OLS, MLS
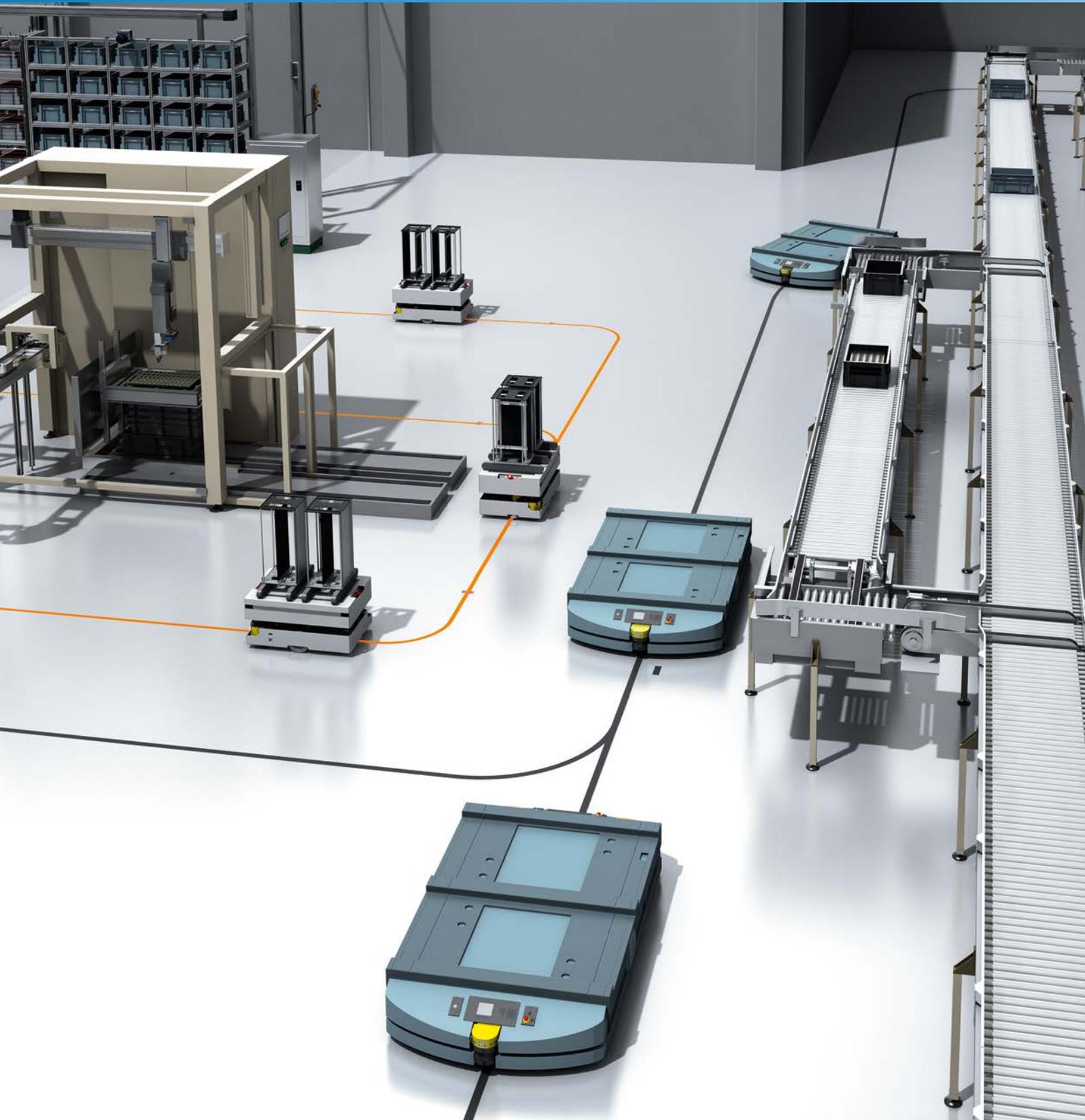## SENSORS FOR OPTICAL AND MAGNETIC LINE GUIDANCE

Line guidance sensors

SICK
Sensor Intelligence.

Line guidance for automated guided vehicles

Autonomous material transport systems are now used in nearly every single area of the production industry. Whether you use automated guided vehicle systems, semi-automated guided vehicle systems, transfer cars, manned forklift trucks, or narrow aisle trucks – a whole host of different sensor functions has to be performed – such as for navigation, as well as for rough and fine positioning of vehicles, transporting the load or for protection of people, the load and the vehicle.

To enable autonomous driving on routes from A to B, mobile transport vehicles must be equipped with sensors for navigation and position determination. Line guidance is a straightforward and cost-effective type of navigation for automated guided vehicles (AGVs) or mobile platforms. It functions through a sensor on the vehicle that detects and tracks a line on the floor; the sensor outputs the deviation relative to the vehicle's center, which enables precise positioning of the vehicle in the line. SICK provides two different sensor technologies for line guidance. Depending on the ambient conditions and intended use, optical or magnetic line guidance may be the best choice for navigation of mobile platforms.

