

scanGrid2 CANopen SG2-AAA00011CB0S01

Multibeam scanner

SICK
Sensor Intelligence.



Described product

scanGrid2 CANopen SG2-AAA00011CB0S01

Manufacturer

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Original document

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1 About this document

1.1 Information on the operating instructions

Read these operating instructions carefully before starting any work in order to familiarize yourself with the product and its functions.

The operating instructions are an integral part of the product and should remain accessible to the personnel at all times. When handing this product over to a third party, include these operating instructions.

These operating instructions do not provide information on the handling and safe operation of the machine or system in which the product is integrated. Information on this can be found in the operating instructions for the machine or system.

1.2 Scope

Product

This document applies to the following products:

- Product code: scanGrid2 CANopen SG2-AAA00011CB0S01
- "Operating instructions" type label entry: 8028157

Document identification

Document part number:

- This document: 8028159
- Available language versions of this document: 8028157

You can find the current version of all documents at www.sick.com.

1.3 Target group

This document is intended for persons who commission, install, operate and maintain the product.

1.4 Further information

You can find the product page with further information via the SICK Product ID: pid.sick.com/{P/N}/{S/N} (see "Product identification via the SICK product ID", page 9).

The following information is available depending on the product:

- This document in all available language versions
- Data sheets
- Other publications
- CAD files and dimensional drawings
- Certificates (e.g., declaration of conformity)
- Software
- Accessories

1.5 Related applicable documents

Related applicable documents from SICK

Document	Title	Part number	Source
Operating instructions	scanGrid2 CANopen	8025988	www.sick.com/8025988

1.6 Symbols and document conventions

Warnings and other notes



DANGER

Indicates a situation presenting imminent danger, which will lead to death or serious injuries if not prevented.



WARNING

Indicates a situation presenting possible danger, which may lead to death or serious injuries if not prevented.



CAUTION

Indicates a situation presenting possible danger, which may lead to moderate or minor injuries if not prevented.



NOTICE

Indicates a situation presenting possible danger, which may lead to property damage if not prevented.



NOTE

Highlights useful tips and recommendations as well as information for efficient and trouble-free operation.

Instructions to action

- ▶ The arrow denotes instructions to action.
- 1. The sequence of instructions is numbered.
- 2. Follow the order in which the numbered instructions are given.
- ✓ The tick denotes the results of an action.

2 Safety information

2.1 Basic safety notes

Please observe the safety notes and the warnings listed here and in other sections of this product documentation to reduce the possibility of risks to health and avoid dangerous situations.



CAUTION

Failure to observe the relevant work safety regulations may lead to physical injury or cause damage to the system.

Laser notes



CAUTION

If you use different operating or adjusting equipment from the operating or adjustment equipment specified in this document or if you carry out different procedures, this may lead to dangerous radiation effects.

- ▶ Only use the operating or adjusting equipment specified in this document.
- ▶ Only carry out the procedures specified in this document.
- ▶ Do not open the device.

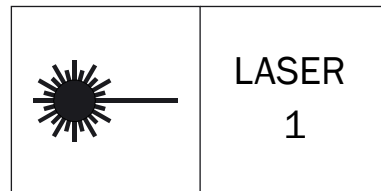


Figure 1: Laser class 1

This device complies with the following standards:

- IEC 60825-1:2014
- 21 CFR 1040.10 and 1040.11, except compliance with IEC 60825-1:2014, as described in Laser Notice No. 56 dated May 8, 2019

Further laser protection regulations that need to be observed may apply (e.g. national laws).

The laser is eye-safe.

The laser marking is located on the back of the multibeam scanner.

Mounting and electrical installation



DANGER

Death or severe injury due to electrical voltage and/or an unexpected startup of the machine

- ▶ Make sure that the machine is (and remains) disconnected from the voltage supply during mounting and electrical installation.
- ▶ Make sure that the dangerous state of the machine is and remains switched off.

