BERTHOLD
TECHNOLOGIES

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10:30 11:00 11:30 12:00 12:30

Time

castXpert LB 452

GAMMAcast Detectors
LB 6739, LB 6760, LB 6752

Technical Data

47344TI

Rev. Nr.: 03, 12/2018

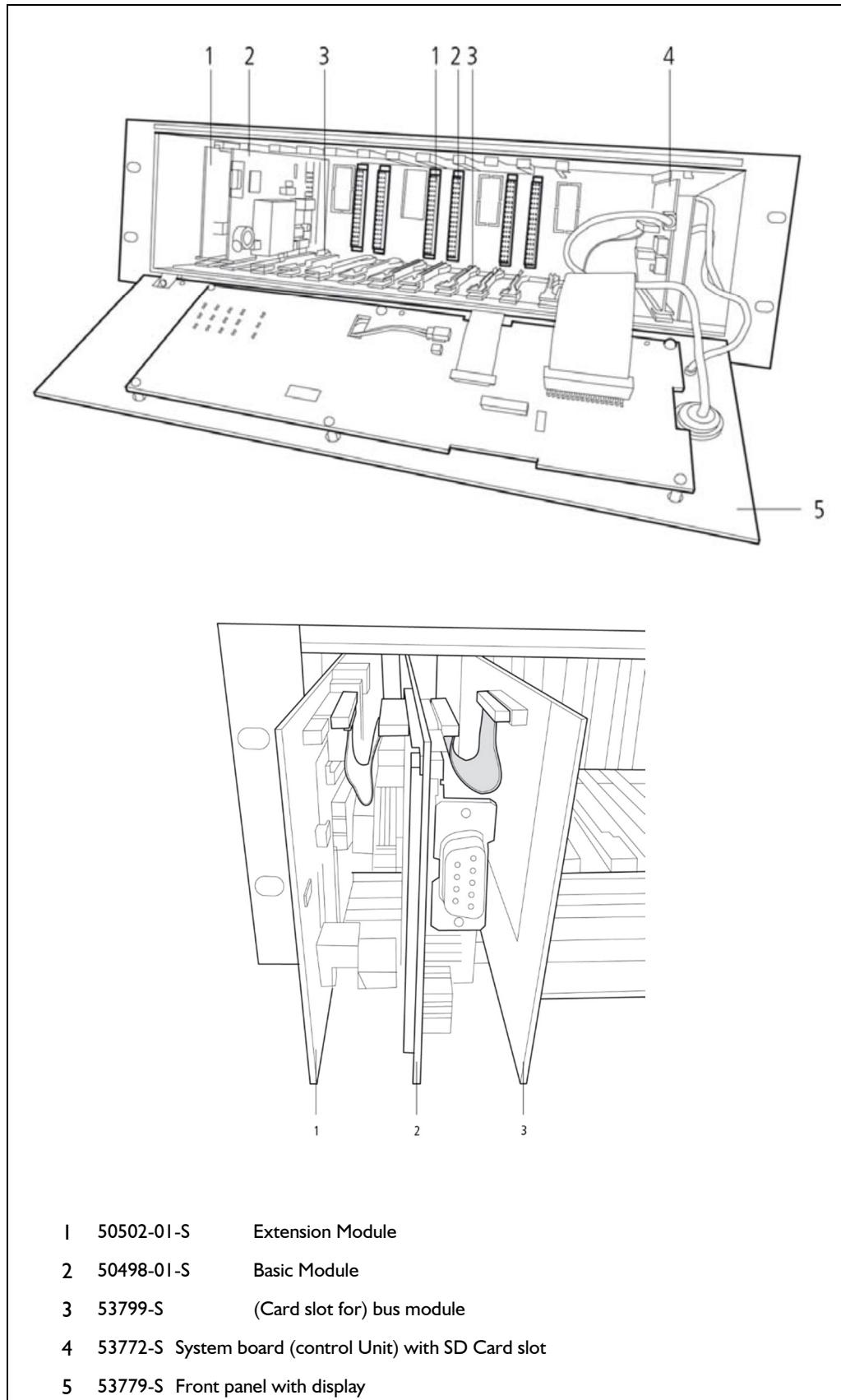## LB 452: Technical Data

Mechanical Design	
Frame	19" Rack, 3 HE Operating unit with 7 inch colour display and touch screen
Max. Assembly	4 measurement channels
Weight	approx. 4-6 kg depending on assembly
Degree of protection	IP 20
Connections	USB port for the connection of USB storage devices or external devices Keyboard 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)
Power consumption	Control unit equipped with a measurement channel: approx. 30 W Every additional measurement channel: approx. 15 W
Operating-temperature	0 ... + 50 °C
Storage temperature	-20 ... +70 °C
Control unit	Control of the display Configuration of measurement channels Fuses: 2 x (Si1 and Si2) 1A/T/250 V according to IEC60127-2/1
Each Measurement Channel	

Basic Module (required)	CPU with separate power supply unit and connection (90-264 VAC, 50/60 Hz)
	Detector connection
	4-20 mA current output (fill level) with option of activating current output signal monitoring (can be switched on and off):
	    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
	2 digital inputs:
	    Floating, for external empty and full adjustment
	Relay output for error signalling:
	    Single pole double throw (SPDT), max. AC 33 V, DC 46 V, 5 A, non- inductive
	Fuses:
	    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

ExtensionModule (Option)	4-20 mA current output with option of activating current output signal monitoring:
	    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
	    Can be configured for:
	        Fill level (additional time constant, freely adjustable)
	        Detector temperature
	        Detector count
	2 digital inputs:
	    potential-free, for ext. Choice of up to 4 calibration curves
	2 relay outputs for alarm signalling:
	    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
	    Can be configured for alarm signals:
	        Max. level
	        Min. level
	        Detector temperature
	        Digital input confirmation
	Pulse output:
	    Detector pulses looped, max. 12 V amplitude
	Fuses:
	    2 x (Si3 and Si4) 5A/T/250 V according to IEC60127-3
	    1 x (Si5) 50 mA/T/250V according to IEC60127-3

Bus Module (Option)	GSD file is provided. Transmission of the following data:
	    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
	Profibus DP:
	    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
	Profinet IO (planning stage):
	    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