Optical line guidance:
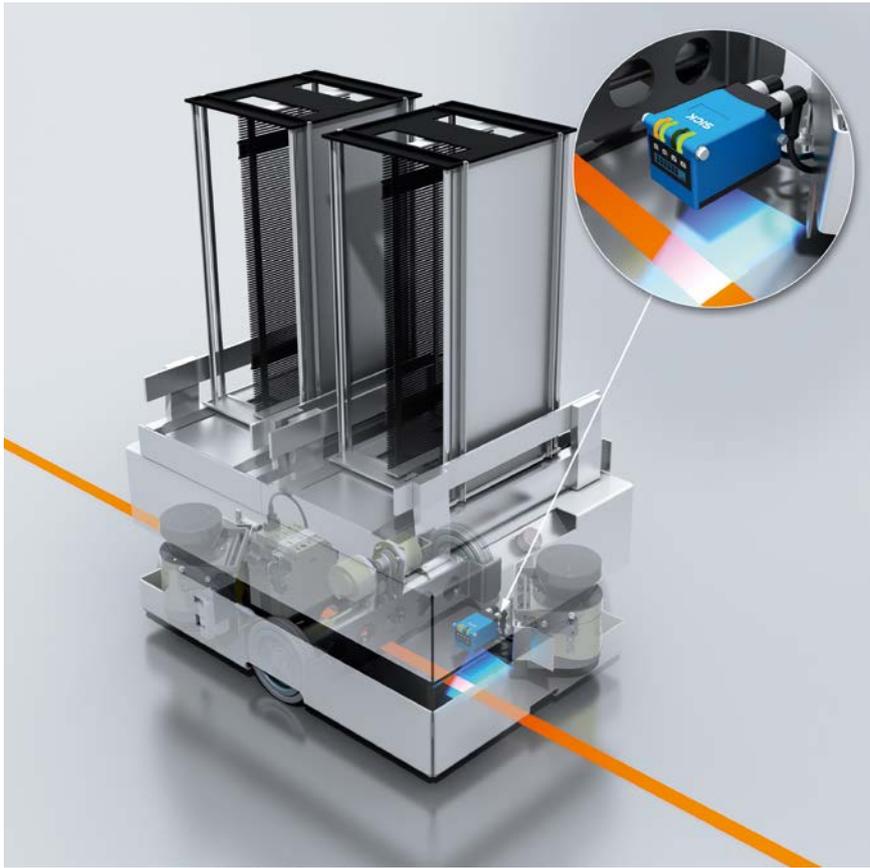Easy commissioning
and maintenance

Magnetic line guidance:
Rugged and straightforward

Optical line guidance with OLS

Optical line guidance with the OLS pattern sensor makes installing and maintaining lines particularly easy and economical. The OLS detects conventional luminescent adhesive tape regardless of the background, contamination or surface defects and reliably outputs the deviation from the center of the line. In addition, it offers the option of reading 1D codes while driving, making it possible to transmit route information and drive commands.
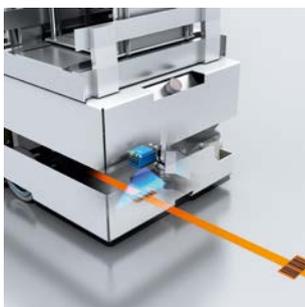
The OLS reliably reads 4-digit 1D bar codes perpendicular to the line. This makes it easy to transmit route or position information.
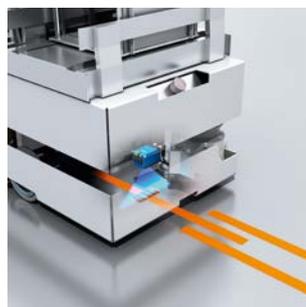
Thanks to its wide reading field of 180 mm, the OLS can detect up to three lines. This enables flexible arrangement of diverters or line junctions.
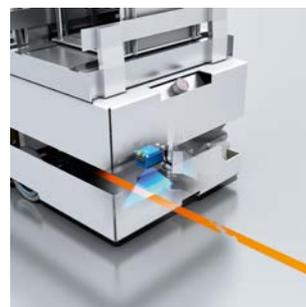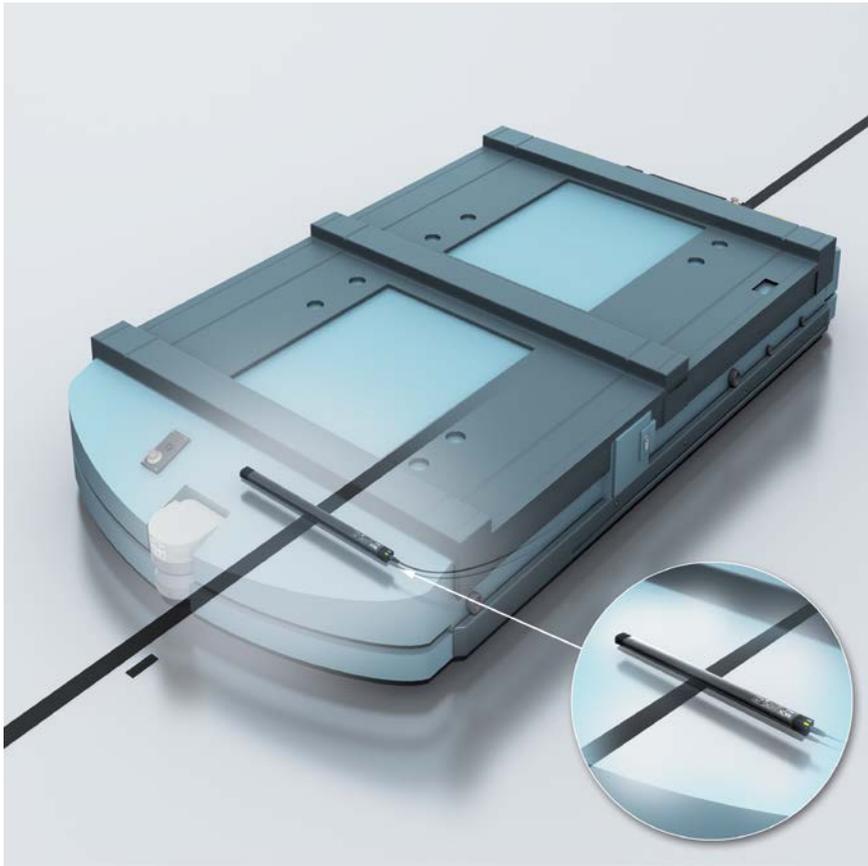

Thanks to the reliable luminescence detection, there's no need to worry about contamination. Surface defects can be ignored over a length that can be adjusted by the customer.

