



## Bulkscan®

NON-CONTACT AND MAINTENANCE-FREE SENSOR  
FOR MEASURING VOLUME FLOW

Flow sensors

**SICK**  
Sensor Intelligence.

# THE ABSOLUTE PACKAGE: THE Bulkscan® PRODUCT FAMILY



Bulkscan® LMS111 and Bulkscan® LMS511

→ [www.sick.com/Bulkscan](http://www.sick.com/Bulkscan)

For more information, simply enter the link or scan the QR code and get direct access to technical data, CAD design models, operating instructions, software, application examples, and much more.





More volume, not mass: If you need to measure bulk materials on conveyor belts or in piles, the laser volume flowmeter Bulkscan® offers you a precise measuring procedure and an appealing alternative to a belt scale. The Bulkscan® continuously measures the flow rate without making contact – regardless of weather conditions and the condition of the material. Intelligent additional functions on Bulkscan® LMS511, such as measurement of the center of gravity, height of the bulk, and belt monitoring prevent damage to the machines and conveyor belts. A definite benefit when optimizing the flow of goods and efficiently controlling conveyor belts.

The Bulkscan® is exemplary in both maintenance and cost-effectiveness: Thanks to a special alloy housing and integrated heating, it is robust and suitable for outdoor use – it is even reliable in Siberian ice and cold, because the Bulkscan® LMS511 can work at an ambient temperature of  $-40\text{ }^{\circ}\text{C}$ .



# ABSOLUTELY PRECISE: MEASUREMENT OF VOLUME FLOW RATE



## THE ADVANTAGES OF DIRECT VOLUME MEASUREMENT WITH THE Bulkscan®

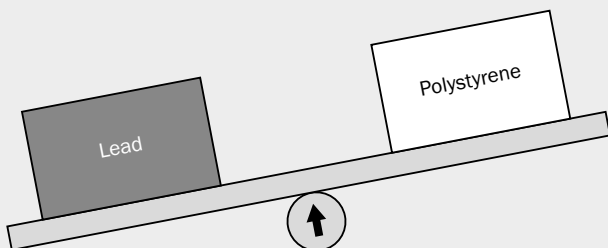
Only measuring the weight of the bulk materials involves certain risks: With belt scales, for example, the volume is calculated indirectly based on a fixed value for the density factor. In many applications, the density is not homogeneous or constant.

Even environmental influences such as humidity affect the density factor. Using only a belt scale as the measurement instrument in these cases, will lead to significant deviations between the calculated conveyor volume and the actual conveyor volume. This can also greatly impact the process control system: Due to the incorrectly calculated volume, overfilling, material jam and thus a system standstill can result.

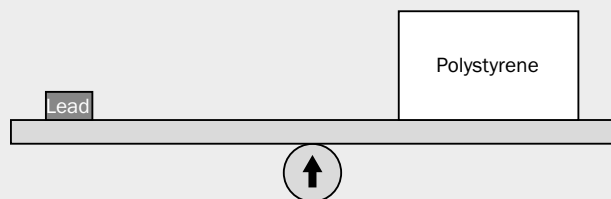
The measurement principle of determining volume via a laser beam produces a series of practical advantages:

- The measurement is non-contact
- The process can be optimized according to volume. Overloading or underloading the downstream station is prevented
- The sensor measures the actual volume on the conveyor belt. In doing so, influencing factors such as humidity and the condition of the bulk materials are taken into account during measurement

### Possible sources of error when only determining the measured values of mass and density:



Lead has a greater mass than polystyrene foam.  
→ The volume for both, however, is the same.



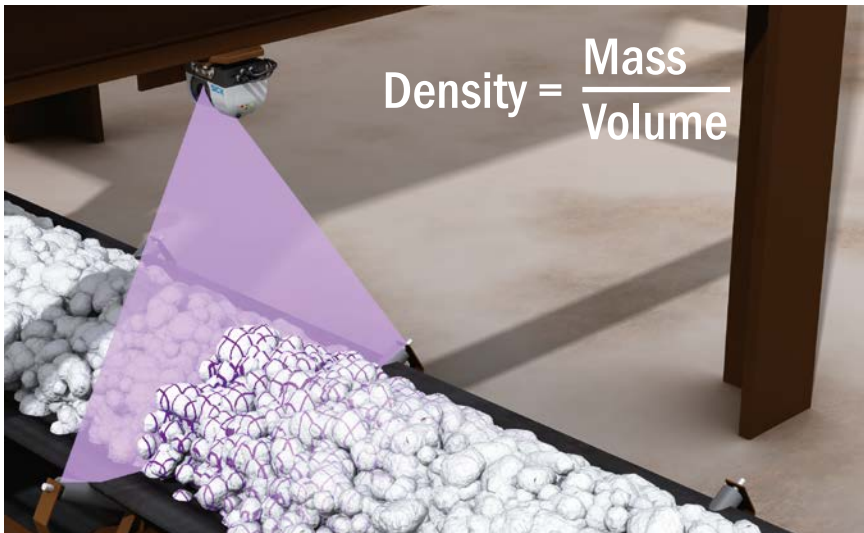
Lead and polystyrene foam have the same mass.  
→ The volume of polystyrene foam, however, is higher than that of lead.



# ABSOLUTELY VERSATILE: INTELLIGENT ADDITIONAL FUNCTIONS

Volume and flow rate, level, center of gravity, loading position as well as belt monitoring: When it comes to the optimal control of each individual process stage, it is not just the measurement of the flow rate that is crucial. The Bulkscan® provides other useful measurands thanks to its intelligent additional functions.

## Calculating the bulk density



Calculating the material density makes it possible to assess the condition and quality of the material. The bulk density can be calculated in real time in combination with a belt scale.



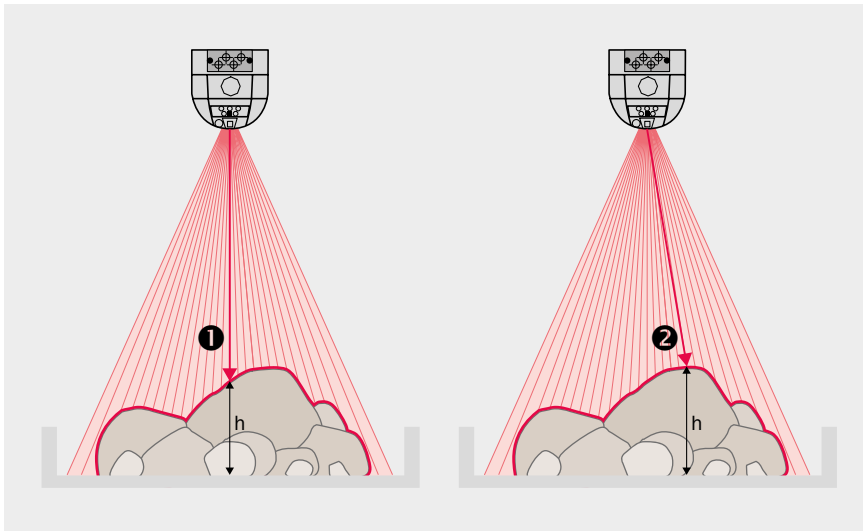
## Loading position and belt monitoring with Bulkscan® LMS511



Shifting of the conveyor belts can sooner or later lead to belt wear. Bulkscan® LMS511 detects the loading position and limit at an early stage using the belt monitoring function. This ensures optimal system utilization.



