

deTec4 Core Ex

Safety light curtain



Described product

deTec4 Core Ex

Manufacturer

SICK AG
Erwin-Sick-Str. 1
79183 Waldkirch
Germany

Legal information

This work is protected by copyright. Any rights derived from the copyright shall be reserved for SICK AG. Reproduction of this document or parts of this document is only permissible within the limits of the legal determination of Copyright Law. Any modification, abridgment or translation of this document is prohibited without the express written permission of SICK AG.

The trademarks stated in this document are the property of their respective owner.

© SICK AG. All rights reserved.

Original document

This document is an original document of SICK AG.



Contents

1	About this document.....	6
1.1	Scope.....	6
1.2	Target groups and structure of these operating instructions.....	6
1.3	Additional information.....	7
1.4	Symbols and document conventions.....	7
2	Safety information.....	9
2.1	General safety notes.....	9
2.2	Correct use.....	9
2.3	Requirements for the qualification of personnel.....	11
3	Product description.....	13
3.1	Structure and function.....	13
3.2	Product characteristics.....	14
3.2.1	Automatic calibration of the protective field width.....	14
3.2.2	Status indicators.....	14
3.3	Example applications.....	16
4	Project planning.....	18
4.1	Manufacturer of the machine.....	18
4.2	Operator of the machine.....	18
4.3	Design.....	18
4.3.1	Scanning range and protective field width.....	19
4.3.2	Minimum distance from the hazardous point.....	19
4.3.3	Minimum distance to reflective surfaces.....	22
4.3.4	Protection against interference from systems in close proximity to each other.....	23
4.4	Integration in electrical control.....	24
4.4.1	Restart interlock.....	26
4.4.2	External device monitoring (EDM).....	27
4.4.3	Connection diagrams.....	27
4.5	Testing plan.....	28
4.5.1	Test rod check.....	29
4.5.2	Visual check of the machine and the protective device.....	30
5	Mounting.....	32
5.1	Safety.....	32
5.2	Unpacking.....	33
5.3	Installation.....	33
5.3.1	Mount the safety light curtain in the explosion-proof enclosure (only if the safety light curtain is used in North America).....	35
5.3.2	Mount the optional cable gland.....	36
5.3.3	Mount the handles to the cover of the explosion-proof enclosure.....	37

5.3.4	Mount the safety light curtain.....	37
6	Electrical installation.....	44
6.1	Safety.....	44
6.2	System connection (M12, 5-pin).....	46
6.3	System connection via connection cable (M12, 5-pin to 8-pin).....	47
7	Commissioning.....	48
7.1	Safety.....	48
7.2	Overview.....	48
7.3	Switching on.....	48
7.4	Alignment of the sender and receiver.....	49
7.4.1	Aligning the sender and receiver.....	49
7.4.2	Alignment with the alignment bracket.....	50
7.4.3	Indication of the alignment quality.....	51
7.5	Check during commissioning and modifications.....	52
8	Operation.....	53
8.1	Safety.....	53
8.2	Regular thorough check.....	53
9	Maintenance.....	54
9.1	safety.....	54
9.2	Regular cleaning.....	54
9.3	Regular thorough check.....	56
10	Troubleshooting.....	57
10.1	Safety.....	57
10.2	Diagnostic LEDs.....	57
10.2.1	Fault indicators.....	57
11	Decommissioning.....	60
11.1	Protection of the environment.....	60
11.2	Disposal.....	60
12	Technical data.....	61
12.1	Data sheet.....	61
12.2	Response time.....	63
12.3	Power consumption.....	63
12.4	Table of weights.....	63
12.5	Dimensional drawings.....	64
13	Ordering information.....	68
13.1	Scope of delivery.....	68
13.2	Ordering information deTec4 Core Ex.....	68
14	Accessories.....	69
14.1	Brackets.....	69

14.2	Mounting accessories.....	70
14.3	Connectors.....	70
14.4	Alignment aid.....	71
14.5	Deflector mirrors.....	71
14.5.1	Function and use.....	71
14.5.2	Mounting.....	72
14.5.3	Change in scanning range using deflector mirrors.....	72
14.5.4	Deflector mirror PNS75 - ordering information.....	72
14.5.5	Deflector mirror PSN125 - ordering information.....	72
14.6	Test rods.....	72
15	Annex.....	73
15.1	Compliance with EU directives.....	73
15.2	Note on specified standards.....	74
15.3	Checklist for initial commissioning and commissioning.....	75
16	List of figures.....	76
17	List of tables.....	77

1 About this document

These operating instructions contain information required during the life cycle of the safety light curtain.

These operating instructions are available to all those who work with the safety light curtain.

Please read these operating instructions carefully and make sure that you understand the content fully before working with the safety light curtain.

1.1 Scope

These operating instructions only apply to the deTec4 Core Ex safety light curtain with one of the following type label entries in the “Operating Instructions” field:

- 8017107
- 8017107/YIZ2

This document is included with the following SICK part numbers (this document in all available language versions):

8017107/ZOH3

1.2 Target groups and structure of these operating instructions

These operating instructions are intended for the following target groups: Project developers (planners, developers, designers), installers, electricians, safety experts (e.g., CE authorized representatives, compliance officers, persons who test and approve the application), operators, and maintenance personnel.

The structure of these operating instructions is based on the life cycle phases of the safety light curtain: Project planning, mounting, electrical installation, commissioning, operation, and maintenance.

In many applications, the target groups are assigned as follows to the manufacturer and the organization operating the machine in which the safety light curtain is integrated:

Area of responsibility	Target group	Special chapters of these operating instructions ¹⁾
Manufacturer	Project developers (planners, developers, designers)	Project planning, page 18 Technical data, page 61 Accessories, page 69
	Installers	Mounting, page 32
	Electricians	Electrical installation, page 44
	Safety specialists	Project planning, page 18 Commissioning, page 48 Technical data, page 61 Checklist for initial commissioning and commissioning, page 75
Operating company	Operator	Operation, page 53 Troubleshooting, page 57
	Maintenance personnel	Maintenance, page 54 Troubleshooting, page 57 Ordering information, page 68

¹⁾ Chapters not listed here are intended for all target groups. All target groups must take into account the safety and warning instructions of the complete operating instructions!

In other applications, the operating organization is also the manufacturer of the equipment with the corresponding allocation of the target groups.

1.3 Additional information

www.sick.com

The following information is available on the Internet:

- This document in other languages
- Data sheets and application examples
- CAD data of drawings and dimensional drawings
- Certificates (e.g. EU declaration of conformity)
- Guide for Safe Machinery Six steps to a safe machine

1.4 Symbols and document conventions

The following symbols and conventions are used in this document:

Safety notes 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

Indicates useful tips and recommendations.

Instructions to action

- The arrow denotes instructions to action.
- 1. The sequence of instructions for action is numbered.
- 2. Follow the order in which the numbered instructions are given.
- ✓ The check mark denotes the result of an instruction.



LED symbols

These symbols indicate the status of an LED:

- The LED is off.
- ◐ The LED is flashing.
- The LED is illuminated continuously.

Sender and receiver

These symbols indicate the sender and receiver of the device:

-  The symbol indicates the sender.
-  The symbol indicates the receiver.

2 Safety information

This chapter contains information on general safety for the safety light curtain.

More safety information about specific usage situations of the safety light curtain is available in the respective chapters.

2.1 General safety notes



DANGER

Hazard due to lack of effectiveness of the protective device

In the case of non-compliance, it is possible that the dangerous state of the machine may not be stopped or not stopped in a timely manner.

- ▶ Please read this document carefully and make sure that you understand the content fully before working with the device.
- ▶ Follow all safety notes in this document.



WARNING

Risk of ineffectiveness of the protective device

Please observe the following information to ensure that you are using the deTec4 Core Ex safety light curtain safely and correctly.

- ▶ National and international regulations and guidelines must be observed when mounting, using, and commissioning electrical devices as well as when carrying out regular technical inspections in explosion-hazardous areas. Article 500 of the National Electrical Code and ATEX Directive 2014/34/EU shall apply in particular. Manufacturers and operators of machines using safety light curtains are responsible for ensuring that all applicable safety regulations and guidelines are complied with.
- ▶ These operating instructions must be made available to the operator of the machine on which the safety light curtain is used. Qualified safety personnel must instruct the operator in how to use the device. The operator must also be directed to read and follow the operating instructions.



NOTE

SICK provides more information about the following explosion-proof connections:

- Joint between glass and cover
- Joint between cover and explosion-proof enclosure

2.2 Correct use

Overview

The deTec4 Core Ex safety light curtain is an electro-sensitive protective device (ESPE) and is suitable for the following applications:

- Hazardous point protection
- Access protection
- Hazard area protection

The deTec4 Core Ex safety light curtain is suitable for use in enclosed spaces only. It has UL/cUL certification for the following hazardous areas defined in the National Electrical Code® and Canadian Electrical Code®:

- Class I, groups C, D
- Class II, groups E, F, G
- Class III

The deTec4 Core Ex safety light curtain also complies with these standards: EN 60079-0:2012/A11:2013/IEC 60079-0 Edition 6.0, EN 60079-1:2014/ IEC 60079-1 Edition 7.0, EN 60079-31:2014/IEC 60079-31 Edition 2.0 and is certified for the following hazardous areas:

- Ⓜ II 2 G Ex db IIB T6
- Ⓜ II 2 D Ex tb IIIC T56 °C Db IP6X
- Ex db IIB T6
- Ex tb IIIC T56 °C Db IP6X

DEMKO 14 ATEX 1315X
IECEX UL 14.0034X

The deTec4 Core Ex safety light curtain does not emit any substances which hinder paint coating, any volatile silicones or any solid parts or materials into its surroundings.

The deTec4 Core Ex safety light curtain must only be used within the limits of the prescribed and specified technical data and operating conditions at all times.

Any instance of improper use, incorrect modification, or manipulation of the deTec4 Core Ex safety light curtain shall void any warranty provided by SICK AG; furthermore, SICK AG shall not accept any responsibility or liability for any resulting damage and consequential damage.

Important information



DANGER

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

The safety light curtain works as an indirect protective measure and cannot provide protection from parts thrown out nor from emitted radiation. Transparent objects are not detected.

- ▶ Only use the safety light curtain as an indirect protective measure.
-



DANGER

Risk of ignition

Failure to observe this information could result in a risk of ignition.

- ▶ The sender, receiver, and cables delivered with the deTec4 Core safety light curtain are not explosion-proof. The person purchasing, assembling, and using the safety light curtain is responsible for fitting the cables in suitable explosion-proof conduits and/or cable glands to ensure the integrity of the system.
 - ▶ The type label on each individual explosion-proof enclosure contains information on the device's hazardous area class and group. Every device that penetrates the explosion-proof enclosure must be suitable for the environment in which the explosion-proof enclosure is installed with regard to its hazardous area class and group or zone.
-

**DANGER**

Risk of ignition

Failure to observe this information could result in a risk of ignition.

- ▶ If the safety light curtain is used in an environment classified as tb IIIC, tc IIIB or tc IIIC the cover must not be removed, not even temporarily (e.g. for maintenance purposes).

**DANGER**

Risk of ignition

Failure to observe this information could result in a risk of ignition.

Only if the safety light curtain is used outside North America:

- ▶ A cable gland must be mounted.
- ▶ The cable gland must be certified for d and tb environments.

**DANGER**

Risk of ignition

Failure to observe this information could result in a risk of ignition.

Only if the safety light curtain is used in North America:

- ▶ Any conduit openings that are not in use must be sealed. Sealing fittings must turn at least five (5) full revolutions and be at least 3.175 mm thick (1/8 of an inch).
- ▶ Conduit sealing fittings must be applied in each installed conduit run (located a maximum of 457 mm (18 inches) away from the explosion-proof enclosure) in order to comply with the provisions of the most recent version of the National Electrical Code, Article 501.15 and/or 502.15, and all other applicable regulations.

Foreseeable misuse

Among others, the deTec4 Core Ex safety light curtain is **not** suitable for the following applications:

- Outdoors
- Underwater
- At altitudes over 3,000 m above sea level NHN
- In environments with enhanced ionizing radiation

2.3 Requirements for the qualification of personnel

The safety light curtain must be configured, installed, connected, commissioned and serviced only by qualified safety personnel.

Project planning

For project planning, a person is considered competent when he/she has expertise and experience in the selection and use of protective devices on machines and is familiar with the relevant technical rules and national work safety regulations.

Mechanical mounting

For mechanical mounting, a person is considered competent when he/she has the expertise and experience in the relevant field and is sufficiently familiar with the application of the protective device on the machine that he/she can assess its operational safety status.

Electrical installation

For electrical installation, a person is considered competent when he/she has the expertise and experience in the relevant field and is sufficiently familiar with the application of the protective device on the machine that he/she can assess its operational safety status.

Commissioning

For commissioning, a person is considered competent when he/she has the expertise and experience in the relevant field and is sufficiently familiar with the application of the protective device on the machine that he/she can assess its operational safety status.

Operation and maintenance

For operation and maintenance, a person is considered competent when he/she has the expertise and experience in the relevant field and is sufficiently familiar with the application of the protective device on the machine and has been instructed by the machine operator in its operation.

Maintenance and thorough checks may only be carried out by qualified and trained personnel, who are familiar with the regulations and provisions for potentially explosive atmospheres, in particular with:

- Ignition protection types
- Installation regulations
- Regulations on distances which must be complied with.

An operator must clean the safety light curtain. Additional information for the operator of the machine: [see "Operation", page 53](#), and [see "Regular cleaning", page 54](#).

3 Product description

This chapter provides information on the operation of the safety light curtain and shows examples of its range of use.

3.1 Structure and function

Overview

The deTec4 Core Ex safety light curtain is an electro-sensitive protective device (ESPE) consisting of a sender and receiver.

A series of parallel infrared light beams form a protective field between sender and receiver that protects the hazardous area (hazardous point, access, and hazardous area protection). When one or more beams are completely interrupted, the safety light curtain reports the interruption in the light path to the secure output signal switching devices (OSSDs) by a signal change. The machine or its control must safely analyze the signals (for example using a safe control or safety relays) and stop the dangerous state.

Sender and receiver automatically synchronize themselves optically. An electrical connection between both components is not required.

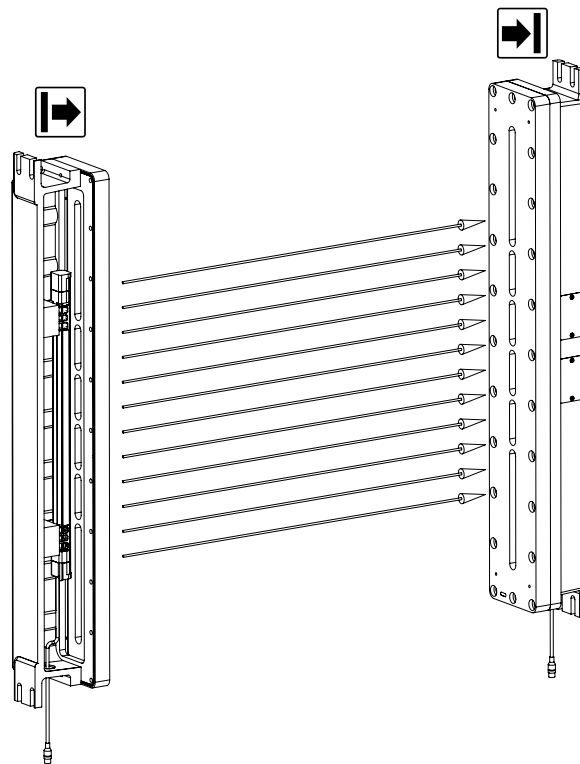


Figure 1: Sender and receiver

Protective field height

The protective field height indicates the range within which the test rod belonging to the safety light curtain is reliably detected. The size of the safety light curtain determines the protective field height.

Protective field width

The protective field width is the dimension of the light path between sender and receiver. The maximum protective field width is limited by the scanning range.

Resolution

The resolution describes the size of the smallest object detected by the safety light curtain in the protective field. The resolution corresponds to the diameter of the test rod belonging to the safety light curtain, which is reliably detected when in the protective field.

The safety light curtain has a resolution of 30 mm. This resolution provides hand protection.

Scanning range

The deTec4 Core Ex safety light curtain is available with a protective field height of 600, 900, 1,200, and 1,500 mm. It has a range of 0 m to 8 m.

The scanning range is reduced by using deflector mirrors.

Further topics

- ["Data sheet", page 61](#)
- ["Deflector mirrors", page 71](#)

3.2 Product characteristics

3.2.1 Automatic calibration of the protective field width

When switched on, the safety light curtain automatically calibrates to the protective field width.

3.2.2 Status indicators

The sender and receiver LEDs indicate the operating status of the safety light curtain.

Sender indicators

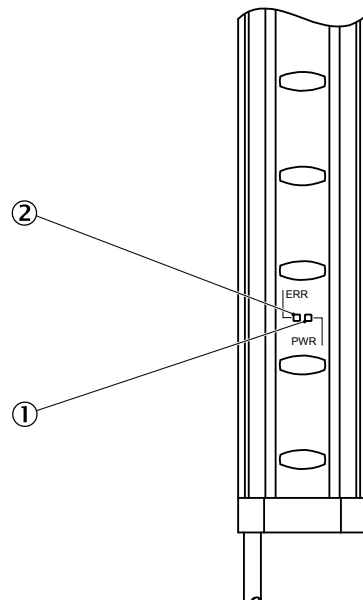


Figure 2: Sender indicators

Two light emitting diodes on the sender indicate the operational status:

Position	LED color	Indication	Labeling
①	Yellow	Status indicator	PWR
②	Red	Fault indicator	ERR

Complete overview of the LED statuses and their meanings: see "Diagnostic LEDs", page 57.

Receiver indicators

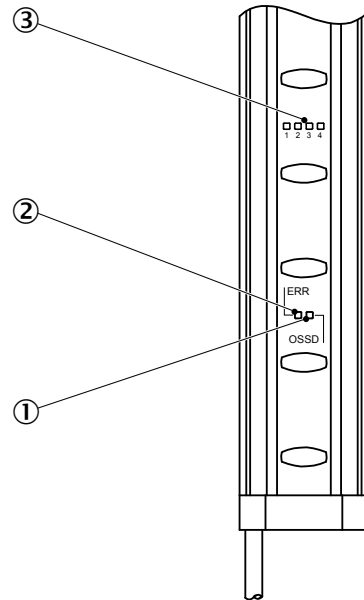


Figure 3: Receiver indicators

Six light emitting diodes on the receiver indicate the operational status:

Position	LED color	Indication	Labeling
①	Red/green	OSSD status	OSSD
②	Red	Fault indicator	ERR
③	Blue	Alignment quality	1, 2, 3, 4

The blue alignment quality LEDs in combination with the red flashing ERR LED also denote fault indications.

