

# deTec4 Prime

Safety light curtain

**SICK**  
Sensor Intelligence.



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**Described product**

deTec4 Prime

**Manufacturer**

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**Original document**

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## Contents

<b>1</b>	<b>About this document.....</b>	<b>7</b>
1.1	Scope.....	7
1.2	Target groups and structure of these operating instructions.....	7
1.3	Additional information.....	8
1.4	Symbols and document conventions.....	8
<b>2</b>	<b>Safety information.....</b>	<b>10</b>
2.1	General safety notes.....	10
2.2	Correct use.....	11
2.3	Requirements for the qualification of personnel.....	11
<b>3</b>	<b>Product description.....</b>	<b>13</b>
3.1	Structure and function.....	13
3.2	Product characteristics.....	14
3.2.1	Device overview.....	14
3.2.2	Absence of blind zones.....	15
3.2.3	Automatic calibration of the protective field width.....	15
3.2.4	Beam coding.....	15
3.2.5	Alignment aid.....	15
3.2.6	Restart interlock.....	15
3.2.7	External device monitoring (EDM).....	15
3.2.8	Cascading.....	15
3.2.9	System plug.....	16
3.2.10	Flexible control cabinet cabling and status indication on both sides.....	17
3.2.11	Status indicators.....	18
3.3	Example applications.....	20
<b>4</b>	<b>Project planning.....</b>	<b>22</b>
4.1	Manufacturer of the machine.....	22
4.2	Operator of the machine.....	22
4.3	Design.....	22
4.3.1	Scanning range and protective field width.....	23
4.3.2	Minimum distance from the hazardous point.....	24
4.3.3	Minimum distance to reflective surfaces.....	26
4.3.4	Protection against interference from systems in close proximity to each other.....	28
4.4	Integration in electrical control.....	31
4.4.1	Restart interlock.....	33
4.4.2	External device monitoring (EDM).....	34
4.4.3	Application diagnostic output.....	35
4.4.4	Connection of sender and receiver.....	35
4.4.5	Laser alignment aid.....	36
4.4.6	Cascading.....	37

4.4.7	Connection diagrams.....	40
4.5	Testing plan.....	43
4.5.1	Test rod check.....	43
4.5.2	Visual check of the machine and the protective device.....	46
<b>5</b>	<b>Mounting.....</b>	<b>47</b>
5.1	Safety.....	47
5.2	Unpacking.....	47
5.3	Mounting the system plug.....	48
5.4	Installation.....	49
5.4.1	Mounting the QuickFix bracket.....	52
5.4.2	Mounting the FlexFix bracket.....	54
5.4.3	Mounting the upgrade bracket.....	57
<b>6</b>	<b>Electrical installation.....</b>	<b>58</b>
6.1	Safety.....	58
6.2	System connection (M12, 5-pin).....	59
6.3	System connection (M12, 8-pin).....	60
6.4	Extension connection (M12, 5-pin).....	61
<b>7</b>	<b>Configuration.....</b>	<b>63</b>
7.1	Factory settings.....	63
7.1.1	Reset to factory settings.....	63
7.1.2	Changing the configuration later.....	64
7.2	Configuration mode.....	65
7.3	Configuring beam coding.....	65
7.4	Configuring the restart interlock.....	67
7.5	Configuring external device monitoring (EDM).....	67
7.6	Configuring application diagnostic output.....	68
7.7	Configuring cascading.....	68
7.7.1	Cascading new devices.....	69
7.7.2	Connecting a new device in an existing cascade.....	70
7.7.3	Connecting preconfigured devices in an existing cascade...	70
7.8	Status indication on both sides.....	71
<b>8</b>	<b>Commissioning.....</b>	<b>72</b>
8.1	Safety.....	72
8.2	Overview.....	72
8.3	Switching on.....	73
8.4	Sender and receiver alignment.....	73
8.4.1	Aligning the sender and receiver.....	74
8.4.2	Alignment with the QuickFix bracket.....	75
8.4.3	Alignment with the FlexFix bracket or with the upgrade bracket.....	76
8.4.4	Indication of the alignment quality.....	77
8.5	Check during commissioning and modifications.....	78

<b>9</b>	<b>Operation.....</b>	<b>79</b>
9.1	Safety.....	79
9.2	Regular thorough check.....	79
9.3	LEDs.....	79
<b>10</b>	<b>Maintenance.....</b>	<b>82</b>
10.1	safety.....	82
10.2	Regular cleaning.....	82
10.3	Regular thorough check.....	83
<b>11</b>	<b>Troubleshooting.....</b>	<b>84</b>
11.1	Safety.....	84
11.2	Diagnostic LEDs.....	84
11.2.1	Indications when switching on.....	84
11.2.2	Status indication.....	86
11.2.3	Fault indicators.....	88
<b>12</b>	<b>Decommissioning.....</b>	<b>92</b>
12.1	Protection of the environment.....	92
12.2	Disposal.....	92
<b>13</b>	<b>Technical data.....</b>	<b>93</b>
13.1	Data sheet.....	93
13.2	Response time.....	96
13.3	Power consumption.....	97
13.4	Length of cable.....	98
13.5	Table of weights.....	99
13.6	Dimensional drawings.....	100
<b>14</b>	<b>Ordering information.....</b>	<b>101</b>
14.1	Scope of delivery.....	101
14.2	Variants.....	101
14.3	Ordering information deTec4 Prime.....	101
<b>15</b>	<b>Accessories.....</b>	<b>106</b>
15.1	Brackets.....	106
15.2	Mounting accessories.....	107
15.3	Weld spark guard.....	107
15.4	Connectors.....	109
15.5	Alignment aid.....	113
15.6	Deflector mirrors.....	113
15.6.1	Function and use.....	113
15.6.2	Mounting.....	113
15.6.3	Change in scanning range using deflector mirrors.....	114
15.6.4	Deflector mirror PNS75 - ordering information.....	114
15.6.5	Deflector mirror PSN125 - ordering information.....	115
15.7	Mirror columns and device columns.....	115

15.7.1	Mirror columns.....	115
15.7.2	Device columns.....	115
15.8	Cleaning agent.....	116
15.9	Test rods.....	116
<b>16</b>	<b>Annex.....</b>	<b>117</b>
16.1	Compliance with EU directives.....	117
16.2	Note on specified standards.....	118
16.3	Checklist for initial commissioning and commissioning.....	119
<b>17</b>	<b>List of figures.....</b>	<b>120</b>
<b>18</b>	<b>List of tables.....</b>	<b>122</b>

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

- 8017724

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

8017724

## 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 <sup>1)</sup>
Manufacturer	Project developers (planners, developers, designers)	"Project planning", page 22 "Configuration", page 63 "Technical data", page 93 "Accessories", page 106
	Installers	"Mounting", page 47
	Electricians	"Electrical installation", page 58
	Safety specialists	"Project planning", page 22 "Configuration", page 63 "Commissioning", page 72 "Technical data", page 93 "Checklist for initial commissioning and commissioning", page 119
Operating company	Operator	"Operation", page 79 "Troubleshooting", page 84
	Maintenance personnel	"Maintenance", page 82 "Troubleshooting", page 84 "Ordering information", page 101

<sup>1)</sup> 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](http://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

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#### **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

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#### **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

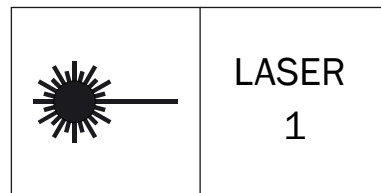


Figure 1: Laser class 1

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.
-

## 2.2 Correct use

### Overview

The deTec4 Prime 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 Prime 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 Prime 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

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#### 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.
- 

### Foreseeable misuse

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

- Outdoors
- Underwater
- In explosion-hazardous areas
- 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.

An operator may clean the safety light curtain and carry out specific checks as instructed. Additional information for the operator of the machine: [see "Operation", page 79](#), and [see "Regular cleaning", page 82](#).

## 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 Prime 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.

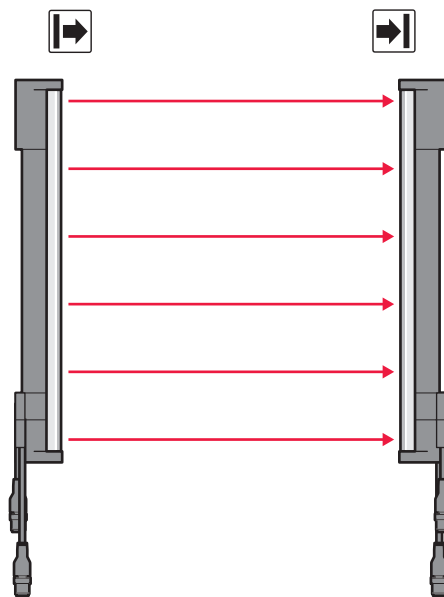


Figure 2: Sender and receiver

#### Protective field height

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

#### Protective field width

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

#### Resolution

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

With the appropriate resolution, the safety light curtain provides finger and hand protection.

#### Scanning range

The scanning range is the maximum protective field width. It is subject to the resolution variant (14 mm or 30 mm).

The scanning range is reduced by the use of deflector mirrors and/or a weld spark guard.

#### Further topics

- ["Flexible control cabinet cabling and status indication on both sides", page 17](#)
- ["Data sheet", page 93](#)
- ["Deflector mirrors", page 113](#)
- ["Weld spark guard", page 107](#)

## 3.2 Product characteristics

### 3.2.1 Device overview

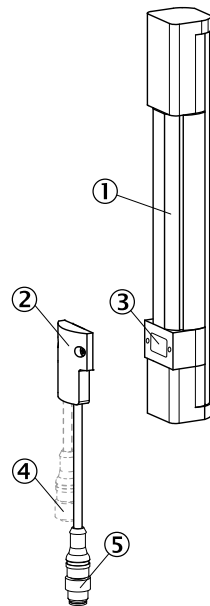


Figure 3: Device overview

- ① Sender or receiver
- ② System plug
- ③ Terminal compartment
- ④ Extension connection (only for certain system plugs)
- ⑤ System connection

### 3.2.2 Absence of blind zones

The design and construction of the safety light curtain extends the protective function of a device to the end of the housing without any blind spots. The absence of blind zones reduces the space requirement when integrated in the machine.

### 3.2.3 Automatic calibration of the protective field width

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

### 3.2.4 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.

### 3.2.5 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.

Alignment quality LEDs are installed in the receiver of the safety light curtain. To perform a simple alignment of the receiver, the alignment quality LEDs indicate the alignment quality once the safety light curtain has been switched on.

### 3.2.6 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.

The reset pushbutton can be connected locally to the extension connection or in the control cabinet.

### 3.2.7 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.

### 3.2.8 Cascading

Cascading allows up to 3 safety light curtains to be connected in series, e.g. for reliable presence detection. The device connected to the control cabinet is the host device. The subsequent sensors are called guest 1 and guest 2.

### 3.2.9 System plug

#### Overview

The safety light curtain requires a system plug. The system plug is available in a range of variants.

Depending on the variant, there are one or two M12 plug connectors on the system plug:

- System plug with 5-pin system connection
- System plug with 8-pin system connection
- System plug with 5-pin system connection and 5-pin extension connection
- System plug with 8-pin system connection and 5-pin extension connection

#### System plug and functions of the safety light curtain

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

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

Restart interlock

- Requirement for the receiver: 8-pin system connection or extension connection.

External device monitoring (EDM)

- Requirement for the receiver: 8-pin system connection or extension connection.

Application diagnostic output

- Requirement for the receiver: 8-pin system connection or extension connection.
- 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.
- 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.

Cascading

- Requirements: extension connection at the host, 5-pin system connection at the guest devices.
- Additional requirement for cascades with two guest devices: extension connection at the first guest.
- Restart interlock, external device monitoring (EDM), and application diagnostic output are possible if one of the following requirements is met:
  - 8-pin system connection at the host receiver.
  - Extension connection at the last guest receiver of the cascade.

#### Using the system plugs

System plug with 5-pin system connection

- Single system without additional function
- Last guest of a cascade, no additional function on the device

System plug with 8-pin system connection

- Single system with restart interlock, external device monitoring (EDM), or application diagnostic output at the system connection

System plug with 5-pin system connection and extension connection

- Host of a cascade, no additional function on the device
- First guest of a cascade with two guest devices, no additional function on the device
- Receivers only: single system with restart interlock, external device monitoring (EDM), or application diagnostic output at the extension connection



- Receivers only: last guest of a cascade, restart interlock, external device monitoring (EDM), or application diagnostic output at the extension connection
- If a sender does not have an additional guest connected to it, the extension connection has no function and must be sealed with a protective cap.

