OPERATING INSTRUCTIONS

deTec4 Ex

Safety light curtain

SICK
Sensor Intelligence.

Described product

deTec4 Ex

Manufacturer

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

Legal information

Original document

This document is an original document of SICK AG.

Contents

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 Ex safety light curtain with one of the following type label entries in the “Operating Instructions” field:

- 8022831

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

8022831

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 23 "Configuration", page 60 "Technical data", page 89 "Accessories", page 99
	Installers	"Mounting", page 43
	Electricians	"Electrical installation", page 56
	Safety specialists	"Project planning", page 23 "Configuration", page 60 "Commissioning", page 66 "Technical data", page 89 "Checklist for initial commissioning and commissioning", page 106
Operating company	Operator	"Operation", page 73 "Troubleshooting", page 79
	Maintenance personnel	"Maintenance", page 76 "Troubleshooting", page 79 "Ordering information", page 98

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 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.

CAUTION
Laser class 1

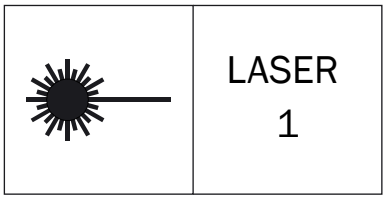

Figure 1: Laser class 1

This device has been classified in accordance with the following standards:

- IEC 60825-1:2007/EN 60825-1:2007
- IEC 60825-1:2014/EN 60825-1:2014
- 21 CFR 1040.10 and 1040.11, except for deviations pursuant to Laser Notice No. 50 dated 2007-06-24

The laser is eye-safe. Looking directly into the laser may cause temporary impairments.

The outlet opening of the laser radiation is located in the sender, see figure 4, page 18. The laser is only active when the laser alignment aid is switched on.

Laser identification is located on the rear of the sender.

- ▶ Comply with the latest version of the applicable provisions on laser protection.

CAUTION
If any operating or adjusting devices other than those specified in this document are used or other methods are employed, this can lead to dangerous exposure to radiation.

- ▶ Only use the operating or adjusting devices specified in this document.
- ▶ Only follow the methods specified in this document.
- ▶ Do not open the housing, except for the purposes of the installation and maintenance work specified in these operating instructions.

WARNING
Risk of ineffectiveness of the protective device

Please observe the following information to ensure that you are using the deTec4 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.

DANGER
Risk of ignition

Failure to observe this instruction can result in a risk of ignition from potential sparking.

- Ensure that only accessories that are approved for explosion-hazardous areas are used.

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

- Hazardous point protection
- Access protection
- Hazardous area protection

The deTec4 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 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:

- Ⓔx II 2 G Ex db IIB T6
- Ⓔx 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 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 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 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 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.

Only if the device 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 device 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 Ex safety light curtain is **not** suitable for the following applications:

- Outdoors
- Underwater
- At altitudes over 3,000 m above sea level
- 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.

Configuration

For configuration, 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 work safety aspects.

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 73, and see "Regular cleaning", page 76.

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 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 light 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, but is advantageous.

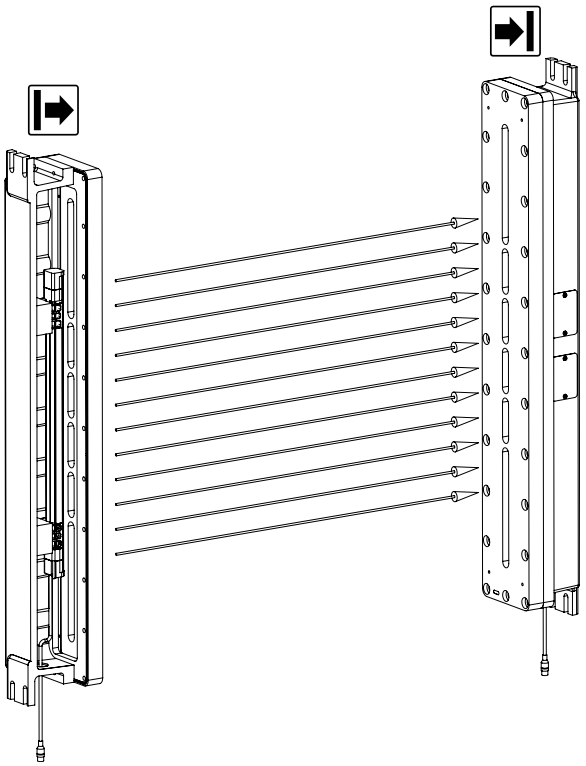

Figure 2: Sender and receiver

Protective field height

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

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.

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

Scanning range

The scanning range is the maximum protective field width.

The scanning range is reduced by using deflector mirrors.

Further topics

- "Flexible control cabinet cabling and status indication on both sides", page 18
- "Data sheet", page 89
- "Deflector mirrors", page 100

3.2 Product characteristics

3.2.1 Device overview

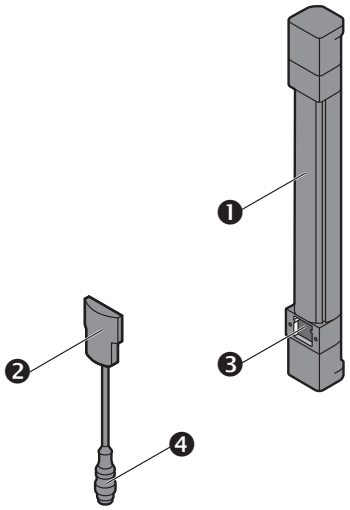

Figure 3: Device overview

❶ Sender or receiver
❷ System plug
❸ Terminal compartment
❹ System connection

3.2.2 Automatic calibration of the protective field width

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

3.2.3 Beam coding.

Depending on its configuration, the safety light curtain operates with 1 of 3 beam codings: uncoded, code 1 or code 2. The beam coding “uncoded” allows for particularly short response times. In order to avoid mutual interference between 2 neighboring safety light curtains, one can be operated with code 1 and the other with code 2.

3.2.4 Alignment aid

A laser alignment aid is installed in the sender of the safety light curtain. The laser alignment aid can be switched on to perform a simple alignment of the sender.

Diagnostic LEDs are installed in the receiver of the safety light curtain. For a simple alignment of the receiver, diagnostic LEDs 1, 2, 3 and 4 indicate the alignment quality once the safety light curtain has been switched on.

Diagnostic LEDs 5 and 6 light up if the topmost beam (far from system plug) is synchronized. Diagnostic LEDs 7 and 8 light up if the bottommost beam (near system plug) is synchronized.

3.2.5 Restart interlock

The safety light curtain has an integrated restart interlock. The function can be configured during commissioning.

A restart interlock prevents the machine from starting again once the protective device has been triggered. The operator must first press a reset pushbutton to allow the protective device to resume its monitoring function. The operator can then restart the machine.

3.2.6 External device monitoring (EDM)

The safety light curtain has integrated external device monitoring. The function can be configured during commissioning.

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

In order to use the external device monitoring, positively guided contactors must be used to switch off 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.

3.2.7 Application diagnostic output

The safety light curtain has an application diagnostic output on the system connection.

Depending on the configuration, the application diagnostic output signals a certain status of the safety light curtain, e.g. if the reset pushbutton must be engaged or if there is a weak signal at the receiver.

For a signal of the safety light curtain to be displayed, a light can be connected to the application diagnostic output or the signal can be transmitted to the machine controller.

3.2.8 System plug

Overview

The following system plugs are available for the safety light curtain:

- SP1 system plug

The system plugs are available in the following versions:

- System plug (flying leads, 8-wire)

The following functions are available depending on the system plug used:

- Beam coding
- Restart interlock
- External device monitoring (EDM)
- Application diagnostic output

3.2.9 Flexible control cabinet cabling and status indication on both sides

The safety light curtain can be connected to the control cabinet in different ways as required:

- Separate connecting cables for sender and receiver
- Separate connecting cables for sender and receiver with connection in the control cabinet

The OSSD status and the status of the protective field are indicated via LEDs on the sender and receiver when the following applies:

- The sender and receiver are connected to one another in the control cabinet

If the sender and receiver are not connected to each other, this status information is only indicated at the receiver.

Further topics

- "Connection diagrams", page 38

3.2.10 Status indicators

Overview

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

Sender indicators

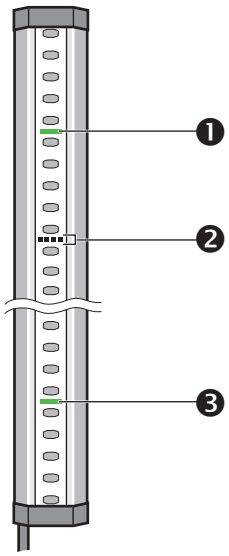

Figure 4: Sender indicators

The sender has one laser alignment aid and at least two light emitting diodes, which indicate the operational status:

Position	LED color	Function	Labeling
❶	Red/yellow/green	Field indicator [1]; shows the status of the protective field and additional information about the status display	–
❷	–	Laser alignment aid	–
❸	Red/yellow/green	Status indicator	STATE

1) Safety light curtains with protective field height > 300 mm have several light emitting diodes for the field indicator.

Receiver indicators

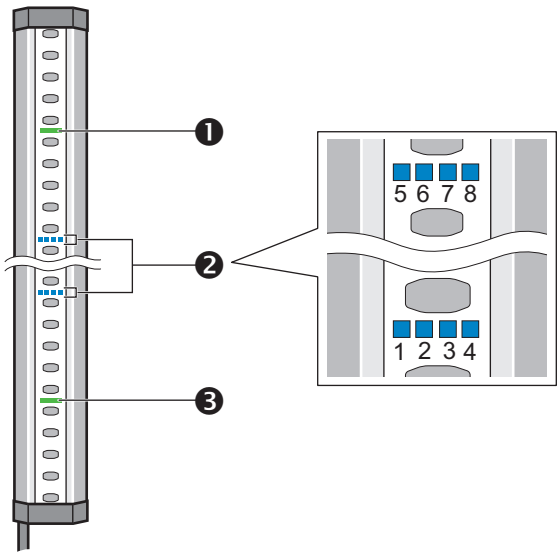

Figure 5: Receiver indicators

At least ten light emitting diodes on the receiver indicate the operational status:

Position	LED color	Function	Labeling
❶	Red/yellow/green	Field indicator [1]; shows the status of the protective field and additional information about the status display	–
❷	Blue/red/yellow/white	Diagnostics	1, 2, 3, 4, 5, 6, 7, 8
❸	Red/green	OSSD status	OSSD

1) Safety light curtains with protective field height > 300 mm have several light emitting diodes for the field indicator.

Further topics

- "Diagnostic LEDs", page 79

3.2.10.1 Indication of diagnostic LEDs

Table 1: Colors and their meaning

Color	Color	Meaning
●	White	Configuration status

Color	Color	Meaning
●	Blue	Alignment quality
●	Red	Fault indicator
●	Yellow	Warning

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

Table 2: Indication of the configuration status

Diagnostic LEDs	Color	Configuration
1	● White	External device monitoring (EDM) is configured.
2	● White	Reserved
3	● White	Beam coding is configured.
4	● White	Restart interlock is configured.
5	● White	Reserved
6	● White	Reserved
7	● White	Reserved
8	● White	Reserved

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

Table 3: Indication of the alignment quality

Diagnostic LEDs	Color	Meaning
1 ... 4	● Blue	Indication of the alignment quality. If only one diagnostic LED lights up, the alignment is insufficient. If all 4 diagnostic LEDs light up, the alignment is excellent.
5, 6	● Blue	The topmost beam (far from system plug) is synchronized.
7, 8	● Blue	The bottommost beam (near system plug) is synchronized.

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

Table 4: Fault indicator

Diagnostic LEDs	Color	Meaning
1 ... 8	● Red	A red illuminated diagnostic LED signals the function at which an error has occurred.
1 ... 8	☼ Red	A red flashing diagnostic LED signals the reason for the error.

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

Example: If diagnostic LED 1 lights up red and diagnostic LED 5 flashes red, there is an EDM error.

Table 5: Warnings

Diagnostics LED	Color	Meaning
1 ... 8	● Yellow	A yellow illuminated diagnostic LED signals which function is affected.
1 ... 8	☼ Yellow	A yellow flashing diagnostic LED signals the reason for the warning.

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

Further topics

- "Diagnostic LEDs", page 79

3.3 Example applications

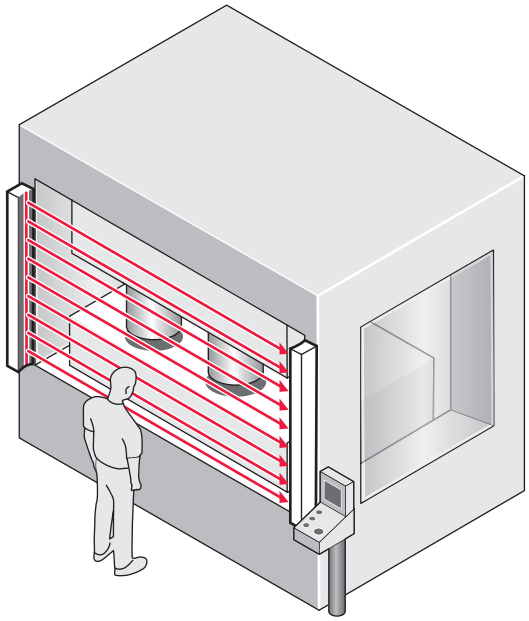

Figure 6: Hazardous point protection

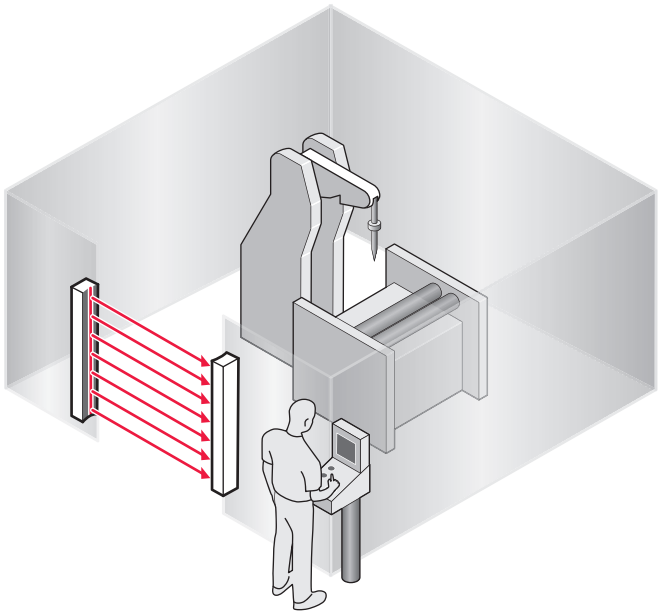

Figure 7: Access protection

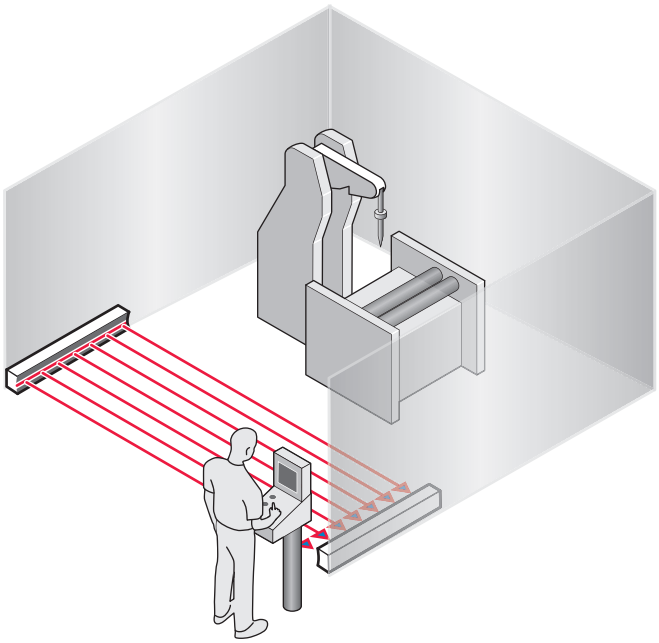

Figure 8: Hazardous area protection

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.

DANGER
Hazard due to lack of effectiveness of the protective device

Certain types of light radiation can influence the protective device, e.g., light radiation from fluorescent lamps with electronic ballast installed in the path of the beam, or beams from laser pointers directed at the receiver.

- If this type of light radiation is present in the environment of the protective device, take additional measures to ensure that the protective device does not become dangerous.

Further topics

- "Mounting", page 43

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.

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.

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.

Further topics

- "Minimum distance to reflective surfaces", page 27
- "Technical data", page 89
- "Deflector mirrors", page 100

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.

Calculation of 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, then 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 device
- 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

More information is available in the ISO 13855 standard and in the Guide for Safe Machinery.

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

Further topics

- "Response time", page 92

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 in accordance with ISO 13855 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 mm/s × T + 8 ×(d – 14 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 mm/s × T + 8 ×(d – 14 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.

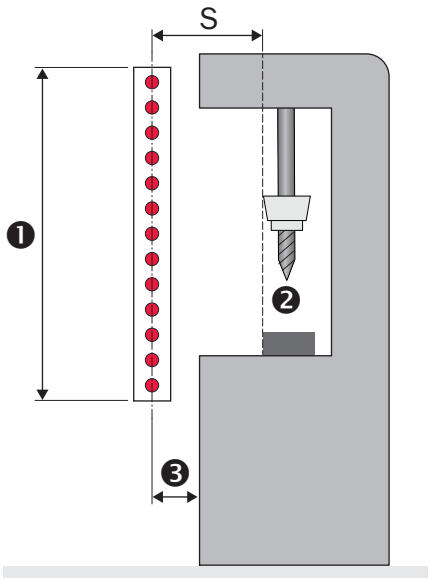

Figure 9: Minimum distance to the hazardous point for orthogonal (rectangular) approach to the protective field

❶ Protective field height

❷ Hazardous point

❸ 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 ms +30 ms = 320 ms = 0.32 s

S = 2,000 mm/s × 0.32 s +8 × (30 mm –14 mm) = 768 mm

S > 500 mm, therefore:

S = 1,600 mm/s × 0.32 s +8 × (30 mm –14 mm) = 640 mm

4.3.2.2 Taking reach over into account

In accordance with ISO 13855, it must not be possible to defeat the ESPE. 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.