Complete overview of the LED statuses and their meanings: see "Diagnostic LEDs", page 57.

3.3 Example applications

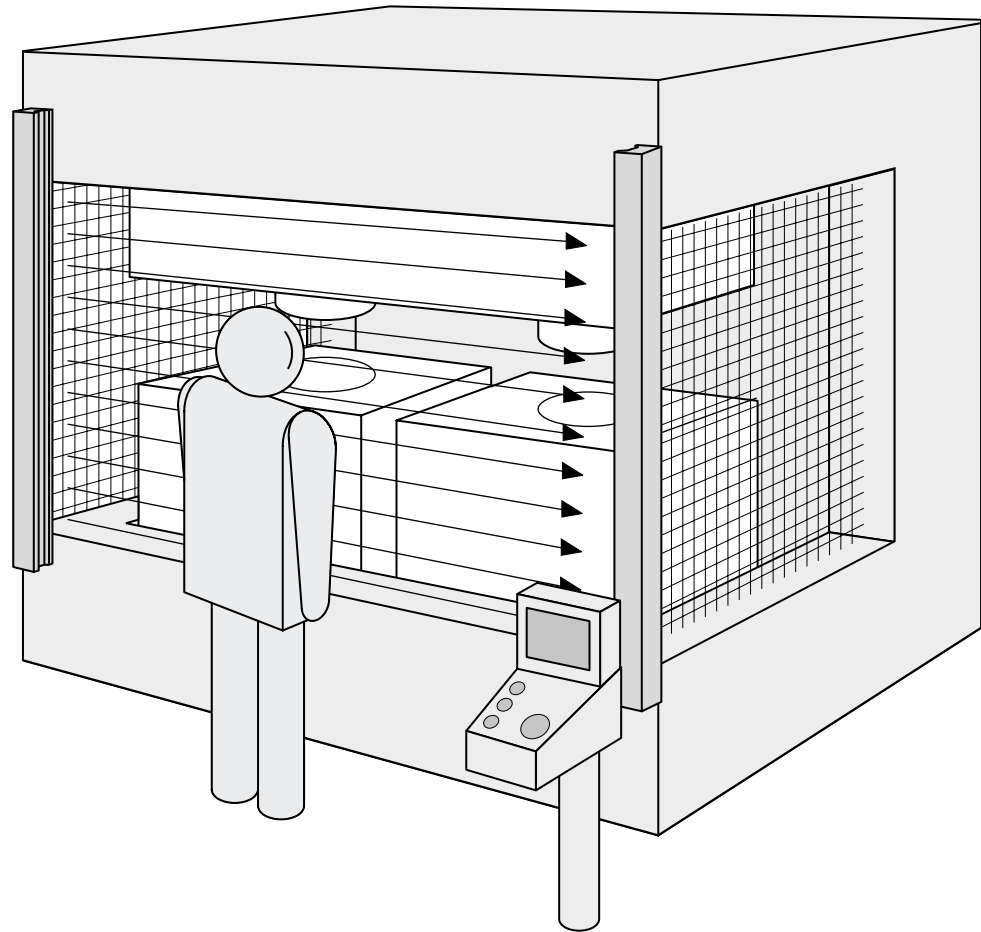


Figure 4: Hazardous point protection

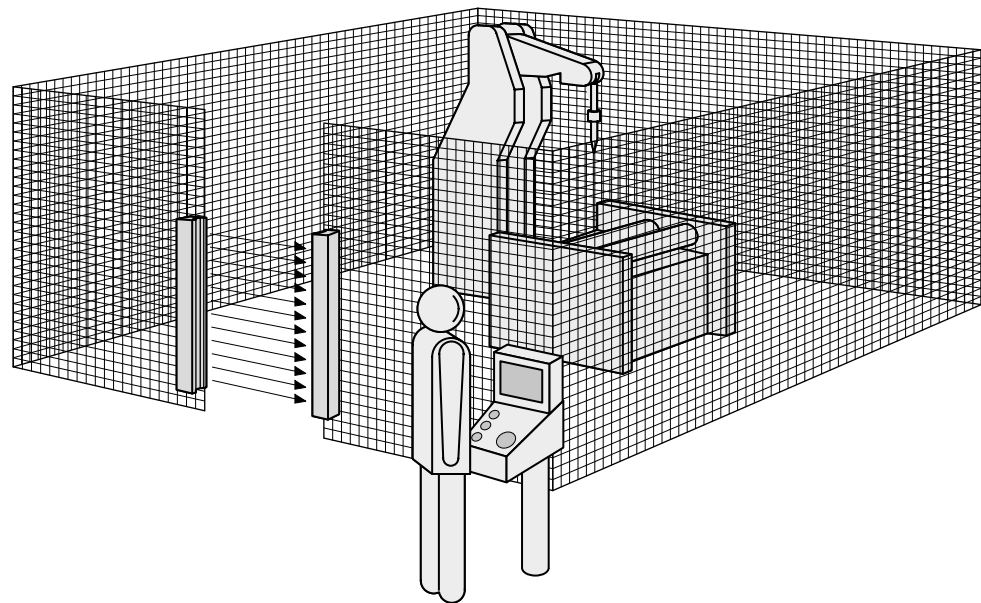


Figure 5: Access protection

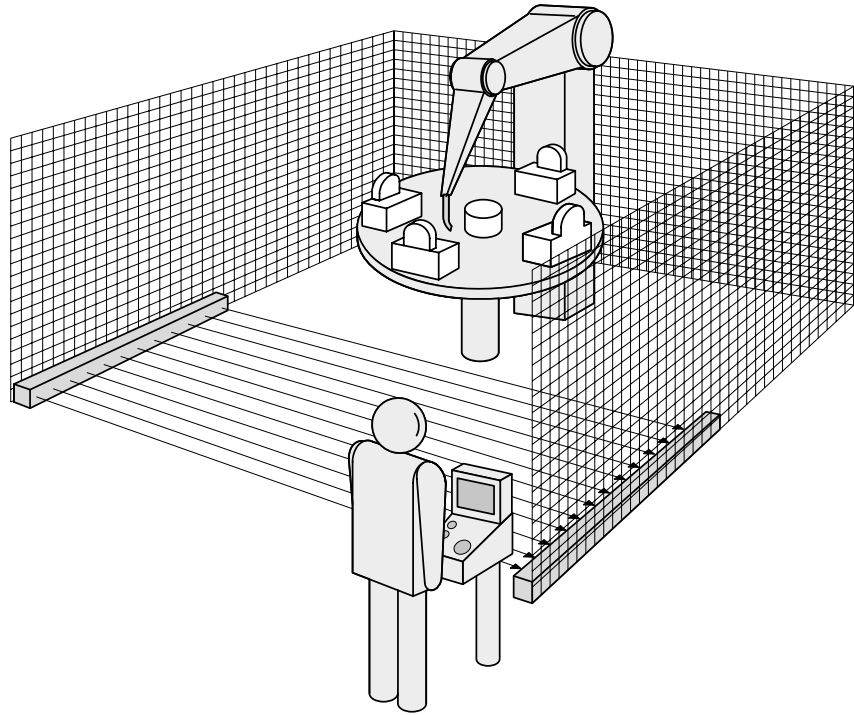


Figure 6: Hazardous area protection

4 Project planning

This chapter includes important information about the proper integration of the safety light curtain in machines for planners, developers and designers.

4.1 Manufacturer of the machine



DANGER

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ▶ Conduct a risk assessment and check whether additional protective measures are required.
 - ▶ Comply with the applicable national regulations derived from the application (e.g., work safety regulations, safety rules, or other relevant safety guidelines).
 - ▶ Do not combine the components of the safety light curtain with components from other safety light curtains.
 - ▶ Apart from for the procedures described in this document, the components of the safety light curtain must not be opened.
 - ▶ The components of the safety light curtain must not be tampered with or changed.
 - ▶ Do not carry out any repairs on the device components. Improper repair of the protective device can lead to a loss of the protective function.
-

4.2 Operator of the machine



DANGER

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ▶ Changes to the electrical integration of the safety light curtain in the machine control and changes to the mechanical installation of the safety light curtain require another risk assessment. The results of this risk assessment may require the operator of the machine to meet the obligations of a manufacturer.
 - ▶ Apart from the procedures described in this document, the components of the safety light curtain must not be opened.
 - ▶ The components of the safety light curtain must not be tampered with or changed.
 - ▶ Do not carry out any repairs on the device components. Improper repair of the protective device can lead to a loss of the protective function.
-

4.3 Design

Overview

This chapter contains important information about the design.

Important information



DANGER

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ▶ Make sure that the following construction requirements are met so that the safety light curtain can fulfill its protective function.
 - Sender and receiver must be arranged such that persons or parts of the body are reliably detected when they enter the hazardous area.
 - Reaching under, over, and around as well as moving the safety light curtain must be prevented.
 - Check whether additional safety measures (e.g. restart interlocking) are necessary when it is possible for people to be located between the protection system and the danger point without being detected.
-

Further topics

- ["Mounting", page 32](#)

4.3.1 Scanning range and protective field width

Important information



DANGER

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ▶ The safety light curtain can only be mounted on machines on which the protective field width does not change when the safety light curtain is switched on.
-

Scanning range

The scanning range limits the maximum protective field width. The protective field width cannot change during operation.

The scanning range is reduced by using deflector mirrors.

Protective field width

The protective field width is the dimension of the light path between sender and receiver.

The protective field width is automatically calibrated when the safety light curtain is switched on during initialization and must not be changed during operation.

Further topics

- ["Technical data", page 61](#)
- ["Deflector mirrors", page 71](#)

4.3.2 Minimum distance from the hazardous point

Overview

A minimum distance must be maintained between the safety light curtain and the hazardous point. This distance is required to prevent a person or part of their body from reaching the hazardous point before the end of the machine's dangerous state.

Calculating the minimum distance according to ISO 13855

The calculation of the minimum distance is based on international or national standards and statutory requirements applicable at the place of installation of the machine.

If the minimum distance is calculated according to ISO 13855, it depends on the following points:

- Machine stopping time (time interval between triggering the sensor function and the end of the machine's dangerous state)
- Response time of the Protective Equipment.
- Reach or approach speed of the person
- Resolution (detection capability) of the safety light curtain
- Type of approach: orthogonal (at right angles) or parallel
- Parameters specified based on the application

For the USA (scope of OSHA and ANSI), different regulations may apply, e.g.:

a) Laws: Code of Federal Regulations, Title 29 (CFR 29), Part 1910.217

b) Standards: ANSI B11.19

Complementary information

Additional information is available in the ISO 13855 standard and in the Guidelines Safe Machinery.

SICK offers a stopping/run-down time measurement service in many countries.

Further topics

- ["Response time", page 63](#)

4.3.2.1 Calculating minimum distance from the hazardous point

Important information



DANGER

Minimum distance from the hazardous point is too small

The dangerous state of the machine may not be stopped or not be stopped in a timely manner due to a minimum distance that is too small.

- ▶ Calculate the minimum distances for the machine in which the safety light curtain is integrated.
 - ▶ When mounting the safety light curtain, observe the minimum distance.
-

Approach

The example shows the calculation of the minimum distance for an orthogonal (right-angled) approach to the protective field. A different calculation may be required depending on the application and the ambient conditions (e.g., for a protective field parallel to or at any angle to the direction of approach or an indirect approach).

1. First, calculate S using the following formula:

$$S = 2,000 \text{ mm/s} \times T + 8 \times (d - 14 \text{ mm})$$

Where:

- S = minimum distance in millimeters (mm)
- T = machine stopping time + response time of the protective device after interruption in the light path in seconds (s)
- d = resolution of the safety light curtain in millimeters (mm)

The reach or approach speed is already included in the formula.

2. If the result S is ≤ 500 mm, then use the determined value as the minimum distance.

3. If the result S is > 500 mm, then recalculate S as follows:
 $S = 1,600 \text{ mm/s} \times T + 8 \times (d - 14 \text{ mm})$
4. If the new value S is > 500 mm, then use the newly determined value as the minimum distance.
5. If the new value S is ≤ 500 mm, then use 500 mm.

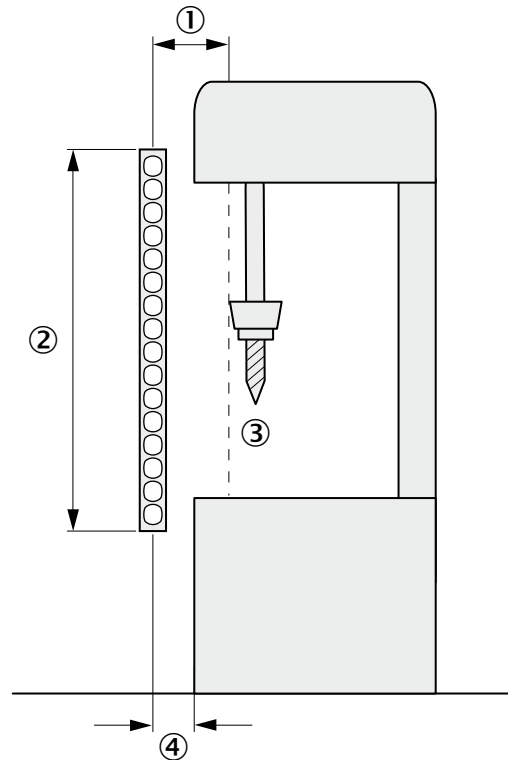


Figure 7: Minimum distance to hazardous point for orthogonal (right-angled) approach to protective field

- ① Minimum distance S
- ② Protective field height
- ③ Hazardous point
- ④ Depending on the application and distance, persons must be prevented from standing behind the protective device.

Example calculation

Machine stopping time = 290 ms

Response time after interruption of the light path = 30 ms

Resolution of the safety light curtain = 30 mm

$T = 290 \text{ ms} + 30 \text{ ms} = 320 \text{ ms} = 0.32 \text{ s}$

$S = 2,000 \text{ mm/s} \times 0.32 \text{ s} + 8 \times (30 \text{ mm} - 14 \text{ mm}) = 768 \text{ mm}$

$S > 500$ mm, therefore:

$S = 1,600 \text{ mm/s} \times 0.32 \text{ s} + 8 \times (30 \text{ mm} - 14 \text{ mm}) = 640 \text{ mm}$

4.3.2.2 Taking reach over into account

If access to the hazardous area by reaching over a protective field cannot be prevented, the height of the protective field and minimum distance of the ESPE must be determined. This is done by comparing the calculated values based on the possible detection of limbs or body parts with the values resulting from reaching over the protective field. The greater value resulting from this comparison must be used.

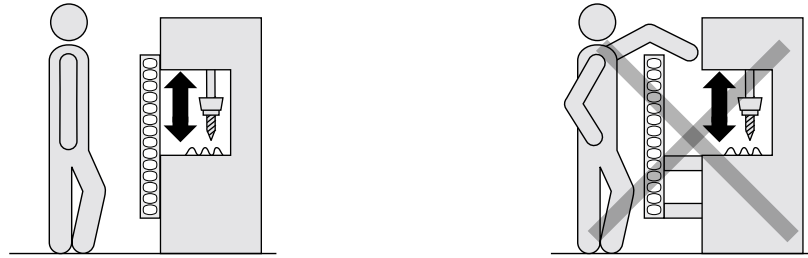


Figure 8: Representation of the accessibility of electro-sensitive protective device by reaching over. Left: Protective field that cannot be reached over. Right: Protective field that can be reached over.

4.3.3 Minimum distance to reflective surfaces

Overview

The light beams from the sender may be deflected by reflective surfaces and dispersive media. This may prevent an object from being detected.

Therefore, all reflective surfaces and objects (e.g. material bins, machine table, etc.) must maintain a minimum distance (a) from the protective field. This minimum distance (a) must be maintained on all sides of the protective field. This applies in horizontal, vertical and diagonal directions as well as at the end of the safety light curtain. The same area must be free of dispersive media (e.g., dust, fog, or smoke).

The minimum distance (a) depends on the distance (D) between sender and receiver (protective field width).

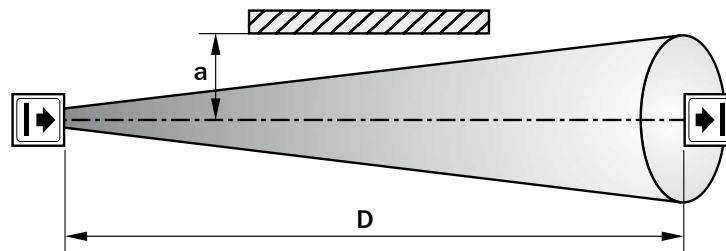


Figure 9: Minimum distance from reflective surfaces

Important information



DANGER

Hazard due to lack of effectiveness of the protective device

Reflective surfaces and dispersive media can prevent persons or parts of the body to be protected from being properly reflected and, therefore, remain undetected.

- ▶ Make sure that all reflective surfaces and objects maintain a minimum distance from the protective field.
- ▶ Make sure that no dispersive media (e.g., dust, fog, or smoke) are within the calculated minimum distance from the protective field.

