

GAMMAcast detectors

LB 6739

LB 6750

LB 6752

Operating Manual
48452BA2

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Embedded software as of vers. 1.2.2

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About this document

1.1 Some prior remarks

The GAMMAcast detectors were produced by the manufacturing company BERTHOLD TECHNOLOGIES GmbH & Co. KG and supplied to you in a complete and functionally reliable condition.

It is essential that you have read this operating manual prior to operation. We have tried to compile for you all information for safe and proper operation. However, if you should still have questions which are not answered in this operating manual, please refer to BERTHOLD TECHNOLOGIES GmbH & Co.KG.

1.2 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 GAMMAcast detectors.

1.3 Validity of the operating manual

Before commissioning and using the GAMMAcast detectors "LB 6739", "LB 6750", and "LB 6752" in connection with a suitable evaluation unit provided by BERTHOLD TECHNOLOGIES, it is required to carefully read the present operating manual as well as the operating manual of the corresponding evaluation unit.

The operating manual is valid from the delivery of the GAMMAcast detectors to the user until their disposal. Modification services are not carried out by the manufacturer BERTHOLD TECHNOLOGIES GmbH & Co.KG.

1.4 Copyright

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

1.5 Target group

The GAMMAcast detectors may only be installed, operated, maintained and repaired by trained personnel.

1.6 Notation

In this manual, the following notations are used to state the software interface and the operation:

Identifier	Meaning	Example
Quotation mark	Field	"Calibrating"
Line	Path	Settings Selection/Display
Pointed brackets	Keys and buttons	<Update>
Round brackets	Image reference	Connect the plug (fig. 1, pos. 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 (key) or an area on the touch display if a mouse is not used for controlling.

1.7 Symbols used

The safety instructions point out possible dangers to you and instruct you on the operation. They apply to the whole document.



Possible consequences: Death or serious injury!

Points out a direct threat of danger. If the danger is not avoided, death or serious bodily injury are the consequences.

- Possible consequences are described.
 - Measures for prevention are described.
-



Possible consequences: Serious injuries!

Points out a possibly dangerous situation. If the situation is not avoided, death or serious bodily injury could result.

- Possible consequences are described.
 - Measures for prevention are described.
-



Possible consequences: Minor or moderate injury!

Points out a possibly dangerous situation. If the situation is not avoided, minor or moderate bodily injury could occur.

- Possible consequences are described.
 - Measures for prevention are described.
-



Possible consequences: Material Damage!

Points out a situation which could result in the event of material damage if the instructions have not been observed.

- Possible consequences are described.
 - Measures for prevention are described.
-



Points out helpful information on the product or on handling.

2 Safety

2.1 Proper use

The GAMMAcast detectors are used in connection with a suitable evaluation unit provided by BERTHOLD TECHNOLOGIES and a corresponding source of radiation in order to measure the radiation intensity occurring during a radiometric measurement.

The following constitutes proper use:

- Adhering strictly to the instructions and operation sequences and not undertaking any different, unauthorised practices which could put your safety and the operational reliability of the GAMMAcast detectors at risk!
- Observing the provided safety instructions!
- Carrying out the prescribed maintenance measures or having them carried out for you!

2.2 Improper use



Attention

Injuries to person and material damage!

In the event of improper use, risks may arise that are a threat to:

- the health of the user.
- the efficient operation of the evaluation unit (EVU).
- the functional reliability of the EVU.

Observe the instructions provided in the proper use section.

- If the GAMMAcast detectors are used in a way which is not described in the present operating manual, the warranty will be void.
- BERTHOLD TECHNOLOGIES only accepts liability for and/or guarantees the compliance of the GAMMAcast detectors with their published specifications.

Improper use (continued)

Avoid the following circumstances:

- Using the GAMMAcast detectors in systems in which explosive gases may escape to the surroundings. The GAMMAcast detectors and the EVU are not explosion-proof.
- Non-compliance with the sections in the operating manual on the EVU used and on the GAMMAcast detectors "48452BA2".
- Applying conditions and requirements which do not conform to those stated in the technical documents, datasheets, operating and assembly instructions and other specific guidelines of the manufacturer.
- Using the GAMMAcast detectors in a damaged or corroded condition.
- Restructuring or changing the system components.
- Using the detectors in "safety-related measurement" applications.

2.3 Qualification of the personnel



Note

Any work on or with the GAMMAcast detectors requires at least persons with proficient technical knowledge who are instructed by a specialist or authorised person.

In different parts of this operating manual, reference is made to personnel with certain qualifications who can be entrusted with different tasks during installation and maintenance.

The personnel is divided into three groups:

- Persons with general knowledge
- Experts
- Authorised persons

The meaning of these terms and the requirements applicable to the respective group of people are described in the following sections.

Qualification of the personnel (continued)

Persons with general knowledge



Note

Those with a 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 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 welders 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. They must be capable of safely assessing the results of their work and they must be familiar with the content of this operating manual.

Authorised persons

Authorised persons are those who are either designated for the corresponding task due to legal regulations or have been approved by BERTHOLD TECHNOLOGIES for certain activities.

3 Product description

The GAMMAcast detectors convert the γ -rays emitted by a source of radiation into electrical impulses. The pulse rate emitted at the output of the GAMMAcast detectors to the evaluation unit is proportional to the impinging radiation intensity.

The GAMMAcast detectors described herein are scintillation counters that, in connection with a suitable evaluation unit, determine the radiation intensity occurring during a radiometric measurement.

3.1 View

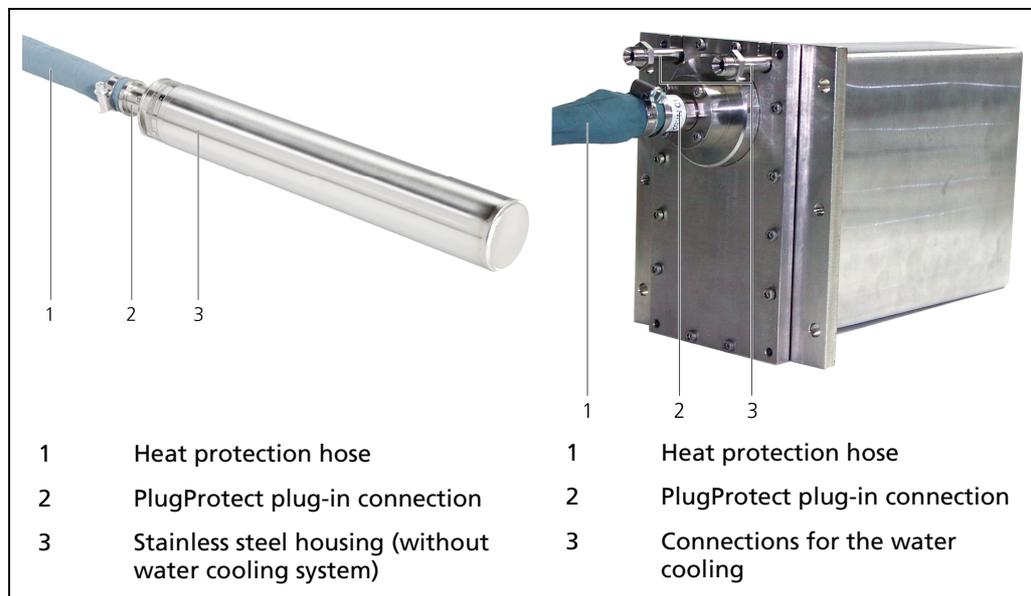


Fig. 1 View of the GAMMAcast detectors,
Left: LB 6739 / LB 6750
Right: LB 6752

The GAMMAcast detectors consist of the following components:

- Stainless steel housing (housing pipe)
- Electronics with integrated CPU
- Scintillator (crystal - LB 6739 / LB 6750 or PVT - LB 6752)
- Water cooling system (optional)
- Connection cable with heat protection hose and PlugProtect plug-in connection.

3.1.1 Scintillator

The GAMMAcast detectors are distinguished by means of the external dimensions and the scintillators used.

- **GAMMAcast detector LB 6739:**
Scintillation counter with crystal and photomultiplier (technical data, see chap. 9.1)
- **GAMMAcast detector LB 6750:**
Scintillation counter with crystal and photodiode (technical data, see chap. 9.1)
- **GAMMAcast detector LB 6752:**
Polymer scintillation counter with photomultiplier (technical data, see chap. 9.2)

3.1.2 Connection cable

The plug-in connection "PlugProtect" protects the transition between the GAMMAcast detector and the connection cable against moisture penetration. The heat protection hose covering the connection cable protects it against too high temperatures.

The connection cables are commonly connected to a terminal box. For this purpose, a variant with HeavyCon plug or open ends can be used. The terminal box is connected to the EVU.

3.1.3 Water cooling system

A version of the GAMMAcast detector LB 6739 and LB 6750 with water cooling is available to protect the scintillators against too high temperatures. The GAMMAcast detector LB 6752 has already been provided with a water cooling system integrated into the housing.

4 Commissioning

4.1 Initial operation



Attention

The GAMMAcast detectors must not be used in systems in which explosive gases or vapours may form. They are not explosion-proof.



Attention

Risk of breaking!

The GAMMAcast detector contains a PMT with glass housing and/or a fragile scintillation crystal.

- The glass housing of the PMT can break.
- The crystal can break/splinter.

Handle the GAMMAcast detector with care.

1. Mount the GAMMAcast detector to the outside or inside of the mould.
2. If required, connect the water cooling system. Additional information is provided in chap. 4.2.

Initial operation (continued)

3. Connect the connection cable of the GAMMAcast detector either to a terminal box (Fig. 2, pos. 1) or directly to the EVU. The connection diagram of the respective evaluation unit is to be taken into account (see Fig. 3). For the connection to the EVU LB 452 castXpert, please also refer to the connection diagram provided in the operating manual of the EVU LB 452, chap. 11.2.

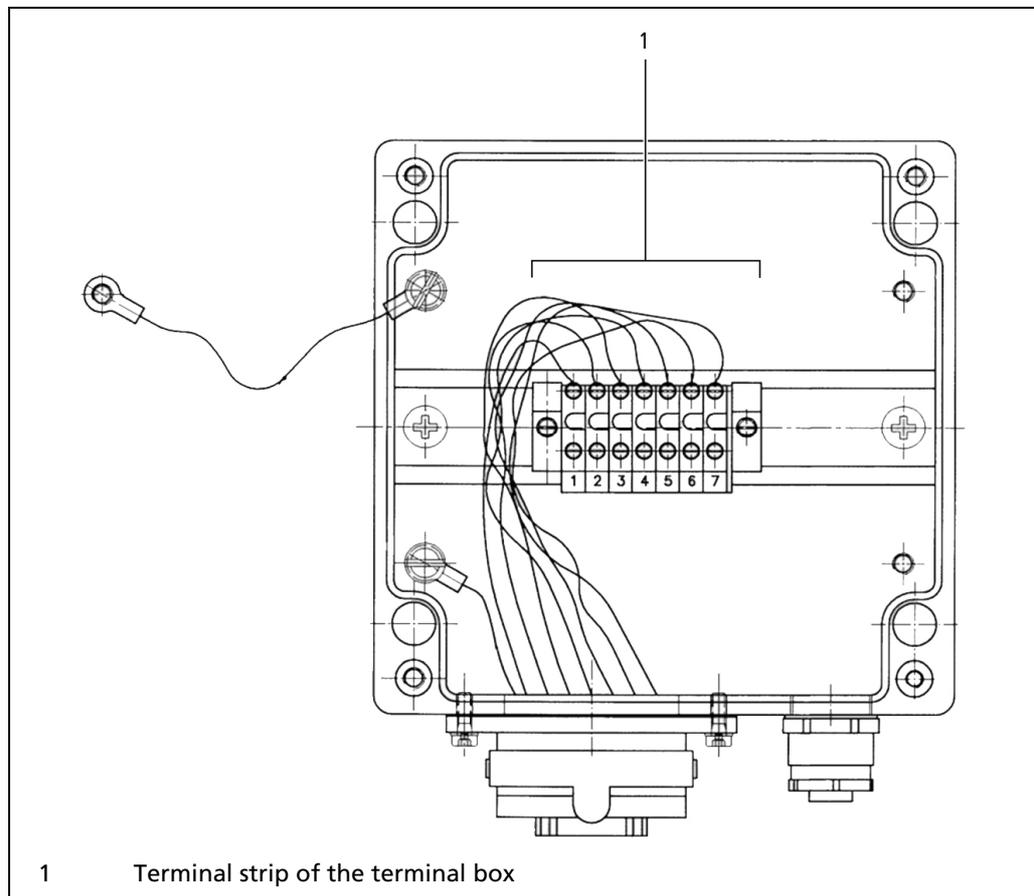


Fig. 2 Terminal box with terminal strip

Initial operation (continued)

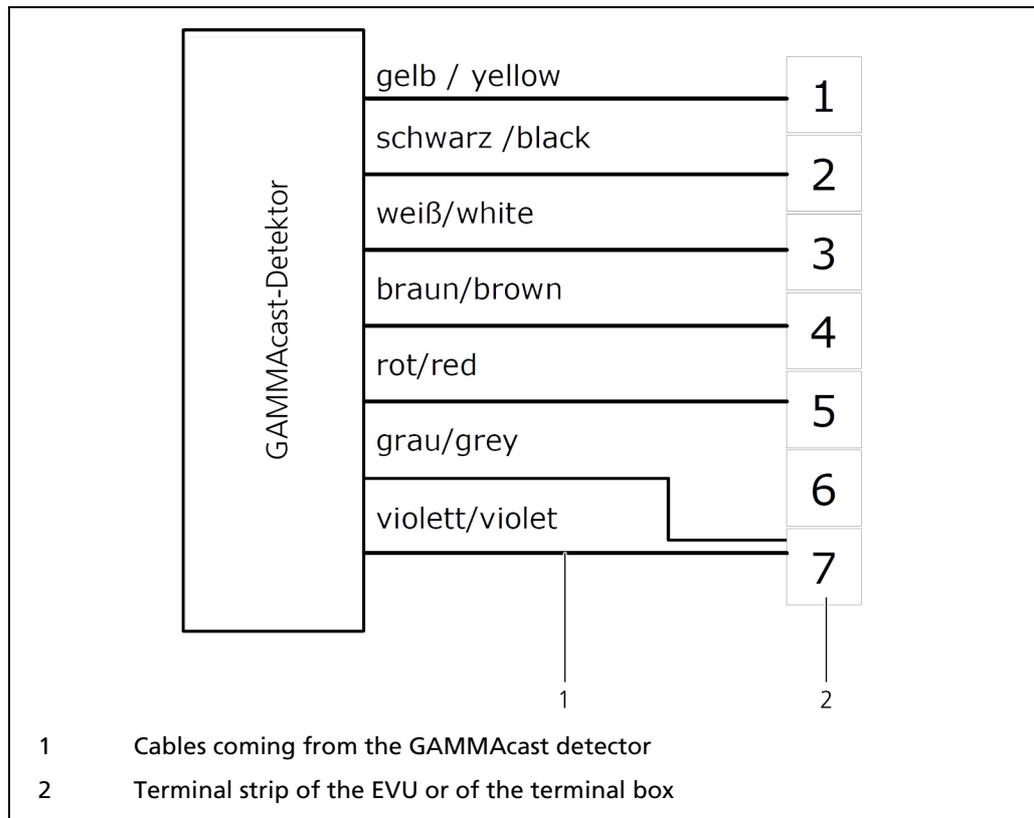


Fig. 3 Terminal assignment for connecting the GAMMAcast detector to the evaluation unit LB 352 or LB 452 castXpert. If connecting to the EVU LB 452 castXpert grey *may* also be connected to pin 6, please also refer to the connection diagram provided in the operating manual of the EVU LB 452, chap. 11.2.

4.2 Water cooling system connection



Note

The GAMMAcast detector LB 6752 is already provided with a water cooling system upon delivery.

The GAMMAcast detectors LB 6739 and LB 6750 can be purchased with an optional water cooling system.

Please make sure that the water is drained at the highest point, as shown in (Fig. 4, pos. 3 and Fig. 5, pos. 4).

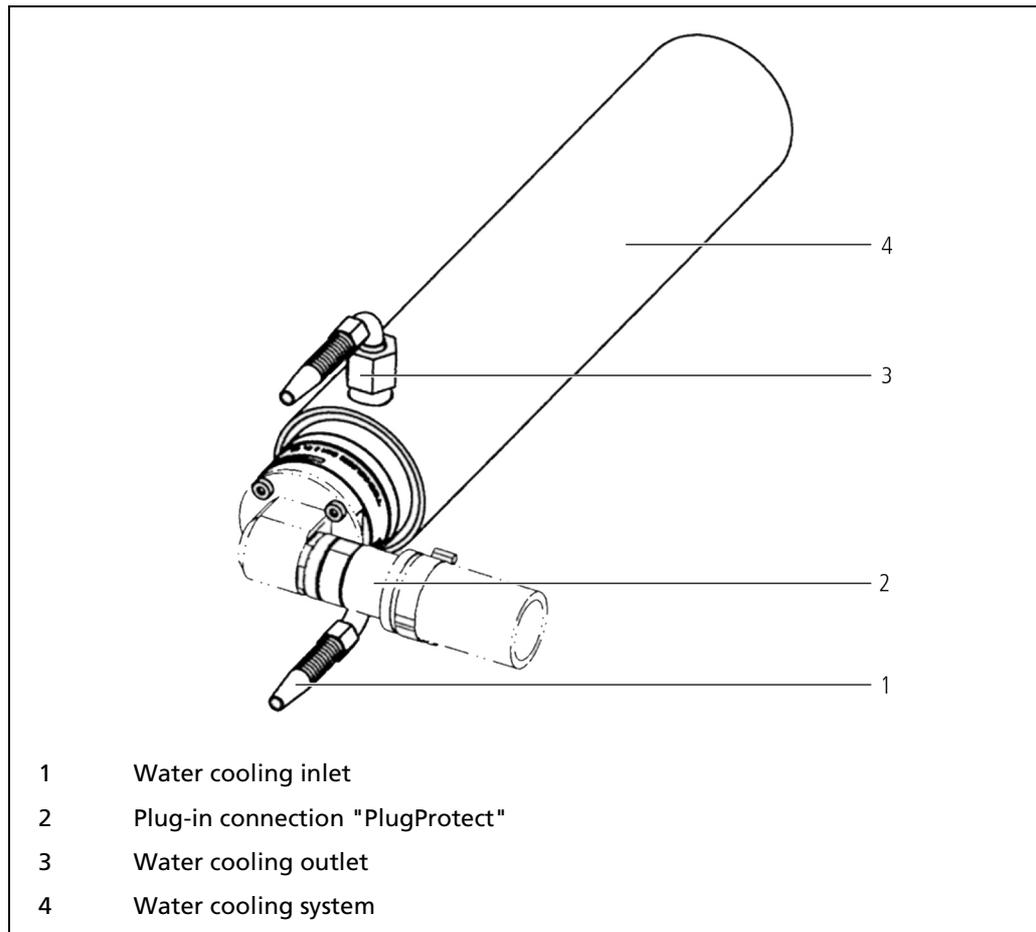


Fig. 4 GAMMAcast detector LB 6739 or LB 6750 with water cooling system

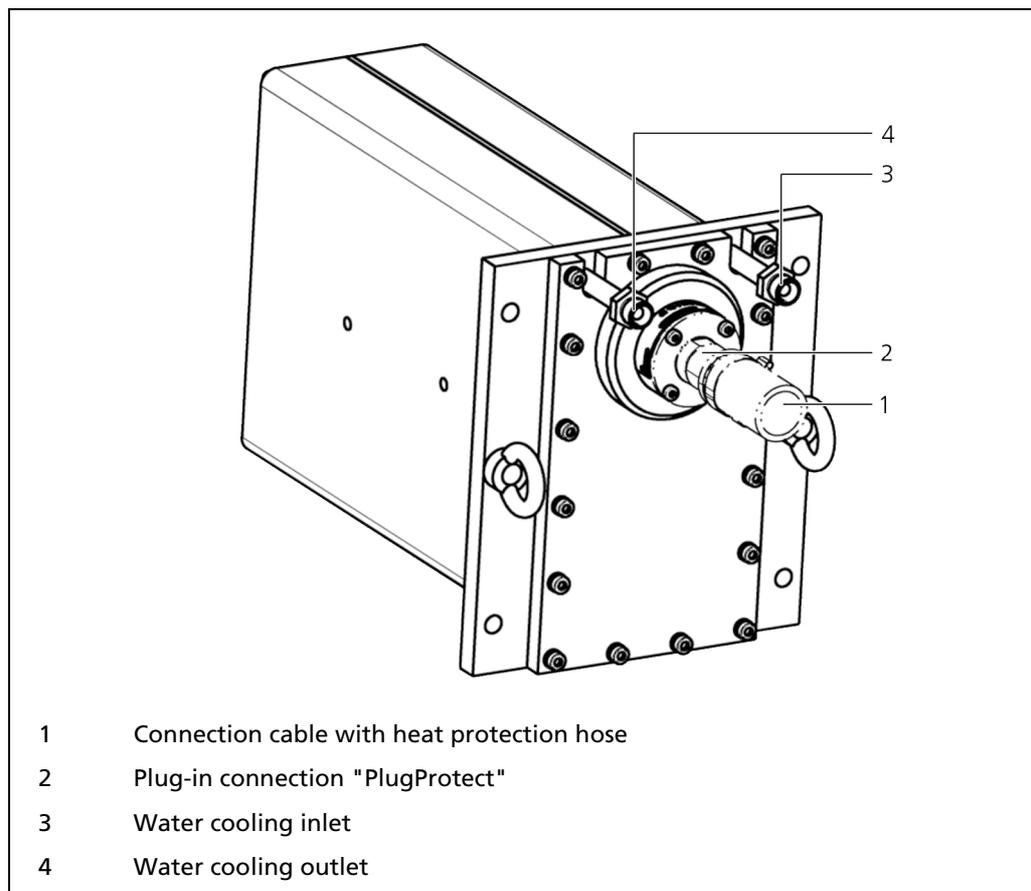
Water cooling system connection (continued)

Fig. 5 GAMMAcast detector LB 6752 with integrated water cooling system

Water cooling system connection (continued)

1. Insert the GAMMAcast detector with/without water cooling system into the bore in the mould that corresponds to the GAMMAcast detector. When using a water cooling system (with GAMMAcast detector LB 6739 or LB 6750), please note that the bore must be accordingly bigger.



