MRS1000

OUTDOORS IS OUR FOURTH DIMENSION

3D LiDAR sensors

SICK
Sensor Intelligence.

MORE LAYERS, LARGER FIELD OF VIEW, MORE BENEFITS – EVEN UNDER ADVERSE AMBIENT CONDITIONS

The MRS1000 simply offers more. With its integrated field evaluation, the 3D LiDAR sensor, also called 3D laser scanner, can detect on four layers at one time. It can therefore be used for a variety of applications and reduces your storage costs and expenditures for different variants – and all this without restrictions on measurement accuracy. Equipped with modern HDDM$^+$ technology, it evaluates three echo signals and always ensures stable and detailed measurement results with up to 165,000 measurement points per second, even under adverse ambient conditions. The reliability of this device, packaged in a housing with enclosure rating IP67, expands its performance range with the "outdoor" dimension, thereby increasing its flexibility in use.
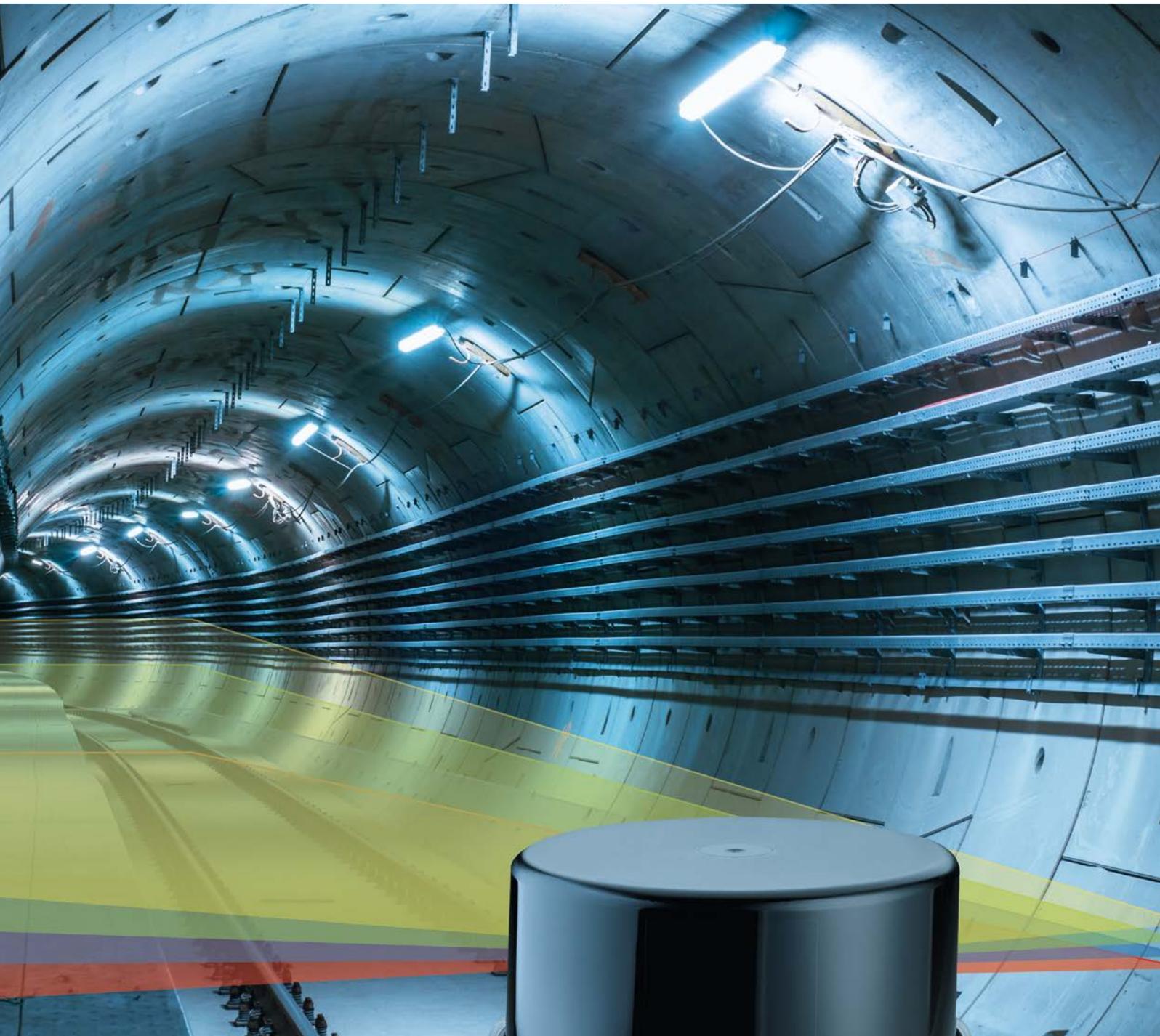
POWERFUL TECHNOLOGY IN A COST-EFFICIENT DEVICE

Excellent outdoor performance

Large aperture angle of 275°

Powerful multi-layer scanner for detection in 3D space

Measured data output of up to 165,000 measurement points

Large range of applications and reduced storage costs

Simple commissioning and operation

High flexibility thanks to rotatable connections and advanced field evaluation

HDDM+
high definition distance measurement plus

HDDM+ technology for greater durability during measurement

The MRS1000 uses the HDDM+ technology. It enables measurement at long distances and is characterized by low noise in the measured value data as well as multi-echo capability.

The principle of operation of the HDDM+ is clever: infrared laser pulses are generated in the device in a swift chronological sequence. The large quantity of measurement data per angle degree generated this way ensures gap-free scanning, thereby enabling high edge precision, for example. Ambient conditions which could impair the measurement are filtered out. The MRS1000 is therefore very reliable when ambient light and other types of interference exist in the measuring range, for example rain, snow or fog, and provides high measurement certainty even when used outdoors.

More layers for more performance

The MRS1000 stands out due to its high performance. It allows for scanning over four spread-out layers at a horizontal aperture angle of 275°, and can even measure at different angles nearly simultaneously. The layers are arranged horizontally, one on top of the other, and fan out from the sensor. At a distance of 20 m, for example, they cover an impressive height of 2.70 m. The fields can be easily configured on one plane and projected on the other planes. The MRS1000 therefore has a much more detailed level of visibility than a 2D LiDAR sensor.