Determining minimum distance to reflective surfaces

- ▶ Determine the distance between sender and receiver D in meters (m).
- ▶ Read the minimum distance a in millimeters (mm) in the graph or calculate it based on the respective formula [table 1](#):

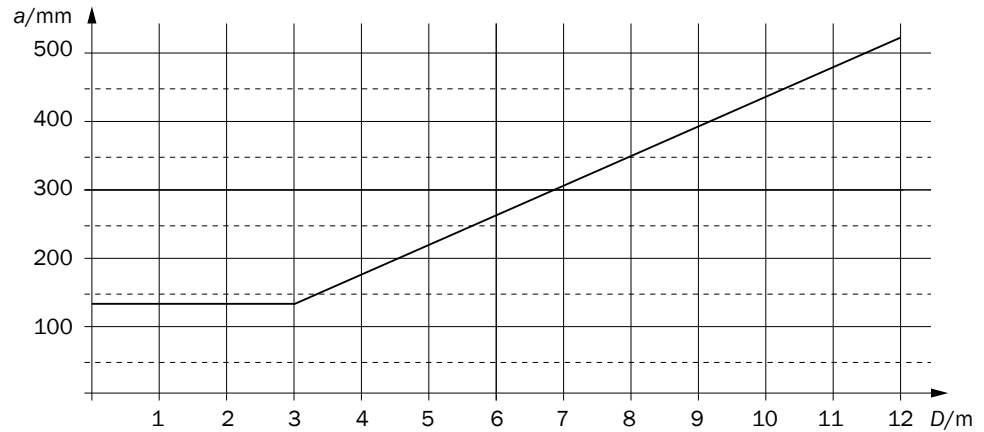


Figure 10: Graph of minimum distance from reflective surfaces

Table 1: Formula for calculating the minimum distance from reflective surfaces

Distance D between sender and receiver in m	Calculation of the minimum distance (a) from reflective surfaces in mm
$D \leq 3 \text{ m}$	$a = 131 \text{ mm}$
$D > 3 \text{ m}$	$a = \tan(2.5^\circ) \times 1,000 \text{ mm/m} \times D = 43.66 \times 1 \text{ mm/m} \times D$

4.3.4 Protection against interference from systems in close proximity to each other

Overview

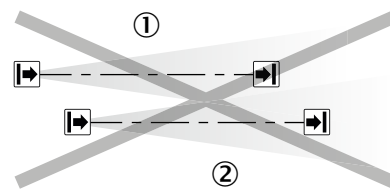


Figure 11: Preventing mutual interference from system ① and system ②

The infrared light beams of the sender of system ① can interfere with the receiver of system ②. This can disrupt the protective function of system ②. This would mean that the operator is at risk.

Avoid such installation situations or take appropriate action, e.g., install optically opaque partitions or reverse the direction of transmission of a system.

Important information



DANGER

Hazard due to lack of effectiveness of the protective device

Systems of safety light curtains that operate in close proximity to each other can interfere with each other.

- Use appropriate measures to prevent systems in close proximity from interfering with each other.

4.3.4.1 Using reversed direction of transmission

Using reversed direction of transmission

The direction of transmission of the system ② can be changed during installation by switching the positions of the sender and receiver. With reversed direction of transmission, the receiver ② is not affected by the infrared light from the sender ①.

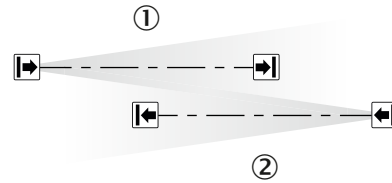


Figure 12: Trouble-free operation due to reversed direction of transmission of system ① and system ②

4.4 Integration in electrical control

Overview

This chapter contains important information about integration in the electrical control. Information about the individual steps for electrical installation of the device: [see "Electrical installation", page 44.](#)

Requirements for use

The output signals of the protective device must be analyzed by downstream controllers in such a way that the dangerous state of the machine is ended safely. Depending on the safety concept, the signal is analyzed by, e.g., safety relays or a safety controller.



DANGER

Hazard due to lack of effectiveness of the protective device

In the case of non-compliance, it is possible that the dangerous state of the machine may not be stopped or not stopped in a timely manner.

- ▶ Make sure that the following control and electrical requirements are met so that the safety light curtain can fulfill its protective function.
 - It must be possible to electrically influence the control of the machine.
 - The electrical control of the machine must meet the requirements of IEC 60204-1.
 - A restart interlock must be implemented depending on applicable national regulations or required reliability of the safety function. Because the safety light curtain does not have this function, it must be implemented in the external control if required.
 - When using a safety controller, different signal levels of both OSSDs must be detected depending on applicable national regulations or required reliability of the safety function. The maximum discrepancy time tolerated by the control must be selected according to the application.
 - The OSSD1 and OSSD2 output signals must not be connected to each other.
 - In the machine controller, the signals of both OSSDs must be processed separately.

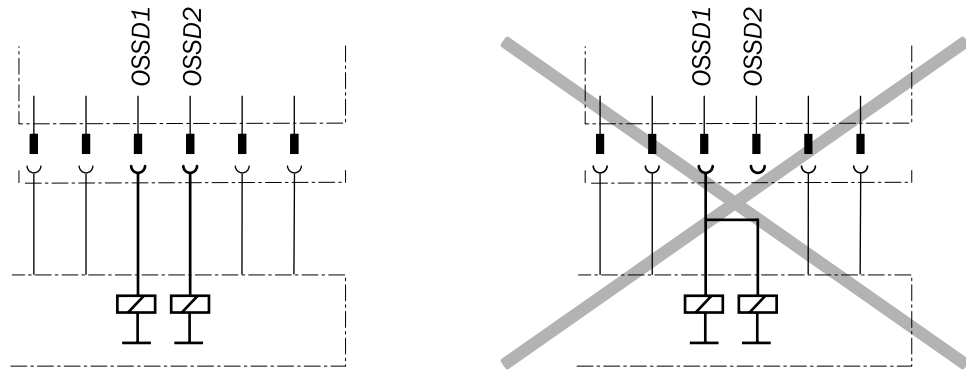


Figure 13: Dual-channel and isolated connection of OSSD1 and OSSD2

- The machine must switch to the safe state at any time if at least one of the two OSSDs switches to the OFF state.
- Prevent the formation of a potential difference between the load and the protective device. If you connect loads to the OSSDs (safety outputs) that then also switch if controlled with negative voltage (e.g., electro-mechanical contactor without reverse polarity protection diode), you must connect the 0 V connections of these loads and those of the corresponding protective device individually and directly to the same 0 V terminal strip. In the event of a fault, this is the only way to ensure that there can be no potential difference between the 0 V connections of the loads and those of the corresponding protective device.

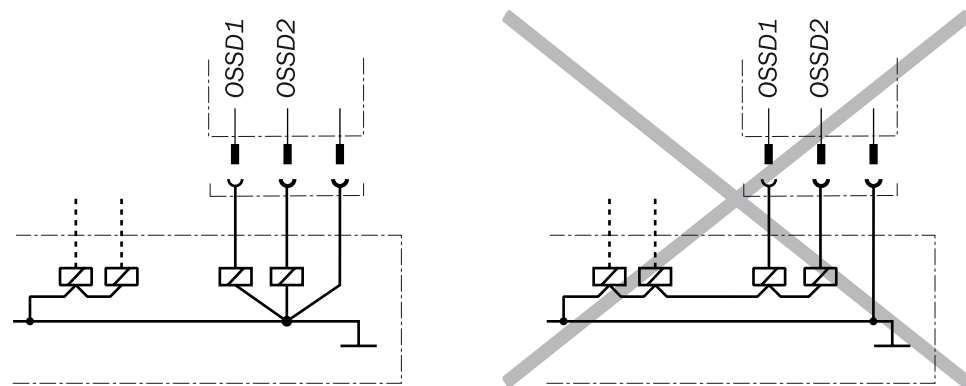


Figure 14: No potential difference between load and protective device



DANGER

Hazard due to lack of effectiveness of the protective device

In the case of non-compliance, it is possible that the dangerous state of the machine may not be stopped or not stopped in a timely manner.

Downstream contactors must be positively guided and monitored depending on applicable national regulations or required reliability of the safety function.

- ▶ Make sure that downstream contactors are monitored (external device monitoring, EDM).
- ▶ Because the safety light curtain does not have integrated external device monitoring, this must be implemented in the external control, if required.

Requirements for the electrical control of the machine

The two outputs are short-circuit protected against 24 V DC and 0 V. When the protective field is clear, the OSSDs are in the ON state and the signal level is HIGH (non-isolated). In the event of an interruption in the light path or device fault, the OSSDs are in the OFF state and the signal level is LOW (above 1.5 kΩ to 0 V).

The safety light curtain complies with the rules for electromagnetic compatibility (EMC) for the industrial sector (Radio Safety Class A). Radio interference cannot be ruled out when used in residential areas.



DANGER

Hazard due to lack of effectiveness of the protective device

In the case of non-compliance, it is possible that the dangerous state of the machine may not be stopped or not stopped in a timely manner.

► Make sure that the following control and electrical requirements are met so that the safety light curtain can fulfill its protective function.

- The external voltage supply of the safety light curtain must be capable of jumpering a brief power failure of 20 ms as specified in IEC 60204-1.
- The power supply unit must ensure safe isolation according to IEC 61140 (SELV/PELV). Suitable power supply units are available as accessories from SICK, see "Accessories", page 69.

4.4.1 Restart interlock

Overview

Depending on the regulations which apply at the place of installation, a restart interlock may be required.

The restart interlock prevents the machine from automatically starting up, for example after a protective device has responded while the machine is operating or after changing the machine's operating mode.

The safety light curtain does not have an internal restart interlock. If required, a restart interlock must therefore be implemented externally via the circuitry or the control, e.g., in connection with the SICK switching amplifier UE48-20S/UE48-30S.

Principle of operation

The restart interlock prevents the machine from automatically starting up, for example after a protective device has responded while the machine is operating or after changing the machine's operating mode.

Before the machine can be restarted, the operator must reset the restart interlock.

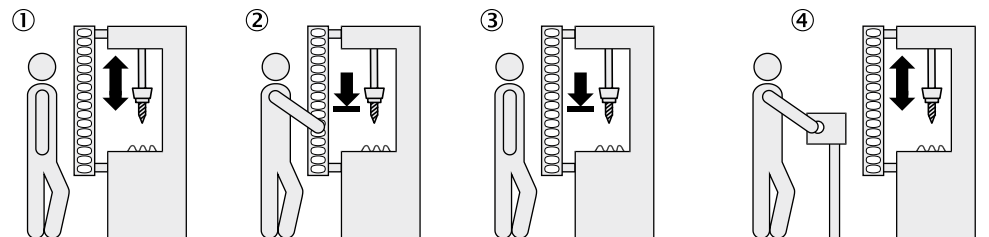


Figure 15: Schematic representation of operation with restart interlock

The dangerous state of the machine ① is brought to an end if the light path is interrupted ② and is not re-enabled ③ until the operator presses the reset pushbutton located outside the hazardous area ④. The machine can then be restarted.

Depending on the applicable national regulations, there must be a restart interlock if a person can stand behind the protective field. Observe IEC 60204-1.

4.4.2 External device monitoring (EDM)

Overview

The external switching elements (external device monitoring, EDM) must be inspected in line with the regulations which apply at the place of installation or the required reliability of the safety function.

The external device monitoring (EDM) monitors the status of downstream contactors.

Important information



NOTE

Because the safety light curtain does not have integrated external device monitoring, this must be implemented in the external control, if required.

Prerequisites

- Positively guided contactors are used for shutting down the machine. If the auxiliary contacts of the positively guided contactors are connected to the external device monitoring, the external device monitoring checks whether the contactors drop off when the OSSDs are switched off.

4.4.3 Connection diagrams

Connection diagram for UE48-20S with restart interlock and external device monitoring

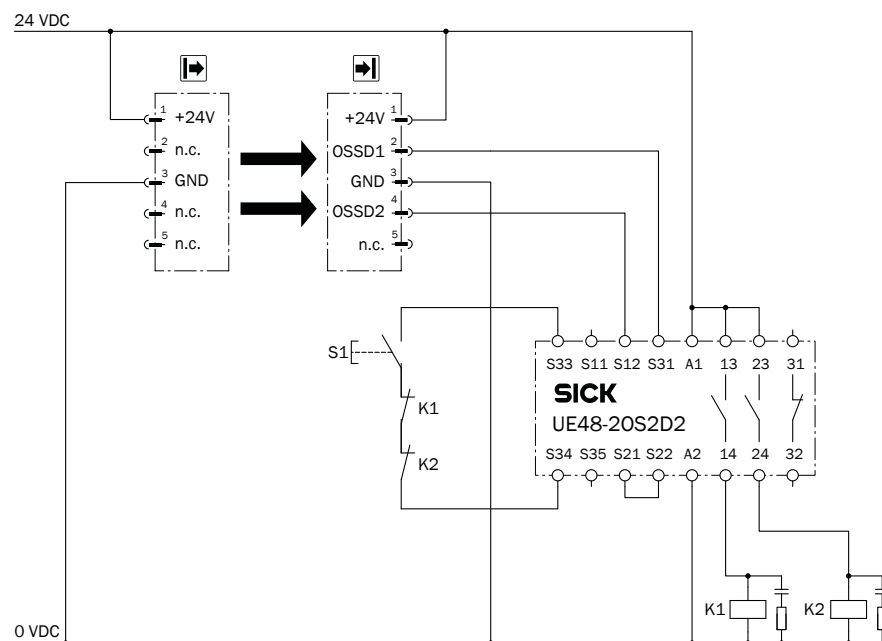


Figure 16: Connection diagram for UE48-20S with restart interlock and external device monitoring

The safety light curtain can be connected to the UE48-20S switching amplifiers. It is operated with restart interlock and external device monitoring.

Functionality

When the protective field is clear, the OSSD1 and OSSD2 outputs carry voltage. The system can be switched on when K1 and K2 are in the de-energized position. Pressing the S1 button switches on the UE48 switching amplifier. Contacts 13-14 and 23-24 of the UE48 activate the K1 and K2 contactors.

When the protective field is interrupted, the OSSD1 and OSSD2 outputs carry no voltage. The UE48 switches off and K1, K2 are deactivated.

Fault analysis

Failure of K1 and K2 does not cause the loss of the shut-down function. Cross-circuits and short-circuits of the OSSD1 and OSSD2 outputs are recognized and lead to the locking state. It is recognized if the K1 or K2 contactors do not de-energize.

4.5 Testing plan

The manufacturer of the machine and the operating entity must define all required checks. The definition must be based on the application conditions and the risk assessment and must be documented in a traceable manner.

- ▶ When defining the check, please note the following:
 - Define the type and execution of the check.
 - Define the frequency of the check.
 - Notify the machine operators of the check and instruct them accordingly.

The following checks are often defined in connection with a protective device:

- Check during commissioning and modifications
- Regular thorough check

Check during commissioning and modifications

The check must detect if it is possible to enter the hazardous area without being detected.

The following points are often helpful for the definition of the check:

- Does the check have to be completed by quality safety personnel?
 - Can the check be completed by personnel specially qualified and authorized personnel?
 - Does the check have to be documented in a traceable manner?
 - Can the check be carried out according to a check list? (see "[Checklist for initial commissioning and commissioning](#)", page 75)
 - Do the machine operators know the function of the protective device?
 - Have the machine operators been trained to work on the machine?
 - Have the machine operators been notified about modifications on the machine?
 - Does the hazardous area to be secured have to be checked with a test rod? (see "[Test rod check](#)", page 29)
- ▶ Define all guidelines for the check.

Regular thorough check

The check must detect if it is possible to enter the hazardous area without being detected. Such possibilities may exist due to modifications, manipulations or external influences.

The following points are often helpful for the definition of the check:

- Which check must be carried out and how is it carried out?

- [Test rod check, page 29](#)
 - [Visual check of the machine and the protective device, page 30](#)
 - How often does the check have to be carried out?
 - Do the machine operators have to be notified of the check and do they need to be instructed accordingly?
- ▶ Define all guidelines for the check.

4.5.1 Test rod check

Overview

The rod test check is used to check whether the hazardous point is only accessible via the protective field of the safety light curtain and whether the protective device is able to identify each time the hazardous point is approached.

The test is carried out with an opaque test rod whose diameter corresponds to the resolution of the safety light curtain.

Important information



DANGER

Use of incorrect test rods

Persons or parts of the body to be protected may not be detected in operation.

- ▶ Only use the included test rod with the diameter specified on the type label of the safety light curtain.
- ▶ Do not use any test rods with a similar or the same diameter of other safety light curtains.



DANGER

Hazard due to unexpected starting of the machine

- ▶ Make sure that the dangerous state of the machine is and remains switched off during the check.
- ▶ Make sure that the outputs of the safety light curtain have no effect on the machine during the check of the components.



DANGER

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

Do not operate the machine if the OSSD LED lights up green during the test!

- ▶ If the OSSD LED lights up green during the test even if only briefly, work must stop at the machine.
- ▶ In this case, the mounting and electrical installation of the safety light curtain must be checked by qualified safety personnel.

Prerequisites

- The OSSD LED lights up green.

Approach

1. Move the test rod slowly through the protective field to be protected (e.g., machine opening as indicated by the arrow, [see figure 17, page 30](#)).
2. Watch the OSSD LED on the receiver during the check. The OSSD LED on the receiver should continuously light up red. The OSSD LED must not illuminate green.

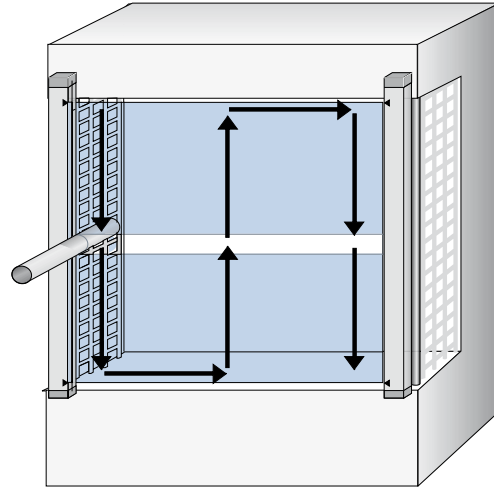


Figure 17: Test rod check: Step 1

3. Then, guide the test rod along the edges of the area to be protected as indicated by the arrow, [see figure 18](#).
4. Watch the OSSD LED on the receiver during the check. The OSSD LED on the receiver should continuously light up red. The OSSD LED must not illuminate green.

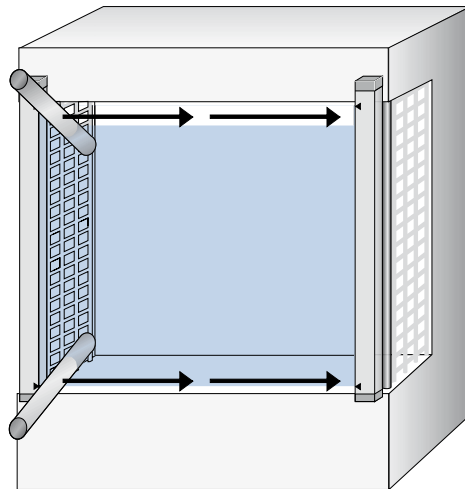


Figure 18: Test rod check: Step 2

5. If one or more deflector mirrors are used, then the test rod should also be guided slowly through the area to be protected directly in front of the deflector mirrors.
6. Watch the OSSD LED on the receiver during the check. The OSSD LED on the receiver should continuously light up red. The OSSD LED must not illuminate green.