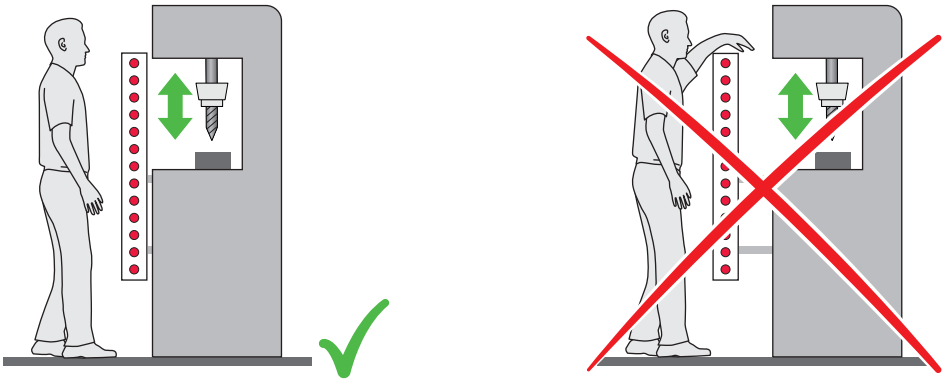

Figure 10: Representation of the accessibility of electro-sensitive protective device by reaching over. Left: Protective field that cannot be reached over. Right: Protective field that can be reached over.

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).

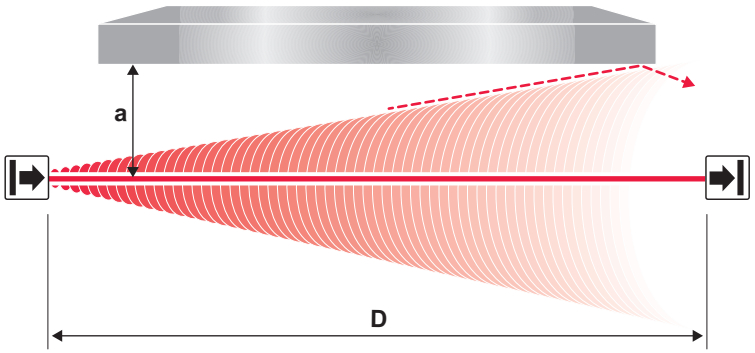

Figure 11: Minimum distance from reflective surfaces

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 from reflective surfaces with automated calibration of the protective field width

The minimum distance can be determined as follows:

- 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 6:

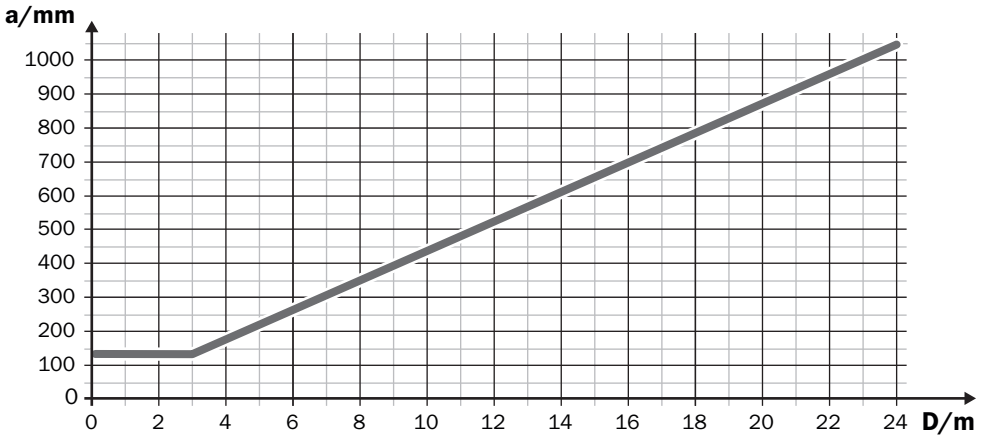

Figure 12: Graph of minimum distance from reflective surfaces

Table 6: Formula for calculating the minimum distance to reflective surfaces with automatic calibration of the protective field width

Distance D between sender and receiver in m	Calculation of the minimum distance (a) from reflective surfaces in mm
D ≤ 3 m	a = 131 mm
D > 3 m	a = tan (2.5°) × 1,000 mm/m × D = 43.66 × 1 mm/m × D

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

Overview

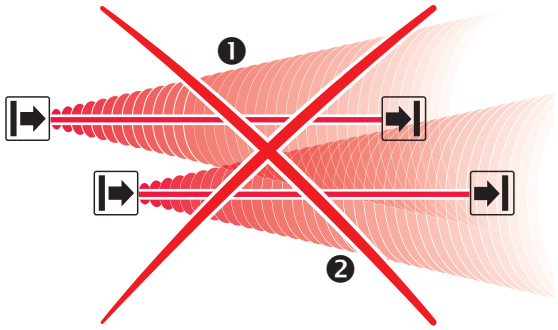

Figure 13: Preventing mutual interference from system ① and system ②

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.

Important information

DANGER
Hazard due to lack of effectiveness of the protective device

The integrated laser alignment aid may influence the receiver of a safety light curtain in close proximity. In such cases, the neighboring safety light curtain may not detect persons or parts of the body that require protection.

- ▶ Perform an alignment or take other measures to ensure that the laser beam only hits the front screen of the relevant receiver. The laser beam must not hit any external receiver should the integrated laser alignment aid be switched on by mistake or due to a fault. An external receiver is a receiver that is not part of the same safety light curtain or same cascade.
- ▶ During alignment in particular, make sure that the laser beam does not hit any external receiver.

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.

Preventing interference between systems in close proximity to each other

The following measures prevent interference from systems in close proximity:
- Different beam coding for neighboring systems
- Reversed direction of transmission for neighboring systems
- Optically opaque partitions

Further topics

- "Using beam coding", page 30
- "Using reversed direction of transmission", page 30

4.3.4.1 Using beam coding

Important information

DANGER
Hazard due to lack of effectiveness of the protective device
Different beam codings only prevent mutual interference if both safety light curtains are of type deTec4 Ex.

- In the case of systems in close proximity that are of a different type, take different measures to prevent mutual interference.

DANGER
Hazard due to lack of effectiveness of the protective device
A safety light curtain with the beam coding “uncoded” can be affected by senders with code 1 or code 2.
A safety light curtain with code 1 or code 2 can be affected by senders with the beam coding “uncoded”.
Safety light curtains with the same beam coding can interfere with each other.

- If systems are in close proximity to each other, only use code 1 and code 2.

Using beam coding

Use suitable beam codings to prevent mutual interference from neighboring systems.

- Configure one safety light curtain with code1 and the other safety light curtain with code 2.

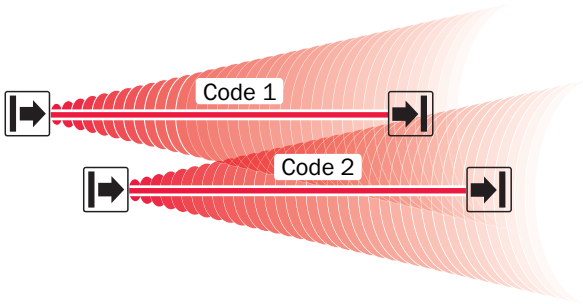

Figure 14: Trouble-free operation due to beam coding

In the figure, the beam coding of systems in close proximity to each other is different. The system with code 2 is not affected by the beams of the system with code 1.

Further topics

- "Configuring beam coding", page 62
- "Combining beam coding and reversed direction of transmission", page 31

4.3.4.2 Using reversed direction of transmission

Important information

NOTE
The direction of transmission of the system can be changed during installation by switching the positions of the sender and receiver. The sender and receiver are easy to exchange with each other if they are wired in the same way.

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.

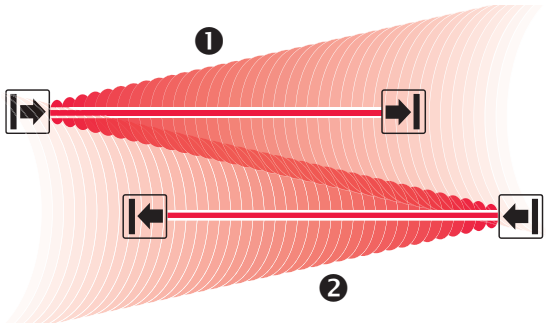

Figure 15: Trouble-free operation due to reversed direction of transmission of system ① and system ②

Further topics

- "Connection of sender and receiver", page 36
- "Combining beam coding and reversed direction of transmission", page 31

4.3.4.3 Combining beam coding and reversed direction of transmission

To prevent a mutual interference in the case of more than two neighboring systems, beam coding and reversed direction of transmission can be combined.

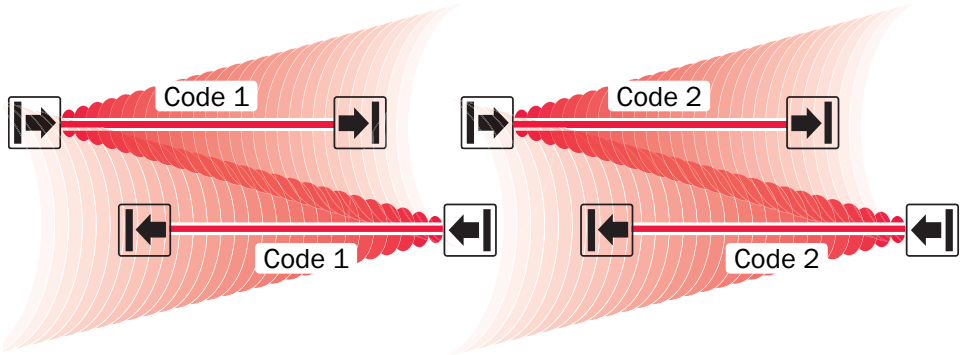

Figure 16: Trouble-free operation of 4 neighboring systems due to beam coding and reversed direction of transmission

In the figure, the beam coding of the systems arranged next to each other is different. The direction of transmission of the systems arranged on top of each other is reversed. This prevents the systems from interfering with each other.

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 56.

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 safety relays or a safety controller, for example.

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
- 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

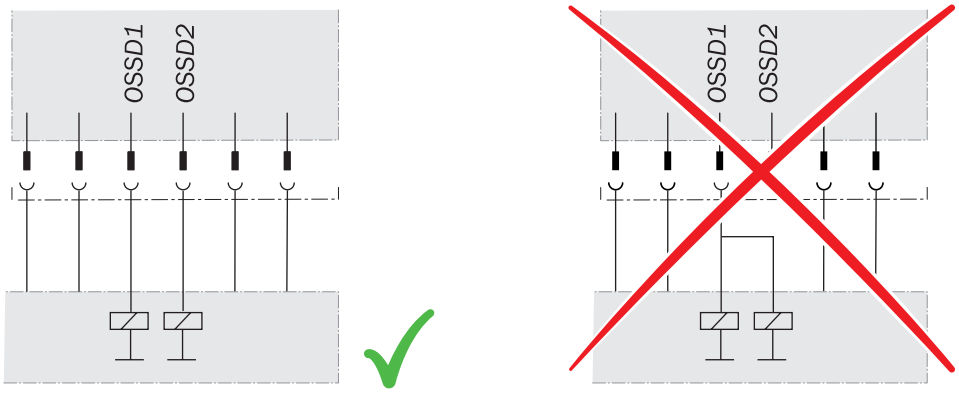

Figure 17: Dual-channel and isolated connection of OSSD1 and OSSD2

- 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.

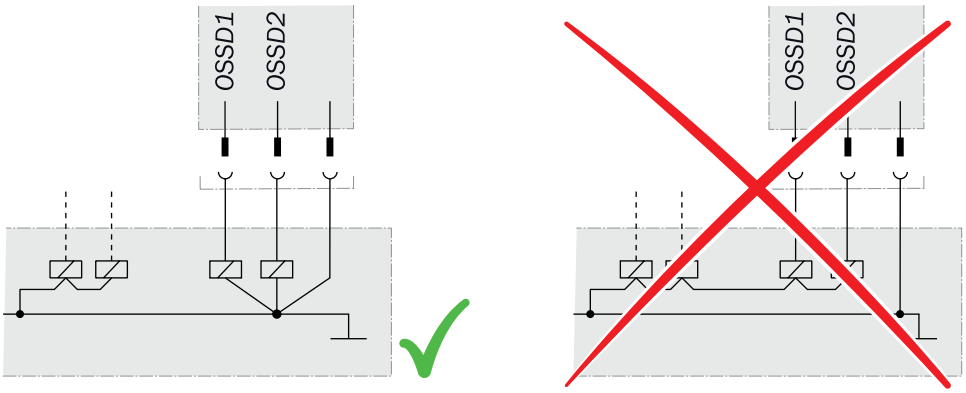

Figure 18: No potential difference between load and protective device

DANGER
Hazard due to unexpected starting of the machine

A restart interlock must be implemented depending on applicable national regulations or required reliability of the safety function.

- ▶ Make sure that a restart interlock is implemented.

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).

Requirements for the electrical control of the machine

Both outputs are short-circuit protected to 24 V DC and 0 V. When the protective field is clear, the OSSDs are in the ON state. When a switch-off condition is present (e.g., interruption in the light path), the OSSDs are in the OFF state. In the event of a device fault, at least one OSSD is in the OFF state.

The safety light curtain complies with the rules for electromagnetic compatibility (EMC) for the industrial sector (Radio Safety Class A).

NOTE
Using the device in residential areas may cause radio interference. The operating entity is responsible for taking appropriate measures (e.g., shielding).

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 99.

4.4.1 Restart interlock

Overview

The safety light curtain has an internal restart interlock.

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.

Important information

DANGER
Hazard due to unexpected starting of the machine
The machine may not restart if the OSSDs switch to the ON state once the reset pushbutton has been pressed. The control must ensure that the machine only restarts if the machine start button is also pressed after the reset pushbutton.

▶ Make sure that the machine can only restart once the reset pushbutton and start button have been pressed in the specified order.

Principle of operation

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

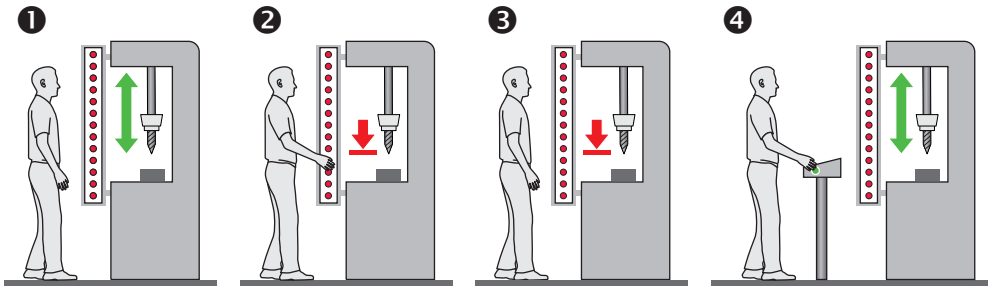

Figure 19: Schematic representation of operation with restart interlock

The dangerous state of the machine (❶) is brought to an end if the light path is interrupted (❷) and is not re-enabled (❸) until the operator presses the reset pushbutton located outside the hazardous area (❹). 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.

4.4.1.1 Integrated restart interlock and reset

Prerequisites

- A reset device, such as a reset pushbutton, is connected.

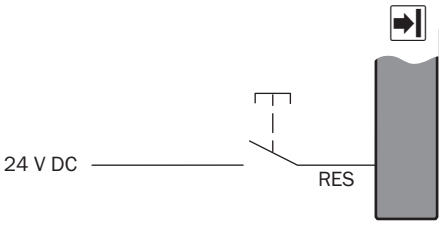

Figure 20: Electrical diagram of the reset device

Using an integrated restart interlock

The restart interlock is configured once the reset pushbutton has been connected.

When the restart interlock is configured, the application diagnostic output located on the same plug connector as the reset pushbutton signals when the reset pushbutton needs to be pressed.

The following applies to the restart interlock:

- If the protective field is clear once the machine has been switched on or following an interruption, the OSSDs do not switch to the ON state
- If someone presses the reset pushbutton and then lets go of it when the protective field is clear, the OSSDs switch to the ON state
- The machine may not restart yet. The operator must also press the machine start button after having pressed the reset pushbutton.

Single system

Only one reset pushbutton may be connected to a single safety light curtain.

Further topics

- "Configuring the restart interlock", page 63

4.4.2 External device monitoring (EDM)

Overview

The safety light curtain has internal external device monitoring.

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.

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.

Principle of operation

If you configure external device monitoring, the safety light curtain then checks the contactors after every interruption to the light path and before the machine restarts. External device monitoring is then able to detect if one of the contactor's contacts is welded, for instance. In this case, the OSSDs remain in the OFF state.