Note

When fixing the GAMMAcast detector to the water cooling system, please make sure that the discharge nozzle on the mould is at the highest point (Fig. 4, pos. 3 and Fig. 5, pos. 4).

This will ensure that there is always enough water in the water cooling system and that no air bubbles can form.

2. Connect the inlet and outlet of the cooling water to the GAMMAcast detector (LB 6739 / LB 6750: Fig. 4, pos.1 and 3; LB 6752: Fig. 5, pos.3 and 4).



Attention

Damage to the device!

When using water that does not have the same quality as drinking water, the water cooling system and the GAMMAcast detector may be damaged due to deposits of dirt particles.

- Reduced cooling power.
- Only water that has the same purity as drinking water may be used as coolant.

Please observe the minimum cooling water requirement of the GAMMAcast detectors (chap. 4.2.1).

4.2.1 Minimum cooling water requirement



Attention

Damage to the device!

If the cooling water flow is shut off too early, the admissible temperature of the GAMMAcast detector may be exceeded.

If the water is left in the water cooling system when there is a risk of frost, this may cause mechanical damage to the water cooling system.

- Temperature of the GAMMAcast detector too high.
 - Damage to the GAMMAcast detector.
- Keep the cooling water flowing as long as necessary.
- Drain the water cooling system when there is a risk of frost.

GAMMAcast detector LB 6739 / LB 6750

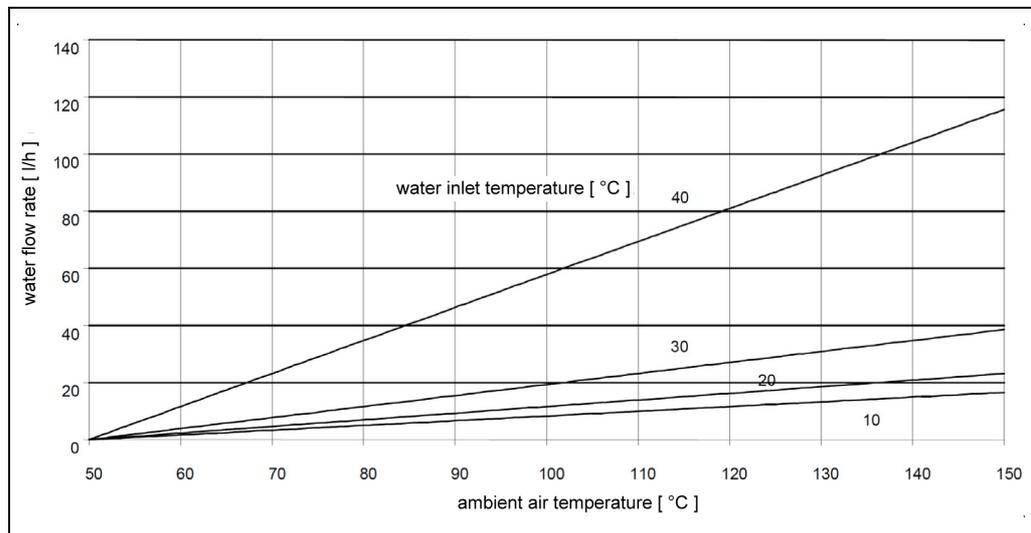


Fig. 6 Minimum cooling water requirement of the GAMMAcast detector LB 6739 / LB 6750

GAMMAcast detector LB 6752

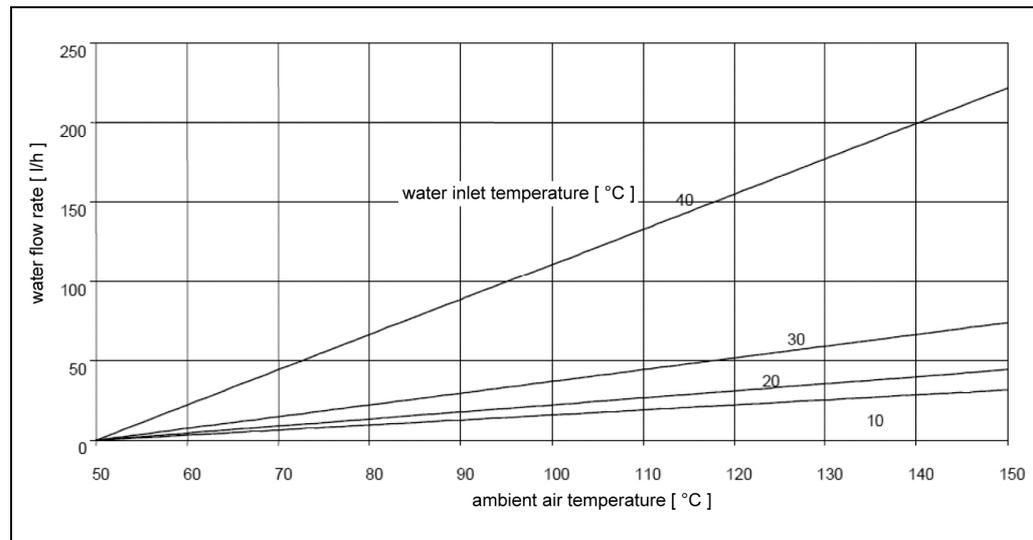


Fig. 7 Minimum cooling water requirement of the GAMMAcast detector LB 6752

5 Use of the software

In order to be able to access all functions of the GAMMAcast detectors, it is required to operate the detector via an EVU, such as the LB 452 castXpert, that enables the use of a software control.

When operating the detector with another EVU, such as the LB 352, a detector software modem can be used in connection with a PC in order to access the software of the detector.

More information on the use of the software of the EVU 452 castXpert are provided in chapter 5 of the operating manual "47344BA2".

5.1 Operation via the "detector service modem"

When they are to be checked in a repair shop, the GAMMAcast detectors can be connected to a PC via the "detector service modem".

In order to use the GAMMAcast detector via the "detector service modem", the following system requirements must be met:



Note

No communication with the GAMMAcast detector!

- Missing drivers or system requirements are not met!
- Please note the system requirements in chap. 9.6.
- Install the drivers by executing the driver file "**BertholdRS485.exe**" before connecting the detector service modem.
- Execute the installation file "Setup.exe" in order to install the operating software "**LB 67xx PC control**".

5.1.1 LB 67xx PC control

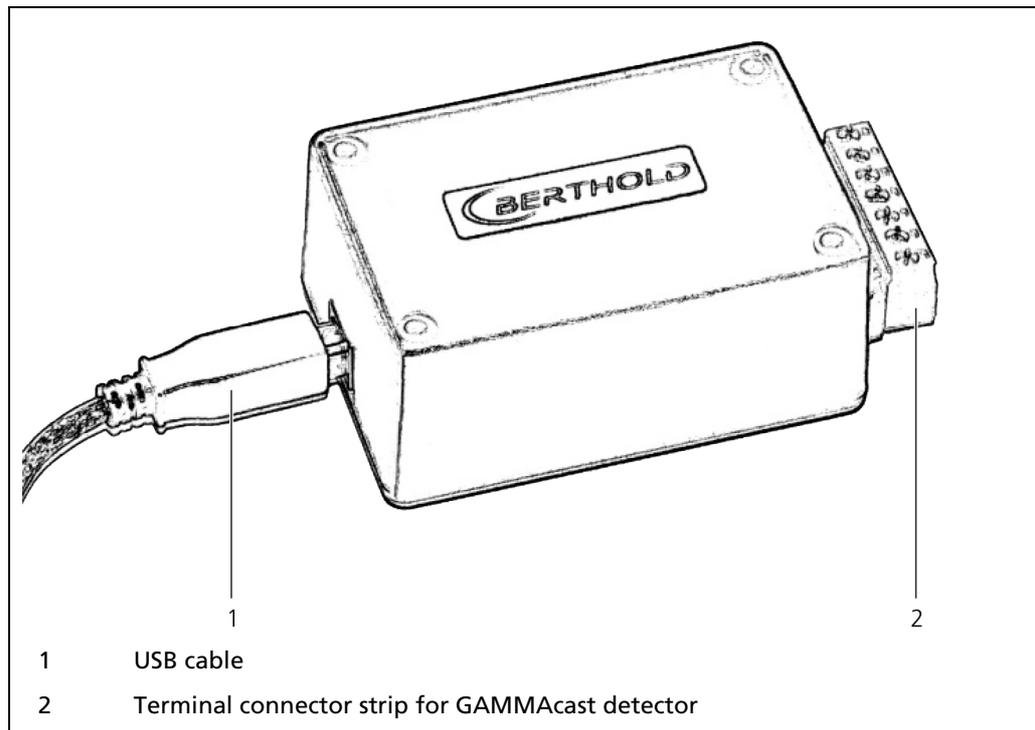


Fig. 8 Detector service modem

The operating software "LB 67xx PC control" provides access to the software of the GAMMAcast detector.

1. Connect the GAMMAcast detector to the terminal strip of the "detector service modem" (Fig. 8, pos. 2).
2. Connect the "detector service modem" via the supplied USB cable (Fig. 8, pos. 1) to a free USB port on your PC.
3. Connect the mains cable (included in the scope of delivery) to the "detector service modem". The mains connection is located on the rear side of the "detector service modem".
4. Start the programme "LB 67xx PC control.exe".
⇒ The programme opens.

Operation via the "detector service modem" (continued)

5. Click on the tab <USB> (pos. 1).
6. In the drop-down menu (pos. 2), select a baud rate of **38400**.
7. Click on <Connect> (pos. 3).

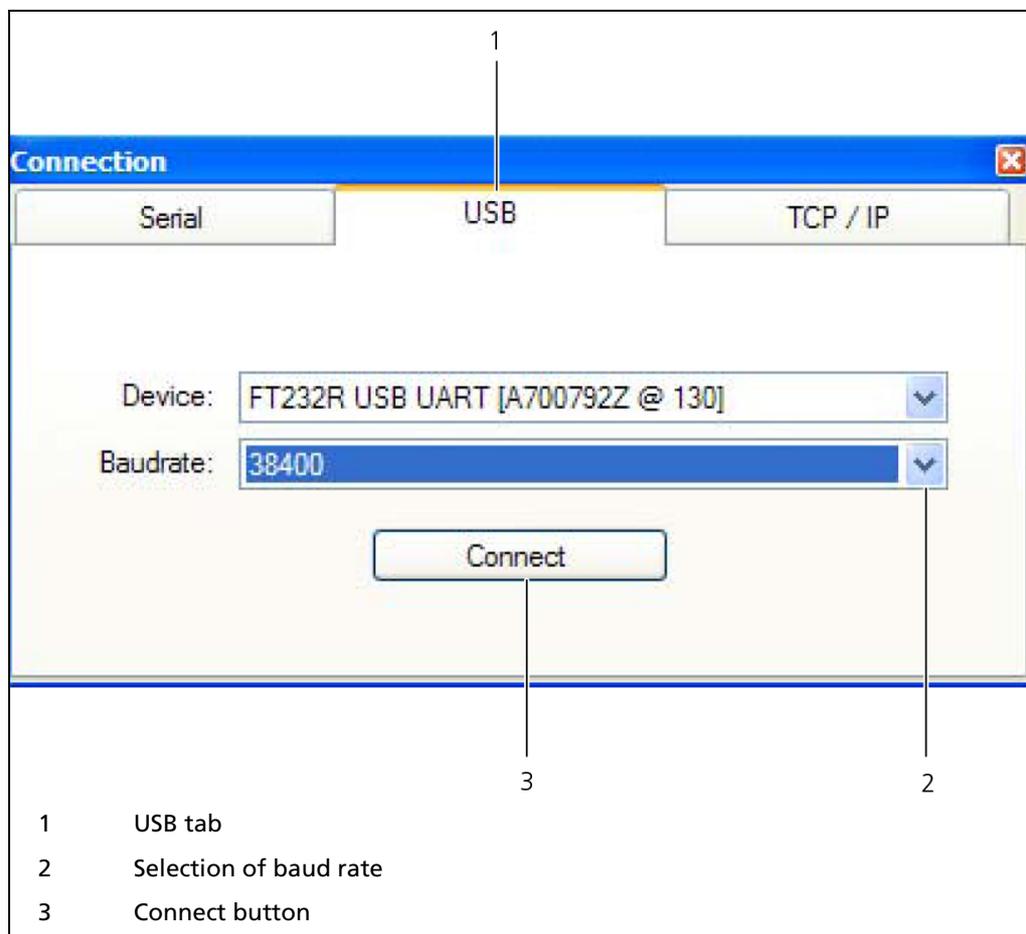


Fig. 9 Connection page, operating software "LB 67xx PC control"

8. The main screen of the program LB 67xx PC control opens:

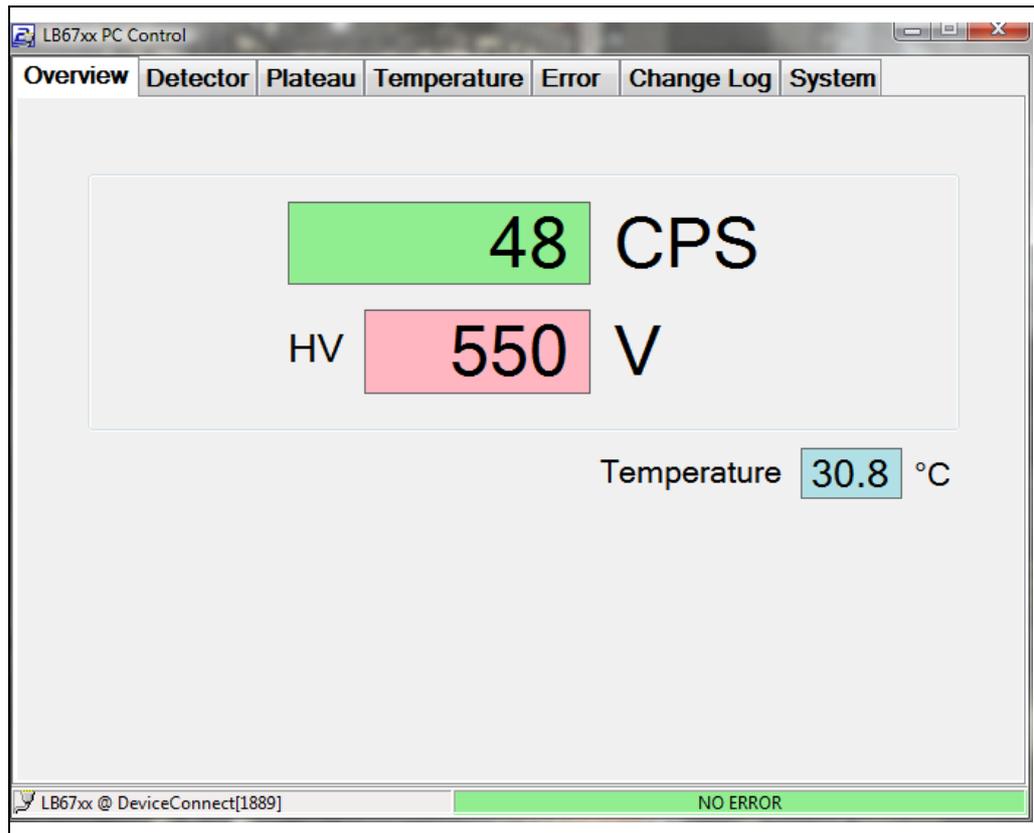


Fig. 10 Start page, operating software "LB 67xx PC control"



Note

The scope of the operating software "LB 67xx PC control" is the same as that of the operating software of the EVU LB 452 castXpert. For this reason, a separate description will not be provided at this point. For more information, please refer to chapter 6.

5.1.2 Software Update

The following chapter will describe a software update of the GAMMAcast detectors using the detector service modem.



Note

A software update can also be performed with the EVU LB 452 castXpert. Please refer to the manual 47344BA2, chapter 6.4.3 for further instructions

1. Follow the instructions from above through points 1 to 3
2. Start the programme "**FlashLoader.exe**"

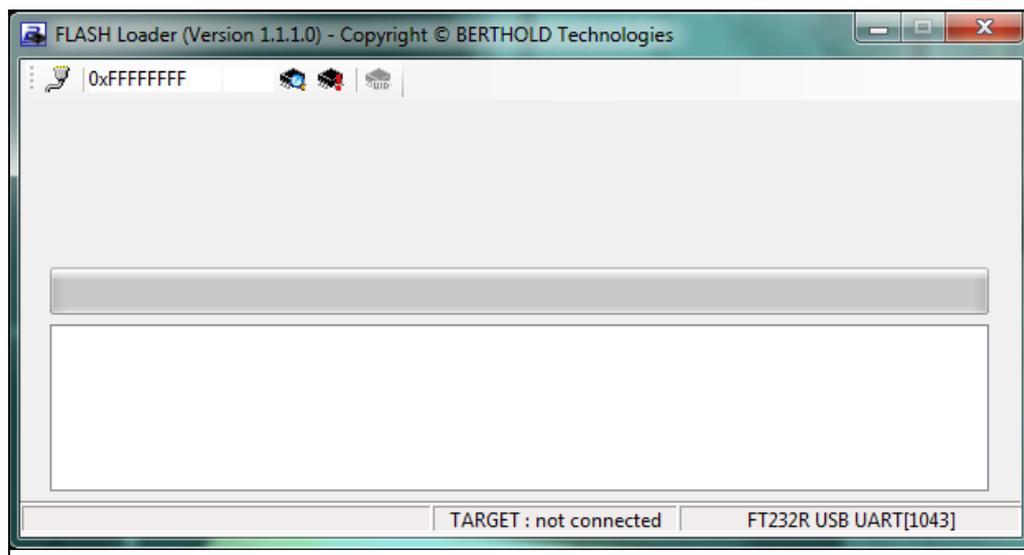


Fig. 11 Flash Loader main screen.

3. Click on the button <detect>.
⇒ The programme establishes a connection to the detector.

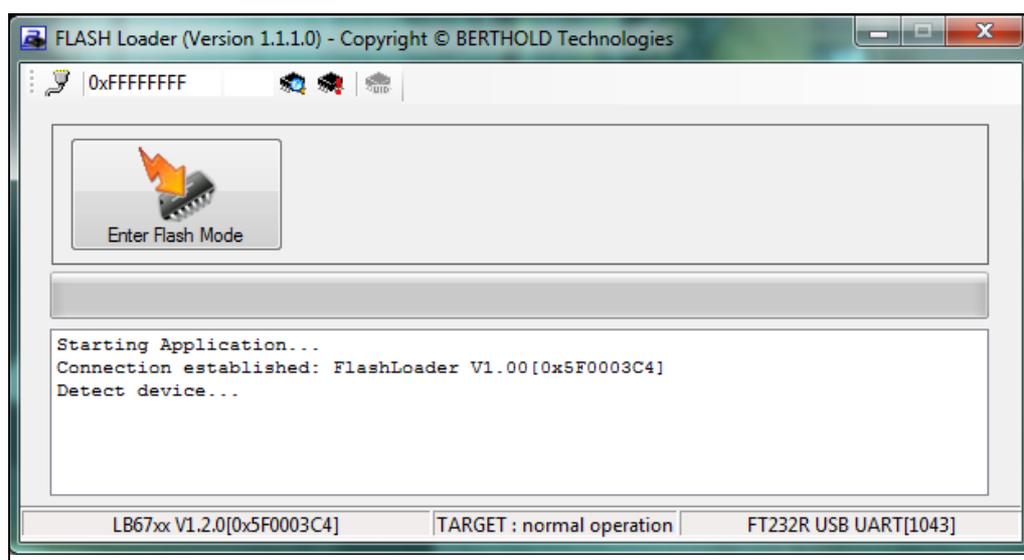


Fig. 12 Flash Loader connection screen.