The OLS detects the luminescent line regardless of the physical features of the floor and background. A separate teach-in process is not necessary.
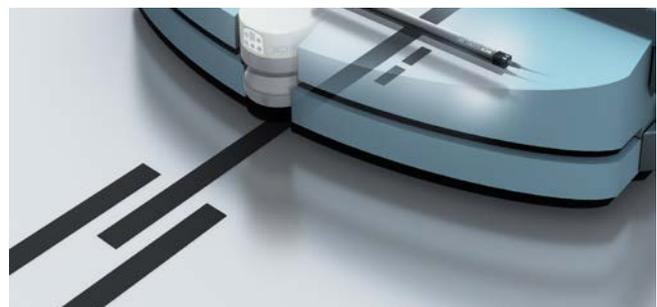
Magnetic line guidance with MLS

Magnetic line guidance with the MLS sensor is not sensitive to ambient conditions such as strong ambient light, condensing atmosphere or contamination of the line. If line guidance needs to be invisible, the magnetic line can be installed below the floor surface. Command marks make coding of information and drive commands easy and flexible.

The MLS is mounted at a 90° angle to the magnetic line. Thanks to different variants with a detection range of 200 mm to 600 mm, there is an appropriate solution for every vehicle.

The MLS reliably differentiates up to three magnetic lines. In addition, positions or commands (such as for turning at intersections) can be coded using lateral magnet marks.

THE SENSOR FOR OPTICAL LINE GUIDANCE

Product description

The OLS is a line guidance sensor based on luminescence technology. It detects conventional luminescent adhesive tape regardless of the background, contamination or surface defects and reliably outputs the deviation from the center of the line. Line shifts can be made flexibly with adhesive tape and are also possible in small curve radii of up to 0.5 m. In addition, the OLS offers the option of reading 1D codes during the overrun and thereby transmitting distance information or drive commands. A CANopen and an Ethernet interface as well as the integrated web server enable simple installation and commissioning. The OLS is therefore the most cost-effective solution for line guidance with a focus on ruggedness and flexibility.

At a glance

- Detection of luminescent adhesive tape
- Very high signal-to-noise ratio (~1:1,000)
- 180 mm reading field (up to 3 lines can be read at the same time)
- Output of deviation from line center point and reading out of bar codes
- Insensitive to ambient light, contamination or glare
- Compensation for surface defects
- Measurement accuracy: ± 1 mm
- CANopen and Ethernet (TCP/IP)

Your benefits

- Rugged and accurate, insensitive to ambient light, contamination or surface defects
- Independent of base material or color
- Simple line shifts and route changes by attaching conventional adhesive tape
- Small curve radii of up to 0.5 m possible
- Large reading field enables flexible line shifts (branches, junctions)
- Reading bar codes makes it possible to transmit distance information or drive commands and simplifies vehicle control
- Cost efficient compared to camera solutions
- Low installation costs

Additional information

➜ www.sick.com/OLS

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

Dimensions (W x H x D)	46 mm x 77 mm x 46 mm
Sensing distance	100 mm
Sensing distance tolerance	± 10 mm
Housing design (light emission)	Rectangular
Light source [1]	LED, Blue
Wave length	450 nm
Light spot size [2]	180 mm x 11 mm
Bar code types	Interleaved 2 of 5
Module width (min.)	≥ 1 mm
Line radius (min.)	≥ 0.5 m

[1] Average service life: 100,000 h at T_U = +25 °C.

[2] Field of view line +-90mm, field of view code +-50mm.

Communication interface

Communication interface	CANopen Ethernet (TCP/IP)

Mechanics/electronics

Supply voltage [1]	12 V DC … 30 V DC
Ripple [2]	≤ 5 V_{pp}
Power consumption [3]	< 6 W
Sampling rate	10 ms [4] 20 ms [5]
Accuracy optical center	± 1 mm
Switching output	PNP
Switching output (voltage)	PNP: HIGH = V_S – ≤ 2 V / LOW < 0,5 V
Status output [6]	PNP: HIGH = V_S – ≤ 2 V / LOW < 0,5 V
Output current $I_{max.}$ [7]	< 100 mA
Initialization time	< 10 s
Connection type	Connector M12, 12-pin
Ambient light immunity	50,000 lx
Protection class	III
Circuit protection	U_v connections, reverse polarity protected Output Q short-circuit protected Interference pulse suppression
Enclosure rating	IP64
LED risk group	1 (IEC 62471)
Weight	325 g
Housing material	Metal

[1] Limit values when operated in short-circuit protected network: max. 8 A.

[2] May not exceed or fall below U_v tolerances.

[3] Without load.

[4] CANopen.

[5] Ethernet.

[6] Detailed description of the status output in operating manual.

[7] Sum I_{out} = Q1 + Q2.

