LoopSeries Detectors
LB 430

Technical Information

69691TI2 Rev.00 01/2025

BERTHOLD

Table Of Contents

1. Informations on Loop Powered Technology

Loop Powered Technology is an innovative solution that enables devices and sensors to be powered directly through the communication line. Instead of requiring a separate power source, such as batteries or external power supplies, this technology leverages the energy used for data transmission between devices. This is achieved by utilizing the existing signal in a two-wire system, which ensures both communication and power supply.

This approach is particularly advantageous in environments where continuous power and minimal maintenance are required, as the energy demand is low and batteries do not need replacement. Loop Powered systems are also highly reliable and cost-efficient, optimizing the infrastructure of existing communication networks.

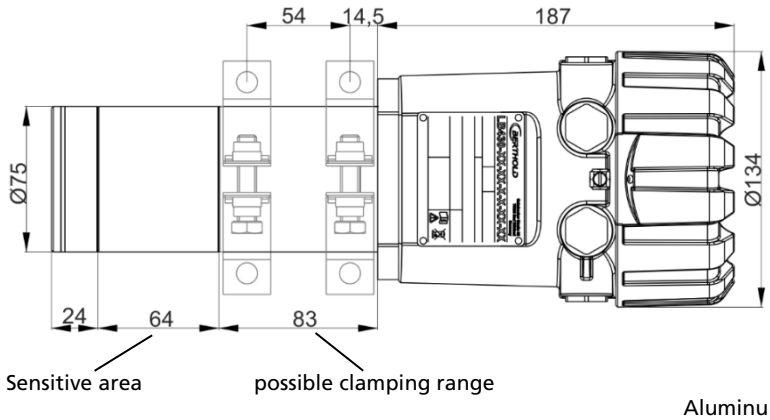
The LB 430 Detector is a loop-powered radiometric detector that operates solely within a 4 to 20 mA current loop, making it a true Loop Powered System. Using advanced SiPM (Silicon Photomultiplier) technology, the detector is suited for extreme process conditions, excelling in switch applications as well as measurements of level, density, and concentration.

- Loop-powered Detector: Operates exclusively on a 4 to 20 mA current loop.
- Latest SiPM Technology: Ensures high sensitivity and reliability.
- Market-leading Repeatability: <0.1% for superior precision.
- Excellent Temperature Stability: ≤ 0.5% over a temperature range of 100 K.
- Robust Design: Long service life in demanding conditions.
- High-sensitivity Scintillation Technology: Ensures accurate radiometric measurements.
- Ex-rated for Hazardous Areas: Certified by ATEX, IECEx, FM, and CSA.
- Fast Response Time: Delivers quick and reliable measurement results.

2. CrystalSENS LB 430-1x

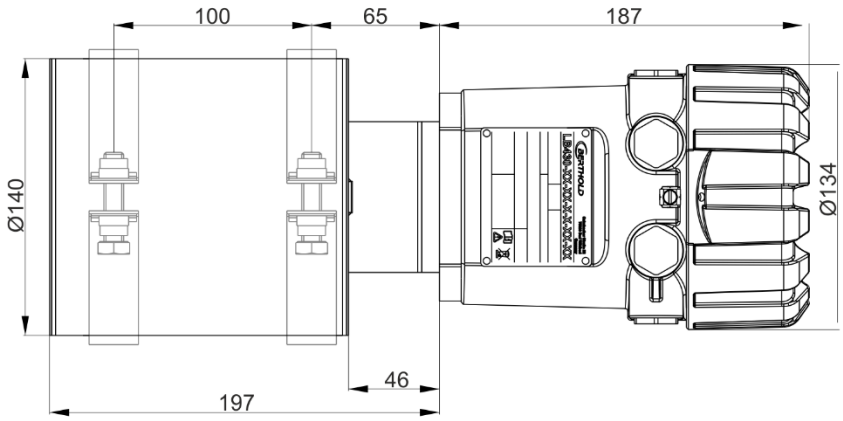
2.1. Without Water Cooling

without water cooling / without collimator



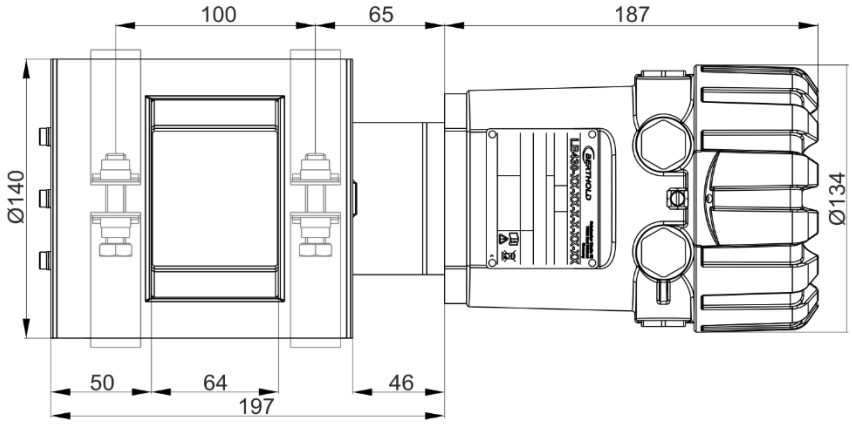
Aluminum version: 5.15 kg
Stainless steel version: 8.05 kg

without water cooling / collimator front irradiation



Aluminium version: 19.65 kg
Stainless steel version: 22.55 kg

without water cooling / collimator side irradiation

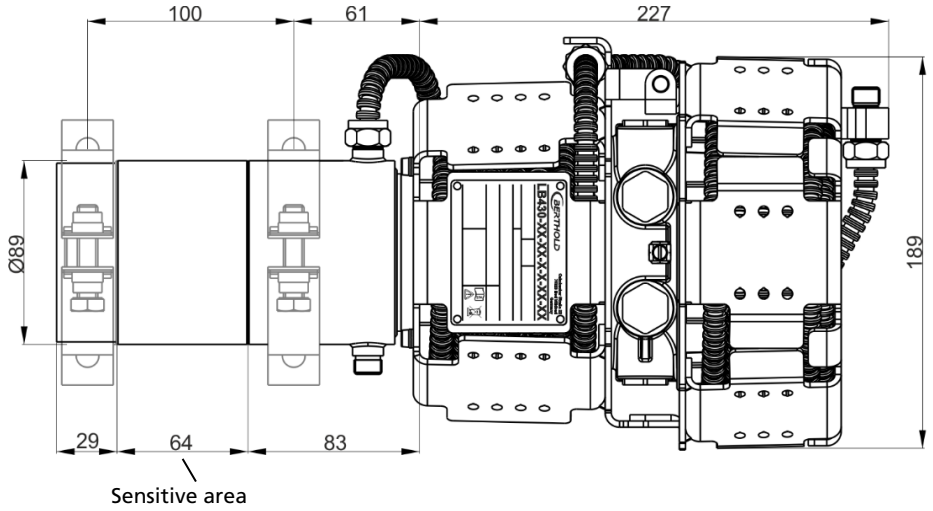


Aluminium version: 18.65 kg
Stainless steel version: 21.55 kg

TI-Fig. 1 CrystalSENS LB 430-1x without water cooling (dimensions in mm)