The MRS1000 can not only detect in two dimensions, but can also measure in three dimensions using the additional layers. The SOPAS ET configuration software or a web server is used to display the data. More data on several planes in a three-dimensional space results in high coverage and greater reliability. With its angular resolution of 0.25° and at a 50 Hz sampling rate in four layers, the MRS1000 detects up to 55,000 measurement points. With three echo values, a total of up to 165,000 measurement points are available per second.
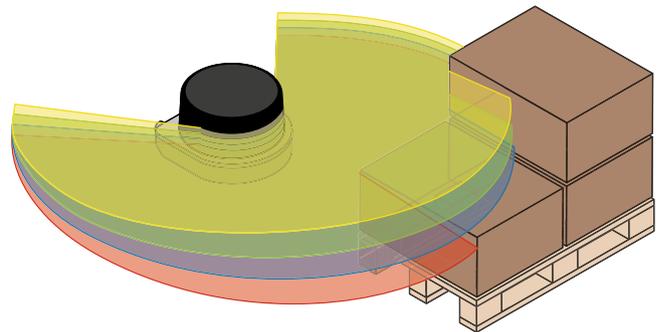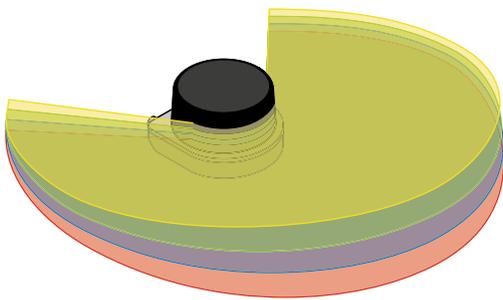
Multi-echo evaluation for higher reliability

The distance between the LiDAR sensor and an object is calculated via the time-of-flight of the emitted pulse. The MRS1000 can evaluate up to three echo signals for each measuring beam, delivering reliable measurement results at all times, no matter whether from behind glass or outside under unfavorable ambient conditions. Even for applications with poor visibility, such as in tunnels or in mines, the MRS1000 always has the best perspective.
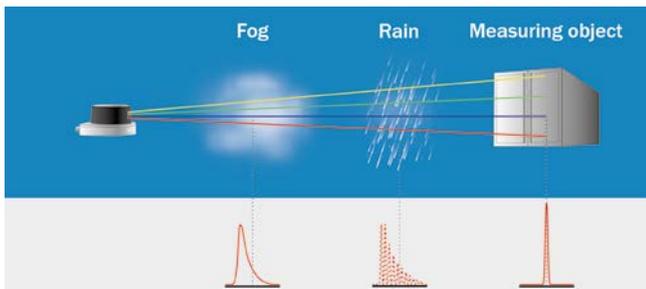
Industry applications: Ports, cranes and traffic.
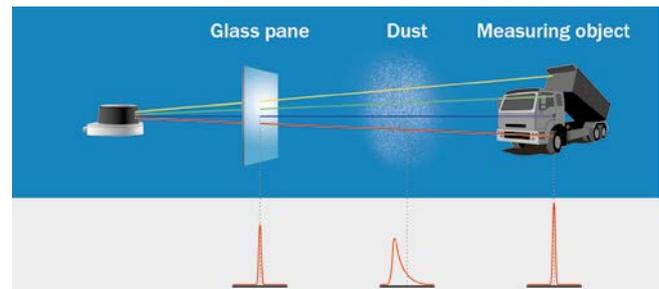
Industry applications: Mining.
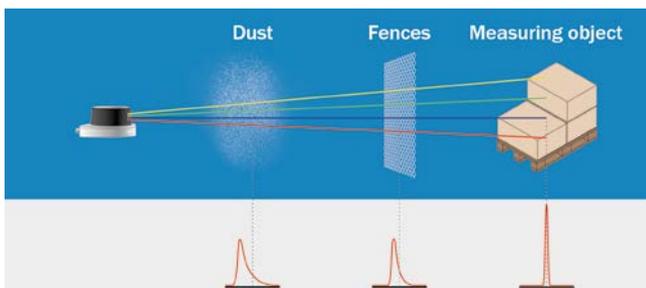
Industry applications: Industrial vehicles.
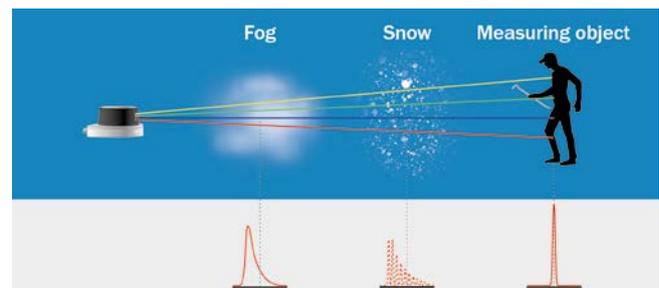
Industry applications: Building management.

ADDITIONAL PERFORMANCE INCREASE THANKS TO FILTERS

The MRS1000 is the ideal solution for indoor and outdoor applications, even for applications under adverse ambient conditions. This outstanding performance can be improved even more with additional digital filters for preparation and optimization of measured distance values. The user therefore has the option of adjusting the LiDAR sensor to the specific requirements of the respective application. This makes it possible to prevent virtually all faults.

SICK offers various filters to perfectly and efficiently adjust the MRS1000 to the present task.

Fog filter

Thanks to the fog filter, the LiDAR sensor eliminates unwanted echoes at close range.

This considerably lowers the probability of false activations at close range in fog.
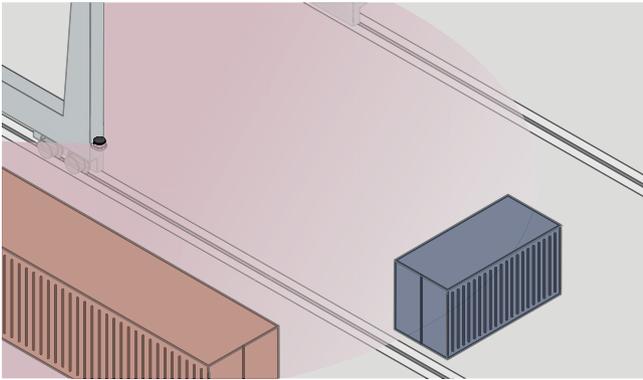
Without a filter: Due to reflections, the object can only be detected through fog with difficulty.
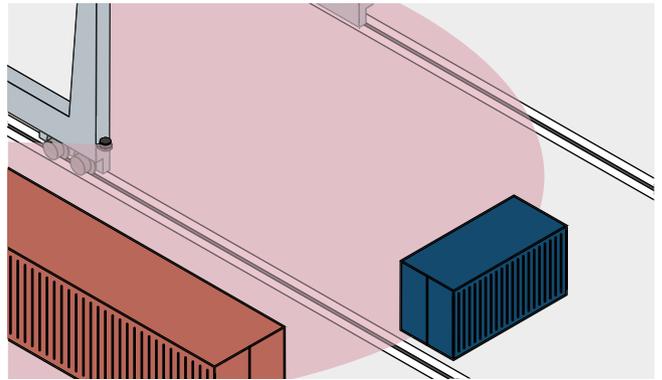
With a filter: Reliable object detection by blanking unwanted echoes.

