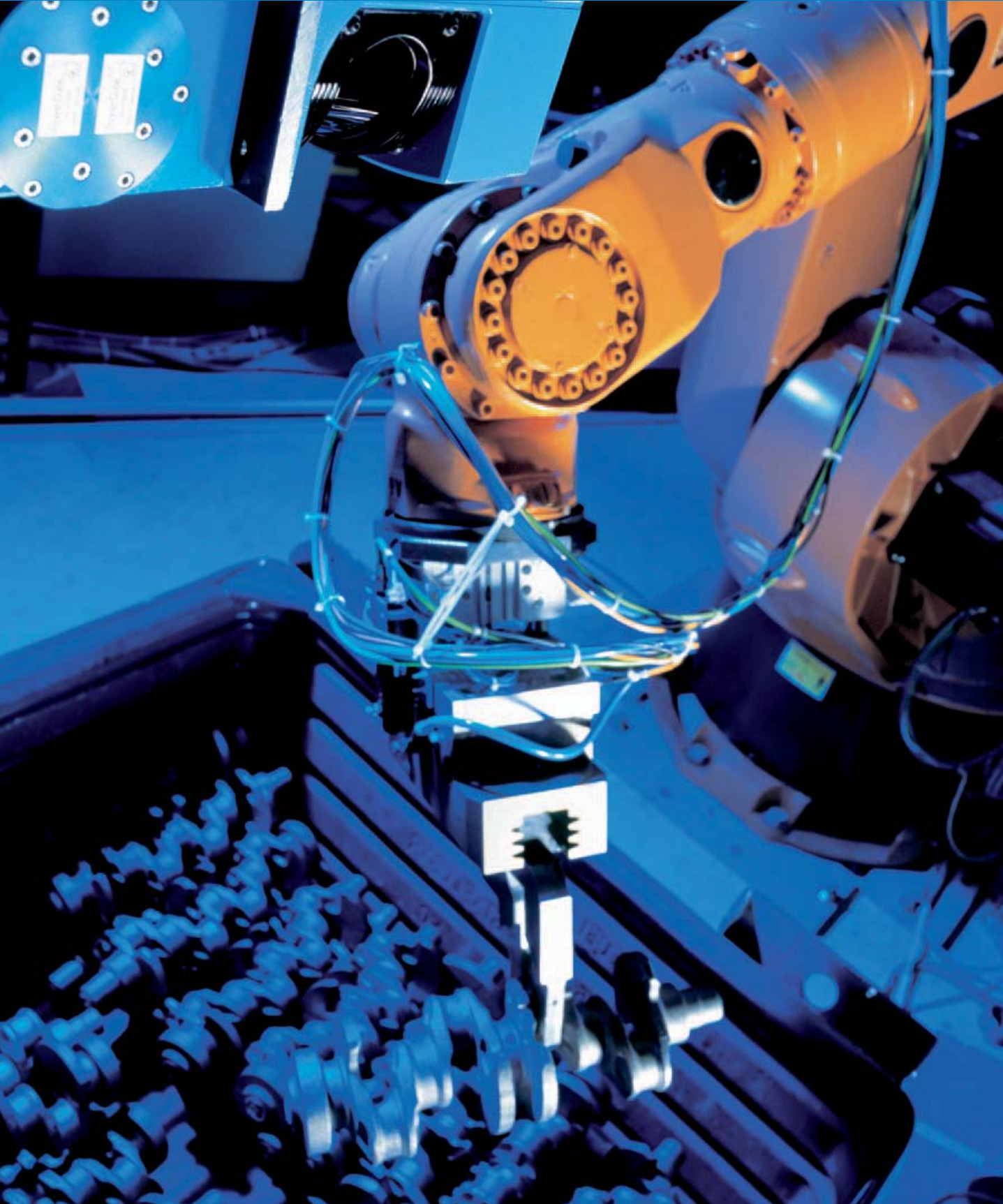


Laser Measurement Systems





Automatic identification not only includes the question: “Who am I?” but also: “What do I look like?” SICK’s laser measurement systems have the answer to this question. Determination of the shape and loading state of a pallet, or the height of a vehicle before entering the Gotthard Tunnel, controlling robots for the automatic loading of flight baggage, or monitoring the tracks ahead of autonomous goods wagons – laser measurement systems from SICK provide all the necessary information.

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Laser Measurement Systems



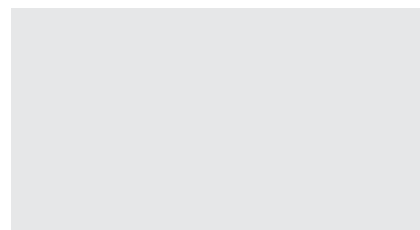
Laser Measurement Systems



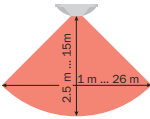
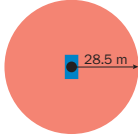
PRODUCT	LMS400	LMS200 ... 291	LD-OEM, -PDS, -LRS
Scanning range			
Application areas	<ul style="list-style-type: none"> Intralogistics, robotics Tote and pallet handling High-bay warehouse management 	<ul style="list-style-type: none"> Volume/contour measurement Intralogistics, robotics, traffic Overhang checking Collisions prevention/building security 	<ul style="list-style-type: none"> Intralogistics, robotics Overhang checking in storage and retrieval systems Navigation of AGVs
Technical data	Scanning frequency: 150 ... 500 Hz Aperture angle: 70° Angle resolution: 0.1 ... 1.5° Operating voltage: 24 V DC ± 15 % Data interfaces: RS-232/RS-422, Ethernet Switching inputs/outputs: 4 x IN/4 x OUT Dimensions (L, W, H): 179/130/106 mm Weight: 2.3 kg Enclosure rating: IP 65	75 Hz 90/100/180° (type-dependent) 0.25 ... 1° 24 V DC ± 15 % RS-232/RS-422 1 x IN/3 x OUT 155/210/156 mm (LMS200) 351/265/236 mm (LMS211) 351/265/228 mm (LMS221) 4.5 kg (LMS200/LMS291) 9 kg (LMS211/LMS221) IP 65 (LMS200/LMS291) IP 67 (LMS211/LMS221)	5 ... 15 (10) Hz 360° or 300° (LRS2100 only) 0.125 ... 1° 24 V DC ± 15 % RS-232/RS-422 CAN, Ethernet (OEM, LRS only) 4 (2) x OUT 120/222/115 mm (OEM, PDS) 120/227/118 mm (LRS1000) 350/392/288 mm (LRS2100) 2.4 kg (OEM, PDS) 4.1 kg (LRS)/9 kg (LRS2100) IP 65 (OEM, PDS, LRS1000) IP 67 (LRS2100)
Special features	<ul style="list-style-type: none"> Typical range at 10 % reflectivity: 3 m “Level Control” application integrated 	<ul style="list-style-type: none"> Typical range at 10 % reflectivity: LMS200: 10 m (Indoor) LMS211/221: 30 m/43 m (Outdoor) LMS211/221: operating temperature down to -30 °C “Field monitoring” application integrated External, programmed application possible 	<ul style="list-style-type: none"> Typical range at 10 % reflectivity: OEM/PDS: 34 m LRS: 80 m PDS: “Field monitoring” application integrated OEM: Programmed, customer-specific application can be loaded
Accessories	<ul style="list-style-type: none"> SOPAS Engineering Tool Software Mounting bracket, can be adjusted in 2 axes External parameter memory CDM490 connection module Reading trigger sensors Incremental encoder 	<ul style="list-style-type: none"> LMSIBS Configuration Software Mounting brackets Weather protection hoods Dust prevention shield Reading trigger sensors Purging air fans Scan finder External evaluation units 	<ul style="list-style-type: none"> SOPAS Engineering Tool Software (OEM, LRS) respectively LD-PDS Configuration Software Mounting bracket Scan finder