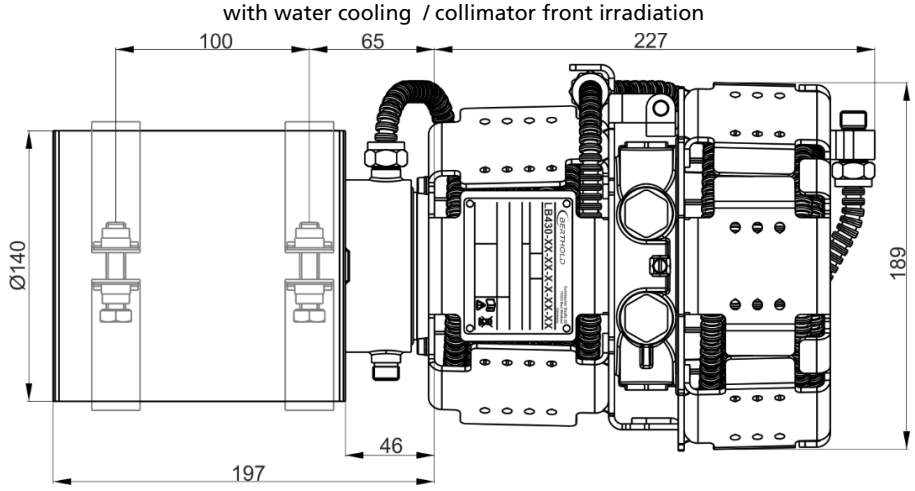
2.2. With Water Cooling

with water cooling / without collimator



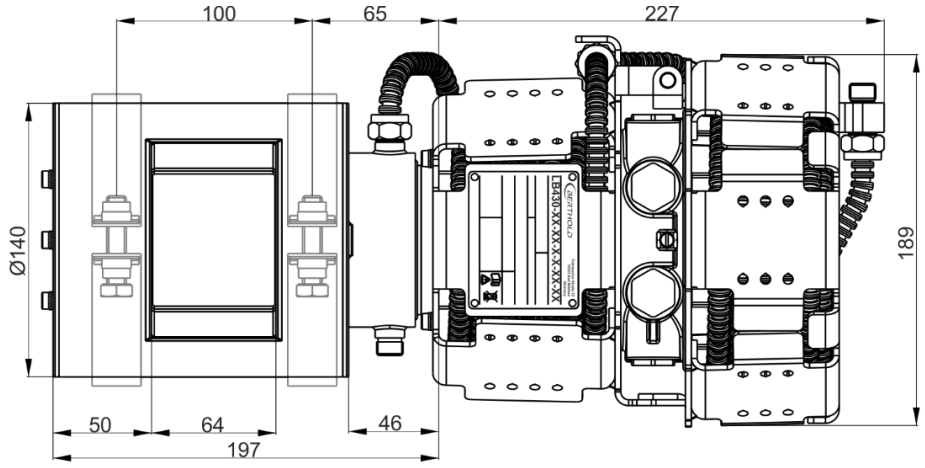
Aluminum version: 11.25 kg
Stainless steel version: 14.15 kg

with water cooling / collimator front irradiation



Aluminum version: 25.75 kg
Stainless steel version: 28.65 kg

with water cooling / collimator side irradiation



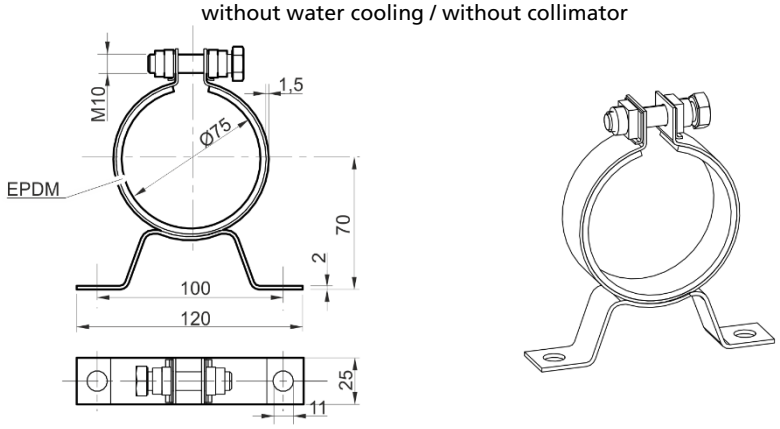
Aluminum version: 24.75 kg
Stainless steel version: 27.65 kg

TI-Fig. 2 CrystalSENS LB 430-1x with water cooling (dimensions in mm)

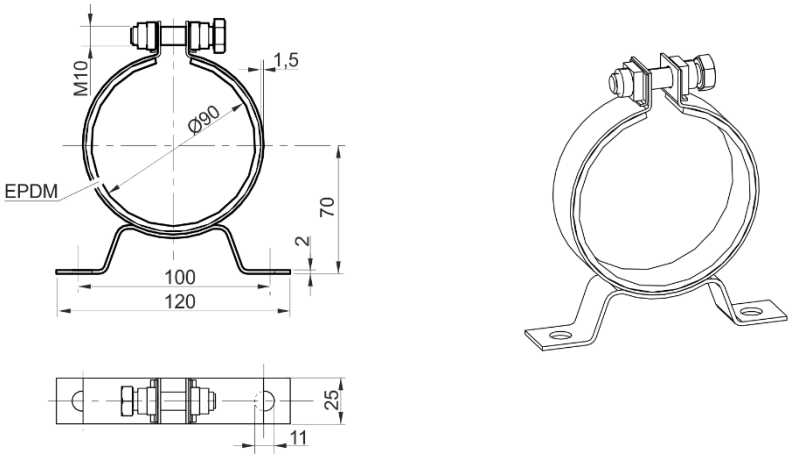
3. Mounting Clamps

3.1. Standard Design

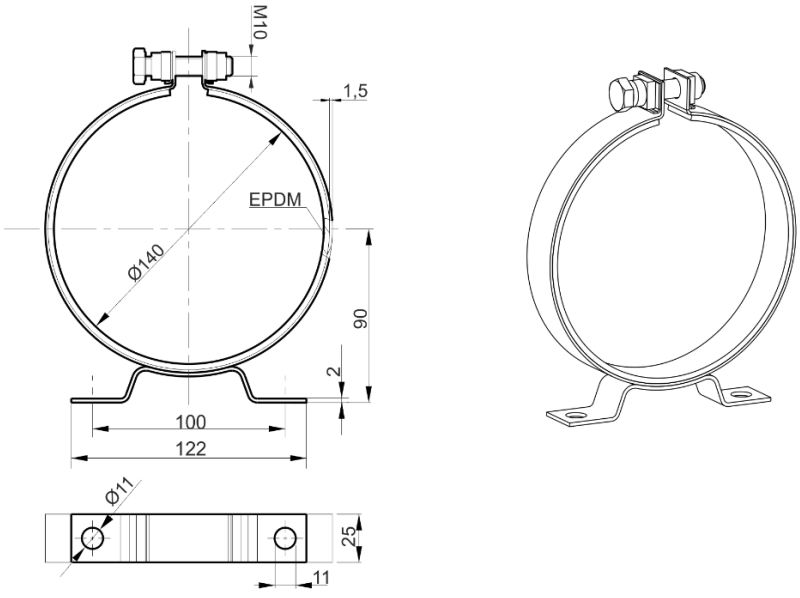
without water cooling / without collimator