4.5.2 Visual check of the machine and the protective device

The following points are often helpful for the definition of the check:

- Has the machine been retrofitted?
- Have machine parts been removed?
- Have modifications been made to the surroundings of the machine?
- Have the protective device or its parts been dismantled?
- Is it possible to enter the hazardous area without being detected?
- Is the protective device damaged?
- Is the protective device severely contaminated?
- Is the front screen contaminated, scratched or destroyed?
- Are there any damaged cables or open cable ends?

If one of the points applies, the machine should be shut down immediately. In this case, the machine and the protective device must be checked by appropriately qualified safety personnel.

5 Mounting

5.1 Safety

Important information

**DANGER**

Risk of ignition or explosion

- ▶ Disconnect the voltage supply before starting to mount the explosion-proof enclosure to avoid igniting hazardous atmospheres.
 - ▶ Only reconnect the voltage supply once you have completed the mounting process.
-

**DANGER**

Risk of ignition

Failure to observe this information could result in a risk of ignition.

- ▶ If the safety light curtain is used in an environment classified as tb IIIC, tc IIIB or tc IIIC the cover must not be removed, not even temporarily (e.g. for maintenance purposes).
-

**DANGER**

Risk of ignition or explosion

- ▶ If you have to remove the cover when working on the safety light curtain, make sure that the joints and o-ring are clean and undamaged before refitting the cover.
-

**DANGER**

Risk of ignition or explosion

- ▶ The safety light curtain must be mounted so that there is a gap of more than 30 mm between all other objects and the flange joints between the housing and the cover.
-

**DANGER**

Dangerous state of the machine

- ▶ Make sure that the dangerous state of the machine is (and remains) switched off during mounting, electrical installation, and commissioning.
 - ▶ Make sure that the outputs of the safety light curtain do not affect the machine during mounting, electrical installation, and commissioning.
-

**DANGER**

Hazard due to lack of effectiveness of the protective device

If unsuitable brackets are used or if subjected to excessive vibrations, the device may become detached or damaged.

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ▶ Only use SICK-approved brackets for mounting.
 - ▶ Take appropriate measures for vibration damping if vibration and shock specifications exceed the values and test conditions specified in the data sheet.
-

**DANGER**

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ▶ Do not do repair work on device components.
- ▶ Do not make changes to or manipulate device components.
- ▶ Apart from the procedures described in this document, the device components must not be opened.

**CAUTION**

Risk of injury due to heavy weight

Lifting and moving heavy loads may cause injury.

Unsecured heavy loads may, for example, fall over and cause bruising.

- ▶ Only lift the safety light curtain using equipment or two persons.
- ▶ Wear suitable protective clothing and safety shoes.

**NOTE**

Mount the device in the following order.

Prerequisites

The construction of the safety light curtain has been correctly executed.

Further topics

- ["Design", page 18](#)
- ["Technical data", page 61](#)

5.2 Unpacking

Approach

1. Check the components for completeness and integrity for all parts.
2. Please contact your respective SICK subsidiary should you have any complaints.

Further topics

- ["Scope of delivery", page 68](#)

5.3 Installation

Important information**NOTE**

- ▶ Read this section completely before installing the safety light curtain.
- ▶ Read the information on aligning the sender and receiver.

**DANGER**

Risk of ignition or explosion

- ▶ Disconnect the voltage supply before starting to mount the explosion-proof enclosure to avoid igniting hazardous atmospheres.
- ▶ Only reconnect the voltage supply once you have completed the mounting process.



DANGER

Risk of ignition

Failure to observe this information could result in a risk of ignition.

- ▶ If the safety light curtain is used in an environment classified as tb IIIC, tc IIIB or tc IIIC the cover must not be removed, not even temporarily (e.g. for maintenance purposes).
-



DANGER

Risk of ignition or explosion

- ▶ If you have to remove the cover when working on the safety light curtain, make sure that the joints and o-ring are clean and undamaged before refitting the cover.
-



DANGER

Hazard due to lack of effectiveness of the protective device

Persons or parts of the body to be protected may not be recognized or not recognized in time in case of non-observance.

- ▶ Observe the calculated minimum distances for the machine in which the safety light curtain is integrated.
 - ▶ Then, mount the safety light curtain such that it is not possible to reach below, above, around, or behind the safety light curtain, and that the light curtain cannot be repositioned.
-



DANGER

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ▶ The safety light curtain can only be mounted on machines on which the protective field width does not change when the safety light curtain is switched on.
-

Approach

The mounting process is comprised of either three or four stages:

1. If the safety light curtain in pre-mounted condition has been purchased, please skip this step.
First mount the deTec4 Core safety light curtain in the explosion-proof enclosure using the two supplied FlexFix brackets and risers. The FlexFix bracket makes it possible to rotate the sender and receiver around the axis of the device and to align it accurately. In addition to the FlexFix brackets, the risers must also be used to mount the deTec4 Core safety light curtain as close to the window on the cover as possible.
2. Install the cable glands if necessary.
3. Secure the handles supplied onto the enclosure cover.
4. Mount the safety light curtain in the explosion-proof enclosure on the machine. The explosion-proof enclosure can either be attached directly or using the alignment bracket (available as an accessory).

Further topics

- ["Minimum distance from the hazardous point", page 19](#)
- ["Minimum distance to reflective surfaces", page 22](#)
- ["Accessories", page 69](#)
- ["Alignment of the sender and receiver", page 49](#)

5.3.1 Mount the safety light curtain in the explosion-proof enclosure (only if the safety light curtain is used in North America)

Important information



NOTE

If the safety light curtain in pre-mounted condition has been purchased, please skip this section.



DANGER

Risk of ignition or explosion

- ▶ Use fixing screws with a yield point of at least 640 MPa to attach the cover to the explosion-proof enclosure.

Approach

1. Unscrew the fixing screws on the cover and remove the cover from the explosion-proof enclosure.
2. Secure the risers and the FlexFix brackets in the explosion-proof enclosure using the supplied M5 screws.
3. Tighten the fixing screws of the FlexFix brackets using a torque of 5 to 6 Nm. A higher torque may damage the brackets, a lower torque does not offer sufficient protection against vibrations.
4. Mount the safety light curtain on the FlexFix brackets so that the connecting cable is at the same end of the explosion-proof enclosure as the 3/4" NPT opening. Do not tighten the fixing screws at this point.

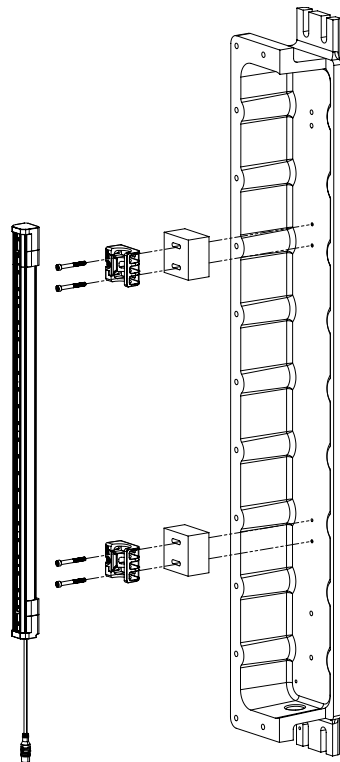


Figure 19: Mounting the safety light curtain in the explosion-proof enclosure

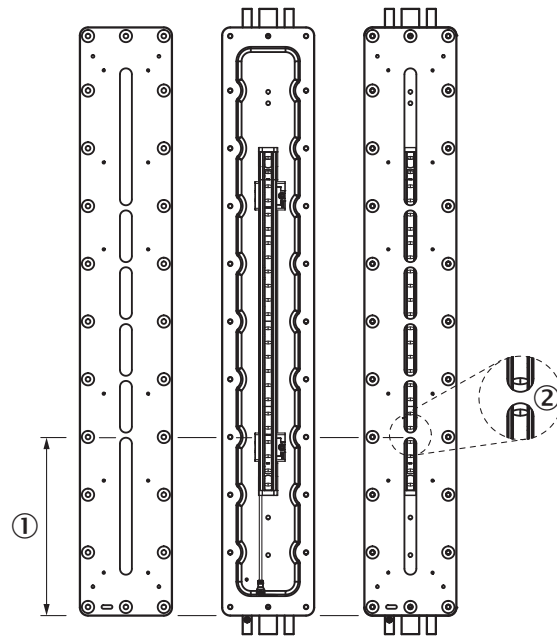


Figure 20: Aligning the safety light curtain in the explosion-proof enclosure

- ① Measure the distance from the end of the cover to the first rib. Position the safety light curtain so that the rib is between two optical lenses.
 - ② Detailed view
5. Rotate the safety light curtain in the FlexFix brackets so that the front screen of the safety light curtain faces the opening in the explosion-proof enclosure. The infra-red rays must be able to pass through the window in the cover without obstruction.
 6. Tighten the screws used to secure the safety light curtain in the FlexFix brackets with a torque of 2.5 to 3 Nm.
 7. Guide the connecting cable through the 3/4" NPT opening.
 8. If a cable gland is required, follow the instructions to mount the gland, [see "Mount the optional cable gland", page 36](#).
 9. Fit the cover to the explosion-proof enclosure using the supplied fixing screws and washers. Tighten the fixing screws with a torque of 11.5 to 14.5 Nm.



NOTE

The washers must be used to obtain enclosure rating IP 66.

5.3.2 Mount the optional cable gland

Overview

Depending on national regulations and requirements, a cable gland may have to be installed. The cable gland is available as an accessory.

Important information



DANGER

Risk of ignition or explosion

- ▶ Check the 3/4" NPT opening on the thread for damage.
- ▶ Do not use the device if the thread for the 3/4" NPT opening is damaged.

Approach

1. Guide the cable through the cable gland.
2. Screw the cable gland into the 3/4" NPT opening on the explosion-proof enclosure.
3. Pull the collar on the cable gland so that the cable is securely attached.

5.3.3 Mount the handles to the cover of the explosion-proof enclosure**Approach**

1. Use the supplied M6 screws to secure the two handles onto the cover of the explosion-proof enclosure.
2. Tighten the screws with a torque of 4.5 to 5 Nm.

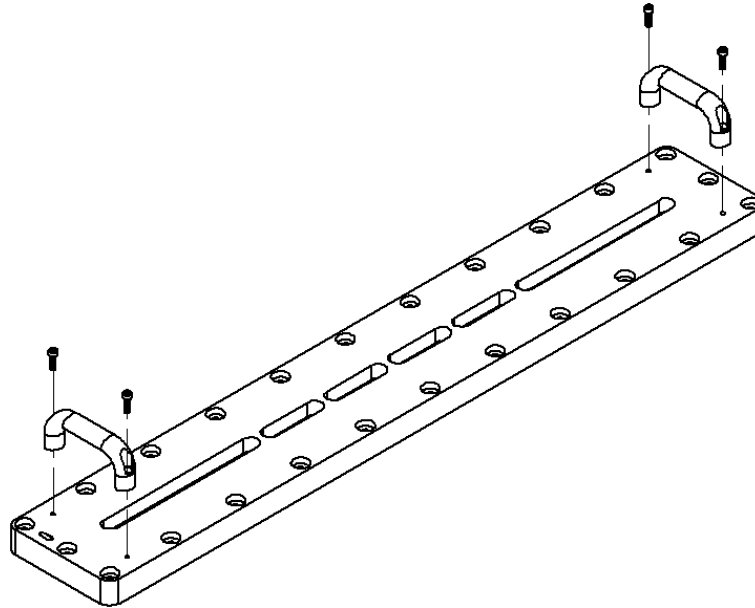


Figure 21: Mounting of the handles

5.3.4 Mount the safety light curtain**General Mounting Instructions**

- ▶ Choose a mounting location with sufficient stability for the weight of the safety light curtain.
- ▶ Mount the sender and receiver on a level surface.
- ▶ Mount the sender and receiver at the same height.

- ▶ The end with the connecting cable must point in the same direction for both devices.

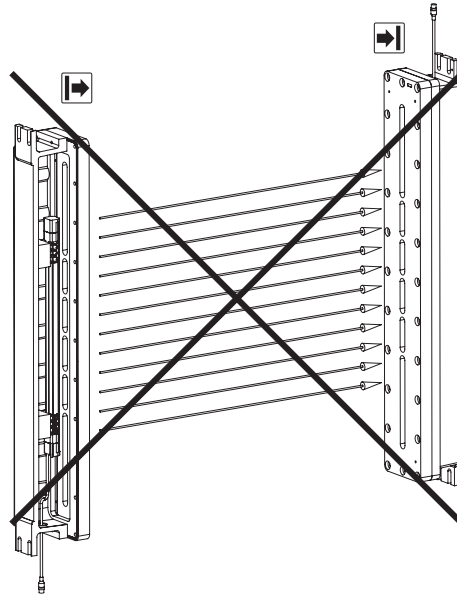


Figure 22: Incorrect installation of sender and receiver

- ▶ Sender and receiver must not be installed at 180° rotated relative to each other.
- ▶ Make sure the sender and receiver are aligned correctly. The optical lens systems of sender and receiver must be located in opposition to each other.
- ▶ If necessary, use a spirit level to check the parallelism of the components.
- ▶ The alignment bracket makes it possible to rotate the sender and receiver around the axis of the device and to align them accurately; see "Alignment of the sender and receiver", page 49.

5.3.4.1 Mounting the safety light curtain without alignment bracket

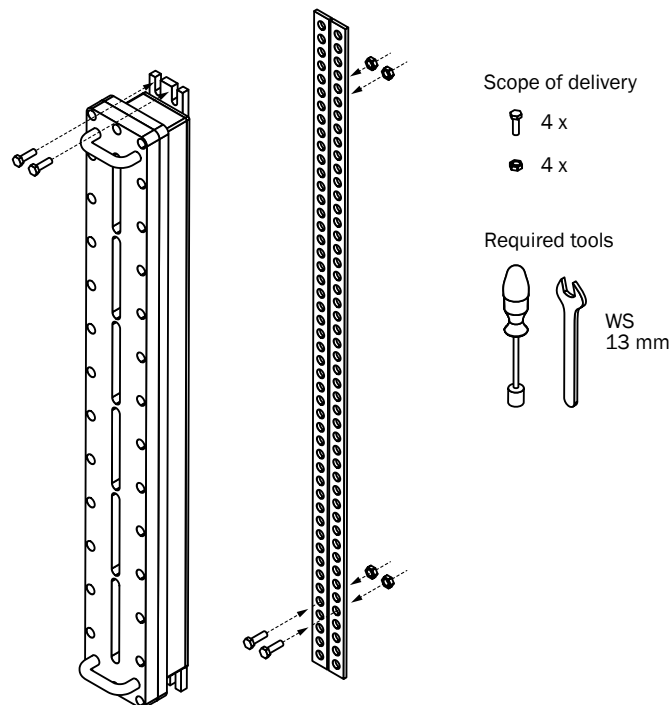


Figure 23: Mounting the safety light curtain without the alignment bracket

Approach

- ▶ Use wrench size 13 mm.

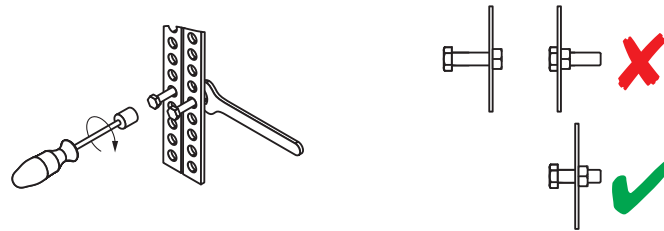


Figure 24: Mounting the safety light curtain without the alignment bracket: Step 1

1. Using 6 to 8 revolutions, screw in the two M8 screws for mounting the lower end of the explosion-proof enclosure. Make sure you leave enough space between the screws and the mounting surface for the lower end of the explosion-proof enclosure.

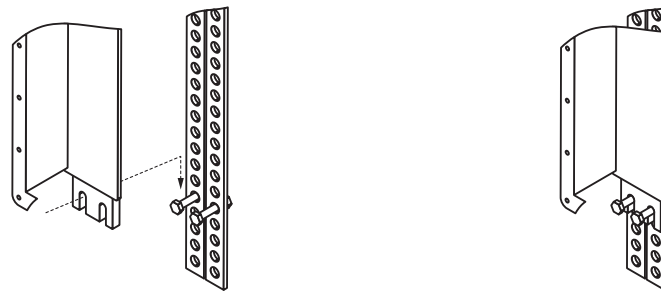


Figure 25: Mounting the safety light curtain without the alignment bracket: Step 2

2. Position the explosion-proof enclosure on the two screws so that the mounting holes are directly over the partly-tightened screws.

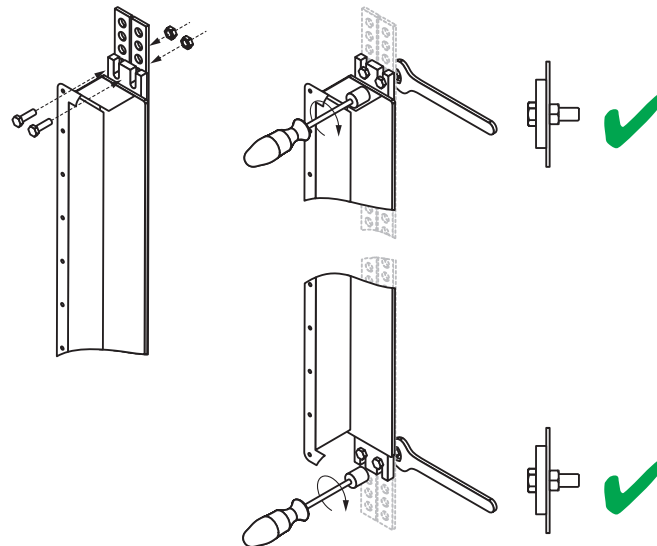


Figure 26: Mounting the safety light curtain without the alignment bracket: Steps 3 and 4

3. Fix the upper end of the explosion-proof enclosure to the mounting surface using two M8 screws.
4. Tighten the two lower M8 screws.