- Standard
- Optional

NOTE: For detailed information please see the Product Overview “Laser Measurement Systems” (no. 8009106)





PRODUCT	LD-PeCo	NAV200
Scanning range		
Application areas	<ul style="list-style-type: none"> • Counting people • Airports, shopping arcades • Museums • Public buildings 	<ul style="list-style-type: none"> • Navigation on reflector boards • Shuttle systems • Automotive industry • Handling and warehousing systems
Technical data	Scanning frequency: 10 Hz Aperture angle: 90° Angle resolution: 0.125° Operating voltage: 24 V DC ± 15 % Data interfaces: RS-422 Switching inputs/outputs: 4 x OUT Dimensions (L, W, H): 350/365/180 mm Weight: 5.9 kg Enclosure rating: IP 54	Scanning frequency: 8 Hz Aperture angle: 360° Angle resolution: 0.1° Operating voltage: 24 V DC ± 15 % Data interfaces: RS-232 Switching inputs/outputs: 1 x IN/3 x OUT Dimensions (L, W, H): 176/178/115 mm Weight: 3.3 kg Enclosure rating: IP 65
Special features	<ul style="list-style-type: none"> • Passage width up to 26 m • Mounting heights 2.5 ... 15 m 	<ul style="list-style-type: none"> • Up to 1,280 reflectors • Integrated navigation computer for position determination • High positioning accuracy
Accessories	<ul style="list-style-type: none"> • Bracket, adjustable in two axes 	<ul style="list-style-type: none"> • Interface cable • Connection plug

- Standard
- Optional



LMS400

Pole position for robotics and material handling



The world of handling and logistics faces new challenges. Increasing numbers of goods must be transported and further processed in ever-shorter times. With the LMS400, SICK offers all users a measurement solution that provides high cycle numbers, comprehensive process reliability and improved resolution at close working ranges.

The integrated "Level Control" application sets standards for flexibility and areas of use in logistical and conveyor systems. Whether in containers, cartons or pallets, the fill level is reliably detected and signalled via integrated switching outputs. The analogue output expands the area of use for the direct control of processes in packaging or handling.

Your benefits:

- A sensor for object measurements in a single mounting position – regardless of whether the pallet is full or empty
- Neither shading nor artificial lighting is necessary
- Can be mounted on robots or externally
- Fine object resolutions even at long ranges

Level Control

- Replaces several sensors, cuts wiring and programming effort
- Objects are detected anywhere within containers
- Small objects are detected regardless of location or colour

The LMS400 at a glance:

- Large dynamic measurement range of 0.7 m to 3 m
- High level of ambient light compatibility
- Robust design
- High angular resolution

Level Control

- Level Control application in sensor
- "Shade-free" detection of objects in boxes
- Gap-free scanning area

Technical data

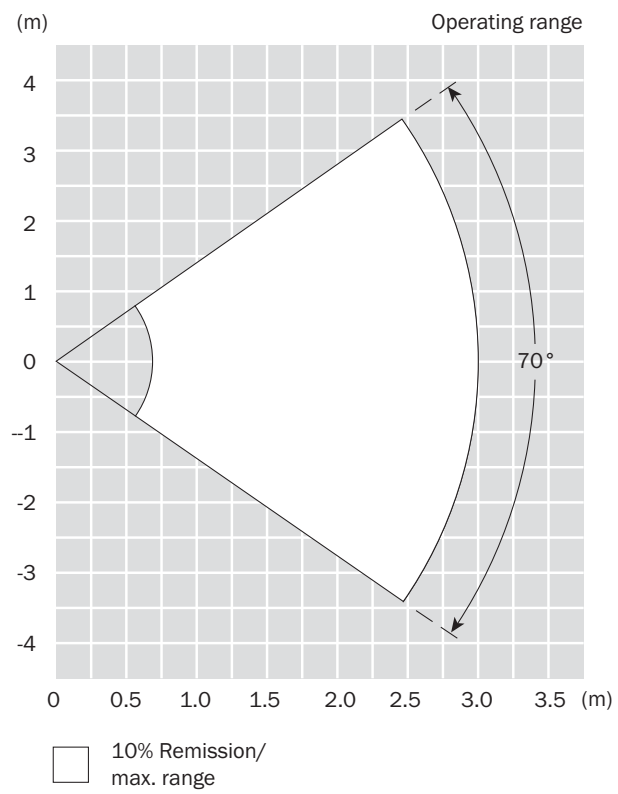
Type	LMS400-1000	LMS400-2000
Max. measurement distance	3 m	
Max. range with 10 % reflectivity	3 m	
Min. remission	6.5%	4.5%
Scanning angle	Max. 70°	
Angular resolution	0.1 ... 1° (adjustable)	
Scanning frequency/Response time	500 ... 180 Hz	500 ... 270 Hz
Resolution	1 mm	
Statistical error	Typ. 3 to 10 mm	
Systematic error	Typ. ± 4 mm	
Data interface	RS-232, RS-422, Ethernet	
Switching inputs	4 x IN	
Switching outputs	5 x OUT (4 x PNP/1 x 4 ... 20 mA)	
Special features	Level Control	
Supply voltage	24 V DC ± 15%	
Laser protection class	2 (eye-safe)	
Ambient operating temperature	0 ... +40 °C	
Enclosure rating	IP 65	
Dimensions in mm (W x H x D)	179 x 107 x 130	