Integrating the product



DANGER

Not a safety product

- ▶ Do not use as a safety component as defined in the relevant applicable safety standards for machines, e.g. Machinery Directive.
-

Repairs and modifications



DANGER

Improper work on the product

A modified product may not offer the expected protection if it is integrated incorrectly.

- ▶ Apart from the procedures described in this document, do not repair, open, manipulate or otherwise modify the product.
-

2.2 Intended use

The multibeam scanner is used for object detection.

The product is suitable for the following applications:

- Collision avoidance

The product must only be used within the limits of the prescribed and specified technical specifications and operating conditions at all times.

Incorrect use, improper modification or manipulation of the product will invalidate any warranty from SICK; in addition, any responsibility and liability of SICK for damage and secondary damage caused by this is excluded.

2.3 Improper use

Impermissible use

- As a safety component as defined in the relevant applicable safety standards for machines, e.g. Machinery Directive.
- Detection of objects that do not reflect light or reflect it incorrectly.

Impermissible ambient conditions

- Outdoor areas
- Underwater
- Explosion-hazardous area

2.4 Qualification of personnel

Any work on the product may only be carried out by personnel qualified and authorized to do so.

Qualified personnel are able to perform tasks assigned to them and can independently recognize and avoid any potential hazards. This requires, for example:

- technical training
- experience
- knowledge of the applicable regulations and standards

3 Product description

3.1 Product identification

3.1.1 Product identification via the SICK product ID

SICK product ID

The SICK product ID uniquely identifies the product. It also serves as the address of the web page with information on the product.

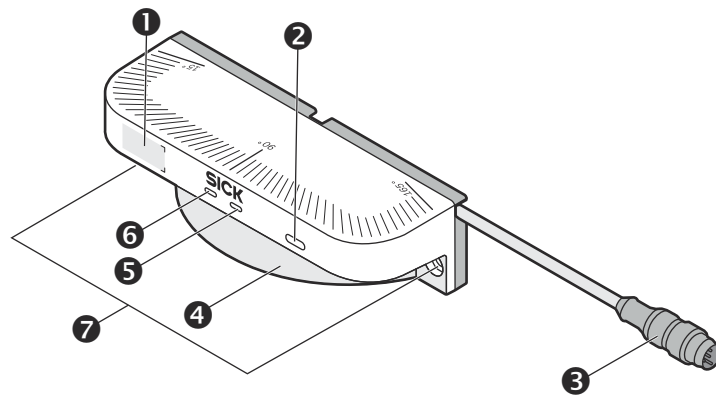
The SICK product ID comprises the host name pid.sick.com, the part number (P/N), and the serial number (S/N), each separated by a forward slash.

The SICK product ID is displayed as text and QR code on the type label and/or on the packaging.



Figure 2: SICK product ID

3.2 Device overview



- ❶ Near Field Communication (NFC) interface
- ❷ USB connection
- ❸ System connection
- ❹ Front screen
- ❺ STATE LED
- ❻ OUT-LED
- ❼ Fixing holes

3.3 Structure and function

Overview

The multibeam scanner detect objects that are located in a configurable detection zone in front of it. The device scans the environment in two dimensions using infrared laser beams.

The multibeam scanner operates on the principle of optical time-of-flight measurement. It emits light pulses in regular, very short intervals. When the light is reflected from an object, the multibeam scanner calculates the distance to the object based on the period of time between transmission and reception (Δt).