## Measuring the level



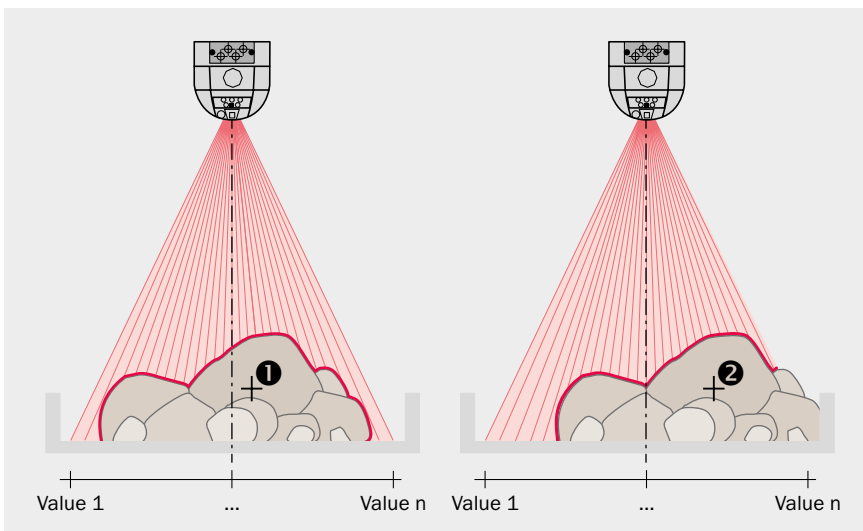
In addition to volume and throughput, the Bulkscan® also calculates the height profile of the bulk materials. This way, large rocks can be detected in a timely manner before blocking or damaging equipment in downline machining processes.

Two strategies can be used to calculate the bulk height:

- Measurement of the belt center ①
- Measurement of the highest point ②



## Calculating the center of gravity



Particularly determining the center of gravity increases system availability: Bulkscan® monitors the belt load on the entire conveying line and detects one-sided loads or one-sided belt loads.

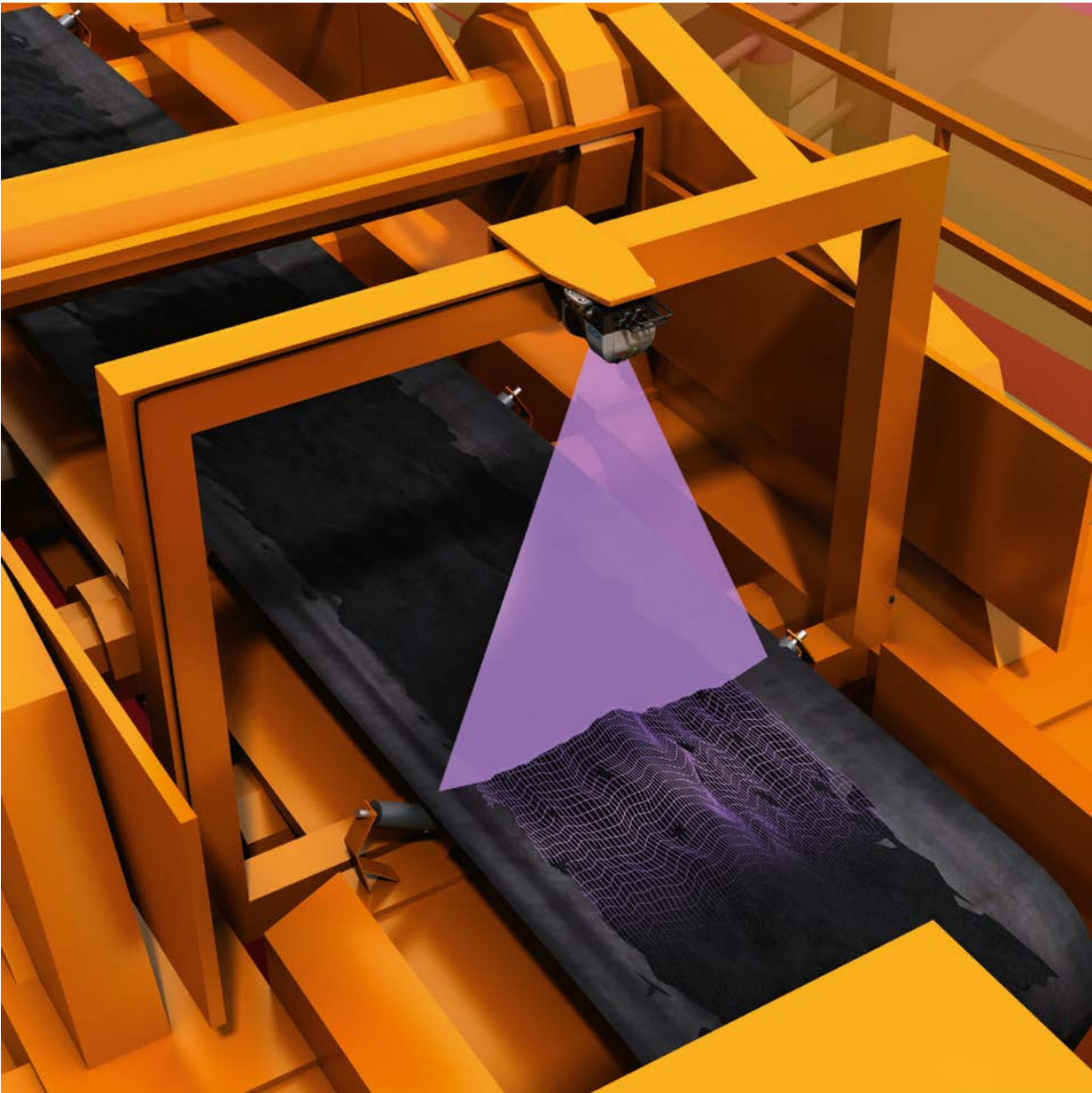
It calculates the load's center of gravity from the bulk height measurement:

- The center of gravity is aligned on the center of the belt ①
- Center of gravity is too far to the right ②



# ABSOLUTELY ROBUST: THE Bulkscan® IN USE

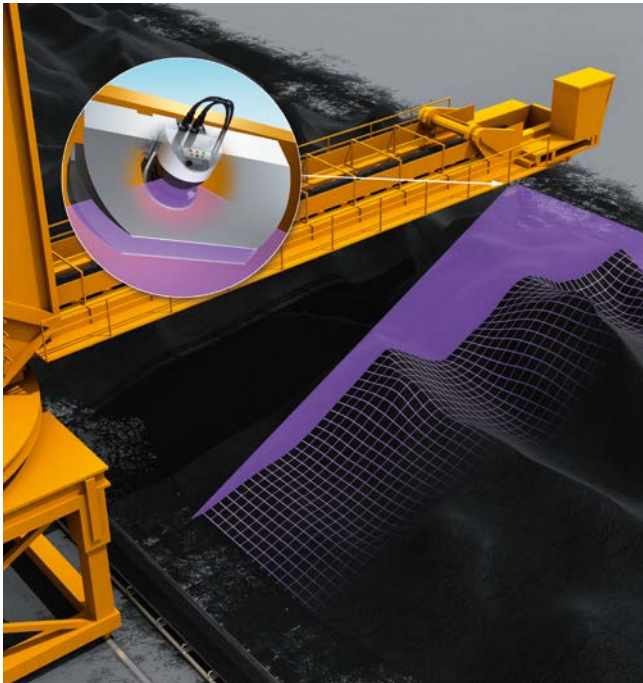
## THROUGHPUT MEASUREMENT ON A COAL OR ORE CONVEYOR BELT



A laser scanner emits a pulsed-laser beam. When it hits the bulk material, it is reflected and registered in the scanner receiver. The time it takes for the pulse to be emitted and received is directly proportional to the distance between scanner and bulk materials.