Echo filter

Thanks to the echo filter, the LiDAR sensor screens out unwanted measurement data and signals caused by edge hits, rain, dust, snow and other ambient conditions. You can set whether the first, the last, or all three echoes are output.

The other pulses triggered by undesirable ambient conditions are not taken into account. For more information, also see
➜ „Multi-echo evaluation" on page 5

Echo 1

Echo 2

Echo 1

Echo 2
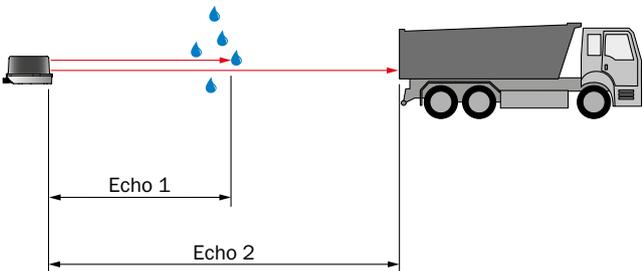
Without a filter: The LiDAR sensor receives unwanted echoes from ambient conditions such as rain.
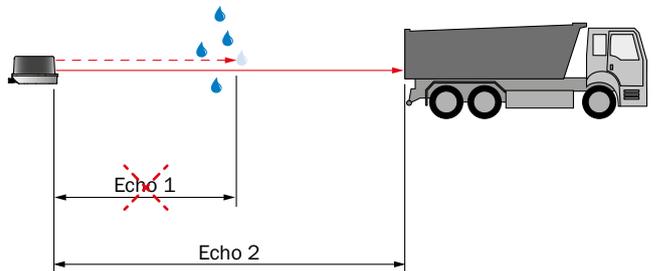
With a filter: The LiDAR sensor blanks unwanted echoes from ambient conditions in accordance with the specifications.

Particle filter

The particle filter blanks small, irrelevant reflection pulses in dusty environments and in rain or snow which are caused by dust particles, raindrops, snowflakes or the like. In doing so, successive scans are continuously evaluated in order to detect static objects.
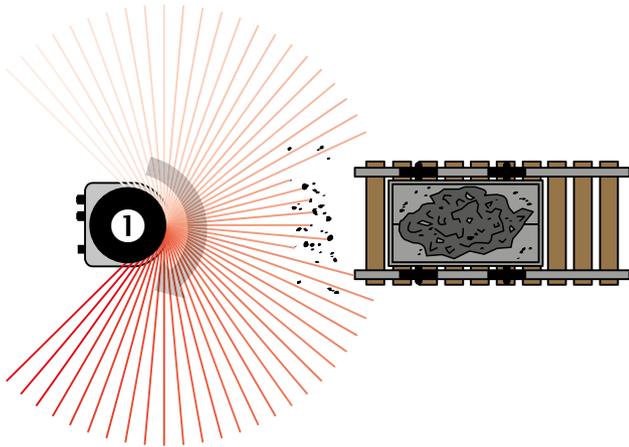
Without a filter: Violation of the contour due to dust particles in the object environment.
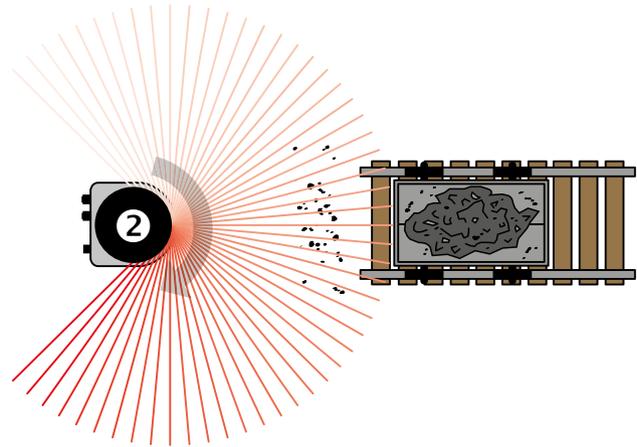

With a filter: The reaction to dust particles in the evaluation field is delayed by a scan. Particles can thereby be blanked.

Mean filter

With the mean filter, an average value is calculated from the number of scans configured and then output. The big advantage when using this filter: Potential noise, i.e. minimal deviation of values, is reduced, which also lowers the quantity of data.

15 m

17 m
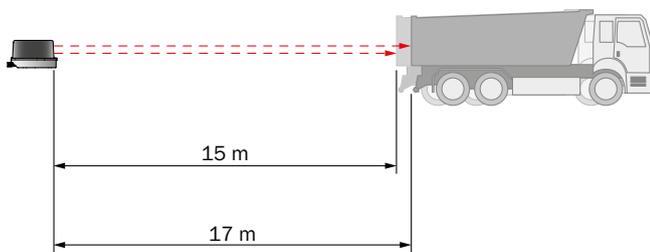
Without a filter: The LiDAR sensor detects and processes all received signal values.

Ø 16 m
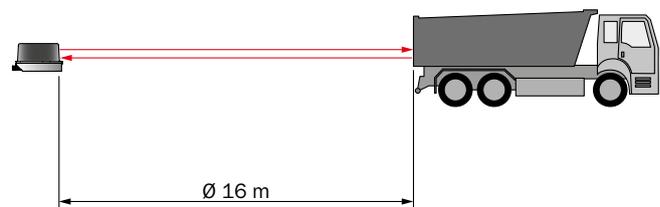
With a filter: The LiDAR sensor calculates an average value from several signal values.

The advantages of the MRS1000 at a glance

- ➕ Outstanding availability even under unfavorable ambient conditions
- ➕ Maximum reliability when detecting objects
- ➕ High measurement field coverage due to high scan speed
- ➕ Flexible and powerful SOPAS ET configuration software for three-dimensional display
- ➕ Display in SOPAS ET and web server
- ➕ Integrated field evaluation and measured data output makes it possible to tackle various applications with one sensor

HIGHER FLEXIBILITY ON SEVERAL PLANES

The MRS1000 covers a wide range of application areas. This increases flexibility when it comes to application possibilities in your industry, while at the same time reducing storage costs and expenditures for different variants as well as integration.

Collision avoidance and assistance systems on cranes, industrial vehicles and mobile work machines

The MRS1000 is the perfect solution for preventing collisions in challenging environments such as ports, warehouses, mines, etc.