4. Click on the button <Enter Flash Mode>.

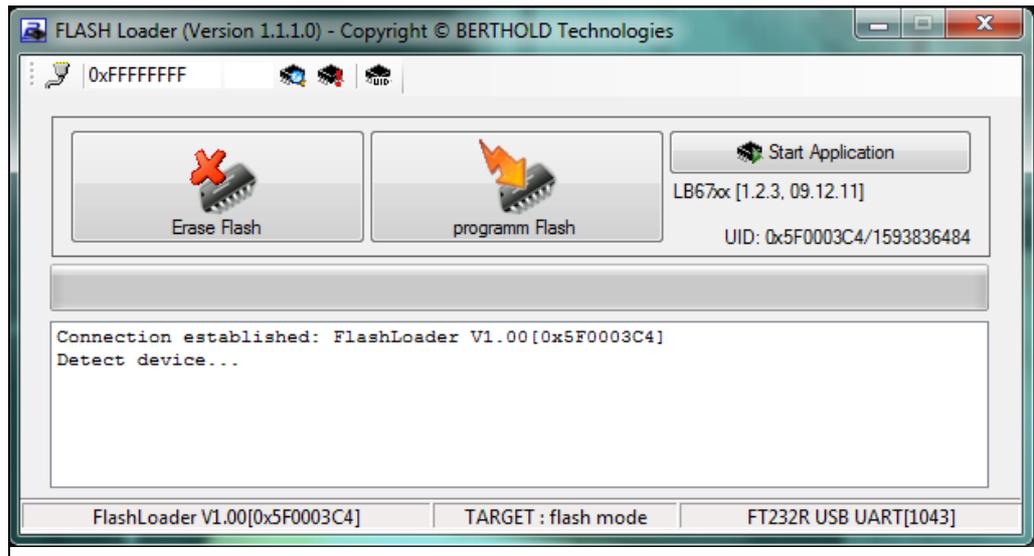


Fig. 13 Flash Loader program flash screen.

5. Click on the button <program Flash>.
 - ⇒ A dialogue window opens.
6. Choose the file for the software update.
 - ⇒ The detector is programmed with the selected software.

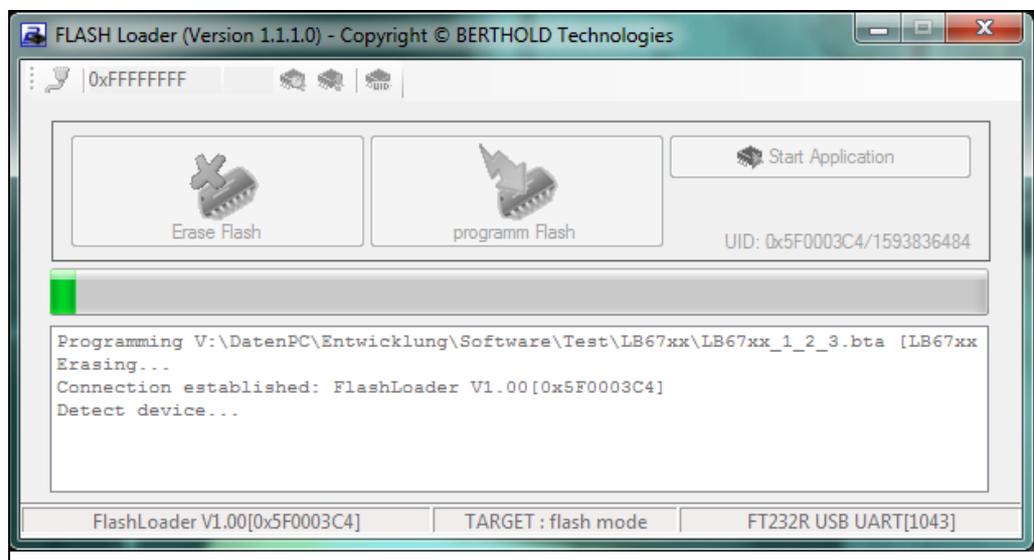


Fig. 14 Flash Loader programming screen.

7. Click on the button <Start Application> after the programming progress finished.



Note

Perform a factory reset using the EVU LB 452 castXpert or the LB 67xx PC control in case the first or second digit of the software version has changed.

5.2 Operation via the software of the EVU LB 452 castX-pert

5.2.1 Installation of the GAMMAcast detector

When connecting the GAMMAcast detector to an installed measurement channel of the EVU, the detector will automatically be detected and started. Proceed as follows in order to set up the measurement channel:

1. In the **standard display** (see operating manual "47344BA2", Fig. 15, pos. 6), click on **System | System Menu | Channel Configuration**, in order to access the "Channel Setting" submenu.

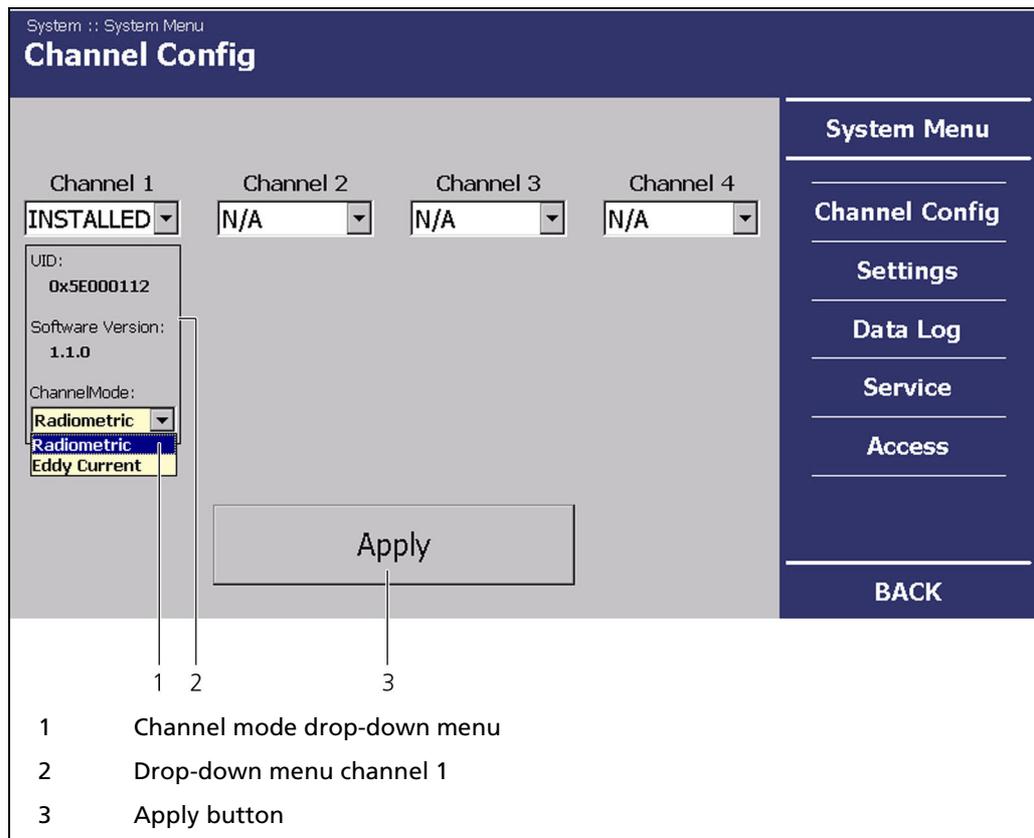


Fig. 15 System menu, channel settings

Installation of the GAMMAcast detectors (continued)



Attention

Measurement not possible!

- The channel mode **"Eddy Current"** is not admissible for the GAMMAcast detectors.
 - In the **<Channel Setting>** menu in the drop-down menu, set the "Channel Mode" (the measurement technique) to "Radiometric" (Fig. 15, pos. 1).

2. In the drop-down menu below "Channel XY" (Fig. 15, pos. 2), select **<INSTALLED>**.



Note

At least one basic module must be installed in the corresponding channel.

3. In the drop-down menu below "Channel Mode" (Fig. 15, pos. 1), select **"Radiometric"** as measurement method.
4. Click on **<Apply>** (Fig. 15, pos. 3).



Attention

Measurement not possible!

- Make sure that the GAMMAcast detector is correctly connected (see chap. 4).

6 The "detector" menu

In Fig. 16 the schematic structure of the "detector" menu is displayed.

In the "detector" menu, you can carry out a check of the detector by acquiring a plateau, make detector settings and set the tripping limits of alarms for temperature exceedings.

You can also look into the error history and export service data, reboot the detector or reset it to the factory settings.

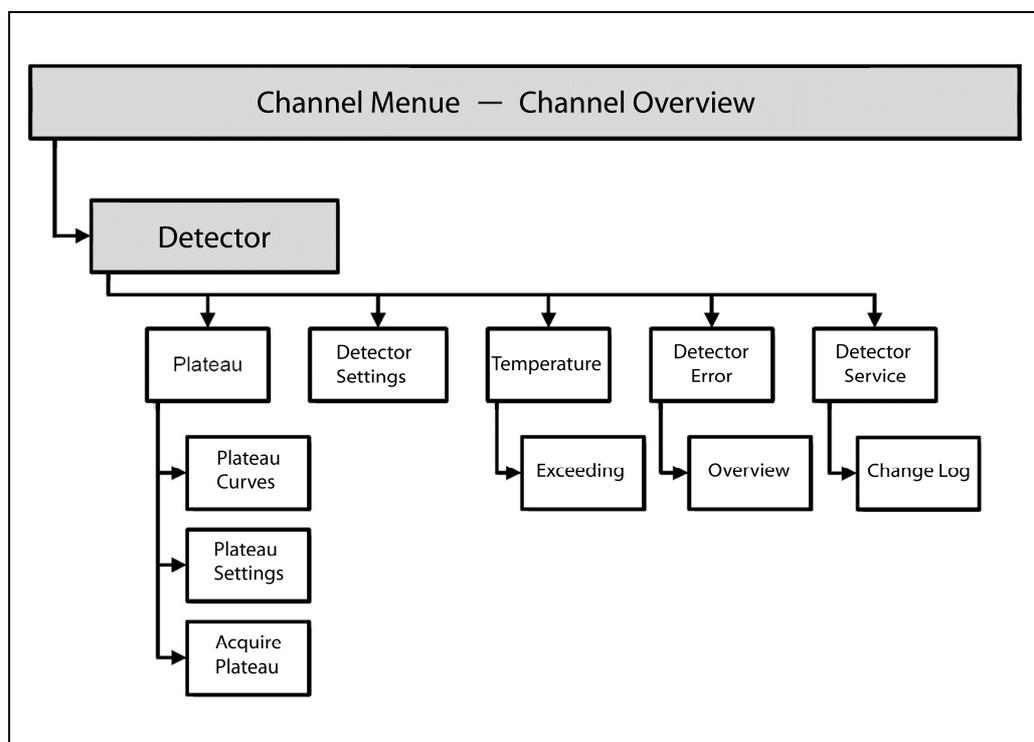


Fig. 16 Menu structure, "detector" submenu

6.1 Plateau (not LB 6750)



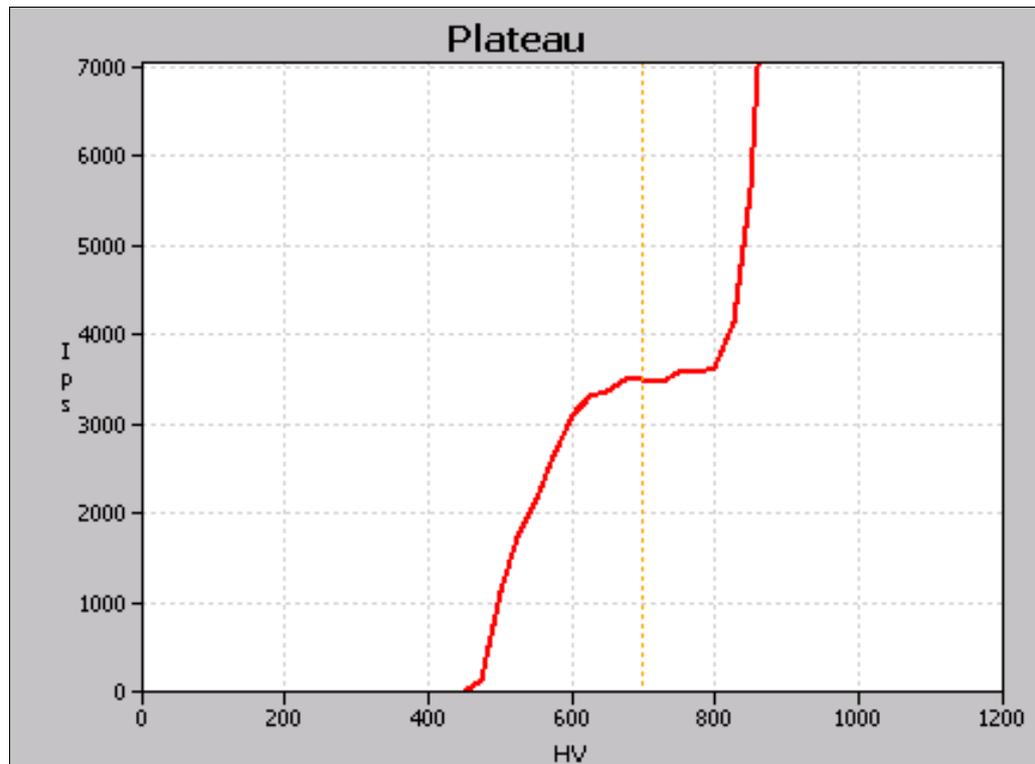
In the condition as supplied, the operating point has already been correctly adjusted by BERTHOLD TECHNOLOGIES by means of plateau curve acquisition.

Note

- Acquiring a plateau and setting the correct supply voltage of the photomultiplier must only be carried out, if the crystal, photomultiplier or electrical components have been exchanged.

During the plateau acquisition, the high voltage required for the operation of the photomultiplier (PMT) is gradually increased. The pulse rate is measured after each increase.

The determined plateau curve is displayed in a diagram. When the high voltage increases, the pulse rate will increase as well. This must result in the development of a clear plateau. If the plateau is too short or too steep, this means that the detector is working in an unstable manner. In the event of an error, the PMT and/or the crystal must be replaced.



Other damages to the scintillation counter can already be determined by means of a **visual inspection**. For more information on the visual inspection, please refer to chap. 6.1.3.1 ; the inspection can be carried out within the framework of maintenance work, see chap. 7 .

Plateau (continued)

1. In the standard display, click on the channel <Channel XY> to which you had connected a GAMMAcast detector and for which you want to acquire a plateau.
 - ⇒ The "Channel Overview" menu opens.
2. In the "Channel Overview" menu, click on <Detector> to access the "Detector" submenu.
 - ⇒ The "Detector" submenu opens (Fig. 17).
3. In the menu Channel XY | menu "Channel Overview" | Detector, click on <Plateau> (Fig. 17, pos. 4) to access the "Plateau" submenu.

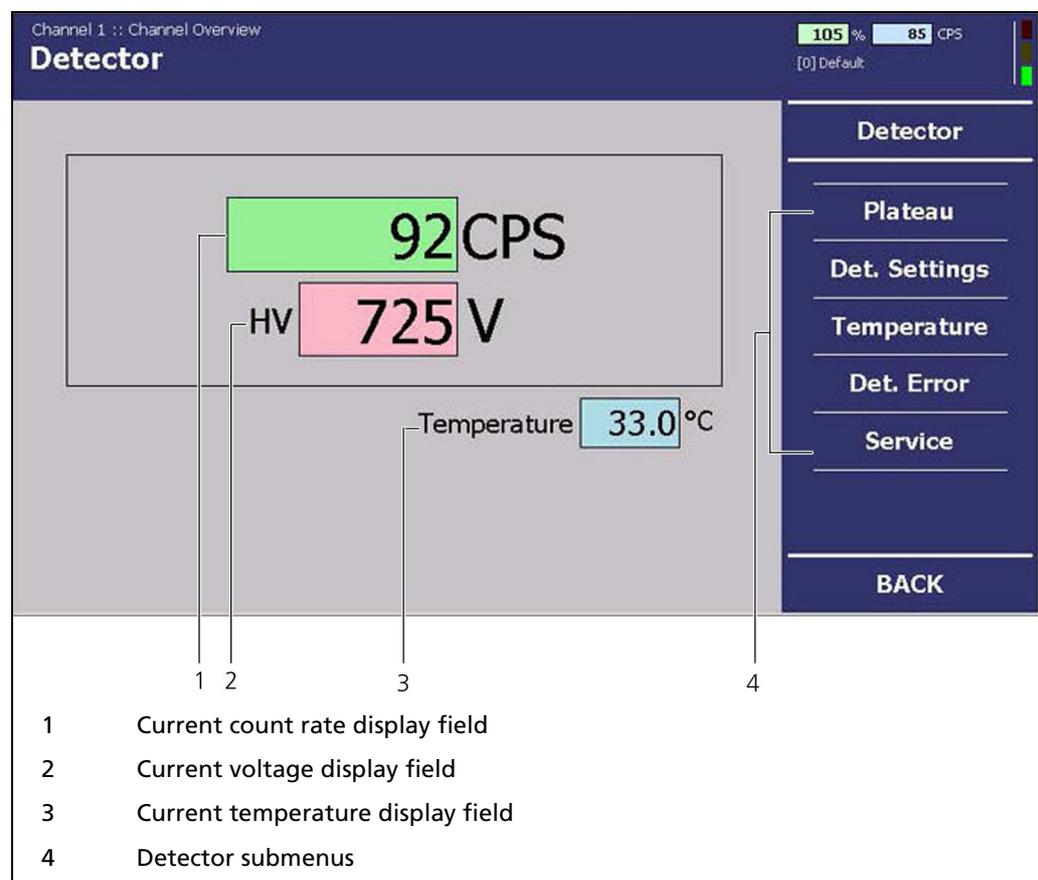


Fig. 17 "Channel Overview" menu, Detector

⇒ The "Plateau" submenu opens.

Plateau (continued)

- Click on **Detector | Plateau | Plateau Settings** (Fig. 18, pos.4), if you wish to change the pre-set values for the plateau acquisition.

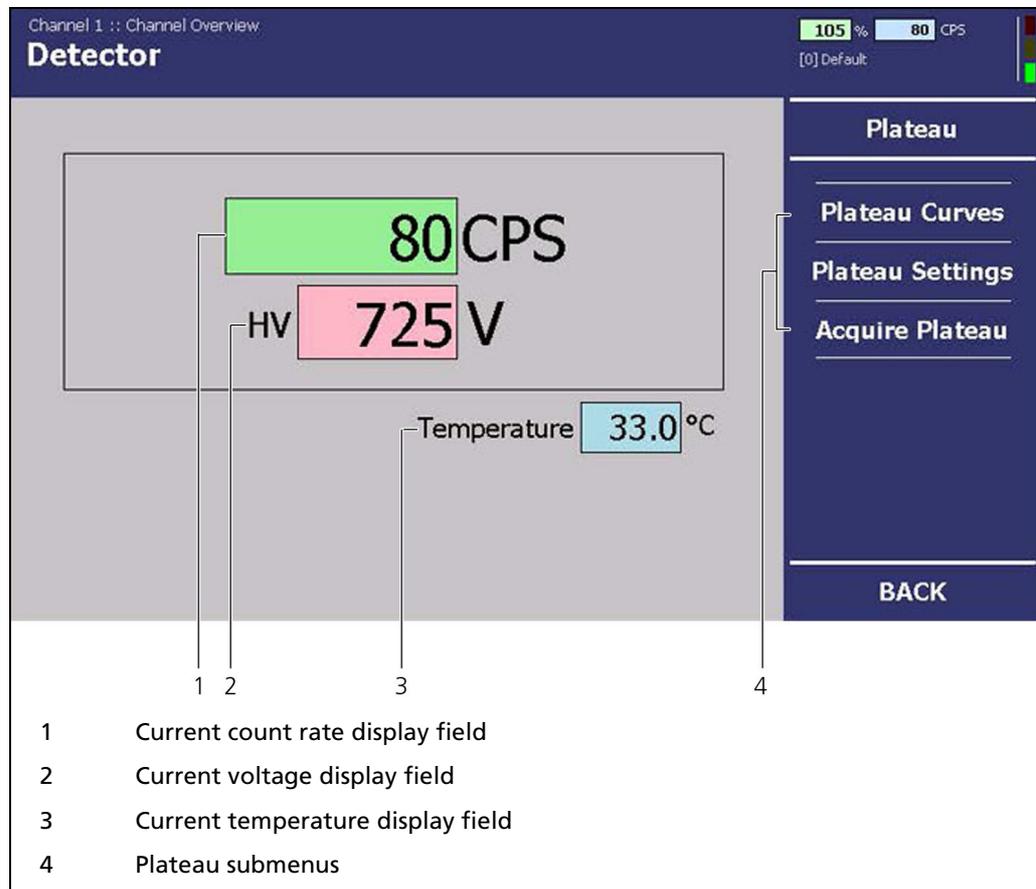


Fig. 18 "Channel Overview" menu, Detector - Plateau

⇒ The "Plateau Settings" submenu opens.