Ambient data

Ambient operating temperature	–10 °C … +55 °C
Ambient storage temperature	–20 °C … +75 °C
Shock load	According to IEC 60068
UL File No.	NRKH.E181493 & NRKH7.E181493

Ordering information

Light source [1]	Sensing distance	Connection diagram	Type	Part no.
LED, Blue	100 mm	cd-395	OLS10-BP112311	1092169

[1] Average service life: 100,000 h at T_U = +25 °C.

Dimensional drawings (Dimensions in mm (inch))
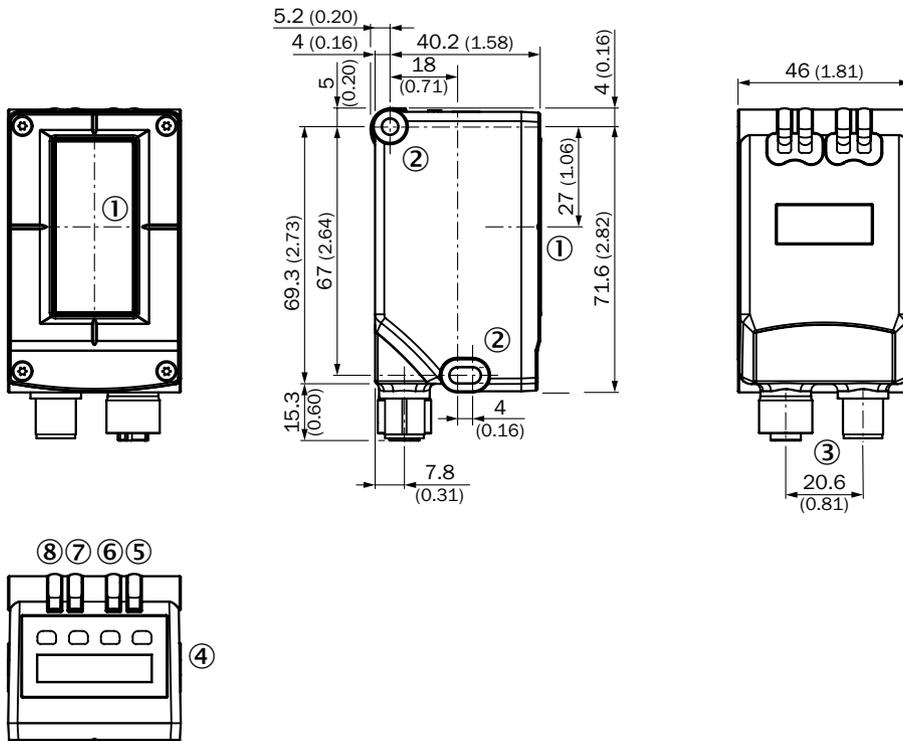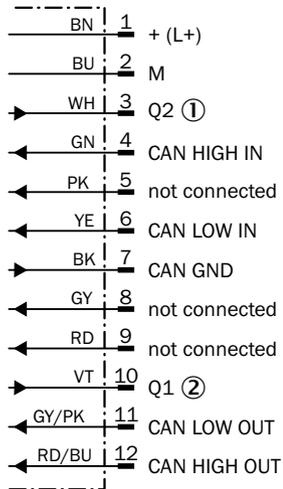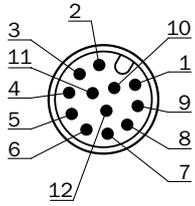
① Center of optical axis
② Mounting hole, Ø 4.2 mm
③ Connector M12, 12-pin/Connector M12, 4-pin, rotatable up to 90° (Ethernet)
④ Display and function buttons
⑤ Function signal indicator (green) "on"
⑥ Function signal indicator (yellow) "Q"
⑦ Function signal indicator (green) "Link"
⑧ Function signal indicator (yellow) "Act"

Connection type and diagram

Cd-395

M12 (A-coded)

Pin	Wire	Signal
1	BN	+ (L+)
2	BU	M
3	WH	Q2 ①
4	GN	CAN HIGH IN
5	PK	not connected
6	YE	CAN LOW IN
7	BK	CAN GND
8	GY	not connected
9	RD	not connected
10	VT	Q1 ②
11	GY/PK	CAN LOW OUT
12	RD/BU	CAN HIGH OUT

① Valid BarCode read
② Line detected

Accessories

Mounting systems

Universal bar clamp systems

Figure	Brief description	Type	Part no.
Universal bar clamp systems			
	Plate N04 for universal clamp, steel, Zinc plated steel (sheet), Zinc die cast (clamping bracket), Universal clamp (5322626), mounting hardware	BEF-KHS-N04	2051610
	Mounting bar, straight, 200 mm, steel, steel, zinc coated, without mounting hardware	BEF-MS12G-A	4056054
	Mounting bar with thread, straight, 100 mm, steel, steel, zinc coated, mounting hardware included	BEF-MS12G-AG	2062405
	Mounting bar, L-shaped, 250 x 250 mm, steel, steel, zinc coated, without mounting hardware	BEF-MS12L-B	4056053