Benefits
- Reliable object detection thanks to excellent outdoor performance
- Highly flexible during mounting thanks to rotatable connections
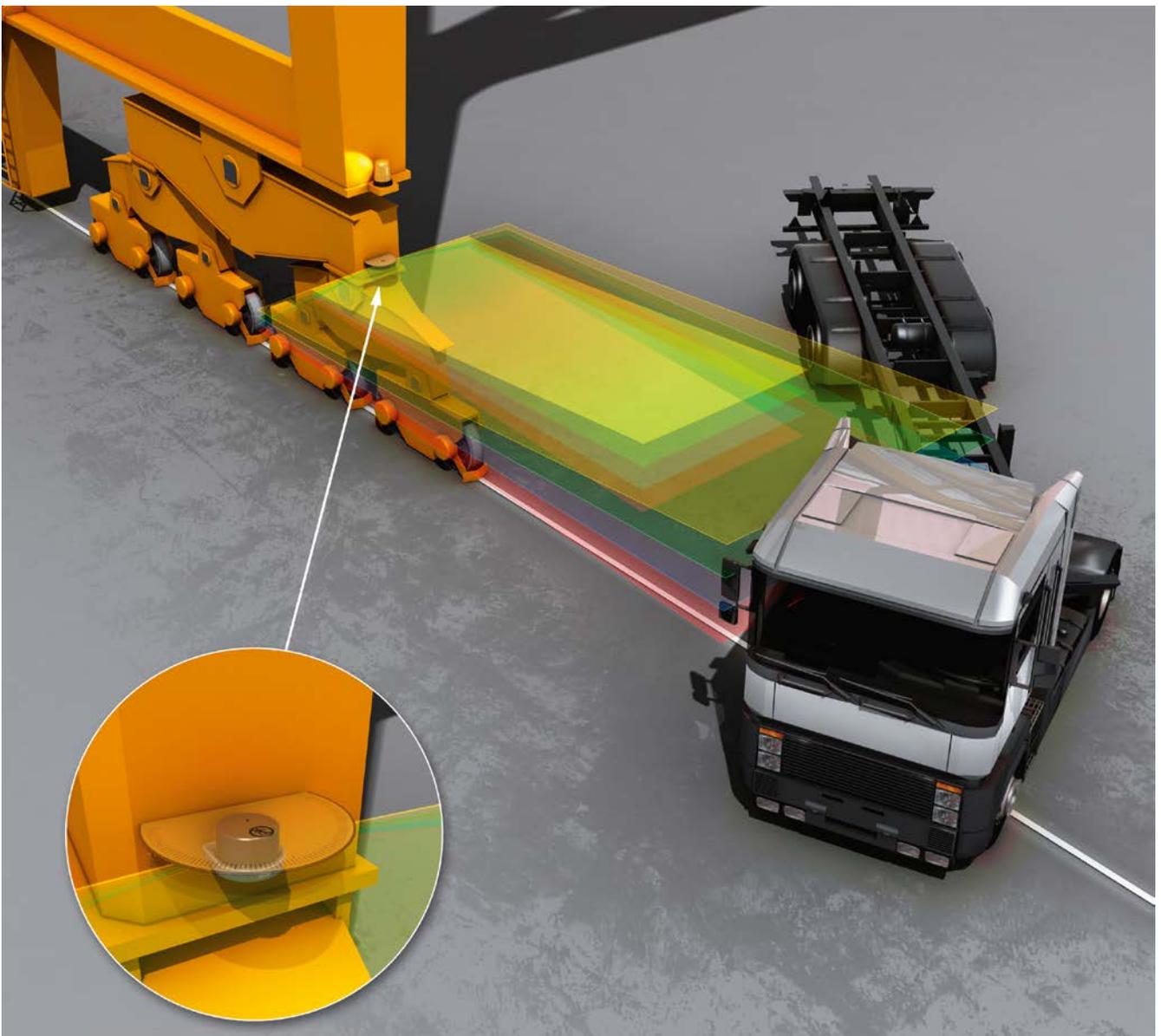
Navigation support

When maneuvering and navigating, the MRS1000 provides support with simultaneous measurement on up to four planes. In this way, it can detect objects lying on the ground or protruding into the path.

Benefits

➕ More measurement data in several dimensions results in extremely high object detection

➕ High economic efficiency thanks to outstanding weather resistance
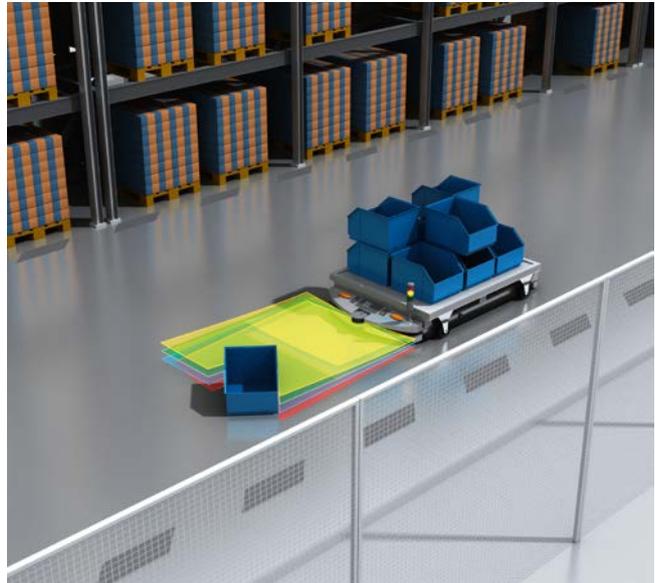
Monitoring in traffic management

Due to its excellent outdoor capabilities, the MRS1000 is perfectly suited for reliable traffic monitoring at toll stations or road control posts.

Benefits

➕ More detected data in several dimensions results in higher reliability in object detection (55,000 ... 165,000 measurement points per second)

➕ Thanks to HDDM⁺ technology with multi-echo evaluation, high availability is possible, even under unfavorable ambient conditions such as rain, snow, dust or glass panes
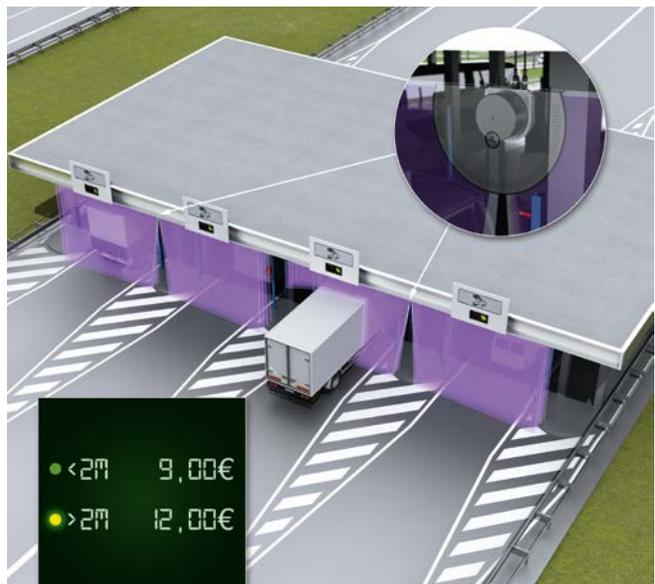
Building safety and security and access control

The MRS1000 delivers reliable measurement results for perimeter protection, object protection and access control when protecting indoor and outdoor areas.