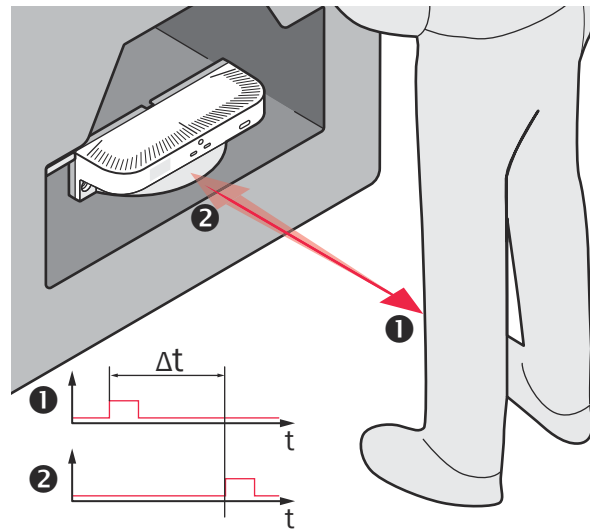


Figure 3: Principle of optical time-of-flight measurement

- ❶ Transmitted light pulse
- ❷ Reflected light pulse

How the detection zone works

The multibeam scanner detects objects within configurable detection fields.

The multibeam scanner uses 8 geometrically arranged sensor modules to build up a gapless detection zone. Each sensor module has its own light source that emits a light pulse. The light pulse of each sensor module is divided into 4 segments, so the detection zone of the multibeam scanner consists of 32 segments. The 32 segments are numbered from left (1) to right (32) (when viewing the sensor from above, see [figure 4, page 11](#)).

The multibeam scanner polls each sensor module in turn for the measurement results. The total time required to poll all sensor modules determines the scan cycle time.

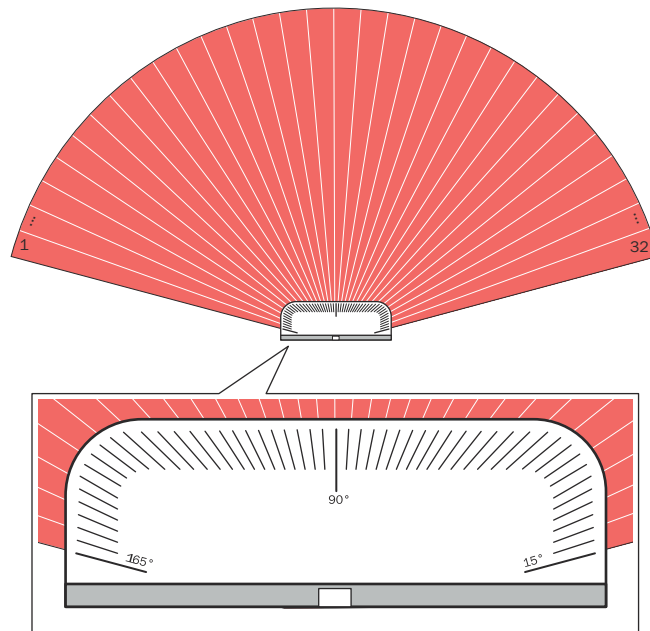


Figure 4: Detection zone consisting of 32 segments

Geometry of the scan plane

The emitted laser beams cover a sector of a circle, so an object can be detected in an area of up to 150° as soon as it is completely within the detection field.

The sector of a circle that is covered ranges from 15° to 165°, where 90° corresponds to the central axis of the device.

The vertical position of the scan plane corresponds approximately to the centers of the fixing holes.

The multibeam scanner measures the distance to objects relative to the front screen.

3.4 Difference to safe multibeam scanner

Important notes



DANGER
Not a safety product

- ▶ Do not use as a safety component as defined in the relevant applicable safety standards for machines, e.g. Machinery Directive.

Difference to safe multibeam scanner

Table 1: Difference to safe multibeam scanner

scanGrid2 CANopen safe multibeam scanner	scanGrid2 CANopen multibeam scanner SG2-AAA00011CB0S01 ¹⁾
SAFE OUT LED	OUT-LED
Safety output	Switching output
Protective field	Detection field
Warning field	Warning field

¹⁾ Both variants have the same designation in the Safety Designer. The scanGrid2 CANopen SG2-AAA00011CB0S01 multibeam scanner is not a safety product

Further topics

- ["Related applicable documents", page 5](#)

4 Mounting

Important notes



NOTE

Information is included in the operating instructions of the scanGrid2 CANopen.