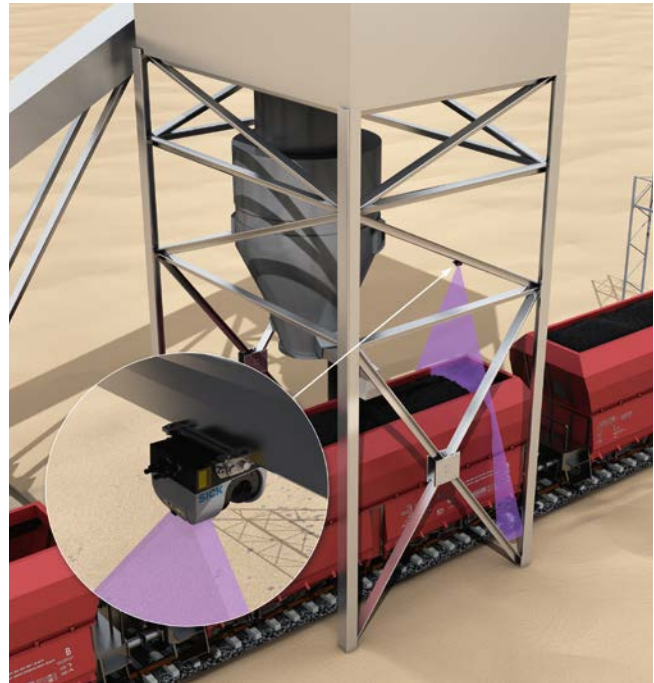


## PILE MEASUREMENT



The non-contact measuring Bulkscan® detects the profile of the bulk material on the conveyor belt. The flow rate is calculated using the belt speed and the bulk material profile. This makes it possible to create a feedback control system that provides optimal belt speed and ensures economic belt utilization.

## VOLUME MEASUREMENT FOR WAGONS



### The benefits at a glance:

- Low-maintenance throughput measurement
- Flexible use
- Optimum belt utilization
- Belt monitoring to reduce belt wear

### Multi-echo technology



The multi-echo technologies from SICK enable high precision laser measurement in virtually all weather and environmental conditions.

The multi-echo technologies are perfectly suited for applications that require the reliable detection of dynamic objects in changing or unfavorable weather conditions. Even for applications with poor visibility, such as in tunnels or in mines. In addition to maintaining excellent visibility in adverse weather conditions, the new, ultra-fast 5-echo technology used on Bulkscan® LMS511 also ensures maximum accuracy.

# NON-CONTACT AND MAINTENANCE-FREE MEASUREMENT OF VOLUME FLOW



## Product description

The Bulkscan® uses time-of-flight laser technology to provide non-contact volume flow measurements on conveyor belts. No matter what kind of bulk materials are involved or how bad weather conditions are, the multi-echo technology allows the Bulkscan® to generate a reliable volume flow signal using the laser's time of flight and the belt speed. Aside from calculating total quantities and mass flow, the Bulkscan® with integrated bulk materials center-of-gravity calculator detects uneven loading

and avoids excessive belt wear. The rugged industrial housing is ideal for extreme operating conditions. An integrated heater also ensures safe operation over a wide range of ambient temperatures. Discrete signals as well as Ethernet TCP/IP can be used to connect the measuring system to a host communication system.

## At a glance

- Efficient and cost-effective non-contact measurement of volume and mass flow of bulk materials
- Laser pulses with high angular resolution ensure outstanding image resolution
- Multi-echo pulse evaluation produces highly reliable measurements
- Integrated center-of-gravity calculator
- Rugged design for harsh ambient conditions
- Integrated heater allows measurement even at low temperatures
- Compact housing with IP67 enclosure rating

## Your benefits

- Maximizes conveyor throughput
- Bulkscan® LMS511 reduces maintenance costs by preventing belt slippage
- Increases efficiency by optimizing belt capacity
- Simple installation
- Low commissioning, operating, and maintenance costs
- Offers savings through minimized energy consumption
- Wide ambient operating temperature range allows outdoor applications



## Additional information

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## Detailed technical data

## Features

	Bulkscan® LMS511	Bulkscan® LMS111
Light source	Infrared (905 nm)	
Laser class	1, eye-safe (IEC 60825-1:2014)	
Aperture angle	190°	
Scanning frequency	35 Hz 50 Hz 75 Hz	25 Hz 50 Hz
Bandwidth	No limit	
Heating	Yes	
Working range	0.5 m ... 20 m	0.5 m ... 10 m
Amount of evaluated echoes	5	2

## Performance

	Bulkscan® LMS511	Bulkscan® LMS111
Response time	13 ms, 20 ms, 28 ms	20 ms, 40 ms
Average filter	0 s ... 3,600 s	
Accuracy <sup>1)</sup>	± 3 % <sup>1)</sup>	± 6 % <sup>1)2)</sup>
Max. conveyor speed	≤ 30 m/s	≤ 20 m/s

<sup>1)</sup> Under reference conditions.

<sup>2)</sup> Contour smoothing set to "High".

## Interfaces

	Bulkscan® LMS511	Bulkscan® LMS111
Auxiliary interface	✓	
	Protocol Data transmission rate	USB 2.0 ≤ 500 kBaud
Serial host interface	✓	
	Protocol Data transmission rate	RS-232/RS-422 ≤ 500 kBaud
Ethernet	✓	
	Protocol Data transmission rate	TCP/IP 100 Mbit/s
Switching inputs	2 (Conveyor belt status and Reset counters); Encoder inputs 1	
Switching outputs	6	3
Analog signals	Available with separate accessory BAM100	
Optical indicators	5 LEDs (Additional 7-segment display)	

## Mechanics/electronics

	Bulkscan® LMS511	Bulkscan® LMS111
Electrical connection	5-pin M12 male connector, A-coded	
Supply voltage scanner/heater	19.2 V ... 28.8 V	10.8 V ... 30 V
Prohibited residual ripple	± 5 %	
Switch-on peak current	2 A	
Operating current scanner	≤ 1.3 A	≤ 0.4 A
Power consumption	22 W, + 55 W heating (typical)	8 W, + 35 W heating (typical)
Housing color	Gray (RAL 7032)	



	Bulkscan® LMS511	Bulkscan® LMS111
Enclosure rating	IP67 (according to IEC 60529)	
Protection class	III	
Weight	3.7 kg	1.1 kg, without cable
Dimensions	160 mm x 155 mm x 185 mm	161 mm x 102 mm x 105 mm
Distance of the sensor to the bulk solid	≥ 0.5 m	
Switch-on time	≤ 60 s	