6.1.1 Plateau settings



Note

In the condition as supplied, the values in the submenu "Plateau Settings" are pre-set by BERTHOLD TECHNOLOGIES.

➤ Only change these values after prior consultation with BERTHOLD TECHNOLOGIES!

In the "Plateau Settings" submenu, you have the following settings options:

Plateau start/end	Definition of the range of the plateau acquisition
Plateau step size	Refers to the step size (interval) between two measuring points.
Plateau acquisition time	Refers to the time that is used per measuring point for the counting of the count rate (cps).

Channel 1 :: Channel Overview :: Detector :: Plateau

106% 65 CPS
[0] Default

Plateau Settings

Start V

End V

Step Size V

Acquisition Time s

1 2 3 4

1 Voltage input field - start of the plateau recording

2 Voltage input field - end of the plateau recording

3 Input field for the voltage - step size (interval)

4 Voltage input field - acquisition time per interval

Plateau

Plateau Curves

Plateau Settings

Acquire Plateau

BACK

Fig. 19 "Channel Overview" menu, Detector - Plateau (Plateau Settings)

6.1.2 Acquiring a plateau

When acquiring a plateau, proceed as follows:

1. Position a **test source** at the front side of the GAMMAcast detector or use the **source of radiation built into the mould**. When using the source of radiation, bring the lock of the shielding to the "OPEN" position.



Note

Incorrect plateau acquisition!

- Please make sure that there is a constant distance between the emitter and the GAMMAcast detector.
- Please make sure that there are no objects in the beam path.



Attention

Measurement will be interrupted!

- By acquiring a plateau, the current measurement of the mould level is interrupted.
- Make sure that there is no measurement in progress at the time of the plateau acquisition.

2. In the menu **Channel XY | menu "Channel Overview" | Detector**, click on **<Plateau>** (Fig. 18, pos. 4) to access the "Plateau" submenu.
3. Click on **<Acquire Plateau>** (Fig. 18, pos. 4).
⇒ The "Acquire Plateau" submenu opens.

Acquiring a plateau (continued)

⇒ The recorded values are read in and entered into the table (Fig. 21, pos. 1) and the plateau curve is drawn and automatically saved.

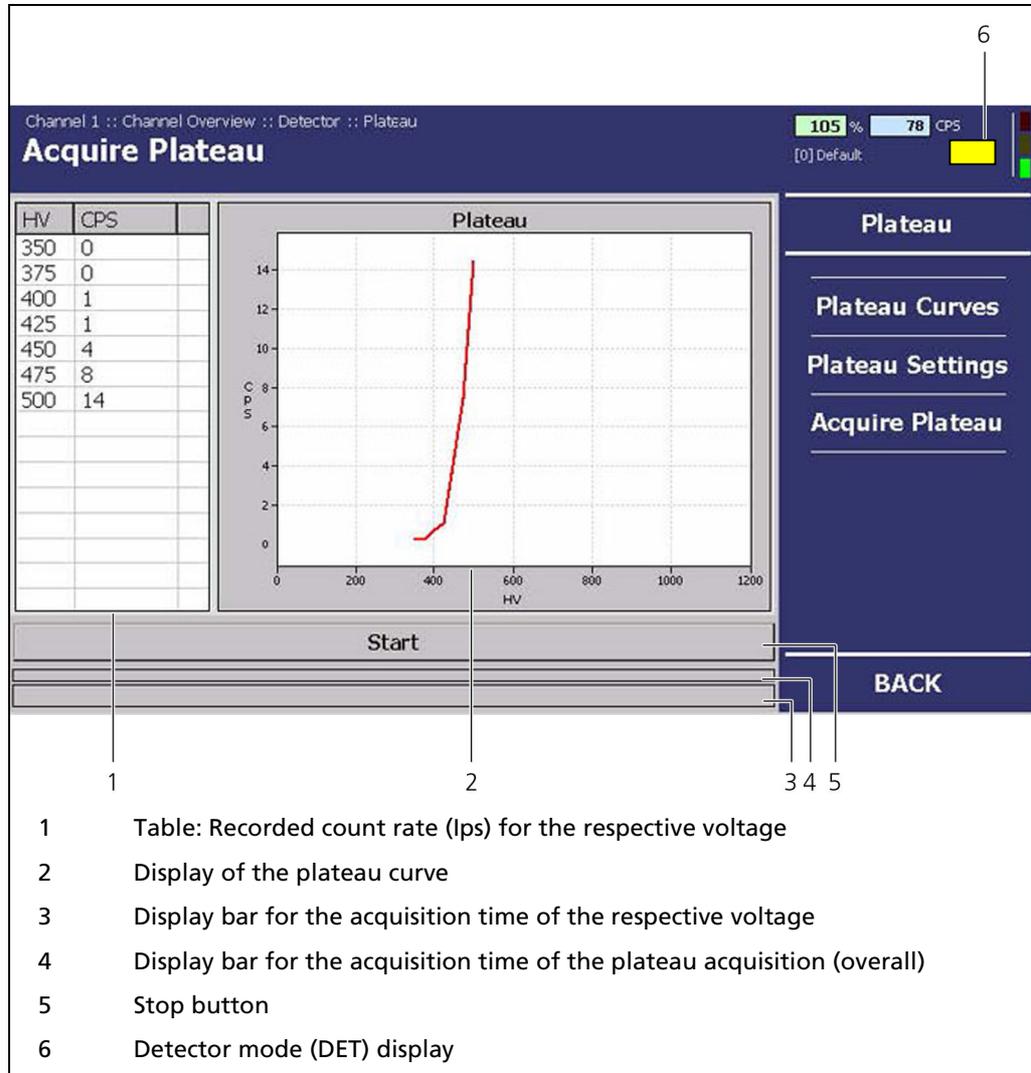


Fig. 21 "Channel Overview" menu, Detector - Plateau (Plateau Acquisition)

⇒ When the acquisition is complete, a confirmation message opens. Confirming it will automatically search for and determine the operating point.

⇒ The plateau recording is complete.



Note

If you detected any malfunctions of the GAMMAcast detector during the plateau acquisition, a visual inspection (chap. 6.1.3.1) is to be carried out as the next step.

6.1.3 Plateau curves

This menu offers you the following options:

- **Display of different plateau curves** (Fig. 22, pos.2). The tabs will only appear, if you have already acquired several plateaus.
 - **Finding the operating point** (Fig. 22, pos.1) using the different plateau curves (if you have acquired several curves).
 - **Export of plateau acquisitions** in tabular form (.txt file) onto a USB flash drive.
1. In the menu Channel XY | menu "Channel Overview" | Detector, click on <Plateau> (Fig. 17, pos. 4) to access the "Plateau" submenu.
 2. Click on <Plateau Curves> (Fig. 18, pos. 4).
 - ⇒ The "Plateau Curves" submenu opens (Fig. 22).

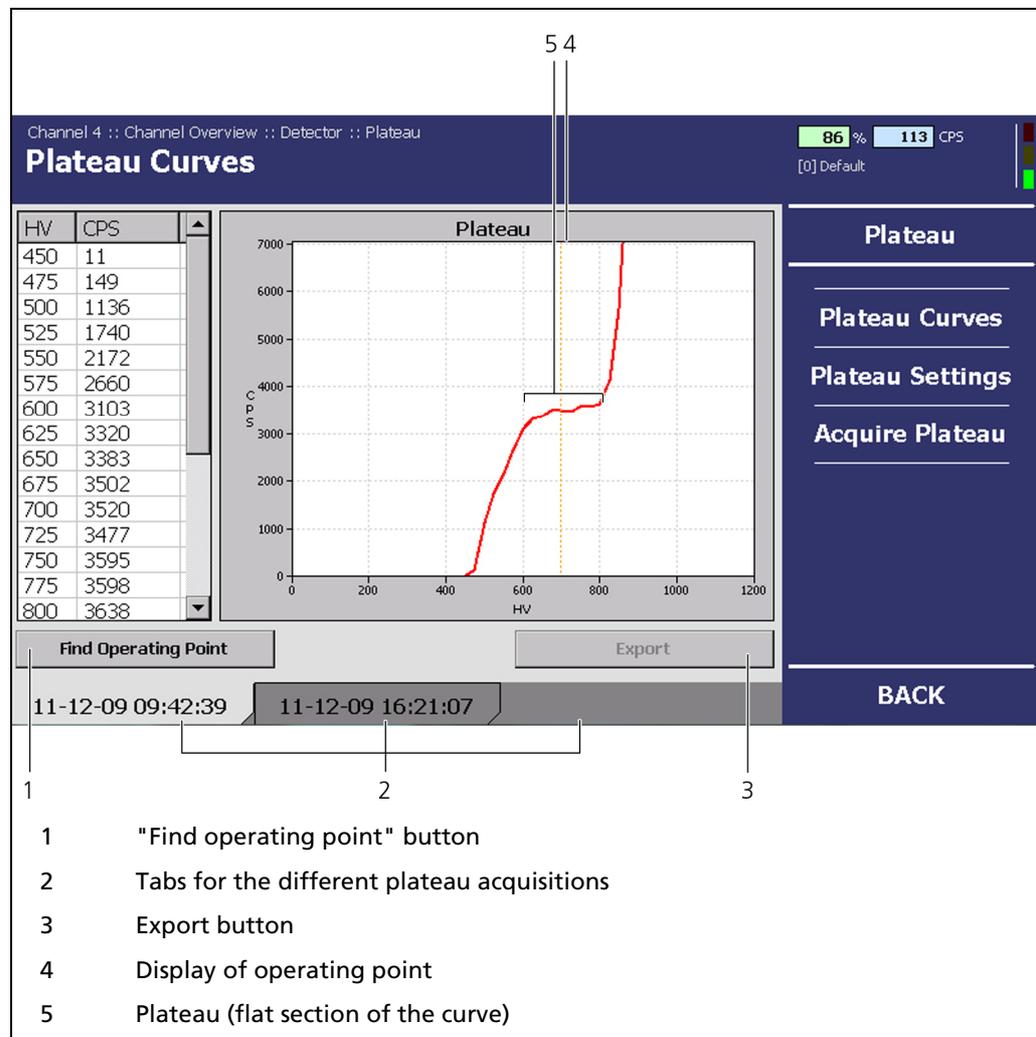


Fig. 22 "Channel Overview" menu, Detector - Plateau – (Plateau Curves)

Finding the operating point

The operating point defines the value for the high voltage that is required for the operation of the photomultiplier.



Note

In the condition as supplied, the operating point of the GAMMAcast detectors has already been pre-set by BERTHOLD TECHNOLOGIES.

- It is only required to find and set a new operating point if the crystal, the photomultiplier or electrical components were exchanged at a later time.

3. Click on the button **<Find operating point>** (Fig. 22, pos. 1) in order to create a new operating point.

⇒ A confirmation message opens (Fig. 23).

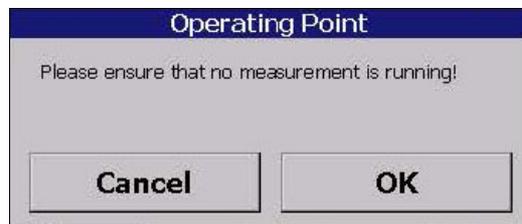


Fig. 23 Confirmation message

4. Confirm the confirmation message by clicking on **<OK>**.

⇒ The operating point is automatically searched for and created.

Export (of plateau acquisition)

1. Click on the button **<Export>** (Fig. 22, pos. 5) in order to export the data (table Fig. 21, pos.1) of the plateau acquisition.

⇒ The table containing the voltages (HV) and count rates (lps) is stored in the main directory of the USB flash drive in form of a txt. file.

Malfunctions in the GAMMAcast detector may be caused by glass breakage, overheating and strong incidence of light. These damages are to be detected by carrying out a visual inspection (see chap. 6.1.3.1).

6.1.3.1 Carrying out a visual inspection of the crystal and photomultiplier

Malfunctions in the GAMMAcast detector may be caused by glass breakage, overheating and strong incidence of light. These damages are to be detected beforehand by carrying out a visual inspection.

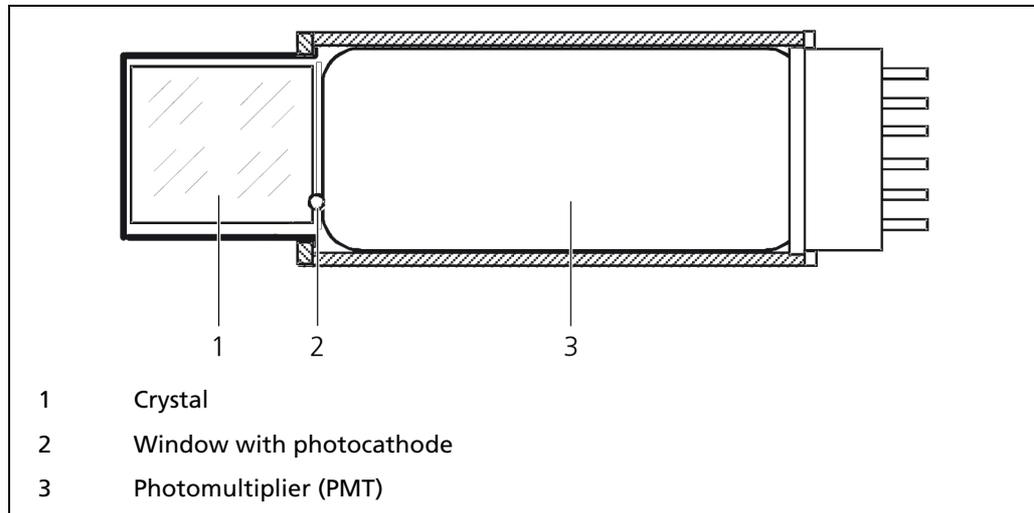


Fig. 24 Representation of the crystal and photomultiplier (only LB 6739)

- The **crystal** must be as clear as glass on the inside and show a slight greenish colouring. Any cracks, milky spots or yellow-brown colouring on or in the crystal are signs of overheating. In this case, the crystal must be replaced.
- There is a vapour-deposited layer (photocathode) on the inside of the **photomultiplier (PMT)**. This layer causes the window to have a slightly brownish or smoked glass colour. If this layer is no longer present or if it is stained, this means that the photocathode including the PMT has been destroyed (e.g. by overheating, glass breakage or incidence of light). In this case, the PMT must be replaced.

The replacement procedure for these two components is detailed in chap. 7.2.

6.2 Detector settings

In the menu Channel XY | menu "Channel Overview" | Detector, click on <Det. Settings> (Fig. 17, pos. 4) to access the "Detector Settings" submenu.

This menu provides you with the following displays:

- High voltage control mode (Fig. 25, pos. 7).
- Detector code (Fig. 25, pos. 6).
- View values for the high voltage (HV) (Fig. 25, pos. 4) and change them if required (Fig. 25, pos. 2 and 3).

Channel 1 :: Channel Overview :: Detector

Det. Settings 105 % 80 CPS
[0] Default

Measurement Channels

Measurement

88 CPS

HV

HV Actual 725 V

HV Manual 725 V

HV Default 725 V

Mode

Manual

Detector Code 1

CsI(Na) 40x50

Detector

Plateau

Det. Settings

Temperature

Det. Error

Service

BACK

1 2 3 4 5 6 7

1 Count rate (lps) display field of the measurement channel(s)

2 High voltage input field "HV Default"

3 High voltage input field "HV Manual"

4 High voltage display field "HV Actual"

5 Scintillator display field

6 Detector code input field

7 Drop-down menu for the control mode

Fig. 25 "Channel Overview" menu, Detector - Detector Settings

6.2.1 Setting the control mode



Using the "Automatic" control mode is not recommended.

Use the control mode "Manual".

Note

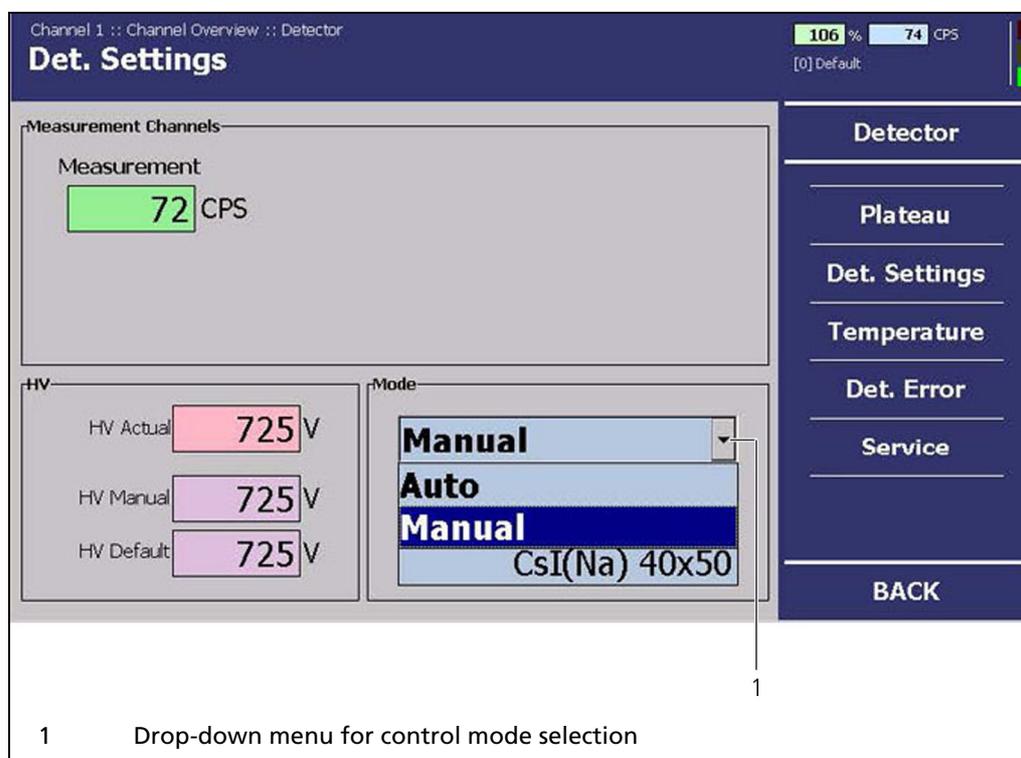


Fig. 26 "Channel Overview" menu, Detector - Detector Settings

1. Click on the drop-down menu (Fig. 26, pos. 1).
⇒ The drop down menu for the control mode selection opens.
2. Select the <Manual> control mode.

6.2.2 Detector code



Depending on the GAMMAcast detector used, the detector code has been pre-set by BERTHOLD TECHNOLOGIES in the condition as supplied.

Note

Possible detector codes:

Detector code	GAMMAcast detector
1	LB 6739; crystal: CsI 40 mm x 50 mm
10	LB 6752; polymer 150 mm x 100 mm x 50 mm
11	LB 6752; polymer 150 mm x 100 mm x 25 mm
20	LB 6750; crystal: CsI 35 mm x 50 mm

6.2.3 Setting high voltage



In the conditions as supplied, the values for the high voltage have already been pre-set by BERTHOLD TECHNOLOGIES.

Note

If the operating point must be readjusted due to a replacement of the crystal, PMT or electrical components, we recommend using the function "Acquire Plateau". **Manually setting the high voltage is not recommended!**

1. Click on the input field "HV Manual" (Fig. 25, pos. 3).
⇒ The numeric keypad opens (see operating manual "47344BA2", Fig. 17).
2. Enter a value for the high voltage (HV) and confirm your entry by clicking on "Enter" (see operating manual "47344BA2", Fig. 17, pos. 4).

6.3 Temperature



Attention

Damage to the GAMMAcast detector

In the condition as supplied, the values for the threshold and the hysteresis have already been pre-set by BERTHOLD TECHNOLOGIES. The maximum temperature specified in the technical data may not be exceeded.

- If the threshold is set too high, the temperature alarm might not be triggered even though the admissible temperature at the GAMMAcast detector has already been exceeded.
- Setting the threshold too high may cause damage to the scintillator of the GAMMAcast detector.

The "Temperature" submenu offers you the following options:

- **Actual:** Display of the current GAMMAcast detector temperature.
- **Extremes:** Display of achieved maximum and minimum temperatures of the GAMMAcast detector.
- **Threshold:** Setting the temperature (threshold) at which an alarm is to be triggered.
- **Hysteresis:** Setting the hysteresis:
 - When the temperature increases, the temperature alarm will be triggered once the set threshold temperature of (in this case) 50°C is exceeded. If the temperature falls again, the alarm does not switch off until the temperature falls below (in this case) $50^{\circ}\text{C} - 3^{\circ}\text{C} = 47^{\circ}\text{C}$.