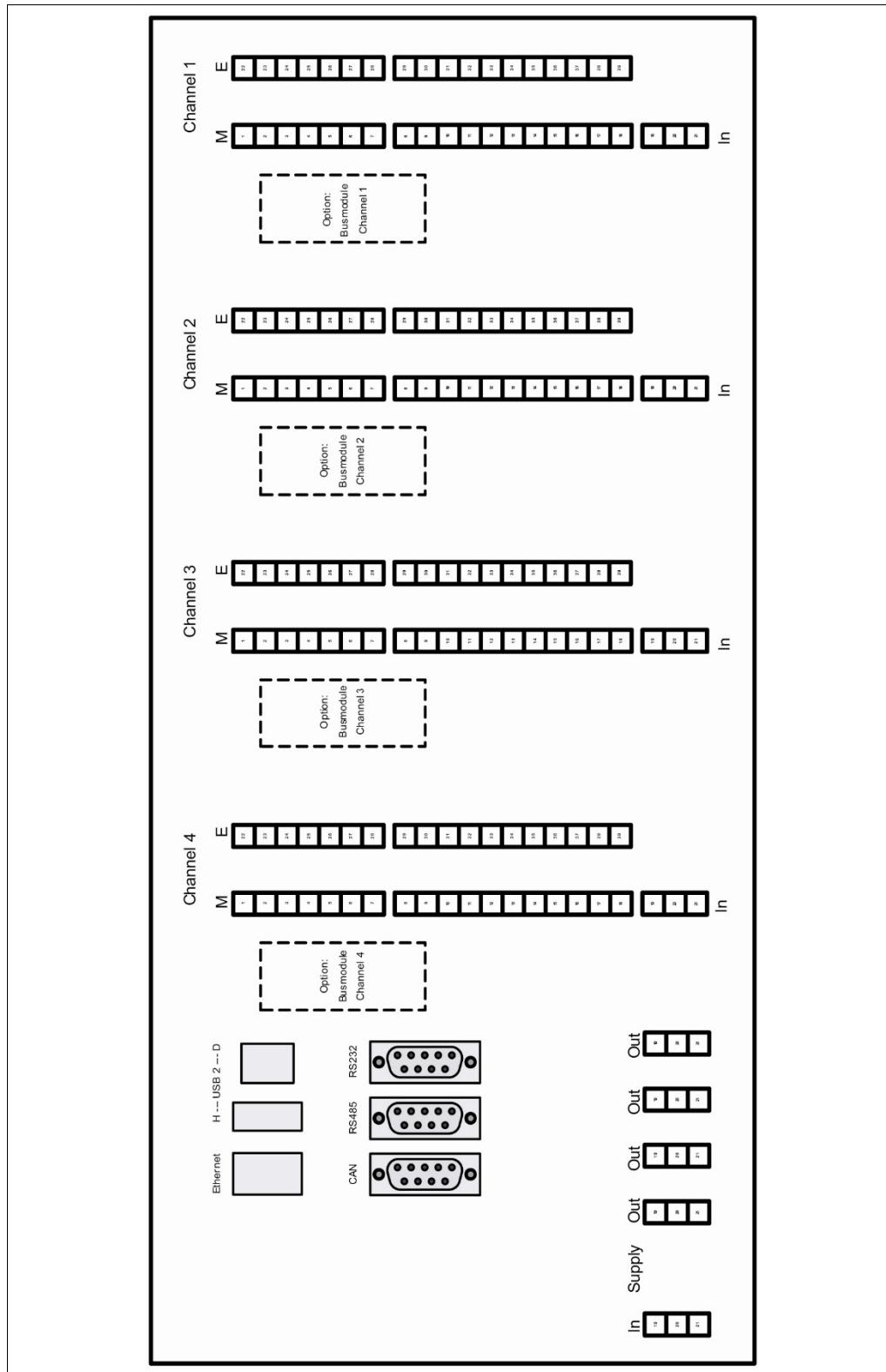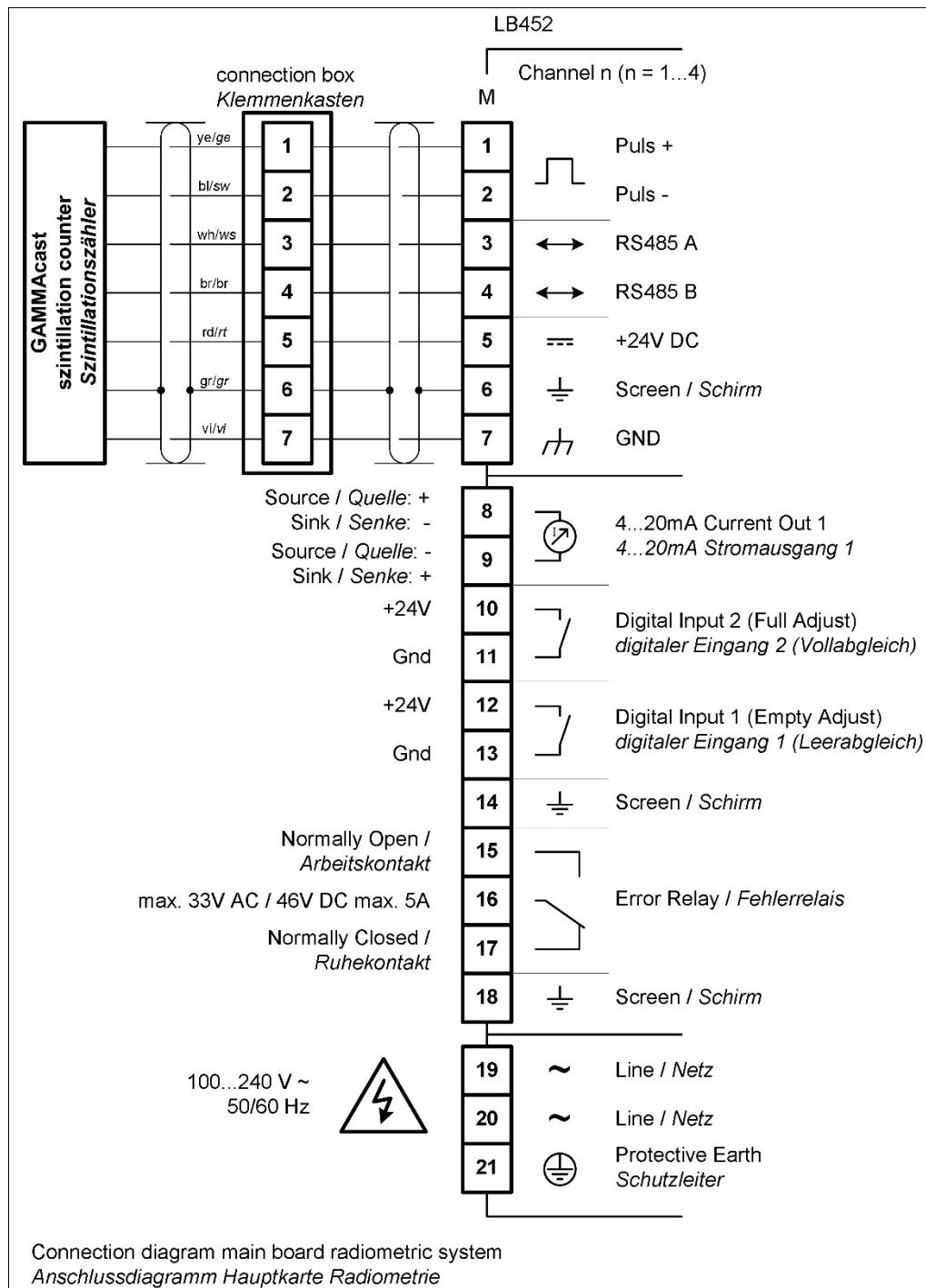| Entire System	

Software	Data entry via touch screen
	Operating languages:
	    Bulgarian, Chinese (option), German, English, French, Italian, Korean (option), Portuguese, Romanian, Russian, Spanish, Czech, Hungarian
	Cycle time: 0.005 s (5 ms)
	Two time constants for filtering the raw signal:
	    Lower measurement range: Fast reaction
	    Upper measurement range: Calm signal
	    Change-over point freely definable
	Plausibility checks for avoiding adjustment errors
	    Minimum empty/full count rate ratio
	    Max. deviation from last adjustment
	Calibration:
	    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)
	Test mode:
	    Current outputs, digital in/outputs, calibration
	    Password protection against unauthorised changes to the settings
	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
	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

LB 452: Inside Overview

1	50502-01-S	Extension Module
2	50498-01-S	Basic Module
3	53799-S	(Card slot for) bus module
4	53772-S	System board (control Unit) with SD Card slot
5	53779-S	Front panel with display

LB 452: Replacement Parts List

Replacement parts castXpert LB 452	
53779-S	Front panel with display for castXpert LB 452
53772-S	System-control unit for castXpert LB 452

LB 452 Connections: Rear Overview

LB 452 Connections: Measuring channel base module

Connection diagram main board radiometric system
Anschlussdiagramm Hauptkarte Radiometrie

LB 452 Connections: Measurement Channel Extension Module

LB452

Channel n (n = 1...4)