#### Ambient data

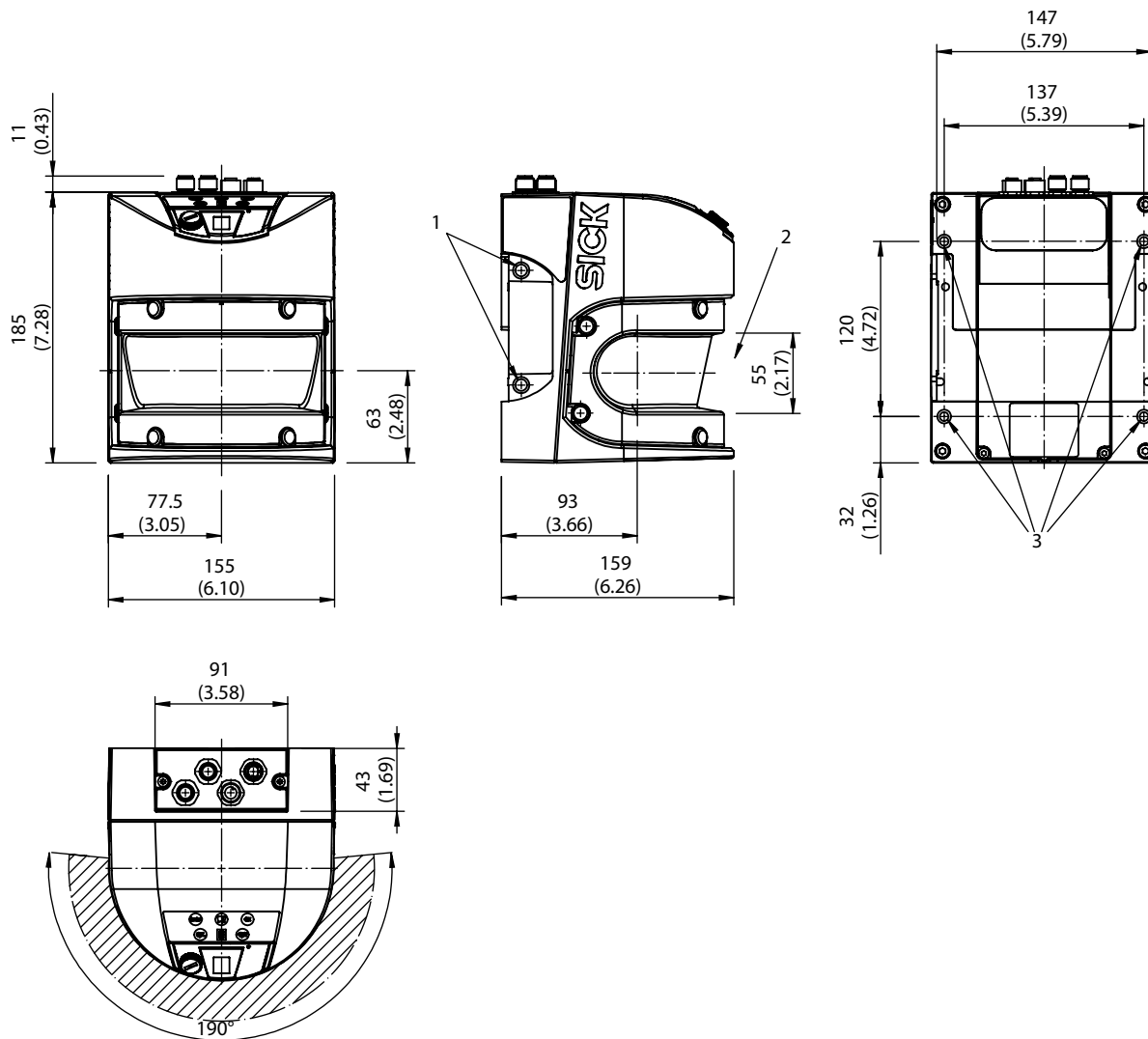
	Bulkscan® LMS511	Bulkscan® LMS111
Electromagnetic compatibility (EMC)	IEC 61000-6-2:2016-08 / IEC 61000-6-3:2006-07 EN 61000-6-2:2005 / EN 61000-6-3 / A1 2011	
Ambient operating temperature	-40 °C ... +60 °C	-30 °C ... +50 °C
Storage temperature	-40 °C ... +70 °C	
Ambient light immunity	70,000 lx	40,000 lx

#### Ordering information

	Sub product family	Type	Part no.
	Bulkscan® LMS511	LMS511-20190	1059529
	Bulkscan® LMS111	LMS111-10190	1093274

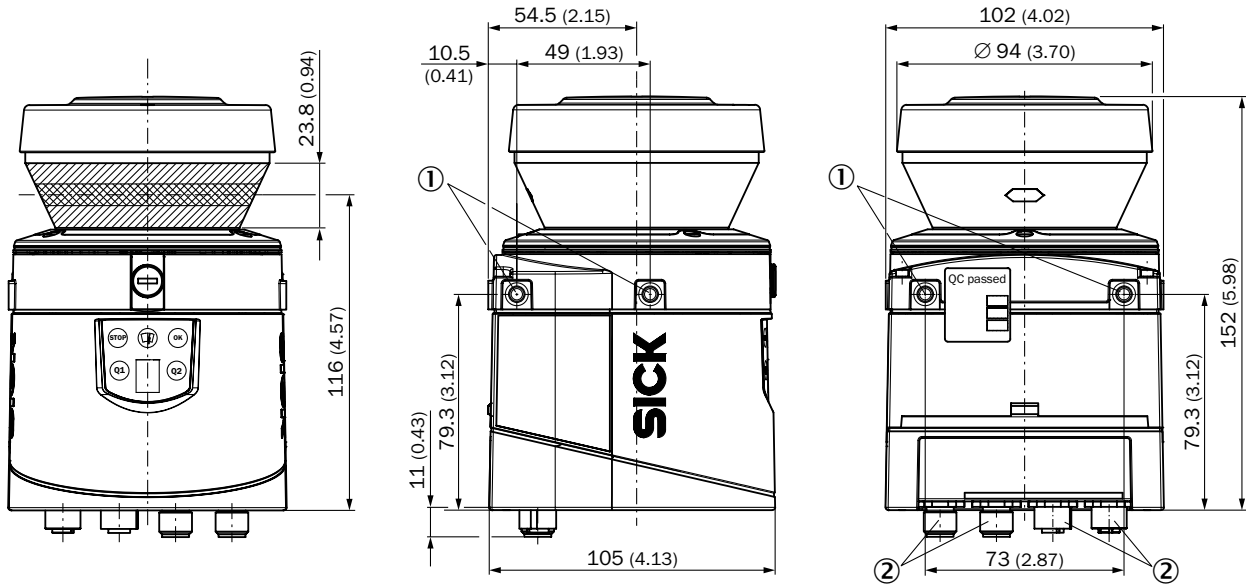
Dimensional drawings (Dimensions in mm (inch))

