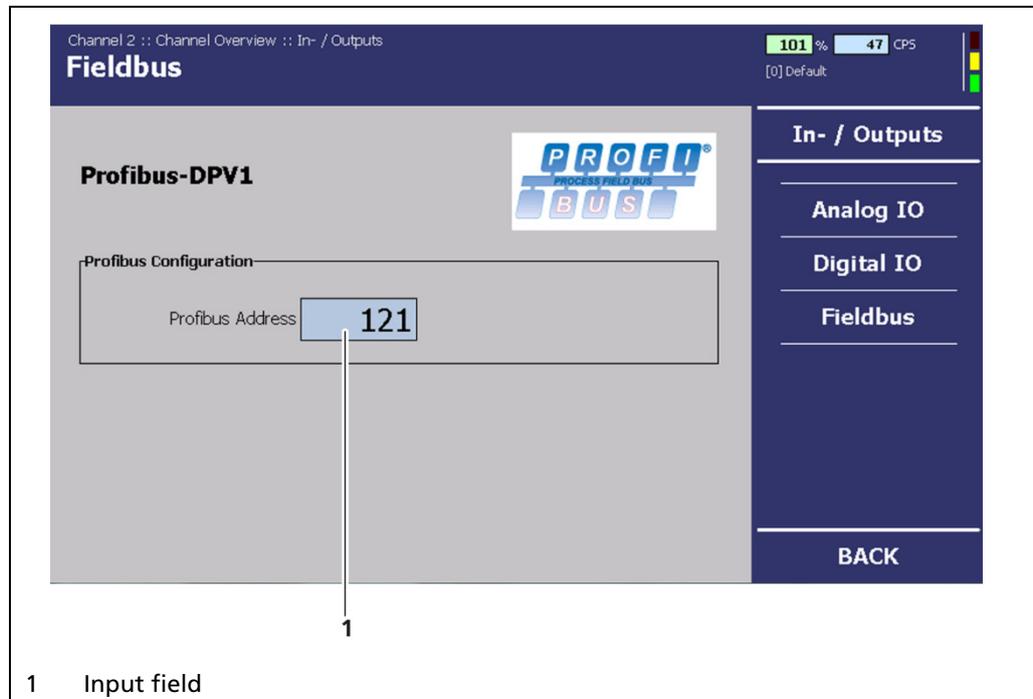


Fig. 72 "Channel Overview" Menu, In/Outputs - Fieldbus

1. In the "Channel Overview" menu click on In/Outputs | Fieldbus.
2. Click in the "Profibus" input field: Address" (Fig. 70, Item 1).
 - ▶ The numeric keypad opens (Fig. 17).
3. In the input field "**Profibus: Configuration**" enter the address of the bus device (Fig. 70, Item 1).

Error

In the "Channel Overview" menu, click on <Error> (Fig. 49, Item 8).

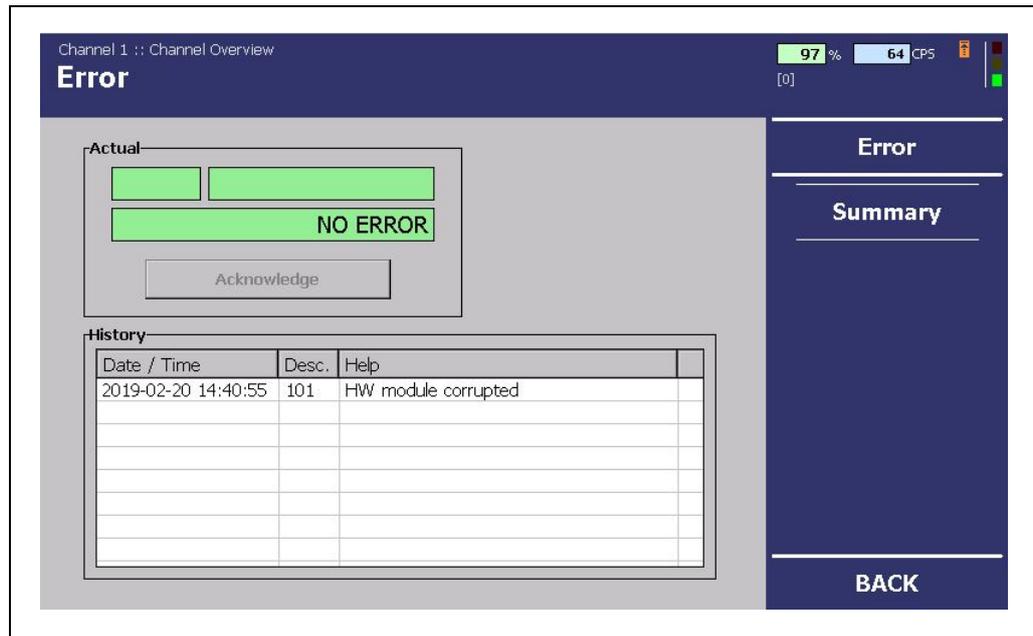


Fig. 73 "Channel Overview" Menu, Error

In the "Error" submenu, you can view the following information:

Current	Displays the current error message and the error code.
History	Displays the error history with the error message and the error codes.

7.3.3 Overview

In the "Channel Overview" menu, click on Error | Overview to reach the Overview submenu.

Channel 1 :: Channel Overview :: Error

105% 78 CPS
[0] Default

Summary

Error Details

Desc.	Help	Count	A...	Occurance	Occurance
101	HW module corrupted	0	x	2000-01-01 00:00:00	2000-01-01
102	Device data corrupted	1	x	2011-10-24 09:01:44	2000-01-01
103	RAM, flash or CPU	0	x	2000-01-01 00:00:00	2000-01-01
104	WD reset	0	x	2000-01-01 00:00:00	2000-01-01
105	WD failure	0	x	2000-01-01 00:00:00	2000-01-01
106	WD off	0	x	2000-01-01 00:00:00	2000-01-01
107	RTC date/time	0	x	2000-01-01 00:00:00	2000-01-01
108	Software exception	0	x	2000-01-01 00:00:00	2000-01-01
201	Monitor ADC failure	0	x	2000-01-01 00:00:00	2000-01-01
202	ADC calibration	0	x	2000-01-01 00:00:00	2000-01-01
203	24V failure	0	x	2000-01-01 00:00:00	2000-01-01
204	3.3V failure	0	x	2000-01-01 00:00:00	2000-01-01
205	GND failure	0	x	2000-01-01 00:00:00	2000-01-01
206	Ref 2.5V failure	0	x	2000-01-01 00:00:00	2000-01-01
207	Temp. sensor failure	0	x	2000-01-01 00:00:00	2000-01-01
208	Temperature too high	0	x	2000-01-01 00:00:00	2000-01-01
209	Quartz synchronization	0	x	2000-01-01 00:00:00	2000-01-01
201	Calibration not monotonic	30	x	2011-11-24 12:18:31	2011-11-24

Error

Summary

BACK

1

1 Display of the error details of the error messages

Fig. 74 "Channel Overview" Menu, Error Overview

In the Overview submenu, you can find a detailed error list (Fig. 72, Item 1).

7.4 Service

In the Service submenu you have the following options:

- Exporting service data to a USB flash drive.
- Resetting of the channel settings to (calibrating, time constants, alarms thresholds, etc.)
- Restarting of the software (of the relevant measurement channel).

Service data includes:

- The change log for the channel and connected detector
- The error log for the channel and connected detector
- The production data

In the "**Channel Overview**" menu click on **<Service>** to reach the Service submenu (Fig. 49, Item 8).

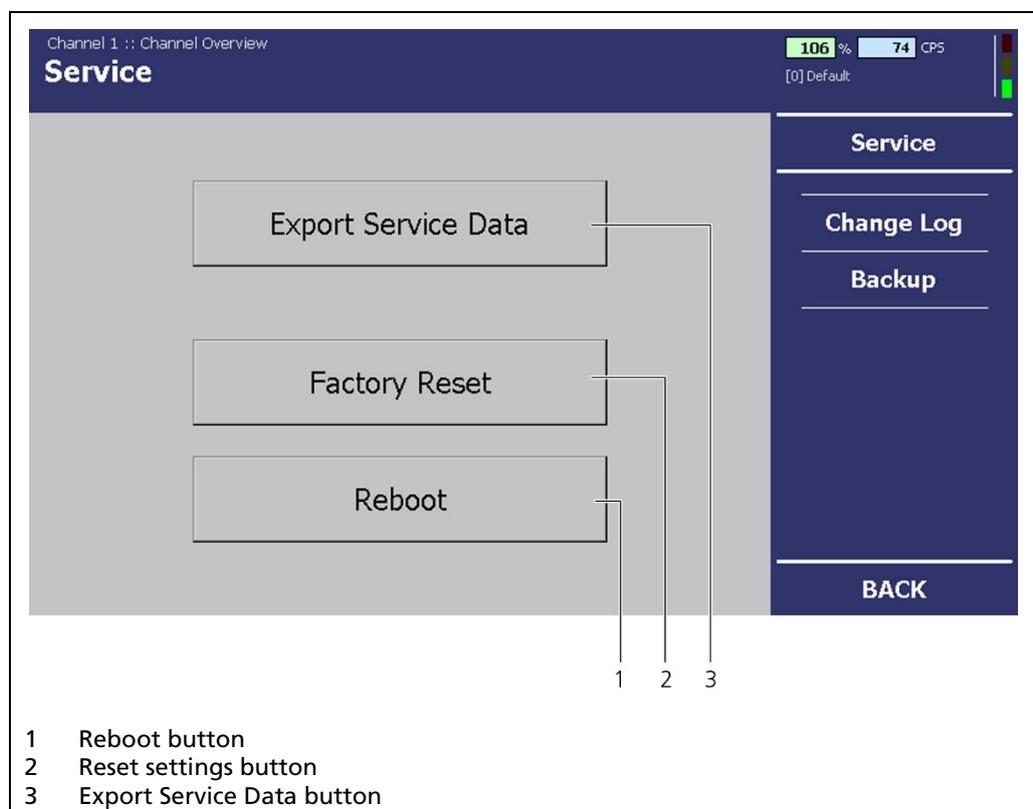


Fig. 75 "Channel Overview" Menu, Service

7.4.1 Exporting Service Data

IMPORTANT



The <Export Service Data> button becomes active if you connect a USB flash drive to the front panel.

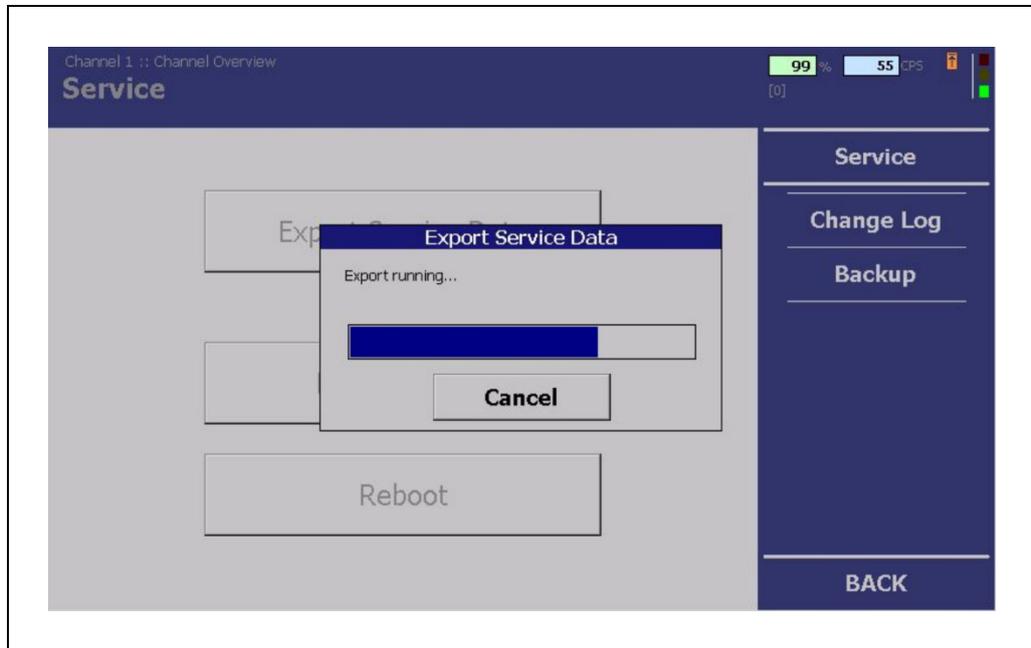


Fig. 76 "Channel Overview" Menu, Service - Backup/restore is running

4. Click on <Export Service Data> (Fig. 73, Item 3).

- ▶ The export of data starts (Fig. 74).