with water cooling / without collimator



with collimator

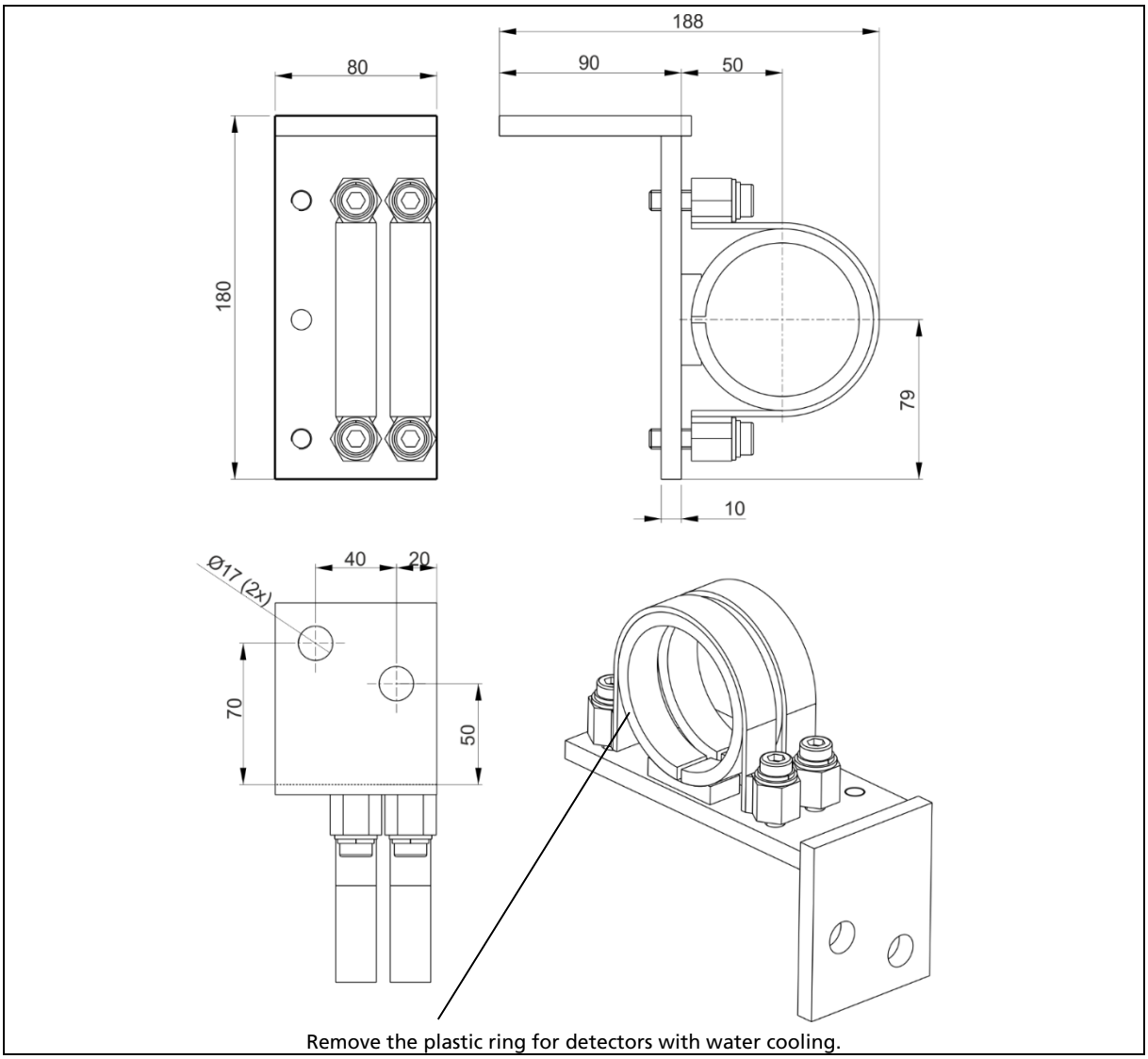


TI-Fig. 3 Mounting clamps for detectors (dimensions in mm)

NOTICE

The distance from the middle of the detector to the vessel surface or surface of heat insulation should be approx. 100 mm. Care should be taken during mounting to avoid as far as possible heat transfer from the vessel via the clamps to the detector.

3.2. Heavy-duty Detector Holder

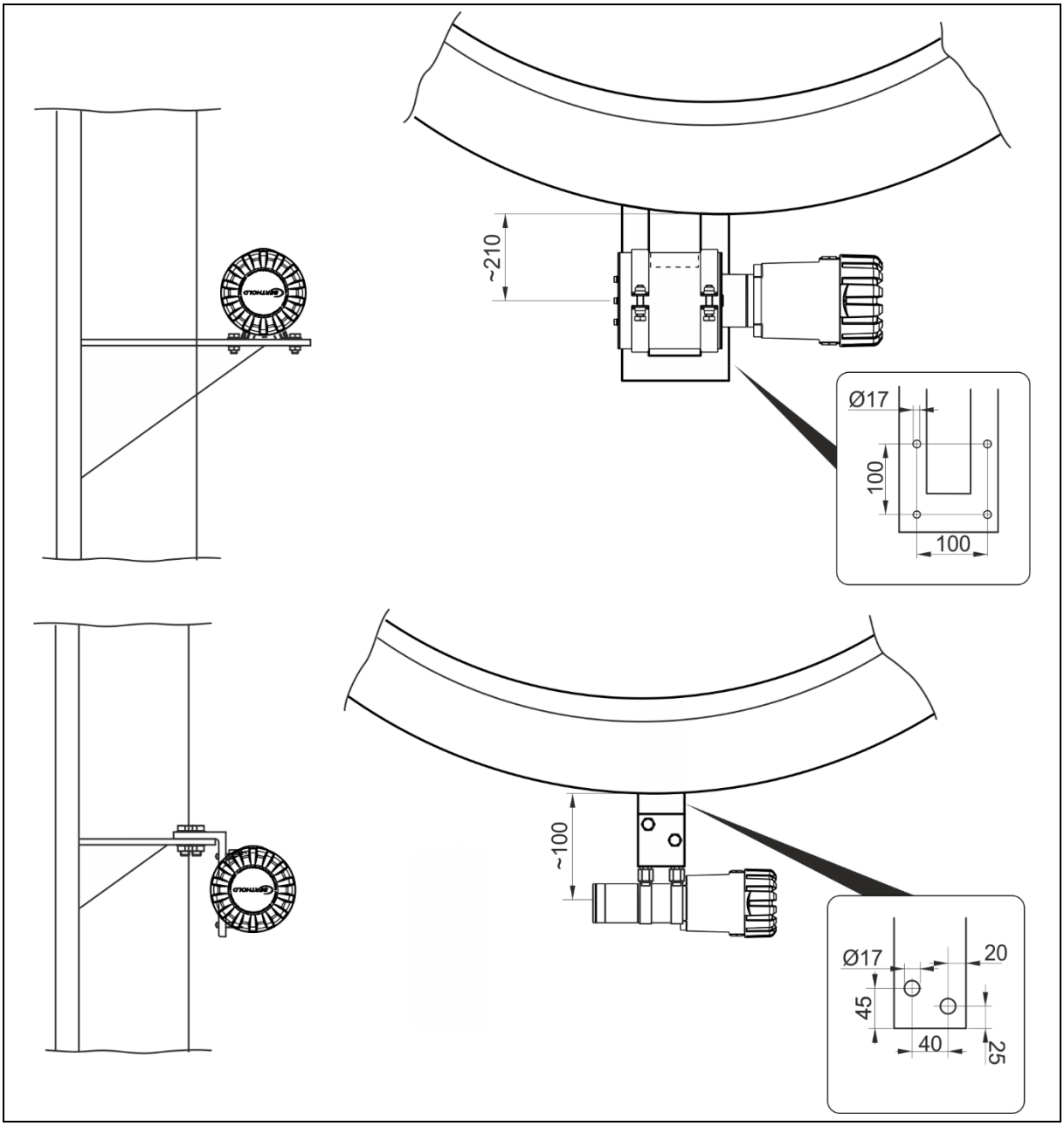


TI-Fig. 4 Heavy-duty version detector holder (dimensions in mm)

3.3. Befestigung Punktdetektor CrystalSENS

NOTICE

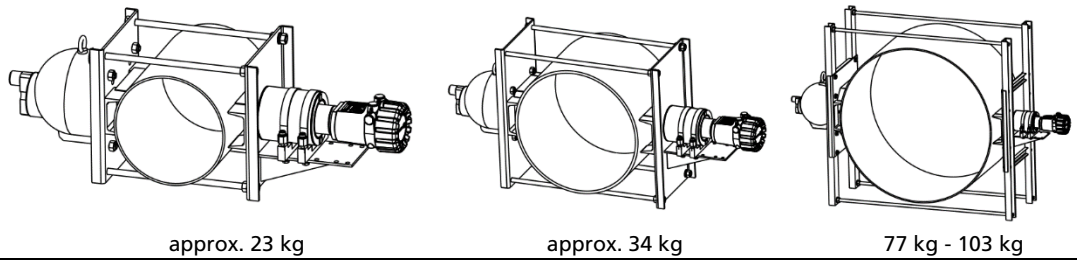
Direct sun radiation can overheat the detector. If the detector temperature can reach more than 50°C, a suitable sun roof must be installed. The heating of the detector by thermal radiation from the vessel can also be moderated by a thermal sheet, e.g. by a thin metal plate. For each detector a water cooling (option) is available.