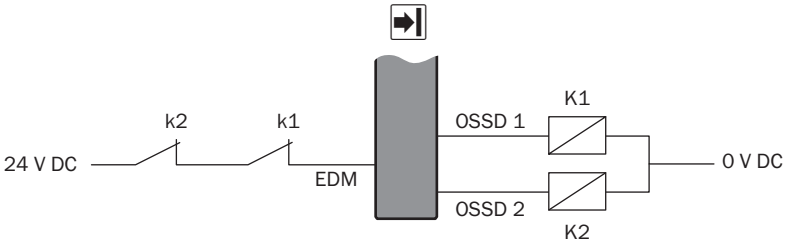

Figure 21: Electrical diagram of external device monitoring (EDM)

You must implement external device monitoring electrically so that the two N/Cs (k1, k2) close in a positively guided manner when the contactors (K1, K2) reach their de-energized position once the protective device has responded. 24 V are then present at the input of external device monitoring. If 24 V are not present once the protective device has responded, one of the contactors is defective and external device monitoring prevents the machine from restarting.

4.4.3 Application diagnostic output

The safety light curtain has an application diagnostic output on the system connection.

Depending on the configuration, the application diagnostic output signals a certain status of the safety light curtain, e.g. if the reset pushbutton must be engaged or if there is a weak signal at the receiver.

For a signal of the safety light curtain to be displayed, a light can be connected to the application diagnostic output or the signal can be transmitted to the machine controller.

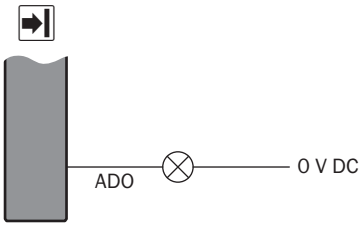

Figure 22: Electrical diagram of the application diagnostic output

Further topics

- "Configuring application diagnostic output", page 64

4.4.4 Connection of sender and receiver

Overview

To indicate the status on both sides, you can connect the sender and receiver to each other in the control cabinet. To do this, connect the following wires:

- 0 V DC of sender and receiver
- +24 V DC of sender and receiver
- Com1 of sender and receiver

Further topics

- "Protection against interference from systems in close proximity to each other", page 29

4.4.5 Laser alignment aid

Important information

DANGER
Hazard due to lack of effectiveness of the protective device
The integrated laser alignment aid switches the OSSDs to the OFF state.

- ▶ Make sure that the outputs of the safety light curtain do not have any effect on the machine when the integrated laser alignment aid is activated.
- ▶ Only use the integrated laser alignment aid to align the safety light curtain.

Prerequisites

- A switch is connected.

Switch

The switch is mounted in the control cabinet. A relay or a PLC can also be used as a switch to enable the integrated laser alignment aid to be switched on and off via a control panel, for example.

The switch must be connected in accordance with the circuit diagram below.

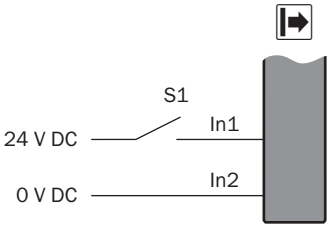

Figure 23: Switch for the integrated laser alignment aid

- S1 closed: integrated laser alignment aid is switched on
- S1 open: integrated laser alignment aid is switched off

Further topics

- "Connection of sender and receiver", page 36

4.4.6 Connection diagrams

8-pin UE10-3OS safety relay

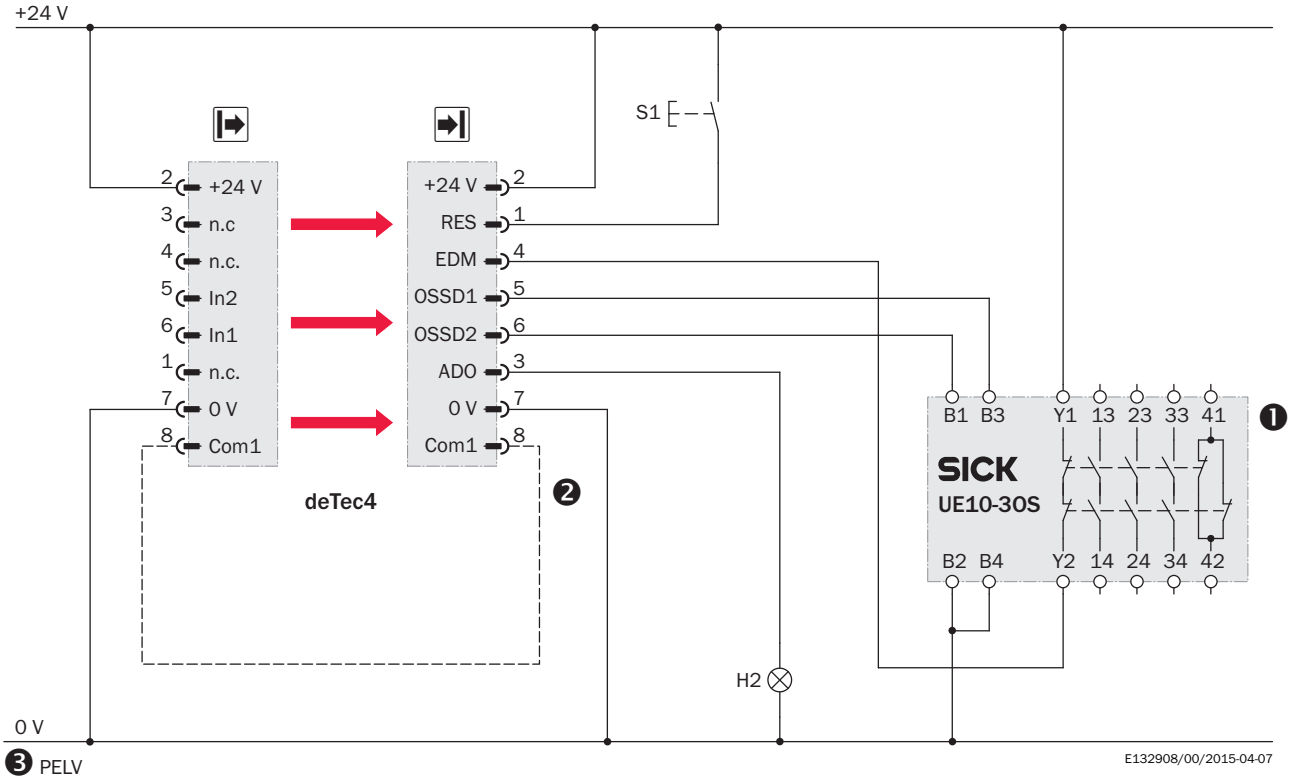

Figure 24: Connection diagram: 8-pin UE10-3OS safety relay

1) Output circuits. These contacts must be incorporated into the control such that the dangerous state is brought to an end if the output circuit is open. For categories 4 and 3, they must be incorporated on two channels (x, y paths). Single-channel incorporation into the control (z path) is only possible with a single-channel control and taking the risk analysis into account.

2) To indicate the status on both sides, the Com1 connections from the sender and receiver must be connected to each other in the control cabinet (optional).

3) SELV/PELV safety/protective extra-low voltage.

- **Task**
  Connection of a deTec4 Ex safety light curtain to a UE10-3OS safety relay. Operating mode: with restart interlock, external device monitoring (EDM), and application diagnostic output.
- **Mode of operation**
  If the protective field is clear and the UE10-3OS is in a fault-free de-energized position, the field indicator and the H2 lamp flash. The system can be switched on. The system is enabled by pressing S1 (pushbutton is pressed and released). Outputs OSSD1 and OSSD2 carry voltage, the UE10-3OS is switched on. When the protective field is interrupted, the OSSD1 and OSSD2 outputs switch the UE10-3OS off.
- **Fault analysis**
  Cross-circuits and short-circuits of the OSSDs are recognized and lead to the locking state (lock-out). The malfunction of the UE10-3OS is detected. The shut-down function is retained. Manipulation (e.g., jamming) of the S1 pushbutton prevents the output circuits from being enabled.

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.

In addition, the device must be checked for correct functioning after each change to the configuration and each insertion of the system plug.

▶ 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 qualified safety personnel?
- Can the check be completed by 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 106)
- 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 being secured have to be checked with a test rod? (see "Test rod check", page 39)

▶ 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 39
  - Visual check of the machine and the protective device, page 42
- 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 field indicator lights up green or yellow during the check!

- If the field indicator lights up green or yellow during the check (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.

NOTE
The integrated laser alignment aid switches the OSSDs to the OFF status.

- Ensure that the integrated laser alignment aid is switched off during the check.

Prerequisites

- The field indicator lights up green or flashes yellow.
  The field indicator only flashes yellow if the internal restart interlock is configured and a reset is required.

Approach

1. Move the test rod slowly through the area to be protected (e.g., machine opening), as indicated by the arrow, see figure 25.
2. Watch the field indicator on the receiver during the check. The field indicator on the receiver must continuously light up red. The field indicator must not light up green or flash yellow.

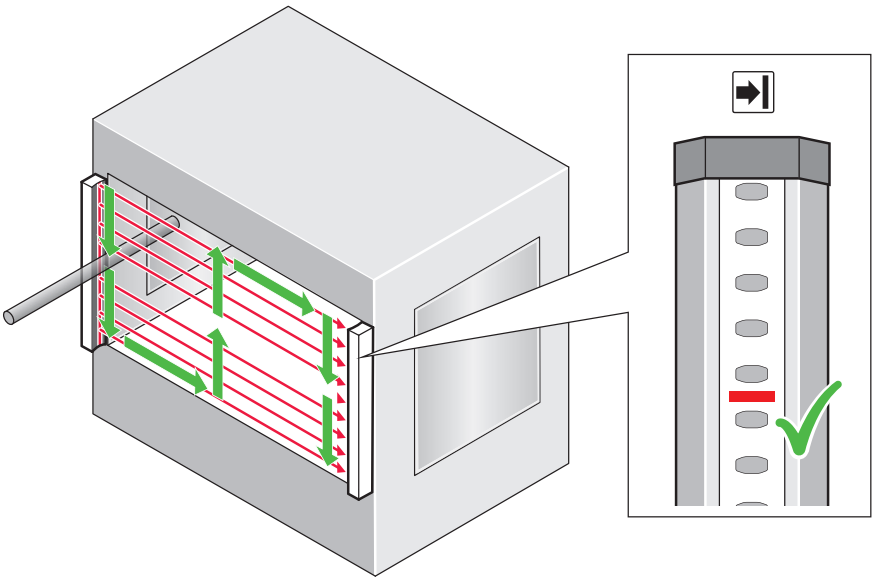

Figure 25: Test rod check: Step 1

3. Then, guide the test rod along the edges of the area to be protected, as indicated by the arrow, see figure 26.
4. Watch the field indicator on the receiver during the check. The field indicator on the receiver must continuously light up red. The field indicator must not light up green or flash yellow.

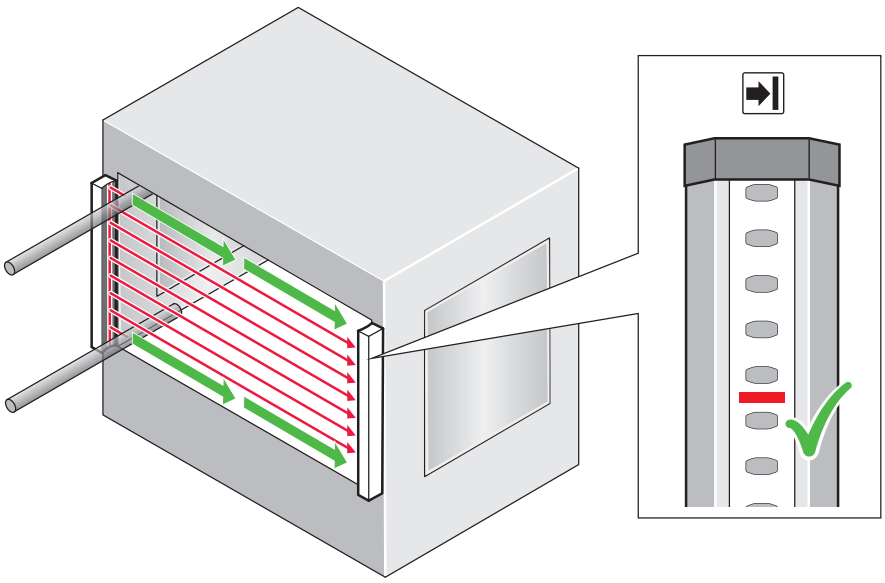

Figure 26: Test rod check: Step 3

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 field indicator on the receiver during the check. The field indicator on the receiver must continuously light up red. The field indicator must not light up green or flash yellow.
7. After the test rod has been removed from the protective field, make sure that the protective field is clear and the field indicator is green or yellow.

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 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 device 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 23
- "Technical data", page 89

5.2 Unpacking

Approach

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

Further topics

- "Scope of delivery", page 98

5.3 Mounting the system plug

Overview

You must mount the system plug on the safety light curtain prior to starting mounting and electrical installation work. Please note that depending on the application, the system plug used at the sender may be different to that at the receiver.

Important information

DANGER
Risk of ignition

Failure to observe this instruction can result in a risk of ignition from potential sparking

The IP enclosure rating only applies if the system plug is mounted.

If the system plug is not mounted, dirt, dust, or moisture may enter the device and cause an explosion the next time the device is switched on.

- ▶ Install the system plug outside the explosion-hazardous area.
- ▶ Prevent the entry of dirt, dust, and moisture.

DANGER
Hazard due to lack of effectiveness of the protective device

Malfunctions can occur if the safety light curtain is connected other than with one of the system plugs provided.

- ▶ Use the system plugs provided.

NOTICE
Fitting the system plug

If the system plug is not fitted, electrostatic discharge at the contacts may damage the device.

- ▶ Prevent electrostatic discharge at the contacts.

Approach

1. Make sure that the safety light curtain and system plug are disconnected from the power supply while the system plug is being mounted.
2. Unpack the system plug.
3. Adjust the DIP switches as necessary.
4. Remove the protective film from the terminal compartment of the safety light curtain.
5. Carefully mount the system plug on the terminal compartment of the safety light curtain.
6. Use the 2 captive screws to screw the system plug onto the safety light curtain. Torque 0.5 Nm ± 0.1 Nm.

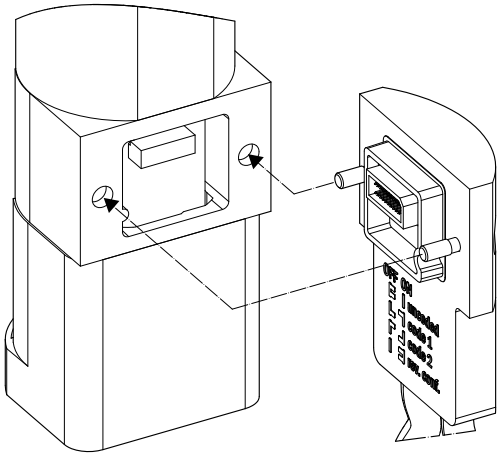

Figure 27: Mounting the system plug

5.4 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 device 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.

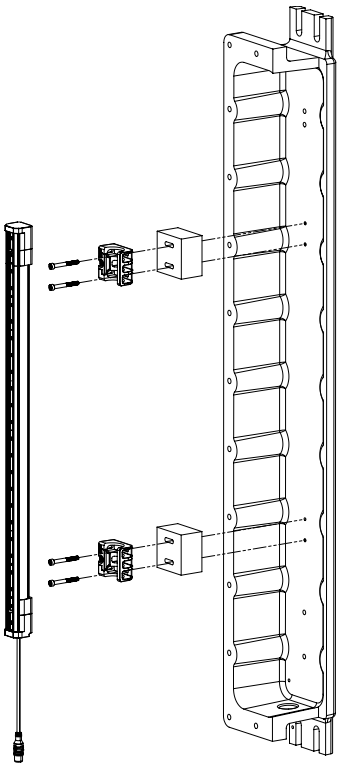

Figure 28: Mounting the safety light curtain in the explosion-proof enclosure

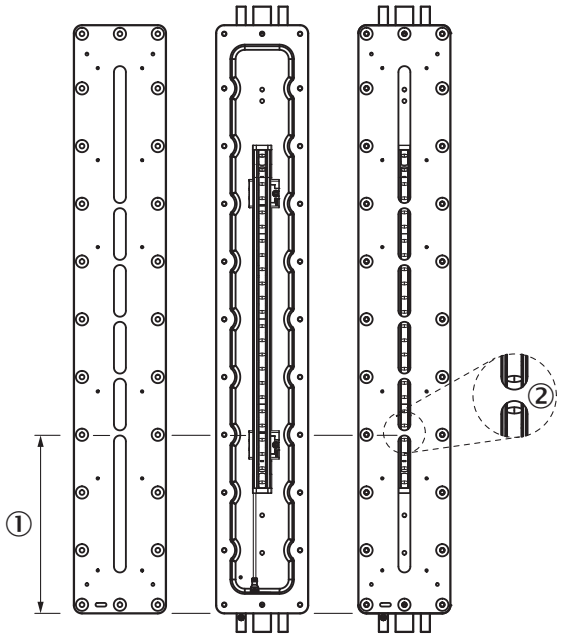

Figure 29: Aligning the safety light curtain in the explosion-proof enclosure

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 47.
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.

5.5 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.

5.6 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.