NOTICE



If you click on <Factory Settings> all applied settings will be reset.

- ▶ The measurement is retained.

If you click <Reboot> the measurement channel restarts and the current settings remain.

- ▶ The measurement of the relevant channel is then retained.

The measurements of the other measurement channels remain unaffected by this.

7.4.2 Change Log

In the Change Log submenu you can view all the applied settings.

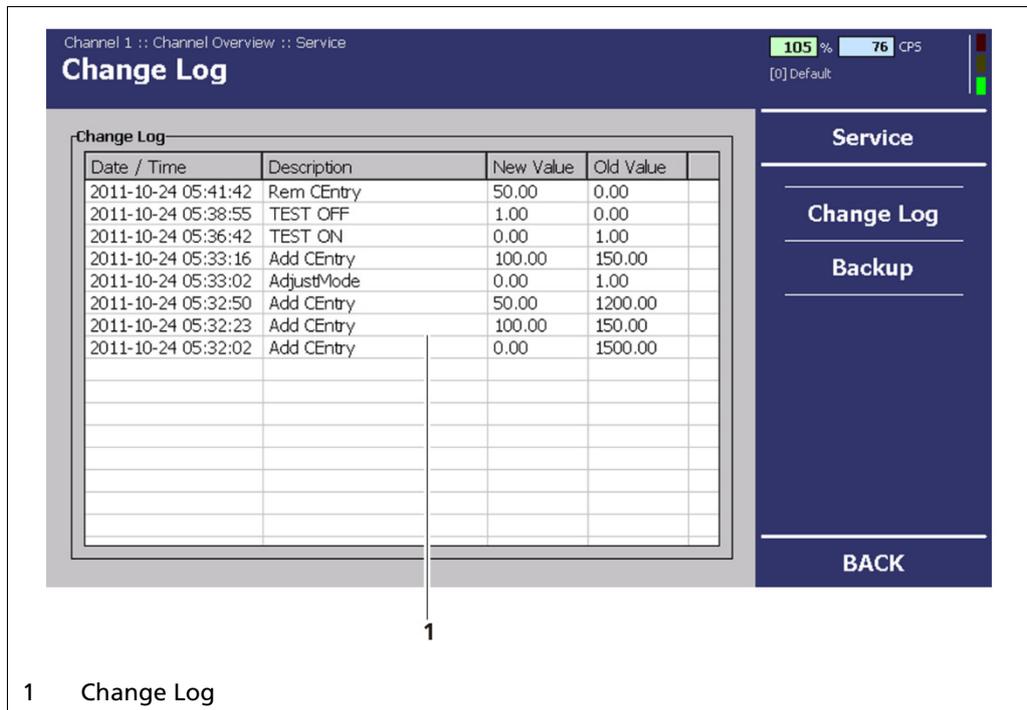


Fig. 77 "Channel Overview" Menu, Service- Change Log

In the "Channel Overview" menu click on Service | Change log to reach the Change Log submenu

- ▶ The change log is displayed (Fig. 75, Item 1).

Backup

The "Backup" submenu offers you the following options:

- Backing up the settings to a USB flash drive.
- Restoring of settings from a USB flash drive.

IMPORTANT



Backing up the settings is always recommended to ensure quality and so original settings can be restored in the event of an emergency.

If several identical strands are being operated, then it is recommended that a change to the settings is carried out in one single channel and then transferred by a USB flash drive to the other channels.

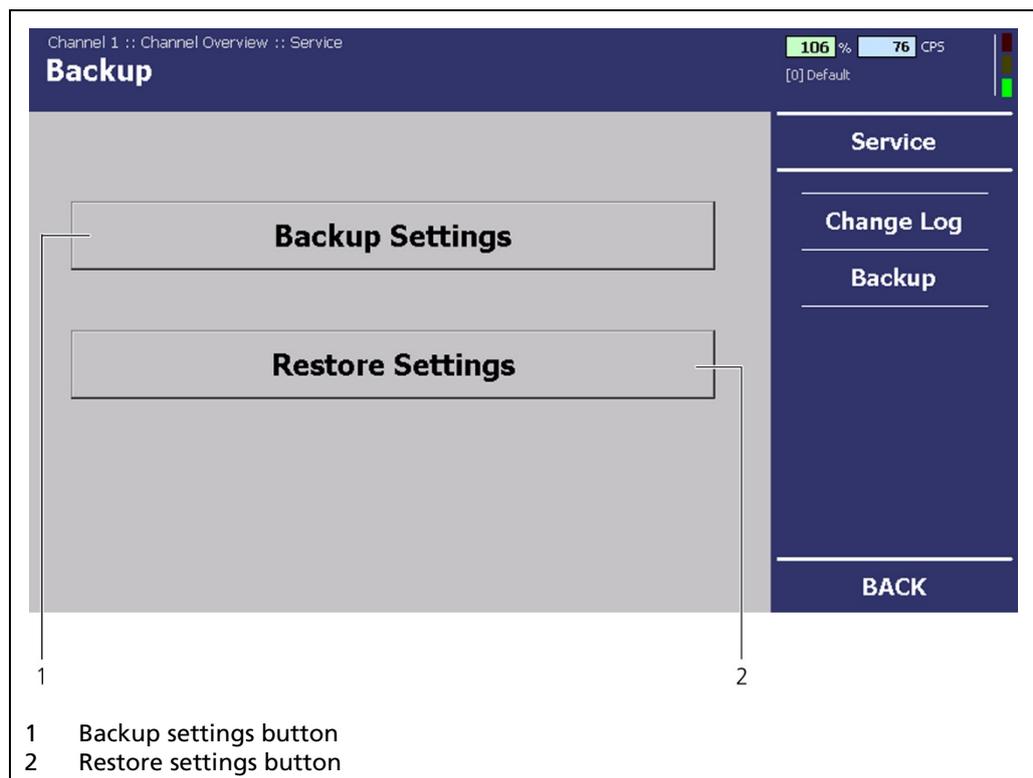


Fig. 78 "Channel Overview" Menu, Service - Backup

IMPORTANT



The buttons <Backup Settings> and <Restore Settings> can only be selected if you have connected a USB-Stick to the front panel.

1. In the "Channel Overview" menu click on **Service | Backup**.
2. Connect a USB flash drive to the USB port of the EVU front panel (Fig.1, Item 3).
3. Click on <Backup Settings> Fig. 76, Item 1).
 - ▶ A confirmation message with the command to wait opens.
 - ▶ A confirmation message opens after a successful backup.
4. After the backup/restore is finished, click on <OK>.

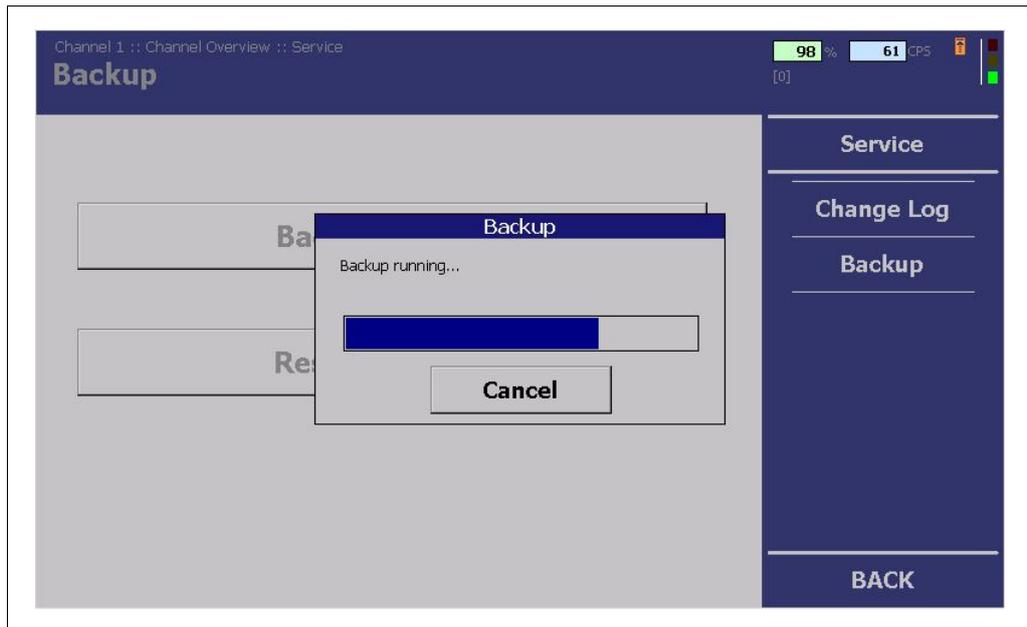


Fig. 79 "Channel Overview" Menu, Service - Backup/restore is running

IMPORTANT



All data relevant to measurement is backed up:

- All calibrations
- Filter constants
- Alarm thresholds

Restore

1. Connect a USB flash drive to the USB port of the EVU front panel (Fig.1, Item 3).
2. Click on <Restore Settings> (Fig. 76, Item 2).
 - ▶ A window for selecting files opens.
3. Select a file and begin the restoration.
 - ▶ A confirmation message with the command to wait opens.
 - ▶ A confirmation message opens after a successful restoration.

IMPORTANT



The files with backed-up settings have .dds at the end. A .txt file is also exported which is solely for information purposes.

8 Troubleshooting

8.1 Verify Radiometric Mould Level System

This chapter is an attempt to briefly outline how to verify the correct function and stability of a running Berthold radiometric mould level system.

Berthold's system for mould level measurement has several monitor functions built-in, and almost every possible malfunction will generate an error or a warning in the evaluation unit, see chapter 8.3.

Introduction

A Berthold radiometric mould level system is a very robust and reliable system. Quite often questions about the mould level system are raised by customer having issues with their mould level control. In most cases these issues do not originate from the mould level system itself, but from the control system or the caster. Herein we suggest a procedure for how to verify that your Berthold radiometric mould level system is working correctly.

Preparations

To verify the function of a mould level system you need to have:

- a commissioned and installed mould level system from Berthold.
- access to a mould in casting position and connected to the mould water.
- a feasible calibration block of the corresponding mould size and means to move it in and keep it in the mould.

Verification Procedure

The verification process is done in steps to be able to ensure the functionality of the system. Before starting the verification, the system should be calibrated using at least the full and empty calibration procedure.

8.1.1 Check System Stability

After the system has been calibrated, it is possible to verify system accuracy.

To do that, then:

1. Make sure you have cooling water running and no air bubbles in the mould (air bubbles in the mould cooling water can affect the mould level signal).
2. Position the calibration block at the normal casting level in the mould.
3. Then log the mould level signal for about 5 mins.
4. Verify that the standard deviation of the logged signal is in line with the theoretically calculated value.
 - ▶ The calculated and measured value should be very much in line, if not the most probable issue is air bubbles in the mould negatively affecting the stability of the mould level signal.

8.1.2 Check System Oscillation Stability

For caster with low oscillation frequency and strong radioactive source, the mould oscillation could yield some noise on the mould level signal.

1. Make sure you have cooling water running and no air bubbles in the mould.
2. Place the calibration block at the normal casting level in the mould.
3. Verify that the mould level signal is as good as expected.
4. Start the oscillation of the mould.
5. Then log the mould level signal for about 5 mins.
6. Verify if there is any difference for the mould level signal with mould oscillation and off.
 - ▶ If the oscillation of the mould does affect the mould level signal, Berthold can provide a software filter for the LB 452 unit to reduce this influence.

8.1.3 Check System Electromagnetic Stability

Casters that have not been correctly designed or not using the correct type of radiometric detector, can be affected by the strong electromagnetic (EM) sources as mould stirrers (EMS) or brakes (EMBr).

1. Make sure you have cooling water running and no air bubbles in the mould, since air bubbles in the mould cooling water can affect the mould level signal.
2. Place the calibration block at the normal casting level in the mould.
3. Verify that the mould level signal is as good as expected.
4. Start logging the mould level signal.
5. Turn the stirrer/brakes on and verify if this event has any impact on the mould level signal or not.
 - ▶ In case there are some negative influences, this can be handled in two ways:
 1. Better isolate the detector by adding ferromagnetic steel around the detector, shielding the detector.
 - ▶ Change to a SiPM-based detector from Berthold that is virtually immune towards EMBr/EMS. In the case of EM influences, the use of Berthold detectors with appropriate EM protection is recommended.