Temperature (continued)

In the menu "Channel Overview" | Detector, click on <Temperature> (Fig. 17, pos. 4) if you want to set the threshold and hysteresis for the temperature alarm of the GAMMAcast detector.

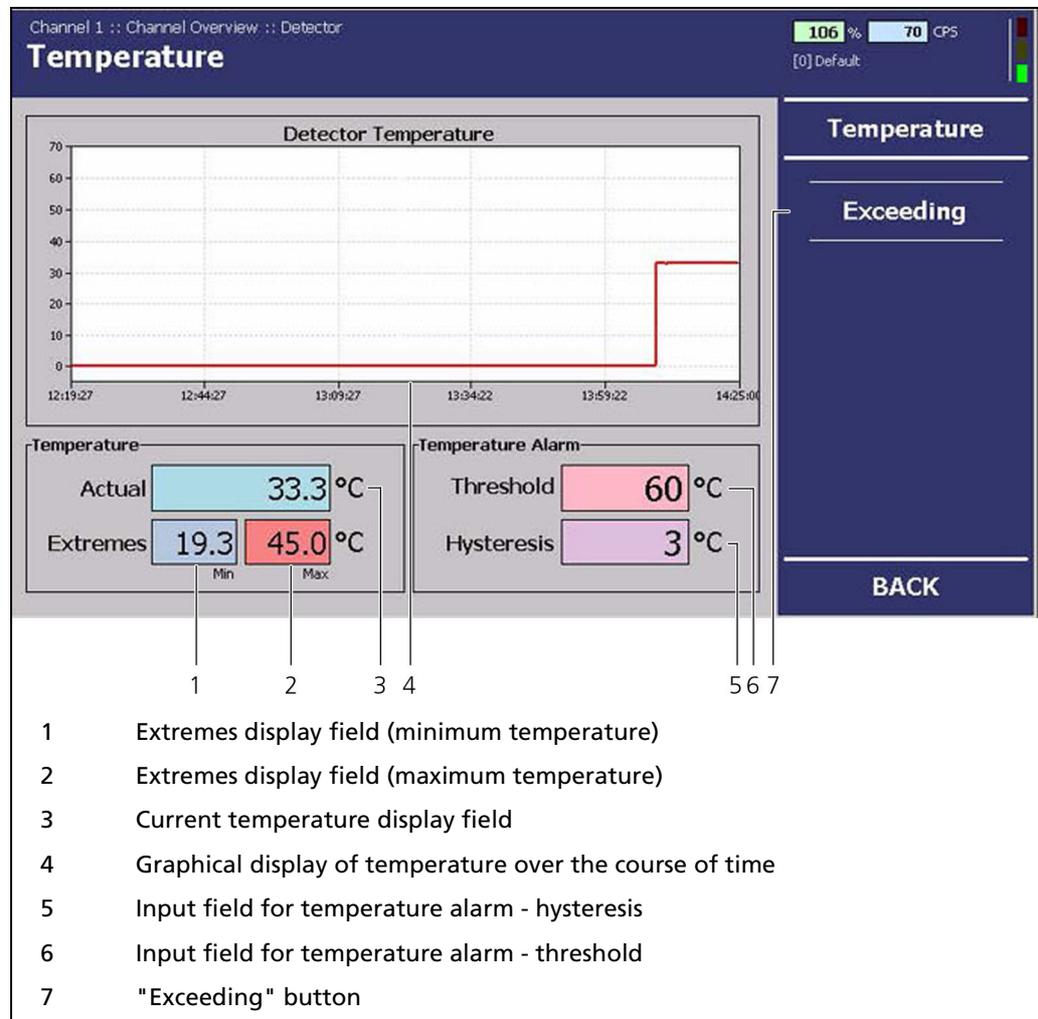


Fig. 27 "Channel Overview" menu, Detector - Temperature

6.3.1 Exceedings



Note

The temperature exceedings displayed in the "Exceeding" submenu do not depend on the set threshold temperature triggering the temperature alarm. The thresholds used for this list are fixed-programmed.

In the menu "Channel Overview" | Detector | Temperature, click on <Exceeding> (Fig. 27, pos. 7) to access the "Exceeding" submenu.

In the "Exceeding" submenu, you can see a tabular overview (Fig. 28, pos. 1) of the excessive temperatures.

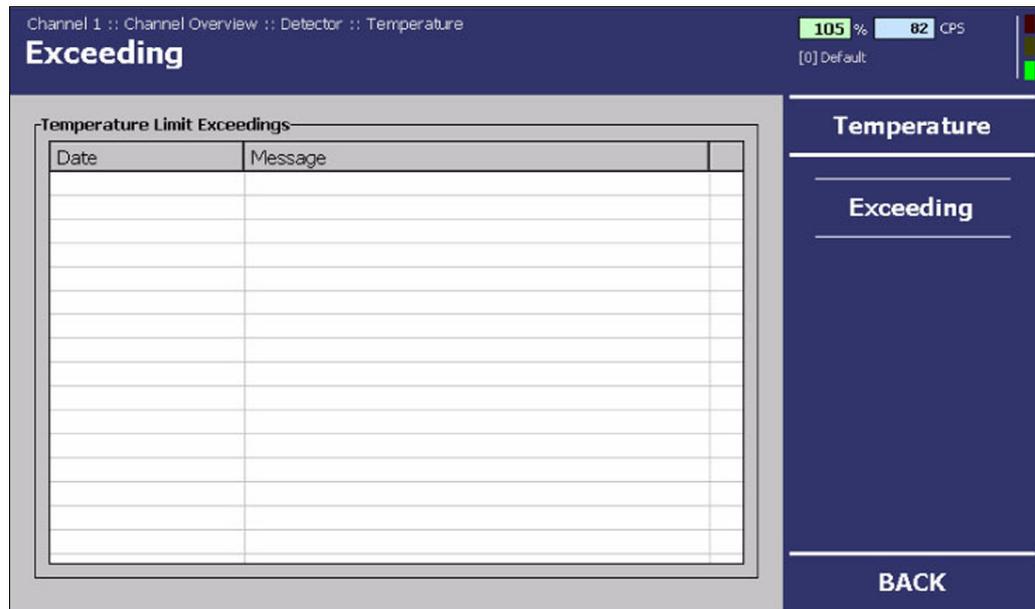


Fig. 28 "Channel Overview" menu, Detector - Temperature (Exceedings)

6.4 Detector error

In the menu "Channel Overview" | Detector, click on <Det. Error> (Fig. 17, pos. 4).

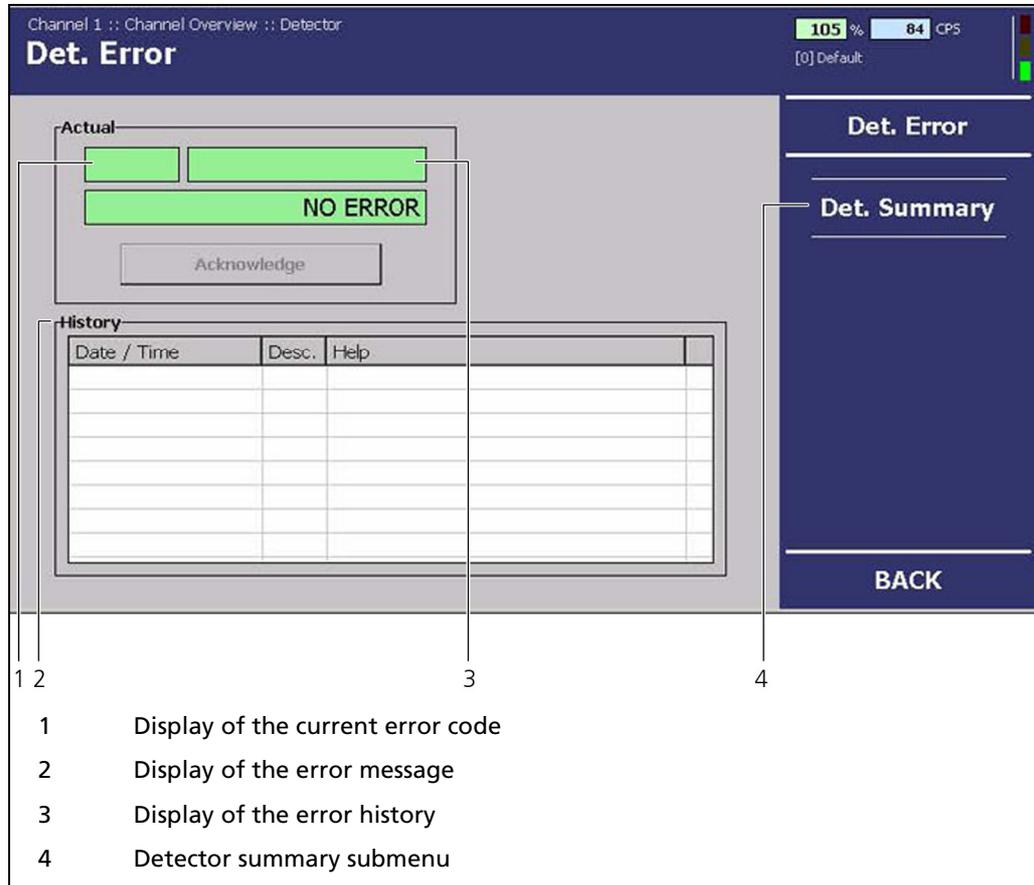


Fig. 29 "Channel Overview" menu, Detector, Det. Error

In the "Det. Error" submenu you can view the following information:

Actual Displays the current error message and the error code.

History Displays the error history with the error message and the error codes.

6.4.1 Overview

In the menu "Channel Overview" | Detector | Det. Error , click on <Summary> to access the "Summary" submenu (Fig. 29, pos. 4).

Desc.	Help	Count	A...	Occurrence	Occurance
101	HW module corrupted	0	x	2000-01-01 00:00:00	2000-01-01
102	Device data corrupted	0	x	2000-01-01 00:00:00	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
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
210	Temperature to high	0	x	2000-01-01 00:00:00	2000-01-01
211	Quartz synchronization	0	x	2000-01-01 00:00:00	2000-01-01
501	No detector found	0	v	2000-01-01 00:00:00	2000-01-01

Fig. 30 "Channel Overview" menu, Detector, Det. Error - Summary

In the "Summary" submenu, you can find a detailed error list (Fig. 30).

6.5 Detector service

The "Service" submenu offers you the following options:

- **Export service data:**
This button will only appear if you connect a USB flash drive to the EVU. The service data is stored in the main directory of the USB flash drive in form of a txt file.

Service data includes:
 - Change log
 - The error log
 - Production data
- **Resetting the detector settings:**
Clicking on the button <Detector Factory Reset> will reset all settings of the detector to the factory settings.
- **Reboot detector:**
Clicking on this button will reboot the GAMMAcast detector. No settings will be deleted in the process.

Detector Service (continued)

In the menu "Channel Overview" | Detector, click on <Service> (Fig. 17, pos. 4) to access the "Detector Service" submenu (Fig. 31).

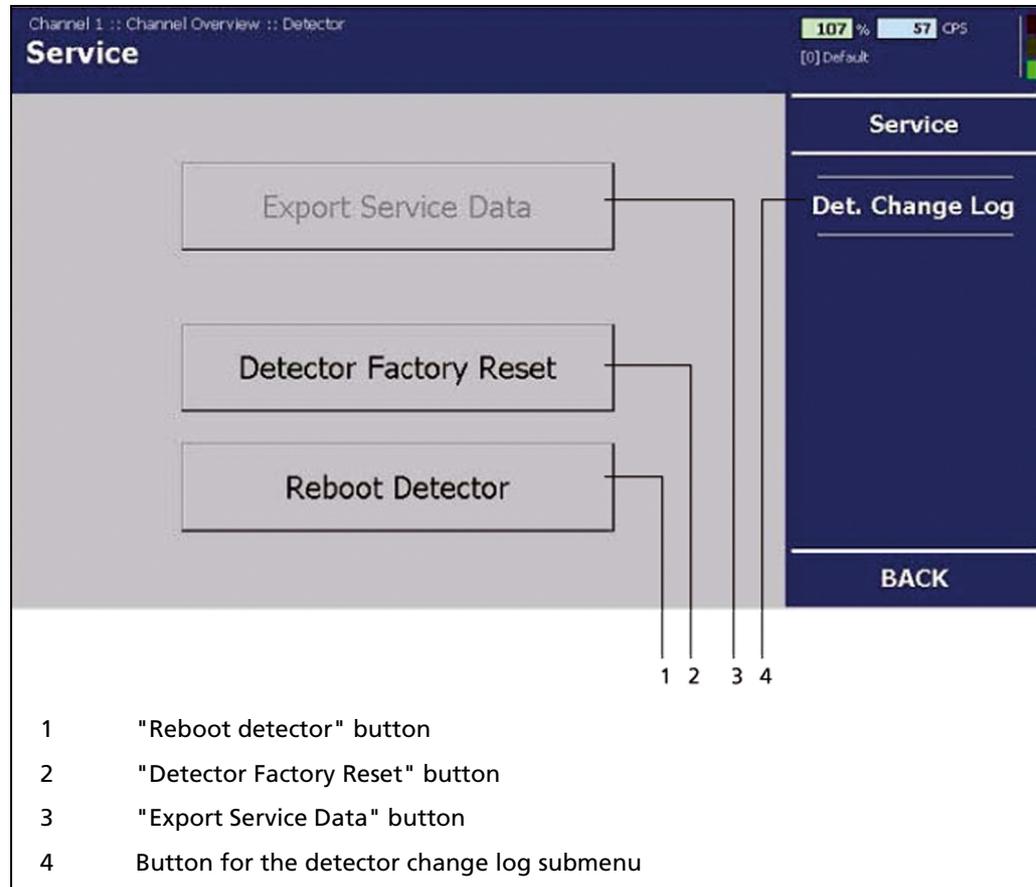


Fig. 31 "Channel Overview" menu, Detector, Service

6.5.1 Exporting service data



Note

Already existing service data will not be overwritten since the file names contain the date and time of the export.

Please note that all data contained in the .txt files is kept in English.

1. Connect the USB flash drive to the USB port of the front panel (see operating manual "47344BA2", fig. 1, pos. 1).
2. Click on <Export Service Data>, (Fig. 31, pos. 3) to save the service data on the USB flash drive.
 - ⇒ The data export starts automatically. During the export, the message "loading..." (Fig. 32) is displayed.

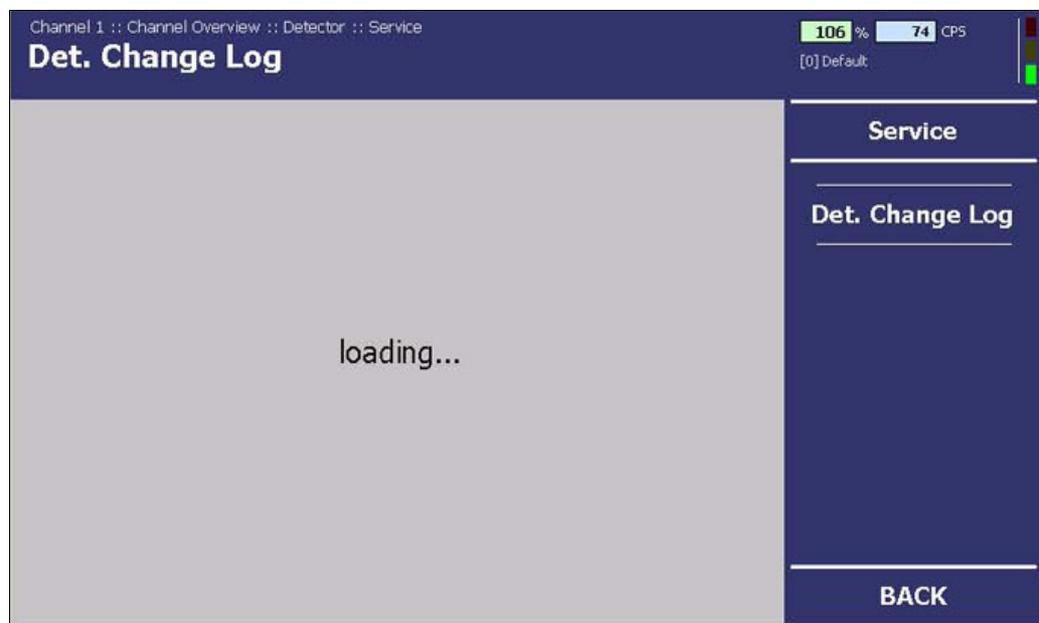


Fig. 32 "Channel Overview" menu, Detector, Service (Data export in progress)

- ⇒ 3 .txt files are saved to the main directory of the USB flash drive (Change Log, Error Log and System Data).
- ⇒ If the process is complete, the display will switch back to the "Service" submenu (Fig. 31).

6.5.2 Detector Factory Reset



Caution

When resetting the detector to its factory settings, **all** entered settings, for example the **plateau acquisitions**, will be lost and the measurement will be stopped.

1. Click on <Detector Factory Reset> (Fig. 31, pos. 2) if you want to reset the GAMMAcast detector to its factory settings.
 - ⇒ The warning window opens (Fig. 33).



Fig. 33 Warning message

2. Confirm the warning message by clicking on <OK>.
 - ⇒ The EVU will switch to "Error" mode for approx. 1 second. The EVU will switch back to "Run" mode afterwards. The measurement system is operating again.
 - ⇒ The GAMMAcast detector has now been reset to its factory settings. A reboot of the EVU is not required.

6.5.3 Rebooting the detector



Note

For safety reasons, you can manually reboot the GAMMAcast detector after an update. However, a reboot is automatically carried out after each update of the GAMMAcast detector, the EVU or the channel.

1. Click on <Reboot detector>. (Fig. 31, pos. 1) in order to reboot the GAMMAcast detector.
 - ⇒ The warning window opens (Fig. 33).
2. Confirm the warning message by clicking on <OK>.
 - ⇒ The EVU will switch to "Error" mode for approx. 1 second. The EVU will switch back to "Run" mode afterwards. The measurement system is operating again.

Rebooting the detector (continued)

⇒ The GAMMAcast detector is automatically rebooted; a reboot of the EVU is not required. Error correction

6.6 Error codes

In the following tables you can find the error codes of the GAMMAcast detectors which provide you with exact information on how to fix the errors.

For more information on the error correction of the EVU, please refer to chap. 8 of the operating manual "47344BA2".