Additional Level Control table

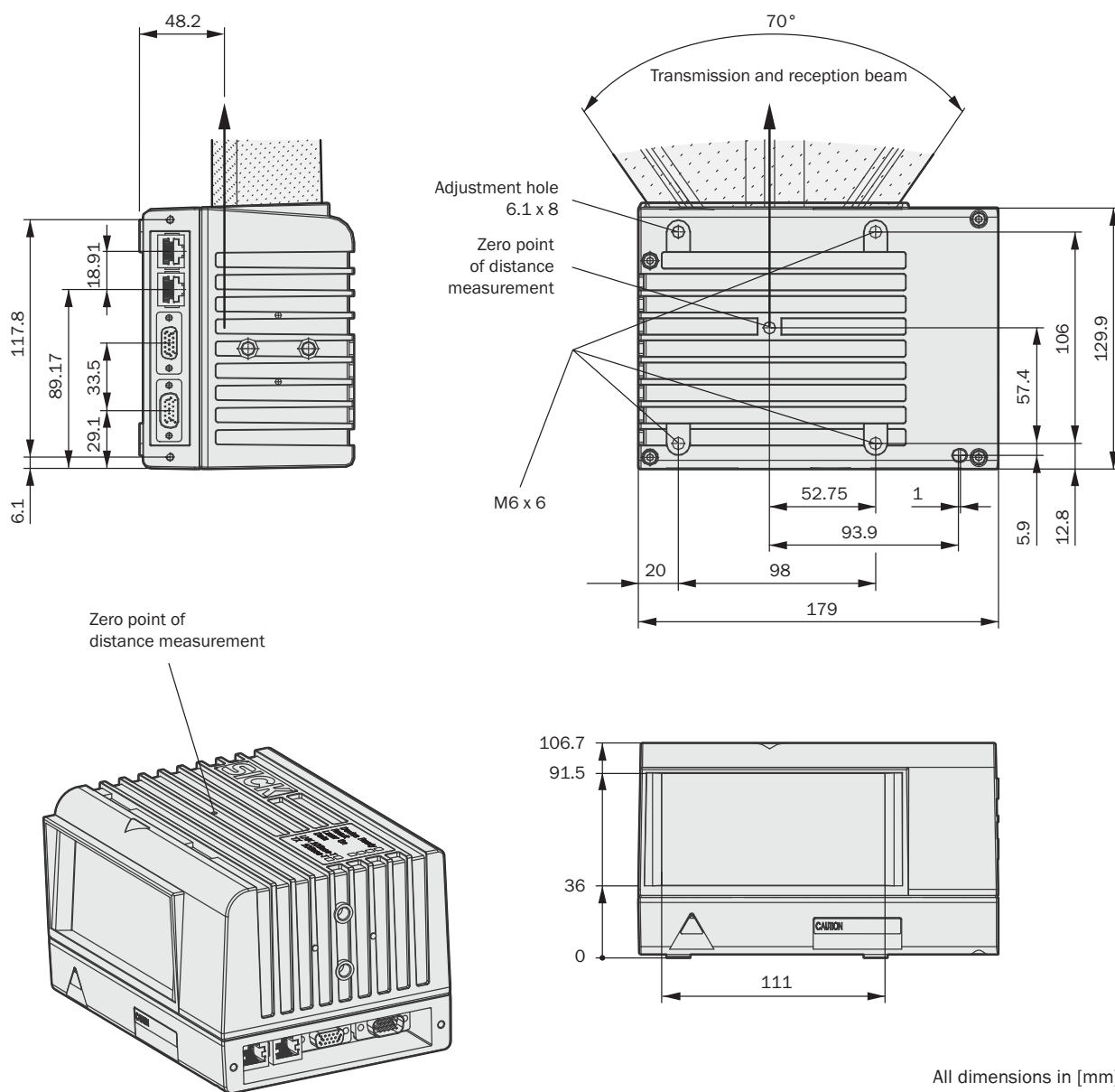
Selectable region of interest	From 50 mm x 3,000 mm to 1,000 mm x 1,750 mm
Number of columns	Up to 50 equidistant or 30 freely positioned
Minimum column width	50 mm
Smallest detectable object	30 mm x 30 mm
Smallest height threshold above container floor	20 mm
Output of switching threshold	Telegram, switching outputs or analogue output
Output of height values in the columns	Telegram, analogue output

Reading field diagram

LMS400



Dimensional drawings



Order information

Type	Description	Order no.
LMS400-1000	LMS for indoor use	1027897
LMS400-2000	LMS for indoor use	1041725

Accessories

Accessories can be found on Page 239

LMS200

Measurably more economical



The LMS200 is a non-contact laser measurement system that scans its surroundings two-dimensionally. As a result of its small light spot and high sensitivity over the first 10 m it is suitable for measuring contours, positioning tasks and checking for projections. Internal fields or distance data can be

evaluated. It operates within a temperature range of 0 °C to +50 °C and requires no auxiliary passive components such as reflectors or position marks. The LMS200's high resolution allows it to take on tasks that have been hitherto impossible or could only be achieved with difficulty or at great cost.

Your benefits:

- Short scanning time, thus high target object speed possible
- Target objects require no special reflectivity properties
- Target objects require no reflectors or marking
- Target object in any position
- Measurement data are available in real time and can be used for further calculation or control tasks
- Active system, no illumination of target object necessary
- Simple installation and commissioning
- Any mounting position

The LMS200 at a glance:

- Non-contact optical measurement even over long distances
- Background or substrate has no effect on measurement
- Integrated field monitoring
- Suitable for object measurement, position determination, and area monitoring
- Output of angle and distance data in real time
- LMS200/ enclosure rating IP 65 (LMS221-30106, LMS211-30106/ IP 67 with heating)
- Reference plants:
Navigation of service robots, automation of airport robots, package robots, checking for projections in the automotive industry, pick-to-light applications

Technical data

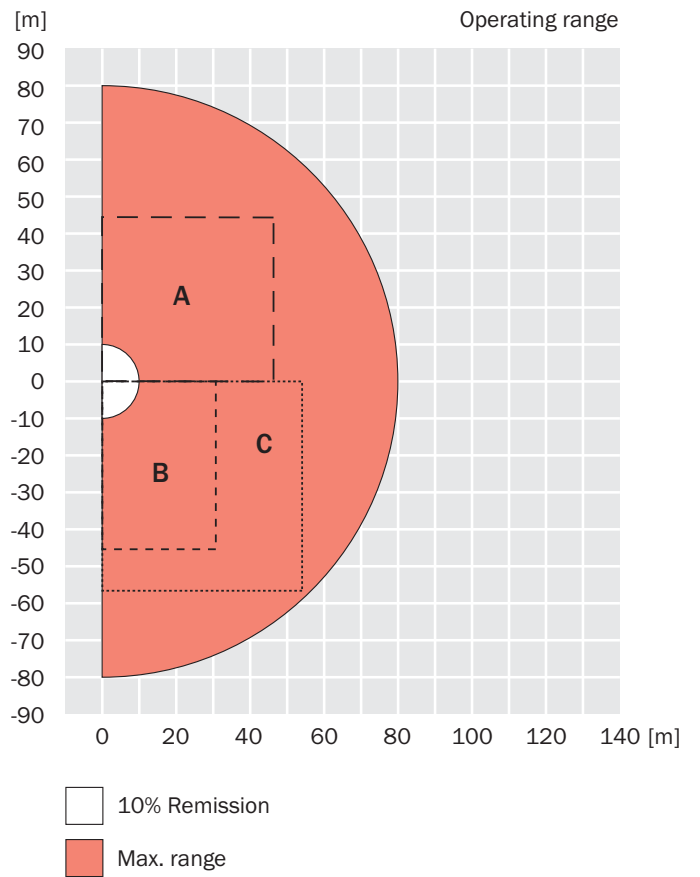
Type	LMS200-30106	LMS211-30106	LMS221-30106
Max. range	80 m		
Max. range with 10 % reflectivity	10 m		
Scanning angle	180° ¹⁾	100°	180° ¹⁾
Angular resolution	0.25°/0.5°/1° (adjustable)		
Scanning frequency	75 Hz		
Response time	53/26/13 ms		
Resolution	10 mm		
Statistical error	Typ. 5 mm		
Systematic error	Typ. ± 15 mm		
Data interface	RS-232/RS-422 ²⁾		
Switching inputs/outputs	1 x IN/3 x OUT (PNP)		
Special features	Area monitoring (3 fields)	Area monitoring, heating	
Supply voltage	24 V DC ± 15%		
Laser protection class	1 (eye-safe)		
Ambient operating temperature	0 ... +50 °C	-30 ... +50 °C	
Enclosure rating	IP 65	IP 67	
Dimensions in mm (W x H x D)	155 x 210 x 156	351 x 265 x 236	351 x 265 x 229