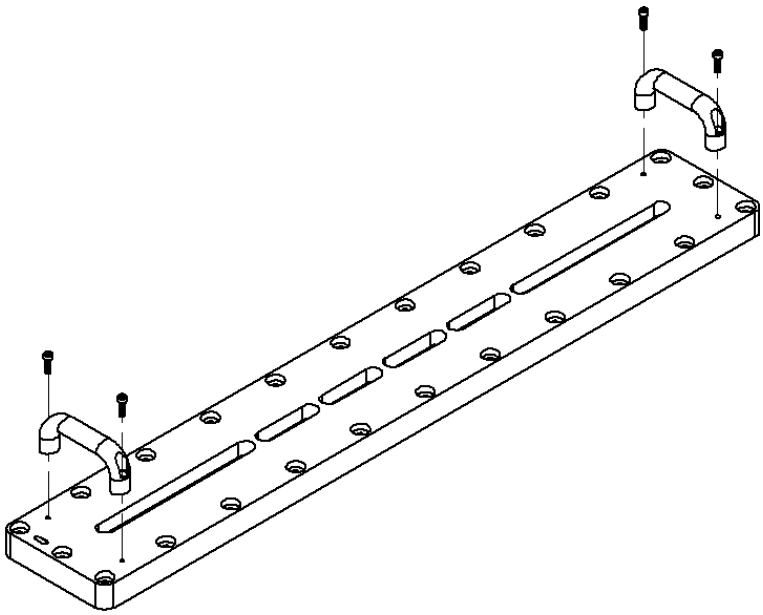

Figure 30: Mounting of the handles

5.7 Installation

Important information

NOTE

- Read all this section before mounting 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 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 minimum distances calculated for the machine in which the safety light curtain is integrated.
- Mount the safety light curtain such that it is not possible to reach under, over, around, or stand behind the safety light curtain, and that the safety 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.

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 end with the cable connection must point in the same direction for the sender and receiver.

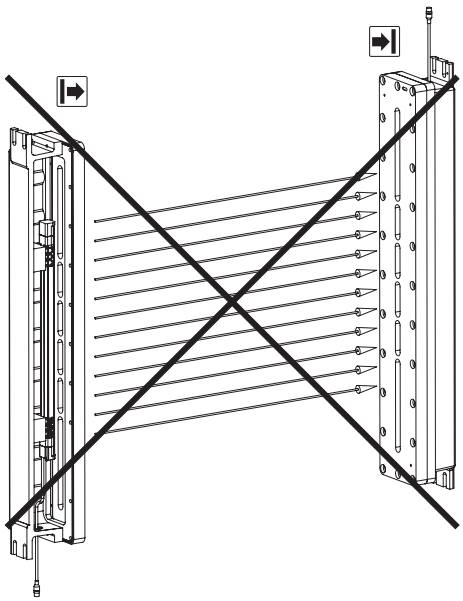

Figure 31: Sender and receiver must not be installed such that they are rotated 180 ° relative to each other

Prerequisites

- The safety light curtain is mounted 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 them accurately. In addition to the FlexFix brackets, the risers must also be used to mount the safety light curtain as close to the window on the cover as possible.
- The cable glands are mounted.
- The handles supplied are mounted on the enclosure cover.

Approach

- Find a place to mount the safety light curtain that is stable enough to hold its weight.
- Mount the sender and receiver on a level surface.
- Mount the sender and receiver at the same height.

- ▶ Make sure that the sender and receiver are aligned correctly. The optical lens systems of the sender and the receiver must be located opposite one another.
- ▶ If necessary, use a spirit level to check that the components are parallel.

Further topics

- "Minimum distance from the hazardous point", page 25
- "Minimum distance to reflective surfaces", page 27
- "Sender and receiver alignment", page 68

5.7.1 Mounting the safety light curtain without alignment bracket

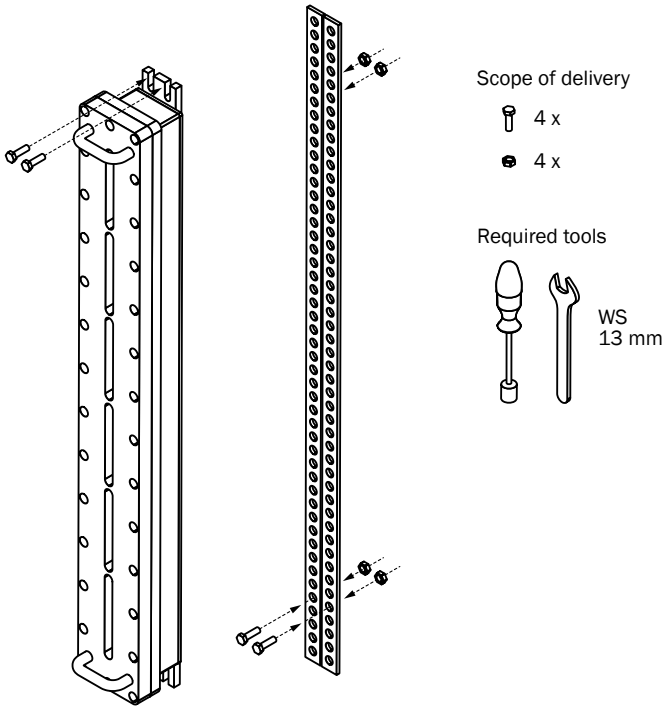

Figure 32: Mounting the safety light curtain without the alignment bracket

Approach

- ▶ Use wrench size 13 mm.

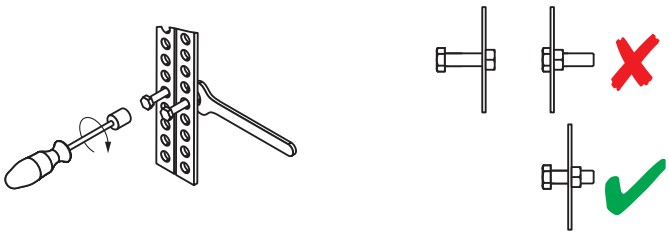

Figure 33: Mounting the safety light curtain without the alignment bracket: Step 1

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.

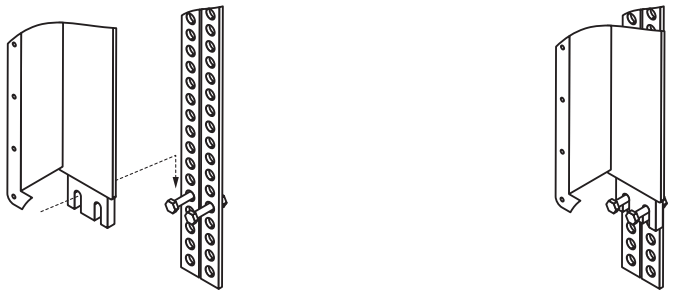

Figure 34: Mounting the safety light curtain without the alignment bracket: Step 2

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

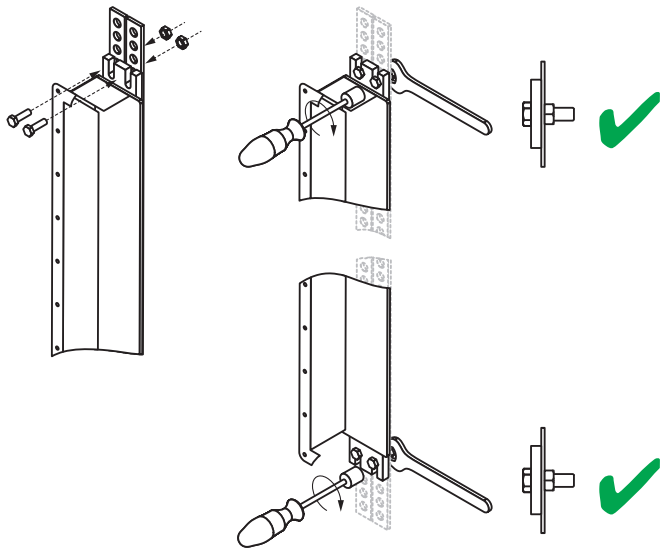

Figure 35: Mounting the safety light curtain without the alignment bracket: Steps 3 and 4

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.

5.7.2 Mounting the safety light curtain with alignment bracket

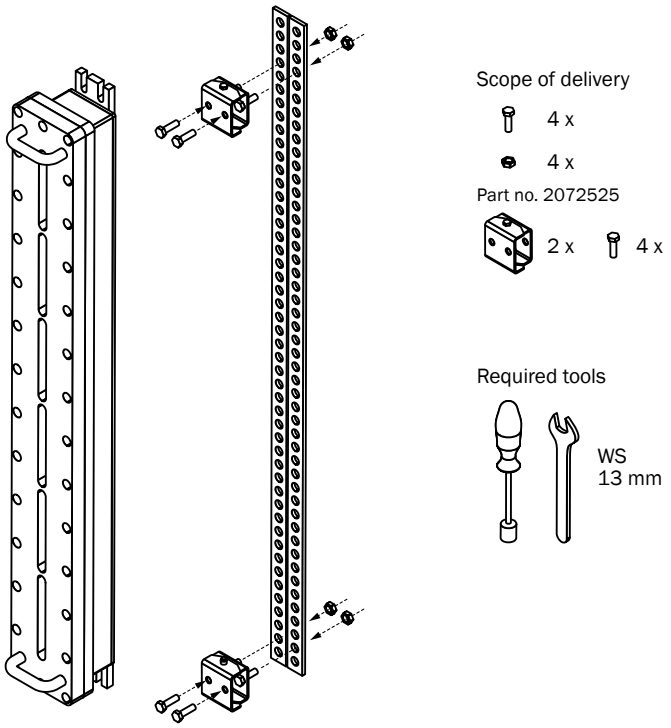

Figure 36: Mounting the safety light curtain using the alignment brackets

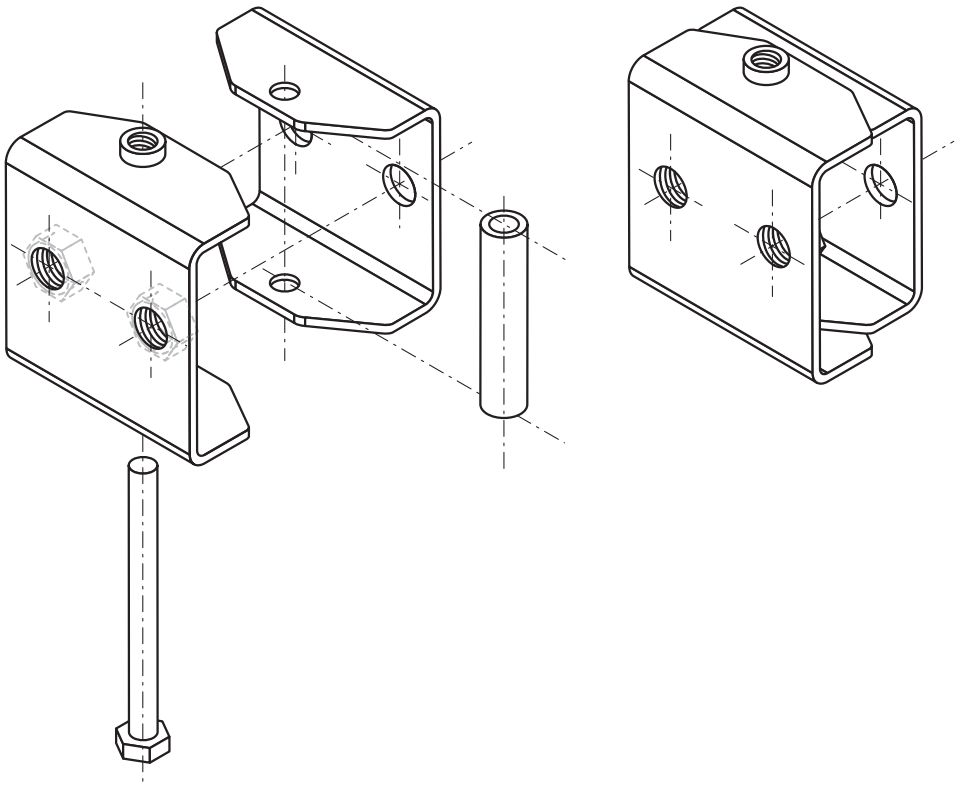

Figure 37: Assembling the alignment brackets

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.

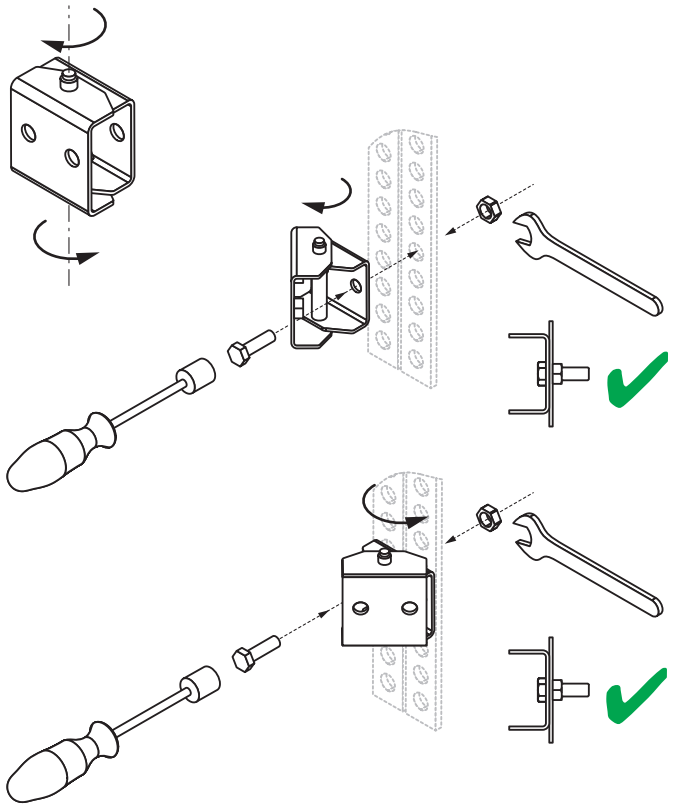

Figure 38: Mounting the safety light curtain using the alignment brackets: Steps 1 to 6

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.

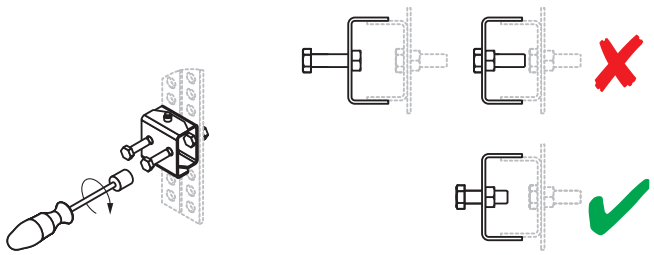

Figure 39: Mounting the safety light curtain using the alignment brackets: Step 7

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

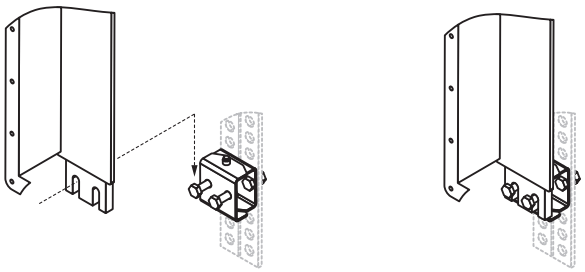

Figure 40: Mounting the safety light curtain using the alignment brackets: Step 8

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.

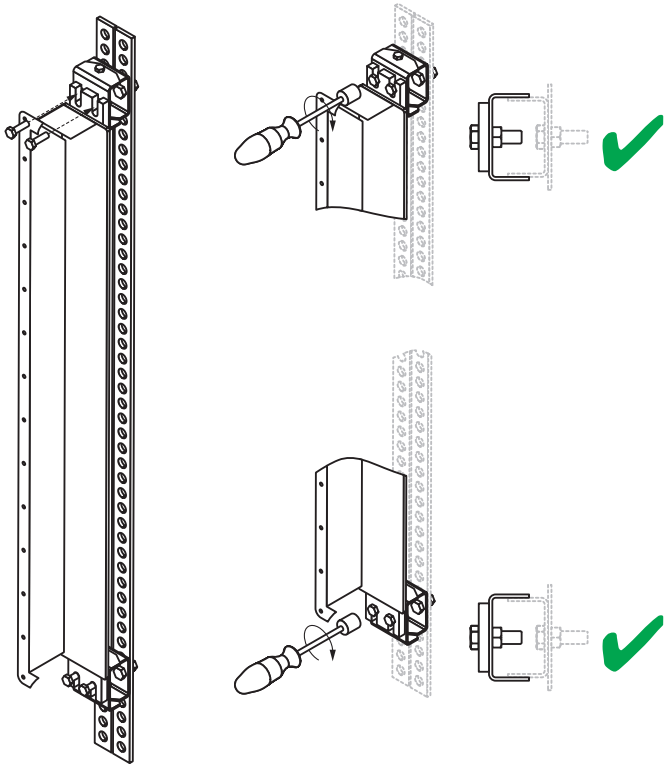

Figure 41: Mounting the safety light curtain using the alignment brackets: Steps 9 and 10

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

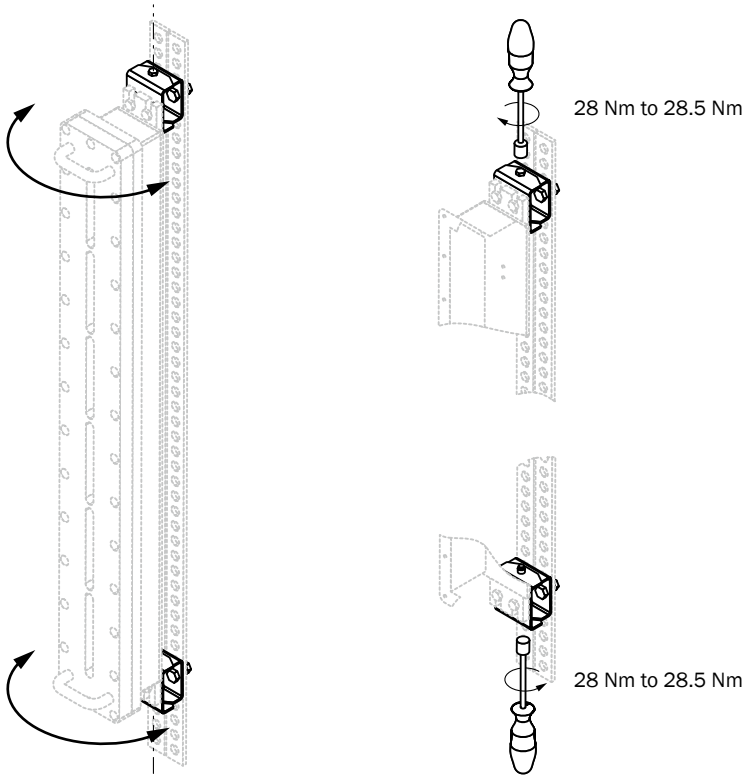

Figure 42: Mounting the safety light curtain using the alignment brackets: Steps 11 and 12

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 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 7: 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 mm²	S
16 mm² < S ≤ 35 mm²	16 mm²
S > 35 mm²	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 89.