Benefits

➕ Fields that are easy to teach in save time during setup

➕ A combination of field evaluation and measured data output makes it possible to cover various applications with only one sensor

DISCOVER THE WORLD OF THE MRS1000

The MRS1000 is the perfect solution for a variety of different applications.
Do you want a taste? We can show you excellent examples of how versatile the applications of the MRS1000 are on YouTube.

More information
➜ www.sick.com/MRS1000

Positioning and collision protection
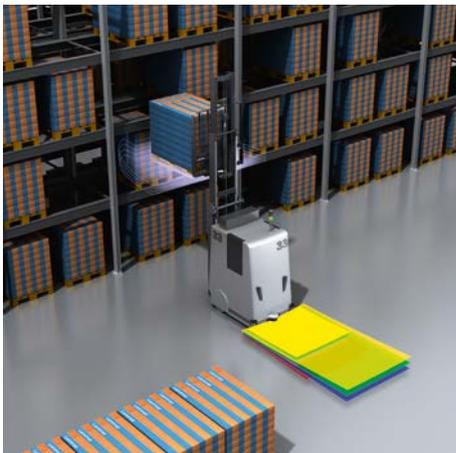
Smooth processes are essential in high-bay warehouses. Free storage spaces must be filled quickly and without complications. The MRS1000 enables exact positioning of transport forks in automated guided vehicle systems (AGVs), making collision-free movement into a free space possible. When moving backwards, the MRS1000 detects objects protruding into the space with its several scanning layers, ensuring reliable collision protection.

Navigation on natural landmarks

Automated guided vehicle systems navigate reliably on natural landmarks in space on four levels using the MRS1000 and its data output. For instance, the MRS1000 simplifies quick and collision-free entry into a truck by detecting and monitoring the driving path.

Visit us at ➜ www.youtube.com/user/SICKSensors

Positioning

The MRS1000 delivers measurement data on four planes, thereby detecting pallet openings, to name one example. It allows for the corresponding positioning of transport forks during the approach and reception of the pallet without stopping the AGVs. The recorded measurement data can be used to create a profile.
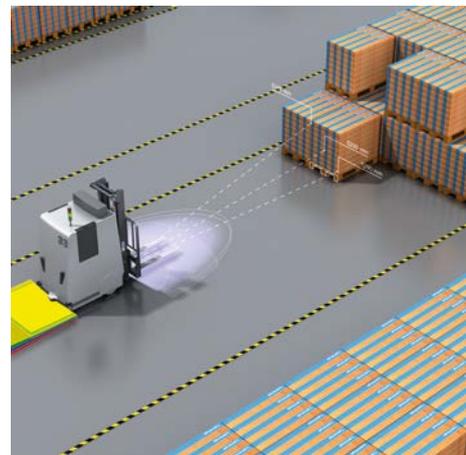
Ground reference evaluation
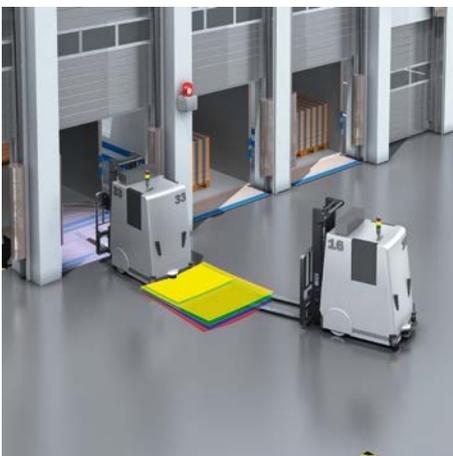
The MRS1000 provides a ground reference evaluation (GRE) for mobile hazardous area protection in automated guided vehicle systems. The sensor can use this to distinguish and detect objects lying on the path (pallets or small load carriers) as well as steps and depressions in the ground. The object height to be detected can be set by adjusting the sensitivity of the LiDAR sensor. In addition, the four scan planes of the MRS1000 enable detection of objects protruding into the path. This is how the MRS1000 helps to prevent collisions, detect pallet openings and support the AGVS when entering a free space.

SERVICES FOR MRS1000

SICK's services increase machine and plant productivity, enhance the safety of people all over the world, provide a solid foundation for a sustainable business operation, and protect investment goods. In addition to its usual consulting services, SICK provides direct on-site support during the conceptual design and commissioning phases as well as during operation.

The range of services not only covers aspects like maintenance and inspection, but also includes performance checks as well as upgrades and retrofits. Modular or customized service contracts extend the service life of plants and therefore increase their availability. If faults occur or limit values are exceeded, these are detected at all times by the corresponding sensors and systems.

Commissioning

Professional commissioning by SICK ensures optimal performance of the MRS1000. It includes the set-up of previously defined functions of the MRS1000 taking into account the interface to the machine or system and the ambient conditions of the application. The effort needed for commissioning depends on the customer application. A distinction is made between the Core and Prime packages.
The MRS1000 and the respective system part are handed over to the customer during a documented end approval with instructions. With the commissioning, the customer profits from quick processing of the qualified SICK technician and the high level of availability from the first day.

Commissioning LMS/MRS/NAV/TiM (Core package)
➜ 1682021
Commissioning LMS/MRS/NAV/TiM (Prime package)
➜ 1680672

Your benefits

- Maximum availability and productivity due to application-optimized settings of the LMS/MRS/NAV/TiM such as several monitored areas
- Cost savings thanks to fewer downtimes, malfunctions, consequential damages or inaccurate measurements as well as follow-up inspections

- Planning security due to a quick shift to normal operation
- Time savings due to archiving of the parameters and commissioning documentation for possible conversion or maintenance work

Maintenance

Planned regular and professional maintenance work on the application ensures uniformly high availability of the SICK product and reduces unwanted downtimes. Maintenance work includes the inspection, maintenance and restoration of defined functions of the SICK product and its interface to the machine or system. This makes it possible to detect performance losses early on and eliminate them. Preventatives measures for preventing errors are also recommended.
SICK defines the maintenance intervals together with the customer. At a fixed price so that maintenance costs remain manageable..