¹⁾ Max. 100° at angular resolution of 0.25°

²⁾ Switchable

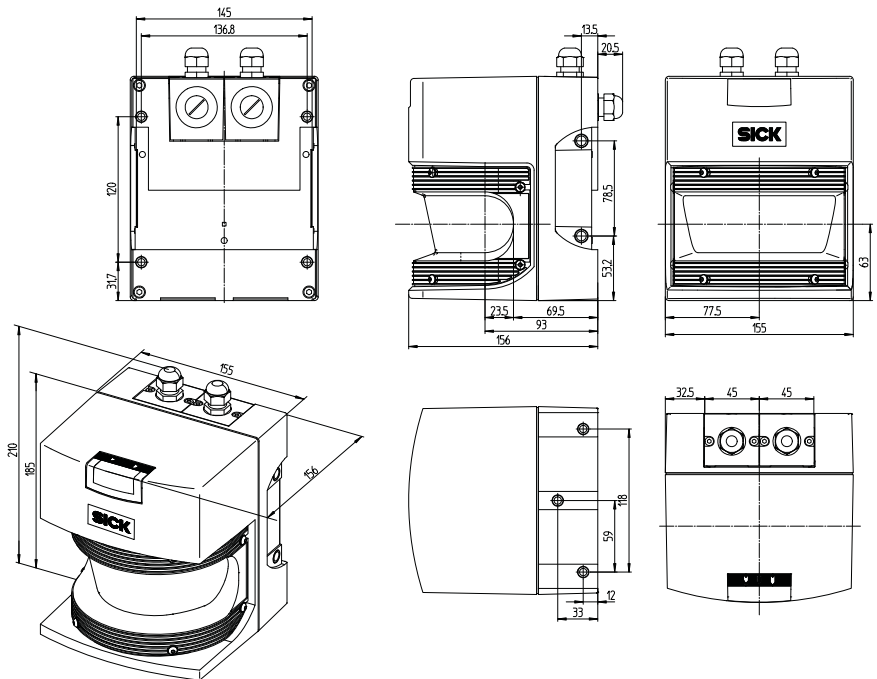
Laser measurement systems

LMS200



Dimensional drawings

LMS200



All dimensions in mm

Order information

Type	Description	Order no.
LMS200-30106	LMS for indoor use, standard device	1015850
LMS209S02	LMS for indoor use, Technical data like LMS200-30106, housing unpainted, special variant	1016414

Accessories

Accessories can be found on Page 240

LMS2xx

LMS Laser Measurement Systems open up new areas of application



SICK's LMS Outdoor Laser Measurement Systems are designed for dark objects at long ranges and are found, for example, in port automation or transportation systems worldwide. In outdoor use for building security the systems are characterised by minimum false alarm rates under the poorest of environmen-

tal conditions. They have robust housings with an enclosure rating of IP 67. Integrated heating in the LMS211 and LMS221 systems permit use in ambient temperatures of $-30\text{ }^{\circ}\text{C}$ to $+50\text{ }^{\circ}\text{C}$. All systems can fulfil area monitoring tasks parallel to measurement tasks.

Your benefits:

- Short scanning time, thus high target object speed
- Target objects require no particular reflectivity properties
- Target objects require no reflectors or marking
- Any position of target object possible
- Measurement data available in real time and can be used for further calculation and control tasks
- Active system, no illumination of measurement location necessary
- Simple installation and commissioning
- Any mounting position

The LMS2xx at a glance:

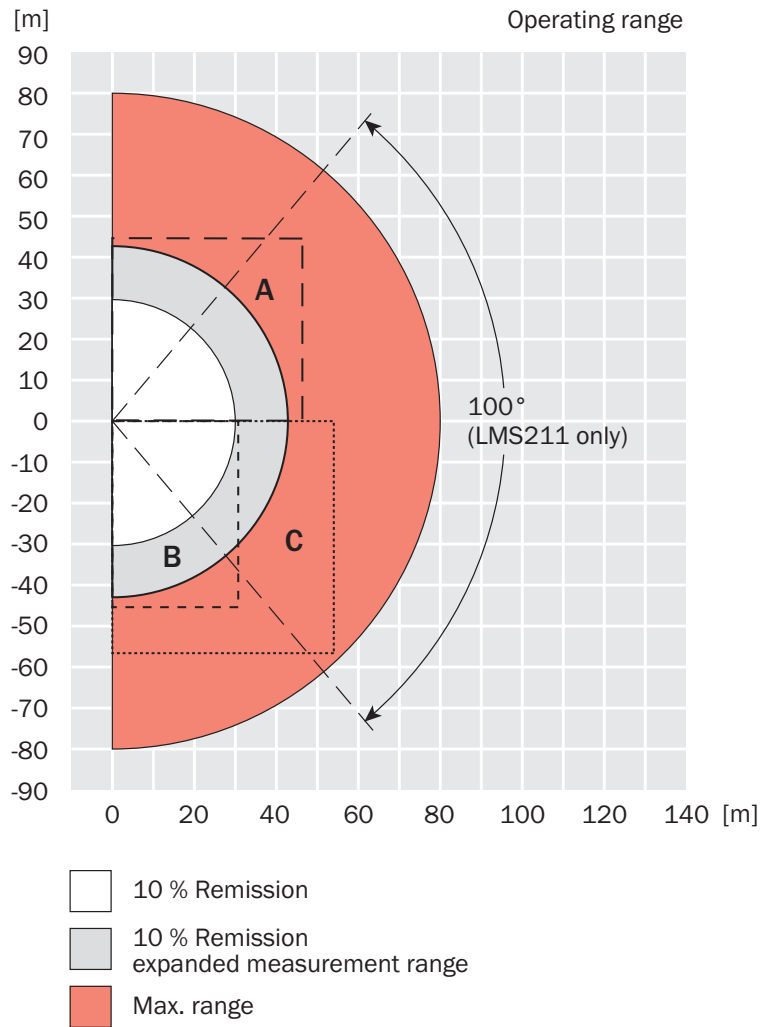
- Non-contact optical measurement even over long distance
- Background or substrate have no effect on measurement
- Integrated field monitoring
- Suitable for: object measurement, position measurement, navigation, and area monitoring
- Real-time data output: angle and distance (polar co-ordinate system)
- Full outdoor variants (IP 67) with heating (LMS291/ IP 65 without heating)
- Reference plants: security at prisons and nuclear power stations, automation of container ports, electronic toll systems, navigation of outdoor robots

Technical data

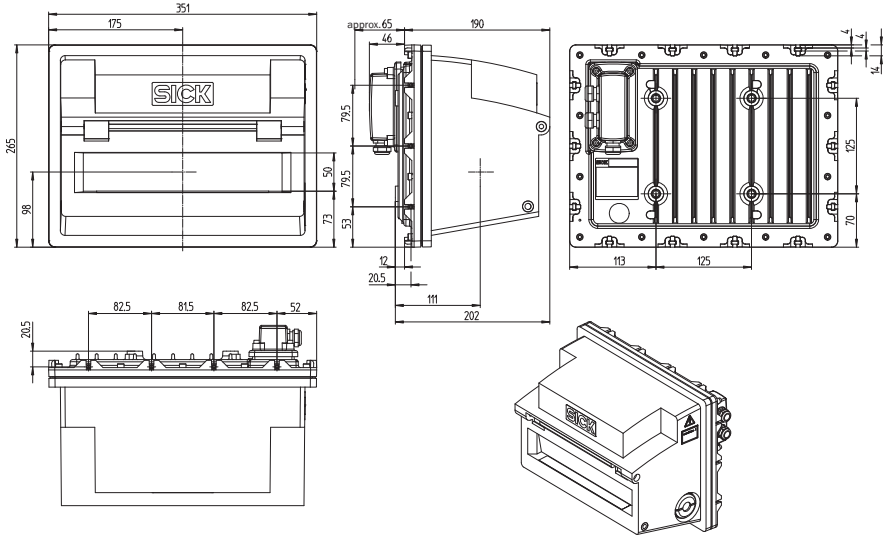
Type	LMS211-30206 LMS221-30206	LMS211-S14 LMS291-S14	LMS291-S05
Scanning range max.	80 m		
Max. range with 10 % reflectivity	30 m		
Scanning angle	LMS211: 100° LMS221: 180°	90°	180°
Angular resolution	0,25°/0,5°/1° (adjustable)	0,5°	0,25°/0,5°/1° (adjustable)
Scanning frequency	75 Hz		
Response time	53/26/13 ms	13 ms	53/26/13 ms
Resolution	10 mm		
Statistical error	Typ. 10 mm		
Systematic error	Typ. ± 35 mm		
Data interface	RS-232/RS-422		
Switching inputs/outputs	1 x IN/3 x OUT (PNP)		1 x IN/3 x OUT (PNP)
Special features	Area monitoring (3 fields) heating	LMS211: heating	Area monitoring (3 fields)
Supply voltage	24 V DC ± 15 % (electronic)		24 V DC ± 15 %
Laser protection class	1 (eye-safe)		
Ambient operating temperature	-30 ... +50 °C	-30 ... +50 °C 0 ... +50 °C (LMS291)	0 ... +50 °C
Enclosure rating	IP 67	IP 67 IP 65 (LMS291)	IP 65
Dimensions in mm (W x H x D)	LMS211: 351 x 265 x 236 LMS221: 351 x 265 x 229	LMS211: 351 x 265 x 236 LMS291: 155 x 210 x 156	155 x 210 x 156