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.

DANGER
Hazard due to lack of effectiveness of the protective device

The protective device can become disabled if the system connection cable is connected incorrectly.

- Make sure (e.g., by routing the cables appropriately) that the system connection cable can only be connected to the system connection of the safety light curtain.

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

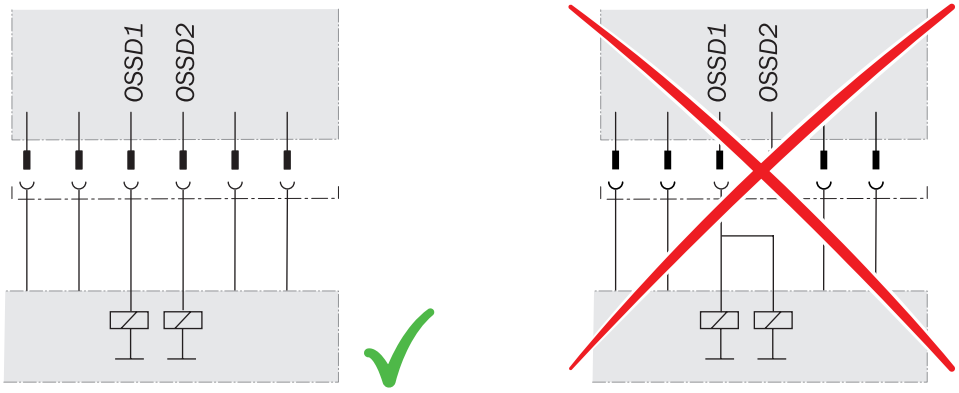

Figure 43: Dual-channel and isolated connection of OSSD1 and OSSD2

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.

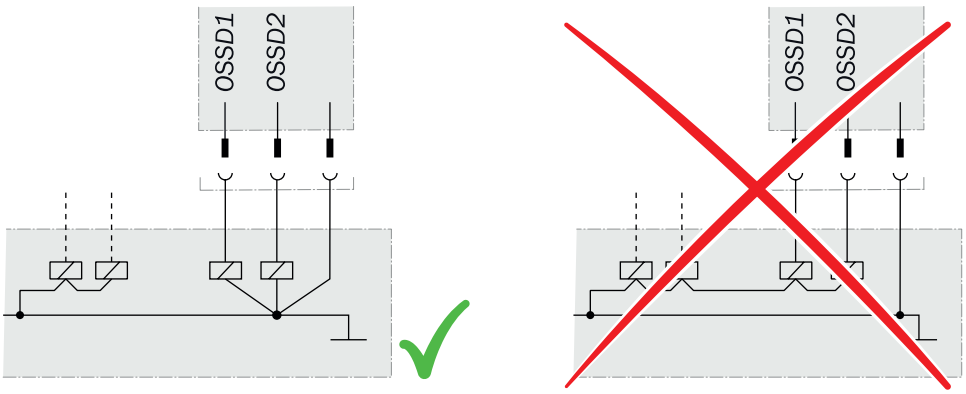

Figure 44: No potential difference between load and protective device

Further topics

- "Integration in electrical control", page 31

6.2 System connection (flying leads, 8-wire)

Table 8: System connection pin assignment for SP1 system plug (flying leads, 8-wire)

Pin	Wire color [1]	Sender	Receiver
1	White	Not assigned	RES (reset pushbutton input)
2	Brown	+24 V DC (voltage supply input)	+24 V DC (voltage supply input)
3	Green	Not assigned	ADO (application diagnostic output)

Pin	Wire color [1]	Sender	Receiver
4	Yellow	Not assigned	EDM (external device monitoring input)
5	Gray	In2 (laser alignment aid pushbutton)	OSSD1
6	Pink	In1 (laser alignment aid switch)	OSSD2
7	Blue	0 V DC (voltage supply input)	0 V DC (voltage supply input)
8	Red	Com1 (Sender-receiver communication)	Com1 (Sender-receiver communication)

1) Applies to the extension cables recommended as accessories.

Further topics

- "Integration in electrical control", page 31

7 Configuration

7.1 Overview

Important information

Table 9: Functions and their configuration type

Function	Configuration type
Beam coding	DIP switch
Set to factory settings	
Restart interlock	Wiring
External device monitoring (EDM)	
Status indication on both sides	

The following system plugs are available for configuring via a DIP switch:

- SP1 system plug

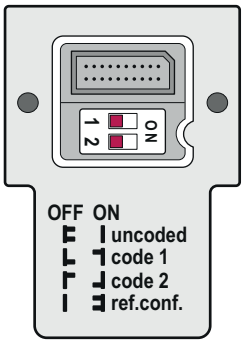

Figure 45: SP1 system plug with 2 DIP switches

Table 10: Overview of DIP switches

DIP switch	Function
1, 2	• Beam coding, see "Configuring beam coding", page 62 • Reset to factory settings, see "Reset to factory settings", page 61

Further topics

- "System plug", page 17
- "Configuring the restart interlock", page 63
- "Configuring external device monitoring (EDM)", page 64
- "Status indication on both sides", page 65

7.2 Factory settings

Table 11: Configurable functions when delivered

Function	Configuration when delivered
Beam coding.	Uncoded
Restart interlock	Not configured
External device monitoring (EDM)	Not configured

Complementary information

The device must be reset to the factory settings to change the configuration to the following functions:

- External device monitoring (EDM)
- Restart interlock

All other functions can be changed later on without having to reset the safety light curtain to the factory settings.

Further topics

- "Reset to factory settings", page 61

7.2.1 Reset to factory settings

Overview

The sender and receiver are reset to factory settings independently of each other. The procedure is the same for the sender and receiver.

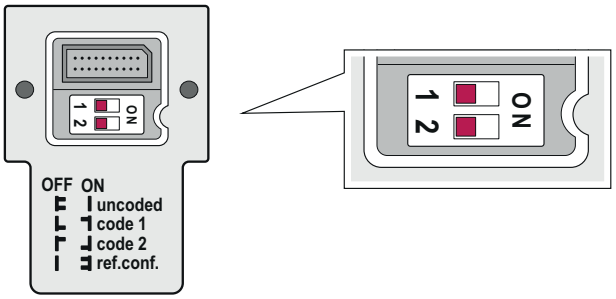

Figure 46: Reset to factory settings

Approach

1. Disconnect the device from the voltage supply.
2. Disconnect the device from all connected devices.
3. Set both DIP switches to ON, see figure 46.
4. Switch the voltage supply on and, within 10 s, [1] disconnect it again. During this, the field indicator flashes alternately yellow and green.
5. Set both DIP switches to OFF.
6. Switch on the voltage supply.

✓ The field indicator flashes green.

✓ Sender: the STATE LED lights up red.

✓ Receiver: the OSSD light emitting diode lights up red.

7. Disconnect the device from the voltage supply.

✓ The device is reset to the factory settings.

1) If the supply voltage is present for more than 10 s, the safety light curtain switches to the locking status. Go back to step 1.

7.3 Configuration mode

Table 12: Configuration mode

	Sender	Receiver
Configuration mode is active	• When resetting the sender to the factory settings	• When resetting the receiver to the factory settings • A permissible change to the external device monitoring configuration has been discovered during switch-on • The reset pushbutton was pressed in order to configure the restart interlock following switch-on
Display of the configuration mode	• Field indicator: Green • STATE LED: Red	• Field indicator: Green • OSSD LED: Red

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

Provided that the device is in configuration mode, you can make further changes to the configuration:

- Configuring the restart interlock

Stopping configuration mode

▶ Briefly interrupt the voltage supply, then switch it back on.

7.4 Configuring beam coding

Overview

The beam coding “uncoded” allows for particularly short response times.

To protect against interference from systems in close proximity to each other, code 1 and code 2 must be used

The beam coding must be the same for the sender and receiver.

Configuring beam coding

The beam coding is configured using 2 DIP switches. The DIP switches are located on the inside of the system plug.

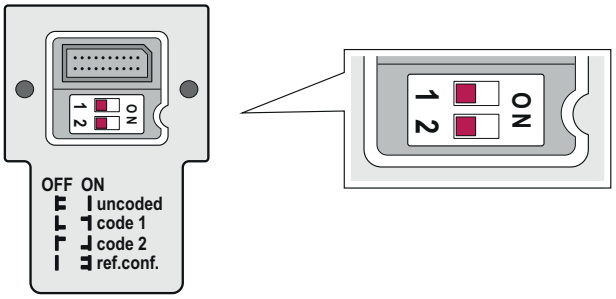

Figure 47: Configuring beam coding

Table 13: DIP switches and beam coding

DIP switch 1	DIP switch 2	Function
Off	Off	Uncoded (fast response time, delivery status)

DIP switch 1	DIP switch 2	Function
On	Off	Code 1 (protection against interference from systems in close proximity to each other)
Off	On	Code 2 (protection against interference from systems in close proximity to each other)
On	On	Reset to factory settings

The beam coding is indicated when the safety light curtain is switched on:

- Uncoded: the field indicator does not flash yellow
- Code 1: the field indicator flashes yellow once
- Code 2: the field indicator flashes yellow twice

Complementary information

You can also change the beam coding later. You do not need to reset the safety light curtain to the factory settings to do this.

During the first change to the beam coding, diagnostic LED 3 flashes white for 3 s. Afterwards, the diagnostic LED lights up white steadily.

Further topics

- "Protection against interference from systems in close proximity to each other", page 29
- "Factory settings", page 60

7.5 Configuring the restart interlock

Prerequisites

- A reset pushbutton is connected

Approach

NOTE
Skip the first and second steps if the device is already in configuration mode.

1. Disconnect the device from the voltage supply.
2. Switch on the voltage supply, then continue with the next step within 30 s.
   If more than 30 s elapses, start with step 1 again.
3. Press the reset pushbutton for between 1 and 3 s, then release it
   If the reset pushbutton is pressed for more than 3 s, start with step 1 again.

✓ The device is in configuration mode, the field indicator flashes green.
✓ Diagnostic LED 4 flashes white and signals that the restart interlock has been configured.
✓ The restart interlock is configured. The reset pushbutton must remain at the connection to which it was connected during configuration.

4. Disconnect the device from the voltage supply.

✓ The device can now be put into operation.

To deactivate the restart interlock, reset the receiver to the factory settings.

Complementary information

The restart interlock is deactivated on delivery.

When the restart interlock is configured, the application diagnostic output located on the same plug connector as the reset pushbutton signals when the reset pushbutton needs to be pressed. The application diagnostic output signals “Reset required” and periodically switches between HIGH and LOW so that any suitable lamp that is connected flashes.

Further topics

- "Factory settings", page 60
- "Restart interlock", page 34

7.6 Configuring external device monitoring (EDM)

Prerequisites

- External device monitoring can only be configured when the wiring has been correctly performed.

Approach

1. Disconnect the device from the voltage supply.
2. Make sure that the wiring has been performed correctly and that the contactor has dropped out so that 24 V are present at the EDM input when the device is switched on
3. Switch on the voltage supply.

✓ The device is in configuration mode, the field indicator flashes green.

✓ Diagnostic LED 1 flashes white and signals that the external device monitoring has been configured.

✓ External device monitoring is active. The wiring must remain at the connection to which it was connected during configuration.

4. If necessary: to configure the restart interlock, press the reset pushbutton for between 1 and 3 s, then release it. If diagnostic LED 4 flashes white, the restart interlock has been configured.
5. Disconnect the device from the voltage supply.

✓ The device can now be put into operation.

To deactivate the external device monitoring, reset the receiver to the factory settings.

Complementary information

External device monitoring is deactivated on delivery.

Further topics

- "External device monitoring (EDM)", page 35
- "Factory settings", page 60

7.7 Configuring application diagnostic output

Overview

The application diagnostic outputs are configured automatically:

- When the restart interlock is configured, the application diagnostic output located on the same plug connector as the reset pushbutton signals when the reset pushbutton needs to be pressed. The application diagnostic output signals “Reset required” and periodically switches between HIGH and LOW so that any suitable lamp that is connected flashes.
- Otherwise, the application diagnostic output signals that the receiver is receiving a weak signal from the sender, e.g., because the sender and receiver are not correctly aligned or because the front screen is contaminated. The application diagnostic output signals a weak signal with the HIGH status.

7.8 Status indication on both sides

The OSSD status and the status of the protective field are indicated via LEDs on the sender and receiver when the following applies:

- The sender and receiver are connected to one another in the control cabinet

The status information is transferred from the receiver to the sender automatically. A configuration process is not required.

Further topics

- "Connection of sender and receiver", page 36

8 Commissioning

8.1 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.

WARNING
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.

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.

1. Make sure that the optical properties of the protective housing of the sender and receiver are not changed during operation, e.g., by:
   - Beading water, mist, frost, or ice formation on the protective housing. Remove condensation of this kind or other types of contamination, then restart the receiver.
   - Scratches or damage to the protective housing. Replace the protective housing of the respective sender or receiver if its protective housing is scratched or damaged.
2. Make sure that all reflective surfaces and objects maintain a minimum distance from the protective field.
3. Make sure that no dispersive media (e.g., dust, fog, or smoke) are within the calculated minimum distance from the protective field.

Further topics

- "Minimum distance to reflective surfaces", page 27

8.2 Overview

Prerequisites

- Configuration has been completed correctly
- Mounting has been completed correctly
- Electrical installation has been completed correctly

Approach

1. Check the DIP switches at the sender and receiver and set them correctly if required.
2. Fitting the system plug.
3. Switch on the voltage supply.
   - If a change to the configuration is detected or the device has been reset to factory settings, the device is in configuration mode and the field indicator flashes green.
4. Configure the restart interlock if required.
5. Once configuration is complete, briefly interrupt the voltage supply, then switch it back on.
6. If the configuration for the cascading of the restart interlock or external device monitoring needs to be changed, reset the device to factory settings.
7. Once configuration is complete and the device has been restarted, align the sender and receiver.
8. Briefly interrupt the voltage supply, then switch it back on.
9. Check alignment.
10. Check the contactors.

Further topics

- "Project planning", page 23
- "Mounting", page 43
- "Electrical installation", page 56
- "Configuration", page 60
- "Mounting the system plug", page 44
- "Configuration mode", page 62
- "Configuring the restart interlock", page 63
- "Factory settings", page 60
- "Sender and receiver alignment", page 68
- "Check during commissioning and modifications", page 72

8.3 Switching on

Overview

After switching on, the sender and receiver initialize. All LEDs on the sender and receiver will light up briefly. They then indicate the following information:

- If a change to the configuration is detected or the device has been reset to factory settings, the device is in configuration mode and the field indicator flashes green
- The field indicator and diagnostic LEDs indicate the current configuration
- The receiver indicates the alignment quality using diagnostic LEDs 1, 2, 3 and 4 after a few seconds
  Diagnostic LEDs 5 and 6 light up if the topmost beam (far from system plug) is synchronized. Diagnostic LEDs 7 and 8 light up if the bottommost beam (near system plug) is synchronized.
- In normal operation, the diagnostic LEDs indicate the current configuration. The field indicator, the STATE LED of the sender and the OSSD LED of the receiver also light up.

Further topics

- "Configuration mode", page 62
- "Indications when switching on", page 79

8.4 Sender and receiver alignment

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.

NOTE
While aligning to the indication of the alignment quality, pay attention to the synchronization indication of the topmost and bottommost beam and the bracket with which the sender and receiver are attached.

Further topics

- "Indication of the alignment quality", page 71
- "Diagnostic LEDs", page 79

8.4.1 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.

DANGER
Hazard due to lack of effectiveness of the protective device

The integrated laser alignment aid switches the OSSDs to the OFF state.

- ▶ Make sure that the outputs of the safety light curtain do not have any effect on the machine when the integrated laser alignment aid is activated.
- ▶ Only use the integrated laser alignment aid to align the safety light curtain.

DANGER
Hazard due to lack of effectiveness of the protective device

The integrated laser alignment aid may influence the receiver of a safety light curtain in close proximity. In such cases, the neighboring safety light curtain may not detect persons or parts of the body that require protection.

- ▶ Perform an alignment or take other measures to ensure that the laser beam only hits the front screen of the relevant receiver. The laser beam must not hit any external receiver should the integrated laser alignment aid be switched on by mistake or due to a fault. An external receiver is a receiver that is not part of the same safety light curtain or same cascade.
- ▶ During alignment in particular, make sure that the laser beam does not hit any external receiver.

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 mounted correctly
- The protective field is free of objects. Neither objects nor body parts (e.g. hand, tool, optional AR60 laser alignment aid) are in the protective field. Otherwise, at most diagnostic LEDs 1 and 2 light up during alignment.