E

Terminal	Description
22	Screen / *Schirm*
23	Puls Output + / *Impulsausgang* +
24	Puls Output - / *Impulsausgang* - (max. 12V)
25	Alarm Relay 2 / *Alarmrelais 2* — Normally Open / *Arbeitskontakt*
26	max. 33V AC / 46V DC max. 5A
27	Current Input *Stromeingang* + / 4...20mA
28	−
29	4...20mA Current Out 2 / 4...20mA *Stromausgang 2* — Source / *Quelle*: + , Sink / *Senke*: -
30	Source / *Quelle*: - , Sink / *Senke*: +
31	Digital Input 4 / *digitaler Eingang 4* — +24V
32	Gnd
33	Digital Input 3 / *digitaler Eingang 3* — +24V
34	Gnd
35	Screen / *Schirm*
36	Alarm Relay 1 / *Alarmrelais 1* — Normally Open / *Arbeitskontakt*
37	max. 33V AC / 46V DC max. 5A
38	Normally Closed / *Ruhekontakt*
39	Screen / *Schirm*

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 - 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): Start-up 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	Unsigned 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 ECcast] Bit 3; 0x8 (8): Trim Adjust Down (One Step) [only ECcast] Bit 4; 0x10 (16): Start Automatic Calibration [only ECcast] Bit 7; 0x80 (128): Acknowledge Actual Error	Unsigned Integer	32 Bit
			40 Bit = 5 B

GAMMAcast detector LB 6739 / LB 6760: Technical data

Mechanics	
Scintillator	LB 6739: CsI crystal; Ø 40 mm or Ø 25 mm, H: 50 mm LB 6760: NaI crystal: Ø 40 mm, H: 50 mm
Admissible operating temperature	-20°C … +60°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)

GAMMAcast LB 6739 and LB 6760: Dimension drawing without water cooling
(all dimensions in mm)
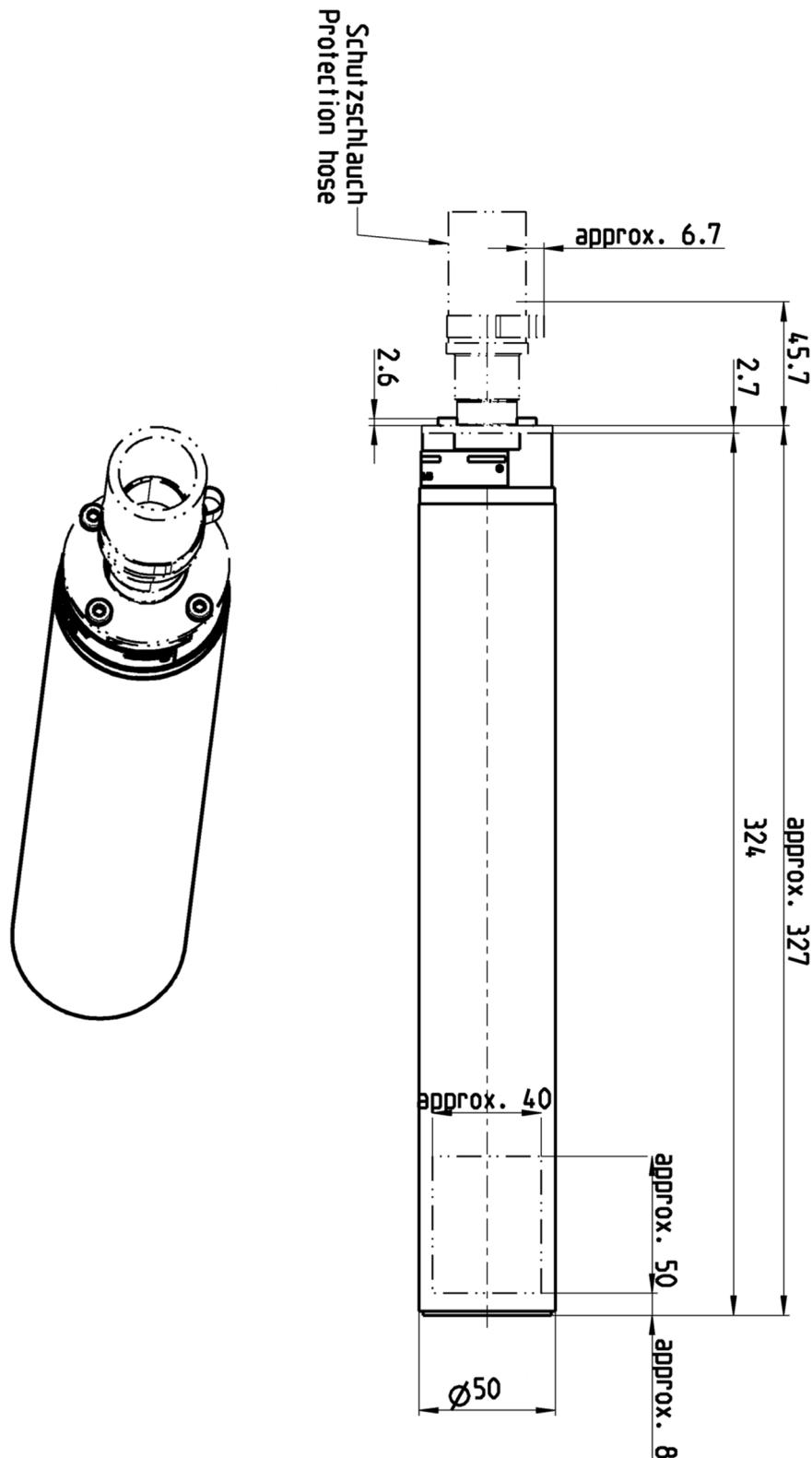
GAMMAcast LB 6739 and LB 6760: Dimension drawing with water cooling
(all dimensions in mm)
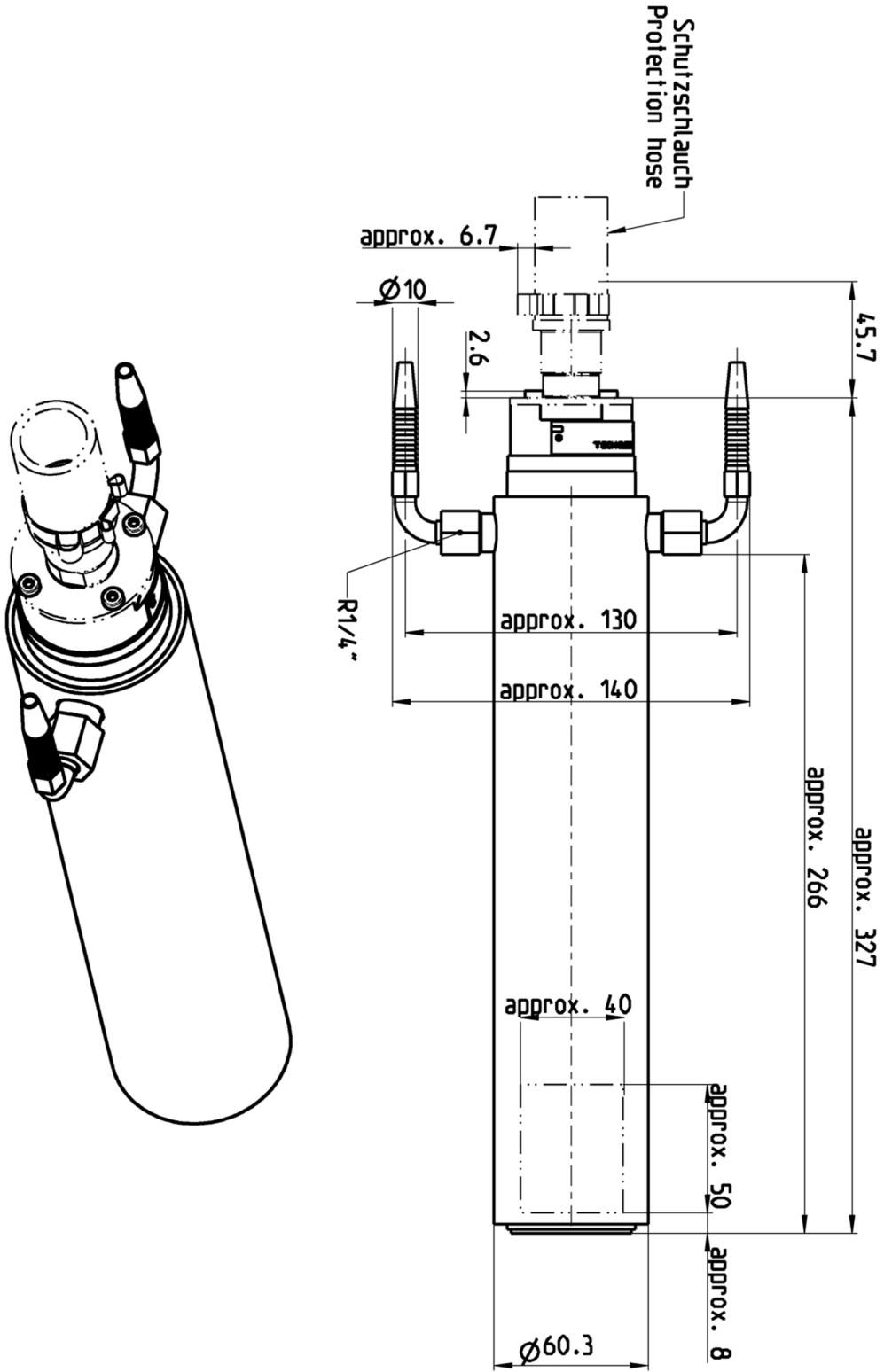
GAMMAcast detector LB 6752: Technical data