Reading field diagram

LMS211/LMS221/LMS291

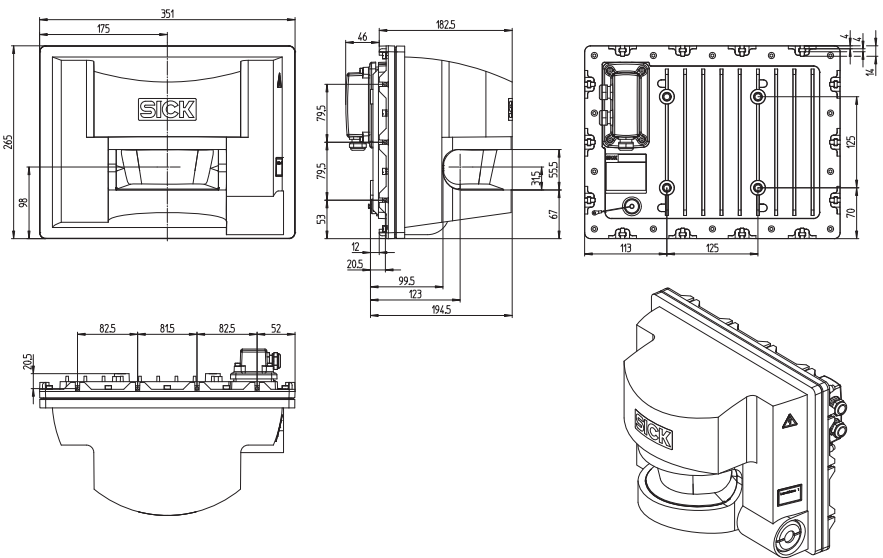


Dimensional drawings



LMS211

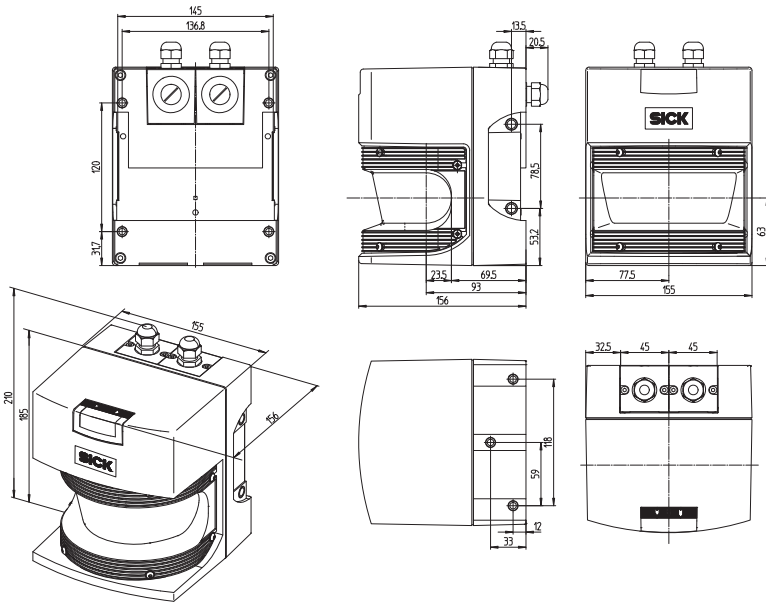
All dimensions in mm



LMS221

Dimensional drawings

LMS291-S05



Order information

Type	Description	Order no.
LMS211-30206	LMS for outdoor use with front screen heating, internal heating and fog correction	1018023
LMS211S07	LMS2x1 with 2 relay outputs	1018966
LMS211S14	LMS Fast, 90° aperture angle; angular resolution 0.5 (fixed); response time 13 ms	1025487
LMS211S19	Special device for outdoor security applications with front screen heating, internal heating and fog correction	1040061
LMS211S20	Special device for outdoor security applications with front screen heating, internal heating and fog correction, with 2 relay outputs	1040435
LMS221-30206	LMS for outdoor use, with internal heating, and fog correction	1018022
LMS221S07	LMS2x1 with 2 relay outputs	1018965
LMS221S19	Special device for outdoor security applications with front screen heating, internal heating and fog correction	1040060
LMS221S20	Special device for outdoor security applications with front screen heating, internal heating and fog correction, with 2 relay outputs	1040434
LMS221-30106	LMS for outdoor use, short range regarding reflectivity, with internal heating, without fog correction, electrical data same as LMS200	1026000
LMS211-30106	LMS for outdoor use, short range regarding reflectivity, with internal heating, without fog correction, electrical data same as LMS200	1025629
LMS291S05	LMS for semi-outdoor use, with fog correction and long range, electrical data same as LMS2X1	1018028
LMS291S14	LMS Fast, 90° aperture angle; angular resolution 0.5 (fixed); response time 13 ms	1025329
LMS291S15	LMS2x1, for connection to LMI400, compatible with laser scanner generations Types 1-5	1026226

Accessories

Accessories can be found on Page 240

LD-OEM/LD-PDS

Precise all-round measurement



The LD-OEM Laser Measurement System is at the heart of the LD family. It is based on a dual-processor hardware structure. The first DSP (digital signal processor) controls laser measurement and I/O data flow, while a second one is dedicated for running application programs, e.g. profile detection for robots or positioning algorithms for free-moving vehicles. Both processors are connected via a high-speed bus, allowing

efficient real-time data acquisition and processing.

By installing a laser scanner you protect both horizontal and vertical areas from intruders. With user-friendly configuration software you define the shape and size of the area to be monitored and can thus take all fixed structures and objects into account.