5.3.4.2 Mounting the safety light curtain with alignment bracket

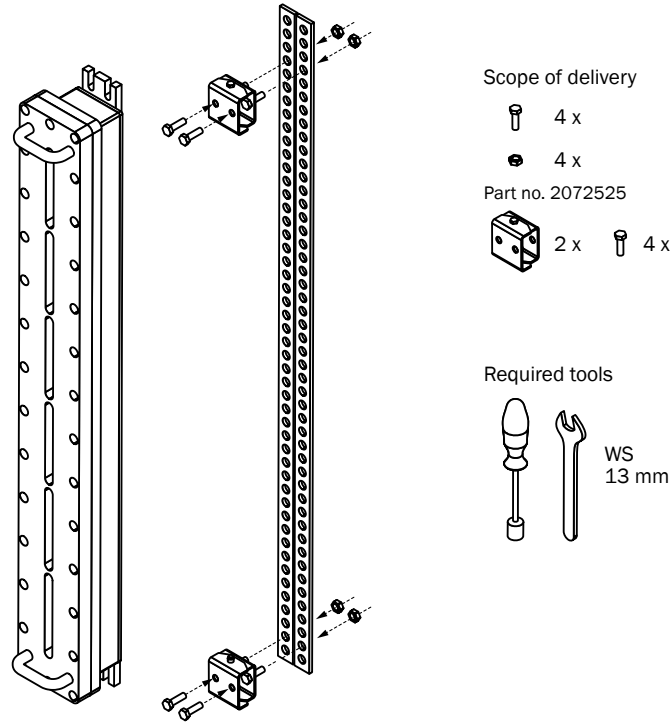


Figure 27: Mounting the safety light curtain using the alignment brackets

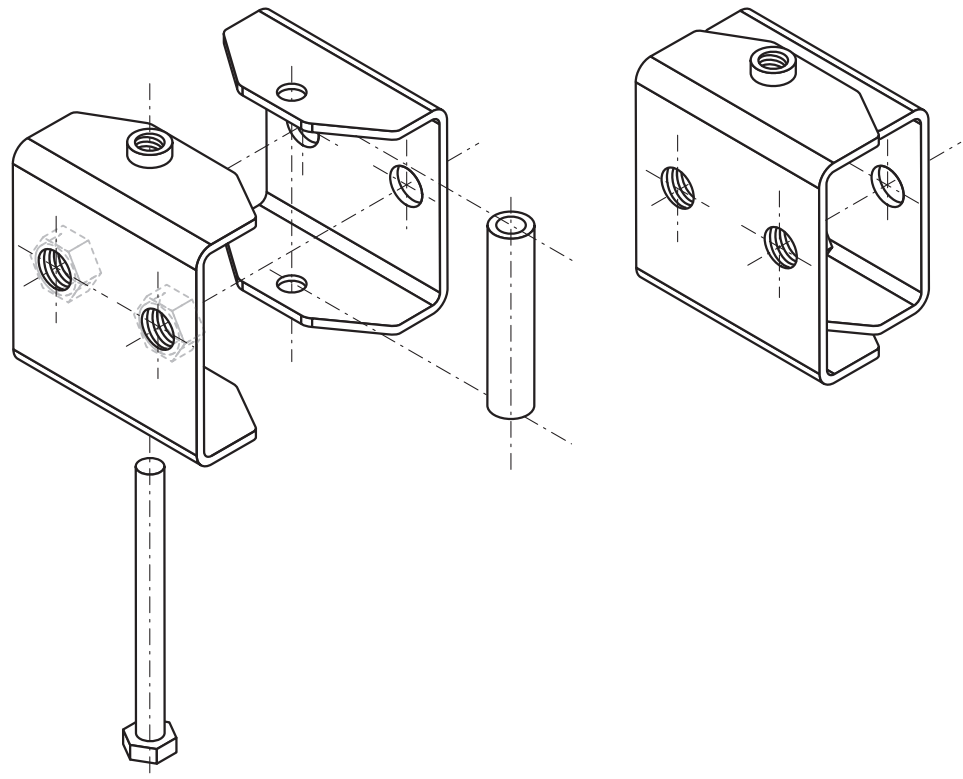


Figure 28: Assembling the alignment brackets

Approach

1. Mount the lower alignment bracket so that the threaded hole faces up and the head of the lock screw faces down.
2. Rotate the alignment bracket as far to one side as possible. Secure the alignment bracket on the open side by screwing the first M8 screw into the through hole.
3. Rotate the lower alignment bracket to the other side. Secure the alignment bracket using the second M8 screw.
4. Mount the upper alignment bracket so that the threaded hole faces down and the head of the lock screw faces up.
5. Rotate the upper alignment bracket as far to one side as possible. Secure the alignment bracket on the open side by screwing the first M8 screw into the through hole.
6. Rotate the upper alignment bracket to the other side. Secure the alignment bracket using the second M8 screw.

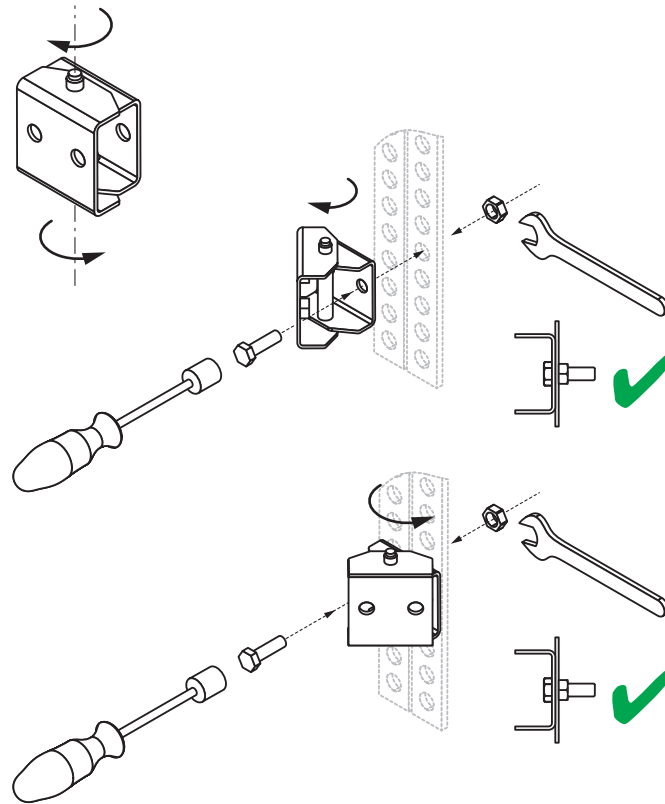


Figure 29: Mounting the safety light curtain using the alignment brackets: Steps 1 to 6

7. Using 6 to 8 revolutions, screw the two M8 screws for mounting the lower end of the explosion-proof enclosure into the lower alignment bracket. Make sure you leave enough space between the screws and the alignment bracket for the lower end of the explosion-proof enclosure.

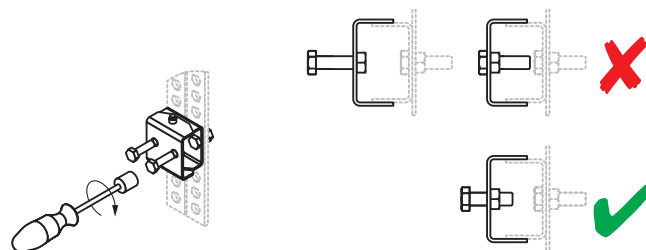


Figure 30: Mounting the safety light curtain using the alignment brackets: Step 7

8. Position the explosion-proof enclosure on the two screws so that the mounting holes are directly over the partly-tightened screws.

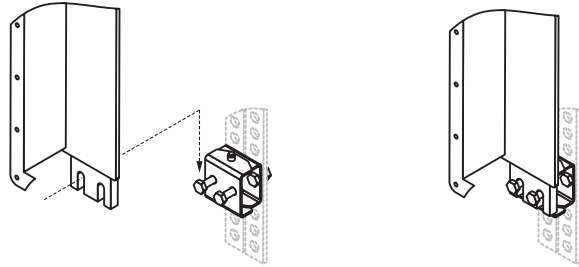


Figure 31: Mounting the safety light curtain using the alignment brackets: Step 8

9. Fix the upper end of the explosion-proof enclosure to the upper alignment bracket using two M8 screws.
10. Tighten the two lower screws.

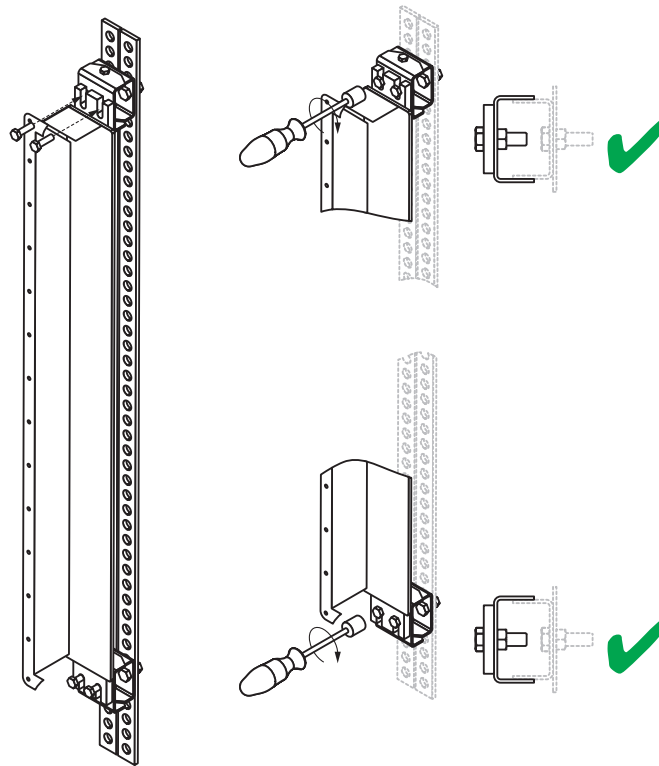


Figure 32: Mounting the safety light curtain using the alignment brackets: Steps 9 and 10

11. Turn the safety light curtains so that they face one another and so that the receiver receives the strongest signal possible.

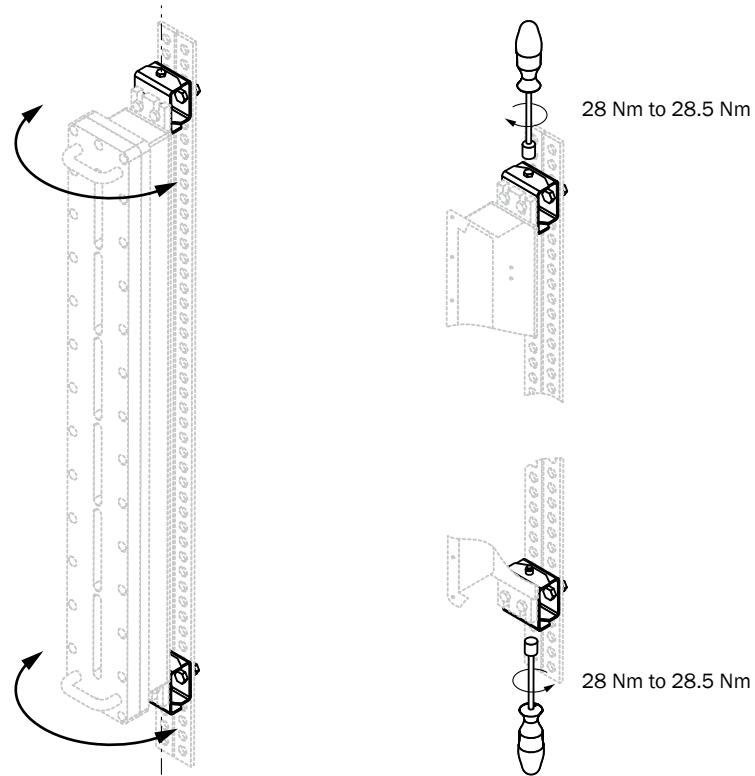


Figure 33: Mounting the safety light curtain using the alignment brackets: Steps 11 and 12

12. Tighten the locking screws on all alignment brackets with a torque of 28 to 28.5 Nm in order to secure the safety light curtain in this position.

6 Electrical installation

6.1 Safety

Important information



DANGER

Ignition Hazard

Failure to observe this information could result in a risk of ignition

- ▶ Always switch the voltage supply off before disconnecting a connecting cable from the device.
 - ▶ Ensure that all electrical connections to the device or to the connections are protected.
 - ▶ The IP enclosure rating for the connections and therefore for the device is only guaranteed if the connections are protected. Otherwise foreign objects can get into the terminal compartment. This can cause an explosion the next time the device is switched on.
 - ▶ Put in place measures for ensuring supply reliability and delivery dependability.
-



DANGER

Risk of ignition

Failure to observe this information could result in a risk of ignition.

- ▶ If the safety light curtain is used in an environment classified as tb IIIC, tc IIIB or tc IIIC the cover must not be removed, not even temporarily (e.g. for maintenance purposes).
-



DANGER

Risk of ignition or explosion

- ▶ If you have to remove the cover when working on the safety light curtain, make sure that the joints and o-ring are clean and undamaged before refitting the cover.
-



DANGER

Risk of ignition or explosion

- ▶ Disconnect the power supply before opening the explosion-proof enclosure to avoid igniting hazardous atmospheres.
 - ▶ Do not reconnect the power supply until you have completed the electrical installation.
-

**DANGER**

Risk of ignition or explosion

- ▶ Each connection to the protection earth (PE) on the explosion-proof enclosure must use at least one wire with a cross-section meeting the requirements of the table below.

Table 2: Minimum wire cross-section for protection earth (PE)

Wire cross-section of outer cable S	Minimum wire cross-section of the corresponding protection earth wire S _p
S ≤ 16 mm ²	S
16 mm ² < S ≤ 35 mm ²	16 mm ²
S > 35 mm ²	0.5 S

**DANGER**

Hazard due to electrical voltage

Hazard due to unexpected starting of the machine

- ▶ Make sure that the machine is (and remains) disconnected from the voltage supply during the electrical installation.
- ▶ Make sure that the dangerous state of the machine is (and remains) switched off during electrical installation.
- ▶ Make sure that the outputs of the safety light curtain have no effect on the machine during the electrical installation work.
- ▶ Use an appropriate voltage supply, see "Technical data", page 61.

**DANGER**

Hazard due to lack of effectiveness of the protective device

The dangerous state may not be stopped in the event of non-compliance.

- ▶ Always connect the two OSSDs separately. The two OSSDs must not be connected to each other.
- ▶ Connect the OSSDs such that the machine controller processes both signals separately.

**DANGER**

Hazard due to lack of effectiveness of the protective device

The dangerous state may not be stopped in the event of non-compliance.

- ▶ Prevent the formation of a potential difference between the load and the protective device.

Prerequisites

- The safety light curtain has been safely integrated into the control system and the electrical system of the machine.
- Mounting has been correctly executed.

Example: Isolated connection of OSSD1 and OSSD2

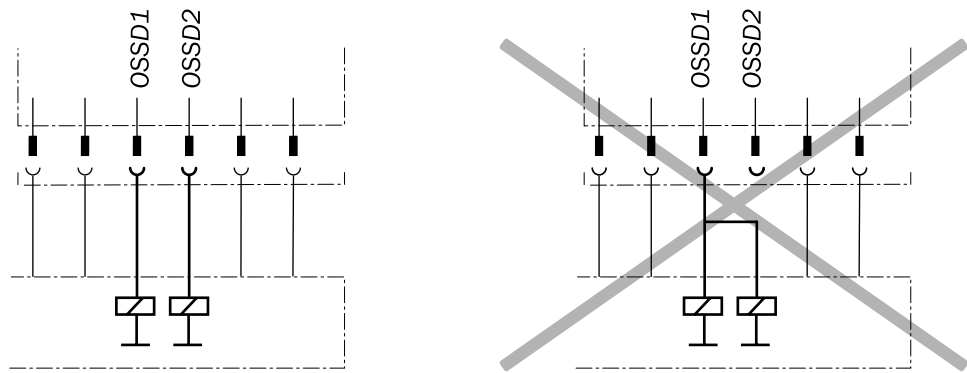


Figure 34: Dual-channel and isolated connection of OSSD1 and OSSD2

Avoiding any potential difference between load and protective device

- If you connect loads to the output signal switching devices (safety outputs) that then also switch if controlled with negative voltage (e.g., electro-mechanical contactor without reverse polarity protection diode), you must connect the 0 V connections of these loads and those of the corresponding protective device individually and directly to the same 0 V terminal strip. In the event of a fault, this is the only way to ensure that there can be no potential difference between the 0 V connections of the loads and those of the corresponding protective device.

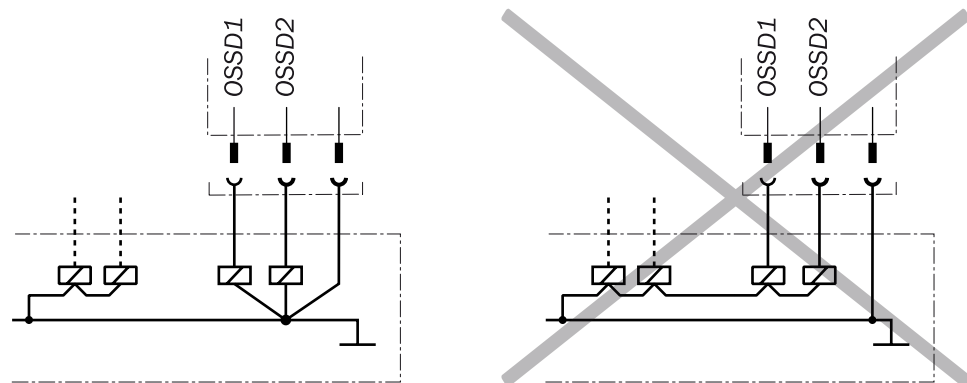


Figure 35: No potential difference between load and protective device

Further topics

- ["Integration in electrical control", page 24](#)

6.2 System connection (M12, 5-pin)

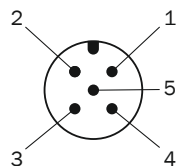


Figure 36: System connection (M12, 5-pin)

Table 3: System connection pin assignment (M12, 5-pin)

Pin	Wire color	Sender	Receiver
1	Brown	+24 V DC (power supply input)	+24 V DC (power supply input)
2	White	Reserved	OSSD1 (output signal switching device 1)
3	Blue	0 V DC (power supply input)	0 V DC (power supply input)
4	Black	Reserved	OSSD2 (output signal switching device 2)
5	Gray	Not yet assigned	Not yet assigned

Connection diagram for the electrical installation: see ["Integration in electrical control", page 24](#).