Further topics

- ["Related applicable documents", page 5](#)

5 Electrical installation

Important notes



NOTE

Information is included in the operating instructions of the scanGrid2 CANopen.

Further topics

- ["Related applicable documents", page 5](#)

6 Configuration

Important notes



NOTE

Information is included in the operating instructions of the scanGrid2 CANopen.

Discrepant designations in the Safety Designer

The detection field is labeled as a protective field in the Safety Designer even though it is not suitable for safety functions.

The data that are output, including the SRDOs, are not suitable for safety functions.

Further topics

- ["Related applicable documents", page 5](#)

7 Operation

Important notes



NOTE

Information is included in the operating instructions of the scanGrid2 CANopen.

Further topics

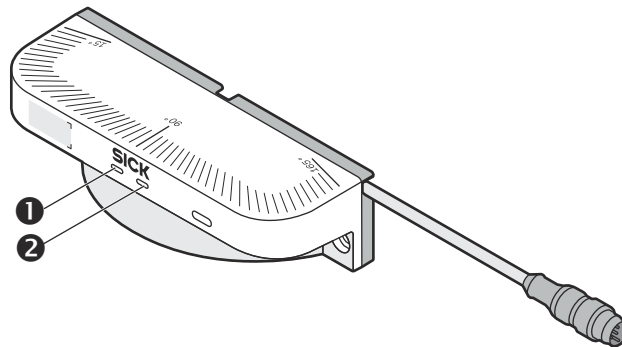
- ["Related applicable documents", page 5](#)

7.1 LEDs

Overview

The multibeam scanner has a STATE LED and an OUT LED.

The OUT LED indicates the state of the switching output (ON or OFF). The STATE LED indicates the status or error on the device.



- ❶ OUT-LED
- ❷ STATE LED

Table 2: LEDs

Number	Name	Function	LED state (color)	Meaning
❶	OUT-LED	Indicates the state of the switching output, which the device outputs.	● Green	ON state: The switching output is in the ON state.
			● Red	OFF state: The switching output is in the OFF state.
❷	STATE LED	Indicates the status of the device.	● Green	ON state: The device is in normal mode. The device has been configured correctly and the configuration is verified. There is no error, no warning and no interruption of the active warning field. The restart delay is not active.
			● Yellow	Interruption of the active warning field
			○ Off	Sleep mode or safety function stopped
			● Red ● Green Flashing red and green alternately	Device was identified in Safety Designer.
			● Red Flashing red	Device error
			● Yellow Flashing yellow (3 Hz)	Recoverable error
			● Red ● Yellow Flashing red and yellow alternately	The device is not configured or an error has been detected in the configuration.
			● Yellow ● Green Flashing yellow and green alternately	The device is configured, but the configuration is not verified.
			● Green Flashing green (3 Hz)	Restart delay active
			● Yellow Flashing yellow (1 Hz)	Contamination warning
● Green Flashing green (1 Hz)	Test mode (for testing an unverified configuration)			

○ LED off. ● LED flashes. ● LED illuminates.

8 Maintenance

Important notes



NOTE

Information is included in the operating instructions of the scanGrid2 CANopen.

Further topics

- ["Related applicable documents", page 5](#)

9 Troubleshooting

Important notes



NOTE

Information is included in the operating instructions of the scanGrid2 CANopen.

Further topics

- ["Related applicable documents", page 5](#)

10 Decommissioning

10.1 Disposal

Procedure

- ▶ Always dispose of unusable devices in accordance with national waste disposal regulations.



Complementary information

SICK will be glad to help you dispose of these devices on request.