Your benefits:

- Customer-specific solutions can be implemented
- Free navigation tasks with a single scanner
- Small objects possible at long distances
- Insensitive to contamination

The LD-OEM/LD-PDS at a glance:

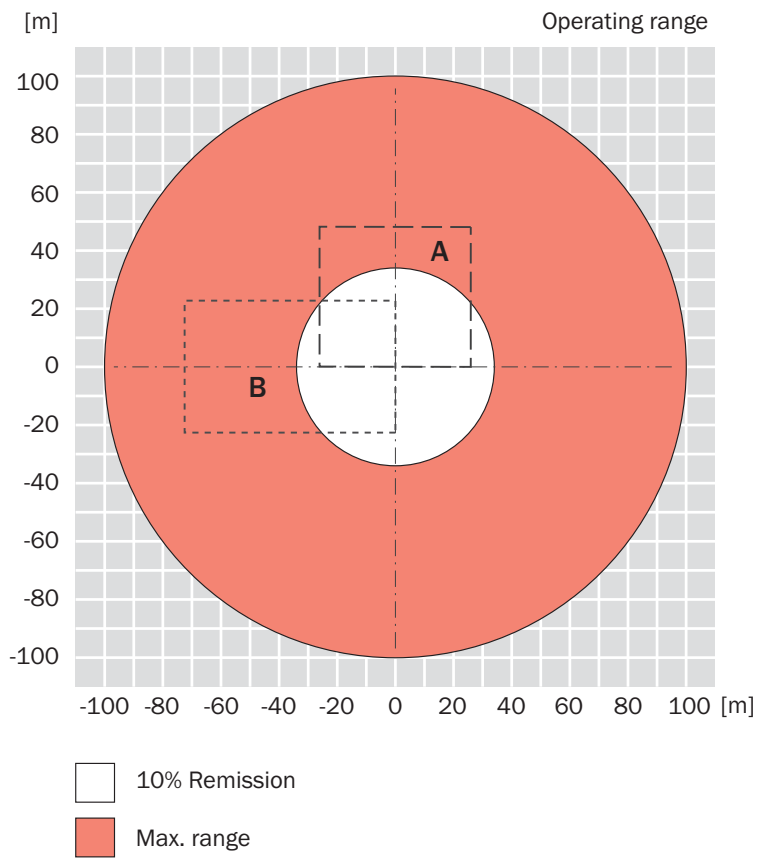
- Freely programmable DSP
- 360° field of view
- Fine angular resolution
- Rotating head

Technical data

Type	LD-OEM1000	LD-PDS0002
Scanning range max.	100 m	
Max. range with 10 % reflectivity	34 m	
Scanning angle	Max. 360°	
Angular resolution	0.125°/0,5°/1°/1.5° (adjustable)	
Scanning frequency	5 ... 15 Hz ± 5 %	
Response time	200 ... 66 ms	
Resolution	3.9 mm	
Statistical error	Typ. 25 mm	
Systematic error	Typ. ± 38 mm	
Data interface	RS-232, RS-422, CAN, Ethernet	
Switching inputs/outputs	4 x OUT (PNP)	2 x OUT (PNP)
Special features		Area monitoring (2 fields)
Supply voltage	24 V DC ± 15 %	
Laser protection class	1 (eye-safe)	
Ambient operating temperature	0 ... +45 °C	
Enclosure rating	IP 65	
Dimensions in mm (W x H x D)	120 x 222 x 115	

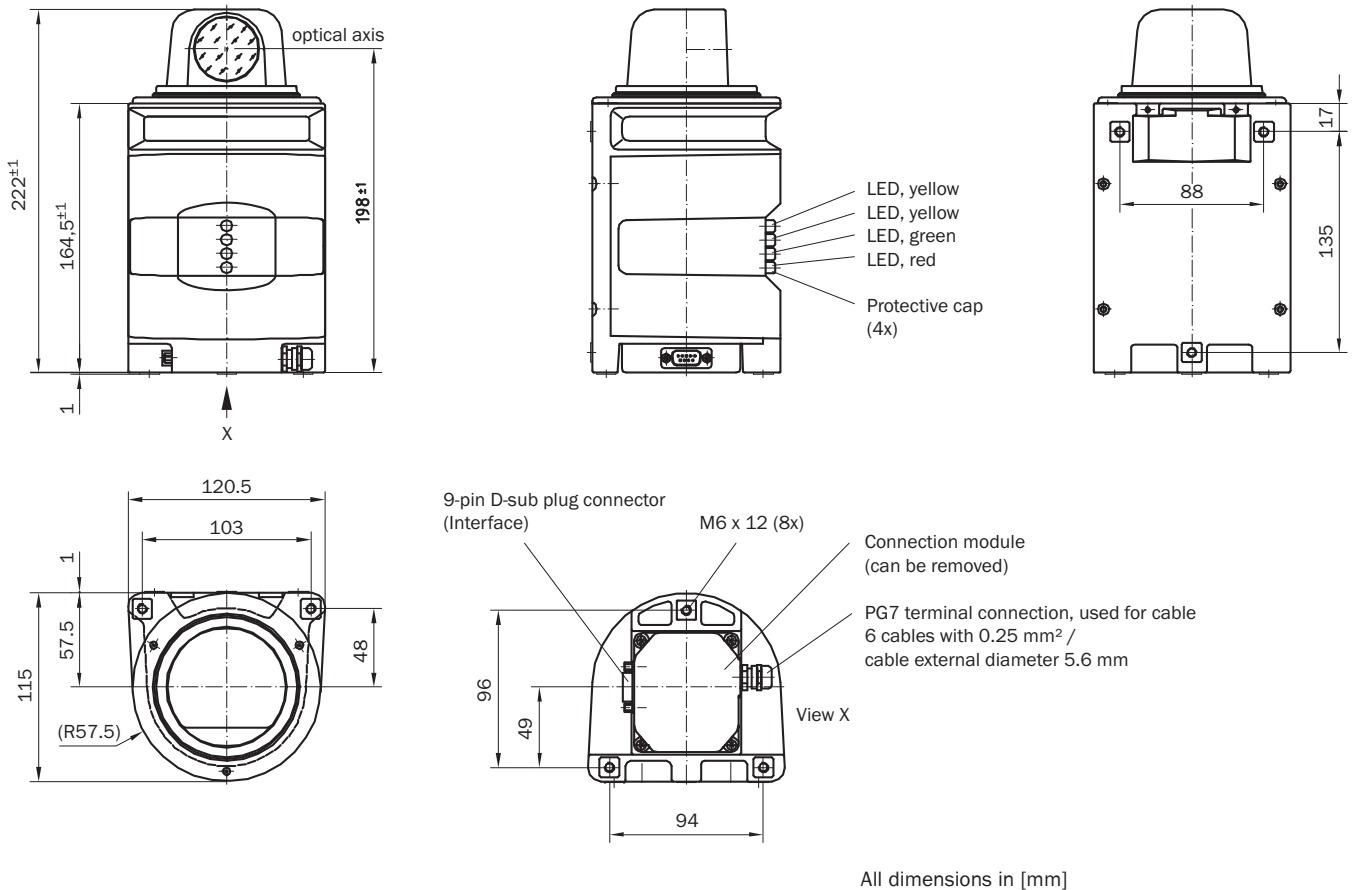
Reading field diagram

LD-OEM



Dimensional drawings

LD-OEM



Order information

Type	Description	Order no.
LD-OEM1000	LD-OEM (RS-232/RS-422/Ethernet/CAN/DSP)	1028698
LD-PDS0002	LD Protection & Detection Scanner with RS-232, RS-422-interface, switchable	1029039

Accessories

Accessories can be found on Page 241

LD-LRS

Long-range measurements with accuracy and speed



Automation of ship-loading processes with the LD-LRS

The LD-LRS laser measurement system, which has a scanning range of up to 250 m, uses state-of-the-art technology to automate ship loading with ship-to-shore cranes.

The powerful laser optics perform a non-contact scan of container stacks and accurately detects any obstacles that may interfere with loading.

Stockpile measuring

The profile measurement data for the bulk-goods fill level can be converted into a 3D model. This results in the

accurate visualisation of the bulk-goods surface profile thereby optimising the discharge.

Container classification

The LD-LRS laser measurement system automates the procedure for loading and stacking containers by cranes, not only in ship-to-shore operation, but also in the container yard. The LD-LRS determines the profile of the container or container stacks, thereby ensuring maximum handling reliability during loading. The automation of the loading process offers great time saving benefits of the port.