8.2 Error Search

Problem	Cause	Measure
No signal	EVU does not work.	▶ Check power supply and fuses; is LED 1 blinking on the display?
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 fill level display	Fill level value entry incorrect.	▶ Check the calibration value and the fill level display.
The fill level display deviates	Defect in detector.	▶ Check detector.
	Incorrect calibration.	▶ Check calibration values.
	Count rate too low (see above).	▶ Check source age and irradiation level, replace detector.
No menus are displayed which are linked to the extension module.	Extension module defect.	▶ Replace extension module.
	Extension module is not correctly installed	▶ Check cable connection (flat ribbon cable) between the fieldbus module and the basic module. ▶ Check whether the extension module is pushed in properly.
No data from the fieldbus module is being received in the control centre.	Fieldbus module defect.	▶ Replace fieldbus module.
	Fieldbus not given and/or incorrect address.	▶ Assign correct address.
	Fieldbus module is not correctly installed.	▶ Check cable connection (flat ribbon cable) between the extension module and the basic module. ▶ Check whether the extension module is pushed in properly.
No data is being received in the control centre via Ethernet	Transfer of the measurement data deactivated.	▶ Activate the output of measurement data over the network.

8.3 Error Codes of the Evaluation Unit

In the following tables you can find the EVU error codes which give you information on how to fix them. All castXpert LB 452 errors have the prefix "M", all detector errors the prefix "D".

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

8.3.1 System

Code	Text	Description	Correction	Class
M101	HW module corrupted	Missing circuit board or incompatible test header.	<ul style="list-style-type: none"> ▶ Carry out software update. ▶ Contact service. 	Error
M102	Device data	Data inconsistency found.	<ul style="list-style-type: none"> ▶ Carry out factory reset. 	Error
M103	RAM, Flash or CPU	Error in main memory. Hardware error.	<ul style="list-style-type: none"> ▶ Contact service. 	Error
M104	WD reset	The system has been reset by the watch dog (WD). Hardware error.	<ul style="list-style-type: none"> ▶ Contact service. 	Error
M105	WD failure	The watch dog (WD) was activated but the system was not reset. Hardware error.	<ul style="list-style-type: none"> ▶ Contact service. 	Error
M106	WD off	The debug jumper is sticking, the watchdog is disabled.	<ul style="list-style-type: none"> ▶ Remove debug jumper. 	Error
M107	RTC date/time	Error in the actual time clock or invalid time.	<ul style="list-style-type: none"> ▶ Check the date and time settings. ▶ Contact service. 	Warning
M108	Software exception	Software exception.	<ul style="list-style-type: none"> ▶ Carry out software update. If the error remains, contact the service. 	Error
M109	HW Application Support	The application running is out of memory.	<ul style="list-style-type: none"> ▶ Check the detector compatibility of the card used in the EVU 	Error

8.3.2 Main board

Code	Text	Description	Correction	Class
M201	Monitoring ADC	The monitoring ADC (Analogue Digital Converter) has failed. Hardware error.	▶ Contact service.	Error
M202	ADC Calibration	Error while calibrating the ADC. Hardware error.	▶ Contact service.	Error
M203	24 V failure	Faulty 24 V operating voltage. Hardware error.	▶ Contact service.	Error
M204	3.3 V failure	Faulty 3.3 V operating voltage. Hardware error.	▶ Contact service.	Error
M205	GND failure	Measured GND value too large. Hardware error.	▶ Contact service.	Error
M206	Ref 2.5 V failure	Faulty 2.5 V reference voltage. Hardware error.	▶ Contact service.	Error
M207	Temp sensor	Temperature sensor on CPU board failed. Hardware error.	▶ Contact service.	Warning
M208	Temperature too high	Temperature of the system is or was too high.	▶ Please ensure adequate cooling of the EVU.	Warning
M209	Quartz synchronization	One of the oscillation quartzes does not work correctly.	▶ Contact service if error exists consistently.	Warning

8.3.3 Application

Code	Text	Description	Correction	Class
M301	Calibration not monotonic	Calibration curve not monotonic.	<ul style="list-style-type: none"> ▶ Check calibration table. 	Error
M302	Background too high	Background count rate larger than smallest occurring calibration point.	<ul style="list-style-type: none"> ▶ Check calibration table. ▶ Check background count rate. 	Error
M303	Empty/Full ratio	Ratio between full and empty count rate too small.	<ul style="list-style-type: none"> ▶ Check calibration table. ▶ Change required ratio on the plausibility page. ▶ Ensure that there are no objects or residue in the beam path. 	Error
M304	Empty adjust tolerance	Change outside of the plausibility limits during empty adjustment.	<ul style="list-style-type: none"> ▶ Check source. ▶ Change plausibility limit. ▶ Carry out the adjustment (twice) again. The error is automatically cleared. 	Error
M305	Full adjust tolerance	Change outside of the plausibility limits during full adjustment.	<ul style="list-style-type: none"> ▶ Check source. ▶ Change plausibility limit. ▶ Carry out the adjustment (twice) again. The error is automatically cleared. 	Error
M306	Count rate stability out of bounds	While reading in, the count rate is not constant and outside the statistical window.	<ul style="list-style-type: none"> ▶ Ensure that no other factors influence the count rate during the read in (e.g. disruptions in the beam path). ▶ Carry out the adjustment (twice, if needed) again. The error is automatically cleared. 	Error
M307	Decay compensation	Error during decay compensation (disabled during casting - factory settings).	<ul style="list-style-type: none"> ▶ Contact service. 	Error
M308	Auto Calibration	Error in the automatic calibration process (only for ECcast)	<ul style="list-style-type: none"> ▶ Contact service. 	Error

8.3.4 Application Extension

Code	Text	Description	Correction	Class
M401	Level CPS not monotonous	Calibration curve for steel level is not monotonous.	<ul style="list-style-type: none"> ▶ Conduct a new complete calibration or manually correct error in the calibration curve. 	Warning
M402	Powder CPS not monotonous	Calibration curve for powder level is not monotonous.	<ul style="list-style-type: none"> ▶ Conduct a new complete calibration with increased read-in time or manually correct if a single small error. 	Warning
M403	Background too high	Detector background value is higher than the smallest calibration point.	<ul style="list-style-type: none"> ▶ Check detector background value. ▶ Contact service. 	Warning
M404	Calibration corrupted	The calibration table for the powder-level calculation is inconsistent.	<ul style="list-style-type: none"> ▶ Conduct a new complete calibration. 	Warning

8.3.5 Detector Control

Code	Text	Description	Correction	Class
M501	No detector found	No compatible detector found.	<ul style="list-style-type: none"> ▶ Connect a compatible detector. ▶ Ensure the correct cabling is in place. ▶ Carry out software update. ▶ Contact service. 	Error
M502	Detector communication	Communication error - Disruption on the line.	<ul style="list-style-type: none"> ▶ Ensure the correct connection of the screen. ▶ Replace cable. ▶ Contact service. 	Warning
M503	Detector internal error	Detector in warning status (Error details and confirmation in the error menu).	<ul style="list-style-type: none"> ▶ Operating Instructions detector or <i>ECcast</i> system 	Error
M504	Detector internal warning	Detector in warning status (Error details and confirmation in the error menu).	<ul style="list-style-type: none"> ▶ Refer to the manual for the corresponding detector. 	Warning
M505	Detector temp too high	Detector temperature is/was too high.	<ul style="list-style-type: none"> ▶ Ensure sufficient cooling 	Warning
M506	Detector Raw Value	Variation discovered between the analogue and the digital pulse lines	<ul style="list-style-type: none"> ▶ Check cabling. ▶ Contact service. 	Error

8.3.6 Process Connection

Code	Text	Description	Correction	Class
M701	Current output	Faulty current output on the basic module.	<ul style="list-style-type: none"> ▶ Calibrate current output. ▶ Contact service. 	Warning
M702	Current output loop open	Current output on the basic module not closed.	<ul style="list-style-type: none"> ▶ Check cabling on current output side. 	Warning
M801	Current output	Current output faulty on extension module.	<ul style="list-style-type: none"> ▶ Calibrate current output. ▶ Contact service. 	Warning
M802	Current output loop open	Current output on the extension module not closed.	<ul style="list-style-type: none"> ▶ Check cabling on current output side. 	Warning
M803	Temp sensor	Temperature sensor on the extension module failed. Hardware error.	<ul style="list-style-type: none"> ▶ Contact service. 	Warning
M804	Current output	Current output 3 is erroneous	<ul style="list-style-type: none"> ▶ Contact service. 	Warning
M805	Current loop 3 open	Current output 3 is not closed, no current flowing.	<ul style="list-style-type: none"> ▶ Contact service. 	Warning
M901	Temp sensor	Temperature sensor on the fieldbus module failed. Hardware error.	<ul style="list-style-type: none"> ▶ Contact service. 	Warning
M902	Fieldbus setup	Error during the fieldbus module set-up process. Hardware error.	<ul style="list-style-type: none"> ▶ Contact service. 	Error
M903	Fieldbus Parameter	Error during parameter exchange with the fieldbus module. Hardware error.	<ul style="list-style-type: none"> ▶ Contact service. 	Warning
M904	Fieldbus module error	Internal fieldbus module error Hardware error	<ul style="list-style-type: none"> ▶ Contact service. 	Error
M905	Fieldbus module error	Internal serious exception in fieldbus module. Hardware error.	<ul style="list-style-type: none"> ▶ Contact service. 	Error
M906	No fieldbus	Fieldbus module has not found a master.	<ul style="list-style-type: none"> ▶ Check connection with the fieldbus master. ▶ Ensure the correct installation of the fieldbus module. 	Warning

9 Maintenance

In the maintenance chapter, the installation of modules, the replacing of fuses and the cleaning of the EVU are described.

9.1 Installation / Exchange of Modules

DANGER



Danger to life from electric shock!

Exposed live parts in the device interior.

- ▶ Installation may only be carried out by a qualified electrician.
- ▶ Installation 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!

- ▶ Install the modules in the correct card slots.
- ▶ Please always observe the prescribed sequence when installing modules.

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
- An existing measurement channel is to be supplemented with an extension and/or fieldbus module
- A defective module is to be replaced
- A software update is to be carried out

For each of the four channels of the EVU, the following modules can be installed:

- Basic module
- Extension module
- Fieldbus module

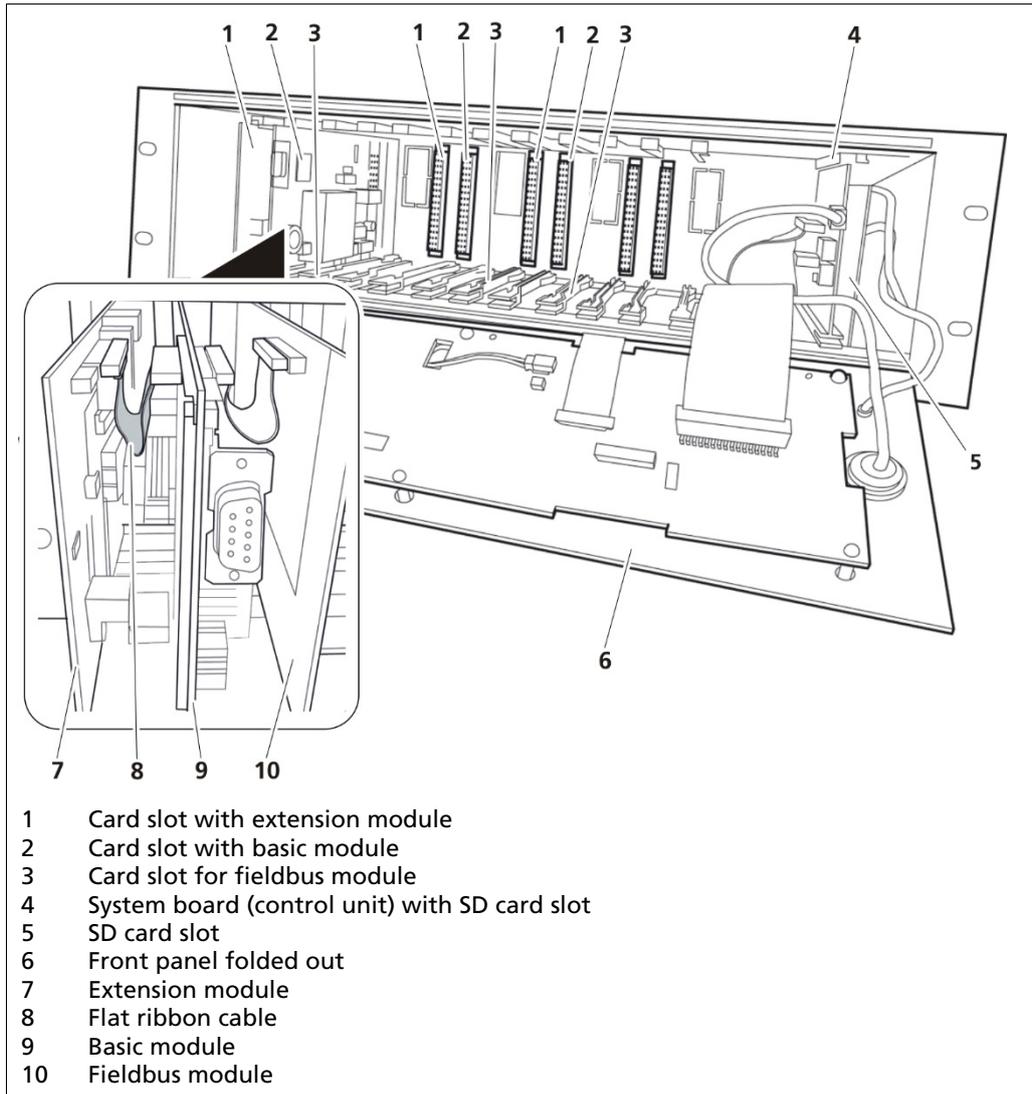


Fig. 80 Front view an open EVU

9.1.1 Installation of the Basic Module/Extension Module

NOTICE

**Damage to the device! Short circuit!**

- ▶ Install the module in the correct card slot!
- ▶ Please always observe the prescribed sequence when installing modules!