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.
   - ▷ If a pushbutton or switch has been connected for the integrated laser alignment aid, activate the integrated laser alignment aid. Turn the sender so that the beam of the integrated laser alignment aid hits the area of diagnostic LEDs 1, 2, 3 and 4 on the longitudinal axis of the receiver.
3. Align the receiver to the sender: Turn the receiver and pay attention to the indication of the alignment quality and the synchronization status of the topmost and bottommost beams.
   - ▷ If a hand or a tool is in the protective field during the alignment, but diagnostic LEDs 5, 6, 7 and 8 are already lit up, remove the object and continue with step 6.
4. Align the sender to the receiver with more precision as needed and pay attention to the indication of the alignment quality and the synchronization status of the topmost and bottommost beams.
5. Align the receiver to the sender with more precision as needed and pay attention to the indication of the alignment quality and the synchronization status of the topmost and bottommost beams.
6. If at least 3 (better: 4) of diagnostic LEDs 1, 2, 3 and 4 and diagnostic LEDs 5, 6, 7 and 8 light up blue, fix the components in place in the brackets. Torque: 28 Nm ... 28.5 Nm.
7. Switch the voltage supply off and then on again.
8. Check diagnostic LEDs 1 to 4 for the alignment quality and diagnostic LEDs 5 to 8 for the synchronization of the topmost and bottommost beams in order to ensure that the components are still aligned with each other correctly.

NOTE
If suitable wiring has been established, activate the integrated laser alignment aid.

Complementary information

In many cases, the optional AR60 laser alignment aid and the alignment tool available as an accessory can make alignment even easier. If deflector mirrors are installed, the laser alignment aid can be used at the receiver. If there is a large protective field height, it can be used at the top end of the sender and at the receiver.

Since the optional AR60 laser alignment aid is placed with the adapter inside the protective field of the safety light curtain, at most diagnostic LEDs 1 and 2 light up blue and the OSSD LED lights up red. To check whether the OSSD LED of the receiver lights up green and diagnostic LEDs 5,6,7 and 8 light up blue, remove the optional AR60 laser alignment aid.

Further topics

- "Indication of the alignment quality", page 71
- "Mounting", page 43
- "Accessories", page 99
- "Laser alignment aid", page 37

8.4.2 Alignment with the alignment bracket

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

- Rotate (± 45°)

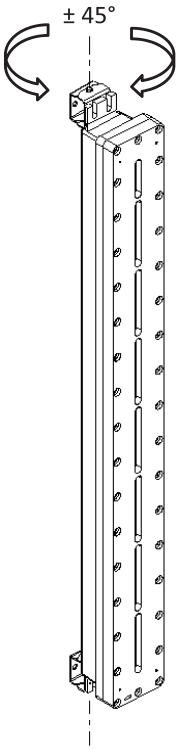

Figure 48: Alignment bracket: rotate

8.4.3 Indication of the alignment quality

Important information

NOTE

As soon as the diagnostic LEDs 1, 2 and 3 light up, the alignment is good and availability is stable.

Body parts or objects in the protective field (e.g., hand, tool, AR60 optional laser alignment aid) may impair the indication of the alignment quality (at most diagnostic LEDs 1 and 2 light up).

- Ensure that no body parts or objects are in the protective field
  Or
- Watch out for diagnostic LEDs 5, 6, 7 and 8. If diagnostic LEDs 5, 6, 7 and 8 light up, the alignment is good and availability is stable.

Indication of the alignment quality

Position of LEDs: see "Receiver indicators", page 19.

If front screen contamination increases in ongoing operation, the laser alignment aid switches on or the alignment takes longer than 3 seconds, the receiver shows the alignment quality again.

Once the safety light curtain is aligned and the protective field is clear (field indicator: flashing yellow or lit up green), the alignment quality display switches off after a certain period of time.

Table 14: Indication of the alignment quality

LEDs								Meaning
Diagnostics LEDs								
1	2	3	4	5	6	7	8	
○	○	○	○	○	○	○	○	Alignment is inadequate, or the protective field is at least partially interrupted. The receiver cannot synchronize with the sender.
● Blue	○	○	○					At least one beam is synchronized. However, the alignment is inadequate, or the protective field is at least partially interrupted.
● Blue	● Blue	○	○					The alignment or the signal strength is still not sufficient for stable availability, or the protective field is at least partially interrupted. [1]
● Blue	● Blue	● Blue	○					Alignment is good, stable availability. [1] [2]
● Blue	● Blue	● Blue	● Blue					Alignment is very good. [1]
				● Blue	● Blue			The topmost light beam (far from system plug) is synchronized.

LEDs								Meaning
Diagnostics LEDs								
1	2	3	4	5	6	7	8	
						● Blue	● Blue	The bottommost light beam (near system plug) is synchronized.

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

1) If external device monitoring is configured and there is an EDM warning, diagnostic LED 1 flashes, while the other diagnostic LEDs 2, 3 and 4 indicate the alignment quality. If there is an error on the reset push-button, diagnostic LED 4 flashes, while the other diagnostic LEDs 1, 2 and 3 indicate the alignment quality.

2) If the protective fields are very wide, there is a possibility that diagnostic LED 4 does not light up, even with optimal alignment.

Further topics

- "Indications when switching on", page 79

8.5 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.

9 Operation

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.

- 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 27

9.2 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.

9.3 LEDs

Sender

Position of LEDs: see "Sender indicators", page 18.

If the sender and receiver are connected to each other by a cable, the LEDs on the sender indicate the same status as the LEDs on the receiver during normal operation. The STATE LED on the sender adopts the status of the OSSD LED on the receiver.

If the sender and receiver are not connected with each other, the STATE LED on the sender lights up yellow when the sender is in operation and no faults are present.

Receiver

Position of LEDs: see "Receiver indicators", page 19.

Table 15: LEDs on the receiver during normal operation

LEDs										Meaning
OSSD	Field	Diagnostics LEDs								
		1	2	3	4	5	6	7	8	
		● White								EDM is configured.
				● White						Beam coding 1 or 2 is configured.
					● White					Restart interlock is configured.
● Red	☀ ☀ Yellow/green	○	○	○	○	○	○	○	○	Reset of the configuration to factory settings is activated.
● Red	☀ Green									The device is in configuration mode following a change to the configuration.
● Red	● Green									The laser alignment aid of the sender is switched on. Its own protective field is clear.
● Red	● Red									Its own protective field is interrupted. OR The protective field is clear. The reset button has just been actuated.
● Red	☀ Yellow									The protective field is clear. Reset required.
					☀ Yellow					The reset pushbutton is defective or is being actuated continuously. Check the wiring of the reset pushbutton.
● Red		☀ Yellow								EDM warning: The EDM input has no signal. Check contactors and wiring. Switch the voltage supply off and back on again.

○ LED off. ☀ LED flashes. ● LED illuminates. Empty cells mean that the LED lights up, flashes, or is off.

If front screen contamination increases in ongoing operation, the laser alignment aid switches on or the alignment takes longer than 3 seconds, the receiver shows the alignment quality again.

Further topics

- "Indication of the alignment quality", page 71
- "Diagnostic LEDs", page 79

10 Maintenance

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

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.

- 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 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.

10.2 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.

If contamination increases, the two lit diagnostics LEDs 1 and 2 show that the receiver is getting a weak signal from the sender. If the device is not cleaned and contamination increases, the safety light curtain switches to the OFF state when contamination is high.

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 73
- "Minimum distance to reflective surfaces", page 27

10.3 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.

11 Troubleshooting

11.1 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
Additional information on troubleshooting can be found at the responsible SICK subsidiary.

11.2 Diagnostic LEDs

11.2.1 Indications when switching on

Overview

Immediately after switching on, all LEDs on the sender and receiver briefly light up.

Following this, the information below regarding configuration is indicated briefly.

Sender

Position of LEDs: see "Sender indicators", page 18.

Table 16: Indications on the sender when switching on

LEDs		Meaning
STATE	Field	
	Yellow, flashes once	Beam coding, code 1 is configured.
	Yellow, flashes twice	Beam coding, code 2 is configured.

LEDs		Meaning
STATE	Field	
● Red	☀ Yellow/green	Reset of the configuration to factory settings is activated, see "Factory settings", page 60.
● Red	☀ Green	Device is in configuration mode, see "Configuration mode", page 62.

○ LED off. ☀ LED flashes. ● LED illuminates. Empty cells mean that the LED lights up, flashes, or is off.

Receiver

Position of LEDs: see "Receiver indicators", page 19.

Table 17: Indications on the receiver when switching on

LEDs										Meaning
OSSD	Field	Diagnostic LEDs								
		1	2	3	4	5	6	7	8	
	☀ Yellow, flashes once			● White (3 s)						Beam coding, code 1 is configured.
	☀ Yellow, flashes twice			● White (3 s)						Beam coding, code 2 is configured.
		● White (3 s)								External device monitoring (EDM) is configured.
					● White (3 s)					Restart interlock is configured.
● Red	☀ Yellow/green	○	○	○	○	○	○	○	○	Reset of the configuration to factory settings is activated, see "Factory settings", page 60.
● Red	☀ Green									Device is in configuration mode, see "Configuration mode", page 62. When a function is configured, the corresponding diagnostic LED flashes.

○ LED off. ☀ LED flashes. ● LED illuminates. Empty cells mean that the LED lights up, flashes, or is off.

After the configuration is indicated, diagnostic LEDs 1, 2, 3 and 4 indicate the alignment quality. Additionally, the synchronization status of the topmost and bottommost beams of the safety light curtain are displayed by means of diagnostic LEDs 5 and 6 as well as 7 and 8.

If the configuration was changed, the diagnostic LEDs flash white for 3 s upon activation.

Once the safety light curtain is aligned and the protective field is clear (field indicator: flashing yellow or lit up green), the alignment quality display switches off after a certain period of time.

Table 18: Indication of the alignment quality

LEDs								Meaning
Diagnostics LEDs								
1	2	3	4	5	6	7	8	
○	○	○	○	○	○	○	○	Alignment is inadequate, or the protective field is at least partially interrupted. The receiver cannot synchronize with the sender.
● Blue	○	○	○					At least one beam is synchronized. However, the alignment is inadequate, or the protective field is at least partially interrupted.
● Blue	● Blue	○	○					The alignment or the signal strength is still not sufficient for stable availability, or the protective field is at least partially interrupted. [1]
● Blue	● Blue	● Blue	○					Alignment is good, stable availability. [1] [2]
● Blue	● Blue	● Blue	● Blue					Alignment is very good. [1]
				● Blue	● Blue			The topmost light beam (far from system plug) is synchronized.
						● Blue	● Blue	The bottommost light beam (near system plug) is synchronized.

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

1) If external device monitoring is configured and there is an EDM warning, diagnostic LED 1 flashes, while the other diagnostic LEDs 2, 3 and 4 indicate the alignment quality. If there is an error on the reset pushbutton, diagnostic LED 4 flashes, while the other diagnostic LEDs 1, 2 and 3 indicate the alignment quality.

2) If the protective fields are very wide, there is a possibility that diagnostic LED 4 does not light up, even with optimal alignment.

11.2.2 Status indication

Overview

During operation, the status of the safety light curtain is indicated with LEDs.

Sender

Position of the LEDs: see "Sender indicators", page 18.

If the sender and receiver are connected to each other by a cable, the LEDs on the sender indicate the same status as the LEDs on the receiver during normal operation. The STATE LED on the sender adopts the status of the OSSD LED on the receiver.

If the sender and receiver are not connected with each other, the STATE LED on the sender lights up yellow when the sender is in operation and no faults are present.

Receiver

Position of the LEDs: see "Receiver indicators", page 19.

Table 19: LEDs on the receiver during normal operation

LEDs										Meaning
OSSD	Field	Diagnostics LEDs								
		1	2	3	4	5	6	7	8	
		● White								EDM is configured.
				● White						Beam coding 1 or 2 is configured.
					● White					Restart interlock is configured.
● Red	☀ Yellow/green	○	○	○	○	○	○	○	○	Reset of the configuration to factory settings is activated.
● Red	● Green									The device is in configuration mode following a change to the configuration.
● Red	● Green									The laser alignment aid of the sender is switched on. Its own protective field is clear.
● Red	● Red									Its own protective field is interrupted. OR The protective field is clear. The reset button has just been actuated.
● Red	☀ Yellow									The protective field is clear. Reset required.
					☀ Yellow					The reset pushbutton is defective or is being actuated continuously. Check the wiring of the reset pushbutton.
● Red		☀ Yellow								EDM warning: The EDM input has no signal. Check contactors and wiring. Switch the voltage supply off and back on again.

○ LED off. ☀ LED flashes. ● LED illuminates. Empty cells mean that the LED lights up, flashes, or is off.

If front screen contamination increases in ongoing operation, the laser alignment aid switches on or the alignment takes longer than 3 seconds, the receiver shows the alignment quality again.

Further topics

- "Indication of the alignment quality", page 71

11.2.3 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 LEDs: see "Sender indicators", page 18.

Table 20: Fault indication on the sender

LEDs		Possible cause	Rectification
STATE	Field		
Yellow	○	Normal operation, no cable connection between sender and receiver. [1)]	–
Yellow	Red	Failure in the voltage supply	▶ Check the voltage supply, see "Technical data", page 89. ▶ Switch the voltage supply off and then on again. ▶ If the fault persists, replace the sender, see "Ordering information", page 98.
Yellow	Red	The sender identified an internal fault.	▶ Switch the voltage supply off and then on again. ▶ If the fault persists, replace the sender, see "Ordering information", page 98.
Red	Yellow/ green	Reset of the configuration to factory settings is activated.	Additional information: see "Factory settings", page 60.
Red	Green	The device is in configuration mode following a change to the configuration.	Additional information: see "Configuration mode", page 62.
Green	Red	A problem occurred when resetting the configuration to factory settings.	▶ Restart configuration, see "Factory settings", page 60.

LEDs		Possible cause	Rectification
STATE	Field		
○	Red	The voltage is or was too high when operating the sender.	▶ Check the voltage supply, see "Technical data", page 89. ▶ Replace the sender, see "Ordering information", page 98.

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

1) If the sender and receiver are connected by a cable, the LEDs on the sender indicate the same status as the LEDs on the receiver during normal operation. The STATE LED on the sender adopts the status of the OSSD LED on the receiver.

Receiver

Position of LEDs: see "Receiver indicators", page 19.

Table 21: Fault indication on the receiver

LEDs										Possible cause	Troubleshooting
OSSD	Field	Diagnostics LEDs									
		1	2	3	4	5	6	7	8		
● Red	Red	Red	○	○	○	○	○	○	○	An internal fault has occurred.	▶ Switch the voltage supply off and back on again. ▶ If the fault continues to persist, replace the receiver, see "Ordering information", page 98.
● Red	Red	○	Red	○	○	○	○	○	○	Failure in the voltage supply.	▶ Check the voltage supply and the voltage supply unit, see "Technical data", page 89. ▶ Switch the voltage supply off and back on again. ▶ If the fault continues to persist, replace the receiver, see "Ordering information", page 98.
● Red	Red	○	Red	○	Red	○	○	○	○	Permanent error in the voltage supply.	▶ Replace device, see "Ordering information", page 98.
● Red	Red	○	Red	Red	Red	○	○	○	○	General error in the configuration.	▶ Check configuration settings including the permitted combination of functions. ▶ Make sure that the correct system plug is used. ▶ Reset device to factory settings.

LEDs									Possible cause	Troubleshooting
OSSD	Field	Diagnostics LEDs								
		1	2	3	4	5	6	7	8	
● Red	☀ Red	○	○	☀ Red	○	○	○	○	○	The receiver has recognized beams from several senders.	▶ Check the distance to senders of the same design. ▶ Check the beam coding of the receiver and systems in close proximity. ▶ Ensure that beams from another sender cannot hit the receiver. (Exception: One of the two systems uses code 1 and the other uses code 2), see "Protection against interference from systems in close proximity to each other", page 29. ▶ Switch the voltage supply off and back on again.
● Red	☀ Red	○	○	○	☀ Red	○	○	○	○	A wiring fault has been identified at the OSSDs or at an input. E.g., at an OSSD: overvoltage, short-circuit, cross-circuit, permissible load capacity exceeded. E.g., at an input: invalid signal, unexpected signal.	▶ Check the system wiring for a fault. Make sure that the OSSDs and inputs have been wired correctly, see "Integration in electrical control", page 31. ▶ Switch the voltage supply off and back on again. ▶ If the fault continues to persist, replace the defective components, see "Ordering information", page 98.
● Red	☀ Red	○	☀ Red	☀ Red	○	○	○	○	○	A wiring fault has been detected.	▶ Check the system wiring for a fault. ▶ Make sure that the IO-link interface was wired correctly. ▶ Switch the voltage supply off and back on again.
● Red	☀ Red	☀ Red	○	☀ Red	○	○	○	○	○	Incompatible device detected.	▶ For a sender-receiver connection, ensure that the sender and receiver devices are compatible, see "Connection of sender and receiver", page 36.

LEDs										Possible cause	Troubleshooting
OSSD	Field	Diagnostics LEDs									
		1	2	3	4	5	6	7	8		
● Red		☀ Yellow								EDM warning (only if the external device monitoring function is active): The OSSDs have constantly been in the OFF status since the safety light curtain was switched on and no signal is present at the EDM input.	Normally, this message is displayed only briefly after switching on and goes out as soon as the voltage supply for the auxiliary contacts is established at the contactors. If the message is displayed for longer: ▶ Check the contactors. ▶ Check the wiring of the contactors. ▶ Switch the voltage supply off and back on again.
● Red	☀ Red	●	○	○	○	☀ Red	○	○	○	EDM fault (only if the external device monitoring function is active): The status of the EDM input has not changed within 300 ms following a change to the OSSD status. OR The status of the EDM input has changed even though the OSSD status has not.	▶ Check the contactors. ▶ Check the wiring of the contactors. ▶ Switch the voltage supply off and back on again.
● Red	☀ ☀ Yellow/green	○	○	○	○	○	○	○	○	Reset of the configuration to factory settings is activated.	For additional information, see "Factory settings", page 60.
● Red	☀ Green									The device is in configuration mode following a change to the configuration.	For additional information, see "Configuration mode", page 62.
● Red	☀ Red	☀ Red	☀ Red	☀ Red	☀ Red	○	○	○	○	A problem occurred when resetting the configuration to factory settings.	▶ Restart configuration, see "Factory settings", page 60.
					☀ Yellow					Reset pushbutton fault.	▶ Check that the reset pushbutton is working. The reset pushbutton may be defective or is being pressed continuously. ▶ Check the wiring of the reset pushbutton.