6.6.1 GAMMAcast detectors

code	Text	Description	Correction	Class
101	HW module corrupted	Missing circuit board or incompatible test header	<ul style="list-style-type: none"> ➤ Carry out a software update ➤ Contact service 	Error
102	Device data corrupted	Data inconsistency found	<ul style="list-style-type: none"> ➤ Carry out factory reset <p>Attention: All settings of the detector will be lost!</p>	Error
103	RAM, Flash or CPU	Error in main memory Hardware error	<ul style="list-style-type: none"> ➤ Contact service 	Error
104	WD reset	The system has been reset by the watch dog (WD) Hardware error	<ul style="list-style-type: none"> ➤ Contact service 	Error
105	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
106	WD off	The debug jumper is sticking, the watchdog is disabled.	<ul style="list-style-type: none"> ➤ Remove debug jumper 	Error

6.6.2 Mainboard

Code	Text	Description	Correction	Class
201	Monitor ADC failure	The monitoring ADC (Analogue Digital Converter) has failed Hardware error.	➤ Contact service	Error
202	ADC Calibration	Error while calibrating the ADC Hardware error	➤ Contact service	Error
203	11 V failure	Faulty 11 V operating voltage Hardware error	➤ Contact service	Error
204	+5 V failure	Faulty +5 V operating voltage Hardware error.	➤ Contact service	Error
205	-5 V failure	Faulty -5 V operating voltage Hardware error	➤ Contact service	Error
206	GND failure	Measured GND value too large Hardware error	➤ Contact service	Error
207	Ref 2.5 V failure	Faulty 2.5 V reference voltage Hardware error	➤ Contact service	Error
208	Temperature sensor CPU	Temperature sensor on CPU circuit board failed Hardware error	➤ Contact service	Warning
209	AMP temperature sensor	Temperature sensor on AMP circuit board failed Hardware error	➤ Contact service	Warning
210	Temperature too high	Temperature is/was too high	<ul style="list-style-type: none"> ➤ Ensure sufficient cooling of the GAMMAcast detector ➤ Use GAMMAcast detector with water cooling 	Warning
211	Quartz synchronisation	Deviations in oscillator detected	➤ Contact service if occurring repeatedly	Error

6.6.3 Detector control

Code	Text	Description	Correction	Class
501	DAC Calibration	Error while calibrating the DACs Hardware error	➤ Contact service	Error
502	Pulse reception error	Timeout upon receipt of pulse rates	➤ Carry out software update	Error
503	Measuring threshold	Threshold of measurement channel 1 incorrect Hardware error	➤ Contact service	Error
504	Threshold channel 2	Threshold of measurement channel 2 incorrect Hardware error	➤ Contact service	Error
505	Threshold channel 3	Threshold of measurement channel 3 incorrect Hardware error	➤ Contact service	Error
506	Threshold Control channel	Threshold of control channel incorrect Hardware error	➤ Contact service	Error
507	Pulse difference	Deviation too big when comparing count rates with redundant channels (only in safety mode)	<ul style="list-style-type: none"> ➤ Ensure that the GAMMAcast detector housing is correctly locked (prevent incidence of light) ➤ Check high voltage supply of photomultiplier ➤ Contact service 	Warning
508	No pulses	Time allowed for zero count rate of the corresponding crystal exceeded	➤ Check PMT and/or high voltage control	Warning
509	lower current limit	Anode current of the PMT too high	➤ Check high voltage control and/or set high voltage	Warning
510	upper current limit	Anode current of the PMT much too high	➤ Check high voltage control and/or set high voltage	Error
511	HV control voltage	HV control voltage not correct Hardware error	➤ Contact service	Error
512	HV failure	HV not correct. Hardware error	➤ Contact service	Error
513	HV limit value	HV too high (only during active control)	➤ Check PMT and/or high voltage control	Warning
514	HV 20 % below average	HV value < 20 % below average (only during active control)	➤ Check PMT and/or high voltage control	Warning

Detector Control (continued)

Code	Text	Description	Correction	Class
515	HV 20 % above average	HV value >20 % above average (only during active control)	➤ Check PMT and/or high voltage control	Warning
516	Glitch	Glitch detected (only during active control)	➤ Contact service if occurring repeatedly	Error
517	Detector Control error	Error in detector control Hardware error	➤ Contact service	Error

6.6.4 Process connection

Code	Text	Description	Correction	Class
701	Data reception	Timeout upon receipt of output data	➤ Carry out software update	Error
702	Pulse output	Pulse output does not correspond to measured count rate Hardware error	➤ Contact service	Error

7 Maintenance

Malfunctions of the GAMMAcast detectors can be caused by mechanical or thermal overloading.

These malfunctions do not always result in a complete failure of the GAMMAcast detectors.

In most cases, the specific sensitivity changes or noticeable instabilities occur.

In these cases, acquiring a new plateau can be helpful (for instructions on how to acquire a plateau, see chap. 6.1.2) to compensate for possible instabilities.

7.1 Visual inspection of crystal and photomultiplier (not LB 6750)

Malfunctions in the GAMMAcast detector may be caused by glass breakage, overheating and strong incidence of light. These damages are to be detected by carrying out a visual inspection.

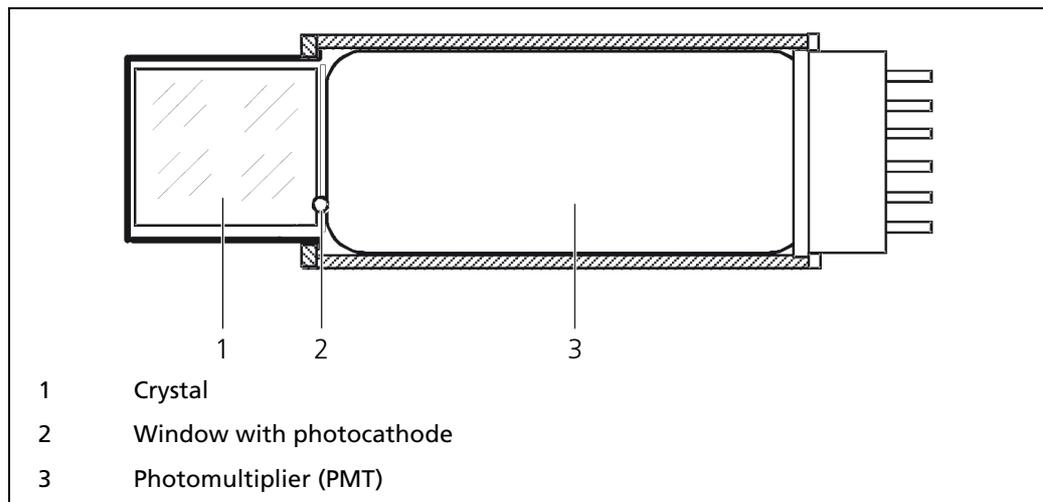


Fig. 34 Representation of the crystal and photomultiplier (LB 6739)

- The **crystal** must be as clear as glass on the inside and show a slight greenish colouring. Any cracks, milky spots or yellow-brown colouring on or in the crystal are signs of overheating. In this case, the crystal must be replaced.
- There is a vapour-deposited layer (photocathode) on the inside of the **photomultiplier (PMT)**. This layer causes the window to have a slightly brownish or smoked glass colour. If this layer is no longer present or if it is stained, this means that the photocathode including the PMT has been destroyed (e.g. by overheating, glass breakage or incidence of light). In this case, the PMT must be replaced.

The replacement procedure for these two components is detailed in chap. 7.2.

7.2 Replacing the PMT or the PMT crystal combination (only LB 6739)

A replacement of the PMT or PMT crystal combination is carried out in the following cases:

- Noticeable instabilities due to thermal or mechanical overloading or bright light incidence.
- Error during plateau recording (short or too steep plateau).

For replacing the crystal or photomultiplier, the following tools/materials are required:

- Spanner
- Pliers
- Screwdriver/hexagon wrench
- If required, spacer rings
- Thread grease

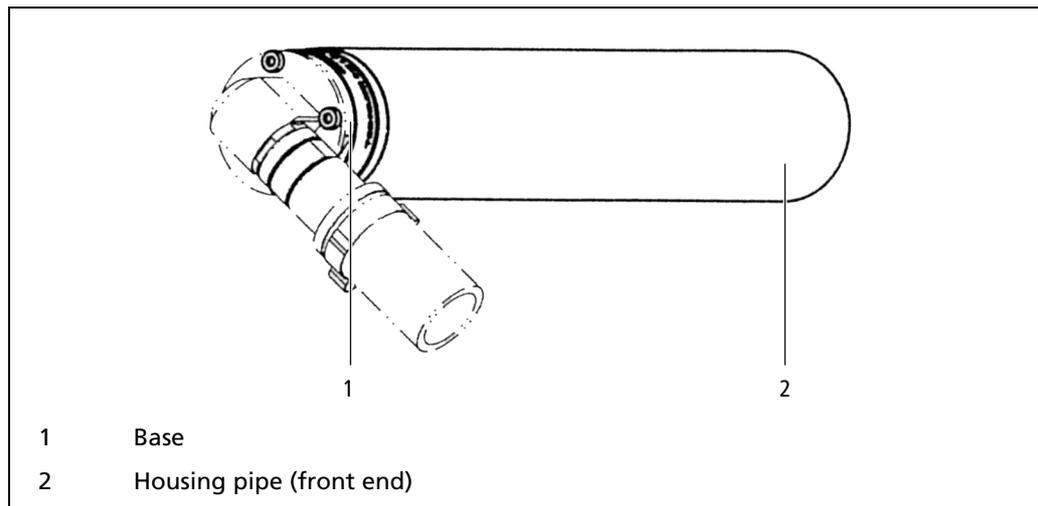


Fig. 35 GAMMAcast detector LB 6739 with housing pipe

1. De-energise the GAMMAcast detector. In order to do this, remove the plug of the GAMMAcast detector from the EVU.
2. Fix the base (Fig. 35, pos.1) using a spanner.
3. Carefully screw on the housing pipe using pliers. Only use the pliers at the front end of the housing pipe (Fig. 35, pos.2). Ensure that the housing pipe is not deformed in any way.

Replacing the PMT or PMT crystal combination (continued)

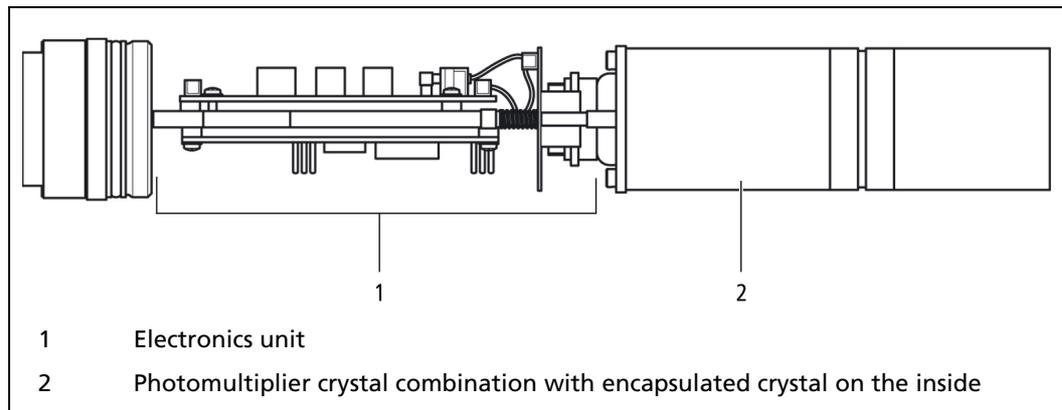


Fig. 36 GAMMAcast detector LB 6739 Csl 40/50 without housing pipe

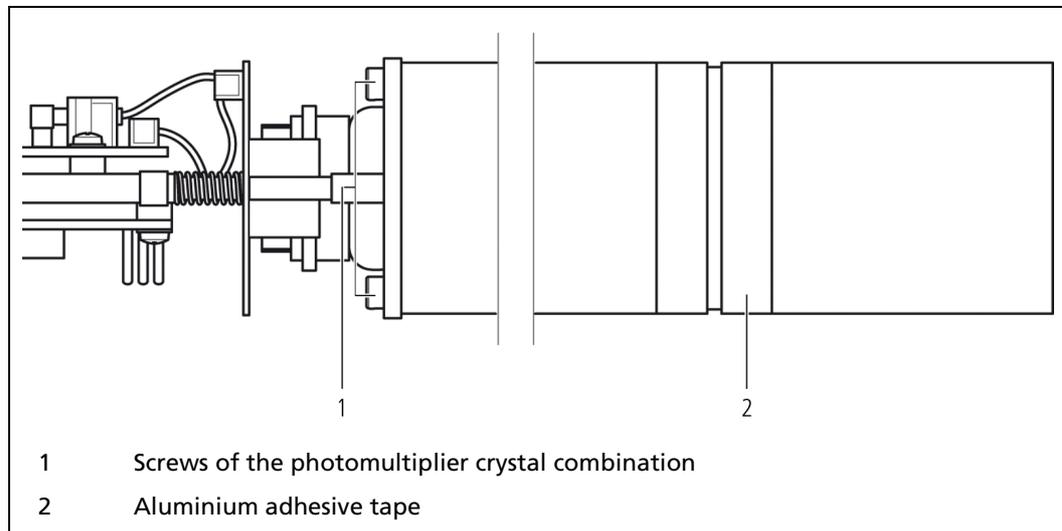


Fig. 37 GAMMAcast detector LB 6739 Csl 40/50, magnetic shielding and aluminium adhesive tape

4. Loosen the screws on the magnetic shielding (Fig. 37, pos. 1).
If the entire photomultiplier crystal combination is to be replaced, proceed with step 12.
5. Remove the aluminium adhesive tape (Fig. 37, pos. 2) from the metal shielding.
6. Unscrew the metallic shielding.
7. Pull the PMT (Fig. 38, pos. 2) out of the metallic shielding.
8. Insert the new PMT into the metallic shielding.
9. Evenly and centrally place the silicon washer located between the crystal and the PMT on the crystal.

Replacing the PMT or PMT crystal combination (continued)

10. Screw the crystal back onto the magnetic shielding.
11. Glue the connection together using aluminium adhesive tape.

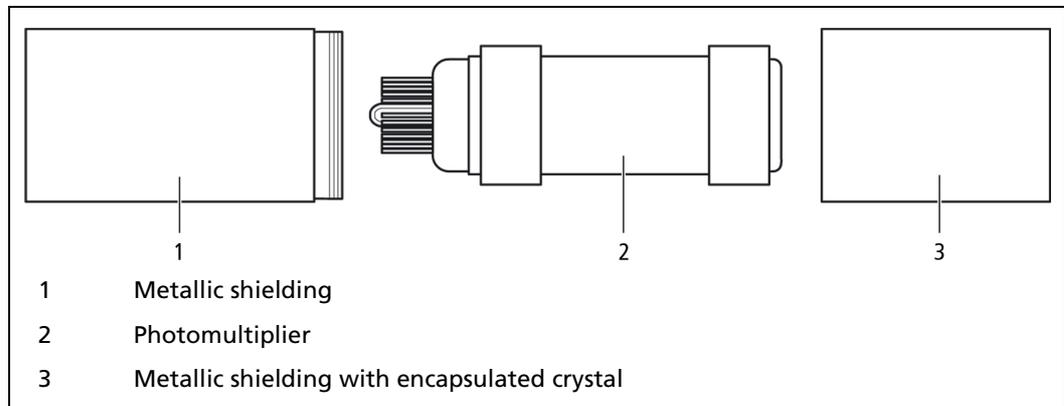


Fig. 38 GAMMAcast detector LB 6739 CsI 40/50, PMT removed

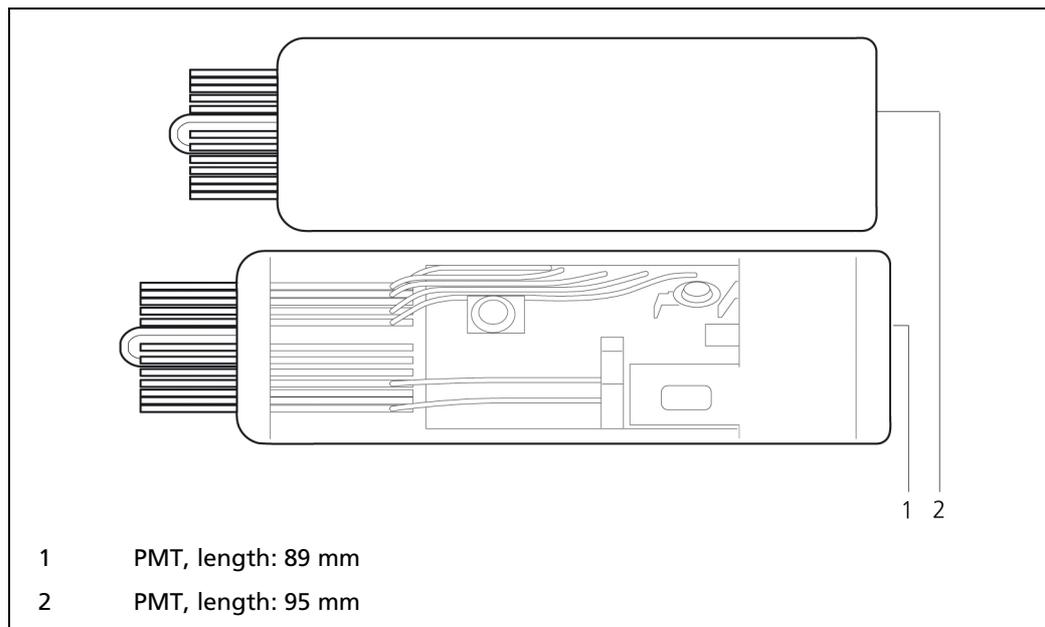


Fig. 39 PMT, 89 mm and 95 mm long

Replacing the PMT or PMT crystal combination (continued)



Note

Two different photomultipliers of different length are used. For length compensation, two **spacer rings** are supplied that need to be installed and/or removed if required.

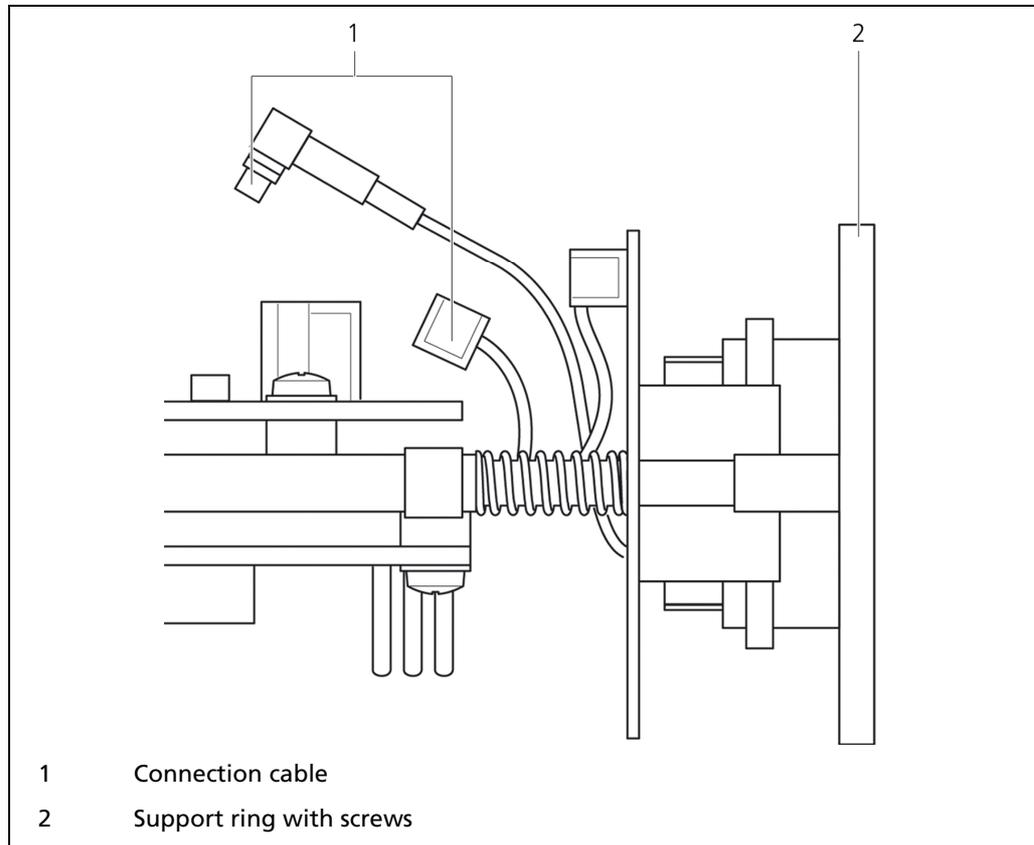


Fig. 40 GAMMAcast detector LB 6739 Csl 40/50, PMT removed

12. If a modification of the spacer rings should be required, disconnect both connection cables (Fig. 40, pos. 1) from the electronics unit and remove the screws located at the support ring (Fig. 40, pos. 2).

Replacing the PMT or PMT crystal combination (continued)

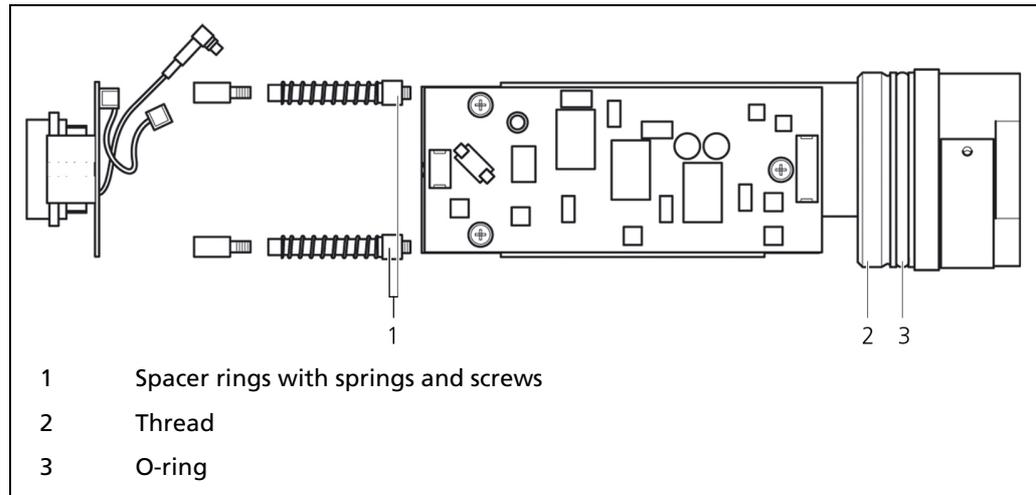


Fig. 41 PMT without Mu-metal shielding, spacer rings installed

13. Remove the screws and springs at the spacer rings and push on the spacer rings (Fig. 41, pos. 1) - if the shorter PMT is used - or remove them. Put the springs back on afterwards.
14. Tighten the support ring (Fig. 40, pos. 2) again
15. Plug the connection cable (Fig. 40, pos. 1) back into the electronics unit.
16. Tighten the PMT crystal combination again.
17. Before screwing on the housing pipe, grease the thread and the O-ring using a suitable thread grease.