| Mechanics	
Scintillator	Polymer scintillator 100x50x150 mm
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: 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°) with open ends or HeavyCon plug
	Terminal box – evaluation unit:
	    6-wire, shielded (6 x 1.5 mm²)
	    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)

Dimensional drawing

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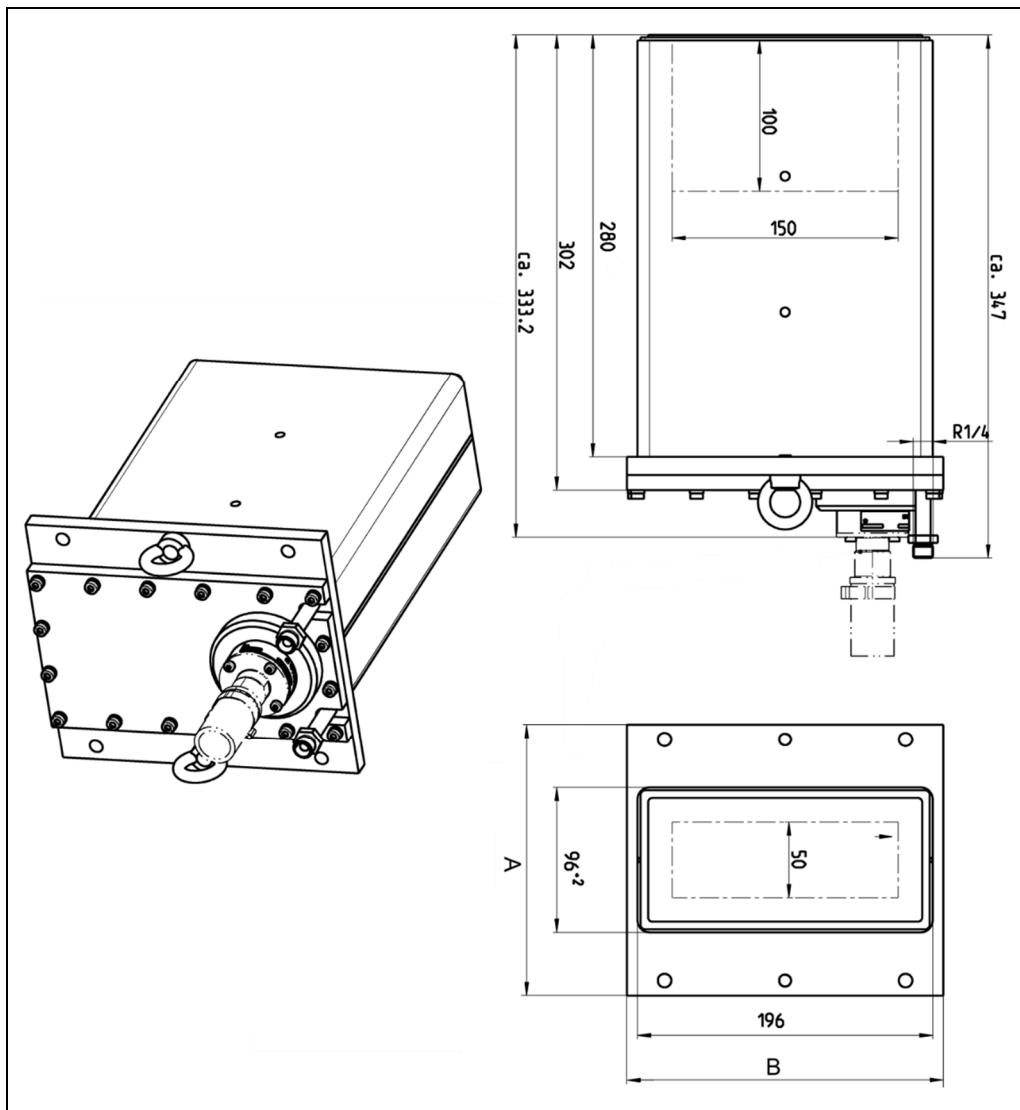
Flange sizes AxB (mm) and bores (9 mm)	
LB 6752-11	180x210, 4 bores on long side plus 2 eyebolts
LB 6752-21	155x210, 4 bores on long side plus 2 eyebolts
LB 6752-31	120x280, 6 bores on short side
LB 6752-53	155x210, as LB 6752-21, 25 mm scintillator
LB 6752-54	180x210, as LB 6752-11, 25 mm scintillator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