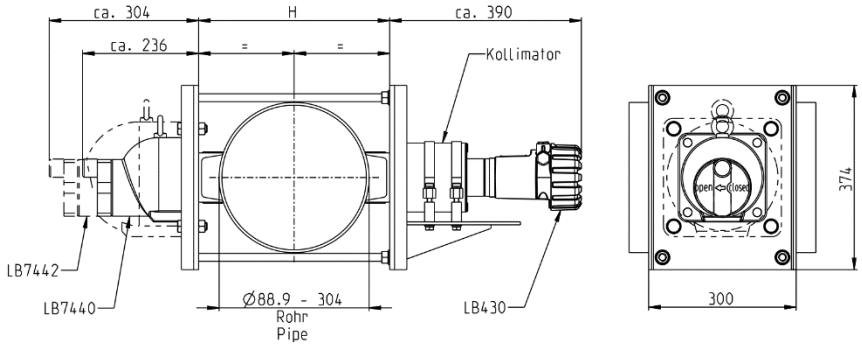
TI-Fig. 5 Installation point detector CrystalSENS (dimensions in mm)

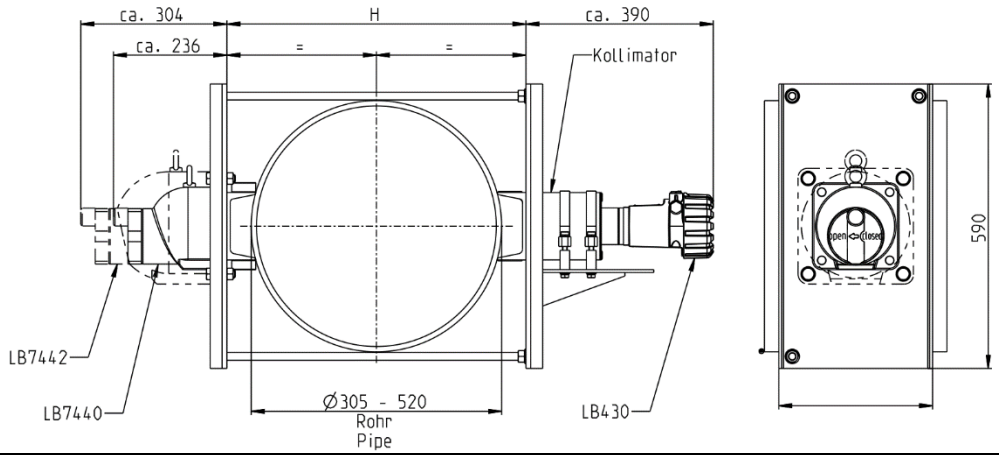
3.4. Installation Point Detector on Pipelines

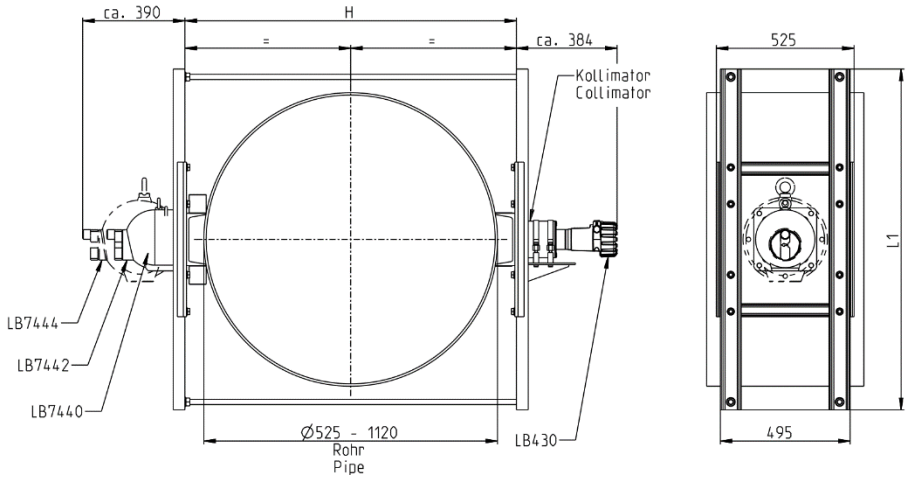
Radiation angle 90° and vertical detector mounting for pipe diameters 88 mm – 1120 mm