Note

After having replaced the PMT and assembled the GAMMAcast detector, a plateau curve must be acquired and the operating point must be readjusted.

8 Decommissioning

Follow this sequence for decommissioning:

1. Remove the connection cable from the GAMMAcast detector.
2. Remove the GAMMAcast detector with/without water cooling from the mould.
3. If required, remove the GAMMAcast detector from the water cooling system.
4. If required, dispose of the GAMMAcast detector at a specialist waste management company.

8.1 Disposal of GAMMAcast detectors



Toxic!

The GAMMAcast detector is an electronic component which contains toxic substances.

- Damage to health due to toxic substances.
- Do not dispose of the GAMMAcast detector in general waste, but via a specialised waste management company.

9

Technical information

9.1 GAMMAcast detector LB 6739 / LB 6750: Technical data

Mechanics	
Scintillator	LB 6739: CsI crystal; Ø 40 mm or Ø 25 mm, H: 50 mm LB 6750: CsI crystal: Ø 35 mm, H: 50 mm
Admissible operating temperature	-20°C ... +50°C ambient temperature At higher temperatures, a water cooling system is required (optional)
Storage temperature	-20°C ... +70°C
Auxiliary energy	15...32 V _{DC} , approx. 1.2 W
Output signal	Pulses, max. 10 V
Communication	RS 485
Water cooling system (optional)	Connection: R¼ Max. pressure: 6 bar Cooling water quality requirement: Drinking water quality (or filtered operating water without suspended matter)
Protection class	IP 66 / IP 67
Connection	Detector – terminal box and/or detector – evaluation unit: Special connection cable with PlugProtect connector (straight or angled by 90°) open ends or HeavyCon plug Terminal box – evaluation unit: 6-wire, shielded (6 x 1.5 mm ²) Max. length 1000 m
Weight	Approx. 2 kg With water cooling system approx. 3 kg
Software	Measurement of the temperature in the detector Storage of temperature extreme values Possibility of acquiring the plateau curve with automatic determination of the correct high voltage supply of the photomultiplier (either via castXpert LB 452 or via the detector service modem) Storage of the last three plateau curves (LB 6739) Error log (stored in detector)

9.1.1 Dimensional drawing with water cooling system

(All dimensions in mm)

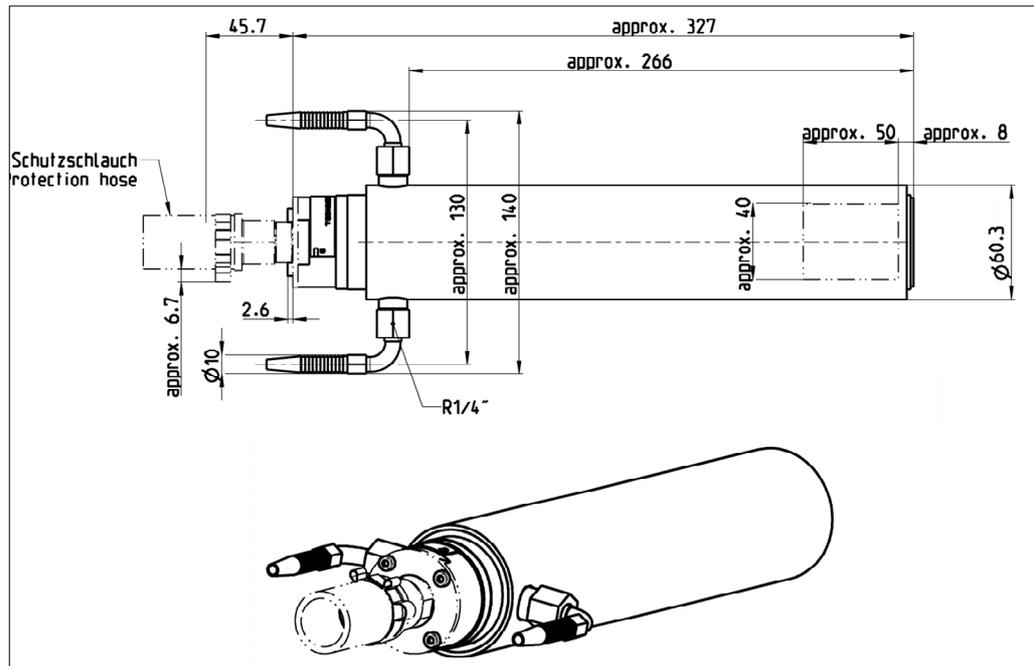


Fig. 42 GAMMAcast detector LB 6739 and LB 6750, dimensional drawing with water cooling system

9.1.2 Dimensional drawing without water cooling system

(All dimensions in mm)

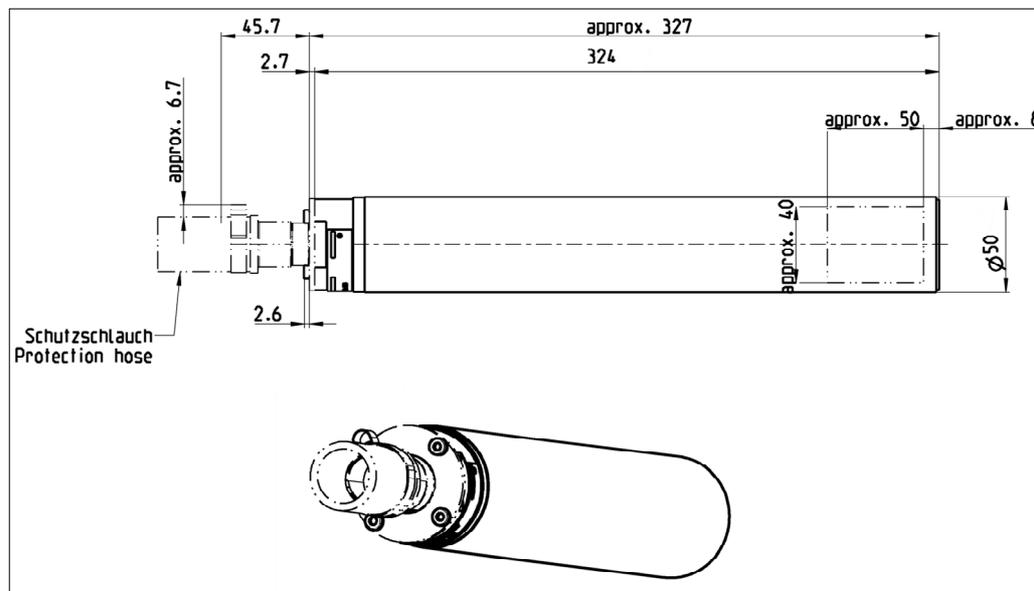


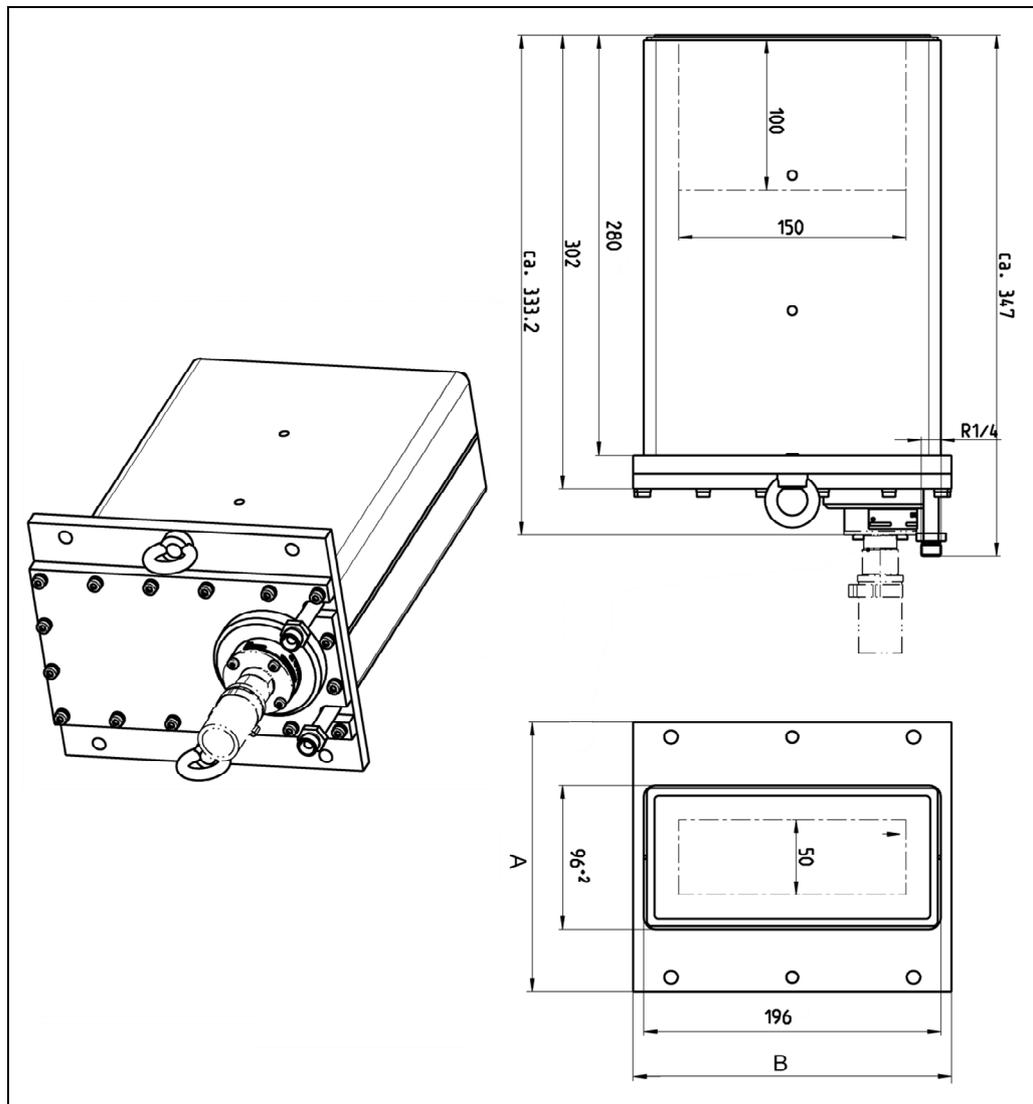
Fig. 43 GAMMAcast detector LB 6739 and LB 6750, dimensional drawing without water cooling system

9.2 GAMMAcast detector LB 6752: Technical data

Mechanics	
Scintillator	Organic polymer scintillator; 150x100x50 mm ³ or 150x100x25 mm ³
Admissible operating temperature	-20°C ... +50°C ambient temperature At higher temperatures, the water cooling system must be used.
Storage temperature	-20°C ... +65°C
Auxiliary energy	15...32 V _{DC} , approx. 1.2 W
Output signal	Pulses, max. 10 V
Communication	RS 485
Water cooling system	Connection: R ¹ / ₄ Max. pressure: 6 bar Cooling water quality requirement: Drinking water quality (or filtered operating water without suspended matter)
Protection class:	IP 66 / IP 67
Connection	Detector – terminal box and/or detector – evaluation unit: Special connection cable with PlugProtect connector (straight or angled by 90°) with open ends or HeavyCon plug Terminal box – evaluation unit: 6-wire, shielded (6 x 1.5 mm ²) Max. length 1000 m
Weight	Approx. 24 kg
Software	Measurement of the temperature in the detector Storage of temperature extreme values Possibility of acquiring the plateau curve with automatic determination of the correct high voltage supply of the photomultiplier (either via castXpert LB 452 or via the detector service modem) Storage of the last three plateau curves Error log (stored in detector)

9.2.1 Dimensional drawing

(All dimensions in mm)

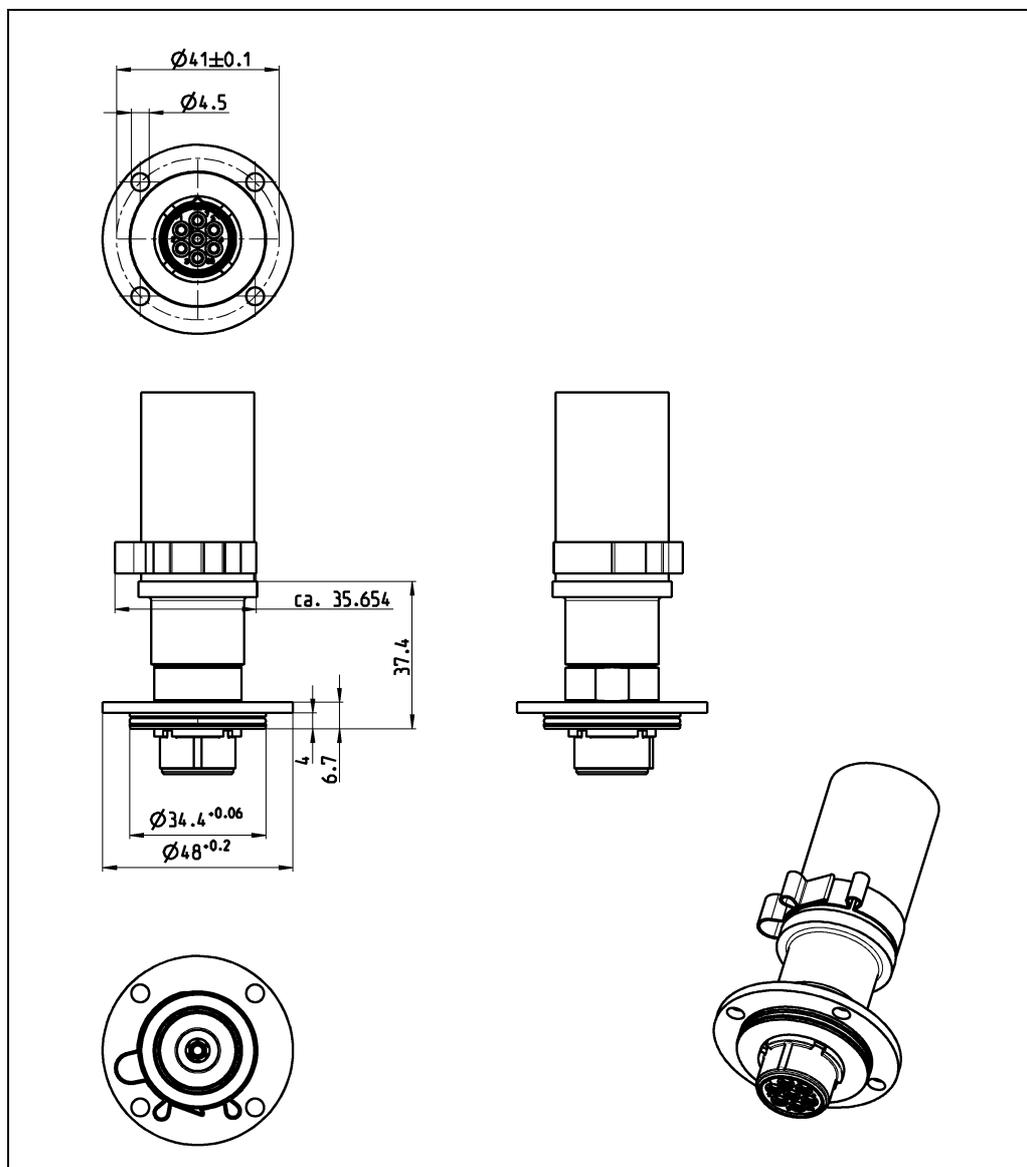


Flange sizes AxB (mm) and bores (9 mm)	
LB 6752-11	180x210, 4 bores on long side plus 2 eyebolts
LB 6752-21	155x210, 4 bores on long side plus 2 eyebolts
LB 6752-31	120x280, 6 bores on short side
LB 6752-53	155x210, as LB 6752-21, 25 mm scintillator
LB 6752-54	180x210, as LB 6752-11, 25 mm scintillator
LB 6752-80	155x210, 4 bores on long side plus 2 eyebolts, without water cooling (Attention: changed housing dimensions: 78x178)

9.3 Connection cable: Connection possibilities

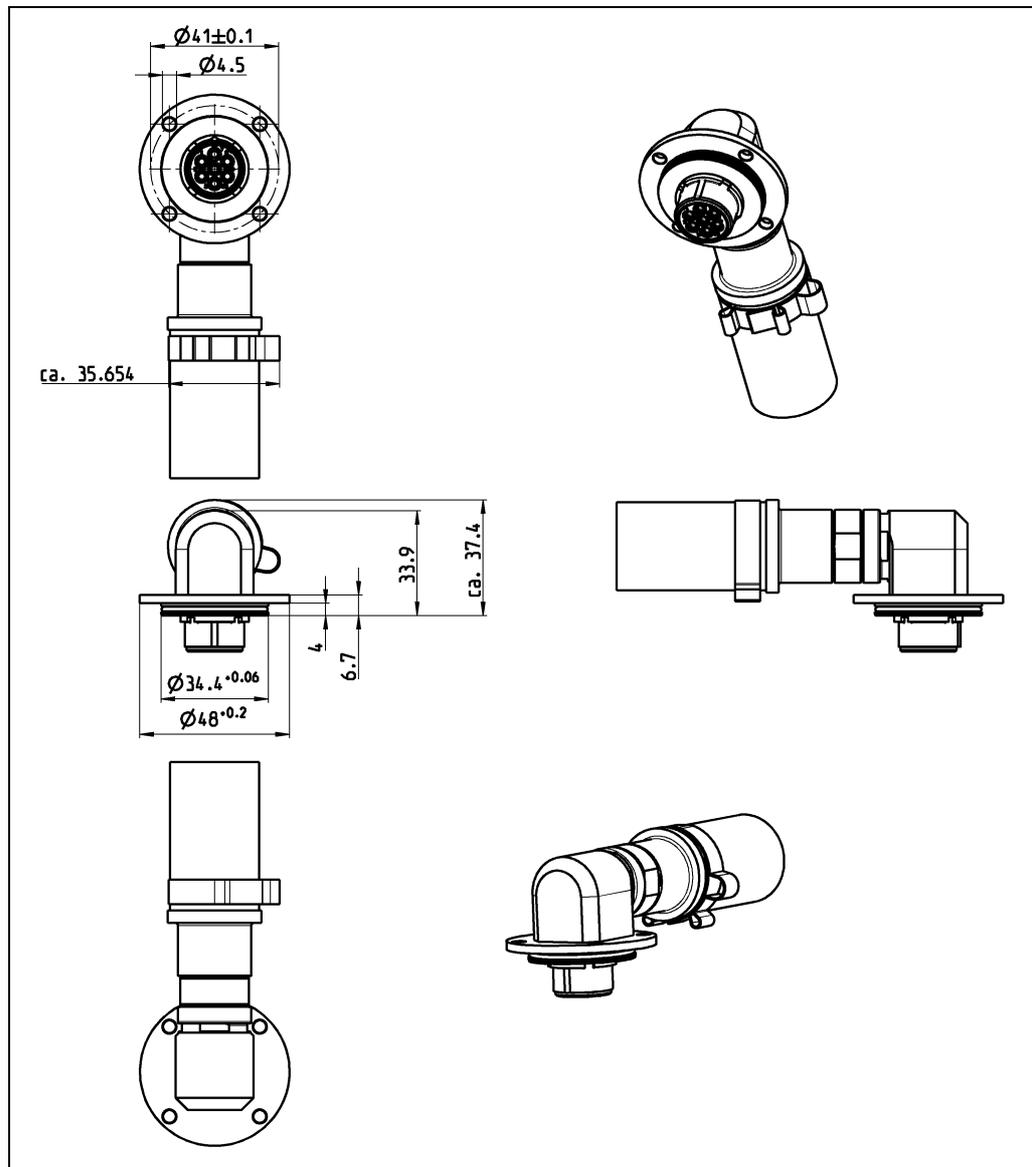
PlugProtect plug-in connection, straight

(All dimensions in mm)



PlugProtect plug-in connection angled by 90°

(All dimensions in mm)



Connection cable: Technical data

Connections	At the detector: PlugProtect with straight plug or plug angled by 90° At the terminal box: open cable ends or HeavyCon plug
Cross section	6-wire, shielded (6 x 0.5 mm ²)
Material	Internal cable: Core insulation and cable jacket: FEP 6Y Heat protection hose: Special Hypalon® mixture
Temperature range	Internal cable: Ambient temperature: -100°C to +205°C Conductor: up to +180°C Heat protection hose: 140°C permanent up to 700°C for short periods Flame-resistant at 800°C for short periods (approx. 20 sec.), self-extinguishing, hardly inflammable
Resistance	Internal cable: absolute ozone-resistant and weather-proof very well resistant to acids, alkalies, solvents, oil and petrol Heat protection hose: resistant to ageing and chemicals UV-resistant, ozone-resistant and weather-proof
Lengths	Total cable length: 5 m, 10 m, 15 m or 20 m Length of heat protection hose: 3 m or in cable length (not 20 m)