System plug with 8-pin system connection and extension connection

- Host of a cascade, restart interlock, external device monitoring (EDM), or application diagnostic output at the system connection
- Receivers only: single system with restart interlock, external device monitoring (EDM), or application diagnostic output
- If a sender does not have an additional guest connected to it, the extension connection has no function and must be sealed with a protective cap.

Table 1: Using the system plugs

		System plug type code			
		1000	1200	1100	1300
Single system	Sender		○ <sup>1)</sup>	○ <sup>2)</sup>	○ <sup>1) 2)</sup>
	Receiver	○	●	●	●
Host	Sender				○ <sup>1)</sup>
	Receiver	-	-	○	●
First guest (for cascade with 2 guest devices)	Sender				
	Receiver	-	-	○	-
Last guest	Sender			○ <sup>2)</sup>	
	Receiver	○	-	●	-

- 1) At the sender, the 8-pin system connection is solely for the purposes of providing standardized wiring. It is particularly recommended if the 8-pin system connection at the receiver is used and the sender and receiver are connected to each other via a T-connector.
- 2) If a sender does not have an additional guest connected to it, the extension connection has no function and must be sealed with a protective cap.

- System plug not suitable.
- System plug suitable. No additional function on the device.
- System plug suitable. Restart interlock, external device monitoring (EDM), or application diagnostic output available at this system plug.

**Further topics**

- ["Restart interlock", page 33](#)
- ["External device monitoring \(EDM\)", page 34](#)
- ["Cascading", page 37](#)

**3.2.10 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
- Connection of sender and receiver via a T-connector, shared 5-pin or 8-pin connecting cable to the control cabinet

In a cascade, only the host sender and host receiver are connected to the control cabinet.

The OSSD status and the status of the protective field are indicated at the sender and receiver via LEDs when the sender and receiver are connected in the control cabinet or via a T-connector. 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 40](#)

#### 3.2.11 Status indicators

##### Overview

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

##### Sender indicators

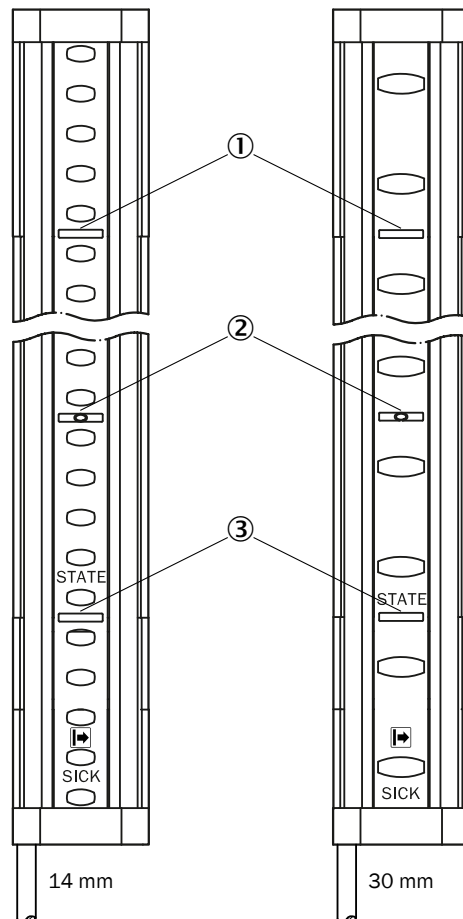


Figure 4: Sender indicators

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

Position	LED color	Function	Labeling
①	Red/yellow/green	Field indicator <sup>1)</sup> ; shows the status of the protective field and additional information about the status display	-
②	-	Laser alignment aid	-
③	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**

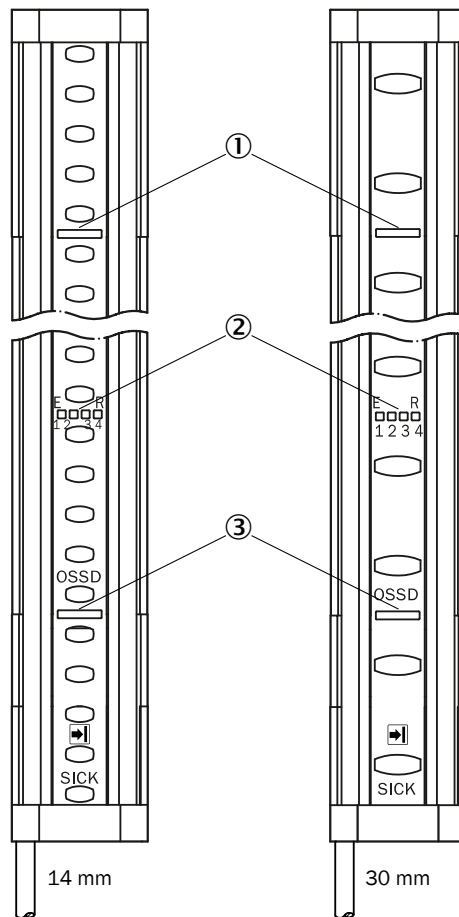


Figure 5: Receiver indicators

There are at least six LEDs on the receiver that indicate operational status:

Position	LED color	Function	Labeling
①	Red/yellow/green	Field indicator <sup>1)</sup>	-
②	Blue	Alignment quality	1 / E, 2, 3, 4 / R
③	Red/green	OSSD status	OSSD

1) Safety light curtains with protective field height > 300 mm have multiple LEDs for the field indicator.

The blue alignment quality LEDs in combination with the red flashing field indicator also denote faults.

Further topics

- "Diagnostic LEDs", page 84

3.3 Example applications

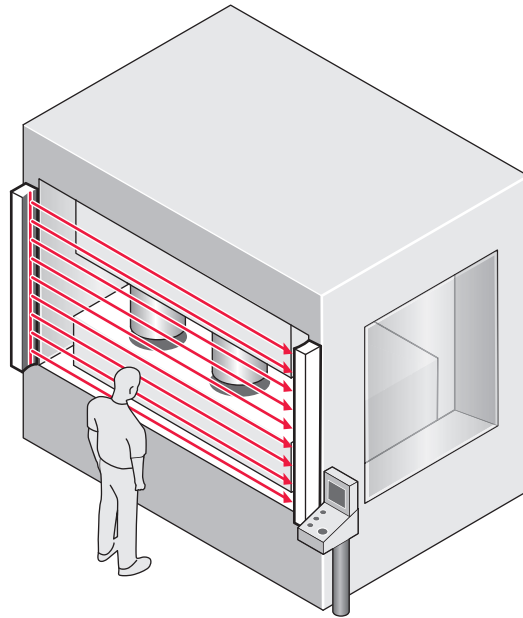


Figure 6: Hazardous point protection

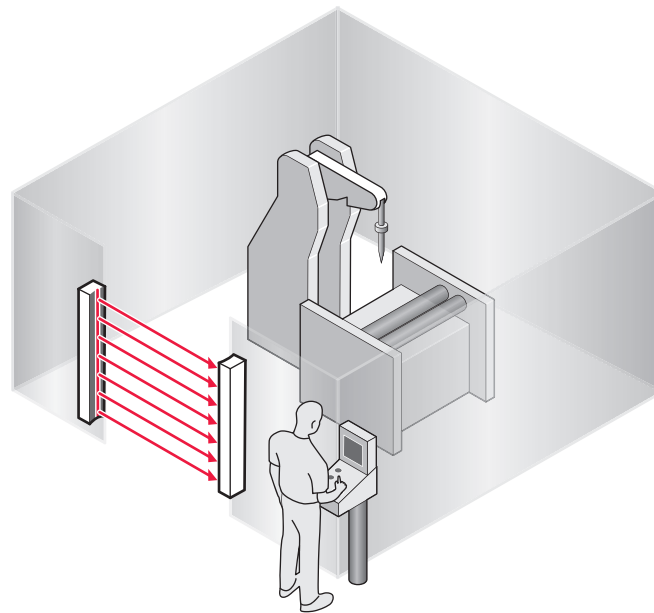


Figure 7: Access protection

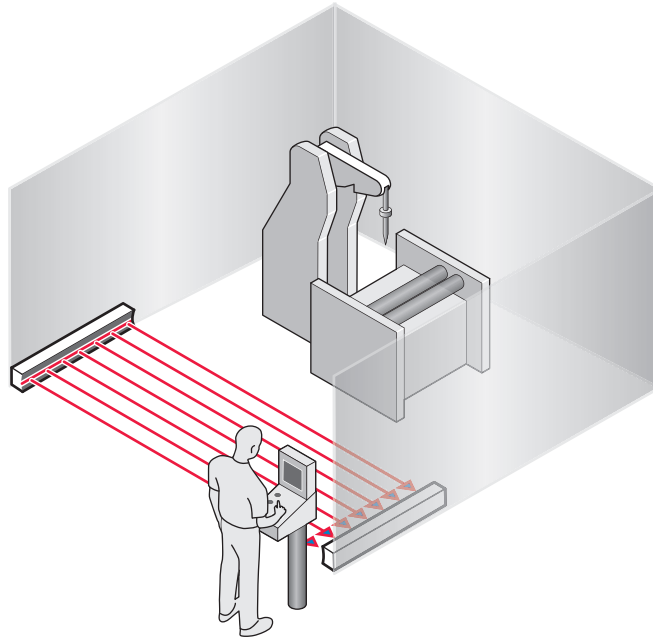


Figure 8: Hazardous area protection

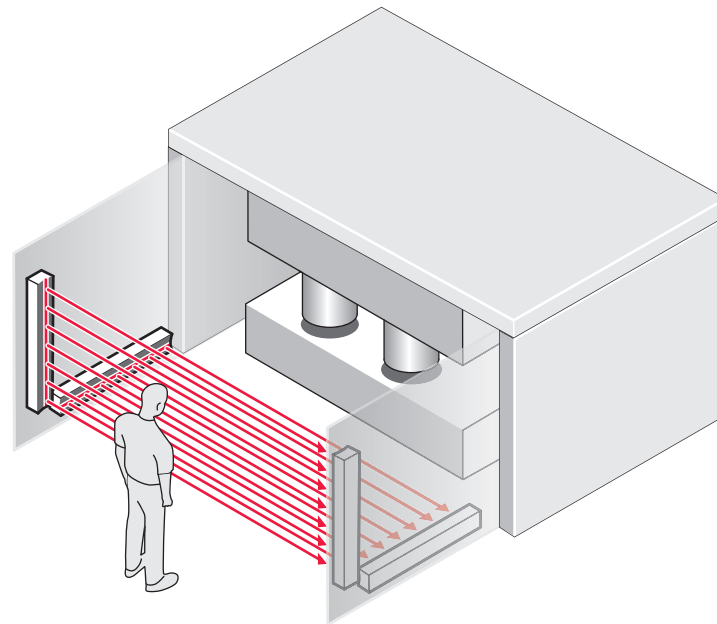


Figure 9: Access protection with presence detection, implemented by cascade

### 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

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##### **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 47](#)

**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 the use of deflector mirrors and/or a weld spark guard.

### Further topics

- ["Minimum distance to reflective surfaces", page 26](#)
- ["Technical data", page 93](#)
- ["Deflector mirrors", page 113](#)
- ["Weld spark guard", page 107](#)

### 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 96](#)

#### 4.3.2.1 Calculating minimum distance from the hazardous point

##### Important information

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#### 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:

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

Where:

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

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

2. If the result S is  $\leq 500$  mm, then use the determined value as the minimum distance.
3. If the result S is  $> 500$  mm, then recalculate S as follows:  

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

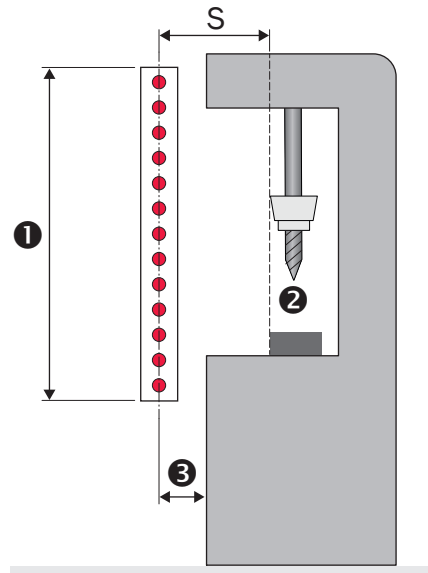


Figure 10: Minimum distance to the hazardous point for orthogonal (rectangular) approach to the protective field