Maintenance LMS/MRS/NAV/TiM ➜1682593

Your benefits

- Maximum availability and improved performance
- Prevention of downtimes, malfunctions or consequential damages
- Predictable maintenance costs

- Cost savings due to fewer inaccurate measurements, meaning fewer follow-up inspections are necessary
- Quick and reliable restoration of parameters if a MRS1000 is replaced later

Warranty extension

The extended warranty offers long-term protection of SICK products for a calculable lump sum. Customers profit above and beyond the standard warranty and protect their investment from unexpected repair costs in the long run. The warranty can be extended to a total period of five years for newly-purchased Identification & Measuring products. This includes free repairs or free exchange of the product in the event of a warranty case.

Three-year extended warranty ➜1680670
Five-year extended warranty ➜1680671

Your benefits

- Protection from unexpected repair costs even after the statutory warranty has expired
- Free repairs or exchange of the device in the event of a warranty case

- Value preservation of your plant or system since it is transferable to the next owner and valid all over the world

OUTDOOR IS OUR FOURTH DIMENSION
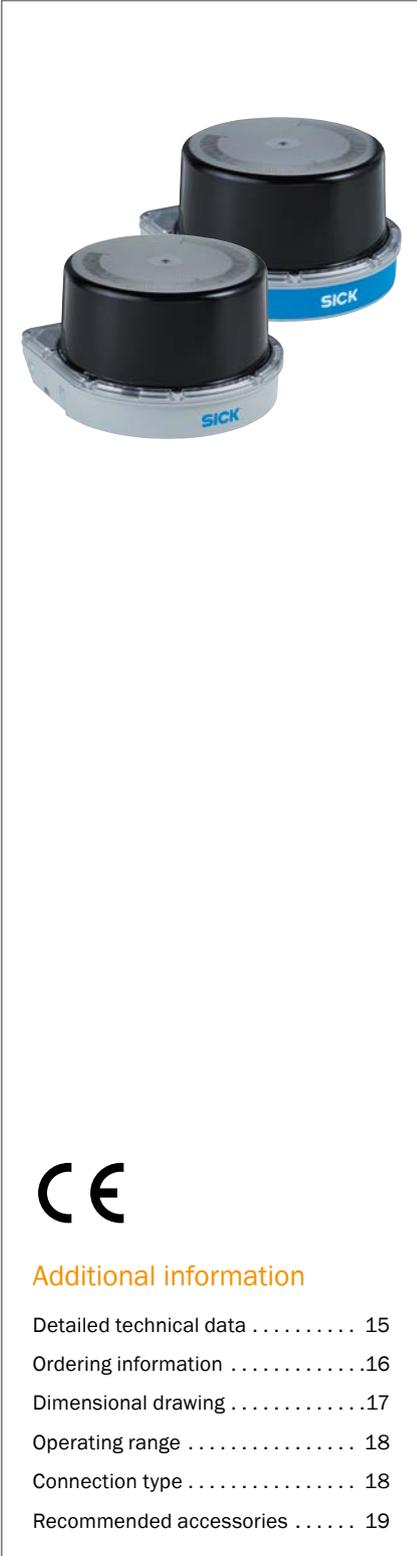
Product description

With the MRS1000 multi-layer scanner, SICK has developed a 3D laser scanner which accurately and reliably detects and measures objects in good time and in multiple dimensions. By collecting large volumes of data on multiple scan layers and from different angles, it can detect and respond to objects on the floor as well as objects that are obstructing the path.

The MRS1000 is characterized by a high degree of ruggedness even when subject to adverse environmental influences such as rain, dust, and fog. The new HDDM+ process, with multi-echo evaluation, ensures the reliable detection of objects and accurate measurement results. Versatile fields of application, both indoor and outdoor, make this an efficient all-rounder among 3D LiDAR sensors.

At a glance

- Four spread layers and a 275° aperture angle
- High weather resistance and reliability through HDDM+ with multi-echo technology
- Field evaluation and measured data in one sensor
- Easy configuration, with the ability to adapt to a changing environment
- Convenient and customer-friendly diagnostics via web server

Your benefits

- Collecting more data in multiple dimensions leads to higher measurement accuracy
- HDDM+ with multi-echo technology for high availability when subject to environmental influences like rain, dust, and fog
- Simultaneous measurement on 4 levels allows objects to be detected which are on the floor or obstructing the path
- High flexibility for installation thanks to rotating connectors
- Integrated field evaluation and measured data output makes it possible to tackle various applications with one sensor
- Low setup costs: Identical telegram, as for the 2D LiDAR sensors from SICK
- Fields that are easy to teach in save time during setup
- Low maintenance costs thanks to high weather resistance

Additional information

CE

➔ **www.sick.com/MRS1000**

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.

Detailed technical data

Features

Measurement principle	HDDM⁺
Application	Outdoor, Indoor (depending on type)
Light source	Infrared (850 nm)
Laser class	1 (EN/IEC 60825-1:2014; EN/IEC 60825-1:2007)
Aperture angle	
Horizontal	275°
Vertical	7.5° (over 4 measurement layers)
Scanning frequency	50 Hz, 4 x 12.5 Hz
Angular resolution	0.25°
Heating	Self-heating
Operating range	0.2 m ... 64 m
Scanning range	
At 10% remission	16 m
At 90% remission	30 m
Spot size (H x W)	10.4 mrad x 8.7 mrad
Amount of evaluated echoes	3

Performance

Scan/frame rate	55,000 ... 165,000 measurement points/s
Response time	4 layers, typ. 20 ms [1] 1 layer, typ. 80 ms
Systematic error	± 60 mm
Statistical error	≤ 30 mm
Integrated application	Integrated field evaluation with flexible fields on four layers, measurement data output
Number of field sets	Up to 64 fields
Simultaneous evaluation cases	Up to 16 evaluations
Filter	Fog filter Particle filter Mean filter Median filter Ground reference evaluation (GRE)

[1] Depending on the selected filter settings and the object size.