Connection cable: Connection possibilities

PlugProtect plug-in connection, straight

(All dimensions in mm)
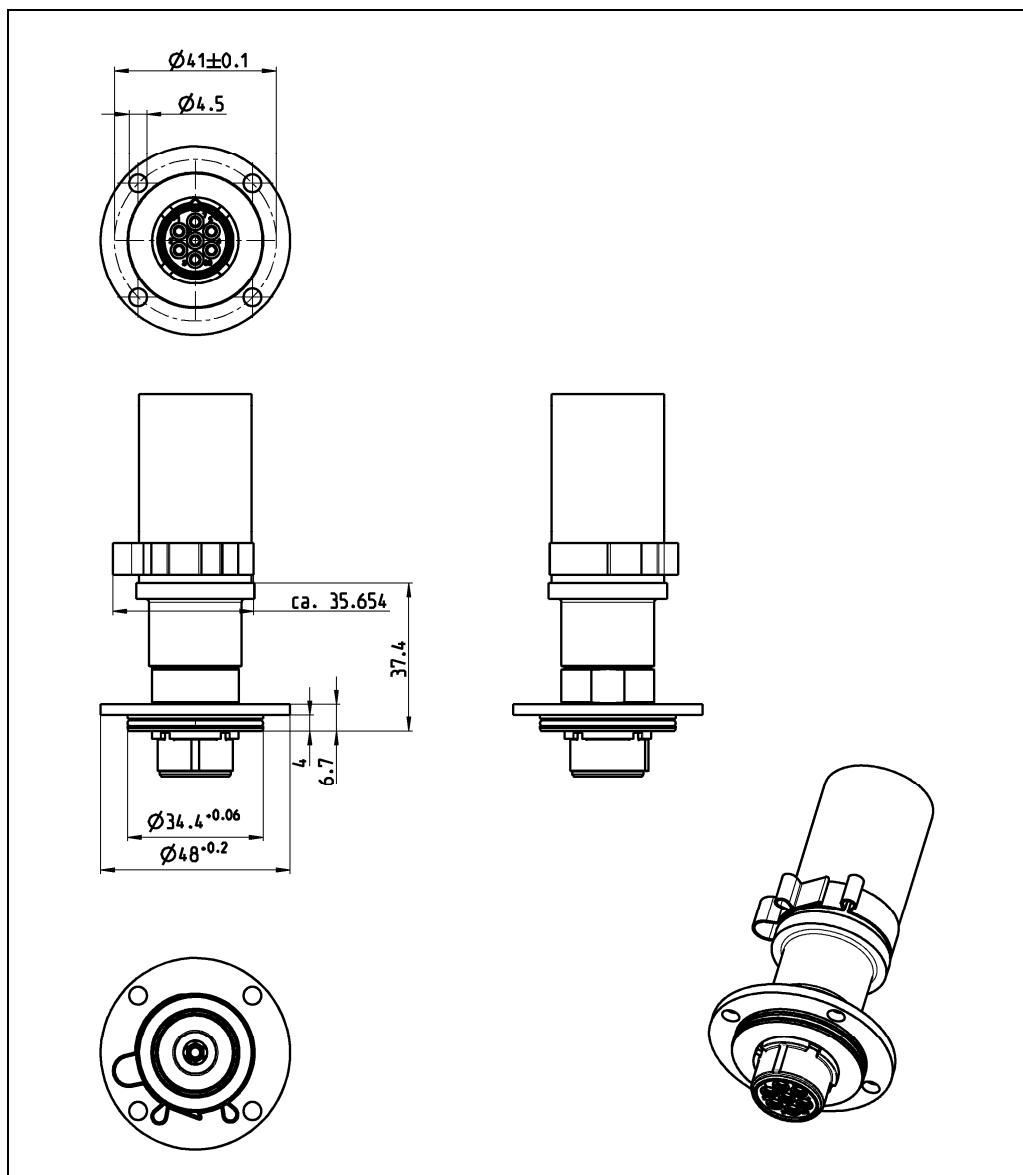
PlugProtect plug-in connection angled by 90°

(All dimensions in mm)
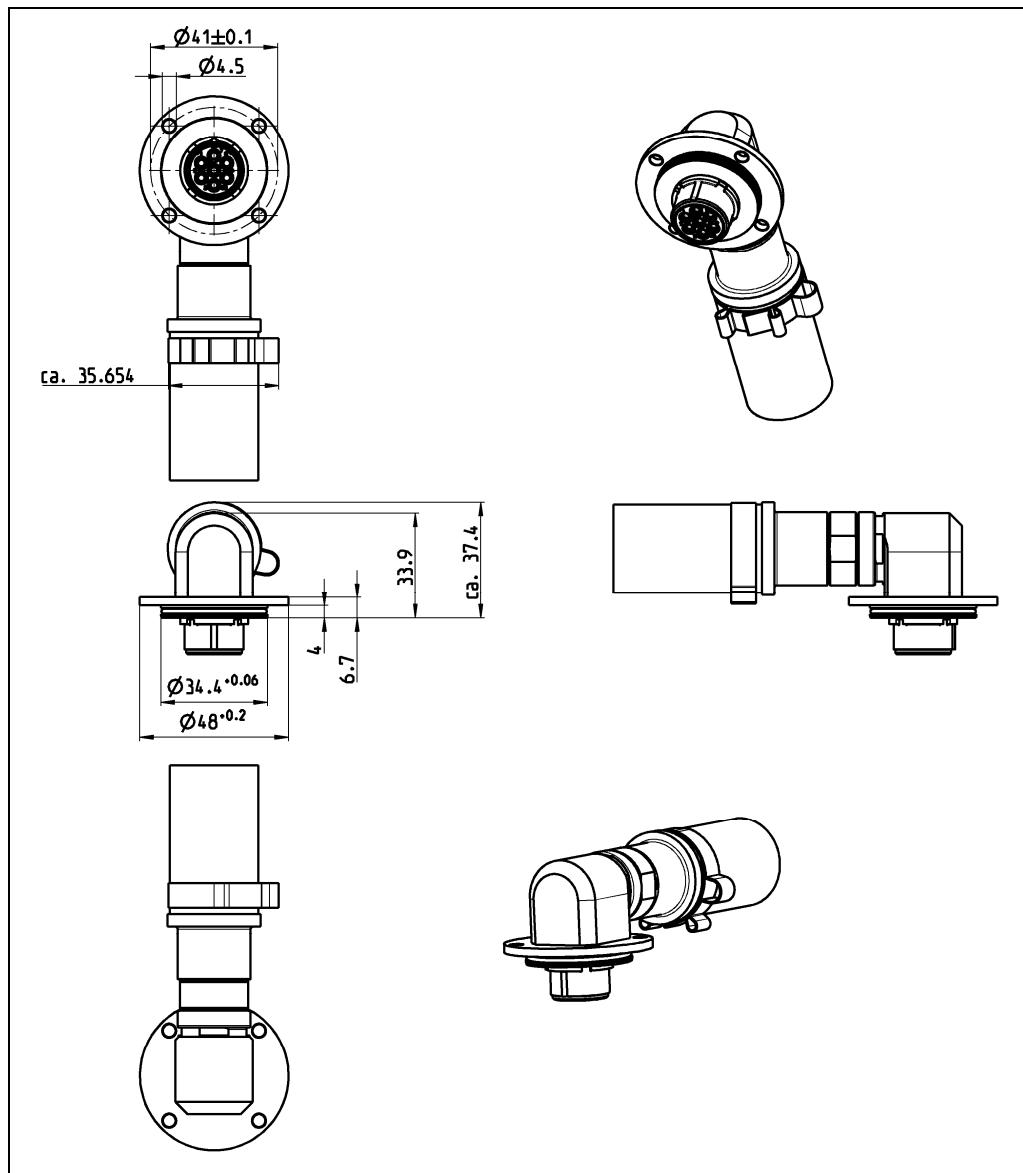
Connection cable: Technical data

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 mm²)

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)