- ① Protective field height
- ② Hazardous point
- ③ 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 = 14 mm

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

$$S = 2,000 \text{ mm/s} \times 0.32 \text{ s} + 8 \times (14 \text{ mm} - 14 \text{ mm}) = 640 \text{ mm}$$

$S > 500 \text{ mm}$ , therefore:

$$S = 1,600 \text{ mm/s} \times 0.32 \text{ s} + 8 \times (14 \text{ mm} - 14 \text{ mm}) = 512 \text{ mm}$$

### 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.

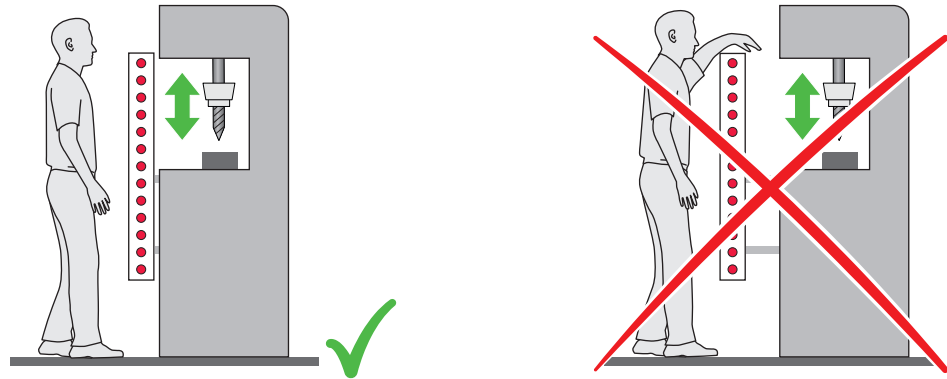


Figure 11: Representation of the accessibility of electro-sensitive protective device by reaching over. Left: Protective field that cannot be reached over. Right: Protective field that can be reached over.

### 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).

The weld spark guard can influence the optical properties of the safety light curtain, meaning that reflective surfaces have to observe a larger minimum distance.

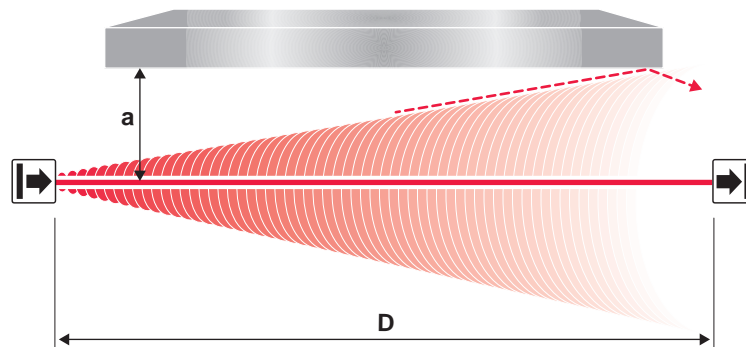


Figure 12: Minimum distance from reflective surfaces

### 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

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 2](#):

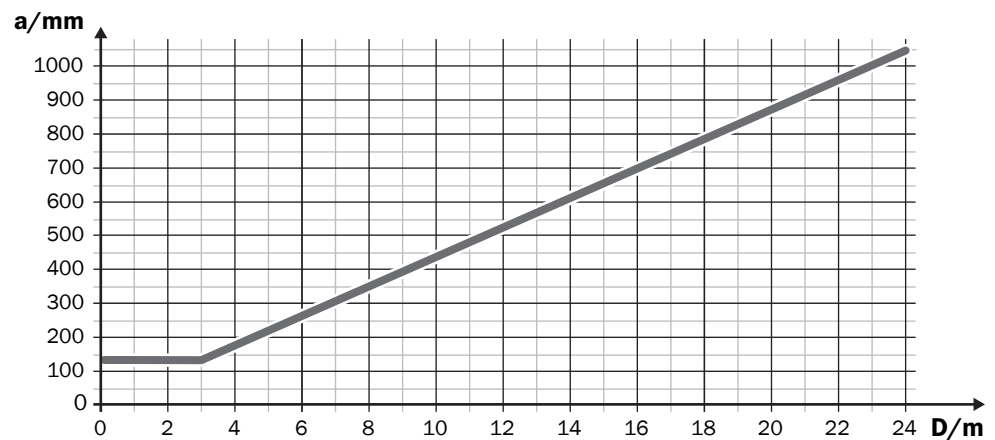


Figure 13: Graph of minimum distance from reflective surfaces

Table 2: Formula for calculating the minimum distance from reflective surfaces

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

### Further topics

- ["Weld spark guard", page 107](#)

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

Overview

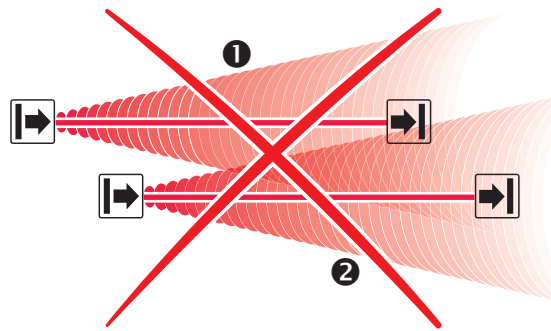


Figure 14: Preventing mutual interference from system ① and system ②

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

**Physical proximity to other opto-electronic products**

Certain opto-electronic products have been tested and do not influence the safety light curtain even if they operate in close physical proximity to one another.

The safety light curtain and the following products do not influence one another:

- microScan3

**Further topics**

- ["Using beam coding", page 29](#)
- ["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 Prime.

- ▶ 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.

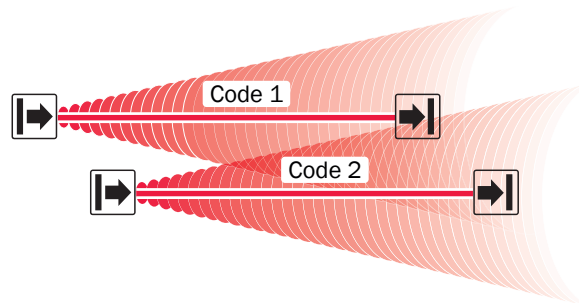


Figure 15: Trouble-free operation due to beam coding

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 65](#)
- ["Combining beam coding and reversed direction of transmission", page 30](#)

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.

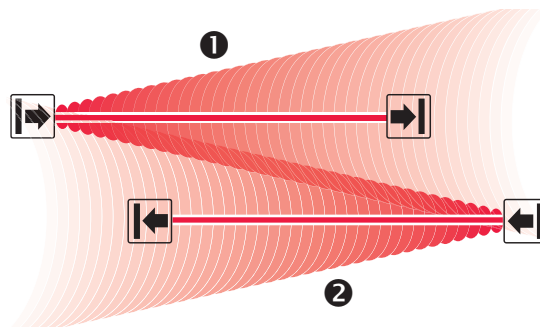


Figure 16: Trouble-free operation due to reversed direction of transmission of system ① and system ②

**Further topics**

- ["Connection of sender and receiver", page 35](#)
- ["Combining beam coding and reversed direction of transmission", page 30](#)

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.

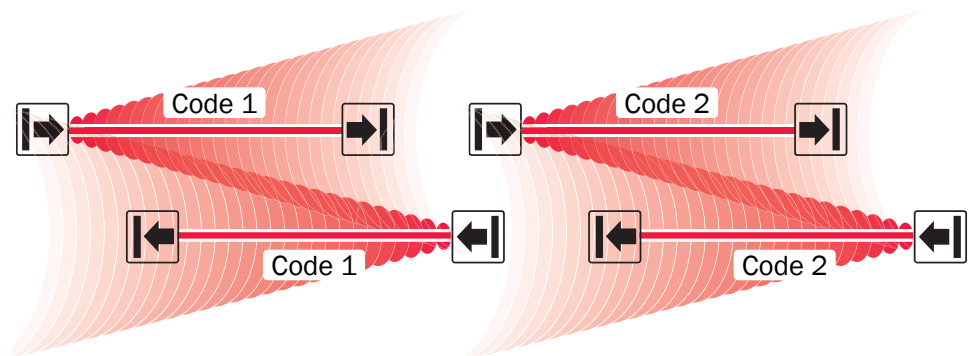


Figure 17: Trouble-free operation of 4 neighboring systems due to beam coding and reversed direction of transmission

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 58.

### 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

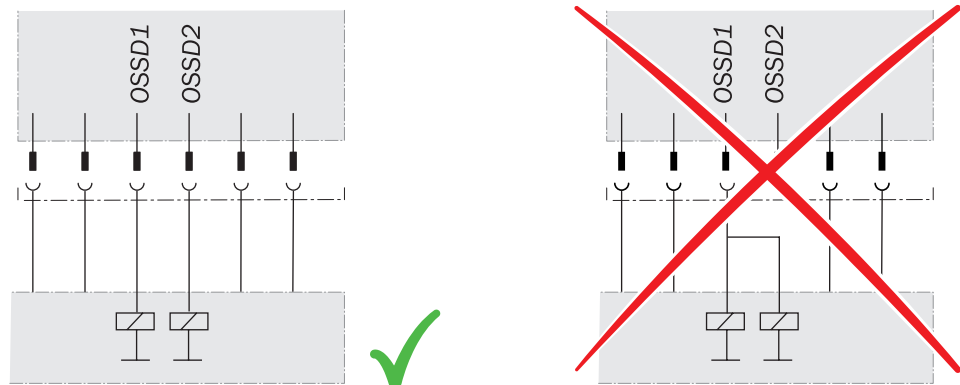


Figure 18: Dual-channel and isolated connection of OSSD1 and OSSD2

- 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.

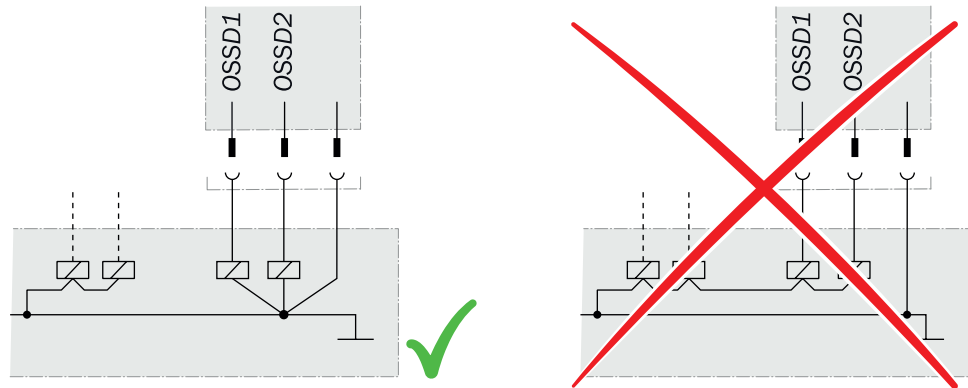


Figure 19: No potential difference between load and protective device



### 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).

Radio interference cannot be ruled out when used in residential areas.



**DANGER**

Hazard due to lack of effectiveness of the protective device

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

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

- The external voltage supply of the safety light curtain must be capable of jumpering a brief power failure of 20 ms as specified in IEC 60204-1.
- The power supply unit must ensure safe isolation according to IEC 61140 (SELV/PELV). Suitable power supply units are available as accessories from SICK, see "Accessories", page 106.

#### 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 push-button 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.

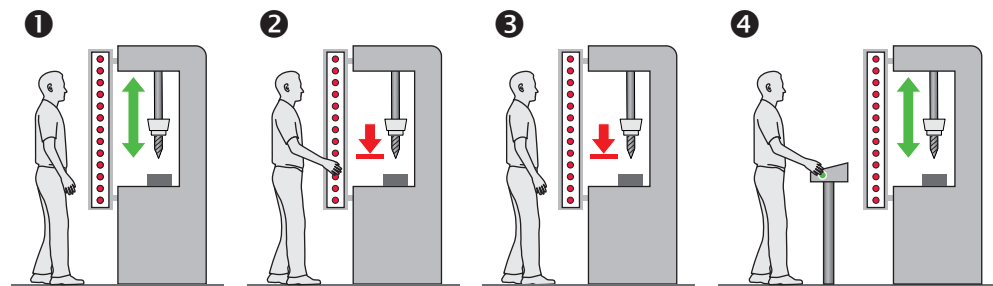


Figure 20: Schematic representation of operation with restart interlock

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.