Interfaces

Ethernet	✔, TCP/IP, UDP/IP
Function	Host, OPC, NTP, Measured data output (distance, RSSI)
Data transmission rate	10/100 MBit/s
Digital inputs/outputs	I/O (8 (Multiport))
Output data	Contamination indication IMU (secondary sensor data)
Optical indicators	LEDs
Configuration software	SOPAS ET Web server (display)

Mechanics/electronics

Electrical connection	M12 round connectors (D-coded, aligned) with swivel connector
Operating voltage	10 V DC ... 30 V DC
Power consumption	≤ 13 W
Housing	AlSi12 Optics cover: PC
Housing color	Gray (RAL 7042) / Light blue (RAL 5012) (depending on type)
Enclosure rating	IP65, IP67 (IEC 60529:1989+AMD1:1999+AMD2:2013) (depending on type)
Protection class	III (IEC 61140:2016-11)
Electrical safety	IEC 61010-1:2010-06
Weight	1.2 kg
Dimensions (L x W x H)	151.9 mm x 150 mm x 92.5 mm

Ambient data

Object remission	2 % ... > 1,000 % (Reflector)
Electromagnetic compatibility (EMC)	EN 61000-6-2:2005 EN 61000-6-3:2007+A1:2011
Vibration resistance	IEC 60068-2-6:2007
Shock resistance	IEC 60068-2-27:2008
Ambient operating temperature	–30 °C ... +50 °C (depending on type)
Storage temperature	–40 °C ... +75 °C
Ambient light immunity	80 klx

Ordering information

- **Spot size (H x W):** 10.4 mrad x 8.7 mrad
- **Electrical connection:** M12 round connectors (D-coded, aligned) with swivel connector
- **Angular resolution:** 0.25°
- **Object remission:** 2 % ... > 1,000 %, Reflector

Field of application	Housing color	Type	Part no.
Outdoor	Gray (RAL 7042)	MRS1104C-111011	1081208
Indoor	Light blue (RAL 5012)	MRS1104C-011010	1075367

Dimensional drawing (Dimensions in mm (inch))
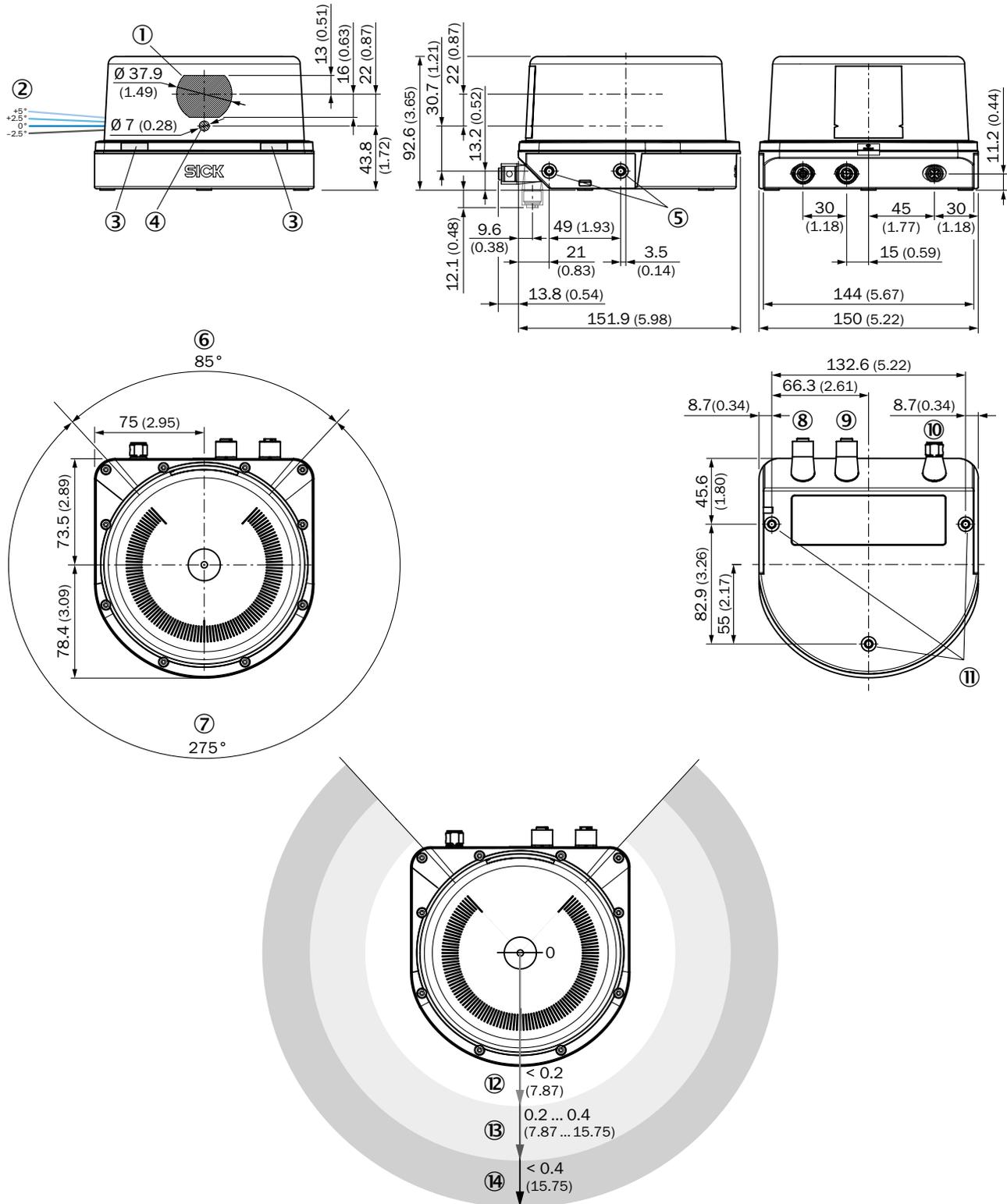
① Receiver
③ Status LEDs
④ Sender
⑤ Mounting hole M5 x 7.5
⑥ Blind zone
⑦ Field of view
⑧ Ethernet connection

⑨ I/O connection
⑩ POWER connection
⑪ Mounting hole M5 x 7.5
⑫ Close range (no detection or measurement possible)
⑬ Detection zone
⑭ Measuring range

Operating range

Height in m (ft)

Scanning range in m

Typical scanning range

Radius in m (ft)