Your benefits:

- Flexible mounting position on excavators and cranes
- For harsh operating conditions
- No restrictions regarding the area to be monitored
- Small objects can be detected at long ranges
- Reliable detection of objects even at long distances

The LD-LRS at a glance:

- Long range on dark objects
- IP 67 housing
- 360° field of view
- Fine angular resolution
- High ambient light compatibility
- Small spot diameter
- Up to 4 fields can be programmed

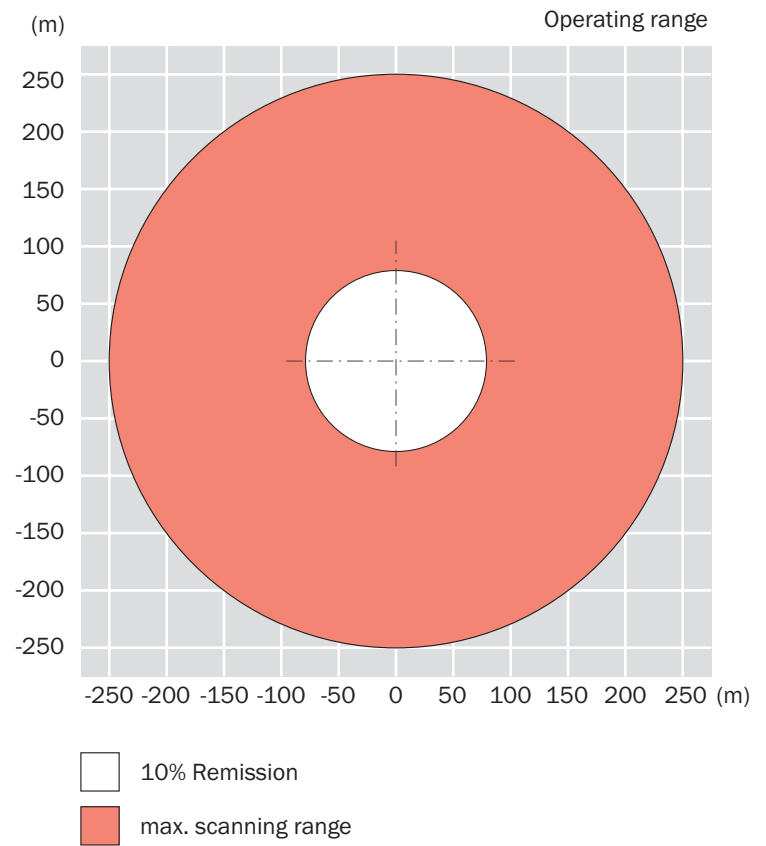
Technical data

Type	LD-LRS1000	LD-LRS2100 LDS-LRS3100
Max. distance	250 m	
Range at 10 % permission	80 m	
Scanning angle	Max. 360°	
Angular resolution	0.125°/0.5°/1°/1,5° adjustable	
Scanning frequency	5 to 10 Hz ± 5 %	
Response time	200 to 100 ms	
Resolution	3.9 mm	
Statistical error	Typ. 30 mm	
System error	Typ. ± 38 mm	
Data interfaces	RS-232/RS-422*), CAN, Ethernet	Ethernet, CAN, RS-232 or RS-422
Switching inputs/outputs	4 x OUT (PNP)	
Operating voltage	24 V DC ± 15%	
Laser class	1 (eye-safe)	
Operating temperature	0 ... +45 °C	-25 ... +45 °C
Enclosure rating	IP 65	IP 67
Dimensions in mm (B x H x T)	120 x 277 x 119	350 x 392 x 288

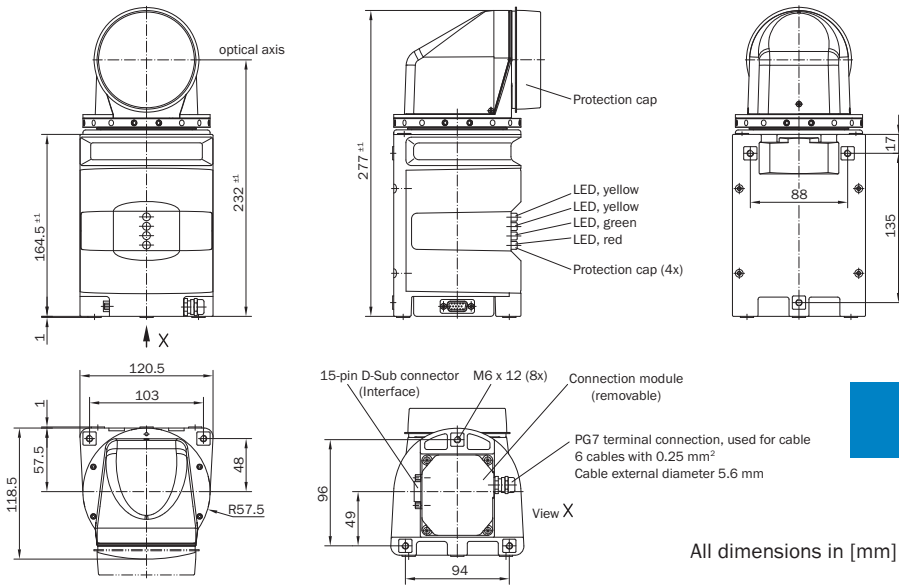


Reading field diagram

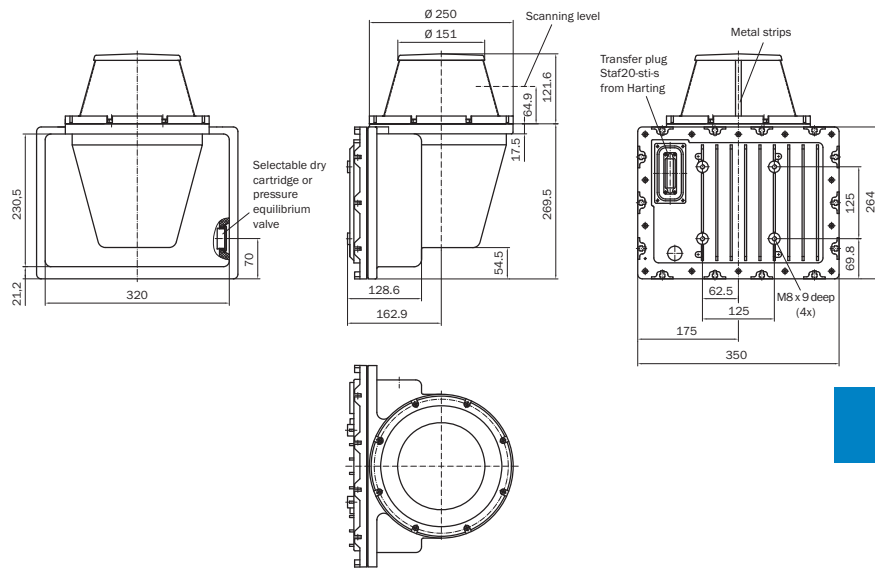
LD-LRS



Dimensional drawing



LD-LRS1000



LD-LRS2100
LD-LRS3100

Order Information

Type	Description	Order no.
LD-LRS1000	LD-LRS (IP 65), with RS-232, RS-422, switchable, Ethernet, CAN	1028941
LD-LRS2100	LD-LRS (IP 67) with RS-232 interface, Ethernet, CAN	1029041
LD-LRS3100	LD-LRS (IP 67) with RS-422 interface, Ethernet, CAN	1029042

Accessories

Accessories can be found on Page 242

LD-PeCo

Innovative counting of people



The LD-PeCo is based on proven light time-of-flight technology from SICK. An invisible double laser curtain detects persons walking through it. The direction of passage is determined, allowing unambiguous numbers to be provided. The LD-PeCo is easy to install, offers accurate counting and is maintenance-free. Unlike conventional counting technology, counting of persons with the

PeCo is possible at almost any mounting height. Fixed structures within the counting area can be blanked out. In contrast to camera technology, the number results are not impaired by external factors, large numbers of people, or shaded areas in the field of view.