11 Technical data

11.1 Data sheet

Table 3: General data

Detection field	≤ 1.1 m (for an object resolution of 70 mm), details:
Warning field	≤ 4.0 m ¹⁾
fields	≤ 16
Field sets	≤ 8
Monitoring cases	≤ 8
Scanning angle	150° (15° ... 165°)
Object resolution	50 mm, 70 mm, 150 mm, 200 mm
Maximum object speed	1.6 m/s
Angular resolution	$\leq 6^\circ$
Vertical aperture angle	$\leq 4^\circ$
Response time	≤ 63 ms + $t_{\text{CANtransmission}}$ (for multiple sampling = 1), details: "Response time", page 24
Scan cycle time	≤ 46 ms
Switch-on delay of the switching output or detection field status	< 190 ms + $t_{\text{CANtransmission}}$
Duration of monitoring case switching t_{CSR}	≤ 20 ms + $2 \times t_{\text{CANtransmission}}$
Generally necessary detection field supplement (TZ = tolerance zone of the multibeam scanner)	100 mm
Additional detection field supplement Z_E for background-related measurement error	220 mm
Multiple sampling	1 ... 4

¹⁾ At a minimum object size of 70 mm and a remission of 80%.

Table 4: Interfaces

Automatic restart of the switching output after	Immediately or between 2 s ... 60 s (configurable)
Length of cable for system connection ¹⁾	
For a baud rate of 1,000 kBit/s	≤ 30 m
Cable type to be connected	Twisted pairs with copper braid screen
Impedance of the cable to be connected	108 Ω ... 132 Ω (typ. 120 Ω)
Terminator	External
CAN interface	

Baud rate	Configurable: <ul style="list-style-type: none"> • 10 kBit/s • 20 kBit/s • 50 kBit/s • 125 kBit/s • 250 kBit/s • 500 kBit/s • 1,000 kBit/s
Address range (node ID) ²⁾	1 ... 127 (configurable)
USB interface for configuration and diagnostics	
Connection type	USB 2.0 Type-C
Transmission rate	12 Mbit/s (Full Speed)
Length of cable	≤ 5 m

1) For a conductor cross section of 0.25 mm².

2) When transmitting distance values using the objects TPD02 to TPD09, there must be no node IDs > 63 within the network.

Table 5: Electrical data

Operating data	
Protection class	III (IEC 61140)
Supply voltage V_S	24 V DC (8.4 V ... 30 V DC) (SELV/PELV) ^{1) 2) 3)}
Residual ripple	± 10% ⁴⁾
Power consumption (maximum value)	≤ 3 W
Average power consumption during a scan cycle	≤ 2 W
Power consumption in sleep mode	≤ 1 W
Power-up time	≤ 2 s
Galvanic separation	No
CAN signal	
Signal level	In accordance with ISO11898-2 (high speed CAN)
Common-mode operating range	-25 V ... 25 V
Error tolerance for CAN_HI/ CAN_LO	-30 V ... 30 V ⁵⁾

1) The power supply unit must be able to jumper a brief power failure of 20 ms as specified in IEC 60204-1. Suitable power supply units are available as accessories from SICK.

Battery-powered systems must be able to jumper brief power failures of 5 ms.

2) A fuse with a maximum rated current of 2 A (slow blow) must be installed in the power supply circuit to the device in order to limit the available current.

3) The system is intended for operation with power sources with a nominal voltage of 12 V to 24 V.

4) The voltage level must not fall below the specified minimum voltage.

5) Every CAN bus node must be supplied with a maximum supply voltage of 30 V. If the supply voltage is > 30 V (e.g., 48 V battery system), measures must be taken to limit the CAN voltage to < 30 V in the event of a fault.