approx. 23 kg | approx. 34 kg | 77 kg - 103 kg

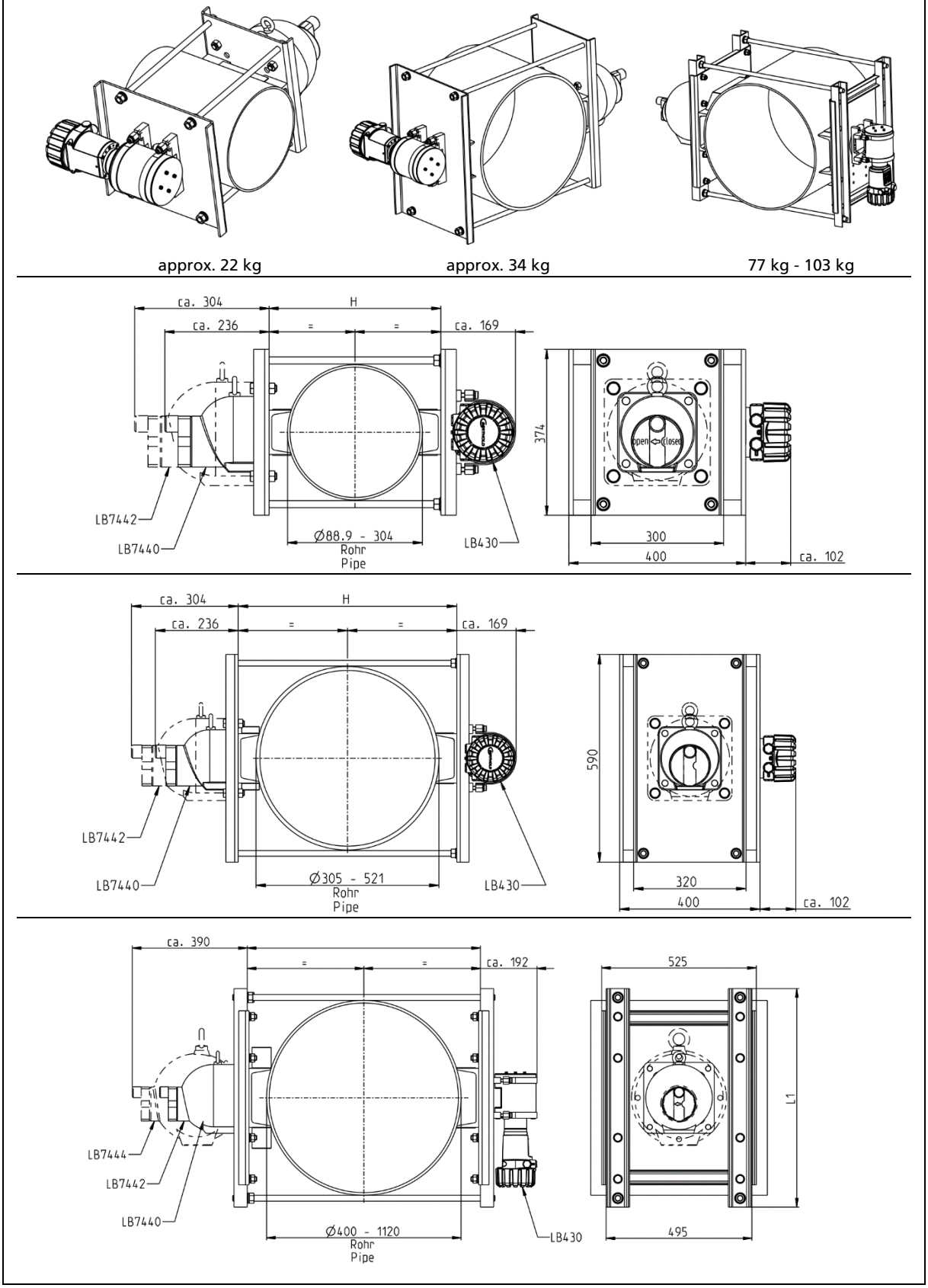






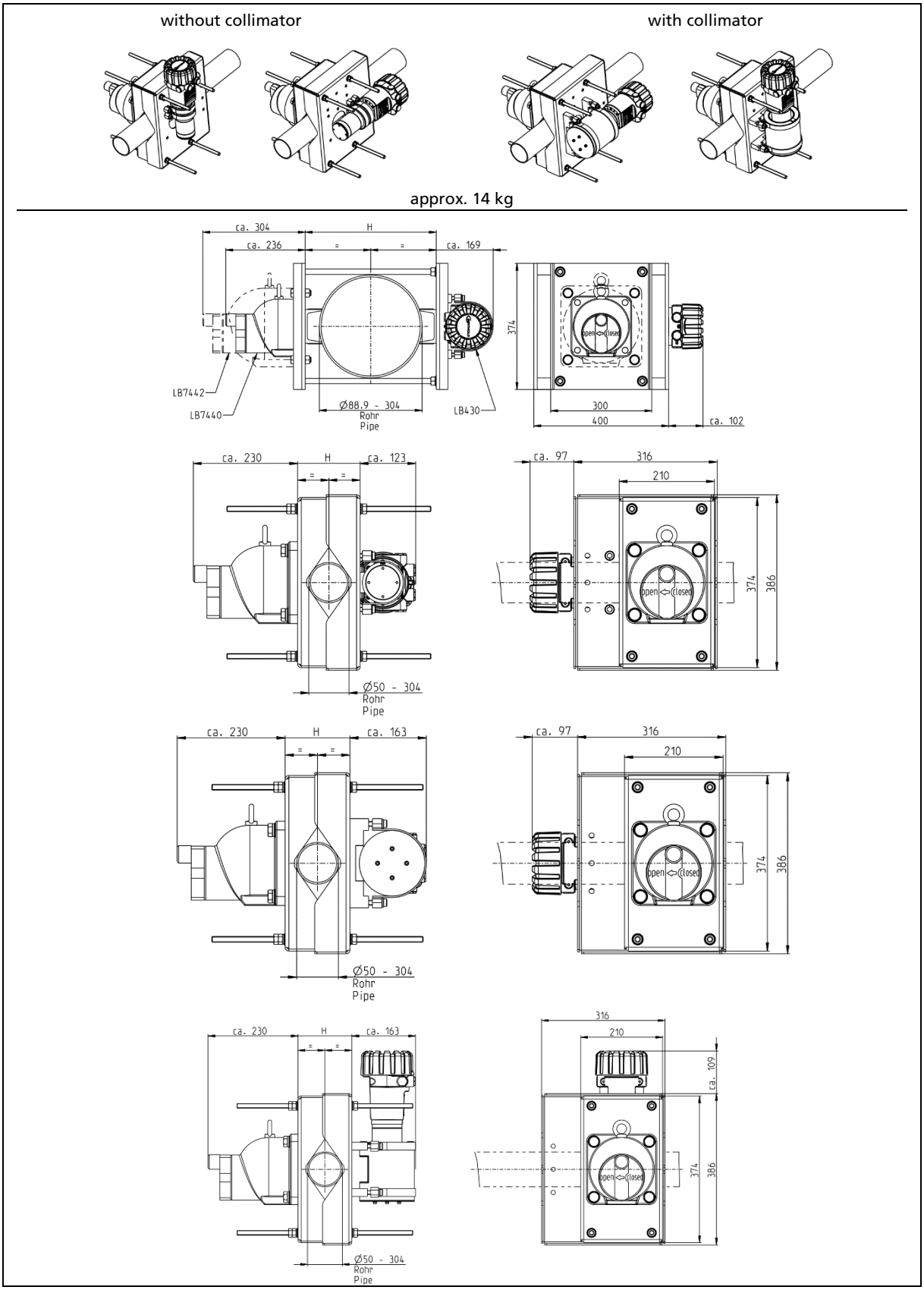
TI-Fig. 6 Mounting device for 90° radiation angle and vertical detector mounting ø 85 - 1120 (dimensions in mm)

Radiation angle 90° and parallel detector mounting for pipe diameters 85 mm - 1120 mm



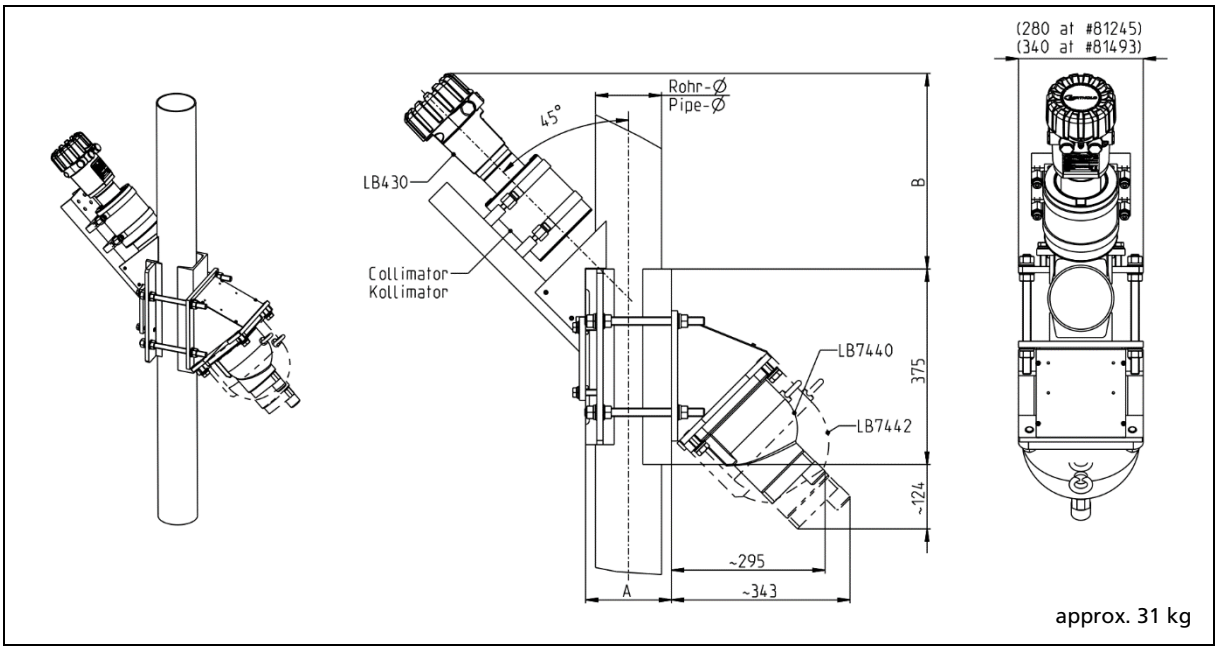
TI-Fig. 7 Mounting device for 90° radiation angle and parallel detector mounting ø 85 mm - 1120 mm (dimensions in mm)

Radiation angle 90° und and parallel detector mounting for pipe diameters 50 mm - 304 mm



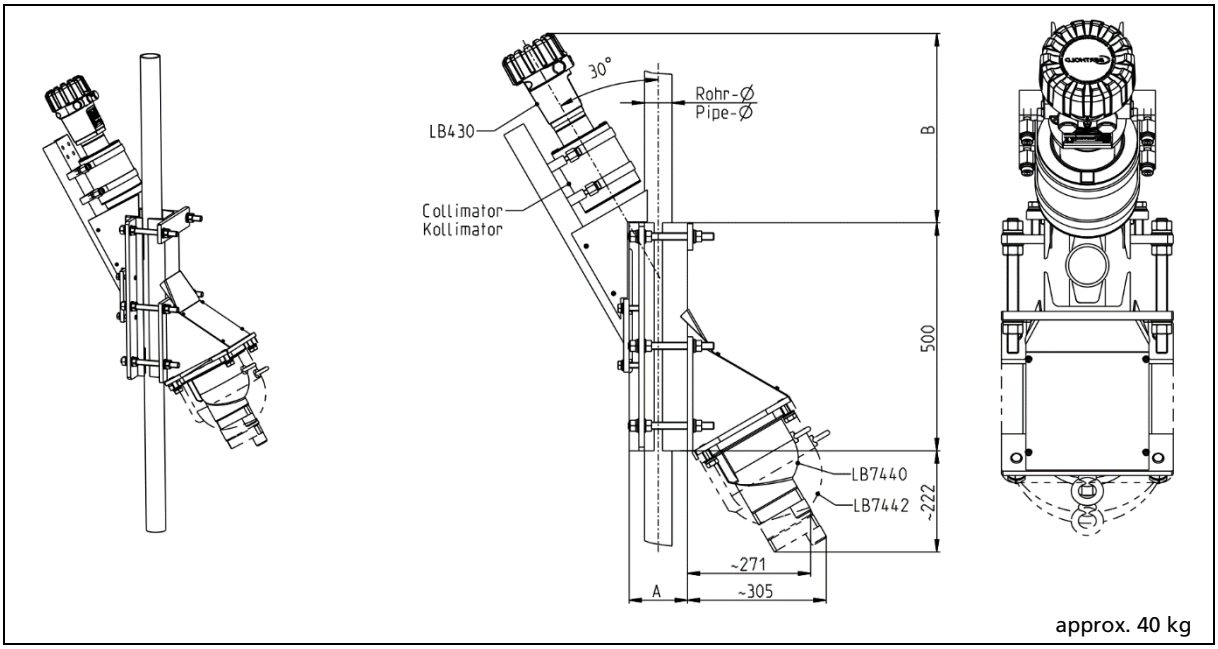
TI-Fig. 8 Mounting device for 90° radiation angle and parallel detector mounting ø 50 - 304 (dimensions in mm)