Connection terminal box for GAMMAcast detectors

with plug-in connection (34787):
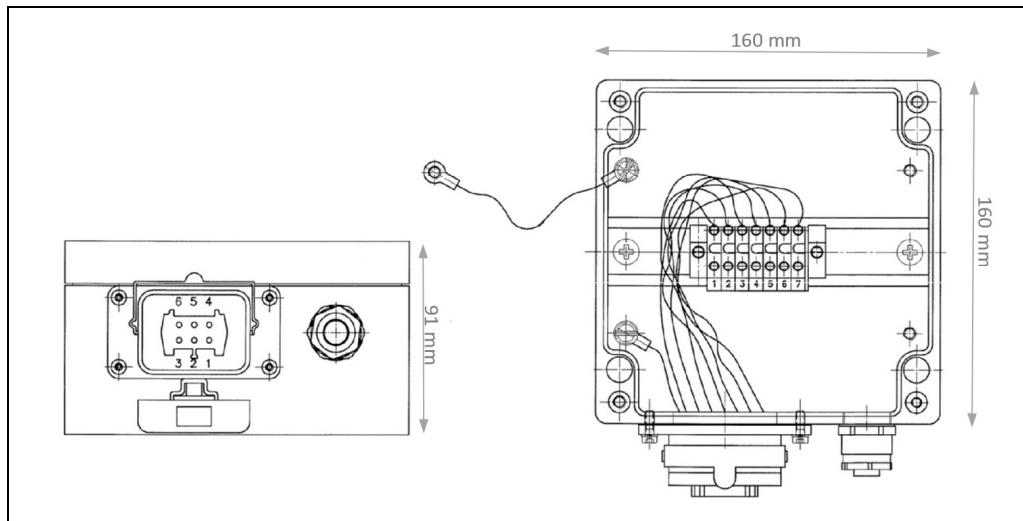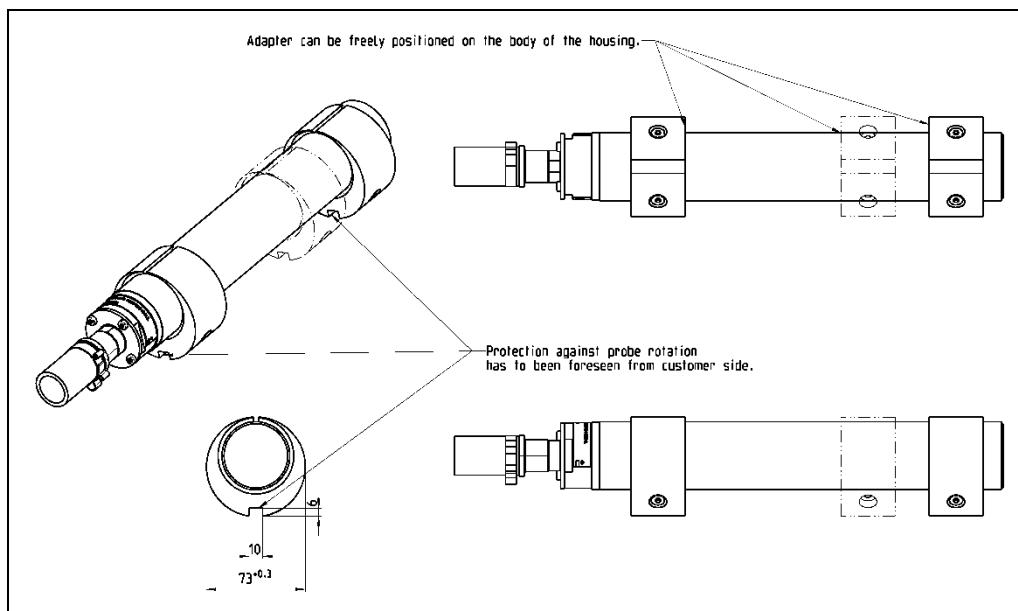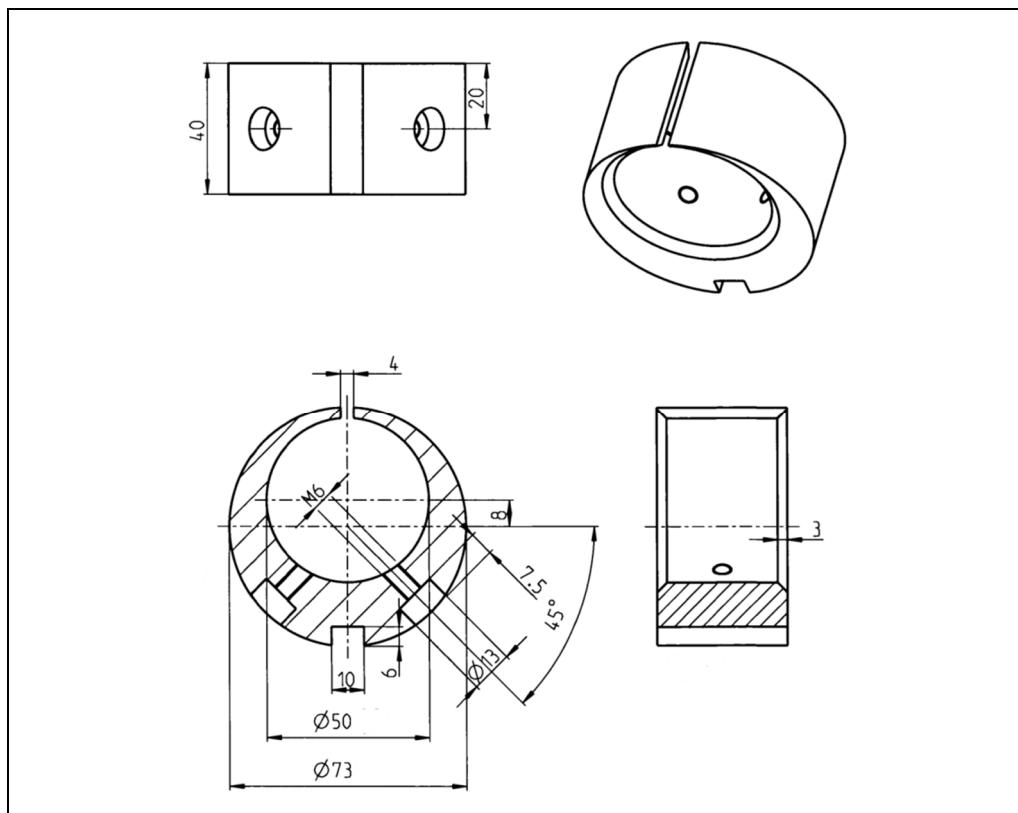

for open ends (07005):
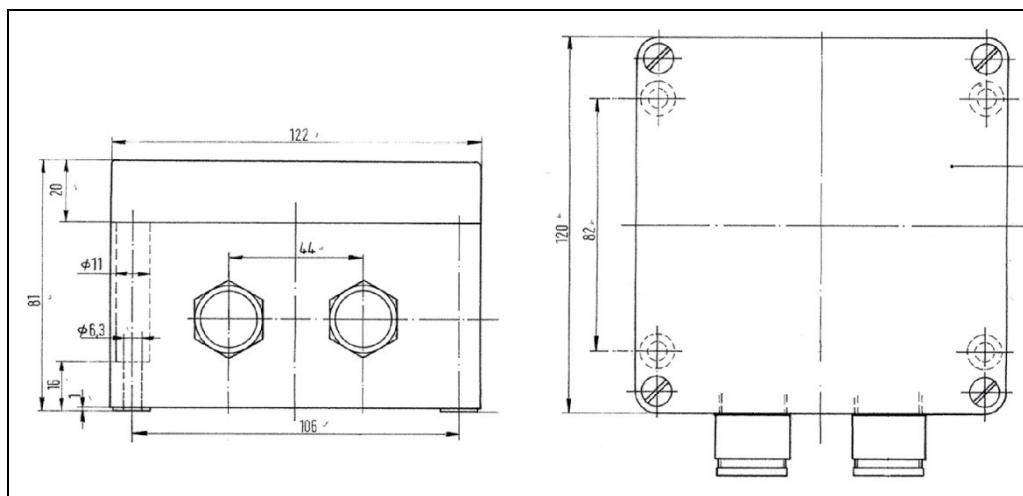
Protection class IP 65