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 status
- If someone presses the reset pushbutton and then lets go of it when the protective field is clear, the OSSDs switch to the ON status
- The machine may not restart yet. The operator must also press the machine start button after having pressed the reset pushbutton.

### Internal restart interlock and reset

A reset device (e.g., a reset pushbutton) must be connected to allow the restart interlock to be used.

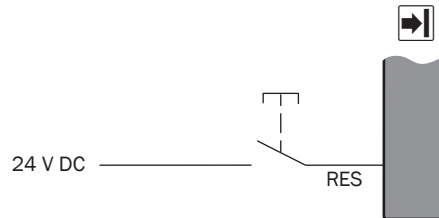


Figure 21: Electrical diagram of the reset device

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

Only one reset pushbutton may be connected to a single safety light curtain. A total of just one reset pushbutton may be connected to a cascade comprising two or three safety light curtains.

In the case of a single system, you can connect the reset pushbutton to the 8-pin system connection or to the extension connection of the receiver.

In the case of a cascade, you can connect the reset pushbutton to the 8-pin system connection of the host receiver or to the extension connection of the last guest receiver.

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.

### Further topics

- ["Configuring the restart interlock", page 67](#)

## 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.

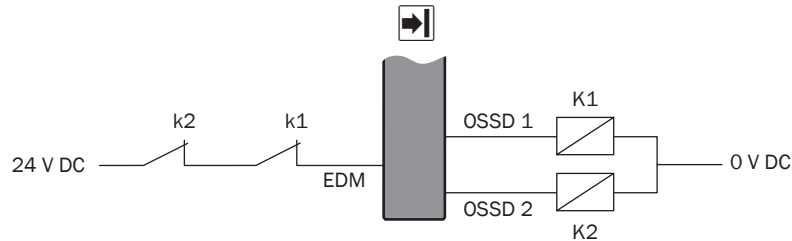


Figure 22: Electrical diagram of external device monitoring (EDM)

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

At the application diagnostic output, you can, for example, connect a light or transmit a signal to the machine controller. Depending on the configuration, the application diagnostic output signals if the reset pushbutton needs to be pressed or if 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.

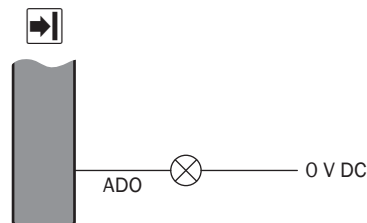


Figure 23: Electrical diagram of the application diagnostic output

### 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

#### Connection via a T-connector

Alternatively, you can connect the sender and receiver to each other via a T-connector (with an optional pushbutton for the laser alignment aid). In such cases, you only require a cable to the control cabinet and the status will also be indicated on both sides. Please note that the sender and receiver are protected jointly by one fuse when a T-connector is used. In the T-connector, all contacts are routed from the female connector to the same pins of both male connectors.

The T-connector must only be connected to the system connection of an individual device or a host device.

The OSSD status and the status of the protective field are indicated at the sender and receiver via LEDs when the sender and receiver are connected in the control cabinet or via a T-connector. If the sender and receiver are not connected to each other, this status information is only indicated at the receiver.

Even if you do not use a T-connector, you can connect the sender and receiver with identical cables. The advantage of this is that the sender and receiver can be switched without changing the cables if the installation situation so requires, e.g., to prevent mutual interference between systems in close proximity to each other.

### Further topics

- ["Accessories", page 106](#)
- ["Protection against interference from systems in close proximity to each other", page 28](#)

### 4.4.5 Laser alignment aid

#### Overview

You can use the integrated laser alignment aid if you connect a suitable pushbutton or switch.

#### Important information

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#### 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.
- 

#### Pushbutton

The pushbutton is mounted at the system connection of the sender between the system plug and the connecting cable.

The pushbutton can be temporarily mounted for alignments or used to maintain a permanent connection.

Functionality of the pushbutton

- Press the pushbutton once and release: integrated laser alignment aid is switched on
- Press the pushbutton again and release: integrated laser alignment aid is switched off

#### Switch

The switch is not suitable for safety light curtains where the sender and receiver are connected via a T-connector.

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.

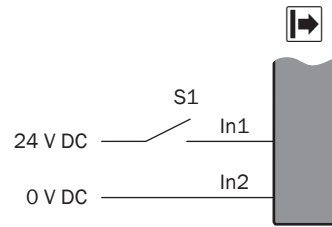


Figure 24: Switch for the integrated laser alignment aid

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

#### Complementary information

A suitable button is available as an accessory, alternatively as a T-connector with push-button for the laser alignment aid.

#### Further topics

- ["Connection of sender and receiver", page 35](#)
- ["Accessories", page 106](#)

### 4.4.6 Cascading

#### Important information



#### DANGER

Hazard due to lack of effectiveness of the protective device

If 2 or more identical safety light curtains (same resolution and same protective field height) are used in a cascade, the protective device can be disabled if the connecting cables are switched round.

- ▶ Make sure (e.g., by routing the cables appropriately) that the operator is unable to switch round the connecting cables of 2 senders or receivers of the same type.

#### Integrating a safety light curtain in a cascade

You can use cascading to connect up to 3 safety light curtains, e. g., to provide reliable presence detection. The connected devices act like a long safety light curtain. Only one device, the host, is connected to the control cabinet. The second device, guest 1, is connected to the host. The third device, guest 2, is connected to guest 1.

Advantages of cascading:

- Rapid connection, no additional external circuitry required
- No optical mutual interference between the protective fields within a cascade. Host and guests are operated with the same beam coding.
- Resolution and protective field heights of the individual systems may be different

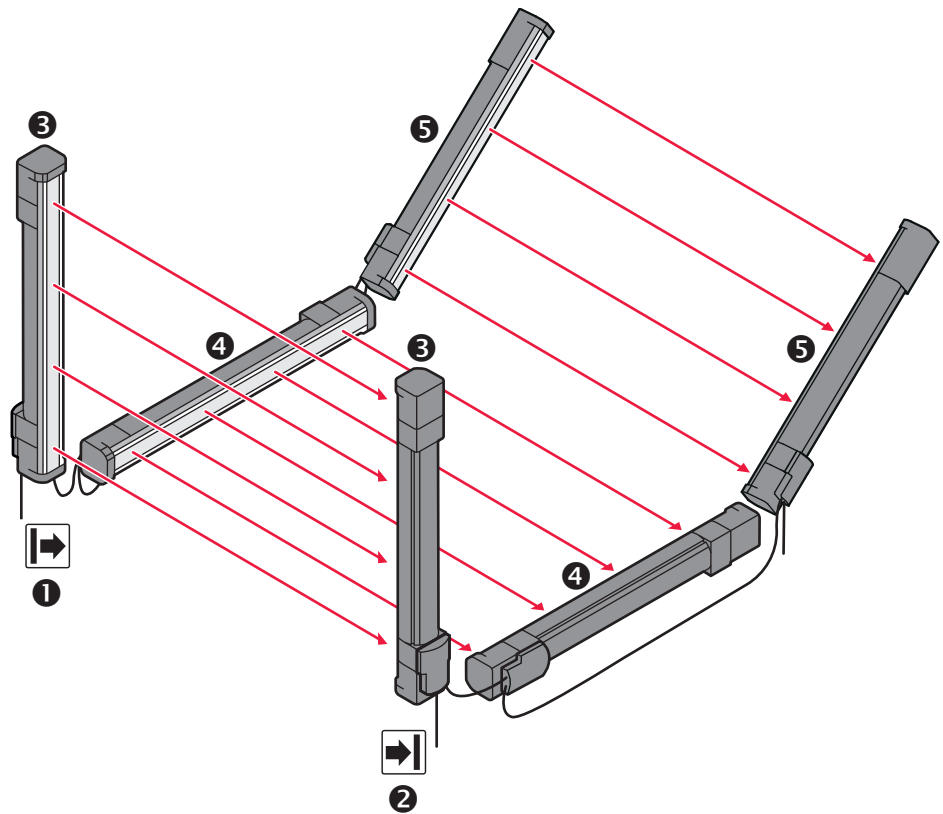


Figure 25: Cascade

- ❶ Sender
- ❷ Receiver
- ❸ Host
- ❹ Guest 1
- ❺ Guest 2

**Using the system plugs**

- Requirements: extension connection at the host. 5-pin system connection at the guest devices.
- Additional requirement for cascades with 2 guest devices: extension connection at the first guest
- Restart interlock, external device monitoring (EDM), and application diagnostic output are possible if one of the following requirements is met:
  - 8-pin system connection at the host receiver
  - Extension connection at the last guest receiver of the cascade

Table 3: Using the system plugs

		System plug type code			
		1000	1200	1100	1300
Single system	Sender		○ <sup>1)</sup>	○ <sup>2)</sup>	○ <sup>1) 2)</sup>
	Receiver	○	●	●	●
Host	Sender				○ <sup>1)</sup>
	Receiver	-	-	○	●
First guest (for cascade with 2 guest devices)	Sender				
	Receiver	-	-	○	-
Last guest	Sender			○ <sup>2)</sup>	
	Receiver	○	-	●	-

1) At the sender, the 8-pin system connection is solely for the purposes of providing standardized wiring. It is particularly recommended if the 8-pin system connection at the receiver is used and the sender and receiver are connected to each other via a T-connector.

2) If a sender does not have an additional guest connected to it, the extension connection has no function and must be sealed with a protective cap.

- System plug not suitable.

○ System plug suitable. No additional function on the device.

● System plug suitable. Restart interlock, external device monitoring (EDM), or application diagnostic output available at this system plug.

### Complementary information

Information regarding the maximum number of beams in a cascade can be found at [Data sheet, page 93](#).

4.4.7 Connection diagrams

8-pin UE10-30S safety relay

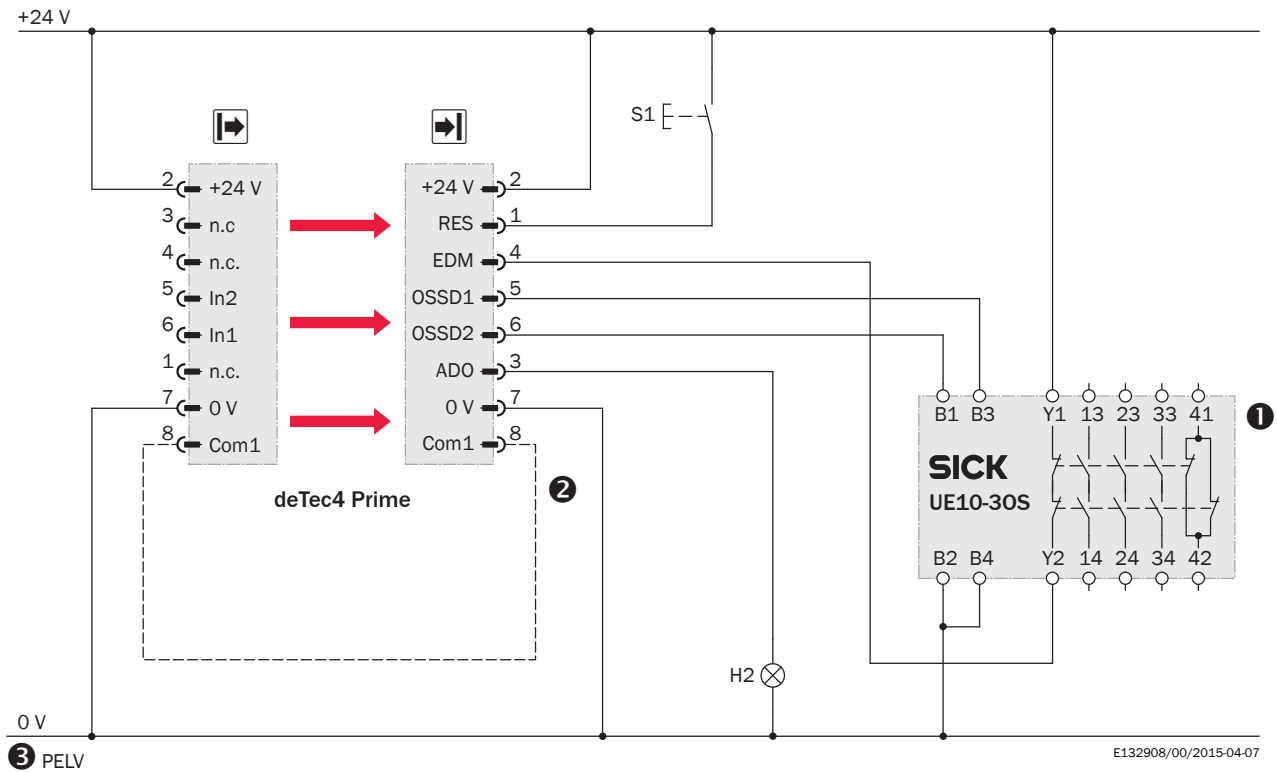


Figure 26: Connection diagram: 8-pin UE10-30S safety relay

- 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 Prime safety light curtain to a UE10-30S 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 UE10-30S 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 UE10-30S is switched on. When the protective field is interrupted, the OSSD1 and OSSD2 outputs switch the UE10-30S 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 UE10-30S is detected. The shut-down function is retained. Manipulation (e.g., jamming) of the S1 pushbutton prevents the output circuits from being enabled.