Mounting device for 45° radiation angle



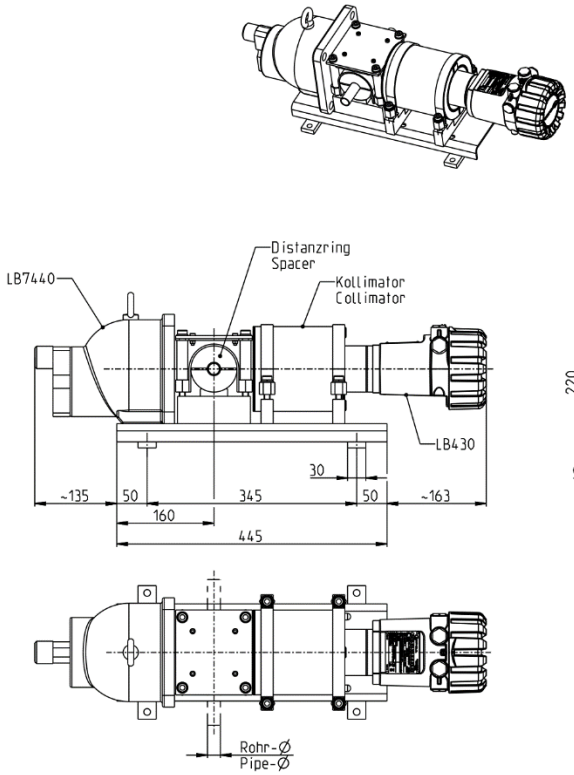
TI-Fig. 9 Mounting device for 45° beam angle (dimensions in mm)

Mounting device for 30° radiation angle



TI-Fig. 10 Mounting device for 30° radiation angle (dimensions in mm)

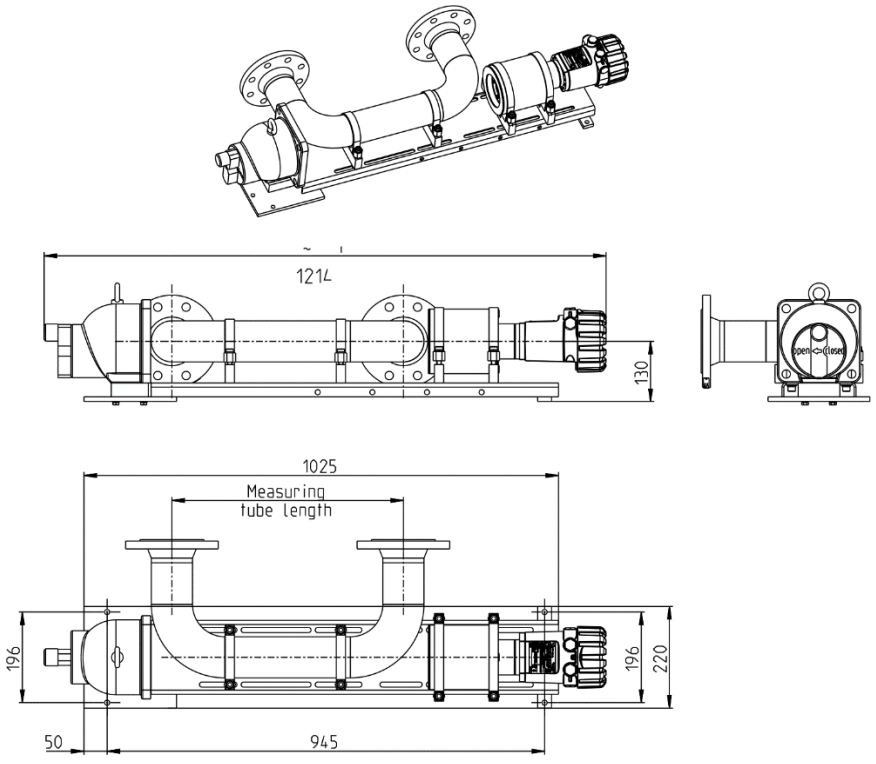
Radiation angle 90° / Parallel Detector Mounting / Small Pipe Cross-sections



approx. 70 kg

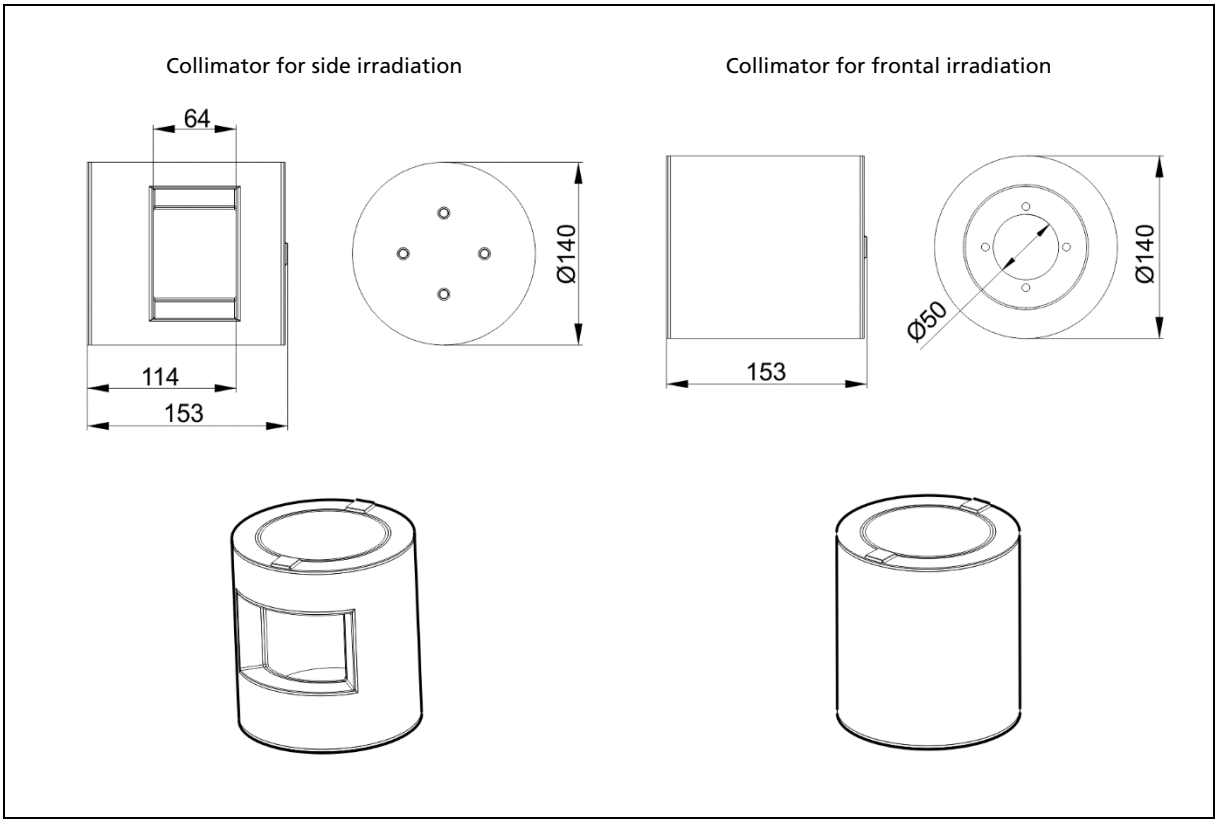
TI-Fig. 11 Parallel detector installation / small pipe cross-sections (dimensions in mm)