LEDs									Possible cause	Troubleshooting
OSSD	Field	Diagnostics LEDs								
		1	2	3	4	5	6	7	8	
● Red	☀ Red	○	○	● Red	○	○	○	○	☀ Red	Different beam coding on the sender and receiver detected.	▶ Configure sender and receiver with the same beam coding. ▶ Switch the voltage supply off and back on again.

○ LED off. ☀ LED flashes. ● LED illuminates. Empty cells mean that the LED lights up, flashes, or is off.

12 Decommissioning

12.1 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.

12.2 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.

13 Technical data

13.1 Data sheet

Table 22: General system data

	Minimum	Typical	Maximum
Protective field height, depending on type	450 mm, 600 mm, 900 mm, 1,200 mm and 1,500 mm		
Resolution (detection capability)	30 mm		
Protective field width [1) 2) 3)]			
Resolution 30 mm	0 m ... 20 m	0 m ... 25.2 m	
Protection class [4)]	III (IEC 61140)		
Enclosure rating [5)]	IP 66 [6)] (IEC 60529)		
Supply voltage U_V at the device [7) 8) 9)]	19.2 V	24 V	28.8 V
Residual ripple [10)]			± 10%
Synchronization	Optical		
Type	Type 4 (IEC 61496-1)		
Category	Category 4 (ISO 13849-1)		
Performance level [11)]	PL e (ISO 13849-1)		
Safety integrity level [11)]	SIL3 (IEC 61508)		
SIL claim limit [11)]	SILCL3 (IEC 62061)		
PFHd (mean probability of a dangerous failure per hour)			
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 after supply voltage is applied		2 s	
Test rod speed at which the test rod is safely detected [12)]	0 m/s ... 1.6 m/s		

1) If the protective fields are very wide, there is a possibility that all four diagnostic LEDs 1, 2, 3 and 4 will not light up even when alignment is optimal.
2) The minimum scanning range specifies a range in which a function is guaranteed to operate correctly and safely under industrial conditions. A sufficient level of signal reserve to ensure very high availability is included in the calculation.
3) The typical scanning range specifies a range in which the safety light curtain operates correctly and safely under industrial conditions. The level of signal reserve is enough to ensure high availability.
4) SELV/PELV safety/protective extra-low voltage.
5) The specified enclosure rating only applies when the system plug is fitted.
6) In order to achieve enclosure rating IP 66, washers must be used for the fixing screws on the enclosure cover.
7) 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.
8) 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.
9) All inputs of the safety light curtain must be supplied by the same voltage supply. If the sender and receiver are connected to each other, they must be supplied by the same voltage supply.
10) Within the limits of U_V.
11) For more detailed information on the exact configuration of your machine, please consult your respective SICK subsidiary.
12) Direction of movement and axis of the test rod perpendicular to the protective field.

Table 23: Technical data for sender

	Minimum	Typical	Maximum
Wavelength of sender		Near-infrared (NIR), invisible	
Weight	Depending on the protective field height, see "Table of weights", page 92		
Laser alignment aid			
Wavelength		650 nm (red)	
Average output power			390 µW
Laser class	1		
Laser alignment aid switch input (In1)			
Input voltage HIGH (active)	13 V	24 V	30 V
Input current HIGH	2 mA	5 mA	7 mA
Input voltage LOW (deactivated)	–3 V	0 V	3 V
Input current LOW	–0.1 mA	0 mA	0.5 mA
Laser alignment aid pushbutton input (In2)			
Input voltage HIGH (active)	13 V	24 V	30 V
Input current HIGH	2 mA	5 mA	7 mA
Input voltage LOW (deactivated)	–3 V	0 V	3 V
Input current LOW	–0.1 mA	0 mA	0.5 mA
Control switch actuation time	50 ms		
Permissible cable resistance [1]			
Supply cable			2.5 Ω

1) Limit the individual conductor resistance to the specified values to ensure that the light curtain functions correctly. (Also observe IEC 60204-1.)
The specified values apply to the total resistance of each conductor including contact and connector resistances.

Table 24: 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 92		
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			500 mA each
Leakage current of the OSSDs			2 mA each
Load capacity			2.2 µF
Load inductance			2.2 H
Test pulse data [4]			
Test pulse width		150 µs	300 µs
Test pulse rate	3 s^{-1}	5 s^{-1}	10 s^{-1}

	Minimum	Typical	Maximum
Discrepancy time (time offset between switching of OSSD2 and OSSD1)			1 ms
Inputs			
Input voltage HIGH (active) [2]	11 V	24 V	30 V
Input current HIGH	6 mA	10 mA	20 mA
Input voltage LOW (deactivated) [2]		0 V	5 V
Input current LOW	-2.5 mA	0 mA	0.5 mA
External device monitoring input (EDM)			
Connected contactors			
Permissible dropout time			300 ms
Permissible pull in time			300 ms
Reset pushbutton input (RES)			
Control switch actuation time	50 ms		
Application diagnostic output (ADO)	PNP semiconductor, short-circuit protected [1]		
Output voltage HIGH (active)	U_V - 3 V		
Output voltage LOW (inactive)		High resistance	
Output current HIGH (active)			100 mA
Permissible conductor resistance[5]			
Supply cable [6]			1 Ω
Cable between OSSD and load			2.5 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 can be exceeded.
4) 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.
5) Limit the individual conductor resistance to the specified values to ensure that the light curtain functions correctly, particularly that a cross-circuit between the outputs is safely detected. (Also observe IEC 60204-1.)
The specified values apply to the total resistance of each conductor including contact and connector resistances.
6) The supply cable must not be used to connect other loads with the exception of the senders.

Table 25: Operating data

	Minimum	Typical	Maximum
System connection	Flying leads, 8-wire, 30 m preassembled		
Ambient operating temperature [1] [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 93		
Vibration resistance [4]	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)		

	Minimum	Typical	Maximum
Shock resistance [5]	10 g, 16 ms (IEC 60068-2-27)		

1) The cable belonging to the device incl. the associated connection plug must not be flexibly mounted under –25 °C.
1)) The temperature difference between sender and receiver must not exceed 25 K.
2) Maximum ambient operating temperature over 1,000 m above NHN: +50 °C.
Maximum ambient operating temperature over 2,000 m above sea level: +45 °C.
3) Test conditions per axis: 1 octave/minute, amplitude: 0.35 mm, 20 sweeps.
4) Test conditions per axis: 1,000 shocks.
5) maximum permissible conductor resistance must be observed.

13.2 Response time

Table 26: Response time for a single device

Protective field height in mm	Response time in ms	
	Uncoded	Code 1 or code 2
450	10	14
600	10	15
900	11	17
1200	12	20
1500	13	22

13.3 Power consumption

Table 27: Power consumption for sender and receiver, 30 mm resolution

Protective field height in mm	Typical power consumption for sender in W	Typical power consumption for receiver in W [1] [2]
450	1.31	3.30
600	1.38	3.36
900	1.53	3.50
1200	1.68	3.63
1500	1.82	3.76

1) Power discharged again via the OSSDs depending on the connected OSSD load must be added to the table values.
2) The power consumption increases by 0.5 W with the use of a receiver with integrated LED.

13.4 Table of weights

Table 28: Weight of sender and receiver

Protective field height in mm	Weight in kg [1]	
	Sender	Receiver
450	30.13	30.14
600	29.35	29.36
900	37.7	37.71
1200	46.05	46.06
1500	46.32	46.33

1) Tolerance: ± 50 g.

13.5 Dimensional drawings

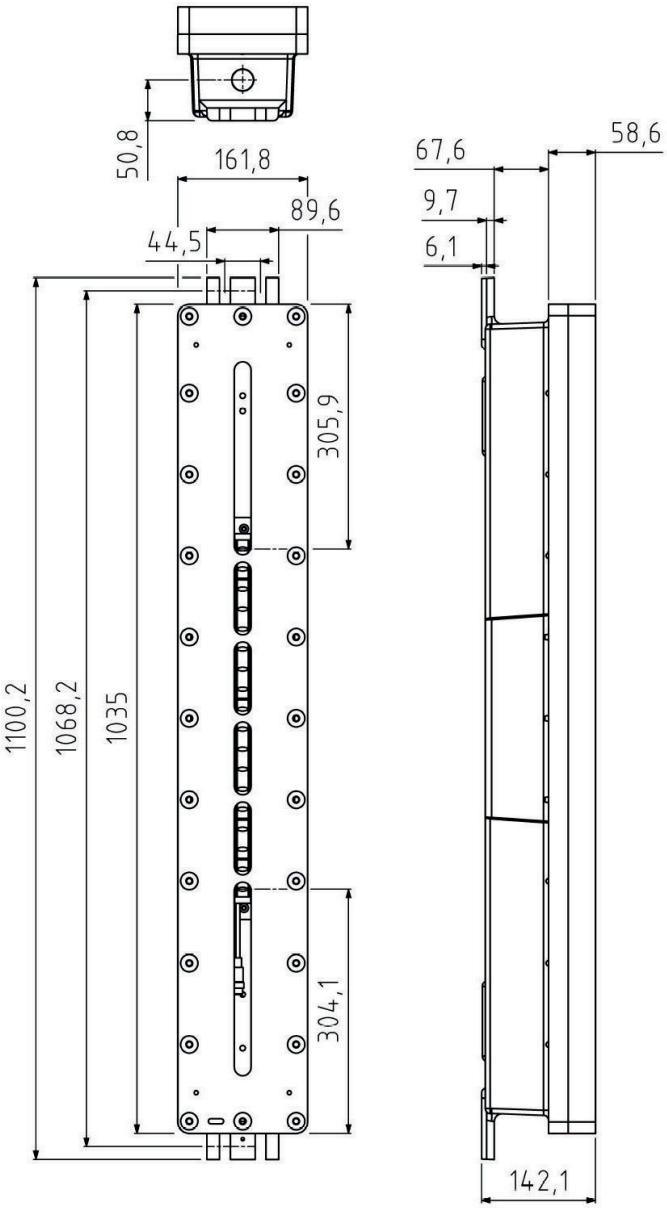

Figure 49: Dimensional drawing, sender and receiver, protective field height 450 mm

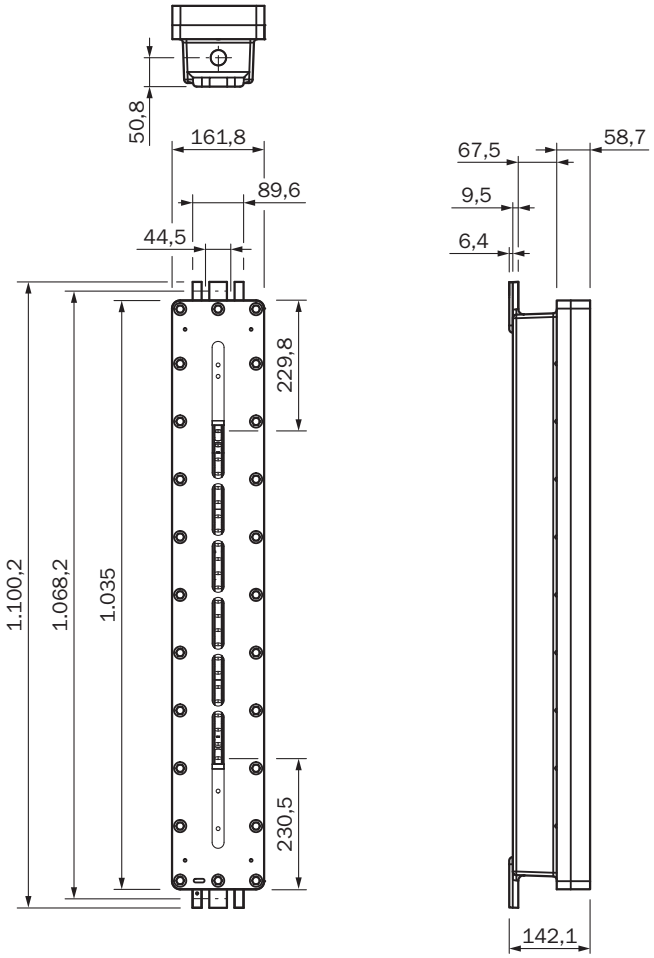

Figure 50: Dimensional drawing, sender and receiver, protective field height 600 mm

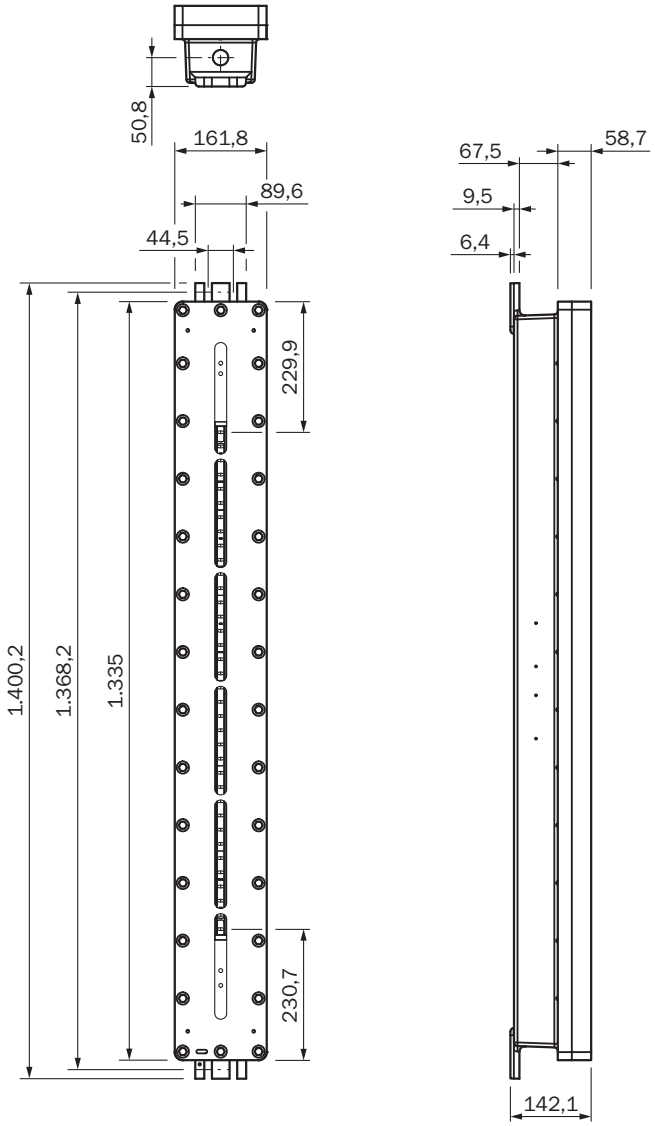

Figure 51: Dimensional drawing, sender and receiver, protective field height 900 mm

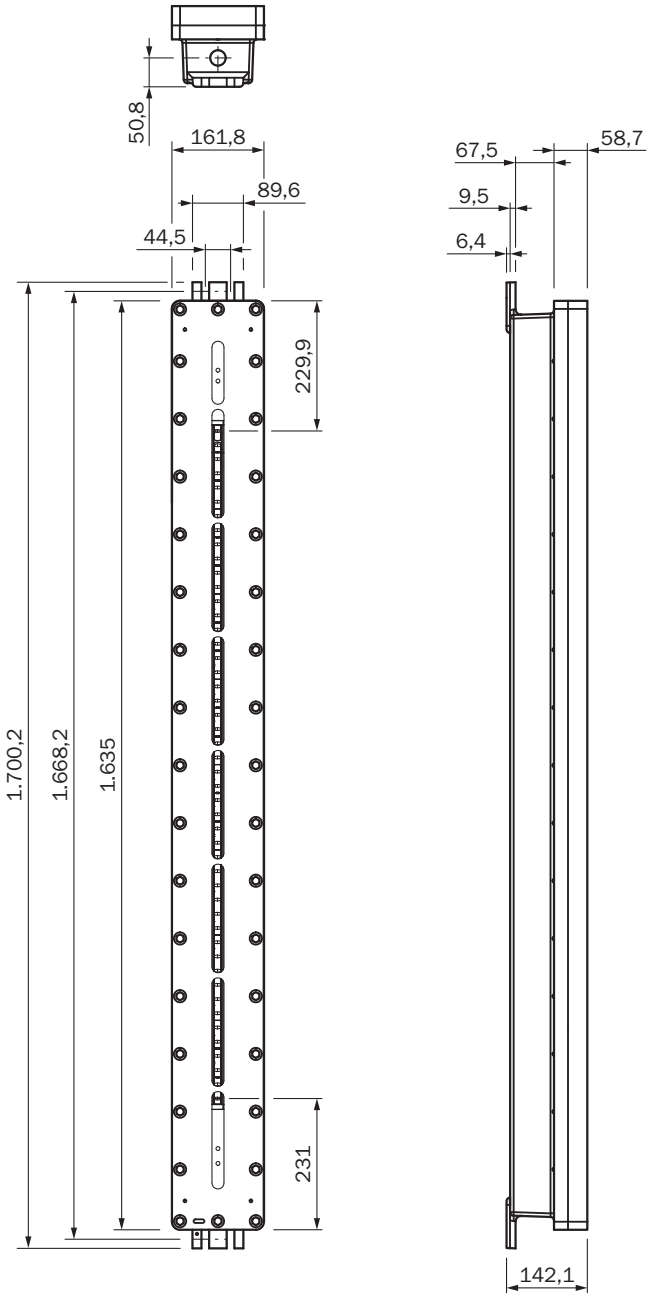

Figure 52: Dimensional drawing, sender and receiver, protective field height 1,200 mm