Table 6: Mechanical data

Dimensions (W × H × D)	160 mm x 43 mm x 56 mm
Weight	0.17 kg
Housing material	Durabio (front part, black) Polycarbonate (back part, colza yellow)

Housing color	RAL 9005 (black) and RAL 1021 (colza yellow)
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Table 7: Ambient data

Enclosure rating ¹⁾	IP65 (IEC 60529)
Ambient light immunity	≤ 10 klx ²⁾
Ambient operating temperature	0 °C ... 50 °C
Storage temperature	-30 °C ... 70 °C
Air humidity	15% ... 95%, non-condensing
Height above sea level during operation	≤ 3,000 m
EMC	According to IEC 61000-6-2, IEC 61000-6-3
Vibration resistance ³⁾	
Standards	<ul style="list-style-type: none"> • IEC 60068-2-6 • IEC 60068-2-64 • IEC 60721-3-5 • IEC TR 60721-4-5
Class	5M1 (IEC 60721-3-5)
Sinusoidal vibrations	<ul style="list-style-type: none"> • 0.35 mm, 50 m/s², 10 Hz ... 55 Hz • 1.5 mm, 2 Hz ... 9 Hz • 5 m/s², 9 Hz ... 200 Hz
Noise vibrations	<ul style="list-style-type: none"> • 0.5 m²/s³, 5 Hz ... 200 Hz • 0.1 m²/s³, 200 Hz ... 500 Hz
Shock resistance	
Standards	<ul style="list-style-type: none"> • IEC 60068-2-27 • IEC 60721-3-5 • IEC TR 60721-4-5
Class	5M1 (IEC 60721-3-5)
Single shock	50 m/s ² , 11 ms
Continuous shock	100 m/s ² , 16 ms

1) The specified enclosure rating only applies when the USB connection is sealed with the protective cover.

2) Against indirect ambient light (reflected from the background) according to IEC 61496-3: ≤ 1,500 lx

3) For direct mounting.

Table 8: Miscellaneous data

Type of light	Pulsed laser diode
Wavelength	850 nm
Detectable remission factor	10% ... several 1,000%
Maximum uniform contamination of the front screen without reducing the detection capability ¹⁾	30%
Area where detection capability is restricted	≤ 50 mm ²⁾
Pulse duration	Typ. 1.5 ns
Laser class	1 ³⁾

Measurement error with measurement data output	Typ. ± 60 mm
--	--------------

- 1) In the event of strong contamination, the multibeam scanner indicates a contamination error and switches the switching output to the OFF state and the detection field status to the "Interrupted" status.
- 2) In close proximity (50 mm-wide area in front of the front screen), the detection capability of the multibeam scanner may be restricted.
- 3) This laser product is rated as a class 1 laser according to IEC 60825-1:2014. In some cases, evaluation is required according to the older IEC 60825-1:2007 standard, e.g. by employers in the EU according to Directive 2006/25 / EC. According to the older IEC 60825-1:2007 standard, laser class 1M must be used as the basis.

11.2 Response time

Overview

The response time of the multibeam scanner is the maximum time between the occurrence of the event leading to the response of the sensor and the provision of the switch-off signal to the interface of the multibeam scanner (for example the OFF state of the switching output).

In addition to the response time of the multibeam scanner, further signal transmission and processing also influence the time until the end of the dangerous state. This includes a control's processing time and the response times of downstream contactors, for example.

Response time

The response time of the multibeam scanner depends, among other things, on the set multiple sampling.

You can calculate the response time using the following formula:

$$t_R = n \times t_{SC} + t_{RO} + t_{CANtransmission}$$

Where:

- t_R = Response time of the multibeam scanner
- n = Multiple sampling setting (default: $n = 1$)
- t_{SC} = Scan cycle time (≤ 46 ms)
- t_{RO} = Supplement for the response time (≤ 17 ms)
- $t_{CANtransmission}$ = Time for the CAN transmission of the PDO/SRDO in milliseconds

$t_{CANtransmission}$ depends on the following configuration settings:

- Configured baud rate
- CAN bus load
- For PDO: transmission type (event-driven or synchronous)
- For PDO: configured inhibit time
- For SRDO: configured refresh time / safeguard cycle time (SCT)

Calculation example:

- $t_R = 1 \times 46 \text{ ms} + 17 \text{ ms} + 2 \text{ ms} = 65 \text{ ms}$ ($n = 1$, $t_{CANtransmission} = 2 \text{ ms}$)
- $t_R = 2 \times 46 \text{ ms} + 17 \text{ ms} + 2 \text{ ms} = 111 \text{ ms}$ ($n = 2$, $t_{CANtransmission} = 2 \text{ ms}$)

11.3 Detection field scanning range

The effective detection field scanning range depends on the object resolution that has been set.