## T-connector UE48-20S safety relay, with restart interlock and external device monitoring (EDM)

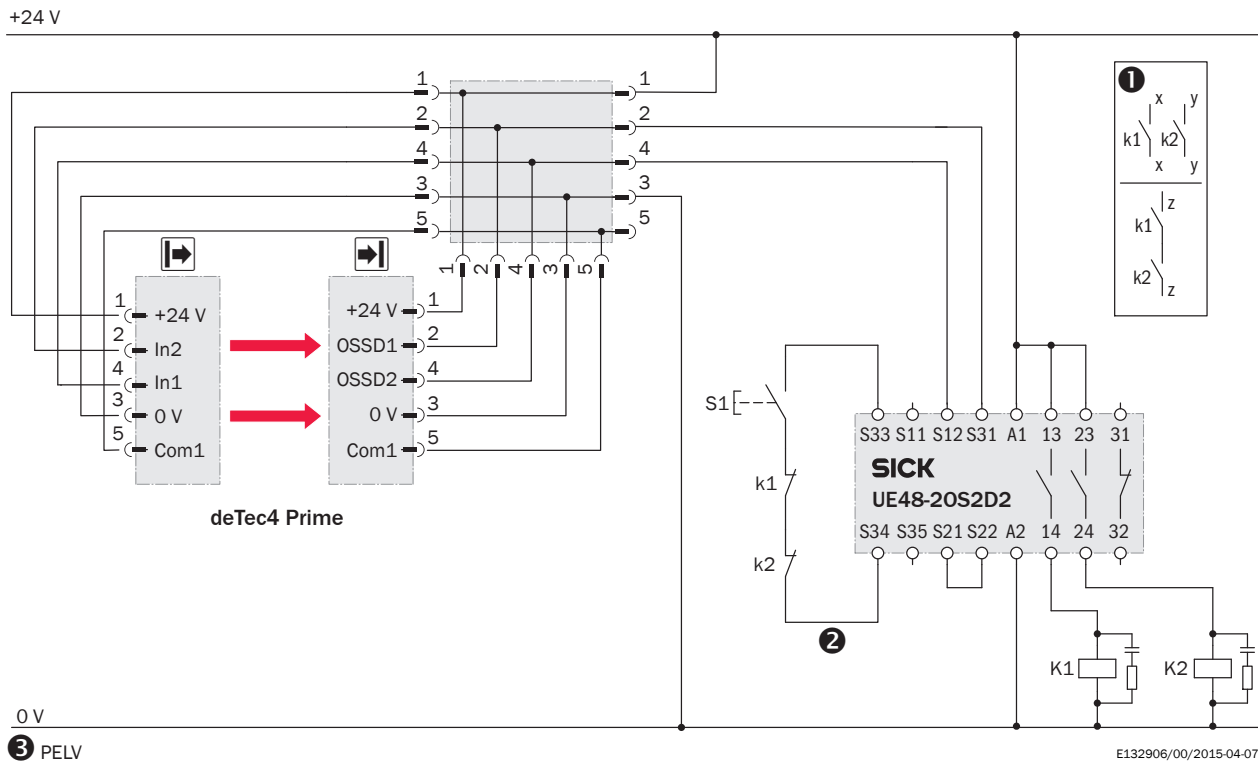
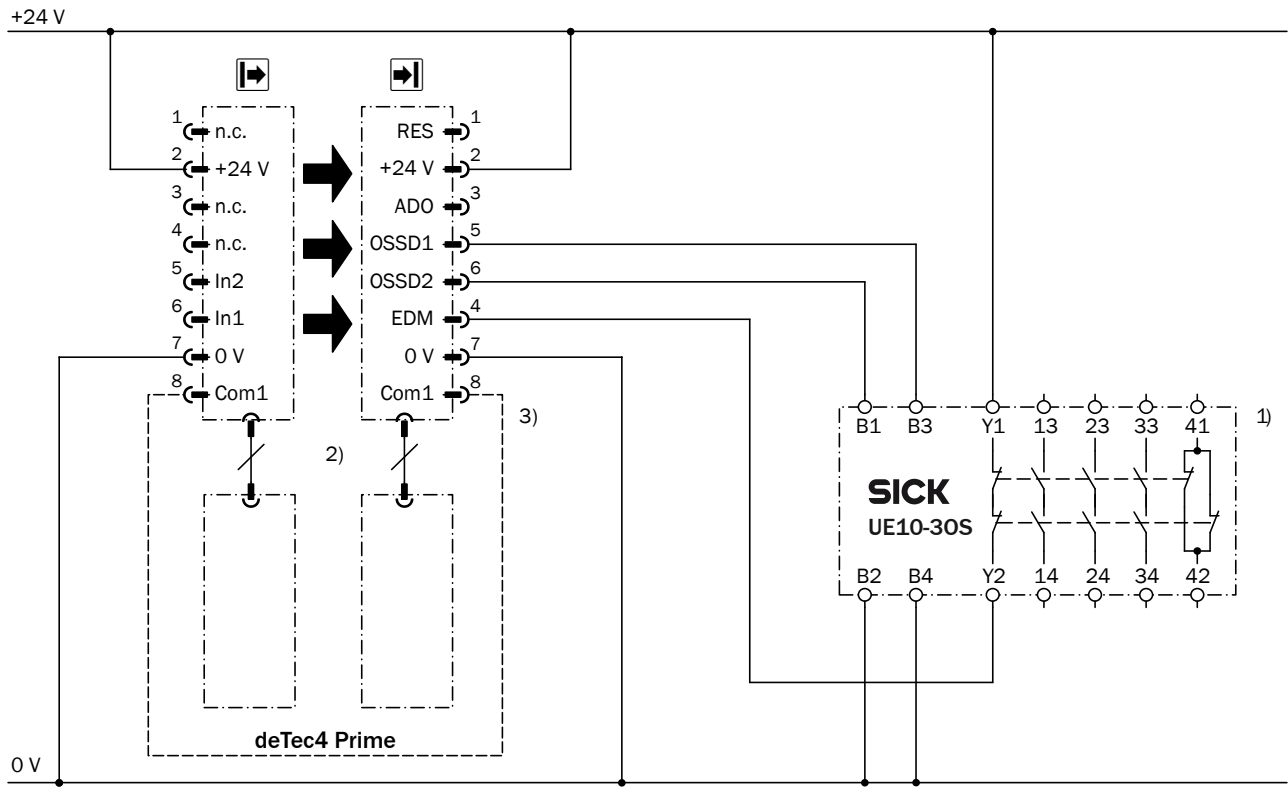


Figure 27: Connection diagram: 5-pin, T-connector, UE48-20S, with restart interlock and external device monitoring (EDM)

- 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) External device monitoring is only static.
- 3) SELV/PELV safety/protective extra-low voltage.
  - **Task**  
Connection of a deTec4 Prime safety light curtain to a UE48-20S safety relay. Operating mode: with restart interlock and external device monitoring (EDM). The T-connector establishes a connection between the sender and the receiver.
  - **Mode of operation**  
When the protective field is clear, the OSSD1 and OSSD2 outputs carry voltage. The system can be switched on when K1 and K2 are in a fault-free de-energized position. The UE48-20S is switched on by pressing S1 (pushbutton is pressed and released). The outputs (contacts 13-14 and 23-24) switch the K1 and K2 contactors on. When the protective field is interrupted, the OSSD1 and OSSD2 outputs switch the UE48-20S off. Contactors K1 and K2 are switched off.
  - **Fault analysis**  
Cross-circuits and short-circuits of the OSSD1 and OSSD2 outputs are recognized and lead to the locking state (lock-out). A malfunction with one of the K1 or K2 contactors is detected. The shut-down function is retained. In the event of manipulation (e.g., jamming) of the S1 pushbutton, the UE48-20S will not re-enable the output current circuits.

Cascade, 8-pin host, 5-pin guest, UE10-30S safety relay



E132954/00/2015-04-07

4) PELV

Figure 28: Connection diagram: cascade, 8-pin host, 5-pin guest, UE10-30S

- 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) Connection of the 5-pin extension connection of the host device to the 5-pin system connection of the guest device.
  - 3) 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).
  - 4) SELV/PELV safety/protective extra-low voltage.
- **Task**  
Connection of two deTec4 Prime safety light curtains to a UE10-30S safety relay. Operating mode: without restart interlock, with external device monitoring (EDM). If required, the restart interlock is implemented via the machine controller.
  - **Mode of operation**  
If the protective field is clear and the UE10-30S is in a fault-free de-energized position, the system is enabled. Outputs OSSD1 and OSSD2 carry voltage, the UE10-30S is switched on. When the protective field is interrupted, the OSSD1 and OSSD2 outputs switch the UE10-30S 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 UE10-30S is detected. The shut-down function is retained.

## 4.5 Testing plan

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

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

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

- Check during commissioning and modifications
- Regular thorough check

### Check during commissioning and modifications

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

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

- Does the check have to be completed by 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 119)
  - 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 43)
- ▶ 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 43
    - [Visual check of the machine and the protective device](#), page 46
  - 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.

If several safety light curtains are connected to each other in a cascade, the complete check for every safety light curtain in the cascade is carried out. During the check, catch the field indicator of the device you are currently testing.

### 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 29](#).
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.

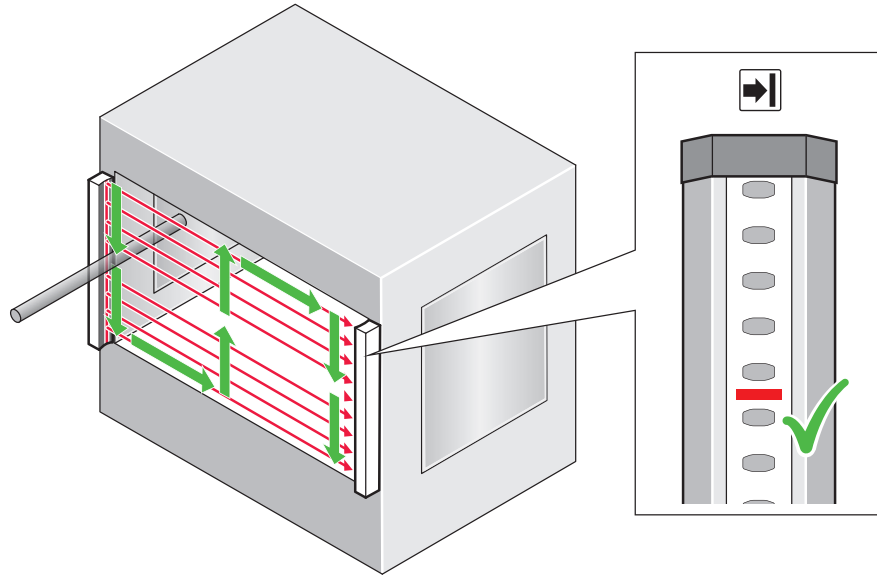


Figure 29: Test rod check: Step 1

3. Then, guide the test rod along the edges of the area to be protected, as indicated by the arrow, [see figure 30](#).
4. Watch the field indicator on the receiver during the check. The field indicator must continuously light up red. The field indicator must not light up green or flash yellow.