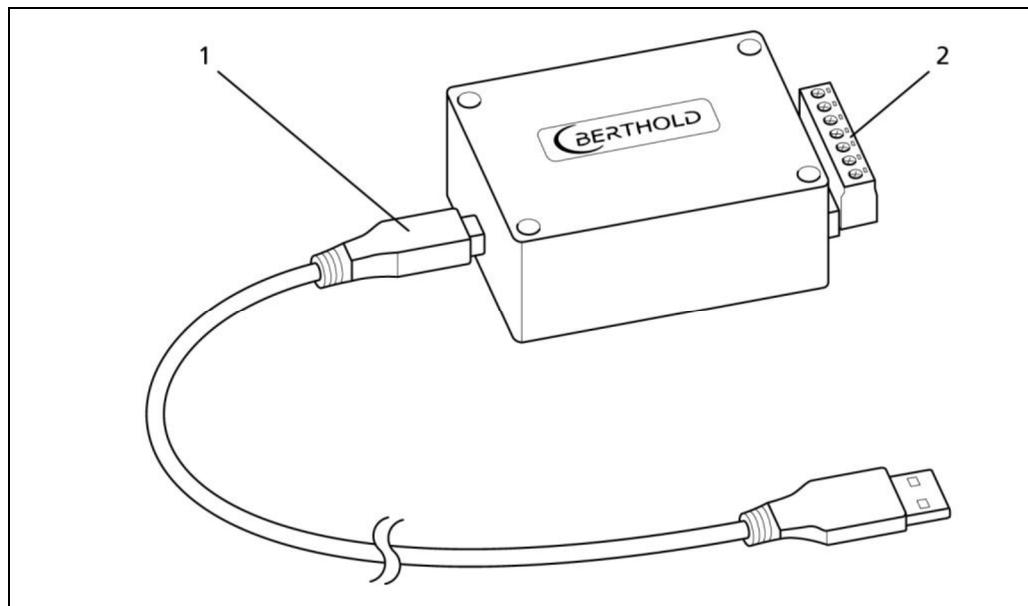# Replacing LB 6651 with GAMMAcast LB 6739

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

(All dimensions in mm)

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 higher512 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
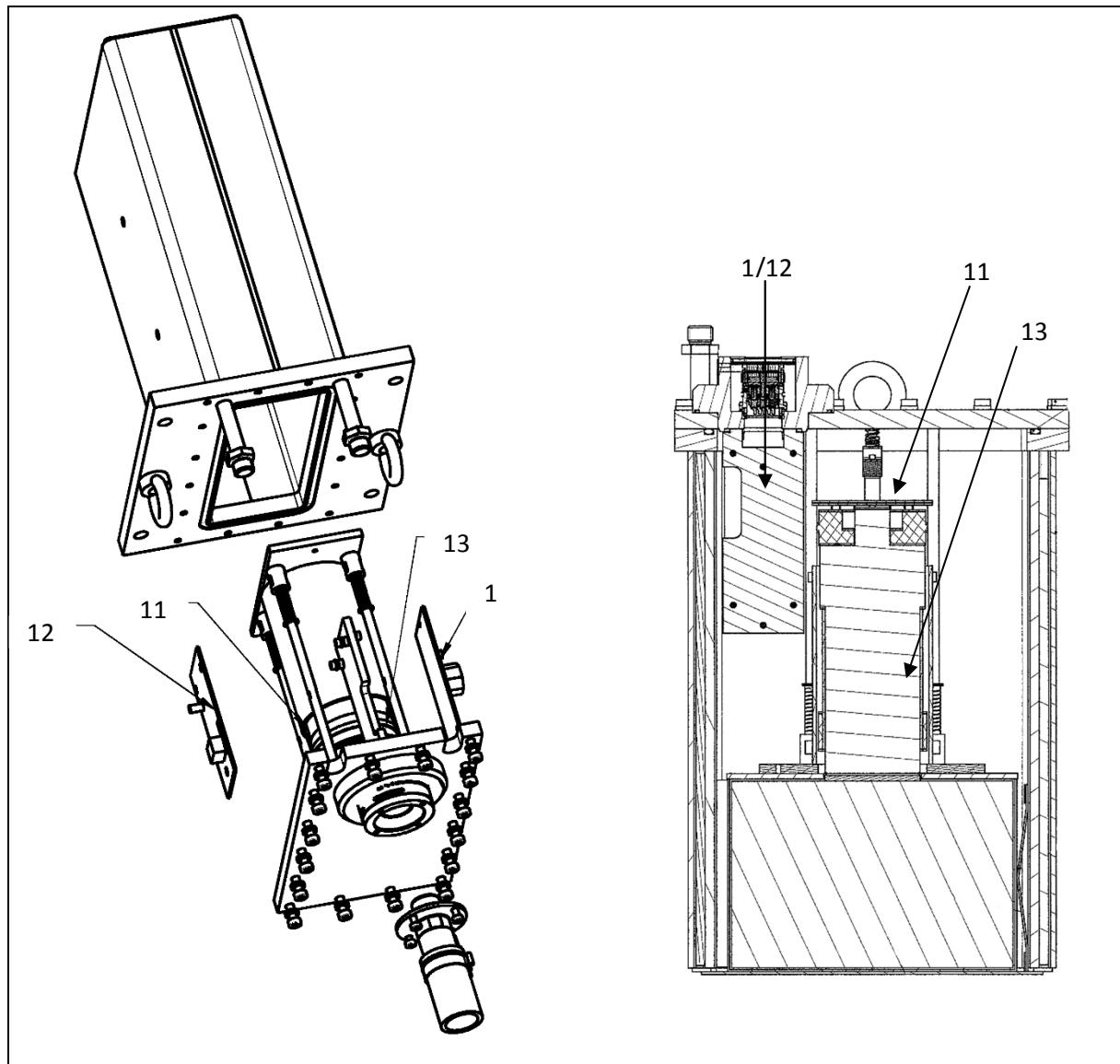
GAMMAcast: Important spare parts (selection)