Bulkscan® LMS511



- ① 4 screw holes M8 x 9
- ② Do not block front screen
- ③ 4 screw holes M6 x 8

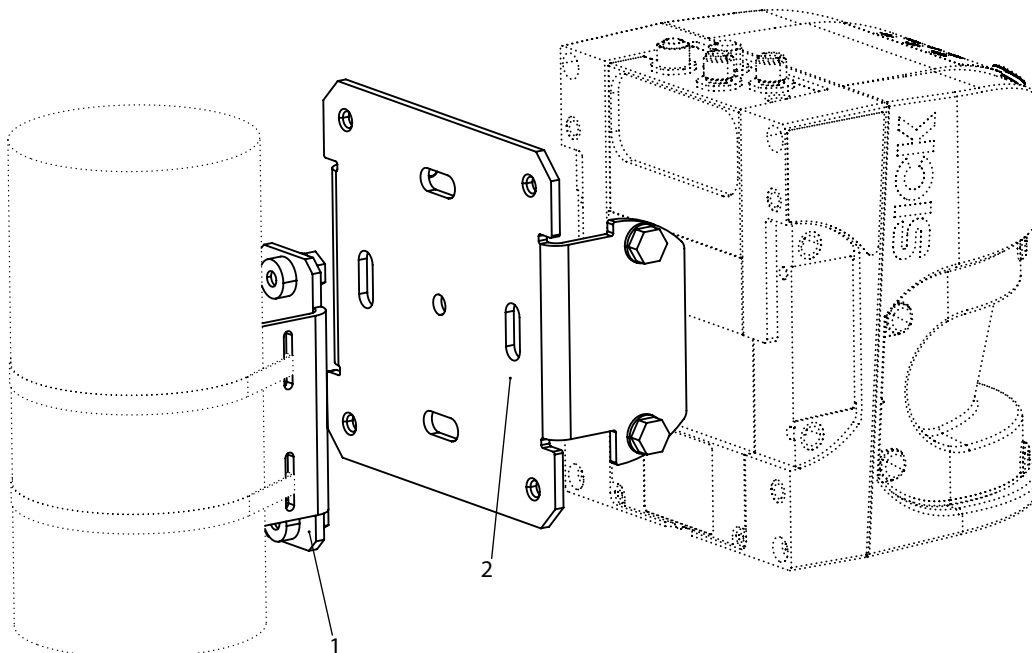
Bulkscan® LMS111



- ① Mounting hole M5 x 7.5
- ② Connector M12

Mounting

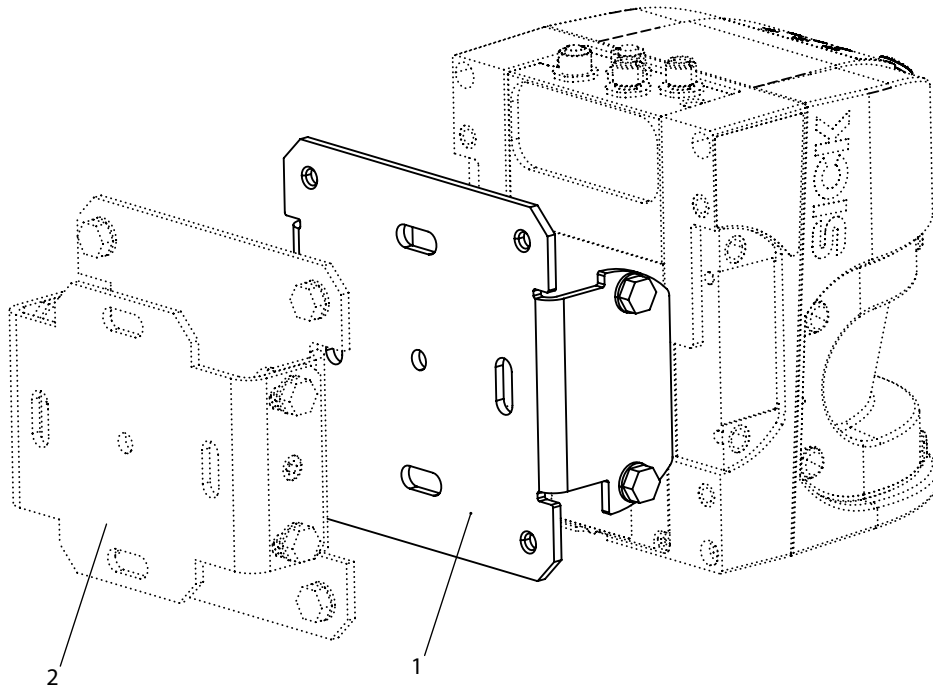
Post bracket (Bulkscan® LMS511)



- ① Post bracket
- ② Adapter bracket

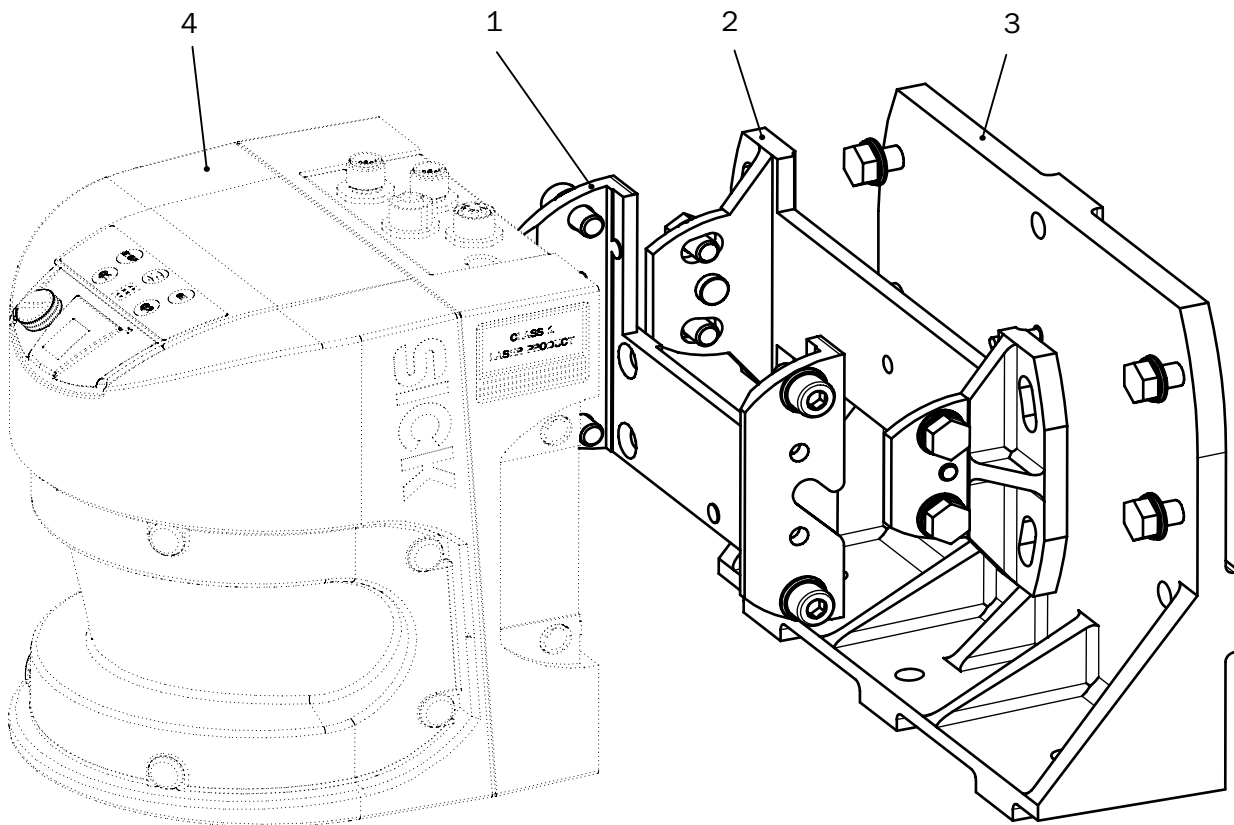


Mounting bracket (Bulkscan® LMS511)