6.3 System connection via connection cable (M12, 5-pin to 8-pin)

An optional connection cable is available to connect the 5-pin system connection to an existing 8-pin female connector. The connection cable can be used to replace an existing C4000 safety light curtain with a deTec4 Core Ex, without having to route new cables.

7 Commissioning

7.1 Safety

Important information



DANGER

Hazard due to lack of effectiveness of the protective device

When changes are made to the machine, the effectiveness of the protective device may be affected unintentionally.

- ▶ After every change to the machine and changes to the integration or operational and secondary conditions of the safety light curtain, check the protective device for effectiveness and recommission as specified in this chapter.
-



DANGER

Dangerous state of the machine

- ▶ Make sure that the dangerous state of the machine is (and remains) switched off during mounting, electrical installation, and commissioning.
 - ▶ Make sure that the outputs of the safety light curtain do not affect the machine during mounting, electrical installation, and commissioning.
-



DANGER

Hazard due to lack of effectiveness of the protective device

- ▶ Before commissioning the machine, make sure that the machine is first checked and released by qualified safety personnel.
 - ▶ Only operate the machine with a perfectly functioning protective device.
-

Further topics

- ["Minimum distance to reflective surfaces", page 22](#)

7.2 Overview

Prerequisites

- The projection has been correctly completed
- The assembly has been correctly completed
- The electrical installation has been completed correctly

Further topics

- ["Project planning", page 18](#)
- ["Mounting", page 32](#)
- ["Electrical installation", page 44](#)

7.3 Switching on

Overview

After switching on, the sender and receiver initialize. All light emitting diodes of the sender and receiver briefly light up. After initialization, the receiver displays the alignment quality using four blue light emitting diodes. Once the safety light beam curtain is aligned (OSSD LED: green), the alignment display switches off after a certain period of time, and only the PWR LED of the sender and the OSSD LED of the receiver continue to light up.

In the event of a fault, the red fault light emitting diode flashes on the respective device. The red fault light emitting diode in combination with the blue light emitting diodes show the cause of the fault on the side of the receiver.

Further topics

- ["Troubleshooting", page 57](#)

7.4 Alignment of the sender and receiver

Overview

After mounting and electrical installation, the sender and receiver must be aligned with each other.

Important information



DANGER

Dangerous state of the machine

- ▶ Make sure that the dangerous state of the machine is (and remains) switched off during the alignment process.
- ▶ Make sure that the outputs of the safety light curtain do not affect the machine during the alignment process.

Further topics

- ["Indication of the alignment quality", page 51](#)
- ["Diagnostic LEDs", page 57](#)

7.4.1 Aligning the sender and receiver

Important information



DANGER

Dangerous state of the machine

- ▶ Make sure that the dangerous state of the machine is (and remains) switched off during the alignment process.
- ▶ Make sure that the outputs of the safety light curtain do not affect the machine during the alignment process.



NOTE

If alignment is not possible when mounting the safety light curtain directly, then use the optional alignment bracket.

Prerequisites

- Sender and receiver have been correctly mounted

Approach

1. Switch on the voltage supply for the safety light curtain.
2. Roughly align the sender with the receiver: Rotate the sender so that it is pointing toward the receiver.
3. Align the receiver with the sender: Rotate the receiver so that as many blue alignment quality light emitting diodes as possible light up on the receiver.

4. If required, align the sender more precisely with the receiver so that as many alignment quality light emitting diodes as possible light up on the receiver.
5. If required, align the receiver more precisely with the sender so that as many alignment quality light emitting diodes as possible light up on the receiver.
6. When at least three (preferably four) alignment quality light emitting diodes light up on the receiver, fasten the components in the brackets. Torque: 28 Nm ... 28.5 Nm.
7. Switch the voltage supply off and then on again.
8. Check the alignment quality light emitting diodes to make sure that the components are still correctly aligned with each other.



NOTE

Once 3 blue alignment quality light emitting diodes light up, alignment is good and availability is stable.

Please note that body parts or objects in the protective field (e.g., hand, tool, AR60 optional laser alignment aid) may impair the function of the alignment quality LEDs. Remove all objects from the protective field to allow the alignment quality to be assessed.

Complementary information

The AR60 optional laser alignment aid can be used for alignment.

Since the AR60 optional laser alignment aid is placed in the protective field of the safety light curtain with the adapter, a maximum of two blue alignment quality LEDs light up and the OSSD LED lights up red. To check whether the OSSD LED of the receiver lights up green, remove the AR60 laser alignment aid.

Further topics

- ["Indication of the alignment quality", page 51](#)
- ["Mounting", page 32](#)
- ["Accessories", page 69](#)

7.4.2 Alignment with the alignment bracket

The alignment bracket offers you the following adjustment options for aligning the sender and receiver with each other:

- Rotate ($\pm 45^\circ$)

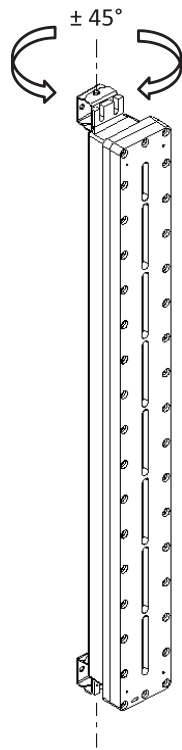


Figure 37: Alignment bracket: rotate

7.4.3 Indication of the alignment quality

Important information



NOTE

Once 3 blue alignment quality light emitting diodes light up, alignment is good and availability is stable.

Please note that body parts or objects in the protective field (e.g., hand, tool, AR60 optional laser alignment aid) may impair the function of the alignment quality LEDs. Remove all objects from the protective field to allow the alignment quality to be assessed.

Indication of the alignment quality

Table 4: Indication of the alignment quality

LEDs		Meaning
Alignment quality light emitting diodes	OSSD	
No light emitting diode lights up	● Red	Alignment is insufficient or the protective field is interrupted at least partially. The receiver cannot synchronize with the sender.
1 light emitting diode lights up	● Red	Alignment is insufficient or the protective field is interrupted at least partially.
2 light emitting diodes light up	● Red	Alignment is insufficient or the protective field is interrupted at least partially.
2 light emitting diodes light up	● Green	Alignment is not yet sufficient for stable availability.

LEDs		Meaning
Alignment quality light emitting diodes	OSSD	
3 light emitting diodes light up	● Green	Alignment is good, stable availability. ¹⁾
4 light emitting diodes light up	● Green	Alignment is very good.

¹⁾ If the protective fields are very wide, there is a possibility that all four alignment quality LEDs will not light up even when alignment is good.

7.5 Check during commissioning and modifications

The check must detect if it is possible to enter the hazardous area without being detected.

- ▶ Carry out the checks according to the instructions from the manufacturer of the machine and from the operating entity.

8 Operation

8.1 Safety

**DANGER**

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ▶ Maintenance work, alignment work, fault diagnoses, and any changes to the integration of the protective device in the machine must only be carried out by qualified personnel.
- ▶ The effectiveness of the protective device must be checked following such work.

**DANGER**

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ▶ Make sure that the optical properties of the front screens of the sender and receiver are not changed, e.g., by:
 - beading water, mist, frost, or ice formation. If applicable, remove films or other types of contamination, disconnect the voltage supply of the receiver and then switch it back on.
 - Scratches or damage. Replace the device whose front screen is scratched or damaged.
- ▶ Make sure that all reflective surfaces and objects maintain a minimum distance from the protective field.
- ▶ Make sure that no dispersive media (e.g., dust, fog, or smoke) are within the calculated minimum distance from the protective field.

**NOTE**

This document does not provide information on operating the machine in which the safety light curtain is integrated.

Further topics

- ["Minimum distance to reflective surfaces", page 22](#)

8.2 Regular thorough check

The check must detect if it is possible to enter the hazardous area without being detected. Such possibilities may exist due to modifications, manipulations or external influences.

- ▶ Carry out the checks according to the instructions from the manufacturer of the machine and from the operating entity.

9 Maintenance

The safety light curtain is maintenance-free. Depending on the ambient conditions, regular cleaning is required.

9.1 safety

**DANGER**

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ▶ Do not do repair work on device components.
- ▶ Do not make changes to or manipulate device components.
- ▶ Apart from the procedures described in this document, the device components must not be opened.

**DANGER**

Risk of ignition or explosion

- ▶ Disconnect the voltage supply before any maintenance work is carried out to avoid igniting hazardous atmospheres.
- ▶ Only reconnect the voltage supply once you have completed the maintenance work.

**DANGER**

Risk of ignition

Failure to observe this information could result in a risk of ignition.

- ▶ If the safety light curtain is used in an environment classified as tb IIIC, tc IIIB or tc IIIC the cover must not be removed, not even temporarily (e.g. for maintenance purposes).

**DANGER**

Risk of ignition or explosion

- ▶ If you have to remove the cover when working on the safety light curtain, make sure that the joints and o-ring are clean and undamaged before refitting the cover.

**DANGER**

Risk of ignition or explosion

- ▶ Use fixing screws with a yield point of at least 640 MPa to attach the cover to the explosion-proof enclosure.

9.2 Regular cleaning

Overview

Depending on the ambient conditions of the safety light curtain, the front screens must be cleaned regularly and in the event of contamination. Static charges can cause dust particles to be attracted to the front screen. The weld spark guard and deflector mirrors must be cleaned regularly and in the event of contamination.

Important information

**DANGER**

Risk of ignition or explosion

Static discharge could cause explosions in hazardous atmospheres.

- ▶ Always use anti-static cleaning agents to prevent static charge.
 - ▶ Do not clean the device using a dry cloth.
-

**DANGER**

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ▶ Regularly check the degree of contamination on all components based on the application conditions.
 - ▶ Observe the information concerning test rod testing.
-

**DANGER**

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ▶ Make sure that the optical properties of the front screens of the sender and receiver are not changed, e.g., by:
 - beading water, mist, frost, or ice formation. If applicable, remove films or other types of contamination, disconnect the voltage supply of the receiver and then switch it back on.
 - Scratches or damage. Replace the device whose front screen is scratched or damaged.
 - ▶ Make sure that all reflective surfaces and objects maintain a minimum distance from the protective field.
 - ▶ Make sure that no dispersive media (e.g., dust, fog, or smoke) are within the calculated minimum distance from the protective field.
-

**DANGER**

Hazard due to unexpected starting of the machine

- ▶ Make sure that the dangerous state of the machine is and remains switched off during the cleaning.
 - ▶ Make sure that the outputs of the safety light curtain do not affect the machine during the cleaning process.
-

**NOTICE**

- ▶ Do not use any aggressive cleaning agents.
 - ▶ Do not use any abrasive cleaning agents.
 - ▶ Do not use any oil-based cleaning agents.
 - ▶ We recommend anti-static cleaning agents.
-

Approach

1. Remove dust from the front screen using a soft, clean brush.
2. Then wipe the front screen with a clean, damp cloth.
3. Check the position of the sender and receiver after cleaning.
4. Check the effectiveness of the protective device.

Further topics

- ["Operation", page 53](#)
- ["Minimum distance to reflective surfaces", page 22](#)

9.3 Regular thorough check

The check must detect if it is possible to enter the hazardous area without being detected. Such possibilities may exist due to modifications, manipulations or external influences.

- ▶ Carry out the checks according to the instructions from the manufacturer of the machine and from the operating entity.

10 Troubleshooting

This chapter describes how you identify and remedy faults that interrupt the function of the safety light curtain.

10.1 Safety



DANGER

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ▶ Immediately shut the machine down if the behavior of the machine cannot be clearly identified.
- ▶ Immediately put the machine out of operation if you cannot clearly identify or allocate the fault and if you cannot safely remedy the fault.
- ▶ Secure the machine so that it cannot switch on unintentionally.



DANGER

Hazard due to unexpected starting of the machine

- ▶ When any work is taking place, use the protective device to secure the machine or to ensure that the machine is not switched on unintentionally.



DANGER

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ▶ Do not do repair work on device components.
- ▶ Do not make changes to or manipulate device components.
- ▶ Apart from the procedures described in this document, the device components must not be opened.



NOTE

If you cannot remedy the fault with the help of the information provided in this chapter, please contact your respective SICK subsidiary.

10.2 Diagnostic LEDs

10.2.1 Fault indicators

Overview

In the event of a fault, the type of fault is indicated by the LED display on the sender or receiver.

Sender

Position of light emitting diodes: see "[Sender indicators](#)", page 14.

Table 5: Fault indicator on the sender

PWR LED (yellow)	ERR LED (red)	Possible cause	Rectification
○	○	No operating voltage or operating voltage is too low or internal fault	<ul style="list-style-type: none"> ▶ Check the voltage supply, see "Technical data", page 61. ▶ Switch the voltage supply off and then on again. ▶ If the fault persists, replace the sender, see "Ordering information", page 68.
○	◐	The voltage was too high when operating the sender.	<ul style="list-style-type: none"> ▶ Check the voltage supply, see "Technical data", page 61. ▶ Replace the sender, see "Ordering information", page 68.
●	◐	Fault in the supply voltage	<ul style="list-style-type: none"> ▶ Check the voltage supply and the power supply unit, see "Technical data", page 61. ▶ Switch the voltage supply off and then on again. ▶ If the fault persists, replace the defective components, see "Ordering information", page 68.
◐	◐	The sender identified an internal fault.	<ul style="list-style-type: none"> ▶ Switch the voltage supply off and then on again. ▶ If the fault persists, replace the sender, see "Ordering information", page 68.

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

Receiver

Position of light emitting diodes: see "Receiver indicators", page 15.

Table 6: Fault indicator on the receiver

LEDs			Possible cause	Rectification
OSSD (red)	ERR (red)	LED 1 2 3 4 (blue)		
●	◐	◐○○○	An internal fault has occurred.	<ul style="list-style-type: none"> ▶ Switch the voltage supply off and then on again. ▶ If the fault persists, replace the receiver, see "Ordering information", page 68.

LEDs				
●	●	○●○○	Fault in the supply voltage	<ul style="list-style-type: none"> ▶ Check the voltage supply and the power supply unit, see "Technical data", page 61. ▶ Switch the voltage supply off and then on again. ▶ If the fault persists, replace the receiver, see "Ordering information", page 68.
●	●	○○●○	The receiver has recognized beams from several senders.	<ul style="list-style-type: none"> ▶ Check the distance to senders of the same type. Make sure that beams from another sender cannot hit the receiver, see "Protection against interference from systems in close proximity to each other", page 23. ▶ Switch the voltage supply off and then on again.
●	●	○○○●	A fault or unexpected state was identified on the OSSDs of the system connection (e. g., over voltage, short-circuit to HIGH or short-circuit to LOW, cross-circuit, permissible load capacity exceeded)	<ul style="list-style-type: none"> ▶ Check the system wiring for a fault. Make sure that the OSSDs have been wired correctly, see "Integration in electrical control", page 24. ▶ Switch the voltage supply off and then on again. ▶ If the fault persists, replace the defective components, see "Ordering information", page 68.

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

11 Decommissioning

11.1 Protection of the environment

The safety light curtain has been designed to minimize its impact on the environment. It uses only minimum of power and natural resources.

- ▶ Always act in an environmentally responsible manner at work. Please note the following information regarding disposal.

11.2 Disposal

Always dispose of serviceableness devices in compliance with local/national rules and regulations with respect to waste disposal.



NOTE

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

12 Technical data

12.1 Data sheet

Table 7: General system data

	Minimum	Typical	Maximum
Protective field height, depending on type	600, 900, 1,200, and 1,500 mm		
Resolution (detection capability)	30 mm		
Protective field width ¹⁾	0 ... 8 m	0 ... 10 m	
Protection class ²⁾	III (IEC 61140)		
Enclosure rating	IP 66 ³⁾ (IEC 60529)		
Supply voltage U _V at the device ^{4) 5)}	19.2 V	24 V	28.8 V
Residual ripple ⁶⁾			± 10%
Synchronization	Optical		
Type	Type 4 (IEC 61496-1)		
Category	Category 4 (ISO 13849-1)		
Performance level ⁷⁾	PL e (ISO 13849-1)		
Safety Integrity Level ⁷⁾	SIL3 (IEC 61508)		
SIL claim limit ⁷⁾	SILCL3 (IEC 62061)		
PFHd (mean probability of a dangerous failure per hour)	3.7 × 10 ⁻⁹		
T _M (mission time)	20 years (ISO 13849-1)		
Safe state when a fault occurs	At least one OSSD is in the OFF state.		
Power-up delay of sender and receiver before ready			2 s

- 1) If the protective fields are very wide, there is a possibility that all four alignment quality LEDs will not light up even when alignment is good.
- 2) SELV/PELV safety/protective extra-low voltage.
- 3) In order to achieve enclosure rating IP 66, washers must be used for the fixing screws on the enclosure cover.
- 4) The external voltage supply must jumper a brief power failure of 20 ms as specified in IEC 60204-1. Suitable power supply units are available as accessories from SICK.
- 5) A fuse rated maximum 2 A shall be installed in the isolated 24 V DC power supply circuit to the device in order to limit the available current.
- 6) Within the limits of U_V.
- 7) For more detailed information on the exact configuration of your machine, please consult your respective SICK subsidiary.