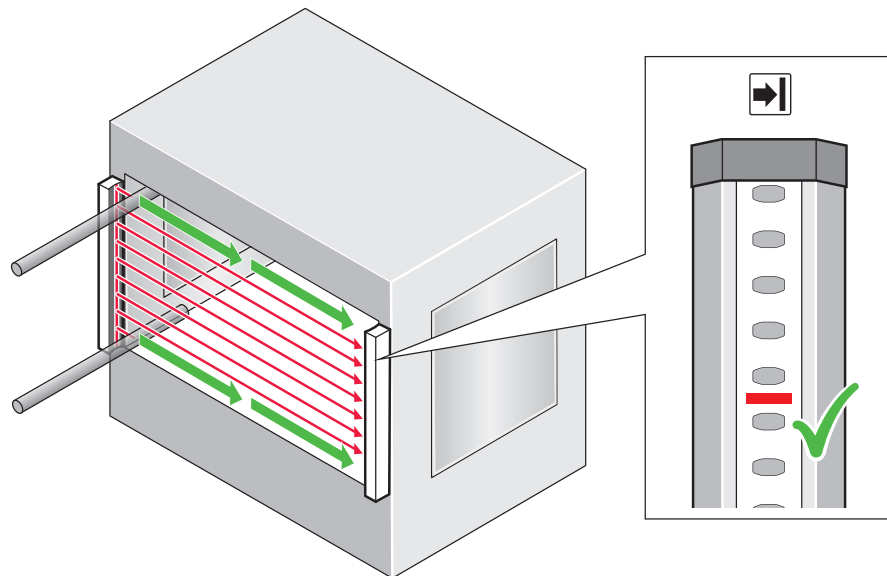


Figure 30: Test rod check: Step 3

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.
8. If multiple devices are connected with each other in a cascade, carry out the entire test for each device of the cascade. During the field indicator test, watch the device that is currently being checked.

### 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

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.
- 



#### NOTE

Mount the device in the following order.

---

#### Prerequisites

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

#### Further topics

- ["Design", page 22](#)
- ["Technical data", page 93](#)

### 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 101](#)

### 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

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.
- 



#### NOTICE

Enclosure ratings IP 65 and IP67 only apply if the front connector is fitted.

If the system plug is not mounted, dirt, dust, or moisture may enter the device and cause damage.

- ▶ Fitting the system plug.
  - ▶ Prevent the entry of dirt, dust, and moisture.
- 

#### 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.



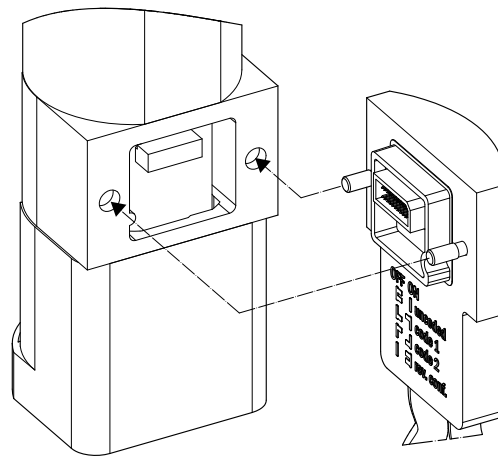


Figure 31: Mounting the system plug

#### Further topics

- ["Configuring beam coding", page 65](#)
- ["Factory settings", page 63](#)

## 5.4 Installation

### Overview

The QuickFix bracket or FlexFix bracket is used to mount the sender and receiver. In many cases, the QuickFix bracket is sufficient for mounting. The FlexFix bracket makes it possible to rotate the sender and receiver around the axis of the device and to align them accurately.

### Important information



#### NOTE

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



#### 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.

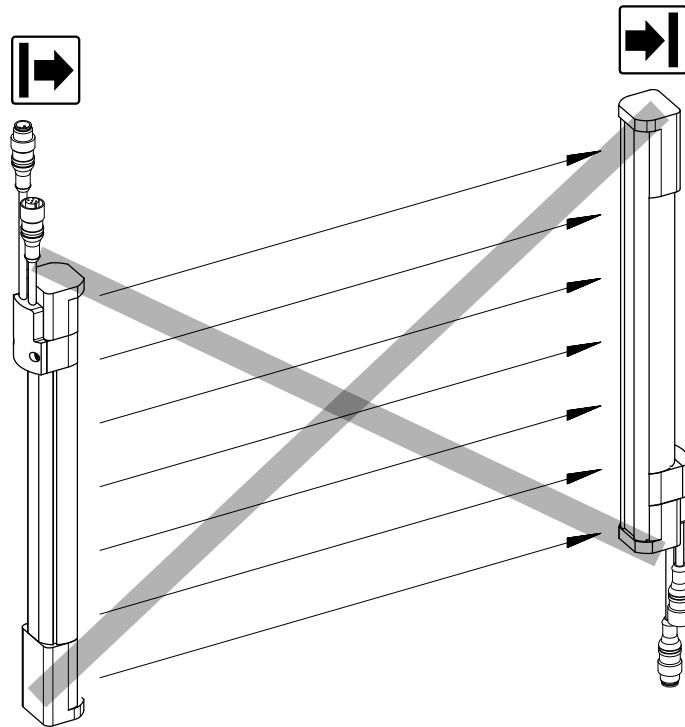
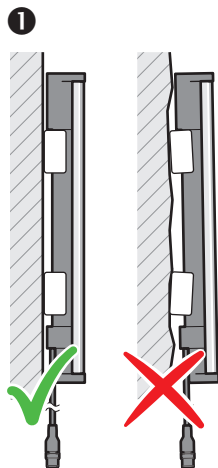


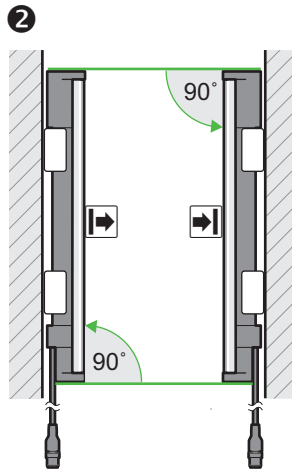
Figure 32: Sender and receiver must not be installed such that they are rotated 180° relative to each other

**Approach**

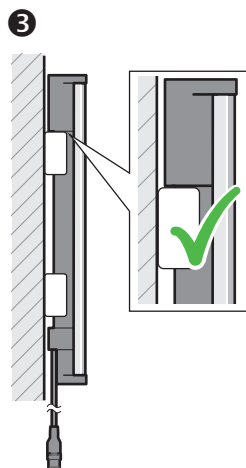
- ▶ Mount the sender and receiver on a level surface (❶).



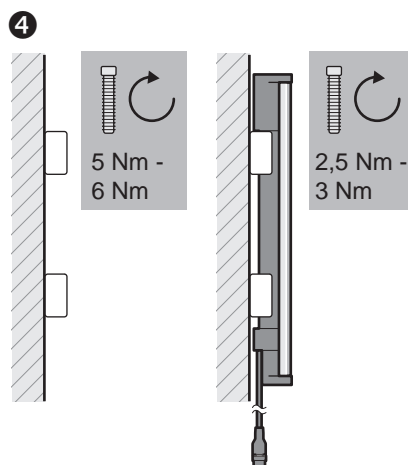
- ▶ Mount the sender and receiver such that a right-angled protective field is established, i.e., when mounted vertically at the same height. For minor adjustments during alignment, the sender and receiver can be adjusted longitudinally in the brackets (❷).



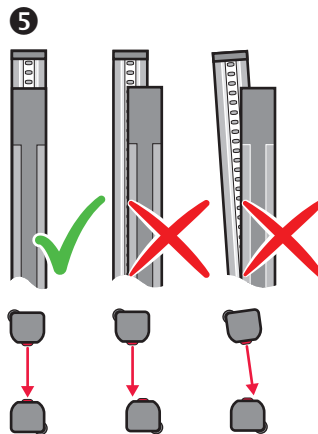
- Position the brackets near the ends of the housing. For devices with a protective field height > 300 mm, the distance between the bracket and the end of the housing must not exceed 1/4 of the length of the housing. If the device is exposed to strong vibrations during operation, mount the top bracket at a height where the offset in the safety light curtain housing rests on the bracket (3).



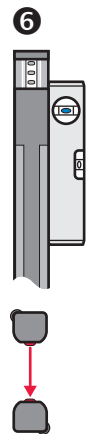
- Tightening torque for the screws used to mount the bracket: 5 Nm to 6 Nm. Tightening torque for the screws used to secure the safety light curtain in the bracket: 2.5 Nm to 3 Nm (4). Higher torques can damage the bracket, while lower torques are not secure enough to prevent the safety light curtain from moving.



- ▶ 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 (5).



- ▶ If necessary, use a spirit level to check that the components are parallel (6).



### Further topics

- ["Minimum distance from the hazardous point", page 24](#)
- ["Minimum distance to reflective surfaces", page 26](#)
- ["Sender and receiver alignment", page 73](#)
- ["Alignment with the QuickFix bracket", page 75](#)
- ["Alignment with the FlexFix bracket or with the upgrade bracket", page 76](#)

### 5.4.1 Mounting the QuickFix bracket

#### Overview

2 QuickFix brackets are used to mount the sender and receiver.

The QuickFix bracket consists of 2 parts, which are pushed into each other. The two individual parts are connected with an M5 screw and the housing (sender or receiver) is clamped with form-fit clamping.

The two mounting surfaces for the brackets of the sender or receiver must be parallel and lie in the same plane.

### Important information



#### NOTE

The following should be considered when mounting the QuickFix bracket:

- Select the appropriate length of the M5 screw to prevent any risk of injury from an overrun.
- When selecting the screw length, observe the wall thickness and the depth of the countersunk screw of the QuickFix bracket, [see figure 47, page 106](#)



#### NOTE

The QuickFix bracket has cable routing. Depending on the installation, the cable routing can make mounting easier.

### Mount QuickFix bracket on a machine or profile frame

Table 4: Lateral and rear mounting with the QuickFix bracket

Mounting type	Description
On the side	Fasten the M5 screw to the machine or profile frame through the QuickFix bracket. A screw nut or threaded hole is required on the machine or profile frame (❶).
	Fasten the M5 screw to the QuickFix bracket through the machine or profile frame. A screw nut is required for each QuickFix bracket (❷).
	Fasten the M5 screw to the profile frame through the QuickFix bracket. A sliding nut is required on the profile frame (❸).
On the back	Fasten the M5 screw to the machine or profile frame through the QuickFix bracket. A screw nut or threaded hole is required on the machine or profile frame (❹).

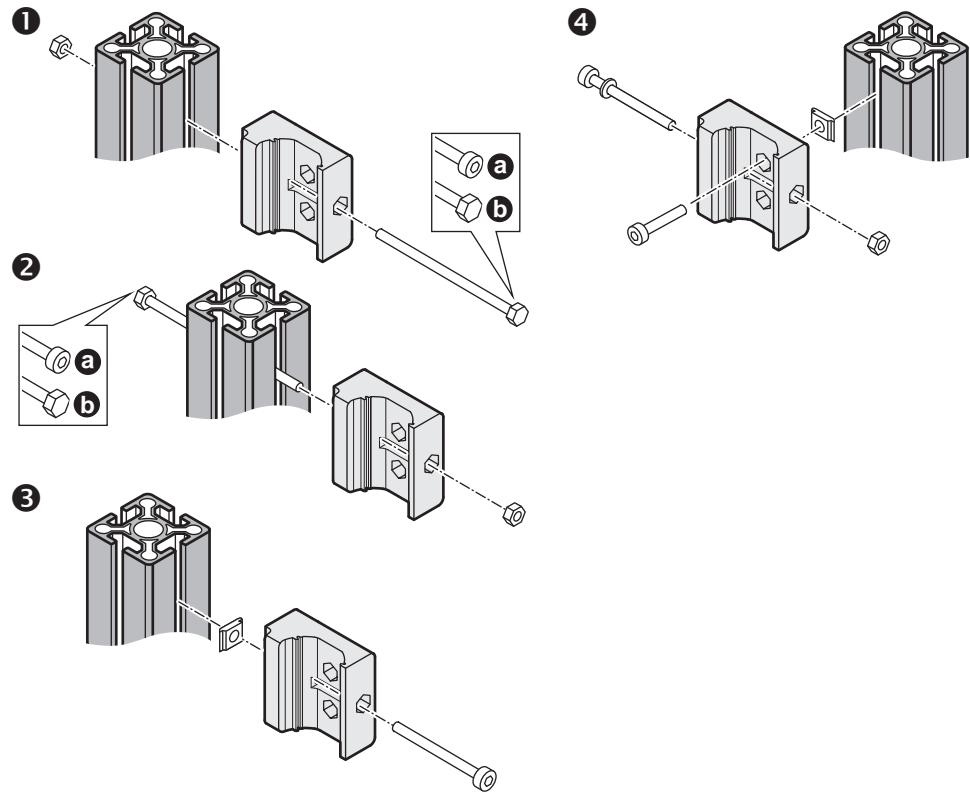


Figure 33: Mounting the QuickFix bracket to a profile

- ① Mounting on the side
- ② Mounting on the side
- ③ Mounting on the side
- ④ Mounting on the back

### 5.4.2 Mounting the FlexFix bracket

#### Overview

In the FlexFix bracket, the sender and receiver can be rotated  $\pm 15^\circ$  around their longitudinal axis.