IMPORTANT



- ▶ If an extension module is to be installed, it must be connected with the basic module via the flat ribbon cable before the installation.
- ▶ The slots are labelled with an adhesive strip with the module name on.

1. Disconnect the EVU voltage.
2. Loosen the screws (Fig. 10, Item 2) on the front panel.
3. Fold the front panel down.
4. Connect the extension module and the basic module with a flat ribbon cable before installation (included in delivery contents) (Fig. 78, Item 8).
5. Push in the extension module, basic module, and fieldbus module back again at the same time until they have clicked into place.
6. Fold the front panel up again.
7. Tighten the screws.
8. Connect all the connection cables to the rear side.
9. Switch on the EVU.
 - ▶ The installation is complete.

9.1.2 Installation of the Fieldbus Module

NOTICE

**Damage to the device!**

Short circuit

- ▶ Install the module in the correct card slot!
- ▶ Please always observe the prescribed sequence when installing modules!

NOTICE

**Device is not recognized! Limited range of functions!**

- ▶ Carry out an EVU software update before installing the fieldbus module if the control unit software version is less than version 1.0.3.

IMPORTANT



- ▶ If an **extension module** is to be installed, it must be connected with the basic card via the flat ribbon cable **before** the installation.
- ▶ The slots are labelled with an adhesive strip with the module name on.

1. Disconnect the EVU voltage.
2. Loosen the screws (Fig. 10, Item 2).
3. Fold the front panel down.
4. Remove any already-installed modules of the relevant measurement channel

before installing the fieldbus module (Fig. 78).

5. Remove the pre-cut metal cover on the rear side of the housing (Fig. 79, Item 1). The cover is already punched out and is held at four points. Loosen the hold points with light pressure (e.g. with a screw driver).

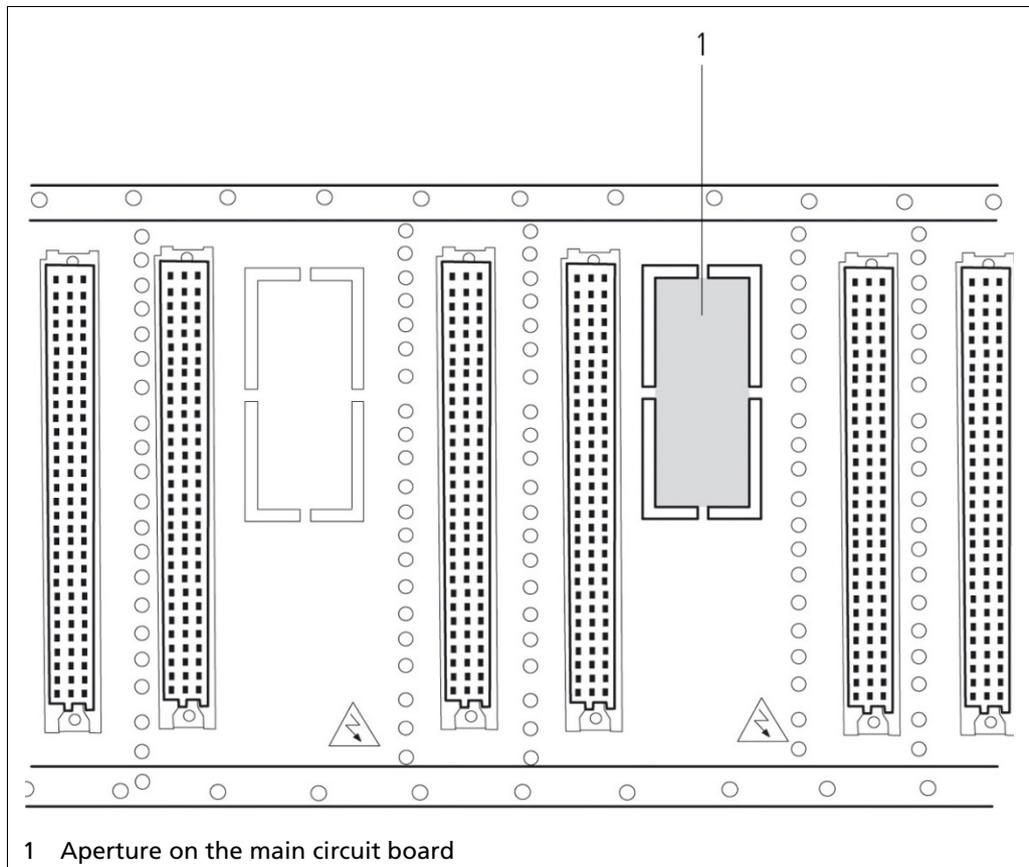


Fig. 81 EVU LB 452, main circuit board

6. Separate and remove the four hold points of the aperture on the pre-punched, green main circuit board with a wire cutter.
 7. Connect the module with the flat ribbon cable again (included in delivery contents) (Fig. 70, Item 2).
 8. Push in the basic module, fieldbus module and extension module back again **at the same time** until they have clicked into place.
 9. Fold the front panel up again.
 10. Tighten the screws.
 11. Connect all the connection cables to the rear side.
 12. Switch on the EVU.
 13. Install the GSD file in the control centre.
- The installation is complete.

9.2 Replacing of Fuses

NOTICE



Damage to the device! Short circuit!

The modules can be damaged if the wrong fuses are used.

- ▶ Only use fuses which correspond to the fuses on the modules.

Two different types of fuses are used in the EVU. These fuse the individual modules and mains inlets.

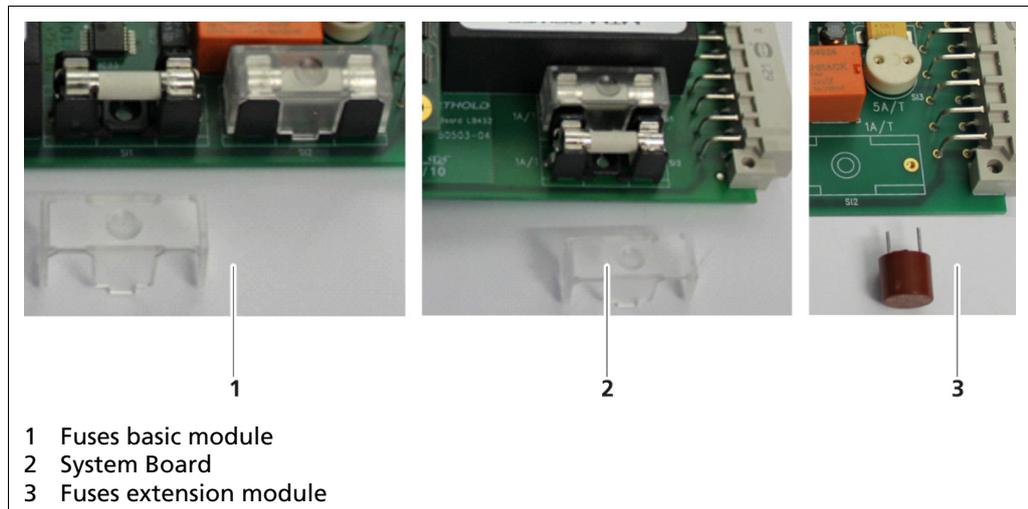


Fig. 82 Fuses

Basic module

The two mains fuses Si1 and Si2 on the basic module fuse the current input. If there is a defect in one of the two fuses, no signal can be transmitted over the measurement channels.

The 5 A fuse Si3 fuses the error relay. If there is a defect in the fuses, the error relay does not work

System board

The two mains fuses Si1 and Si2 on the system board fuse the power supply unit.

If there is a defect in the fuses, no power is supplied to the EVU.

Extension module

The two 5 A, fuses Si3 and Si4, fuse both alarm relays.

If there is a defect in the fuses, the alarm relay does not work.

9.2.1 Replacing of Basic Module Fuse

1. Disconnect the EVU voltage.
2. Loosen the three screws on the front panel (Fig. 10, Item 2).
3. Fold the front panel down.
4. Pull out the basic module and if needed the extension module and/or fieldbus module (Fig. 9, Item 3) carefully.
5. Remove the flat ribbon cable, if needed, (Fig. 9, Item 2) from the extension module and/or the fieldbus module
6. Pull carefully on the fuse (Fig. 81, Item 1) until the top part is fully removed.
7. Remove the plastic covering from the fuses (Fig. 81, Item 2).
8. Take the fuses out carefully.

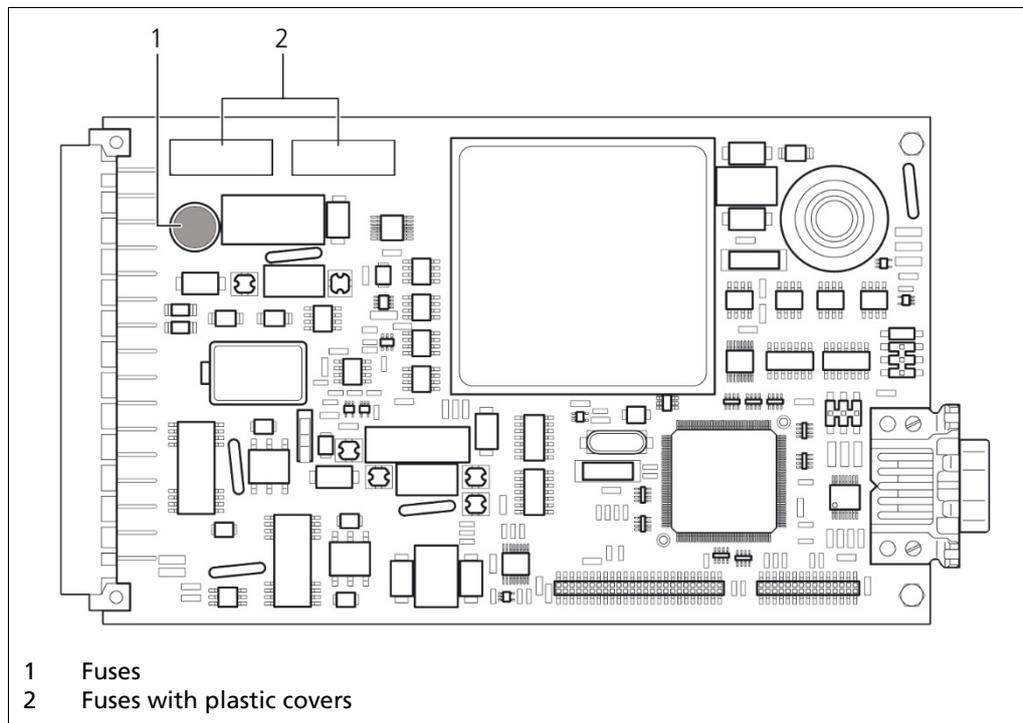


Fig. 83 Basic module fuses

9. Fit the new fuses into the basic module with the contacts and the cavities provided.
10. Connect the basic module if needed to the extension or fieldbus module with flat ribbon cables.
11. Push the module into the EVU again.
12. Fold the front panel up again.
13. Tighten the screws again.
 - ▶ The exchange is complete.