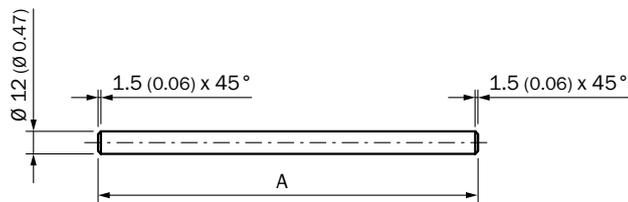| Figure	Brief description	Type	Part no.
Plug connectors and cables			
	Head A: female connector, M12, 12-pin, angled Head B: open cable ends Cable: PVC, shielded, 5 m	DOL-1212-W05MAS02	6044109
	Head A: female connector, M12, 12-pin, straight Head B: open cable ends Cable: PVC, shielded, 5 m	DOL1212-G05MAS02	6042754
	Head A: female connector, M12, 12-pin, straight Head B: male connector, M12, 12-pin, straight Cable: PVC, shielded, 5 m	DSL-1212-G05MAS02	6045234
	Head A: male connector, M12, 4-pin, angled, D-coded Head B: male connector, RJ45, 8-pin, straight Cable: Ethernet, twisted pair, PUR, halogen-free, shielded, 5 m	Connection cable (male connector-male connector)	6039488
	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	SSL-2J04-G05ME	6034415
Further accessories			
	1D bar codes in 2/5 interleaved Format, set of 108 bar codes on 9 A4 Sheets, luminescent PVC backing material with protective film	SHEET,BARCODE	5338408
	Luminescent duct tape for easy application to all types of flooring, width 2.5 cm, length 25 m, neon orange	TAPE, FABRIC	5337868
	Luminescent rugged PVC adhesive tape for easy application to all types of flooring, width 2.5 cm, length 25 m, neon orange	TAPE, PVC	5338378
	Luminescent rugged PVC adhesive tape, prepared as 90° arc with a radius of 500 mm, neon orange	TAPE, PVC BOW	5338387
	Luminescent rugged PVC adhesive tape, prepared as 90° arc with a radius of 1,000 mm, neon orange	TAPE, PVC BOW	5338388
	Protective film for adhesive tape, slip resistance class R10, protection against abrasion and moisture, width 3,5 cm, length 50 m	PROTECTIVE FOIL	5338386
	Protective film for adhesive tape, slip resistance class R10, protection against abrasion and moisture, prepared as 90° arc with a radius of 500 mm	PROTECTIVE FOIL, BOW	5338389
	Protective film for adhesive tape, slip resistance class R10, protection against abrasion and moisture, prepared as 90° arc with a radius of 1,000 mm	PROTECTIVE FOIL, BOW	5338390

Dimensional drawings for accessories (Dimensions in mm (inch))
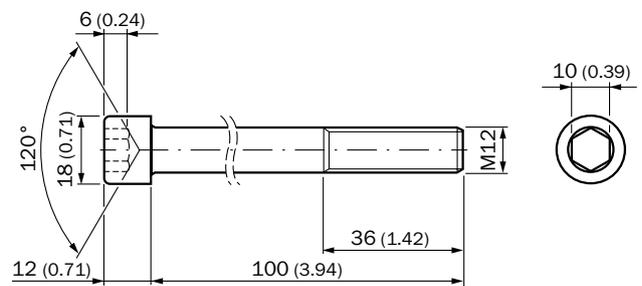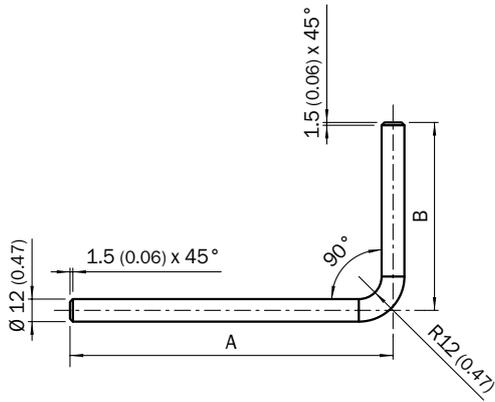
Universal bar clamp systems

BEF-KHS-N04

66 (2.60)
2.5 (0.10)
110 (4.33)
50 (1.97)

37 (1.46)
17 (0.67)
3.3 (0.13)
4.5 (0.18)

27 (1.06)
20 (0.79)
22 (0.87)

29.8 (1.17)
Ø 16 (Ø 0.63)
Ø 12 (Ø 0.47)
10.5 (0.41)
16 (0.63)
5.5 (0.22)