2 FlexFix brackets are used to mount the sender and receiver.

As a rule, each FlexFix bracket is mounted to the mounting surface with 2 screws. In exceptional cases (e.g. reduced vibration and shock requirements), a FlexFix bracket can be mounted with only one screw if this does not impair the function.

#### Important information



#### NOTICE

The housing of the safety light curtain can become scratched if the screw heads protrude when the FlexFix brackets are mounted on the back.

This can be avoided by taking one of the following measures:

- ▶ Use flat-head screws with washers.
- ▶ If using cylinder head screws, use 2 screws per bracket and no washers.



#### NOTE

The FlexFix mounting kit (part number 2073543) contains 2 FlexFix brackets, one alignment tool, and the required screws, sliding nuts, and washers.

**Further topics**

- "Brackets", page 106

## 5.4.2.1 Mounting the FlexFix bracket on a machine or profile frame

**Important information****NOTE**

When selecting the screw length, observe the wall thickness of the FlexFix bracket, see figure 48, page 107.

**Mounting type**

Table 5: Lateral and rear mounting with the FlexFix bracket

Mounting type	Description
On the side	With the M5 screw through the FlexFix bracket on the machine or profile frame. A screw nut or threaded hole is required on the machine or profile frame (❶).
	With the M5 screw through the FlexFix bracket on the profile frame. Two sliding nuts are required on the profile frame (❷).
On the back	With the M5 screw through the FlexFix bracket on the machine or profile frame. A screw nut or threaded hole is required on the machine or profile frame (❸).

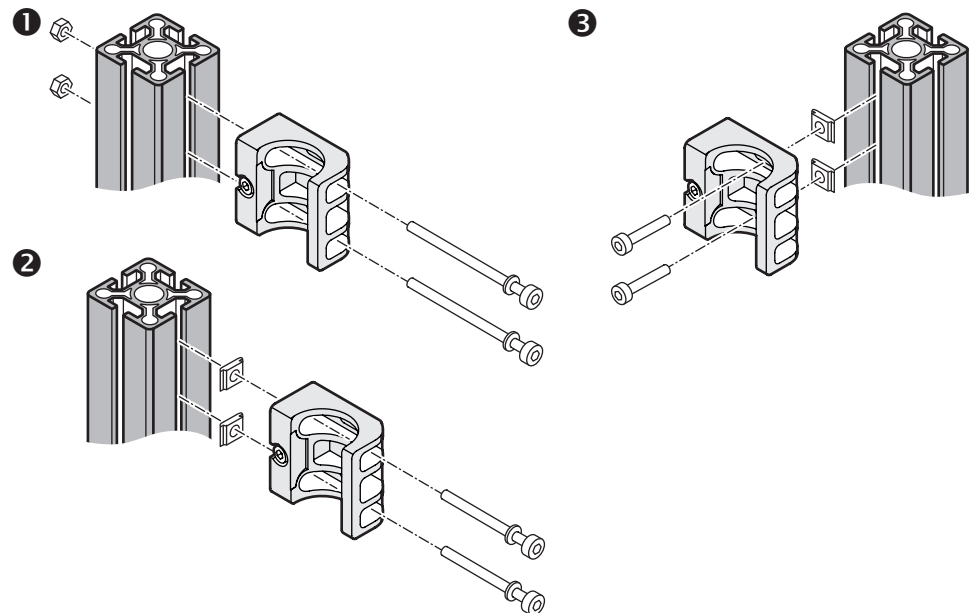


Figure 34: Mount FlexFix brackets to a profile frame

- ❶ Mounting on the side
- ❷ Mounting on the side
- ❸ Mounting on the back

**Approach**

1. After assembling the FlexFix brackets, screw the sender or receiver into the FlexFix brackets from the front (❶).
2. Align the sender and receiver (❷).



**NOTE**

The safety light curtain can only be screwed in when both FlexFix brackets are in alignment.

Recommendation:

1. Only hand-tighten the screws on the FlexFix brackets at first.
2. Align the two FlexFix brackets. To do this, place a straightedge or spirit level, for example, on the screw mounting surfaces of the FlexFix brackets that are not being used.
3. Tighten the screws.

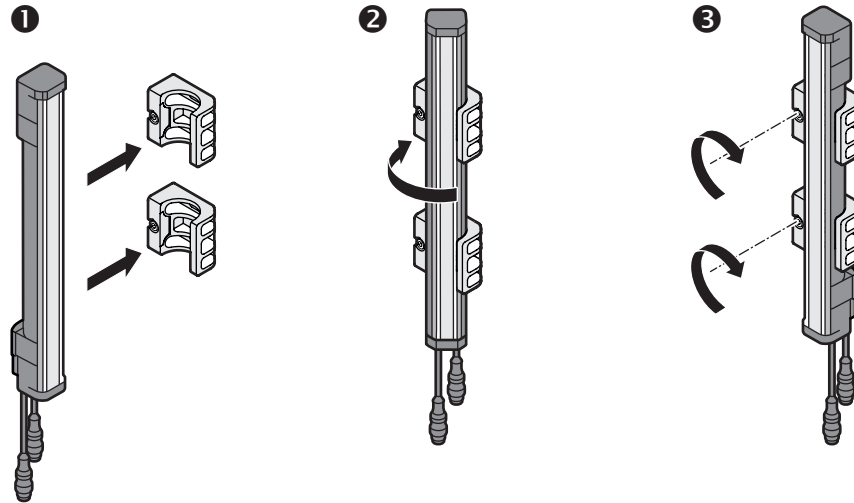


Figure 35: Inserting the safety light curtain in the FlexFix brackets

3. Use an M5 screw to secure the position of the sender and receiver in the FlexFix bracket (3).

**Further topics**

- ["Sender and receiver alignment", page 73](#)

5.4.2.2 Mount FlexFix bracket to the back of a device column

**Overview**

The FlexFix bracket can be mounted in the device column using sliding nuts.

If you wish to mount the sender and receiver in the center of the device column, use washers between the FlexFix brackets and the device column.

**Approach**

1. After mounting the FlexFix brackets, screw the sender and receiver into the FlexFix brackets from the front and align the sender and receiver.
2. Use an M5 screw to fix the position of the sender and receiver in the FlexFix bracket.



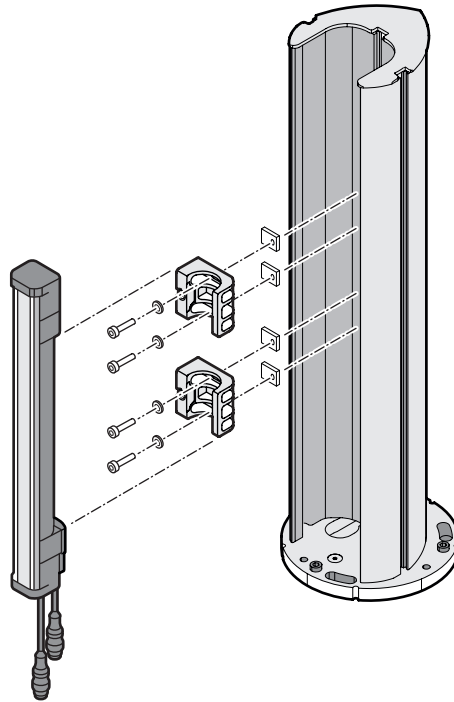


Figure 36: Mounting the FlexFix bracket to a device column (accessory)

#### Further topics

- ["Sender and receiver alignment", page 73](#)

### 5.4.3 Mounting the upgrade bracket

#### Overview

If an existing C4000 safety light curtain is mounted with a swivel-mount bracket or with a side bracket, it can be replaced with a deTec4 Prime safety light curtain using an exchange bracket. There is no need to drill new holes, since the existing ones can be used for the upgrade bracket.

#### Complementary information

Detailed information for assembling a safety light curtain with a replacement bracket can be found in the assembly instructions for the replacement bracket.

### 6 Electrical installation

#### 6.1 Safety

##### Important information

---

**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 93.
- 

**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

Malfunctions can occur if unused inputs are wired incorrectly.

- ▶ Unused inputs must either not be connected or be permanently switched to LOW.
- 

##### 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.

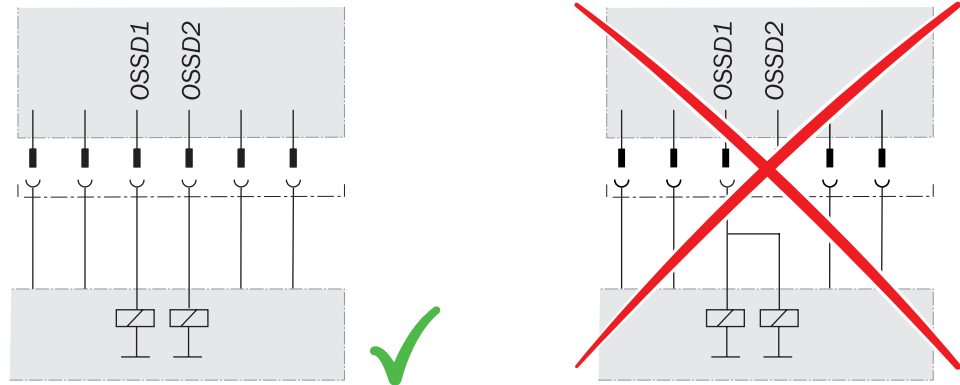
**Example: Isolated connection of OSSD1 and OSSD2**

Figure 37: 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.

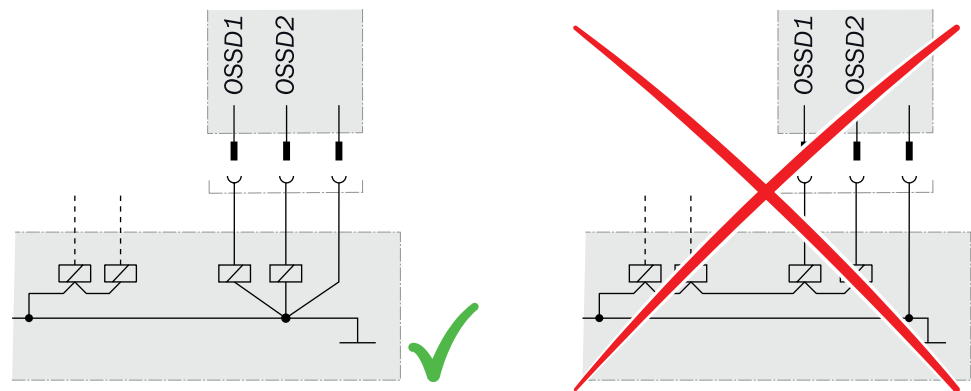


Figure 38: No potential difference between load and protective device

**Further topics**

- ["Integration in electrical control", page 31](#)

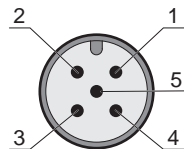
**6.2 System connection (M12, 5-pin)**

Figure 39: System connection (male connector, M12, 5-pin)

Table 6: System connection pin assignment (male connector, M12, 5-pin)

Pin	Wire color <sup>1)</sup>	Sender	Receiver
1	Brown	+24 V DC (voltage supply input)	+24 V DC (voltage supply input)
2	White	In2 (laser alignment aid button)	OSSD1
3	Blue	0 V DC (voltage supply input)	0 V DC (voltage supply input)
4	Black	In1 (laser alignment aid switch/cascade synchronization input)	OSSD2
5 <sup>2)</sup>	Gray	Com1 (Single system or host: sender/receiver communication Guest: cascade communication)	Com1 (Single system or host: sender/receiver communication Guest: cascade communication)

- 1) Applies to the extension cables recommended as accessories.
- 2) If the sender and the receiver are not connected, pin 5 can remain unassigned for a single system or host and, for example, a 4-pin cable with a 4-pin female connector can be used.