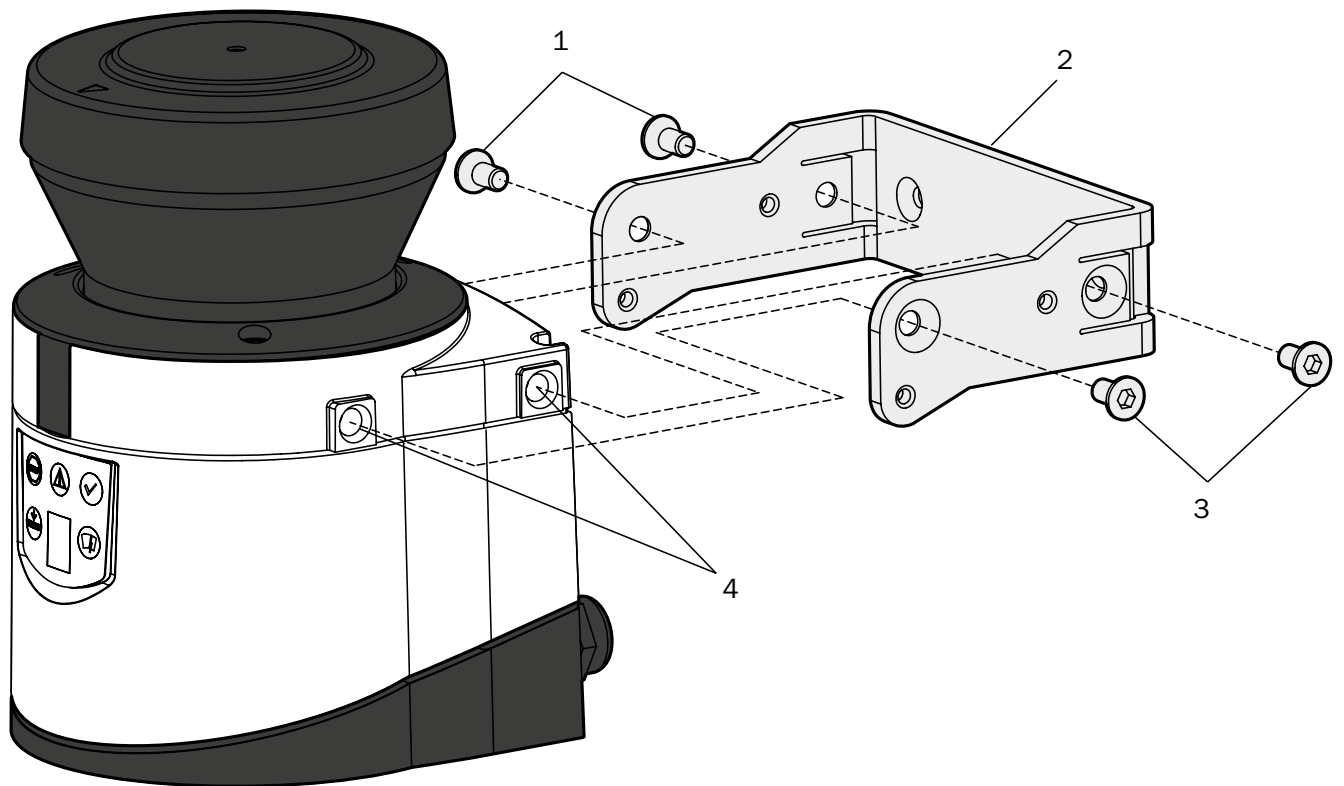
- ① Mounting bracket
- ② Mounting set for LMS2xx Part no. 2018303

Mounting kit (Bulkscan® LMS511)



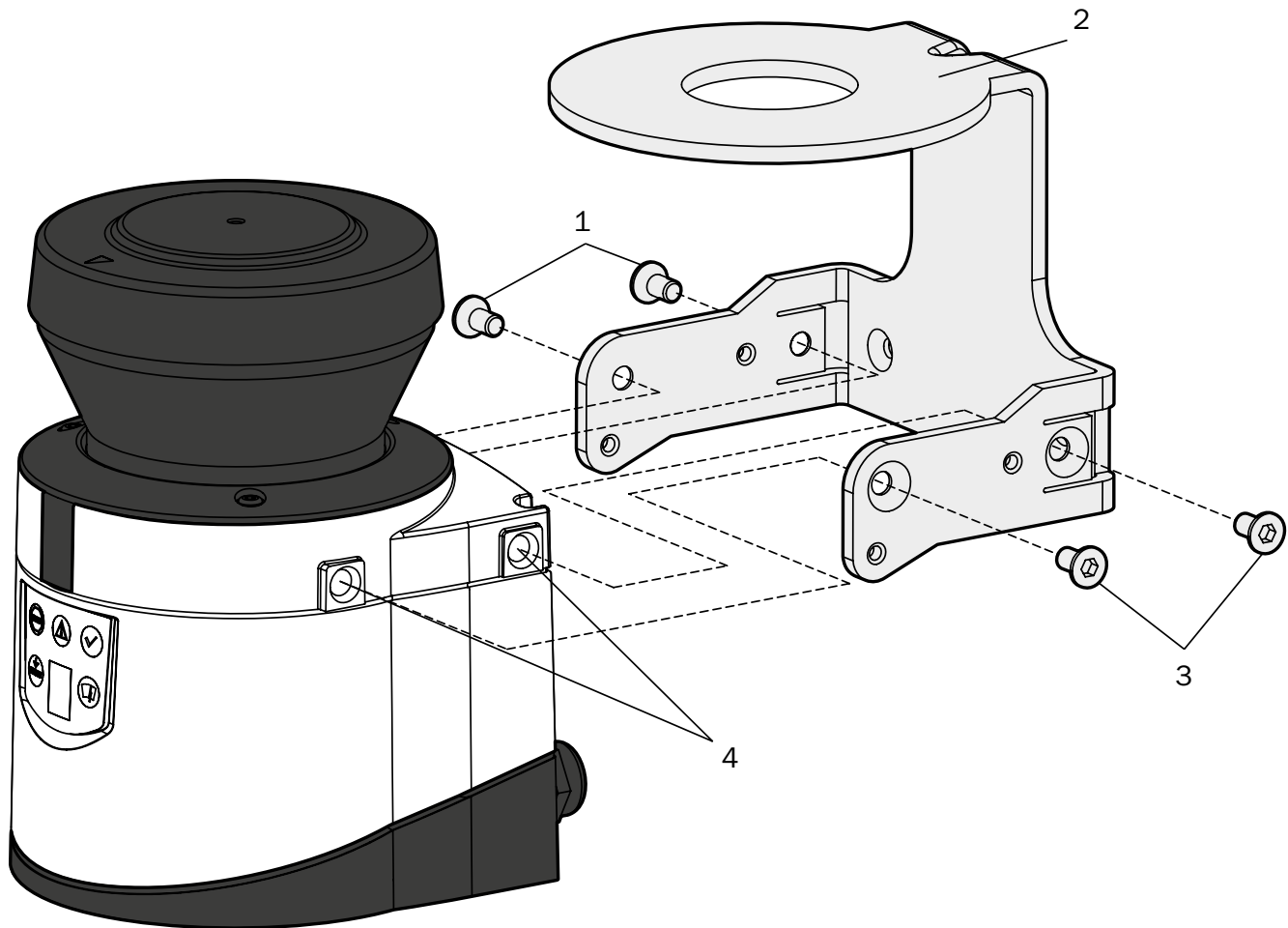
- ① Mounting kit 1
- ② Mounting kit 2
- ③ Mounting kit 3
- ④ Device

Mounting kit 1a (Bulkscan® LMS111)



- ① Mounting screws
- ② Mounting kit 1a (part no. 2034324)
- ③ Mounting screws
- ④ Threaded holes M5x8