BEF-MS12G-A
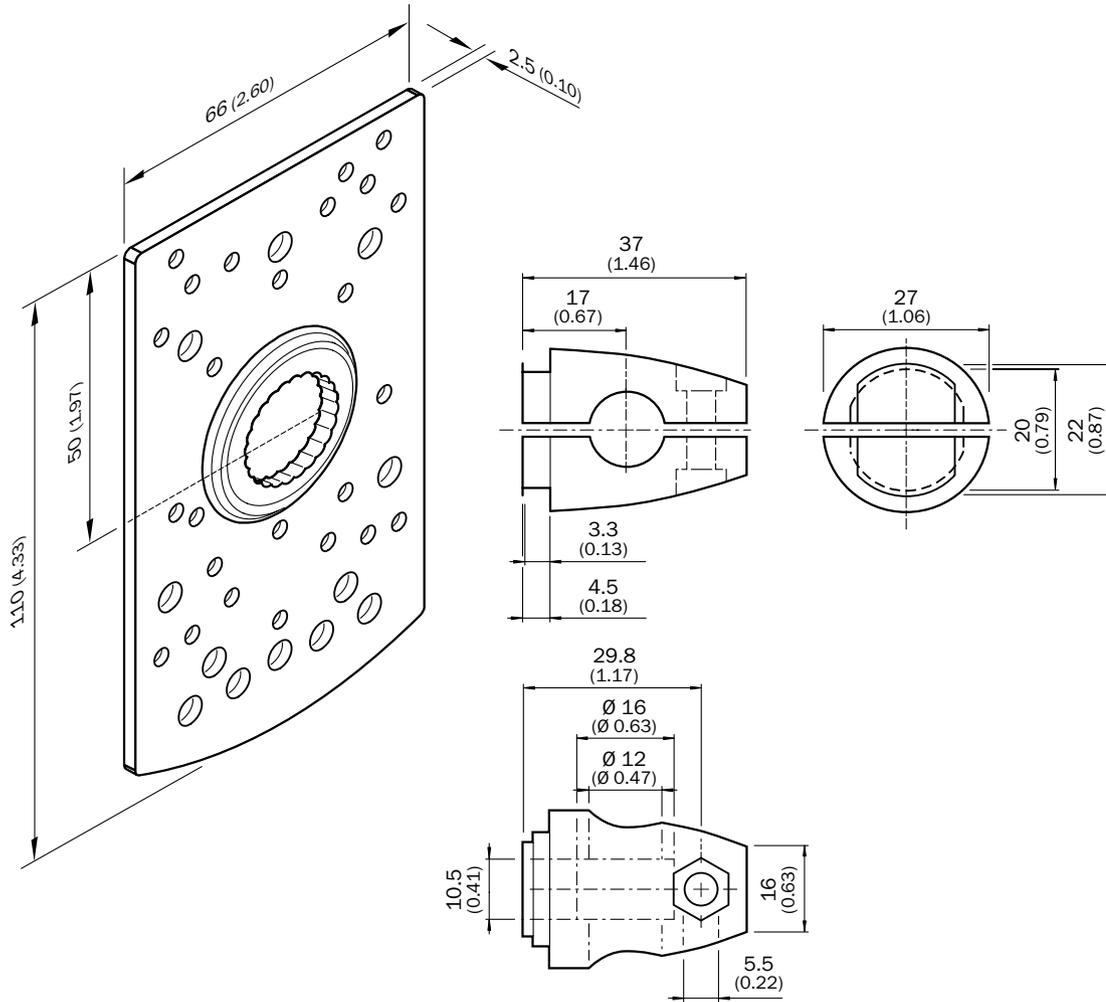
Ø 12 (Ø 0.47)
1.5 (0.06) x 45°
1.5 (0.06) x 45°
A

BEF-MS12G-(N)A: A = 200 mm
BEF-MS12G-(N)B: A = 300 mm

BEF-MS12G-AG

6 (0.24)
120°
18 (0.71)
12 (0.71)
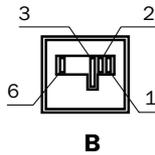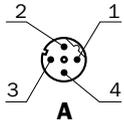100 (3.94)
36 (1.42)
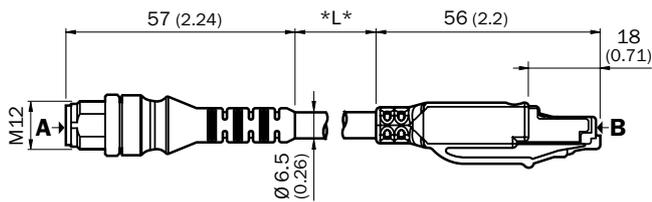M12
10 (0.39)

BEF-MS12L-B
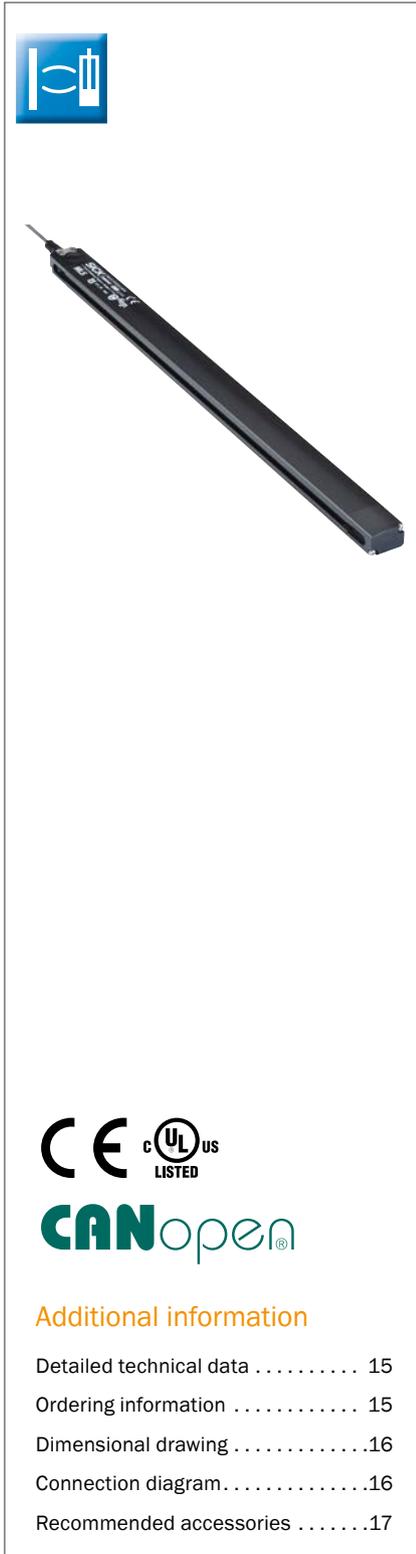

BEF-MS12L-(N)A: A = 200 mm, B = 150 mm
BEF-MS12L-(N)B: A = 250 mm, B = 250 mm

Plug connectors and cables

SSL-2J04-G05ME

THE SENSOR FOR MAGNETIC LINE GUIDANCE

Product description

The MLS is a magnetic line guidance sensor for navigating automated guided vehicles and carts. Navigation is done by aligning the sensor to the center of the magnetic line. Sensor positions are transmitted to the vehicle control via a CANopen interface. The sensor reliably differentiates between up to three lines. The vehicle can therefore maneuver through branches and line junctions with no problem. When selecting the magnetic band and the installation height, the MLS allows for a lot of freedom and is available in various variants with different detection ranges. This enables high flexibility when it comes to design and retrofitting. Magnetic marks for additional vehicle commands can be attached to the side next to the line.