Scanning range in m

① Layer 1
② Layer 2
③ Layer 3
④ Layer 4

■ Max. scanning range
■ 90 % Remission
■ 10 % Remission
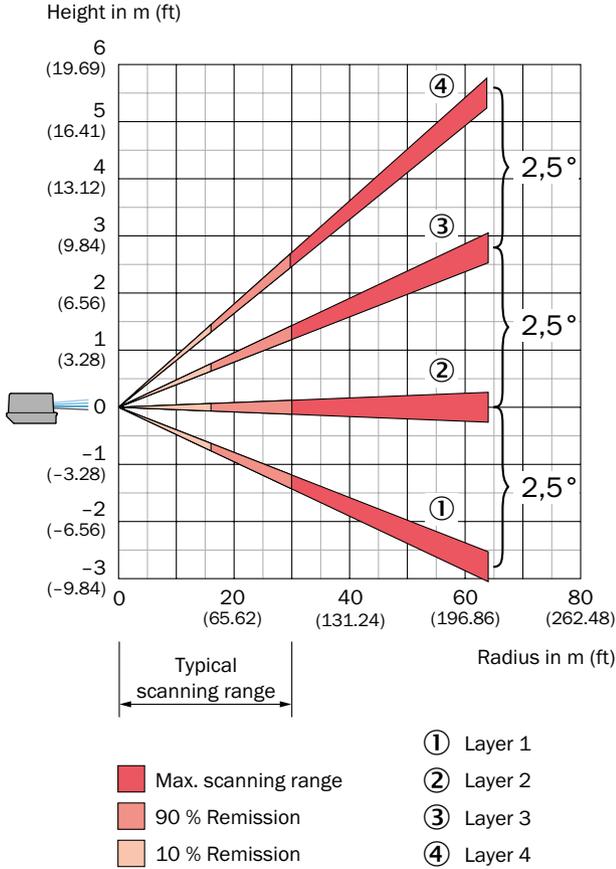
■ Scanning range max. 64 m
■ Scanning range for objects up to 90 % remission 30 m
■ Scanning range for objects up to 10 % Remission 16 m
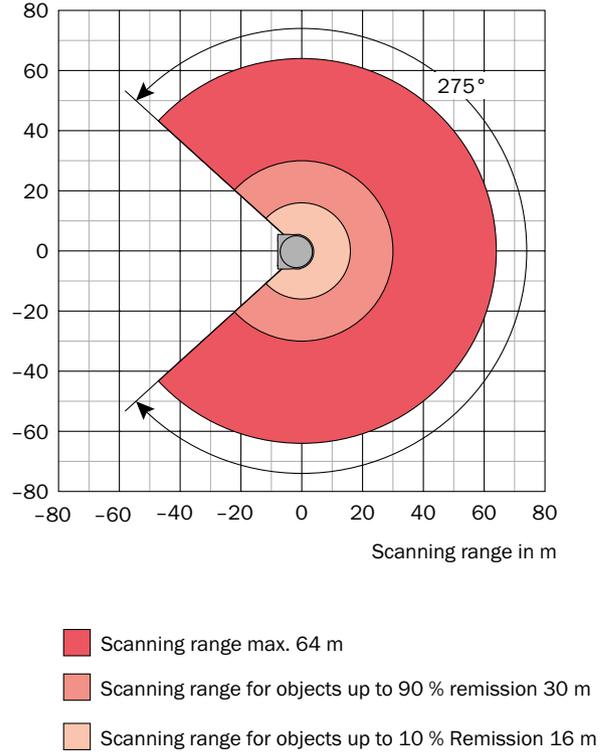
Connection type

I/O
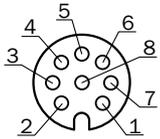
Connector M12, 8-pin, A-coded
① IN1/OUT1
② IN2/OUT2
③ IN3/OUT3
④ IN4/OUT4
⑤ IN5/OUT5
⑥ IN6/OUT6
⑦ GND INx/OUTx
⑧ IN7/OUT7

Ethernet
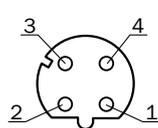
M12 female connector, 4-pin, D-coded
① TX+
② RX+
③ TX-
④ RX-

Power
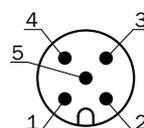
Connector M12, 5-pin, A-coded
① VS 10...30 V
② Reserved
③ GND
④ IN8/OUT8
⑤ Reserved

Recommended accessories

	Brief description	Type	Part no.
Terminal and alignment brackets			
	Easy mount	Mounting bracket	2093194
Device protection (mechanical)			
	Hood for protection of front screen against weather influences	Weather hood, 210°	2085939
Mounting brackets and plates			
	Adapter plate for mounting MRS1000 on accessories components, Aluminum (anodised), mounting hardware included	Adapter plate	2085937
Plug connectors and cables			
	Head A: female connector, M12, 5-pin, straight, A-coded Head B: Flying leads Cable: Sensor/actuator cable, PUR, halogen-free, shielded, 5 m	YF2A25-050UB6XLEAX	2095733
	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, 5 m	YM2D24-050EA1MRJA4	6034415
	Head A: male connector, M12, 8-pin, straight, A-coding Head B: cable Cable: drag chain use, PUR, halogen-free, shielded, 5 m	YF2A28-050UA6XLEAX	6036155

You can find additional accessories online ➜ www.sick.com/MRS1000

Recommended services

Brief description	Type	Part no..
Warranty extensions		
• **Range of services:** The services correspond to the scope of the statutory manufacturer warranty (SICK general terms and conditions of purchase)Long-term protection for calculable lump sum. • **Duration:** Five-year warranty from date of purchase.	Five-year extended warranty	1680671
Commissioning		
• **Range of services:** Inspection of connection, fine adjustment, configuration of monitored areas, configuration and optimization of parameters of the LMS/MRS/NAV/TiM as well as verification testsSetup of previously defined functions of basic settings, parameters of field application, filters for raw data output and product-specific configuration • **Documentation:** Archiving of product parameters in a SICK databaseDocumentation of performanceCreation of a commissioning log • **Duration:** Additional work will be invoiced separately based on time spent • **Note:** The prices do not include expenses or costs for the travel time	Comissioning LMS/MRS/NAV/TiM (Prime package)	1680672
Maintenance		
• **Range of services:** Inspection, analysis and restoring of defined functionsInspection and adaptation of basic settings, parameters of field application, filters for raw data output, and product-specific configuration • **Documentation:** Documentation of operating hours and archiving of parameters in a SICK databaseCreation of a maintenance log • **Duration:** Additional work will be invoiced separately based on time spent • **Note:** The prices do not include expenses or costs for the travel time	Maintenance LMS/MRS/NAV/TiM	1682593

You can find additional services online ➜ www.sick.com/MRS1000

NOTES

REGISTER AT WWW.SICK.COM TO TAKE ADVANTAGE OF OUR FOLLOWING SERVICES FOR YOU

☑ Access information on net prices and individual discounts.

☑ Easily order online and track your delivery.

☑ Check your history of all your orders and quotes.

☑ Create, save, and share as many wish lists as you want.

☑ Use the direct order to quickly order a big amount of products.

☑ Check the status of your orders and quotes and get information on status changes by e-mail.

☑ Save time by using past orders.

☑ Easily export orders and quotes, suited to your systems.

SERVICES FOR MACHINES AND PLANTS: SICK LifeTime Services

Our comprehensive and versatile LifeTime Services are the perfect addition to the comprehensive range of products from SICK. The services range from product-independent consulting to traditional product services.

Consulting and design
Safe and professional

Product and system support
Reliable, fast, and on-site

Verification and optimization
Safe and regularly inspected

Upgrade and retrofits
Easy, safe, and economical

Training and education
Practical, focused, and professional

SICK AT A GLANCE

SICK is a leading manufacturer of intelligent sensors and sensor solutions for industrial applications. With more than 9,700 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.

Detailed addresses and further locations ➜ **www.sick.com**

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