9.2.2 Replacing of Extension Module Fuse

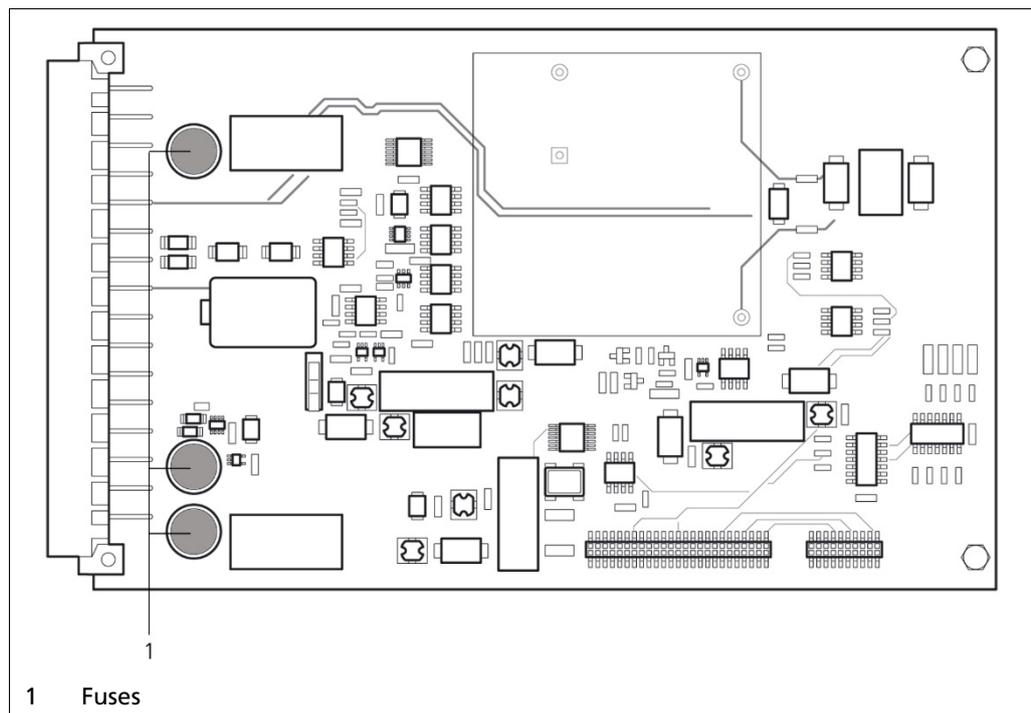


Fig. 84 Extension Module Fuses

1. Disconnect the EVU voltage.
 2. Loosen the three screws on the front panel (Fig. 10, Item 2).
 3. Fold the front panel down.
 4. Pull the extension module and the basic module out (Fig. 9, Item 3) carefully.
 5. Remove the flat ribbon cable (Fig. 9, Item 2) from the extension module and the basic module.
 6. Pull carefully on the fuses (Fig. 82, Item 1) until the top part is fully removed.
 7. Fit the new fuses into the extension module with the contacts and the cavities provided.
 8. Connect the extension module to the basic module again with the flat ribbon cable.
 9. Push the module into the EVU again.
 10. Fold the front panel up again.
 11. Tighten the screws again.
- ▶ The exchange is complete.

9.2.3 Cleaning

NOTE**Unintentional response!**

When cleaning the touch screen, an unintentional response in the controller can be triggered by touching keys.

- ▶ Switch the EVU off before cleaning to prevent unintentional responses.

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.

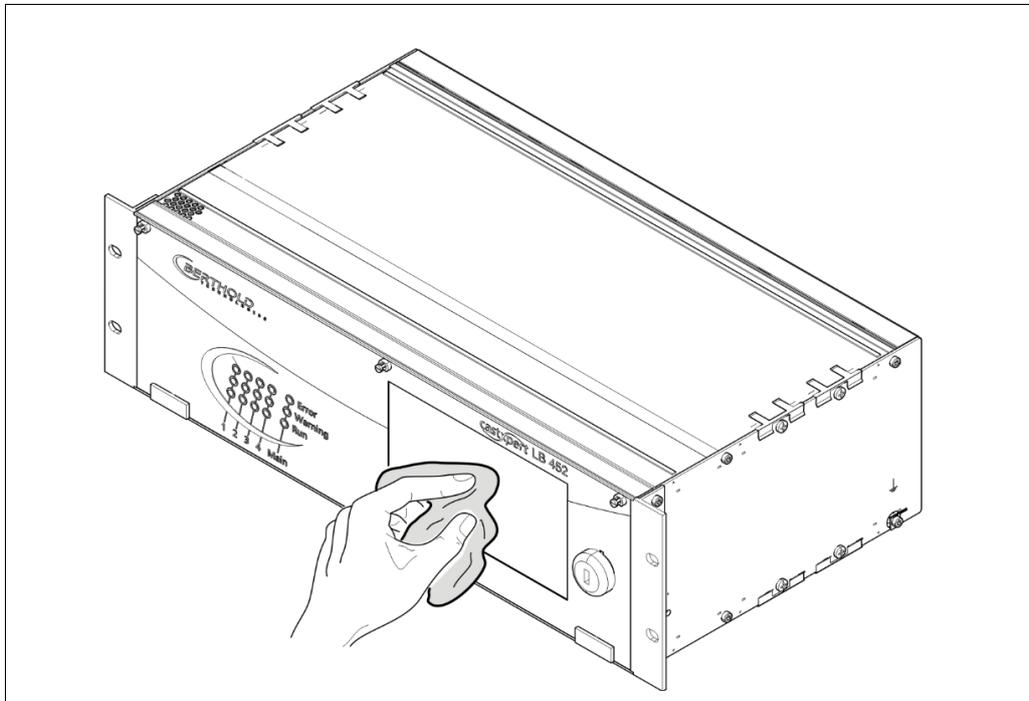


Fig. 85 Cleaning

10 Decommissioning

DANGER



Danger to life from electric shock!

- ▶ All relevant safety regulations must be observed.
- ▶ Decommissioning may only be carried out by qualified electricians.
- ▶ 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.

Follow this sequence for decommissioning:

1. Remove all cables from the rear side of the housing.
2. Remove the connection cables between the EVU and the detector.
3. Remove all externally connected devices (e.g. USB flash drive, SD card, etc.).
4. Dismount the EVU from the 19" rack.

10.1 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.

Modifications due to technical advancement reserved.

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Mat No. 47344BA2



LB 452 Evaluation Unit
LB 452 Auswerteeinheit
Technical Information
Technische Information

47344T1
Rev. No.: 05, 05/2022

1. Mould Level Measurement System

The castXpert LB 452 is the mold level measuring system that has been setting standards for years. It provides accurate and reliable measurements and ensures optimal control of the continuous casting process due to the short cycle time of 5ms.

- Extremely fast
- Highest safety
- (designed according to IEC 61508 (SIL Standard))
- Highest accuracy
- Easy to use, intuitive, multi-language interface
- Automatic start-up
- Handles up to 4 measuring channels
- Monitored current output

1. Gießspiegelmessung

Das castXpert LB 452 ist das Gießspiegelmesssystem, das seit Jahren Maßstäbe setzt. Es liefert genaue und zuverlässige Messungen und gewährleistet aufgrund der kurzen Zykluszeit von 5 ms eine optimale Steuerung des Stranggussprozesses.

- Einfach zu bedienende, intuitive Benutzeroberfläche
- Höchste Sicherheit und robuste Messung
- Unterstützt automatischen Anguss
- Verarbeitet bis zu 4 Messkanäle pro Gerät
- Extrem schnelle Signal-Verarbeitung und Reaktionszeit
- Höchste Sicherheit (ausgelegt nach IEC 61508 (SIL-Standard))
- Höchste Genauigkeit

2. Technical Data

2. Technische Daten

2.1. Evaluation Unit

2.1. Auswerteeinheit

Mechanical Data <i>Mechanische Daten</i>	
Frame <i>Gehäuse</i>	19" Rack, 3 HE (operating unit with 7 inch colour display and touch screen) <i>19" Rack, 3 HE (Bedieneinheit mit 7 Zoll Farbdisplay und Touchscreen)</i>
Max. Assembly <i>Max. Bestückung</i>	4 measurement channels <i>4 Messkanäle</i>
Weight <i>Gewicht</i>	approx. 4 - 6 kg depending on assembly <i>ca. 4 - 6 kg je nach Bestückung</i>
Degree of protection <i>Schutzgrad</i>	IP 20
Connections <i>Anschlüsse</i>	<ul style="list-style-type: none"> • USB port for the connection of USB storage devices or external keyboard or mouse • Ethernet (RJ-45 standard socket) • Control unit operating voltage output (90-264 VAC, 50/60 Hz) • 4 operating voltage outputs (to provide voltage for measurement channels) <ul style="list-style-type: none"> • <i>USB-Port zum Anschluss von USB-Speichergeräten oder externer Tastatur oder Maus</i> • <i>Ethernet (RJ-45 Standardbuchse)</i> • <i>Betriebsspannungsausgang der Steuereinheit (90-264 VAC, 50/60 Hz)</i> • <i>4 Betriebsspannungsausgänge (zur Spannungsversorgung der Messkanäle)</i>
Operating temperature <i>Betriebstemperatur</i>	0 ... + 50 °C
Storage temperature <i>Lagertemperatur</i>	-20 ... +70 °C

2.2. Electrical Data Basic Module

2.2. Elektrische Daten Basismodul

Electrical Data, each Measurement Channel <i>Elektrische Daten, jeder Messkanal</i>	
Basic Module (required)	<p>CPU with separate power supply unit and connection (90-264 VAC, 50/60 Hz).</p> <p>Detector connection: 4-20 mA current output (fill level) with option of activating current output signal monitoring (can be switched on and off):</p> <ul style="list-style-type: none"> • Potential-free • Switchable source (max. Impedance 500 Ω) or sink (max. DC 24 V, 500 Ω; min. DC 12 V, 250 Ω) mode • Adjustable fault current in the event of an error: 2 mA, 22 mA or freezing of last value <p>2 digital inputs:</p> <ul style="list-style-type: none"> • Floating, for external empty and full adjustment <p>Relay output for error signalling:</p> <ul style="list-style-type: none"> • Single pole double throw (SPDT), max. AC 33 V, DC 46 V, 5 A, non-inductive <p>Fuses:</p> <ul style="list-style-type: none"> • 2 x (Si1 and Si2) 1A/T/250 V according to IEC60127-2/1 • 1 x (Si3) 5A/T/250 V according to IEC60127-3
Basismodul (erforderlich)	<p><i>CPU mit separatem Netzteil und Anschluss (90-264 VAC, 50/60 Hz).</i></p> <p><i>Detektoranschluss:</i> <i>4-20 mA Stromausgang (Füllstand) mit Option zur Aktivierung der Stromausgangssignalüberwachung (ein- und ausschaltbar):</i></p> <ul style="list-style-type: none"> • <i>Potentialfrei</i> • <i>Umschaltbarer Source- (max. Impedanz 500 Ω) oder Sink- (max. DC 24 V, 500 Ω; min. DC 12 V, 250 Ω) Modus</i> • <i>Einstellbarer Fehlerstrom im Fehlerfall: 2 mA, 22 mA oder Einfrieren des letzten Wertes</i> <p><i>2 digitale Eingänge:</i></p> <ul style="list-style-type: none"> • <i>Floating, für externen Leer- und Vollabgleich</i> <p><i>Relaisausgang zur Fehlersignalisierung:</i></p> <ul style="list-style-type: none"> • <i>Single Pole Double Throw (SPDT), max. AC 33 V, DC 46 V, 5 A, nicht induktiv</i> <p><i>Sicherungen:</i></p> <ul style="list-style-type: none"> • <i>2 x (Si1 und Si2) 1A/T/250 V gemäß IEC60127-2/1</i> • <i>1 x (Si3) 5A/T/250 V gemäß IEC60127-3</i>