S and U-shaped density measurement section



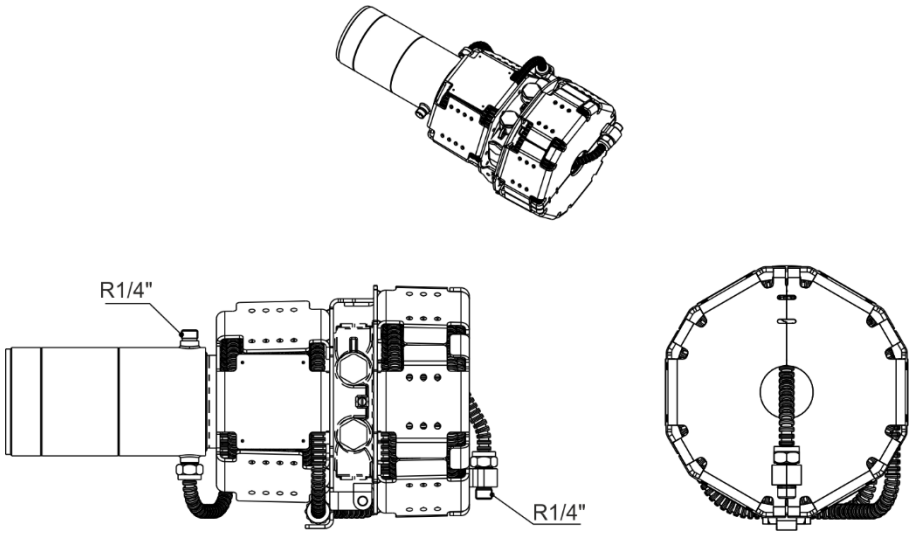
TI-Fig. 12 S and U-shaped density measurement section (dimensions in mm)

4. Collimators

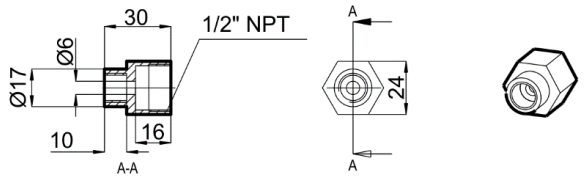


TI-Fig. 13 Collimators für CrystalSENS detectors

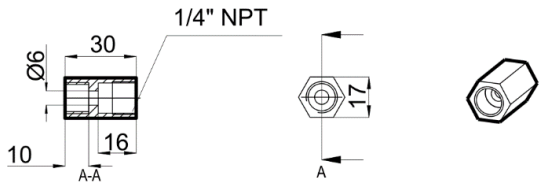
5. Water Cooling Jacket and Adaptor Fittings



Fitting adaptor for standard water cooling
Rp ¼" → ½" NPT female, stainless steel 1.4301 (AISI 304)



Fitting adaptor for standard water cooling
Rp ¼" → ¼" NPT female, stainless steel 1.4301 (AISI 304)



Further fitting adaptors for standard water cooling jacket:
Rp ¼"→ ½" NPT male, stainless steel 304
Rp ¼"→ ¼" NPT male, stainless steel 304

TI-Fig. 14 Water cooling jacket and adaptor fittings

6. Technical Data

Mechanical Design	
Operating temperature	without water cooling -40 to +60 °C (-40 to 140°F) ambient temperature with water cooling 0 to +100 °C (32 to 212°F) ambient temperature Additional notes Observe the maximum permissible ambient and surface temperatures for explosion protection. See safety manual / explosion protection manual.
Storage temperatur	-40…+60 °C (-40…158°F)
General ambient conditions	Designed for use in wet & salty operating environments Altitude: up to 2000 m Humidity: max. 90%
IP protection type/class	IP 68
Housing material	Stainless steel 1.4404 (316L) oder Aluminum
Environmental audits	Vibration resistance: DIN EN 60068-2-6; Fraunhofer ICT test; Resonance test 5...2000 Hz, 0.1 g, 1 Oct./min Resonance dwell 10 million, max 10 h per axis, 1.9 g Shock resistance: DIN EN 60068-2-27, Fraunhofer ICT test Half sine, 300 m/s2, 18 ms, 3 shocks/direction/axis
Scintillator	NaI 50 x 50 mm
Water cooling	Option, stainless steel ISO 1.4404 / AISI 316 Water pressure to 6 bar Water connection G1/4” Weight for CrystalSENS (50 x 50 NaI): approx. 6.1 kg
Collimator	Optional, lead, painted Frontal or lateral irradiation To reduce background radiation Weight: CrystalSENS (50 x 50 NaI) - side: approx. 13.5 kg CrystalSENS (50 x 50 NaI) - frontal: approx. 14.5 kg
Thread size input	M20 x 1.5 or ½” NPT
Total weight	CrystalSENS (50 x 50 NaI) - Aluminum: 5.3 kg CrystalSENS (50 x 50 NaI) - 316L stainless steel: 8.2 kg

Electrical Design	
Supply voltage	14 to 30 VDC via HART 4...20 mA
EMC	Interference emission according to EN 61326-1, equipment class A. Interference immunity according to EN 61326-3-2, NAMUR NE21.
Current output	4 to 20 mA output (max. 500 Ohm) according to NAMUR NE43. Internal monitoring of the loop current and additional fault signaling by hardware when a fault condition is detected.
Wire cross-section for terminals	0.25 mm² (AWG24) to 2.5 mm² (AWG12)

Performance data	
Internal cycle time	500 ms
Damping	0.1 … 99 s
Max. Count rate	Max. 2.000.000 cps
Stability	≤ 0.5% Point (≤0.007 % / °C), over the entire temperature range
Approvals	CE conformity ATEX IECEx CSA

6.1. Point Detectors CrystalSENS

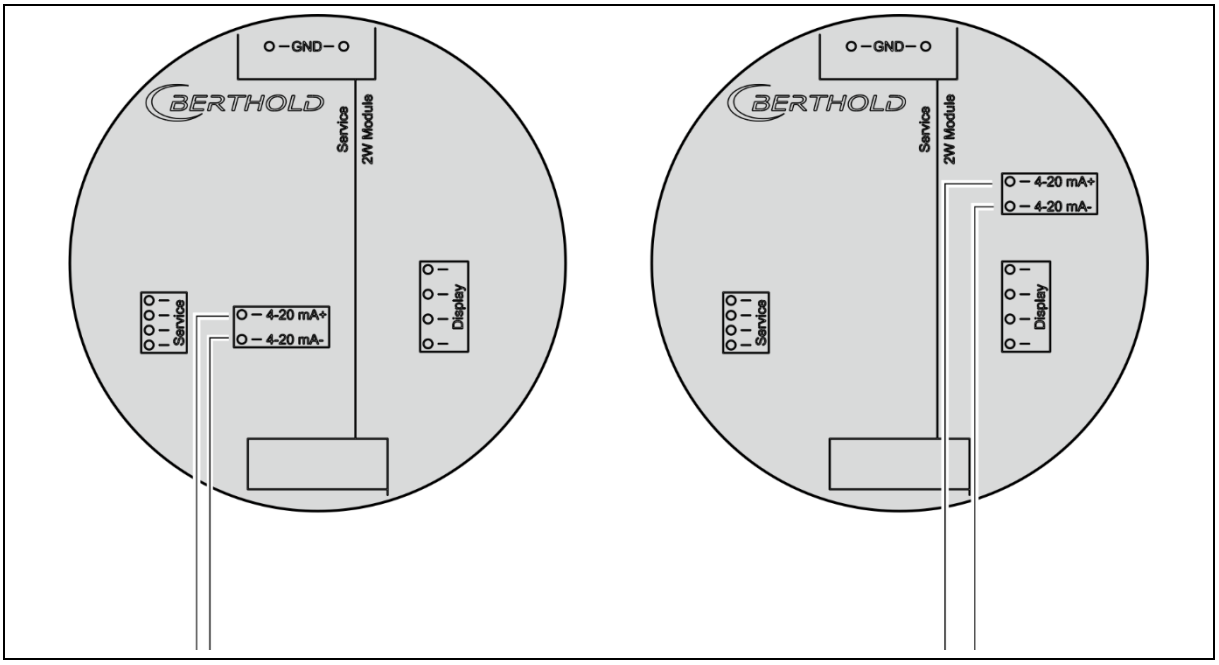
Mechanical Design	
Total weights	CrystalSENS, 50x50 mm NaI, aluminum: approx. 5.15 kg CrystalSENS, 50x50 mm NaI, stainless steel ISO 1.4404 / AISI 316L approx. 8.05 kg With water cooling (option): additional approx. 6.1 kg With collimator (option): additional approx. 14 kg
Installation lengths	CrystalSENS, 50x50 mm NaI, aluminum: approx. 358 mm CrystalSENS, 50x50 mm NaI, stainless steel ISO 1.4404 / AISI 316L approx. 358 mm With water cooling (option): additional approx. 40 mm With collimator (option): additional approx. 26 mm