Table 8: Technical specifications, sender

	Minimum	Typical	Maximum
Wavelength of sender		Near-infrared (NIR), invisible	
Weight	Depending on the protective field height, see "Table of weights" , page 63		

Table 9: Technical specifications, receiver

	Minimum	Typical	Maximum
Output signal switching devices (OSSDs)	2 PNP semiconductors, short-circuit protected ¹⁾ , cross-circuit monitored		
Response time	"Response time" , page 63		

	Minimum	Typical	Maximum
Duration of OFF state	100 ms		
Switch-on delay		3 × response time	
ON state, switching voltage HIGH (U _{rms}) ²⁾	U _V - 2.25 V	24 V	U _V
OFF state, switching voltage LOW ^{2) 3)}	0 V	0 V	2.0 V
Current-carrying capacity of the OSSDs			300 mA each
Leakage current of the OSSDs			2 mA each
Load capacity			2.2 μF ⁴⁾
Load inductance			2.2 H
Test pulse data⁵⁾			
Test pulse range		150 μs ⁶⁾	300 μs ⁶⁾
Test pulse rate	3 1/s	5 1/s	10 1/s
Permissible conductor resistance			
between device and load ⁷⁾			2.5 Ω
Supply cable ⁸⁾			1 Ω

- 1) Applies to the voltage range between -30 V and +30 V.
- 2) According to IEC 61131-2.
- 3) The specified values are the switching voltage passed to the safety light curtain. If higher voltages are impressed from the outside, the maximum value of 2.0 V may be exceeded.
- 4) Applies to devices marked "(Rev. 1)" on the "Ident No." type label entry. For devices not marked "(Rev. 1)", the following applies: Load capacity (maximum) = 30 nF.
- 5) When active, the outputs are tested cyclically (brief LOW). When selecting the downstream controllers, make sure that the test signals do not result in deactivation when using the above parameters.
- 6) Applies to devices marked "(Rev. 1)" on the "Ident No." type label entry. For devices not marked "(Rev. 1)", the following applies: Test pulse width (typical) = 300 μs; test pulse width (maximum) = 350 μs.
- 7) Make sure to limit the individual conductor resistance to the downstream controller to this value to ensure that a cross-circuit between the outputs is safely detected. (Also observe IEC 60204-1.)
- 8) The supply cable must not be used to connect other loads with the exception of the sender.

Table 10: Operating data

	Minimum	Typical	Maximum
Connection	Plug, M12, 5-pin		
Length of cable ¹⁾ E.g., wire cross-section 0.34 mm ² , copper cable E.g., wire cross-section 0.5 mm ² , copper cable			50 m 15 m 30 m
Ambient operating temperature ^{2) 3)}	-20 °C		+55 °C
Air humidity (non-condensing)	15%		95%
Storage temperature	-30 °C		+70 °C
Housing cross-section	142 mm × 163 mm, plus bracket, see " Dimensional drawings ", page 64		
Vibration resistance ⁴⁾	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)		
Shock resistance ⁵⁾	10 g, 16 ms (IEC 60068-2-27)		

- 1) Maximum permissible conductor resistances must be observed.
- 2) The temperature difference between sender and receiver must not exceed 25 K.
- 3) The cable belonging to the device incl. the associated connection plug must not be flexibly mounted under -25° C.
- 4) Test conditions per axis: 1 octave/minute, amplitude: 0.35 mm, 20 sweeps.
- 5) Test conditions per axis: 500 shocks.

12.2 Response time

The response time depends on the protective field height of the system.

Table 11: Response time dependent on the protective field height

Protective field height in mm	Response time in ms
600	10
900	11
1200	12
1500	13

12.3 Power consumption

Table 12: Power consumption, sender and receiver

Protective field height in mm	Typical power consumption of sender in W	Typical power consumption of receiver in W ¹⁾
600	0.91	1.82
900	1.01	2.02
1200	1.10	2.21
1500	1.20	2.40

¹⁾ Power discharged again via the OSSDs depending on the connected OSSD load must be added to the table values.

12.4 Table of weights

Table 13: Weight of sender and receiver

Protective field height in mm	Weight in kg ¹⁾	
	☛ Sender	☛ Receiver
600	28.308	28.318
900	36.041	36.051
1200	43.745	43.755
1500	44.015	44.025

¹⁾ Tolerance: ± 50 g.

12.5 Dimensional drawings

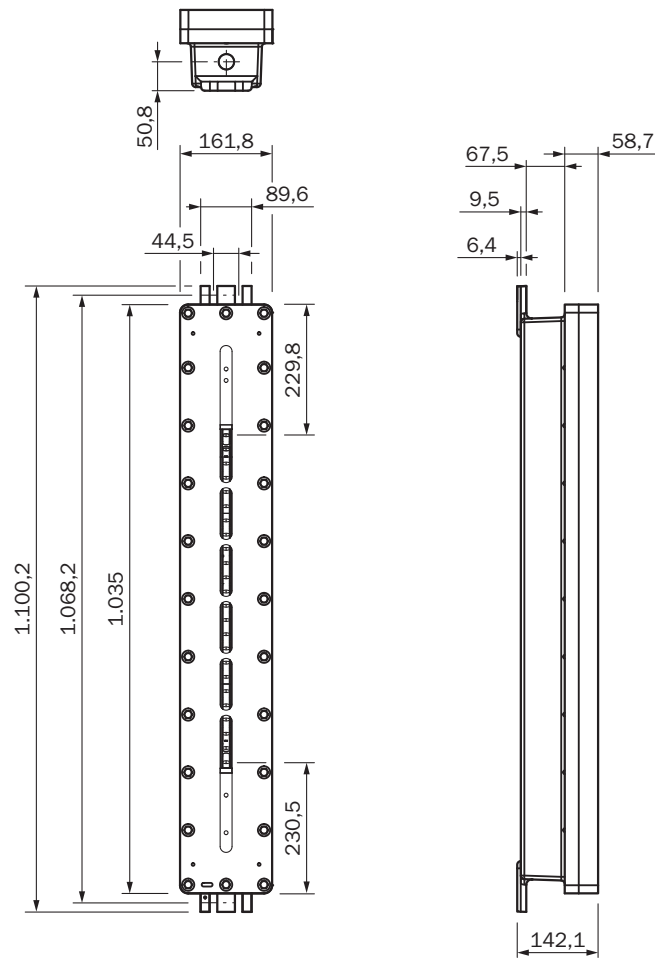


Figure 38: Dimensional drawing, sender and receiver, protective field height 600 mm

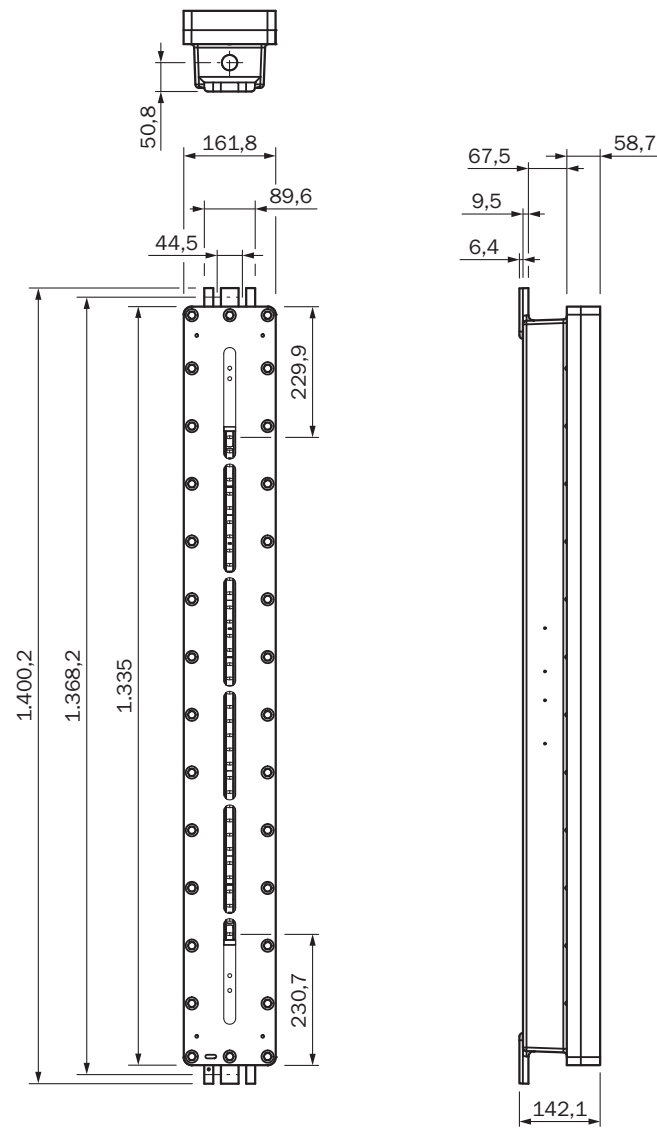


Figure 39: Dimensional drawing, sender and receiver, protective field height 900 mm

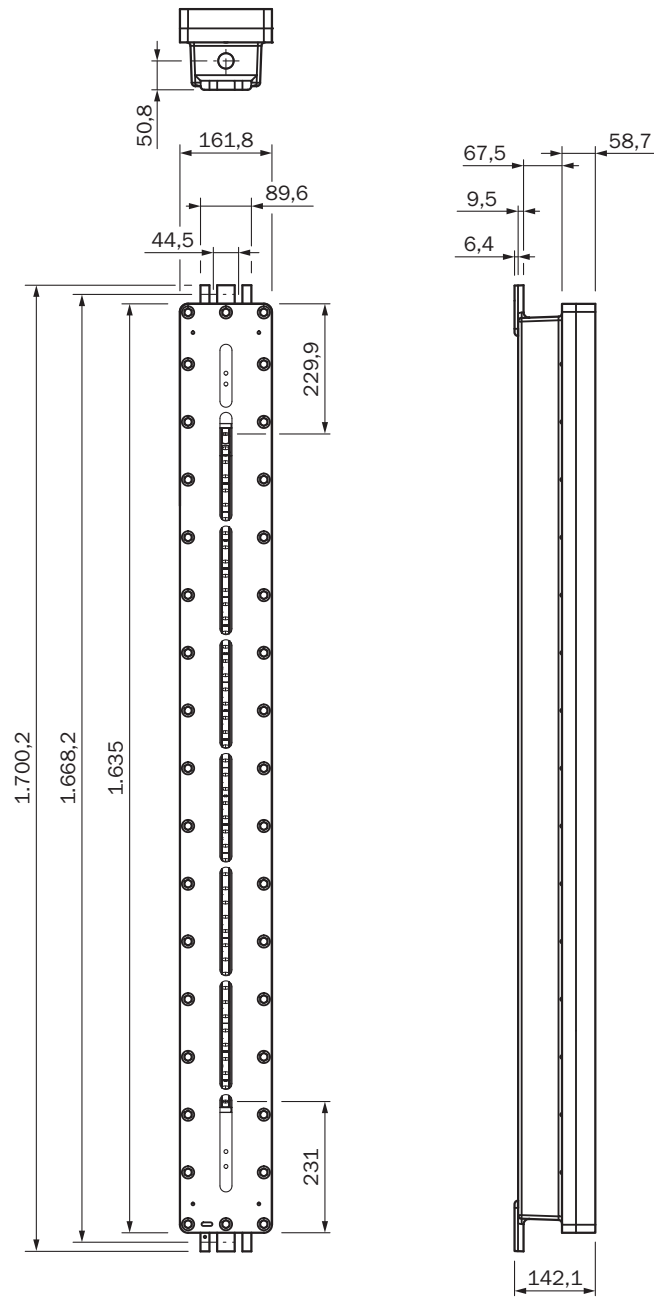


Figure 40: Dimensional drawing, sender and receiver, protective field height 1,200 mm

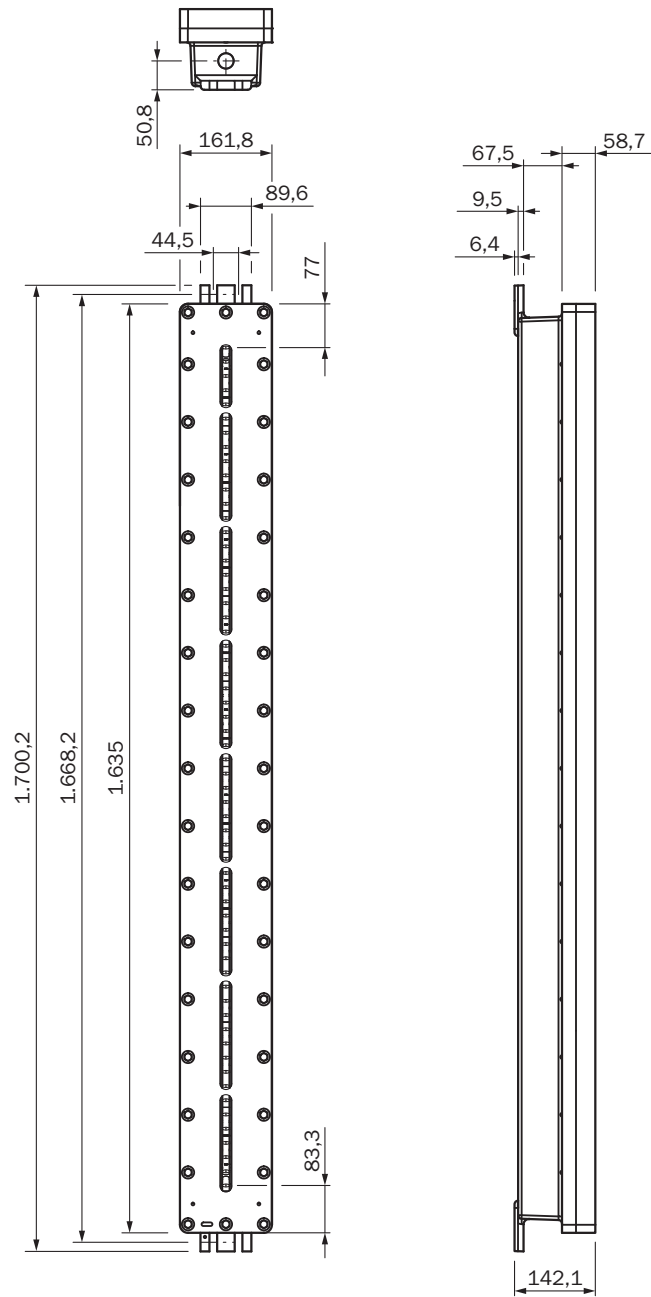


Figure 41: Dimensional drawing, sender and receiver, protective field height 1500 mm

13 Ordering information

13.1 Scope of delivery

Scope of delivery, sender

- deTec4 Core sender
- Explosion-proof enclosure
- 2 x FlexFix bracket with riser
- 2 x handles
- 30 m system connection cables, open end

Scope of delivery, receiver

- deTec4 Core receiver
- Explosion-proof enclosure
- 2 x FlexFix bracket with riser
- 2 x handles
- 30 m system connection cables, open end
- Test rod of 30 mm diameter
- Operating instructions on CD-ROM 2066639

13.2 Ordering information deTec4 Core Ex

Table 14: Ordering information deTec4 Core Ex, resolution 30 mm

Protective field height in mm	☛ Sender		☛ Receiver		☛☛ Sender and receiver	
	Part number	Type code	Part number	Type code	Part number	Type code
600	1068407	EXS-06D6203B020	1068406	EXE-06D6203B020	1068405	EXP-06D6203B020
900	1068410	EXS-09D6403B020	1068409	EXE-09D6403B020	1068408	EXP-09D6403B020
1200	1068413	EXS-12D6603B020	1068412	EXE-12D6603B020	1068411	EXP-12D6603B020
1500	1068416	EXS-12D6803B020	1068415	EXE-12D6803B020	1068414	EXP-12D6803B020

14 Accessories

14.1 Brackets

Table 15: Brackets ordering information

Part	Part number
FlexFix bracket with riser (2x)	2074627
Alignment bracket for explosion-proof housing (2x)	2072525

FlexFix bracket with riser

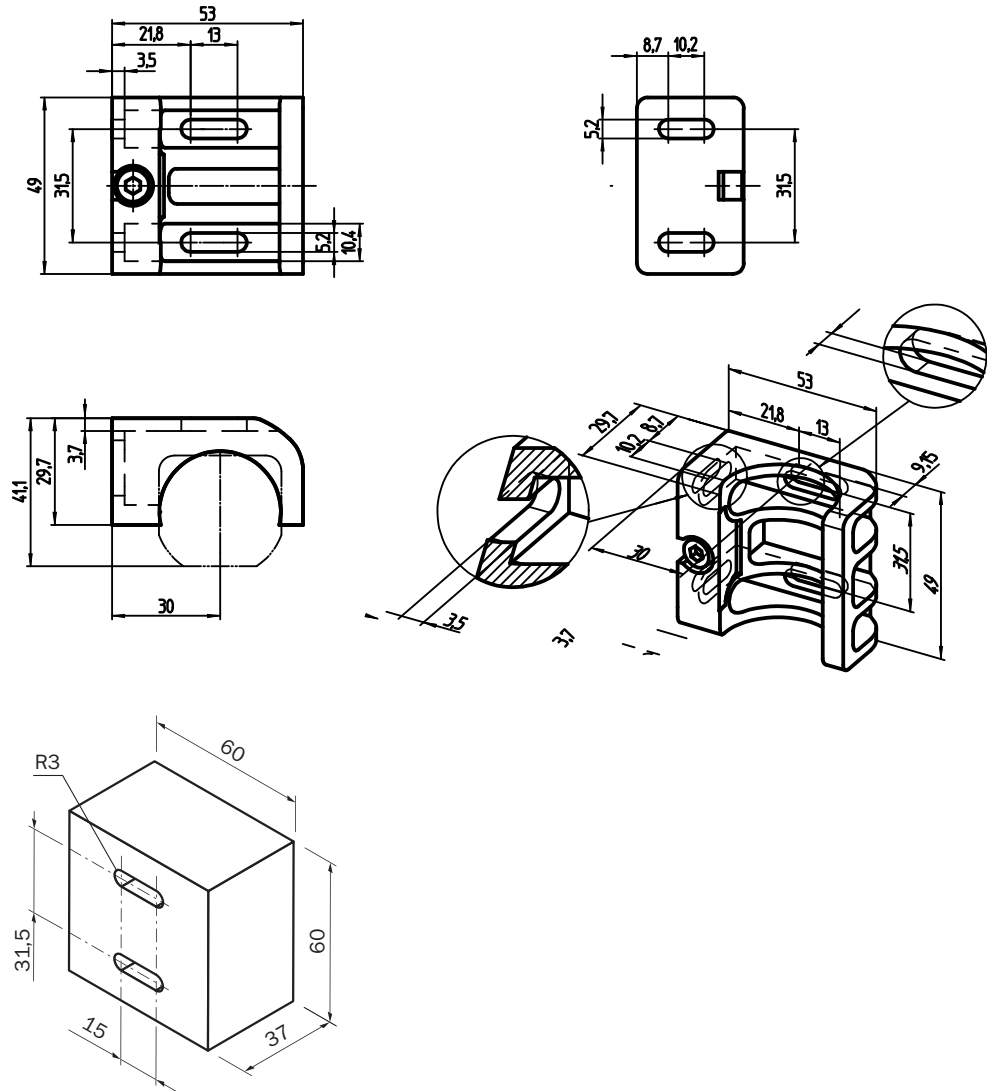


Figure 42: Dimensional drawing of the FlexFix bracket with riser (2074627)