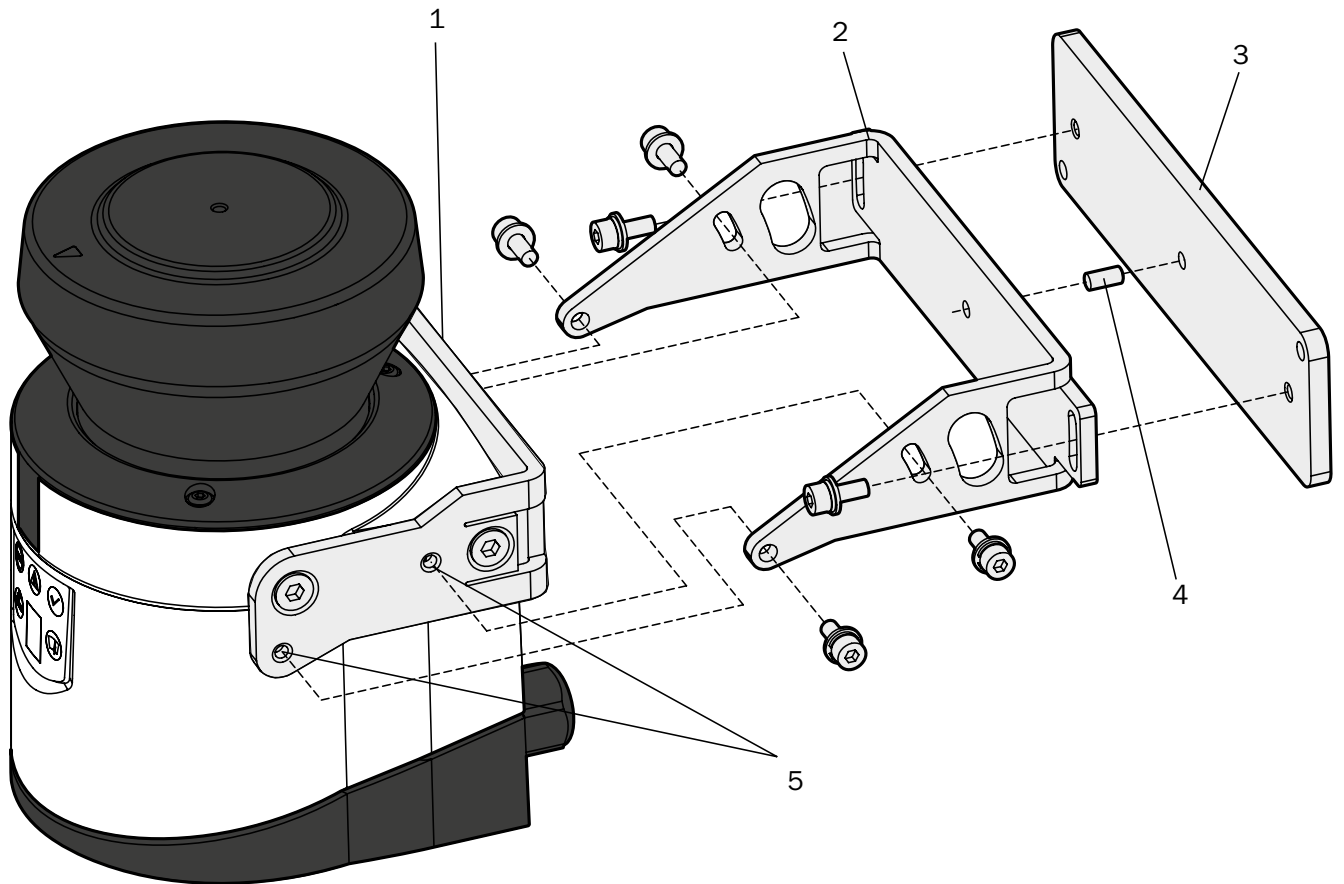
## Mounting kit 1b (Bulkscan® LMS111)



- ① Mounting screws
- ② Mounting kit 1b (part no. 2034325)
- ③ Mounting screws
- ④ Threaded holes M5x8



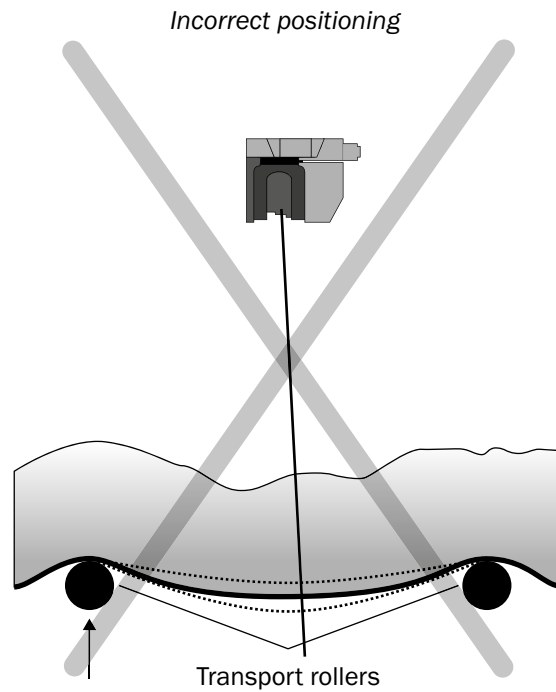
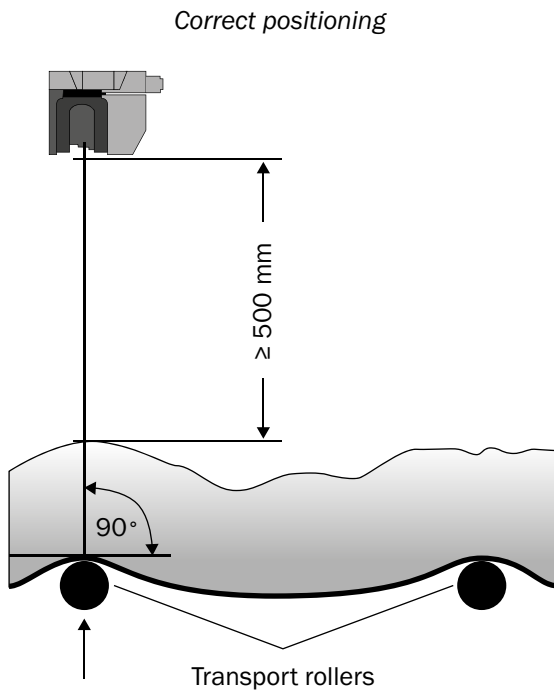
Mounting kit 2 (Bulkscan® LMS111)



- ① Mounting kit 1a
- ② Mounting kit 2 (part no. 2039302)
- ③ Mounting kit 3 (part no. 2039303)
- ④ Centring pin
- ⑤ Threaded holes M4

## Installation instructions

Bulkscan® LMS511 / Bulkscan® LMS111



## Recommended accessories

### Mounting systems

Device protection (mechanical)







Protective housings and protective pipes

	Brief description	Type	Part no.
	Weather hood (180°), vertical mounting (Bulkscan® LMS511)	Weather hood	2063050
	Weather hood, 190°	Weather protection cover 190°	2046459

### Mounting brackets and plates





#### Mounting brackets

	Brief description	Type	Part no.
	Spring arm / mounting arm for DFV60	DFV60 spring arm	2056155
	Mounting bracket for LMS5xx (for retrofitting, if 2018303 is already in use) (Bulkscan® LMS511)	Mounting bracket	2059271
	Standard mounting set for 190° weather hood for Bulkscan® LMS111	Mounting bracket	2046025
	1 piece, mounting bracket for direct mounting, from the rear, on wall or machine, not adjustable (Bulkscan® LMS511)	Mounting kit 1	2015623



	Brief description	Type	Part no.
	1 piece, mounting bracket for rear mounting on wall or machine (Bulkscan® LMS111)	Mounting kit 1a	2034324
	1 piece, mounting bracket for rear mounting on wall or machine with protection of optics hood (Bulkscan® LMS111)	Mounting kit 1b	2034325
	1 piece, mounting bracket for rear mounting on wall or machine, adjustable longitudinal and lateral axes, only in conjunction with mounting kit 1 (2015623) (Bulkscan® LMS511)	Mounting kit 2	2015624
	1 piece, mounting bracket, adjustable lateral axis, only in conjunction with mounting kit 1a (2034324) or 1b (2034325) (Bulkscan® LMS111)	Mounting kit 2	2039302
	1 piece, mounting bracket for rear mounting on wall, floor, or machine, adjustable longitudinal and lateral axes, only in conjunction with mounting kit 1 (2015623) and 2 (2015624) (Bulkscan® LMS511)	Mounting kit 3	2015625
	1 piece, mounting plate, adjustable longitudinal axis, only in conjunction with mounting kit 2 (2039302) (Bulkscan® LMS111)	Mounting kit 3	2039303

Other mounting accessories

Measuring wheels and measuring wheel systems


	Brief description	Type	Part no.
	Plastic measuring wheel with smooth plastic surface (Hytrel), for 10 mm solid shaft, circumference 200 mm	BEF-MR-010020	5312988
	Measuring wheel with ridged plastic surface (Hytrel) for 10 mm solid shaft, circumference 200 mm	BEF-MR-010020G	5318678
	Plastic measuring wheel with smooth plastic surface (Hytrel) for 10 mm solid shaft, circumference 500 mm	BEF-MR-010050	5312989
	Aluminium measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 200 mm	BEF-MR010020R	2055224
	Aluminium measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 300 mm	BEF-MR010030R	2049278
	Measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 500 mm	BEF-MR010050R	2055227