6.2. Scintillator

Mechanical Design	
Scintillator	NaI(Tl) crystal 50x50 mm
Typical sensitivity (Cs-137)	NaI(Tl) crystal 50x50 mm: ≥ 1200 cps / µSv / h

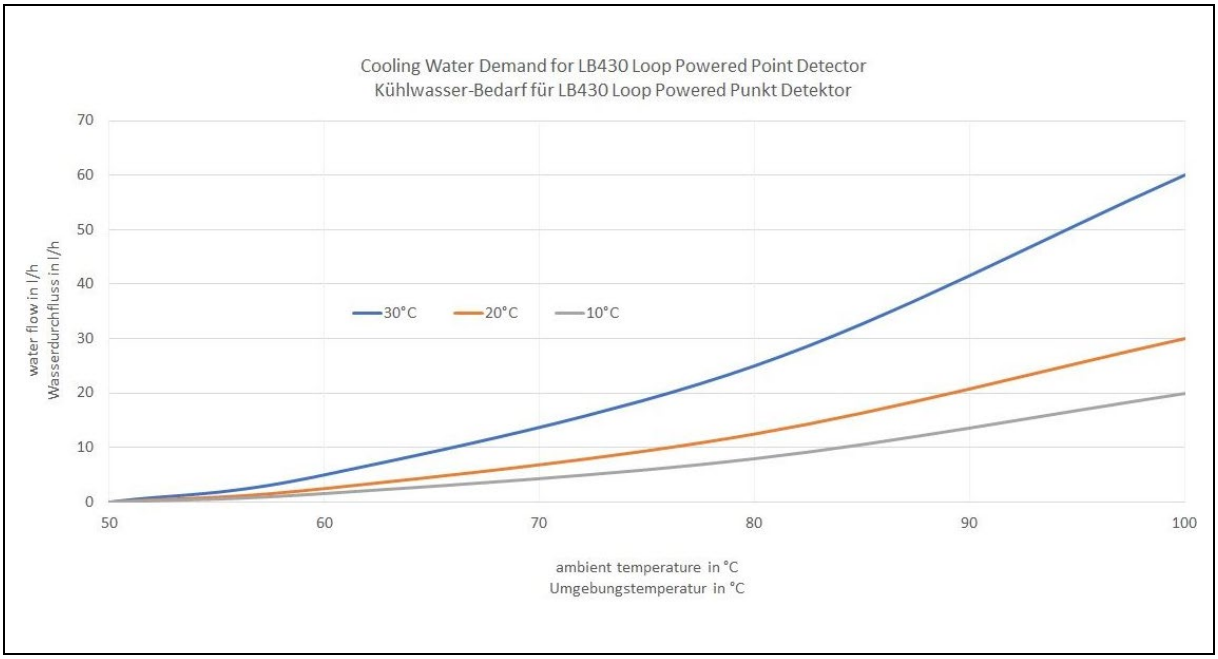
7. Electrical Connection

A minimum load resistance of 250 Ω must be provided for the 4 ... 20 mA HART current loop (siehe Operating manual chapter 5 Electrical installation).



TI-Fig. 15 Circuit diagram 4 ... 20 mA HART connection

8. Cooling Water Demand



TI-Fig. 16 Cooling water demand point detector CrytalSENS

9. Number Key LoopSeries LB 430 Detectors

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
L	B	4	3	0	-	1	1	-	0	0	-	0	-	1	-	0	1	-	0	0

Scintillator

1	NaI

Scintillator size

1	50/50 mm

Ex approval (Revision)

0	0	without Ex approval
J	0	Zones (ATEX/IECEx); Ex-d/t
K	0	Zones (ATEX/IECEx); Ex-d/i

Water cooling compatibility

1	compatible (T4 or Nicht-Ex)

Signal output

1	HART

Housing material

0	Aluminum
3	stainless steel 316L

Cable entry

1	M20 x 1,5 laterally
2	1/2" NPT laterally

SIL

0	without SIL

Software

0	Standard (Level, Density)

10. Parts Overview

Mat.-Nr.	Description
75900	Water cooling for point detectors
75900-1	Pre-assembled water cooling for point detectors
75829	Collimator with frontal irradiation
75829-1	Pre-assembled collimator with frontal irradiation
75836	Collimator with side irradiation
75836-1	Pre-assembled collimator with side irradiation
31346	Clamping set for detectors without water cooling
31347	Clamping set for detectors with water cooling
75911	Robust clamping set for detectors with collimator
75912	Clamping set for detectors with collimator
39246	Holder for point detectors without water cooling, stainless steel
39247	Bracket for point detectors with water cooling
45909	Signal cable
71764	Signal cable for intrinsically safe detectors
74265	Cable gland for flameproof enclosure (Ex-d), M20x1.5, nickel-plated brass
74264	Cable gland for flameproof enclosure (Ex-d), M20x1.5, stainless steel
74263	Cable gland for flameproof enclosure (Ex-d), ½" NPT, nickel-plated brass
74262	Cable gland for flameproof enclosure (Ex-d), ½" NPT, stainless steel
tbd	Sealing plug for flameproof enclosure, M20x1.5, nickel-plated brass
tbd	Sealing plug for flameproof enclosure, M20x1.5, stainless steel
73006	Sealing plug for flameproof housing, ½" NPT, nickel-plated brass
66050	Sealing plug for flameproof housing, ½" NPT, stainless steel

11. EU-Declaration of Conformity

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

EU-Konformitätserklärung

EU-Declaration of Conformity

Nr./*No.: CE20042-01*

Hiermit erklären wir in alleiniger Verantwortung, dass die Bauart des nachfolgend bezeichneten Geräts, in der von uns in den Verkehr gebrachten Ausführung den unten genannten einschlägigen Harmonisierungsvorschriften der EU entspricht.

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

We hereby declare, under our sole responsibility, that the design of the following device placed on the market by us complies with the relevant harmonized rules of the EU.

Unauthorized modifications or unintended use of the product makes this declaration invalid

Hersteller *Manufacturer*	**BERTHOLD TECHNOLOGIES GmbH & Co. KG** Calmbacher Str. 22, D-75323 Bad Wildbad, Germany
Produktbezeichnung *Product name*	**LoopSeries Detektoren** (nicht ATEX) ***LoopSeries Detectors*** *(non ATEX)*
Typenbezeichnung / Modell *Type / model*	**LB430-xx-00**

Richtlinie/Verordnung *directive/regulation*		**angewendete Normen** *applied standards*
EMV / *EMC*	2014/30/EU	EN IEC 61326-1:2021 Namur NE 021:2017
RoHS	2011/65/EU	
Schutzziele der NSR *safety objectives according LVD*	2014/35/EU	EN 61010-1:2010+A1:2019

Diese Erklärung wird in Verantwortung für den Hersteller ausgestellt durch
This declaration is issued by the manufacturer released by

Tobias Stephan

Head of R&D
Bad Wildbad, 10.04.2024

Registergericht / Court of Registration: Stuttgart HRA 330991
Persönlich haftende Gesellschafterin / Fully liable Associates: Berthold Technologies Verwaltungs-GmbH
Registergericht / Court of Registration: Stuttgart HRB 331520
Geschäftsführung / Management: Thomas Bogner
USt.-Id-Nr. / VAT Reg. No.: DE813050511
Deutsche Steuernummer / German Tax No.: 49038/08038
WEEE-Reg. No.: DE99468690

Bankverbindungen / Bank Details	IBAN BLZ Konto / Account	Swift BIC
Sparkasse Pforzheim-Calw	DE37 6665 0085 0008 0450 03	PZHSDE66
Volksbank Pforzheim	DE85 6669 0000 0000 9570 04	VBPFDE66
Commerzbank Pforzheim	DE05 6668 0013 0651 1120 00	DRESDEFF666