2.3. Electrical Data Extension Module

2.3. Elektrische Daten Erweiterungsmodul

Electrical Data, each Measurement Channel <i>Elektrische Daten, jeder Messkanal</i>	
Extension Module (Option)	<p>4-20 mA current output with option of activating current output signal monitoring:</p> <ul style="list-style-type: none"> • potential-free • Switchable source (max. Impedance 500 Ω) or sink (max. DC 24 V, 500 Ω; min. DC 12 V, 250 Ω) mode • Adjustable fault current in the event of an error: 2 mA, 22 mA or freezing of last value <p>Can be configured for:</p> <ul style="list-style-type: none"> • Fill level (additional time constant, freely adjustable) • Detector temperature • Detector count <p>2 digital inputs:</p> <ul style="list-style-type: none"> • potential-free, for ext. Choice of up to 4 calibration curves <p>2 relay outputs for alarm signalling:</p> <ul style="list-style-type: none"> • Alarm relay 1: Single pole double throw (SPDT) • Alarm relay 2: Single pole single throw, normally open (SPST NO) • Max. of 33 VAC, 46 VDC, 5 A for each, non-inductive <p>Can be configured for alarm signals:</p> <ul style="list-style-type: none"> • Max. level • Min. level • Detector temperature • Digital input confirmation <p>Pulse output:</p> <ul style="list-style-type: none"> • Detector pulses looped, max. 12 V amplitude <p>Fuses:</p> <ul style="list-style-type: none"> • 2 x (Si3 and Si4) 5A/T/250 V according to IEC60127-3 • 1 x (Si5) 50 mA/T/250V according to IEC60127-3
Erweiterungsmodul (Option)	<p><i>4-20 mA Stromausgang mit Option zur Aktivierung der Stromausgangssignalüberwachung:</i></p> <ul style="list-style-type: none"> • <i>potentialfrei</i> • <i>Umschaltbare Quelle (max. Impedanz 500 Ω) oder Senke (max. DC 24 V, 500 Ω; Mindest. DC 12 V, 250 Ω) Modus</i> • <i>Einstellbarer Fehlerstrom im Fehlerfall: 2 mA, 22 mA oder Einfrieren des letzten Wertes</i> <p><i>Konfigurierbar für:</i></p> <ul style="list-style-type: none"> • <i>Füllstand (zusätzliche Zeitkonstante, frei einstellbar)</i> • <i>Detektortemperatur</i> • <i>Detektoranzahl</i>

	<p><i>2 digitale Eingänge:</i></p> <ul style="list-style-type: none">• <i>potentialfrei, für ext. Auswahl von bis zu 4 Kalibrierkurven</i> <p><i>2 Relaisausgänge zur Alarmsignalisierung:</i></p> <ul style="list-style-type: none">• <i>Alarmrelais 1: Einpoliger Doppelhub (SPDT)</i>• <i>Alarmrelais 2: Einpoliger Einfachhub, Schließer (SPST NO)</i>• <i>max. 33 VAC, 46 VDC, je 5 A, nicht induktiv</i> <p><i>Konfigurierbar für Alarmsignale:</i></p> <ul style="list-style-type: none">• <i>max. Niveau</i>• <i>Mindest. Niveau</i>• <i>Detektortemperatur</i>• <i>Bestätigung der digitalen Eingabe</i> <p><i>Impulsausgang:</i></p> <ul style="list-style-type: none">• <i>Melderimpulse durchgeschleift, max. 12 V Amplitude</i> <p><i>Sicherungen:</i></p> <ul style="list-style-type: none">• <i>2 x (Si3 und Si4) 5A/T/250 V gemäß IEC60127-3</i>• <i>1 x (Si5) 50 mA/T/250V gemäß IEC60127-3</i>
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2.4. Electrical Data Bus Module

2.4. Elektrische Daten Busmodul

Electrical Data, each Measurement Channel <i>Elektrische Daten, jeder Messkanal</i>	
Bus Module (Option)	<p>GSD file is provided. Transmission of the following data:</p> <ul style="list-style-type: none"> • Cyclic output data: Fill level, detector value (CPS) • Detector temperature, currently selected calibration curve • system status RUN/ERROR/WARNING/STOP) • Cyclic input data: Error confirmation, calibration curve, full and empty adjustment <p>Profibus DP:</p> <ul style="list-style-type: none"> • Complete Profibus DPV1 Slave according to IEC 61158 • Automatic Profibus baud rate recognition (9,600 bit/s - 12 Mbit/s) • Standardised Profibus RS-485 port • Integrated isolation with DC/DC converter and opto-coupler • Profibus connection via 9-pole D-Sub socket <p>Profinet IO:</p> <ul style="list-style-type: none"> • Complete Profinet IO device implementation (Slave) with RT classification • Fast Ethernet transfer 100 MBit/s in full duplex operation • Integrated isolation • Profinet IO connection via RJ45 standard socket
Busmodul (Option)	<p><i>GSD-Datei wird zur Verfügung gestellt. Übermittlung folgender Daten:</i></p> <ul style="list-style-type: none"> • <i>Ausgabe zyklischer Daten: Füllstand, Detektorwert (CPS), Detektortemperatur, aktuell ausgewählte Kalibrierkurve, Fehlernummer und Systemstatus (RUN/ERROR/WARNING/STOP)</i> • <i>Eingabe zyklischer Daten: Fehlerbestätigung, Kalibrierkurve, Voll- und Leerabgleich</i> <p><i>Profibus DP:</i></p> <ul style="list-style-type: none"> • <i>Kompletter Profibus-DPV1-Slave nach IEC 61158</i> • <i>Automatische Profibus-Baudratenerkennung (9.600 bit/s - 12 Mbit/s)</i> • <i>Standardisierte Profibus-RS-485-Schnittstelle</i> • <i>Integrierte Potentialtrennung mit DC/DC-Wandler und Optokoppler</i> • <i>Profibus-Anschluss über 9-polige D-Sub-Buchse</i> <p><i>Profinet IO</i></p> <ul style="list-style-type: none"> • <i>Komplette Profinet-IO-Device-Implementierung (Slave) mit RT-Klassifikation</i> • <i>Fast-Ethernet-Übertragung 100 MBit/s im Full-Duplex-Betrieb</i> • <i>Integrierte Potentialtrennung</i> • <i>Profinet-IO-Anschluss über RJ45-Standardbuchse</i>

3. Software

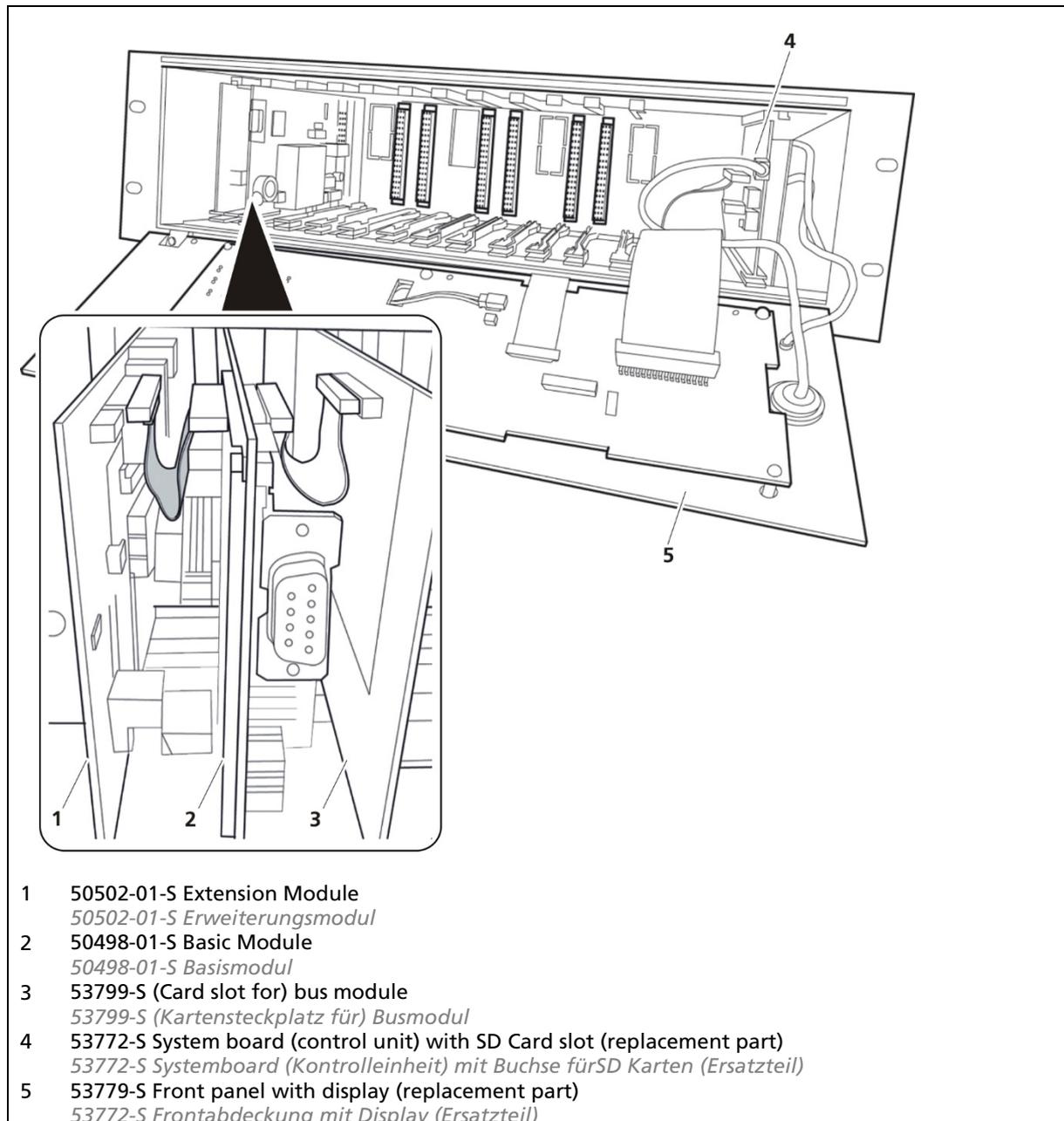
3. Software

Specification Spezifikation	
Operating languages <i>Betriebssprachen</i>	Bulgarian, Chinese (option), German, English, French, Italian, Korean (option), Portuguese, Romanian, Russian, Spanish, Czech, Hungarian <i>Bulgarisch, Chinesisch (Option), Deutsch, Englisch, Französisch, Italienisch, Koreanisch (Option), Portugiesisch, Rumänisch, Russisch, Spanisch, Tschechisch, Ungarisch</i>
Cycle time <i>Zykluszeit</i>	0.005 s (5 ms) <i>0,005 s (5 ms)</i>
Two time constants for filtering the raw signal <i>Zwei Zeitkonstanten zur Filterung des Rohsignals</i>	Lower measurement range: Fast reaction Upper measurement range: Calm signal Change-over point freely definable <i>Unterer Messbereich: Schnelle Reaktion Oberer Messbereich: Ruhiges Signal Umschaltpunkt frei definierbar</i>
Plausibility checks for avoiding adjustment errors <i>Plausibilitätskontrolle zur Vermeidung von Abgleichfehlern</i>	Minimum empty/full count rate ratio Max. deviation from last adjustment <i>Minimales Verhältnis Leer-/Vollzählrate Max. Abweichung zum letzten Abgleich</i>
Calibration <i>Kalibrierung</i>	Stores up to 8 different calibrations Exact or multi-point calibration as frequency polygon (e.g. for AOS-source) Two adjustment modes Factoring in of the natural background radiation Access to detector control and service (depending on detector connected) <i>Bis zu 8 unterschiedliche Kalibrierungen Gerade oder Mehrpunktkalibrierung als Polygonzug (z.B. für AOS-Strahler) Zwei Abgleichmodi Berücksichtigung der natürlichen Hintergrundstrahlung Zugriff auf Detektorsteuerung und -service (je nach angeschlossenem Detektor)</i>
Testmode <i>Testmodus</i>	Current outputs, digital in/outputs, calibration Password protection against unauthorised changes to the settings <i>Stromausgänge, Digitale Ein- und Ausgänge, Kalibrierung Passwortschutz vor unbefugter Änderung der Einstellungen</i>

Data log on internal storage (SD) card or via Ethernet	Separately for each measurement channel Smallest log interval: 0.5 s Date/time, pulses, fill level, detector temperature, error status, Index of the active calibration curve
<i>Datenlog auf interner Speicherkarte (Option) oder per Ethernet</i>	<i>Separat für jeden Messkanal Kleinstes Loginterval: 0,5 s Datum/Uhrzeit, Impulse, Füllstand, Detektortemperatur, Fehlerstatus, Index der aktiven Kalibrierkurve</i>
Export of data to USB storage device	Data log, error log, change log. Export and import of all measurement channel settings using USB storage device. Software update (control unit, measurement channel, detector) using USB storage device.
<i>Datenexport auf USB-Speichermedium</i>	<i>Datenlog, Fehlerlog, Änderungslog. Export und Import aller Messkanaleinstellungen mittels USB-Speichermedium Softwareupdates (Kontrolleinheit, Messkanal, Detektor) mittels USB-Speichermedium.</i>