LB 6739:
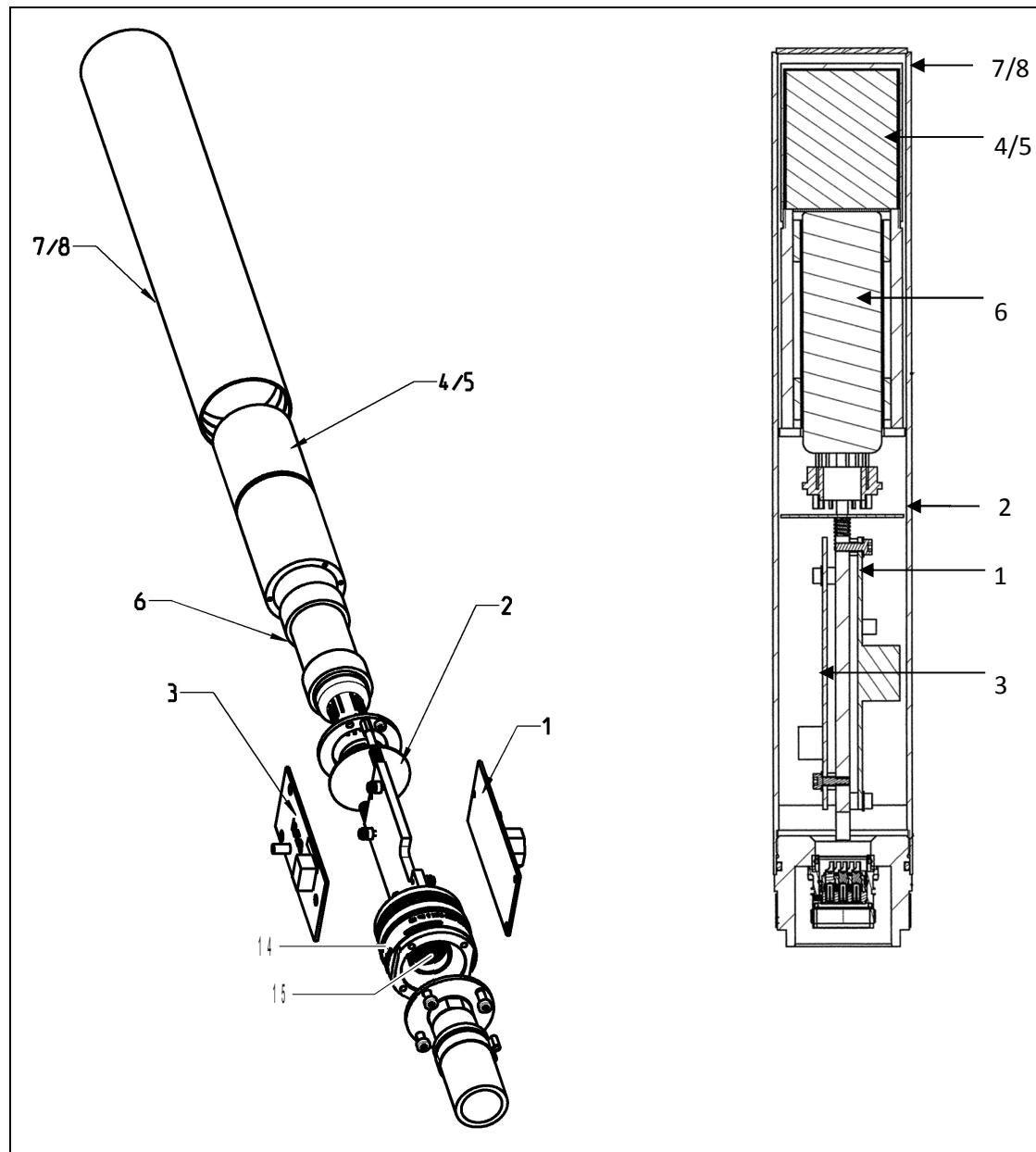
LB 6760:
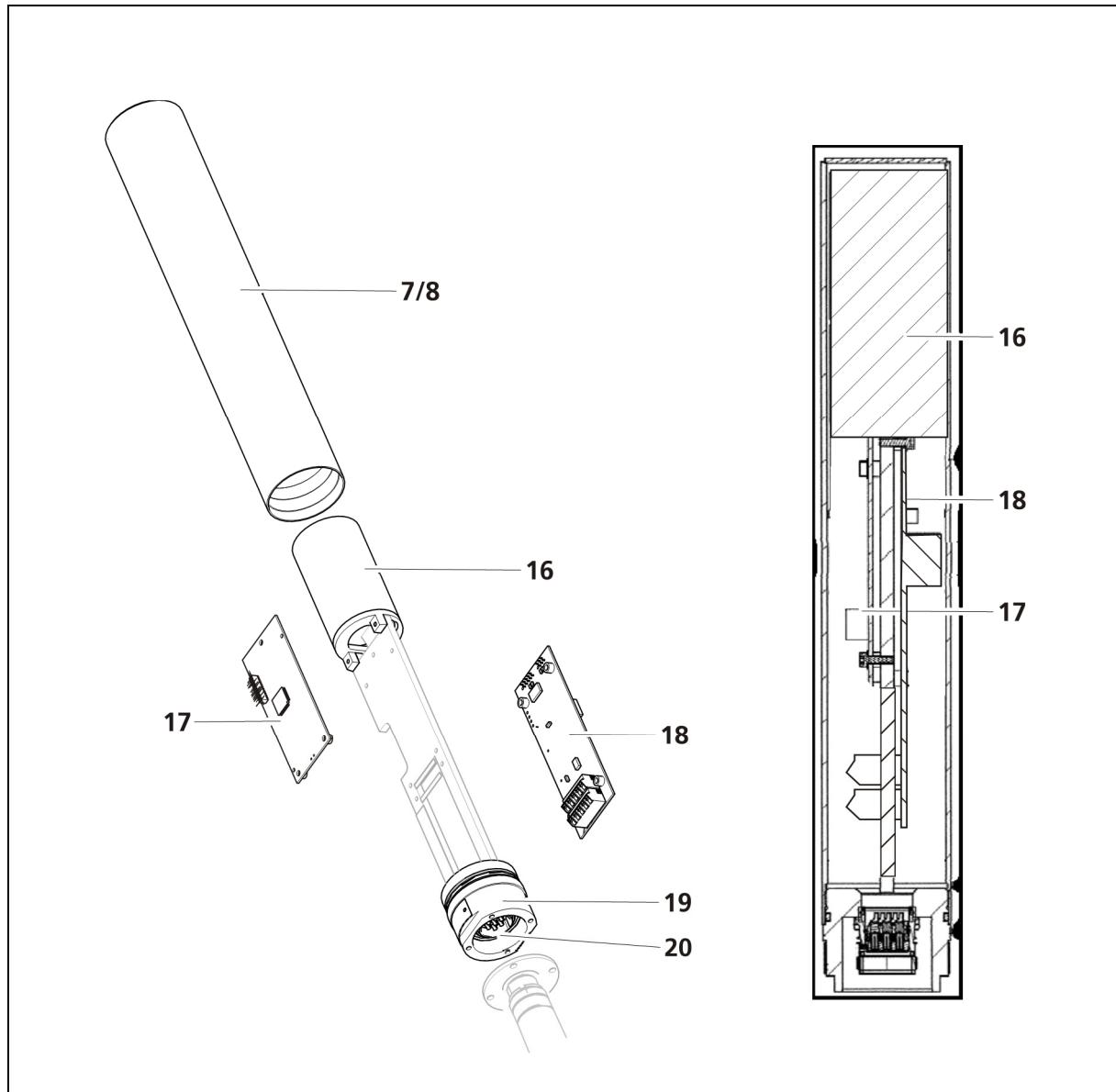
LB 6752:

Spare parts GAMMAcast		
1	64466-S	CPU board for GAMMAcast detectors LB 6739 and LB 6752
2	53148-S	Photomultiplier base for LB 6739 with high voltage cascade and voltage divider
3	53437-S	HV (High Voltage) board for LB 6739
4	59832-S	Crystal unit for LB 6739 (CsI(Na) 40x50mm crystal)
4	59833-S	Crystal unit for LB 6739 (CsI(Na) 25x50mm crystal)
5	55282-S	Photomultiplier crystal unit for LB 6739 (CsI(Na) 40x50mm² crystal)
5	55285-S	Photomultiplier crystal unit for LB 6739 (CsI(Na) 25x50mm² crystal)
6	55653-S	1" Photomultiplier crystal unit for LB 6739
7	52496-S	Detector housing without water cooling for LB 6739 / LB 6760
8	53442-S	Detector housing with water cooling for LB 6739 / LB 6760
9	55873-S	Spare parts kit for LB 6739 (gaskets, screws, other small parts, laid out for 5 detectors)
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
14	64149-S	Mechanical base unit for LB 6739 without plug inner part
14	52479-S	Mechanical base unit for LB 6739 with plug inner part
15	58805-S	Inner part connector (male)
16	63607-S	SiPM-crystal combination for LB 6760 (NaI(Tl) 40x50mm² crystal)
17	64465-S	CPU board for GAMMAcast detector LB 6760
18	64464-S	Signal processing unit for LB 6760
19	63615-S	Mechanical base unit for LB 6760 without plug inner part
19	63616-S	Mechanische Sockeleinheit für LB 6760 with plug inner part
20	63626-S	Plug connector inner part for LB 6760
	5610-S	Hose connector with cap nut (6 pcs.)

Spare Parts for cables: all with *PlugProtect* connectors for GAMMAcast detectors; no heat protection, cable ends cut flat	
58802-050-S	Straight connector, 5 m cable
58802-100-S	Straight connector, 10 m cable
58802-150-S	Straight connector, 15 m cable
58802-200-S	Straight connector, 20 m cable
58803-050-S	90° connector, 5 m cable
58803-100-S	90° connector, 10 m cable
58803-150-S	90° connector, 15 m cable
58803-200-S	90° connector, 20 m cable