At a glance

- Detection of magnetic lines for line guidance
- Detection of switches: Up to 3 lines at a time
- Resolution 1 mm, repeatability 1 mm
- CANopen interface
- Detection of control marks
- IP65, IP67, IP68
- Ambient temperature –20 °C … +70 °C
- Variants with measuring ranges of 100 mm to 1,000 mm

Your benefits

- Rugged aluminum housing
- Easy installation: Thin housing shape and different measurement area variants
- Quick commissioning without setting Optional setting and visualization via a user interface
- Large ground clearance: 10 mm to 50 mm of distance to the magnetic band can be installed
- Safe line detection and differentiation of up to 3 lines for intersections and line junctions
- Monitoring of magnetic strength of the guidance line
- Easy and reliable detection of command marks (STOP, MERGE, SPEED CHANGE)
- Complete accessories available: Magnetic band for lines and markers, mounting bracket

Additional information

➜ www.sick.com/MLS

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

Detection range typ.	200 mm ... 600 mm (depending on type)
Operating height	10 mm ... 50 mm
Teach-in	✔
Enclosure rating [1]	IP65, IP67, IP68

[1] According to EN 60529.

Communication interface

Communication interface	CANopen

Mechanics/electronics

Supply voltage [1]	9 V DC ... 30 V DC
Protection class	III
Power consumption	600 mW
Resolution, typ.	1 mm
Repeat accuracy, typ.	1 mm
Update rate	100 Hz
Reverse polarity protection	✔
Short-circuit protection	✔
Ambient operating temperature	–20 °C ... +70 °C
Shock and vibration resistance	30 g, 11 ms/10 Hz ... 55 Hz, 1 mm
EMC	According to EN 60947-5-2
Housing material	Metal, Aluminum, Plastic
Cable material	PUR
Conductor cross-section	0.08 mm^2
UL File No.	NRKH.E181493 & NRKH7.E181493

[1] Reverse-polarity protected, operation in short-circuit protected network: max. 8 A.

Ordering information

Other models ➜ **www.sick.com/MLS**

Detection range typ.	Connection [1]	Connection diagram	Type	Part no.
200 mm	Cable with M8 male connector, 4-pin, 0.3 m	cd-396	MLSE-0200A2NP0	1090687
300 mm	Cable with M8 male connector, 4-pin, 0.3 m	cd-396	MLSE-0300A2NP0	1090688
400 mm	Cable with M8 male connector, 4-pin, 0.3 m	cd-396	MLSE-0400A2NP0	1090689
500 mm	Cable with M8 male connector, 4-pin, 0.3 m	cd-396	MLSE-0500A2NP0	1090690
600 mm	Cable with M8 male connector, 4-pin, 0.3 m	cd-396	MLSE-0600A2NP0	1090691

[1] Do not bend below 0 °C.

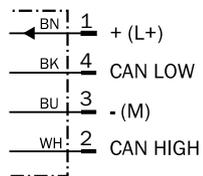## Dimensional drawing (Dimensions in mm (inch))
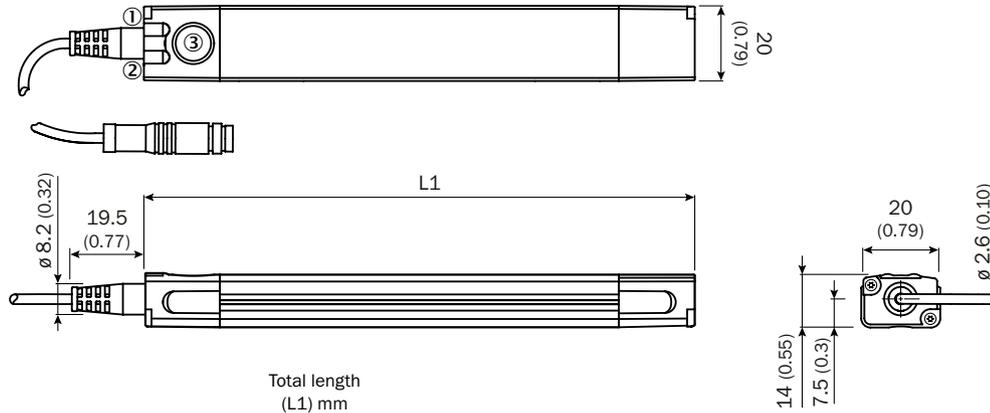
	Total length (L1) mm
MLSE-0200	217
MLSE-0300	325
MLSE-0400	397
MLSE-0500	505
MLSE-0600	613