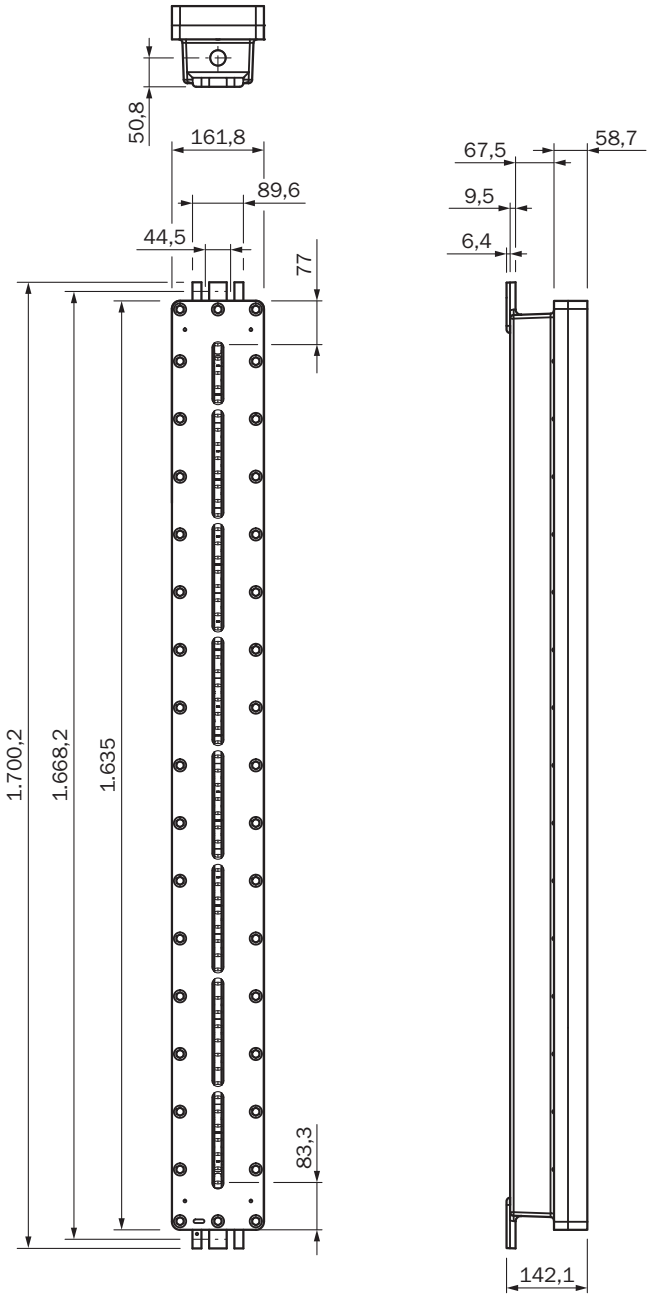

Figure 53: Dimensional drawing, sender and receiver, protective field height 1,500 mm

14 Ordering information

14.1 Scope of delivery

Scope of delivery, sender

- Sender
- Explosion-proof enclosure
- 2 x FlexFix bracket with riser
- 2 x handles
- 30 m system connection cables, flying leads

Scope of delivery, receiver

- Receiver
- Explosion-proof enclosure
- 2 x FlexFix bracket with riser
- 2 x handles
- 30 m system connection cables, flying leads
- Test rod of 30 mm diameter
- Safety note
- Mounting instructions
- Operating instructions on CD-ROM 2066639

14.2 Ordering information deTec4 Ex

Table 29: Ordering information deTec4 Ex for 30 mm resolution

Protective field height in mm	Sender		Receiver		Sender and receiver	
	Part number	Type code	Part number	Type code	Part number	Type code
450	1097705	EXS-06D6113A020	1097704	EXE-06D6113A020	1097703	EXP-06D6113A020
600	1097702	EXS-06D6213A020	1097701	EXE-06D6213A020	1097700	EXP-06D6213A020
900	1097708	EXS-09D6413A020	1097707	EXE-09D6413A020	1097706	EXP-09D6413A020
1200	1097711	EXS-12D6613A020	1097710	EXE-12D6613A020	1097709	EXP-12D6613A020
1500	1097714	EXS-12D6813A020	1097713	EXE-12D6813A020	1097712	EXP-12D6813A020

15 Accessories

15.1 Brackets

Table 30: Brackets ordering information

Part	Part number
FlexFix bracket with riser (2 x), 450 mm	2103450
FlexFix bracket with riser (2 x), 600 mm ... 1,500 mm	2074627
Alignment bracket for explosion-proof housing (2x)	2072525

FlexFix bracket with riser

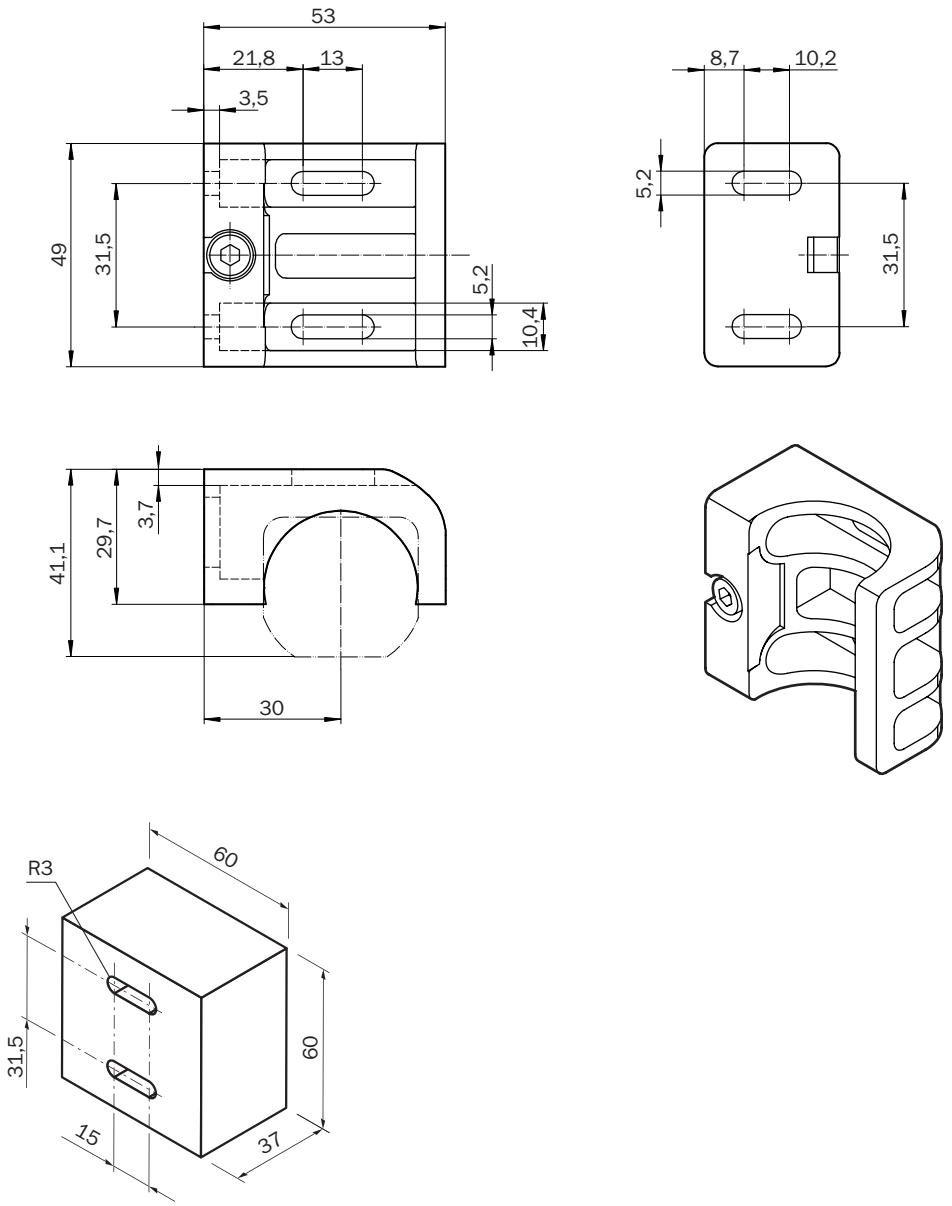

Figure 54: Dimensional drawing of the FlexFix bracket with riser (2074627)

Alignment bracket

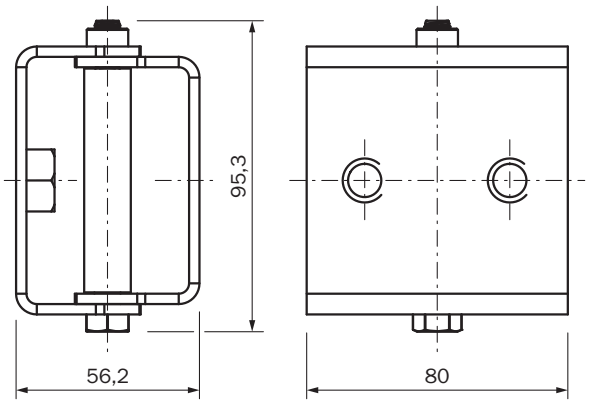

Figure 55: Dimensional drawing of the alignment bracket (2072525)

15.2 Mounting accessories

Table 31: Mounting accessories ordering information

Part	Part number
Alignment tool	4084133

15.3 Connectors

Table 32: Ordering information for cable gland

Part	Part number
Cable gland for the European market	5329002

15.4 Alignment aid

The following accessories can only be used outside the explosion-hazardous area

Table 33: Alignment aid ordering information

Part	Part number
AR60 laser alignment aid	1015741
Adapter	2074849

15.5 Deflector mirrors

15.5.1 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.

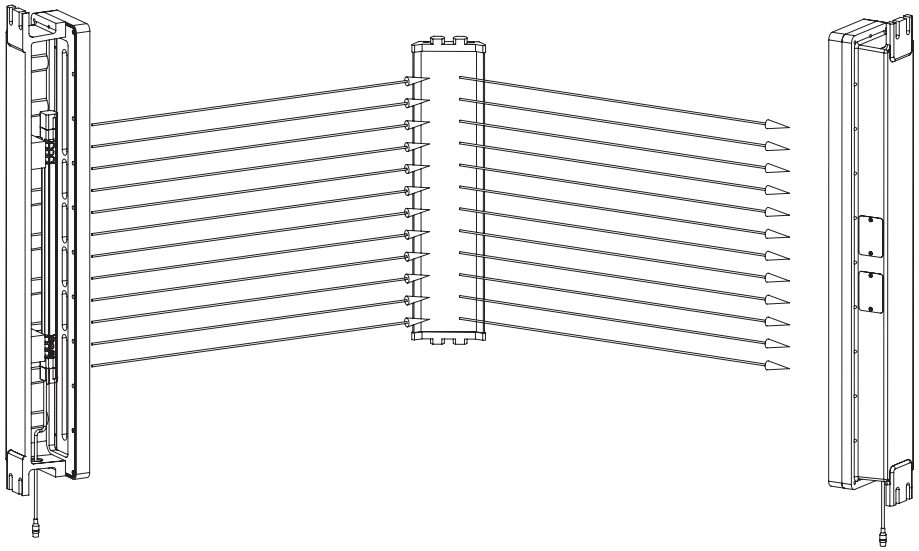

Figure 56: Example of use of deflector mirrors

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.

Further topics

- "Mirror columns", page 102

15.5.2 Mounting

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

15.5.3 Change in scanning range using deflector mirrors

Important information

NOTE

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

Table 34: Scanning range with and without 1 or 2 deflector mirrors

Type	Solution	Scanning range, typical	Scanning range with 1 deflector mirror, typical	Scanning range with 2 deflector mirrors, typical
PNS75, PNS125	30 mm	25.2 m	22.6 m	20.3 m

15.5.4 Deflector mirror PNS75 - ordering information

Table 35: Ordering information for PNS75 deflector mirror

Mirror length in mm	Max. protective field height in mm	Type code	Part number
490	450	PNS75-049	1019415
640	600	PNS75-064	1019416
940	900	PNS75-094	1019418
1240	1200	PNS75-124	1019420
1540	1500	PNS75-154	1019422

15.5.5 Deflector mirror PSN125 - ordering information

Table 36: Ordering information, deflector mirror PSN125

Mirror length in mm	Max. protective field height in mm	Type code	Part number
490	450	PNS125-049	1019426
640	600	PNS125-064	1019427
940	900	PNS125-094	1019429
1240	1200	PNS125-124	1019431
1540	1500	PNS125-154	1019433

15.6 Mirror columns

Table 37: Ordering information, mirror columns

Column height	Mirror length	Type code	Part number
1,281.5 mm	1,082 mm	PM3C13-00030000	1043453
1,569 mm	1,382 mm	PM3C15-00030000	1077525
1,716.5 mm	1,532 mm	PM3C17-00030000	1043454

Complementary information

Observe the information on deflector mirrors, particularly on changing the scanning range.

Further topics

- "Deflector mirrors", page 100

15.7 Device columns

Table 38: Ordering information for device columns

Column height	Max. installation length	Type code	Part number
985 mm	965 mm	PU3H96-00000000	2045490
1185 mm	1165 mm	PU3H11-00000000	2045641
1285 mm	1265 mm	PU3H13-00000000	2045642
1570 mm	1550 mm	PU3H15-00000000	2068813
1740 mm	1720 mm	PU3H17-00000000	2045643
2040 mm	2020 mm	PU3H21-00000000	2045644
2270 mm	2250 mm	PU3H22-00000000	2045645
2420 mm	2400 mm	PU3H24-00000000	2045646

15.8 Cleaning agent

Table 39: Cleaning agent ordering information

Part	Part number
Anti-static plastic cleaner	5600006
Lens cloth	4003353

15.9 Test rods

Table 40: Ordering information, test rods

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

16 Annex

16.1 Compliance with EU directives

EU declaration of conformity (extract)

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

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).

16.2 Note on specified standards

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

Table 41: 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/T 4208
IEC 60825-1	GB 7247.1
IEC 61131-2	GB/T 15969.2
IEC 61140	GB/T 17045
IEC 61496-1	GB/T 19436.1
IEC 61496-3	GB 19436.3
IEC 61508	GB/T 20438
IEC 62061	GB 28526
ISO 13849-1	GB/T 16855.1
ISO 13855	GB/T 19876

16.3 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 ☐ No ☐
Are the applied directives and standards listed in the declaration of conformity?	Yes ☐ No ☐
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 ☐ No ☐
Is access to the hazardous area or hazardous point only possible through the protective field of the ESPE?	Yes ☐ No ☐
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 ☐ No ☐
Are additional mechanical protective measures fitted and secured against manipulation which prevent reaching below, above or around the ESPE?	Yes ☐ No ☐
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 ☐ No ☐
Has the ESPE been mounted such that the required minimum distance from the nearest hazardous point has been achieved?	Yes ☐ No ☐
Are the ESPE devices properly mounted and secured against manipulation after adjustment?	Yes ☐ No ☐
Are the required protective measures against electric shock in effect (protection class)?	Yes ☐ No ☐
Is the control switch for resetting the protective devices (ESPE) or restarting the machine present and correctly installed?	Yes ☐ No ☐
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 ☐ No ☐
Has the protective function been checked in compliance with the test notes of this documentation?	Yes ☐ No ☐
Are the specified protective functions effective at every operating mode that can be set?	Yes ☐ No ☐
Are the switching elements activated by the ESPE, e.g. contactors, valves, monitored?	Yes ☐ No ☐
Is the ESPE effective over the entire period of the dangerous state?	Yes ☐ No ☐
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 ☐ No ☐

17 List of figures

18 List of tables

8022883/2019-03-07/en

Australia
Phone +61 (3) 9457 0600
1800 33 48 02 – tollfree
E-Mail sales@sick.com.au

Austria
Phone +43 (0) 2236 62288-0
E-Mail office@sick.at

Belgium/Luxembourg
Phone +32 (0) 2 466 55 66
E-Mail info@sick.be

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

Canada
Phone +1 905.771.1444
E-Mail cs.canada@sick.com

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

Chile
Phone +56 (2) 2274 7430
E-Mail chile@sick.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 +358-9-25 15 800
E-Mail sick@sick.fi

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

Germany
Phone +49 (0) 2 11 53 01
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 ertekesites@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 27 43 41
E-Mail info@sick.it

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

Malaysia
Phone +603-8080 7425
E-Mail enquiry.my@sick.com

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

Netherlands
Phone +31 (0) 30 229 25 44
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 +40 356-17 11 20
E-Mail office@sick.ro

Russia
Phone +7 495 283 09 90
E-Mail info@sick.ru

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

Slovakia
Phone +421 482 901 201
E-Mail mail@sick-sk.sk

Slovenia
Phone +386 591 78849
E-Mail office@sick.si

South Africa
Phone +27 (0)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 2 645 0009
E-Mail marcom.th@sick.com

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

United Arab Emirates
Phone +971 (0) 4 88 65 878
E-Mail info@sick.ae

United Kingdom
Phone +44 (0)17278 31121
E-Mail info@sick.co.uk

USA
Phone +1 800.325.7425
E-Mail info@sick.com

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

Further locations at **www.sick.com**

SICK AG | Waldkirch | Germany | www.sick.com

SICK
Sensor Intelligence.