Table 9: Detection field scanning range

Resolution	Detection field scanning range ⁴⁾
200 mm	1.35 m
150 mm	1.30 m

Resolution	Detection field scanning range ¹⁾
70 mm	1.10 m
50 mm	0.90 m

1) Includes the generally necessary TZ supplement.

11.4 Dimensional drawings

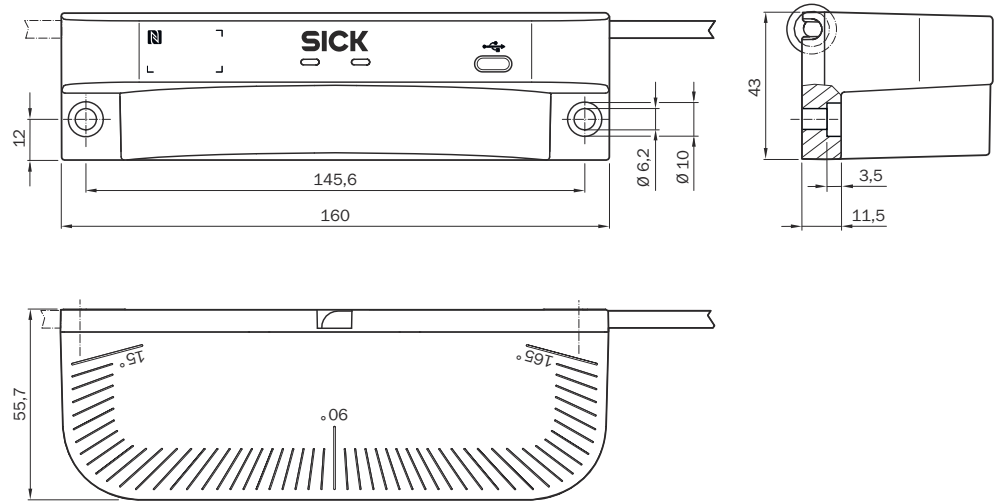


Figure 5: Dimensional drawing

12 Ordering information

12.1 Scope of delivery

- Multibeam scanner
- USB protective cover
- Safety note
- Mounting instructions
- Operating instructions for download: www.sick.com

12.2 Ordering information

Table 10: Ordering information

Designation	Type code	Part number
scanGrid2 CANopen multibeam scanner SG2-AAA00011CB0S01	SG2-AAA00011CB0S01	1131078

13 Annex

13.1 Conformities and certificates

You can obtain declarations of conformity, certificates, and the current operating instructions for the product at www.sick.com. To do so, enter the product part number in the search field (part number: see the entry in the “P/N” or “Ident. no.” field on the type label).

13.1.1 EU declaration of conformity

Excerpt

The undersigned, representing the manufacturer, herewith declares that the product is in conformity with the provisions of the following EU directive(s) (including all applicable amendments), and that the standards and/or technical specifications stated in the EU declaration of conformity have been used as a basis for this.

- ROHS DIRECTIVE 2011/65/EU
- MACHINERY DIRECTIVE 2006/42/EC
- RE DIRECTIVE 2014/53/EU

13.1.2 UK declaration of conformity

Excerpt

The undersigned, representing the following manufacturer herewith declares that this declaration of conformity is issued under the sole responsibility of the manufacturer. The product of this declaration is in conformity with the provisions of the following relevant UK Statutory Instruments (including all applicable amendments), and the respective standards and/or technical specifications have been used as a basis.

- Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012
- Supply of Machinery (Safety) Regulations 2008
- Radio Equipment Regulations 2017

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