Others


	Brief description	Type	Part no.
	Strap lock	Adjustable strap lock	5306221
	Strap for mast bracket (sold by meter)	Tension strap	5306222

Terminal and alignment brackets


Alignment brackets

	Brief description	Type	Part no.
	Pole bracket requires additionally adapter bracket (2059271) or mounting set (2018303)	Mast mounting bracket	2018304

Quick release




	Brief description	Type	Part no.
	Quick-action lock system for weather hood 190°/270°	Quick release	2046989

Programming and configuration tools

	Brief description	Type	Part no.
 Illustration may differ	Incremental measuring wheel encoder, electrical interface: 10 ... 30 V HTL / push-pull, universal mounting bracket, measuring wheel circumference = 300 mm, surface O - ring, connection: M12, 8-pin, number of lines 1,024, operating temperature -20 °C ... +100 °C	DFV60E-22EC01024	1060308
	Incremental measuring wheel encoder, electrical interface: 10 ... 30 V HTL / push-pull, universal mounting bracket, measuring wheel circumference = 300 mm, surface O - ring, connection: cable, 8-pin 1.5 m, number of lines 1024, operating temperature -20 °C ... +100 °C	DFV60E-22EK01024	1060309
	Incremental encoder, blind hollow shaft 15 mm, cable, 8-wire universal, 1.5 m, number of lines: 1024, temperature range: 0°C ... 85 °C	DFS60E-BHEK01024	1055909
	Incremental encoder, cable, 8-wire universal, 1.5 m, number of lines: 1024, temperature range: 0°C ... 85 °C, measuring wheel must be ordered separately	DFS60E-S4EK01024	1037534
	Incremental encoder, blind hollow shaft 15 mm, plug, M12, 8-pin, radial, number of lines: 1024, temperature range: 0°C ... 85 °C	DFS60E-BHEC01024	1036541


Connection systems

Power supply units and power supply cables

	Brief description	Type	Part no.
	Power supply DC 24 V / 10 A	Power supply unit	6020875
 Illustration may differ	Power supply unit 24 V DC / 2.5 A	Power supply unit	6010361
 Illustration may differ	Power supply DC 24 V / 4 A	Power supply unit	6010362

Modules and gateways







Connection modules

	Brief description	Type	Part no.
	BAM100 analog module for Bulkscan, by Beckhoff, 24 V DC supply voltage (-15% / + 20%), rail mounting on 35 mm C rail, according to EN 50022 with interlocking, Ethernet TCP/IP interface (RJ45), CoLa communication, 3 x IN: 4 mA ... 20 mA, 4 x OUT: 4 mA ... 20 mA	BAM100-HE44K	2073296




Plug connectors and cables

Connecting cables

	Brief description	Length of cable	Type	Part no.
	Head A: male connector, M12, 8-pin, straight, A-coded Head B: Flying leads Cable: PUR, halogen-free, shielded, 5.9 mm (Bulkscan® LMS111)	10 m	STL-1208-G10MAC	6036156
	Head A: female connector, M12, 12-pin, straight, A-coded Head B: Flying leads Cable: Power, I/O, twisted pair, PUR, halogen-free, shielded, 8.5 mm (Bulkscan® LMS511)	5 m	Connecting cable (female connector - open)	6042735
		10 m	Connecting cable (female connector - open)	6042736
		20 m	Connecting cable (female connector - open)	6042737
	Head A: female connector, M12, 5-pin, straight, A-coded Head B: Flying leads Cable: Power, shielded	5 m	Connecting cable (female connector - open)	6036159
		20 m	Connecting cable (female connector - open)	6042564
		10 m	Connecting cable (female connector - open)	6042565
	Head A: female connector, M12, 8-pin, straight, A-coded Head B: Flying leads Cable: RS-232, RS-422, shielded (Bulkscan® LMS111)	10 m	Connecting cable (female connector - open)	6028420
		20 m	Connecting cable (female connector - open)	6036154
		5 m	Connecting cable (female connector - open)	6036153
	Head A: male connector, M12, 12-pin, straight, A-coded Head B: Flying leads Cable: Power, I/O, twisted pair, PUR, halogen-free, shielded, 8.5 mm (Bulkscan® LMS511)	5 m	Connecting cable (male connector-open)	6042732
		10 m	Connecting cable (male connector-open)	6042733
		20 m	Connecting cable (male connector-open)	6042734
	Head A: male connector, M12, 8-pin, straight, A-coded Head B: Flying leads Cable: PUR, halogen-free, shielded, 5.9 mm (Bulkscan® LMS111)	5 m	STL-1208-G05MAC	6036155
		20 m	STL-1208-G20MAC	6036157

Connection cables

	Brief description	Length of cable	Type	Part no.
	Head A: male connector, M12, 4-pin, straight, D-coded Head B: male connector, RJ45, 8-pin, straight Cable: Ethernet, twisted pair, PUR, halogen-free, shielded, 6.4 mm, AWG26	5 m	SSL-2J04-G05ME	6034415
		10 m	SSL-2J04-G10ME	6030928
		20 m	SSL-2J04-G20ME	6036158

## Reflectors and optics

### Optics cloths


	Brief description	Type	Part no.
	Cloth for cleaning the front screen	Lens cloth	4003353

## Further accessories

### Cleaning agent

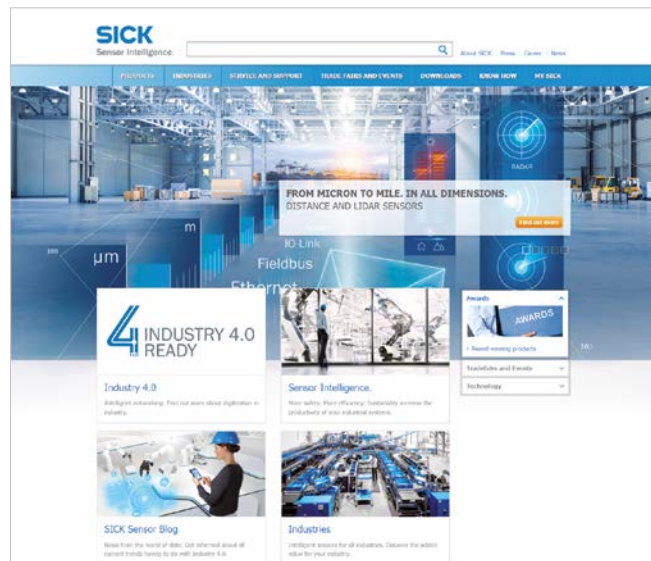
	Brief description	Type	Part no.
	Plastic cleaner and care product, anti-static, 0.5 liter	Plastic cleaner	5600006

## Test and monitoring tools

	Brief description	Type	Part no.
 Illustration may differ	Scan finder, receiver to localize infrared scans	Scan-Finder LS-80L	6020756

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## SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With more than 8,800 employees and over 50 subsidiaries and equity investments as well as numerous agencies worldwide, SICK is always close to its customers. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents, and preventing damage to the environment.

SICK has extensive experience in various industries and understands their processes and requirements. With intelligent sensors, SICK delivers exactly what the customers need. In application centers in Europe, Asia, and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes SICK a reliable supplier and development partner.

Comprehensive services round out the offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

**That is “Sensor Intelligence.”**

### **Worldwide presence:**

Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hungary, Hong Kong, India, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Poland, Romania, Russia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, USA, Vietnam.

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