4. LB 452 Parts

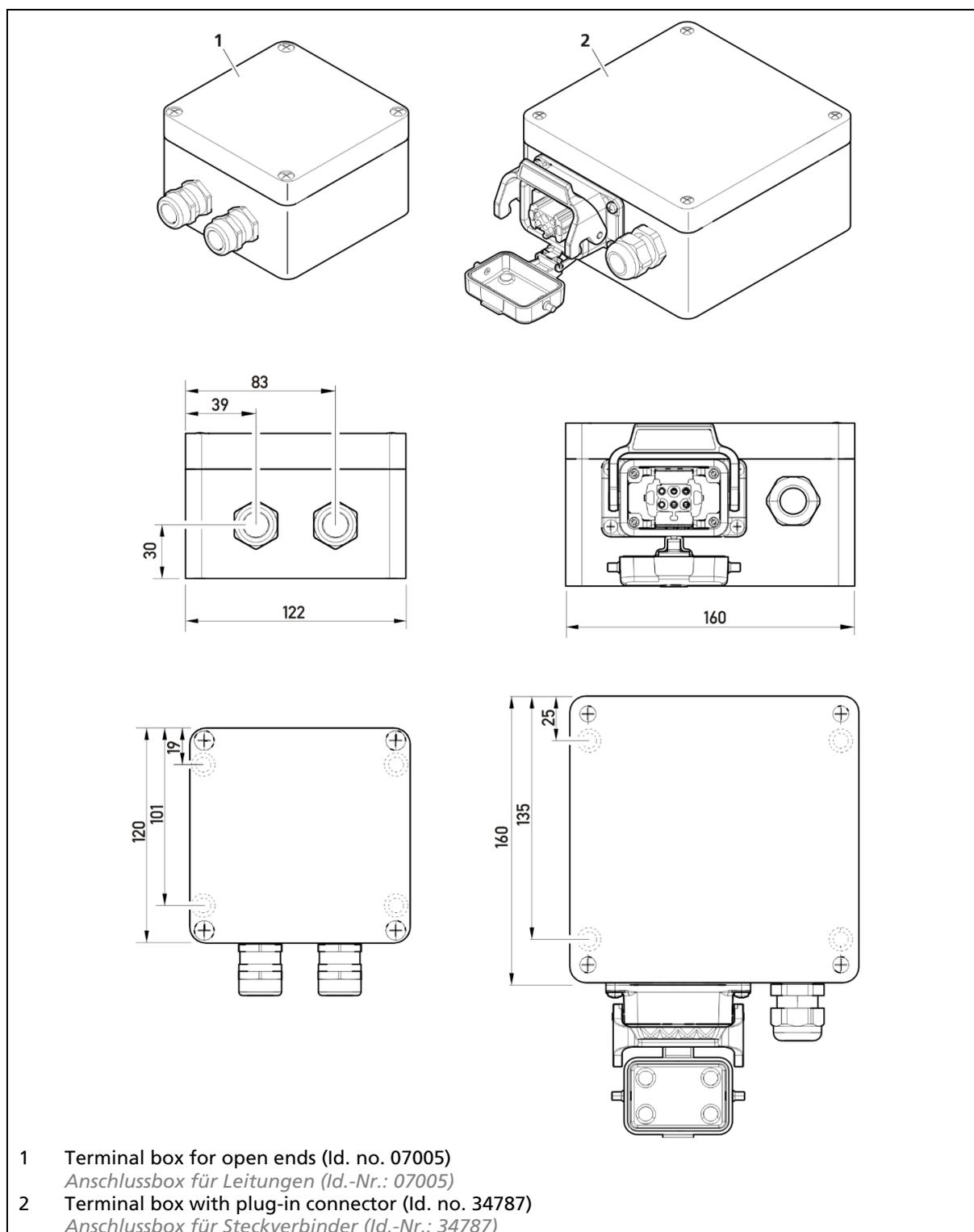
4. LB 452 Teile



TI-Abb. 1 Parts
Teile

5. Terminal Box

5. Anschlussbox



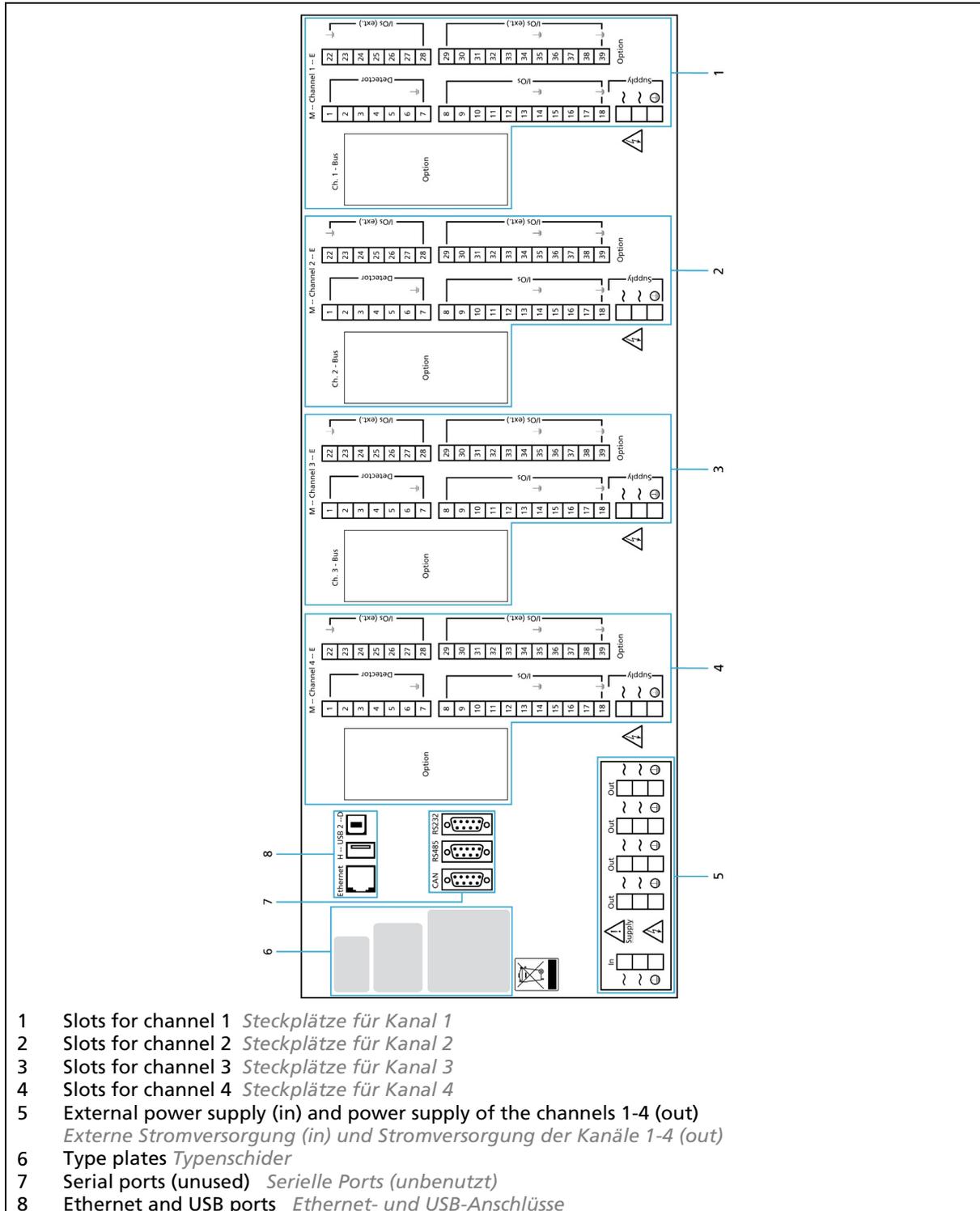
TI-Abb. 2 Terminal box
Anschlussbox

6. LB 452 Connections

6. LB 452 Anschlüsse

6.1. Back View

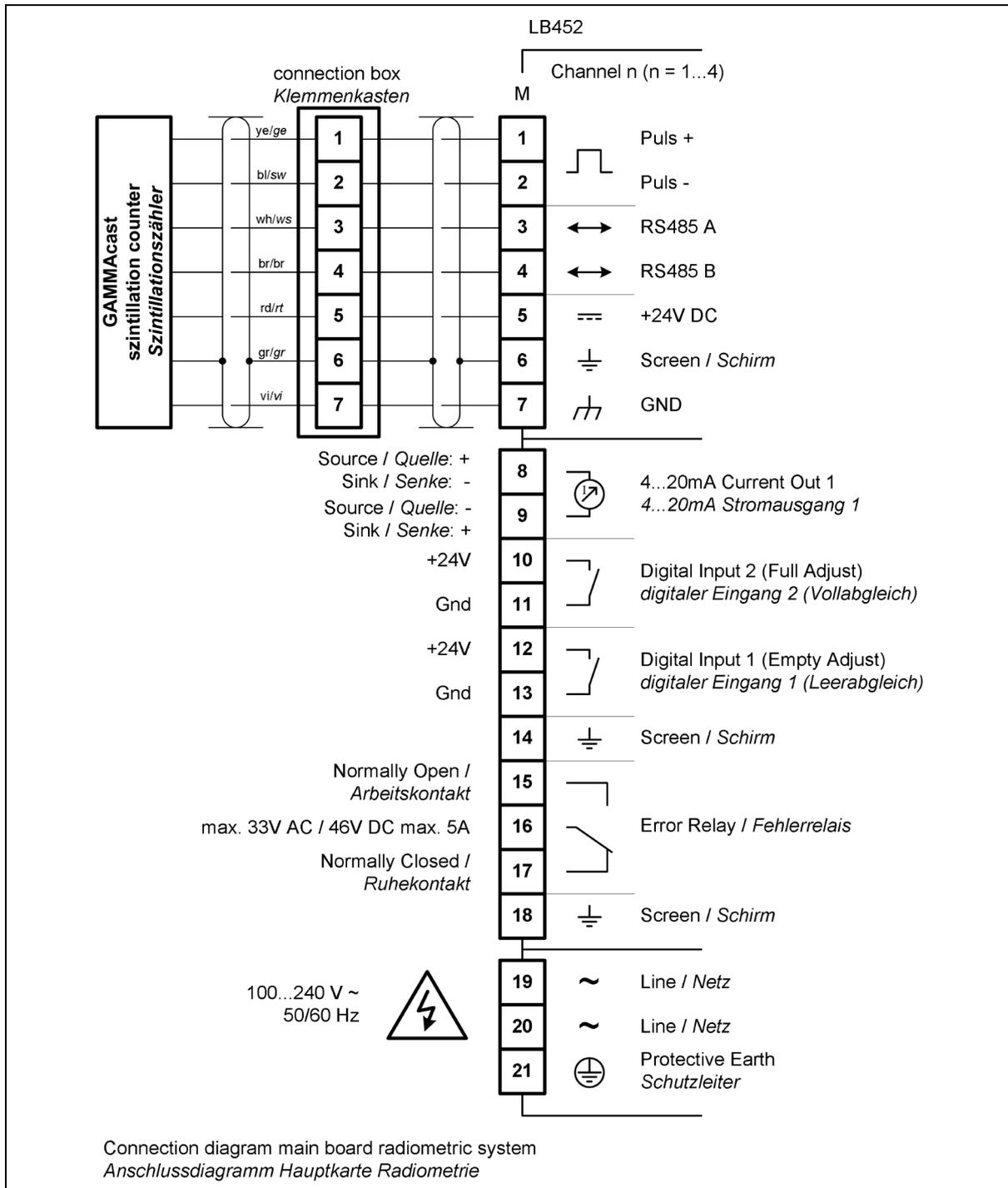
6.1. Rückansicht



TI-Abb. 3 Back view
Rückansicht

6.2. Measurement Channel Basic Module

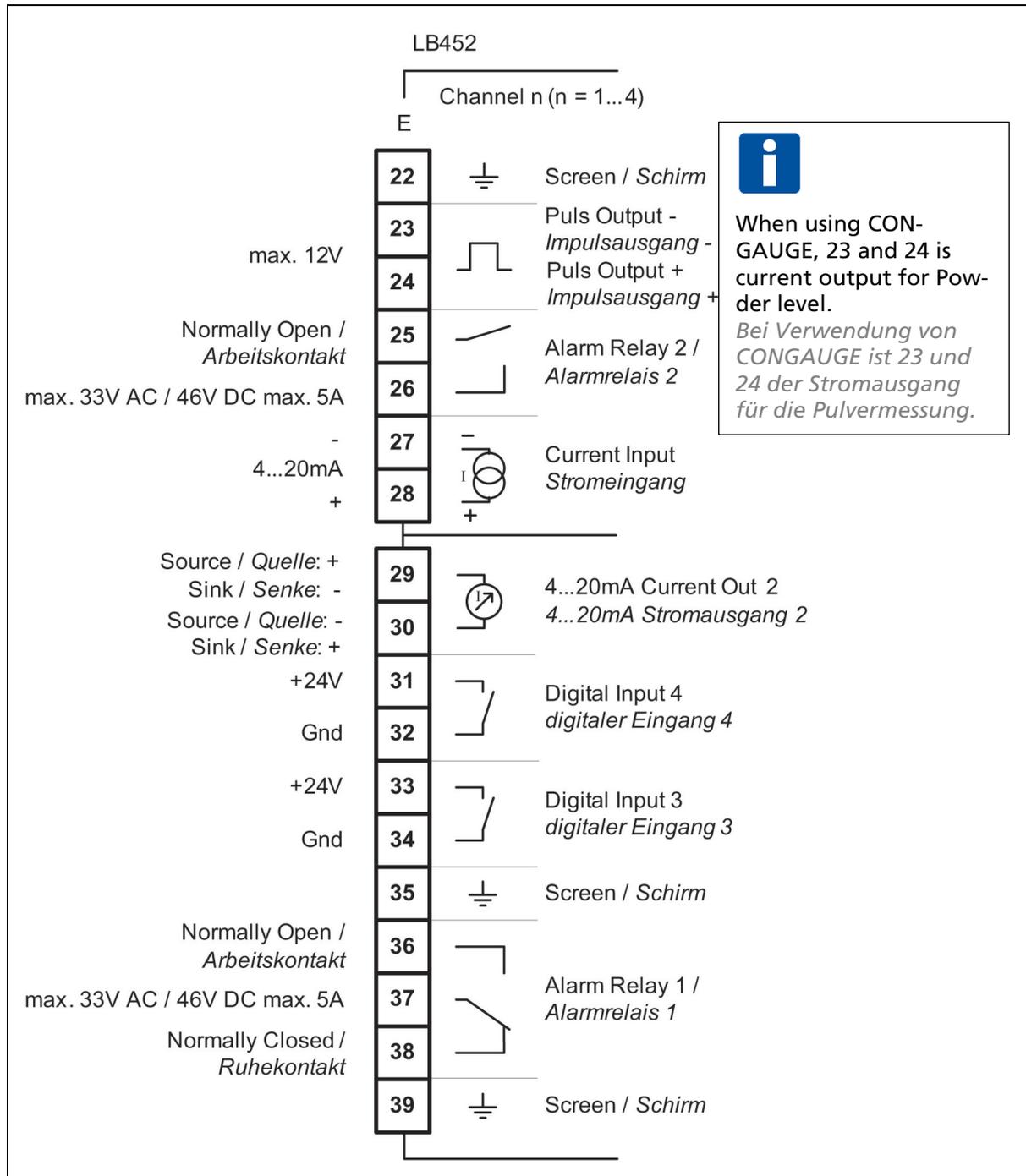
6.2. Messkanal Basismodul



TI-Abb. 4 Measurement Channel Basic Module
Messkanal Basismodul

6.3. Channel Extension Module

6.3. Messkanal Erweiterungsmodul



TI-Abb. 5 Channel Extension Module
Messkanal Erweiterungsmodul

6.4. Data definition Profibus DP

6.4. Datendefinition Profibus DP

Cyclical output data

Zyklische Ausgabedaten

Name of Variable <i>Name der Variable</i>		Description <i>Beschreibung</i>	Type <i>Typ</i>	Size <i>Größe</i>
Level <i>Gießspiegel</i>		Actual mould level Unit: % / mm / inch (selectable) <i>Aktueller Gießspiegel</i> <i>Einheit: % / mm / inch (auswählbar)</i>	Float	32 Bit
Only in CONGAUGE mode Nur im CONGAUGE Modus	Steel Level <i>Stahl Füll- stand</i>	Actual mould level without powder influ- ence; Unit: % / mm / inch (selectable) <i>Tatsächlicher Füllstand ohne Pulverein- fluss; Einheit: % / mm / Zoll (wählbar)</i>	Float	32 Bit
	Powder Level <i>Gießpul- verspiegel</i>	Actual powder level; Unit: % / mm / inch (selectable) <i>Tatsächlicher Gießpulverspiegel-Füllstand;</i> <i>Einheit: % / mm / Zoll (wählbar)</i>	Float	32 Bit
Detector Value <i>Detektor-Rohwert</i>		Actual detector value Unit: GAMMAcast/CONGAUGE - counts per second (CPS); ECcast – milli Volts (mV) <i>Aktueller Detektor-Rohwert</i> <i>Einheit: GAMMAcast/CONGAUGE - Impulse</i> <i>pro Sekunde (CPS); ECcast – Millivolt (mV)</i>	Float	32 Bit
Detector Temperature <i>Detektortemperatur</i>		Actual detector temperature Unit: °C / °F (selectable) <i>Aktuelle Dektortemperatur</i> <i>Einheit: °C / °F (auswählbar)</i>	Float	32 Bit
Actual Calibration In- dex <i>Kalibrier-index</i>		Index of actual selected calibration set- tings [0...7] (real number) (Calibration curve, alarm levels, time con- stant, etc.) <i>Derzeitig verwendete Kalibrierung [0...7]</i> <i>(Dezimalzahl)</i> <i>(Kalibrierkurve, Alarmschwellen, Zeitkon- stante, usw.)</i>	Byte	8 Bit
System Status		Status of system. This field contains a bi- nary coded system information: Bits 0-2: System Main State Bit 0; 0x1 (1): RUN Bit 1; 0x2 (2): STOP Bit 2; 0x4 (4): ERROR Bit 3: Warning State	Un- signed Integer	32 Bit

<p>Systemstatus</p>	<p>Bit 3; 0x0 (0): NO WARNING Bit 3; 0x1 (1): WARNING Bits 4-11: Stop Condition Bit 4-11; 0x00 (0): Not in STOP state Bit 4; 0x01 (1): No Detector Bit 5; 0x02 (2): Detector Offline Bit 6;0x04 (4): Test Mode Bit 7;0x08 (8): Calibration running Bit 8;0x10 (16): Full Adjust running Bit 9;0x20 (32): Empty Adjust running Bits 12-19: Alarm Indicators Bit 12-19; 0x00 (0) No Alarm active Bit 12; 0x01 (1): Detector Temperature Bit 13; 0x02 (2): Level Low Bit 14; 0x04 (4): Level High Bit 15; 0x08 (8): Start Mode Bit 16; 0x10 (16): Trim Adjust Up in Progress [only ECcast] Bit 17; 0x20 (32): Trim Adjust Down in Progress [only ECcast] Bits 20-31: Error Number A 12 Bit unsigned integer number representing the number of the actual error. Error# < 1000: LB 452 error Error# > 1000: Detector error</p> <p><i>Systemstatus. Das Feld enthält binärkodierte Informationen:</i></p> <p><i>Bits 0-2: System Gesamtzustand</i> Bit 0; 0x1 (1): RUNIMESSUNG LÄUFT Bit 1; 0x2 (2): STOP Bit 2; 0x4 (4): ERROR/FEHLER</p> <p><i>Bit 3: Warnung</i> Bit 3; 0x0 (0): Keine WARNUNG Bit 3; 0x1 (1): WARNUNG</p> <p><i>Bits 4-11: Stop Bedingung</i> Bit 4-11; 0x00 (0): Nicht im STOP-Zustand Bit 4; 0x01 (1): Kein Detektor gefunden Bit 5; 0x02 (2): Detektor Offline Bit 6;0x04 (4): Test Modus Bit 7;0x08 (8): Kalibrierung aktiv Bit 8;0x10 (16): Vollabgleich aktiv Bit 9;0x20 (32): Leerabgleich aktiv</p> <p><i>Bits 12-19: Alarme</i> Bit 12-19; 0x00 (0) Kein Alarm aktiv Bit 12; 0x01 (1): Detektor Übertemperatur Bit 13; 0x02 (2): Min. Füllstand</p>		