Lengths and variants

3 m heat protection hose:

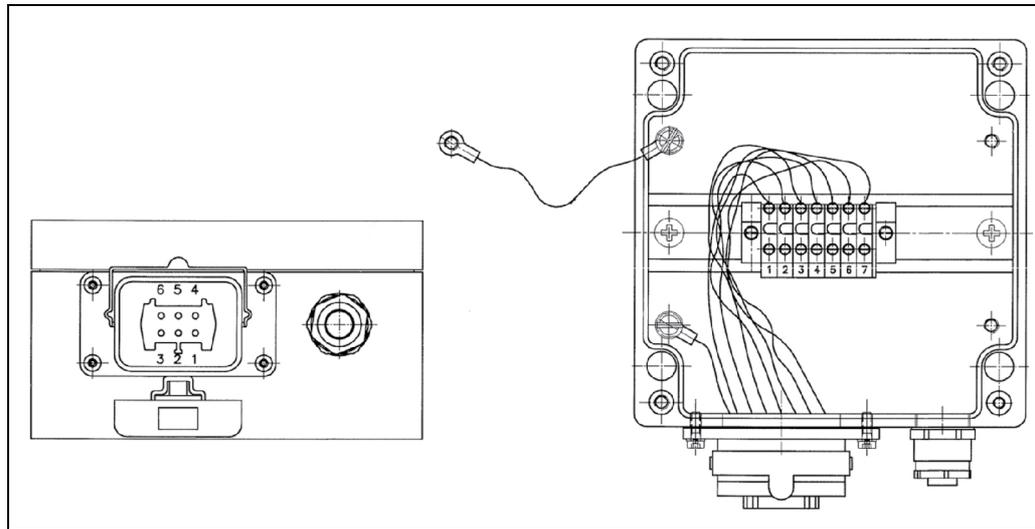
Ident. no.
Straight connection, open ends
52592-050 (5 m)
52592-100 (10 m)
52592-150 (15 m)
52592-200 (20 m)
90° connection, open ends
52593-050 (5 m)
52593-100 (10 m)
52593-150 (15 m)
52593-200 (20 m)
Straight connection, HeavyCon plug
52594-050 (5 m)
52594-100 (10 m)
52594-150 (15 m)
52594-200 (20 m)
90° connection, HeavyCon plug
52595-050 (5 m)
52595-100 (10 m)
52595-150 (15 m)
52595-200 (20 m)

Heat protection hose in cable length:

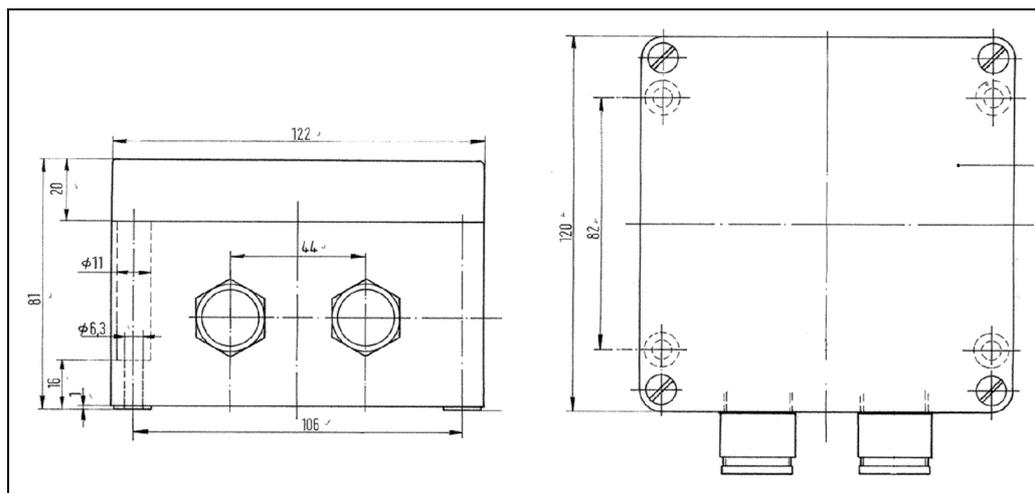
Ident. no.
Straight connection, open ends
55249-050 (5 m)
55249-100 (10 m)
55249-150 (15 m)
90° connection, open ends
55250-050 (5 m)
55250-100 (10 m)
55250-150 (15 m)
Straight connection, HeavyCon plug
55067-050 (5 m)
55067-100 (10 m)
55067-150 (15 m)
90° connection, HeavyCon plug
55252-050 (5 m)
55252-100 (10 m)
55252-150 (15 m)

9.4 Connection terminal box for GAMMAcast detectors

with plug-in connection (34787):



for open ends (07005):

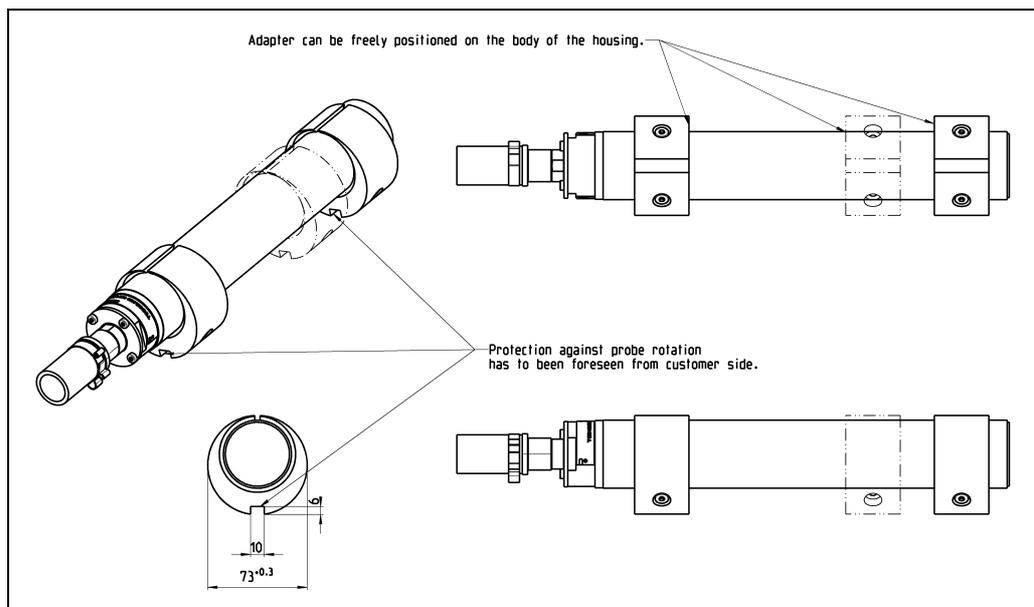
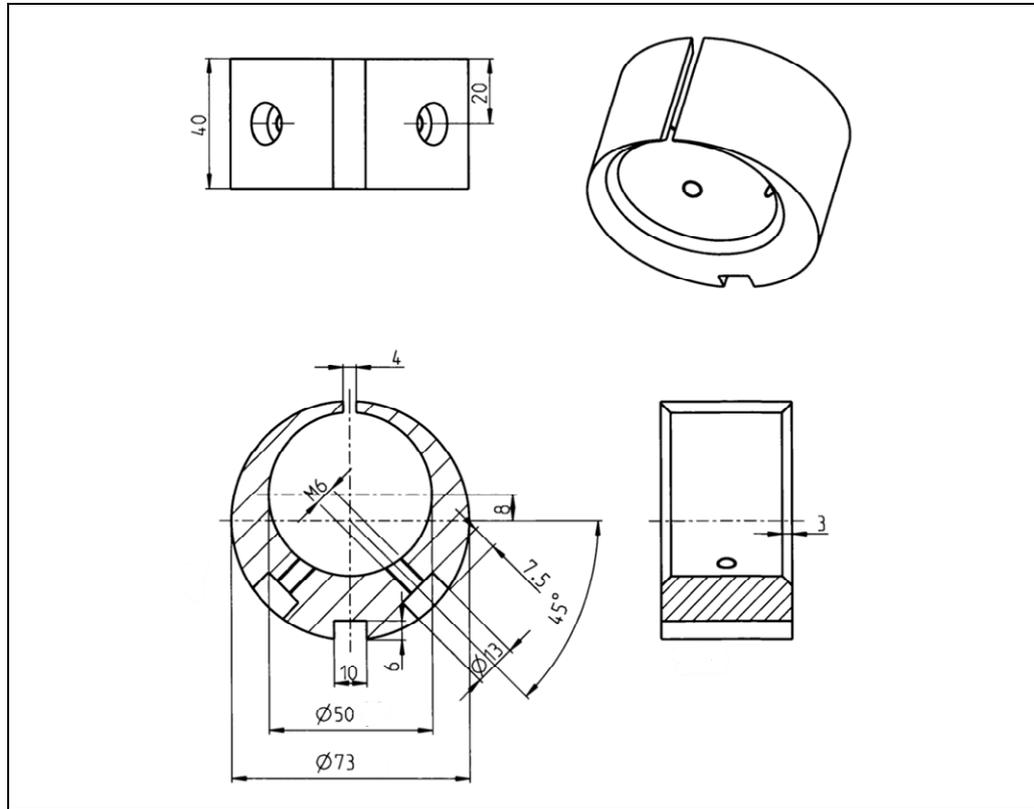


Protection class IP 65

9.5 Replacing LB 6651 with GAMMAcast LB 6739:

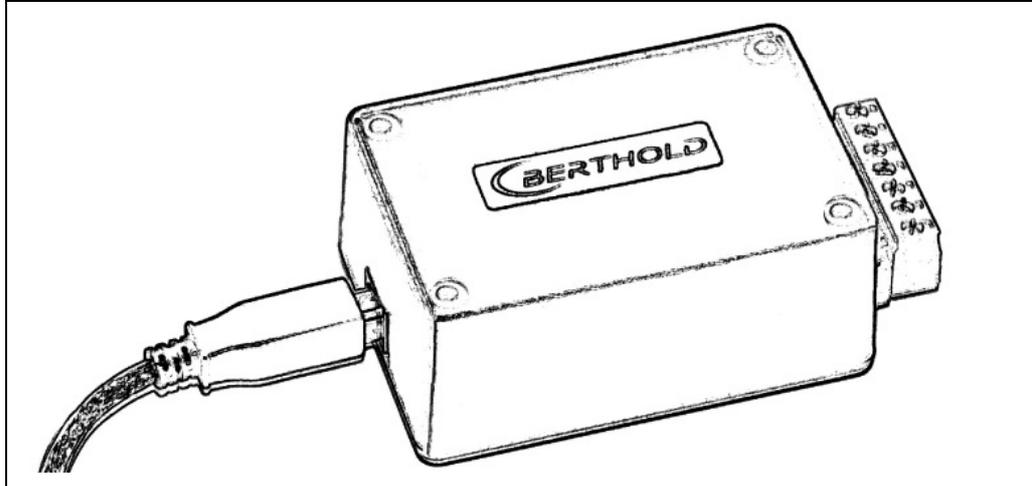
Changed detector dimensions are compensated by adapter ring (58009).

(All dimensions in mm)



9.6 Detector service modem

Modem (55105) for connecting the detectors of the GAMMAcast series to a PC for maintenance purposes.

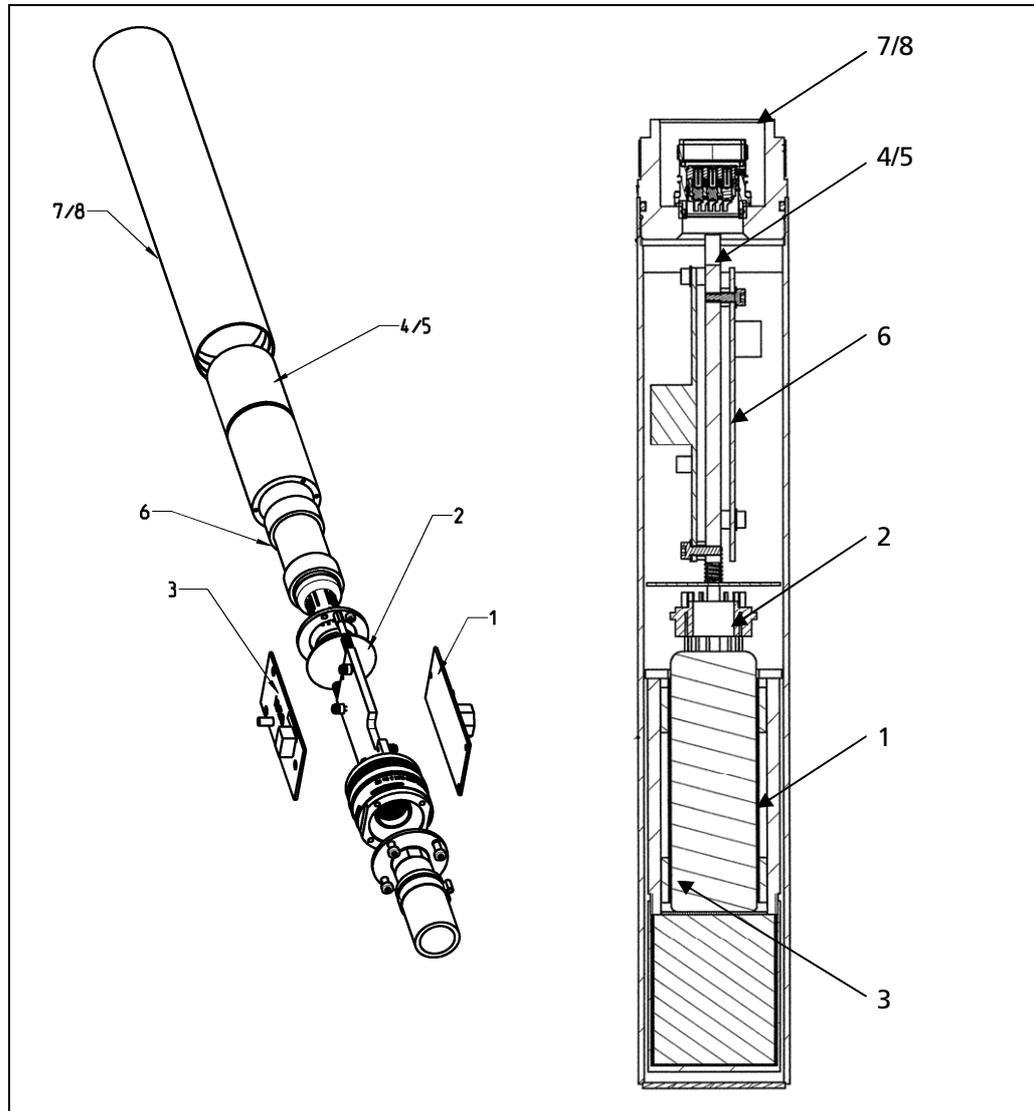


System requirements	Menu language: English Windows XP or higher 512 MB RAM 1 gigahertz processor USB port
Connections	USB 2.0 to PC RS485 to detector Supply voltage 24 VDC (100-240 VAC power supply unit included)
Software LB 67xx PC Control	Display of count rate Display of the detector temperature Display of extreme values of detector temperature Automatically and manually setting of high voltage for the operation of the photomultiplier * Automated process for acquiring the amplifier plateau of the photomultiplier * Access to the change log of the connected detector Access to the error log of the connected detector Software update Resetting the detector to the factory settings

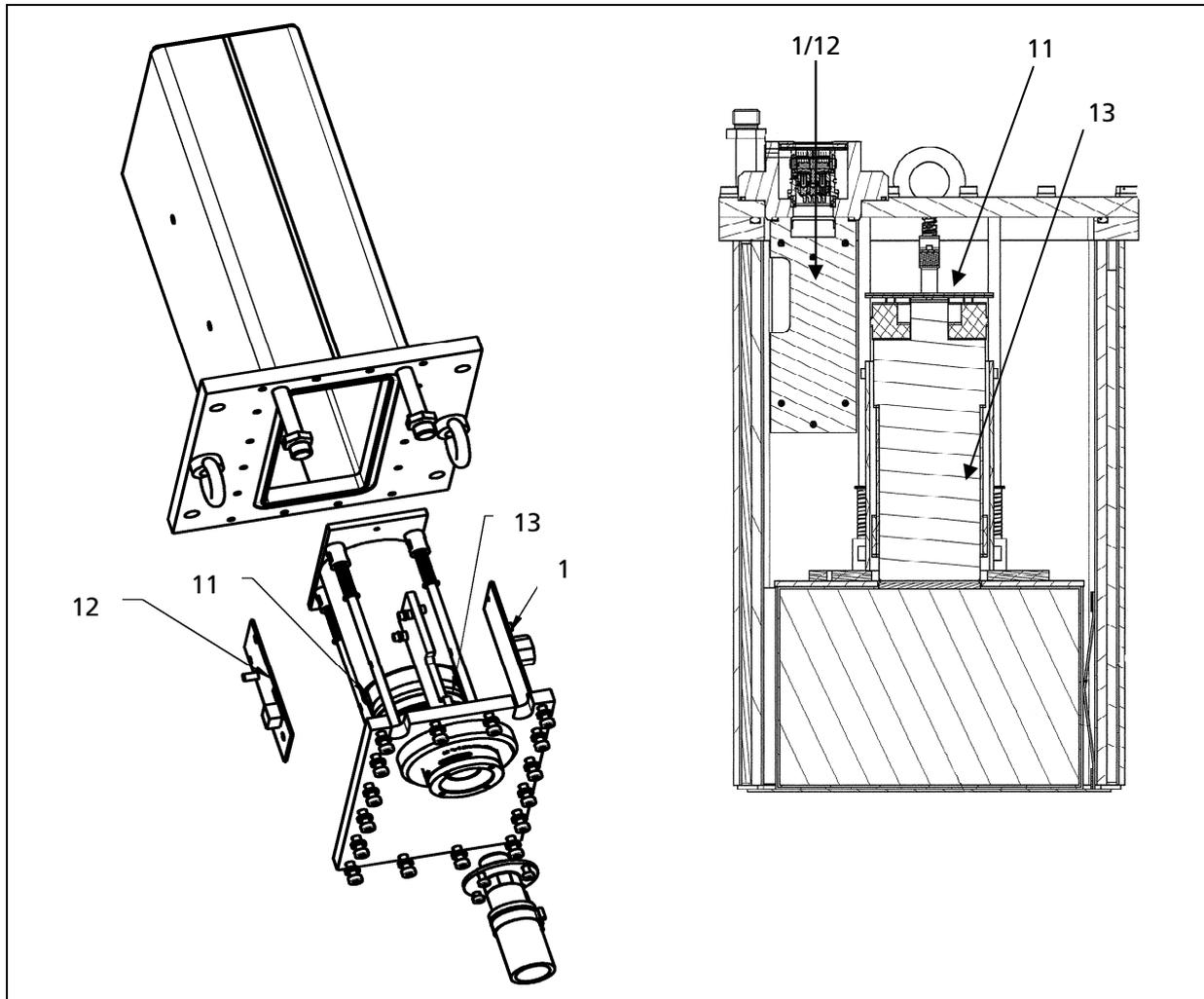
* depending on the connected detector

9.7 GAMMAcast: Important spare parts (selection):

LB 6739 / LB 6750:



LB 6752:



Spare parts GAMMAcast		
1	44535-S	CPU board for GAMMAcast detectors
2	53148-S	Photomultiplier base for LB 6739 with high voltage cascade and voltage divider
3	53437-S	LB 6739: HV (high voltage) board for LB 6739
3	57914-S	LB 6750: Signal Processing Unit for LB 6750
4	55282-S	Photomultiplier crystal unit for LB 6739 (CsI(Na) 40x50 mm ² crystal)
5	55285-S	Photomultiplier crystal unit for LB 6739 (CsI(Na) 25x50 mm ² crystal)
5	34101-S	Photodiode Crystal Unit for LB 6750 (CsI(Tl) 35x50mm Crystal)
6	55653-S	1" photomultiplier unit for LB 6739
7	52496-S	Detector housing without water cooling for LB 6739/6750
8	53442-S	Detector housing with water cooling for LB 6739/6750
9	55873-S	Spare parts kit LB 6739
11	53144-S	Photomultiplier base for LB 6752 with high voltage generator
12	56085-S	Preamplifier board for LB 6752
13	34819-S	2" photomultiplier unit for LB 6752

Spare Parts for cables: all with <i>PlugProtect</i> connectors for GAMMAcast detectors; no heat protection, cable ends cut flat	
58002-050-S	Straight connector, 5 m cable
58002-100-S	Straight connector, 10 m cable
58002-150-S	Straight connector, 15 m cable
58002-200-S	Straight connector, 20 m cable
58003-050-S	90° connector, 5 m cable
58003-100-S	90° connector, 10 m cable
58003-150-S	90° connector, 15 m cable
58003-200-S	90° connector, 20 m cable

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