Alignment bracket

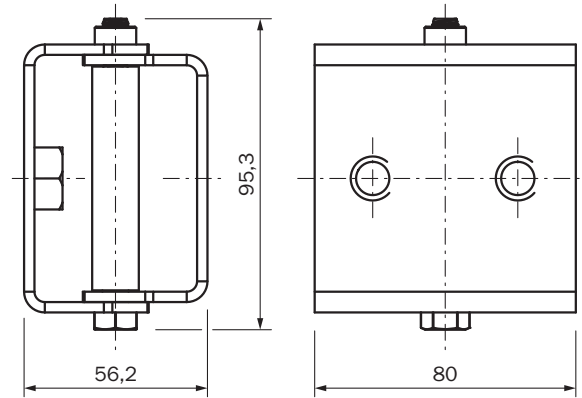


Figure 43: Dimensional drawing of the alignment bracket (2072525)

14.2 Mounting accessories

Table 16: Mounting accessories ordering information

Part	Part number
Alignment tool	4084133

14.3 Connectors

Table 17: Connection technology ordering information

Part	Part number
M12 connecting cable¹⁾, 5-pin	
DOL-1205-G02MC female connector straight with 2 m cable, open end	6025906
DOL-1205-G05MC female connector straight with 5 m cable, open end	6025907
DOL-1205-G10MC female connector straight with 10 m cable, open end	6025908
DOL-1205-G20MC female connector straight with 20 m cable, open end	6050247
DOL-1205-G30MC female connector straight with 30 m cable, open end	6050248
DOL-1205-W02MC female connector angled with 2 m cable, open end	6025909
DOL-1205-W05MC female connector angled with 5 m cable, open end	6025910
DOL-1205-W10MC female connector angled with 10 m cable, open end	6025911
Connection cable	
DSL-1285GM25034KM1, connection cable, M12, 5-pin to M12, 8-pin	2070987
DSL-6187GM25034KM1, connection cable, M12, 5-pin to M26, 7-pin	2070988
DSL-6182GM25034KM1, connection cable, M12, 5-pin to M26, 12-pin	2070989
Cable gland	
Cable gland for the European market	5329001
Distributor	
DSC-1205T000025KM0, T distributor	6030664
Resistance terminal	
Resistance terminal 2.15 kΩ	2073807
Power supplies	
Output 24 V DC, 50 W (2.1 A), power supply NEC Class 2, SELV, PELV, input 120-240 V AC (PS50WE24V)	7028789

Part	Part number
Output 24 V DC, 95 W (3.9 A), power supply NEC Class 2, SELV, PELV, input 100-120/220-240 V AC (PS95WE24V)	7028790

1) Ambient operating temperature: Down to -30° C with fixed installation

14.4 Alignment aid

Table 18: Alignment aid ordering information

Part	Part number
AR60 laser alignment aid	1015741
Adapter	2074849

14.5 Deflector mirrors

14.5.1 Function and use

Overview

Deflector mirrors can be used to shape the protective field to secure hazardous points from multiple sides using a single safety light curtain.

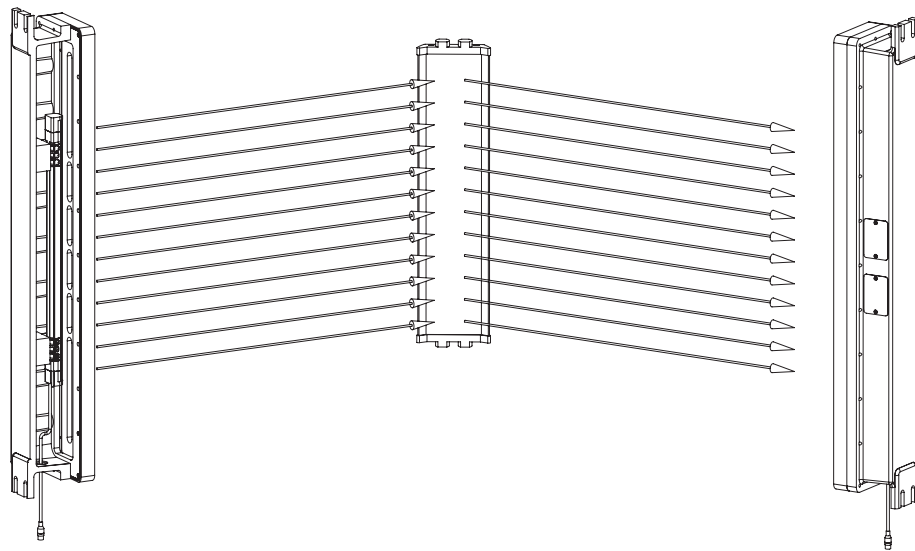


Figure 44: Example of use of deflector mirrors

Important information



DANGER

Hazard due to lack of effectiveness of the protective device

Persons and parts of the body to be protected may not be recognized in case of non-observance.

- ▶ Only mount deflector mirrors to solid walls or machine components. The position of the deflector mirrors must not change after alignment.
- ▶ Do not use deflector mirrors if contamination, beading water, condensation, or frost on the deflector mirrors is to be expected.
- ▶ Make sure that the deflector mirrors are intact and free of scratches, contamination, beading water, condensation, frost, etc. at all times.

14.5.2 Mounting

To mount the deflector mirrors, use the included swivel mount brackets.

14.5.3 Change in scanning range using deflector mirrors

Overview

The information relates to 90° beam deflection per mirror and a protective field height of 900 mm.

Important information



NOTE

The use of deflector mirrors reduces the scanning range depending on the number of deflector mirrors in the protective field.

Table 19: Scanning range with and without 1 or 2 deflector mirrors

Model name	Resolution	Scanning range, typical ¹⁾	Scanning range with 1 deflector mirror, typical ¹⁾	Scanning range with 2 deflector mirrors, typical ¹⁾
PNS75, PNS125	30 mm	10 m	8.9 m	8.0 m

¹⁾ If the protective fields are very wide, there is a possibility that all four alignment quality LEDs will not light up even when alignment is good.

14.5.4 Deflector mirror PNS75 - ordering information

Table 20: Ordering information, deflector mirror PNS75

Mirror length in mm	Max. protective field height in mm	Type code	Part number
640	600	PNS75-064	1019416
940	900	PNS75-094	1019418
1240	1200	PNS75-124	1019420
1540	1500	PNS75-154	1019422

14.5.5 Deflector mirror PSN125 - ordering information

Table 21: Ordering information, deflector mirror PSN125

Mirror length in mm	Max. protective field height in mm	Type code	Part number
640	600	PNS125-064	1019427
940	900	PNS125-094	1019429
1240	1200	PNS125-124	1019431
1540	1500	PNS125-154	1019433

14.6 Test rods

Table 22: Ordering information, test rods

Part	Part number
Test rod 30 mm	2022602
Test rod holder	2052249

15 Annex

15.1 Compliance with EU directives

EU declaration of conformity (excerpt)

The undersigned, who represents the manufacturer below, hereby declares that the product complies with the regulations of the EU directive(s) below (including all relevant changes), and that it is based on the relevant standards and/or technical specifications.

Complete EU declaration of conformity for download

You can call up the EU declaration of conformity and the current operating instructions for the protective device by entering the part number in the search field at www.sick.com (part number: see the type label entry in the "Ident. no." field).

15.2 Note on specified standards

Standards are specified in this document. The table shows regional standards with similar or identical contents.

Table 23: Note on specified standards

Standard	Standard (regional)
	China
IEC 60068-2-6	GB/T 2423.10
IEC 60068-2-27	GB/T 2423.5
IEC 60204-1	GB 5226.1
IEC 60529	GB 4208
IEC 60825	GB 7247.1
IEC 61131-2	GB/T 15969.1
IEC 61140	GB/T 17045
IEC 61496-1	GB/T 19436.1
IEC 61496-3	GB/T 19436.3
IEC 61508	GB/T 20438
IEC 62061	GB 28526
ISO 13849-1	GB/T 16855.1
ISO 13855	GB/T 19876

15.3 Checklist for initial commissioning and commissioning

Checklist for manufacturers or installers for installing electro-sensitive protective device (ESPE)

The details relating to the items listed below must be available no later than when the system is commissioned for the first time. However, these depend on the specific application (the requirements of which must be reviewed by the manufacturer or installer).

This checklist should be retained and kept with the machine documentation to serve as reference during recurring tests.

This checklist does not replace the initial commissioning, nor the regular inspection by qualified safety personnel.

Have the safety rules and regulations been observed in compliance with the directives and standards applicable to the machine?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are the applied directives and standards listed in the declaration of conformity?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Does the protective device comply with the required PL/SIL claim limit and PFHd in accordance with EN ISO 13849-1/EN 62061 and the required type in accordance with EN 61496-1?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Is access to the hazardous area or hazardous point only possible through the protective field of the ESPE?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Have appropriate measures been taken to protect (mechanical protection) or monitor (protective devices) any persons or objects in the hazardous area when protecting a hazardous area or hazardous point, and have these devices been secured or locked to prevent their removal?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are additional mechanical protective measures fitted and secured against manipulation which prevent reaching below, above or around the ESPE?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Has the maximum shutdown and/or stopping time of the machine been measured, specified and documented (at the machine and/or in the machine documentation)?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Has the ESPE been mounted such that the required minimum distance from the nearest hazardous point has been achieved?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are the ESPE devices properly mounted and secured against manipulation after adjustment?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are the required protective measures against electric shock in effect (protection class)?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Is the control switch for resetting the protective devices (ESPE) or restarting the machine present and correctly installed?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are the outputs of the ESPE (OSSDs or safety outputs via the network) integrated according to the required PL/SILCL in accordance with EN ISO 13849-1/EN 62061 and does the integration correspond to the circuit diagrams?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Has the protective function been checked in compliance with the test notes of this documentation?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are the specified protective functions effective at every operating mode that can be set?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are the switching elements activated by the ESPE, e.g. contactors, valves, monitored?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Is the ESPE effective over the entire period of the dangerous state?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Once initiated, will a dangerous state be stopped when switching the ESPE on or off and when changing the operating mode, or when switching to another protective device?	Yes <input type="checkbox"/> No <input type="checkbox"/>

16 List of figures

1.	Sender and receiver.....	13
2.	Sender indicators.....	14
3.	Receiver indicators.....	15
4.	Hazardous point protection.....	16
5.	Access protection.....	16
6.	Hazardous area protection.....	17
7.	Minimum distance to hazardous point for orthogonal (right-angled) approach to protective field.....	21
8.	Representation of the accessibility of electro-sensitive protective device by reaching over. Left: Protective field that cannot be reached over. Right: Protective field that can be reached over.....	22
9.	Minimum distance from reflective surfaces.....	22
10.	Graph of minimum distance from reflective surfaces.....	23
11.	Preventing mutual interference from system ① and system ②.....	23
12.	Trouble-free operation due to reversed direction of transmission of system ① and system ②.....	24
13.	Dual-channel and isolated connection of OSSD1 and OSSD2.....	25
14.	No potential difference between load and protective device.....	25
15.	Schematic representation of operation with restart interlock.....	26
16.	Connection diagram for UE48-20S with restart interlock and external device monitoring.....	27
17.	Test rod check: Step 1.....	30
18.	Test rod check: Step 2.....	30
19.	Mounting the safety light curtain in the explosion-proof enclosure.....	35
20.	Aligning the safety light curtain in the explosion-proof enclosure.....	36
21.	Mounting of the handles.....	37
22.	Incorrect installation of sender and receiver.....	38
23.	Mounting the safety light curtain without the alignment bracket.....	38
24.	Mounting the safety light curtain without the alignment bracket: Step 1.....	39
25.	Mounting the safety light curtain without the alignment bracket: Step 2.....	39
26.	Mounting the safety light curtain without the alignment bracket: Steps 3 and 4.....	39
27.	Mounting the safety light curtain using the alignment brackets.....	40
28.	Assembling the alignment brackets.....	40
29.	Mounting the safety light curtain using the alignment brackets: Steps 1 to 6.....	41
30.	Mounting the safety light curtain using the alignment brackets: Step 7.....	41
31.	Mounting the safety light curtain using the alignment brackets: Step 8.....	42
32.	Mounting the safety light curtain using the alignment brackets: Steps 9 and 10.....	42
33.	Mounting the safety light curtain using the alignment brackets: Steps 11 and 12.....	43
34.	Dual-channel and isolated connection of OSSD1 and OSSD2.....	46
35.	No potential difference between load and protective device.....	46
36.	System connection (M12, 5-pin).....	46
37.	Alignment bracket: rotate.....	51
38.	Dimensional drawing, sender and receiver, protective field height 600 mm.....	64
39.	Dimensional drawing, sender and receiver, protective field height 900 mm.....	65
40.	Dimensional drawing, sender and receiver, protective field height 1,200 mm.....	66
41.	Dimensional drawing, sender and receiver, protective field height 1500 mm.....	67
42.	Dimensional drawing of the FlexFix bracket with riser (2074627).....	69
43.	Dimensional drawing of the alignment bracket (2072525).....	70
44.	Example of use of deflector mirrors.....	71

17 List of tables

1.	Formula for calculating the minimum distance from reflective surfaces.....	23
2.	Minimum wire cross-section for protection earth (PE).....	45
3.	System connection pin assignment (M12, 5-pin).....	47
4.	Indication of the alignment quality.....	51
5.	Fault indicator on the sender.....	58
6.	Fault indicator on the receiver.....	58
7.	General system data.....	61
8.	Technical specifications, sender.....	61
9.	Technical specifications, receiver.....	61
10.	Operating data.....	62
11.	Response time dependent on the protective field height.....	63
12.	Power consumption, sender and receiver.....	63
13.	Weight of sender and receiver	63
14.	Ordering information deTec4 Core Ex, resolution 30 mm.....	68
15.	Brackets ordering information.....	69
16.	Mounting accessories ordering information.....	70
17.	Connection technology ordering information.....	70
18.	Alignment aid ordering information.....	71
19.	Scanning range with and without 1 or 2 deflector mirrors.....	72
20.	Ordering information, deflector mirror PNS75.....	72
21.	Ordering information, deflector mirror PSN125.....	72
22.	Ordering information, test rods.....	72
23.	Note on specified standards.....	74

Australia

Phone +61 3 9457 0600
1800 334 802 - tollfree
E-Mail sales@sick.com.au

Austria

Phone +43 22 36 62 28 8-0
E-Mail office@sick.at

Belgium/Luxembourg

Phone +32 2 466 55 66
E-Mail info@sick.be

Brazil

Phone +55 11 3215-4900
E-Mail marketing@sick.com.br

Canada

Phone +1 905 771 14 44
E-Mail information@sick.com

Czech Republic

Phone +420 2 57 91 18 50
E-Mail sick@sick.cz

Chile

Phone +56 2 2274 7430
E-Mail info@schadler.com

China

Phone +86 20 2882 3600
E-Mail info.china@sick.net.cn

Denmark

Phone +45 45 82 64 00
E-Mail sick@sick.dk

Finland

Phone +358-9-2515 800
E-Mail sick@sick.fi

France

Phone +33 1 64 62 35 00
E-Mail info@sick.fr

Germany

Phone +49 211 5301-301
E-Mail info@sick.de

Hong Kong

Phone +852 2153 6300
E-Mail ghk@sick.com.hk

Hungary

Phone +36 1 371 2680
E-Mail office@sick.hu

India

Phone +91 22 6119 8900
E-Mail info@sick-india.com

Israel

Phone +972 4 6881000
E-Mail info@sick-sensors.com

Italy

Phone +39 02 274341
E-Mail info@sick.it

Japan

Phone +81 3 5309 2112
E-Mail support@sick.jp

Malaysia

Phone +6 03 8080 7425
E-Mail enquiry.my@sick.com

Mexico

Phone +52 (472) 748 9451
E-Mail mario.garcia@sick.com

Netherlands

Phone +31 30 2044 000
E-Mail info@sick.nl

New Zealand

Phone +64 9 415 0459
0800 222 278 - tollfree
E-Mail sales@sick.co.nz

Norway

Phone +47 67 81 50 00
E-Mail sick@sick.no

Poland

Phone +48 22 539 41 00
E-Mail info@sick.pl

Romania

Phone +40 356 171 120
E-Mail office@sick.ro

Russia

Phone +7 495 775 05 30
E-Mail info@sick.ru

Singapore

Phone +65 6744 3732
E-Mail sales.gsg@sick.com

Slovakia

Phone +421 482 901201
E-Mail mail@sick-sk.sk

Slovenia

Phone +386 591 788 49
E-Mail office@sick.si

South Africa

Phone +27 11 472 3733
E-Mail info@sickautomation.co.za

South Korea

Phone +82 2 786 6321
E-Mail info@sickkorea.net

Spain

Phone +34 93 480 31 00
E-Mail info@sick.es

Sweden

Phone +46 10 110 10 00
E-Mail info@sick.se

Switzerland

Phone +41 41 619 29 39
E-Mail contact@sick.ch

Taiwan

Phone +886 2 2375-6288
E-Mail sales@sick.com.tw

Thailand

Phone +66 2645 0009
E-Mail Ronnie.Lim@sick.com

Turkey

Phone +90 216 528 50 00
E-Mail info@sick.com.tr

United Arab Emirates

Phone +971 4 88 65 878
E-Mail info@sick.ae

United Kingdom

Phone +44 1727 831121
E-Mail info@sick.co.uk

USA

Phone +1 800 325 7425
E-Mail info@sick.com

Vietnam

Phone +84 945452999
E-Mail Ngo.Duy.Linh@sick.com

Further locations at www.sick.com