① Function signal indicator 1
② Function signal indicator 2
③ Teach-Pad

Connection diagram

Cd-396

BN	1	+ (L+)
BK	4	CAN LOW
BU	3	- (M)
WH	2	CAN HIGH

Recommended accessories

Figure	Brief description	Type	Part no.
Adapters and distributors			
	CAN-USB Adapter to connect MLS with a PC	AKA-NXL1BXB12KX	6067651
	Y-cable to connect MLS to a CAN-USB Adapter and a power supply	YF8U14-011VA3FYDN2	2098412
Mounting brackets and plates			
	Bracket for low mounting, Stainless steel V2A (bracket/mounting screw), Brass (fixing screw)	BEF-WNL01MPA	2065973
	Bracket for lateral mounting, Stainless steel V2A (bracket/mounting screw), Brass (fixing screw)	BEF-WNZ01MPA	2065577
Others			
	Magnetic tape, North is top side, adhesive, width 25mm, length 50m	MAGNETIC TAPE	5337613
	Magnetic tape, South is top side, adhesive, width 25mm, length 50m	MAGNETIC TAPE	5337614
	Positioning device for magnetic markers	GAUGE	4097520
Plug connectors and cables			
	Head A: female connector, M8, 4-pin, straight Head B: open cable ends Cable: drag chain use, PUR, halogen-free, unshielded, 2 m	DOL-0804-G02MC	6025894
	Head A: female connector, M8, 4-pin, straight Head B: open cable ends Cable: drag chain use, PUR, halogen-free, unshielded, 5 m	DOL-0804-G05MC	6025895
	Head A: female connector, M8, 4-pin, angled Head B: open cable ends Cable: drag chain use, PUR, halogen-free, unshielded, 2 m	DOL-0804-W02MC	6025897
	Head A: female connector, M8, 4-pin, angled Head B: open cable ends Cable: drag chain use, PUR, halogen-free, unshielded, 5 m	DOL-0804-W05MC	6025898

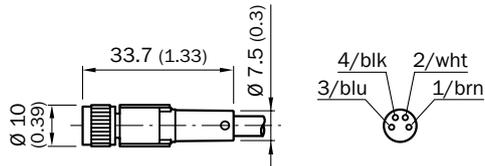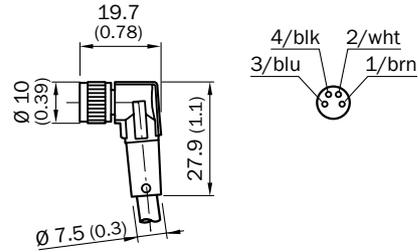## Position sensors (Dimensions in mm (inch))

BEF-WNL01MPA (2065973)
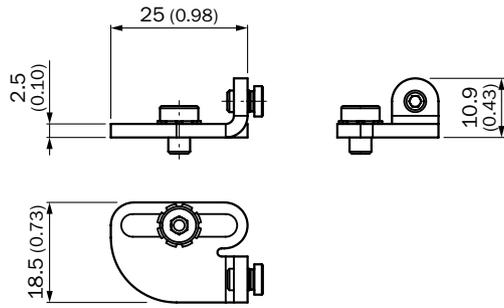
BEF-WNZ01MPA (2065577)
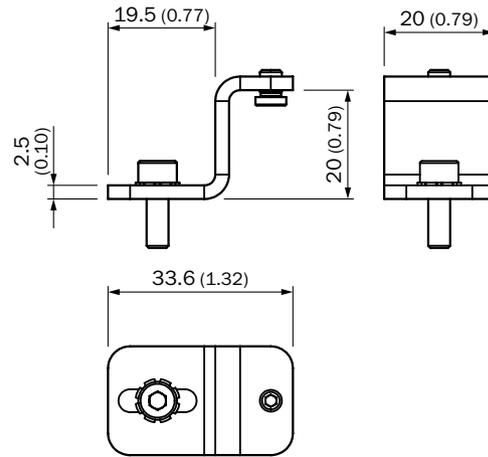
DOL-0804-G02MC (6025894)
DOL-0804-G05MC (6025895)

DOL-0804-W02MC (6025897)
DOL-0804-W05MC (6025898)

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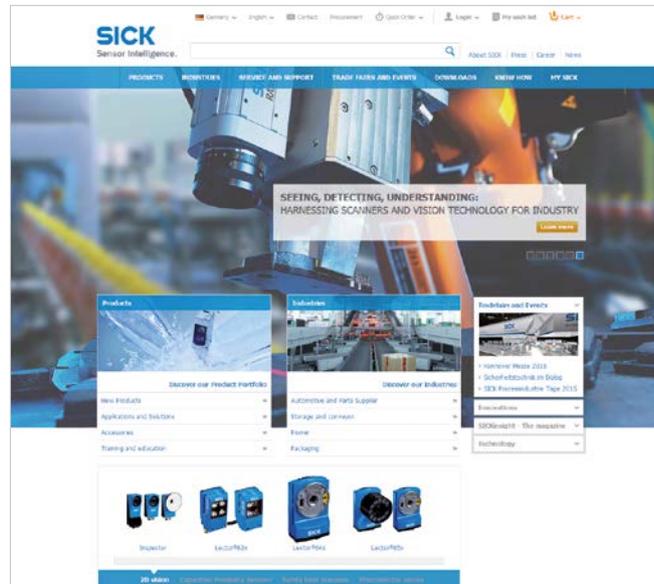
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Safe and professional

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Reliable, fast and on-site

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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 8,000 employees and over 50 subsidiaries and equity investments as well as numerous agencies worldwide, we are always close to our 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.

We have extensive experience in various industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our 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 us a reliable supplier and development partner.

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

For us, that is "Sensor Intelligence."

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

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