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	<p>Bit 14; 0x04 (4): Max. Füllstand</p> <p>Bit 15; 0x08 (8): Anguss-Modus (Zeitkonstante)</p> <p>Bit 16; 0x10 (16): Trim Adjust Up läuft [nur ECcast]</p> <p>Bit 17; 0x20 (32): Trim Adjust Down läuft [nur ECcast]</p> <p>Bits 20-31: Fehlernummer</p> <p>Ein 12 Bit-Integer (ohne Vorzeichen) der die Fehlernummer des momentan vorliegenden Fehlers anzeigt</p> <p>Error# < 1000: LB 452-Fehler</p> <p>Error# > 1000: Detektorfehler</p>		
			136 Bit = 17 B

6.5. Cyclic Input Data (as of MU Software Version 1.6.0)

6.5. Zyklische Eingangsdaten (ab MU-Softwareversion 1.6.0)

Name of Variable <i>Name der Variable</i>	Description <i>Beschreibung</i>	Type <i>Typ</i>	Size <i>Größe</i>
Calibration Index <i>Kalibrier-index</i>	<p>Selection of calibration settings [0..7] (real number) (Calibration curve, alarm levels and time constants.)</p> <p><i>Auswahl der Kalibriereinstellungen [0..7] (Reelle Zahl)</i></p> <p><i>(Kalibrierkurve, Alarmschwellen und Zeitkonstanten.)</i></p>	Byte	8 Bit
Function Actuation <i>Funktion Betätigung</i>	<p>By writing a number in this field functions on the LB452 can be actuated (only one function a time):</p> <p>0x0 (0) Idle (do nothing)</p> <p>Bit 0; 0x1 (1): Empty Adjust</p> <p>Bit 1; 0x2 (2): Full Adjust</p> <p>Bit 2; 0x4 (4): Trim Adjust Up (One Step) [only ECcast]</p> <p>Bit 3; 0x8 (8): Trim Adjust Down (One Step) [only ECcast]</p> <p>Bit 4; 0x10 (16): Start Automatic Calibration [only ECcast]</p> <p>Bit 7; 0x80 (128): Acknowledge Actual Error</p> <p><i>Durch das Schreiben einer Zahl in dieses Feld können Funktionen des LB452 ausgelöst werden (jeweils nur eine Funktion):</i></p> <p><i>0x0 (0) Leerlauf (nichts tun)</i></p> <p><i>Bit 0; 0x1 (1): Leereinstellung</i></p>	Unsigned Integer	32 Bit

	<p><i>Bit 1; 0x2 (2): Vollständige Anpassung</i></p> <p><i>Bit 2; 0x4 (4): Trim Adjust Up (Ein Schritt) [nur ECcast]</i></p> <p><i>Bit 3; 0x8 (8): Trim Adjust Down (One Step) [nur EC-Cast]</i></p> <p><i>Bit 4; 0x10 (16): Automatische Kalibrierung starten [nur EC-Cast]</i></p> <p><i>Bit 7; 0x80 (128): Aktuellen Fehler quittieren</i></p>		
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7. Declaration of Conformity

7. EG Konformitätserklärung



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EC-Declaration of Conformity

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

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

Description: **Continuous Casting Level Measurement System
castXpert**

Type: **LB 452-XX**

	EC-Regulation and Reviews	Standards and Norms		
EMC	2004/108/EC	EN 61326-1 2006-05		
		EN 61000-3-2 2006		
		EN 61000-3-3 1995 +A1:2001 +A2:2005		
		EN 61000-4-2 1995 + A1:1998 + A2:2001		
		EN 61000-4-3 2002		
		EN 61000-4-4 2004		
		EN 61000-4-5 1995 +A1:2000		
		EN 61000-4-6 2003		
		EN 61000-4-8 1993 + A1:2000		
		EN 61000-4-11 2004		
		Namur NE21 2004		
		Low Voltage Directive	2006/95/EC	EN 61010 Part 1 2002-08

This declaration is issued by the manufacturer

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

released by

Dr. Wilfried Reuter
Technical Director
Bad Wildbad, 4th of May, 2010

Registergericht / Court of Registration
Persönlich haftende Gesellschafterin / Fully Fiable Associates
Registergericht / Court of Registration
Geschäftsführung / Management
USt.-Id-Nr. / VAT Reg. No.
Deutsche Steuernummer / German Tax No.
W.F.E.-Reg. No.

StuFigar: HRA 330991
BERTHOLD TECHNOLOGIES Verwaltungs-GmbH
StuFigar: HRB 331520
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Volksbank 75113 Pforzheim Konto/Account No. 957 004 (BLZ 666 900 60) SWIFT-BIC: VBPFDE66 IBAN: DE25 6669 0690 0300 9570 04
Commerzbank 75105 Pforzheim Konto/Account No. 6 511 120 (BLZ 666 800 13) SWIFT-BIC: DRESDE33 IBAN: DE05 6668 0013 0651 1120 00