Your benefits:

- No restrictions regarding mounting position
- Few sensors required
- High counting quality and reliability
- Low installation and operating costs

The LD-PeCo at a glance:

- High mounting heights
- Large passage widths possible
- Simultaneous counting of incoming and outgoing persons
- Simple installation and mounting

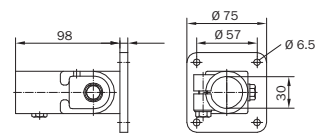
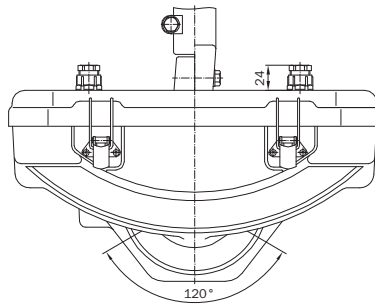
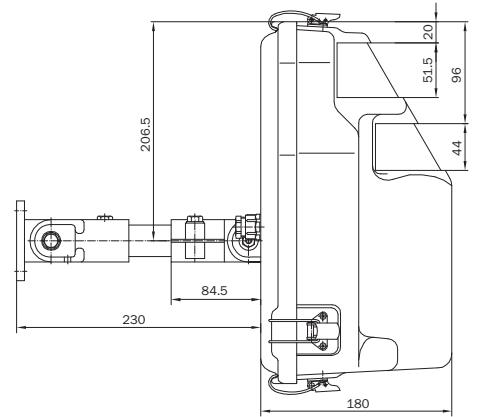
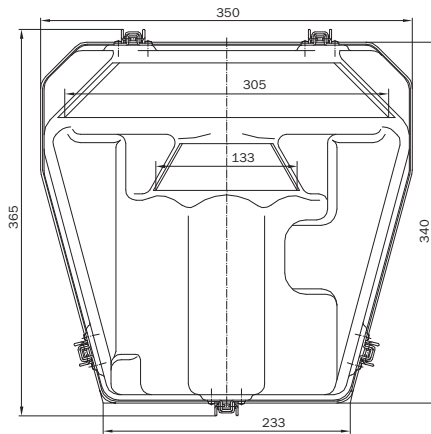
Technical data

Type	LD-PeCo
Passage width	1 m ... 26 m
Installation height	2.5 m ... 15 m
Max. throughput speed	2.4 m/s
Scanning area	90°
Scanning frequency	10 Hz + 5 %
Interface	RS-422 (9-pin D-Sub plug)
Housing colours	Silver (RAL 9006)
Dimensions in mm	350 x 365 x 180 (W x H x D)
Laser protection class	1 (eye-safe)
Weight	5.9 kg
Ambient operating temperature	0 ... +40 °C



Dimensional drawings

LD-PeCo



All dimensions in mm

Order information

Type	Description	Order no.
LD-PeCo5,5	LD-PeCo5,5, recommended mounting height 2.5 m ... 5.5 m	1023382
LD-PeCo15	LD-PeCo15, recommended mounting height 5.5 m ... 15 m	1023383

Accessories

Accessories can be found on Page 242

NAV200

On the route to improved cost-effectiveness: with NAV



The demands made on modern goods transport and the optimum navigation of automated guided vehicles (AGVs) are rising. Commonly used conventional positioning systems, such as guide wire systems or magnetic track guidance, mainly operate within an unchanging layout of routes. The requirement for flexible systems is, however, clearly on the rise. Thus in semi-automatic operation, for example, AGVs are temporarily taken off set routes to carry out loading or

unloading processes manually. Subsequently, AGVs are returned to automatic operation. Modern positioning systems such as the NAV200 offer considerable advantages here. The system provides maximum flexibility as a result of its unrestricted determination of position, via reflectors outside the work area. Even vehicles taken off track temporarily can find their own way back to their fixed route independently.

Your benefits:

- Integrated measurement data evaluation reduces the computing effort in vehicle computers
- The positioning system allows maximum freedom in the design of the vehicle concept
- Economical even for small and medium-sized vehicles
- Simple alteration and teach-in of routes possible

The NAV200 at a glance:

- Precise position information (X, Y, alpha)
- Simple integration via standard interface
- Accurate measuring-in of reflector positions possible
- Output data for remote diagnosis
- Navigation with only 3 reflectors
- Immune to spurious reflections

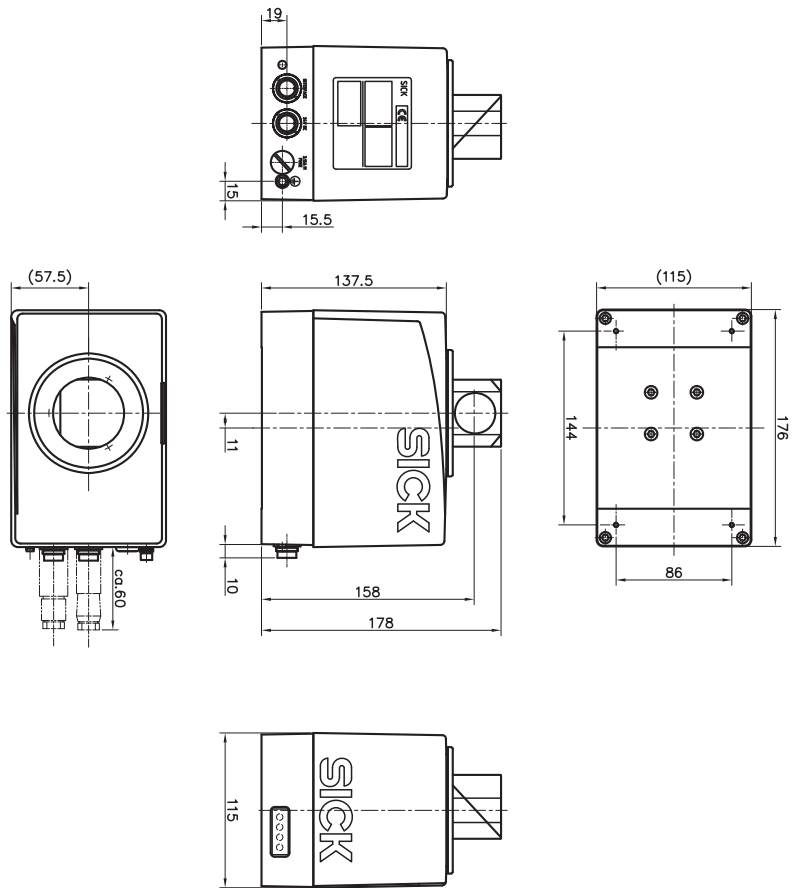
Technical data

Type	NAV200
Reflector memory	Up to 1,280 reflectors in 40 levels
Average reflector distance	1.2 m ... 28.5 m
Typ. positioning accuracy	Up to ± 4 mm
Typ. angular accuracy	0.1°
Measurement area	360°
Range to reflector marks ($B \geq 10$ cm)	28.5 m
Rotational frequency	8 Hz \pm 10% Positional data is calculated back to the time of transfer
Software Interface	Command Interface with XOR block check



Dimensional drawings

NAV200



All dimensions in mm



Order information

Type	Description	Order no.
NAV200-1132	NAV200 complete system for indoor use	1023666

Accessories

Accessories can be found on Page 242