**Further topics**

- ["Integration in electrical control", page 31](#)

**6.3 System connection (M12, 8-pin)**

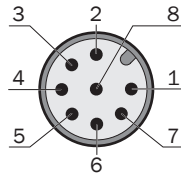


Figure 40: System connection (male connector M12, 8-pin)

Table 7: System connection pin assignment for SP1 system plug (M12 male connector, 8-pin)

Pin	Wire color <sup>1)</sup>	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)
4	Yellow	Not assigned	EDM (external device monitoring input)
5	Gray	In2 (laser alignment aid button)	OSSD1
6	Pink	In1 (laser alignment aid switch/cascade synchronization input)	OSSD2
7	Blue	0 V DC (voltage supply input)	0 V DC (voltage supply input)

Pin	Wire color <sup>1)</sup>	Sender	Receiver
8	Red	Com1 (Single system or host: sender/receiver communi- cation)	Com1 (Single system or host: sender/receiver communi- cation)

<sup>1)</sup> Applies to the extension cables recommended as accessories.

#### Further topics

- ["Integration in electrical control", page 31](#)

## 6.4 Extension connection (M12, 5-pin)

### Important information



#### DANGER

Hazard due to lack of effectiveness of the protective device

If a reset pushbutton and external device monitoring are connected to the extension connection, the protective device can be disabled if the connecting cables are switched round.

- Make sure (e.g., by routing the cables appropriately) that the operator is unable to connect the connecting cable of the safety light curtain to the reset pushbutton and external device monitoring.

### Pin assignment at the extension connection

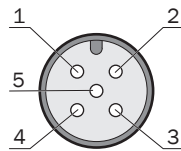


Figure 41: Extension connection (female connector M12, 5-pin)

Table 8: System plug extension connection pin assignment (M12 female connector, 5-pin)

Pin	Wire color <sup>1)</sup>	Sender	Receiver
1	Brown	24 V Out (voltage supply output)	24 V Out (voltage supply output)
2	White	Not connected	In1 (Single system or last guest: EDM [EDM input] Host or first of 2 guests: OSSD 1 input)
3	Blue	0 V Out (voltage supply output)	0 V Out (voltage supply output)
4	Black	Sync-Out (cascade synchronization output)	In2 (Single system or last guest: RES [reset pushbutton input] Host or first of 2 guests: OSSD2 input)

Pin	Wire color <sup>1)</sup>	Sender	Receiver
5	Gray	Com2 (cascade communication)	Com2 (Single system or last guest: ADO [application diagnostic output] Host or first of 2 guests: cascade communication)

<sup>1)</sup> Applies to the extension cables recommended as accessories.

### Further topics

- ["Integration in electrical control", page 31](#)

## 7 Configuration

### 7.1 Factory settings

Table 9: Configurable functions when delivered

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

#### Complementary information

In order to change the configuration of the external device monitoring (EDM), restart interlock and cascading, the device must be reset to factory settings and reconfigured.

The beam coding can be changed later on without having to reset the safety light curtain to the factory settings.

#### Further topics

- ["Reset to factory settings", page 63](#)

#### 7.1.1 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.

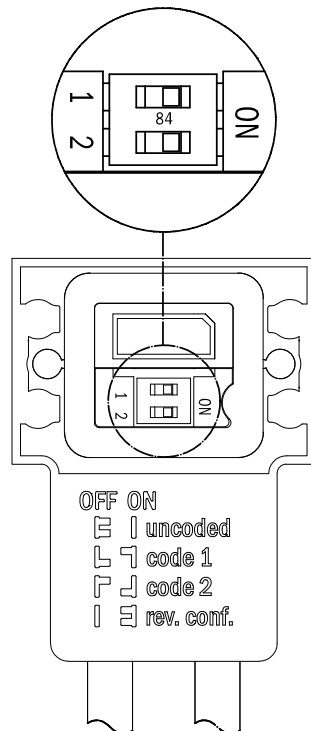


Figure 42: Reset to factory settings

### 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 42](#).
4. Switch the voltage supply on and, within 10 s, <sup>1)</sup> 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.

### 7.1.2 Changing the configuration later

#### Overview

If a pre-configured device is to be installed and wired in its future work environment, the device can be reset to its factory settings and reconfigured in a single operation.

#### Approach

1. Install and wire the device in its future environment. Do not switch on the voltage supply.
2. Set both DIP switches to ON, [see figure 42](#).
3. Switch the voltage supply on and within 10 s <sup>2)</sup> disconnect it again. The field indicator flashes yellow or green.
4. Set both DIP switches to OFF.
5. Switch on the voltage supply.
- ✓ The field indicator flashes green.
- ✓ Sender: the STATE LED lights up red.
- ✓ Receiver: the OSSD LED lights up red. The 4 alignment quality LEDs indicate the current configuration.
6. Receiver: if external device monitoring is connected correctly, it is configured automatically and alignment quality LED 1/E flashes.
7. Receiver: to configure the restart interlock, press the reset pushbutton for between 1 and 3 s, then release it. Alignment quality LED 4/R flashes.
8. When using the device in a cascade, wait until all receivers concerned indicate the correct cascade configuration. If a cascade has 1 guest, alignment quality light emitting diode 2 flashes; if it has 2 guests, alignment quality light emitting diodes 2 and 3 flash.
9. Disconnect the device from the voltage supply.
10. Configure the beam coding.
- ✓ The device can now be put into operation.

#### Complementary information

The beam coding can be changed later on without the safety light curtain needing to be reset to the factory settings.

To change the configuration of the other functions later, you must reset the safety light curtain to the factory settings and reconfigure it.

<sup>1)</sup> 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.

<sup>2)</sup> If the supply voltage is present for more than 10 s, the safety light curtain switches to the locking state. Go back to step 1.







**Further topics**

- ["Reset to factory settings", page 63](#)
- ["Indications when switching on", page 84](#)
- ["Configuring beam coding", page 65](#)

**7.2 Configuration mode**

Table 10: Configuration mode

	Sender	Receiver
Configuration mode is active	<ul style="list-style-type: none"> <li>• When resetting the sender to the factory settings</li> <li>• A permissible change of cascading was discovered during switch-on</li> </ul>	<ul style="list-style-type: none"> <li>• When resetting the receiver to the factory settings</li> <li>• A permissible change of cascading was discovered during switch-on</li> <li>• A permissible change to the external device monitoring configuration has been discovered during switch-on</li> <li>• The reset pushbutton was pressed in order to configure the restart interlock following switch-on</li> </ul>
Display of the configuration mode	<ul style="list-style-type: none"> <li>• Field indicator:  Green</li> <li>• STATE LED:  Red</li> </ul>	<ul style="list-style-type: none"> <li>• Field indicator:  Green</li> <li>• OSSD LED:  Red</li> </ul>

○ 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.

**7.3 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.

In a cascade, the beam coding must be the same for all senders and receivers.

**Configuring beam coding**

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

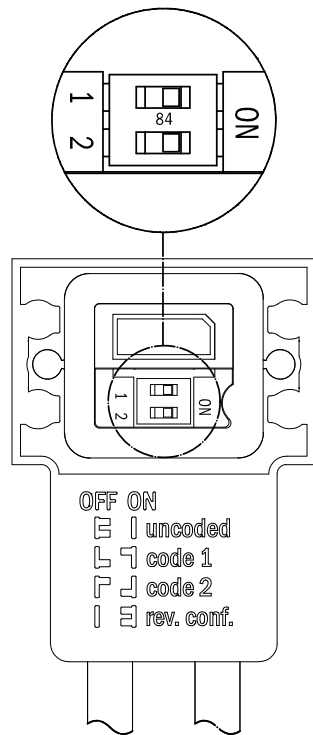


Figure 43: Configuring beam coding

Table 11: DIP switches and beam coding

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

#### Further topics

- ["Protection against interference from systems in close proximity to each other", page 28](#)
- ["Factory settings", page 63](#)

## 7.4 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.
- ✓ Alignment quality LED 4/R flashes and signals that the restart interlock is configured.
- ✓ The restart interlock is configured. The reset pushbutton must remain at the connection to which it was connected during configuration.
4. When using the device in a cascade, wait until all receivers concerned indicate the correct cascade configuration. If a cascade has 1 guest, alignment quality light emitting diode 2 flashes; if it has 2 guests, alignment quality light emitting diodes 2 and 3 flash.
5. 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.

If you connect an unconfigured device in a cascade to a device for which a restart interlock has been configured, the unconfigured device adopts the restart interlock configuration of the configured device.

### Further topics

- ["Factory settings", page 63](#)
- ["Restart interlock", page 33](#)

## 7.5 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.
- ✓ Alignment quality LED 1/E flashes and signals that external device monitoring is 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. Alignment quality LED 4/R flashes.
5. When using the device in a cascade, wait until all receivers concerned indicate the correct cascade configuration. If a cascade has 1 guest, alignment quality light emitting diode 2 flashes; if it has 2 guests, alignment quality light emitting diodes 2 and 3 flash.
6. 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.

If you connect an unconfigured device in a cascade to a device for which external device monitoring has been configured, the unconfigured device adopts the external device monitoring configuration of the configured device.

### Further topics

- ["External device monitoring \(EDM\)", page 34](#)
- ["Factory settings", page 63](#)

## 7.6 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.

## 7.7 Configuring cascading

### Overview

You can use cascading to connect up to 3 safety light curtains, e.g., to provide presence detection. The connected devices act like a long safety light curtain. Only one device, the host, is connected to the control cabinet. The second device, guest 1, is connected to the host. The third device, guest 2, is connected to guest 1.

### Advantages of cascading

Advantages of cascading:

- Rapid connection, no additional external circuitry required
- No optical mutual interference between the protective fields within a cascade. Host and guests are operated with the same beam coding.
- Resolution and protective field heights of the individual systems may be different



#### NOTE

If a sender does not have an additional guest connected to it, the extension connection has no function and must be sealed with a protective cap.

### Configuring cascading

No more than 3 systems can be connected in a cascade.

If your devices are in their as-delivered condition or have been reset to the factory settings, you can connect them to each other. The devices recognize automatically that they are part of a cascade.

Devices that are already configured and are to be connected in a cascade must be reset to the factory settings.

Each device detects the number of devices in the cascade when it is switched on. During configuration, the device stores this information in the configuration memory.

The information stored about the cascade is used to identify inadvertent or intentional changes that could lead to a danger:

- If fewer devices are detected in the cascade when it is switched on than were stored in the configuration, every device in the cascade switches to the locking state
- If more devices are detected in the cascade when it is switched on than were stored in the configuration, every device in the cascade updates its configuration memory to the new value

#### Further topics

- ["Connecting preconfigured devices in an existing cascade", page 70](#)

## 7.7.1 Cascading new devices

### Approach

1. Install and wire the devices.
2. Set the DIP switches for the beam coding on the receiver of the host system.
3. Switch on the voltage supply.
- ✓ The devices are in configuration mode, the field indicator flashes green.
4. Receiver: if external device monitoring is connected correctly, it is configured automatically and alignment quality LED 1/E flashes.
5. Wait until all receivers indicate the correct cascade configuration. If a cascade has 1 guest, alignment quality light emitting diode 2 flashes; if it has 2 guests, alignment quality light emitting diodes 2 and 3 flash.
6. Wait approx. 3 s longer.
7. Receiver: to configure the restart interlock, press the reset pushbutton for between 1 and 3 s, then release it. Alignment quality LED 4/R flashes.
8. Disconnect the devices from the voltage supply.
- ✓ The cascade can now be put into operation.

#### Further topics

- ["Configuring beam coding", page 65](#)

### 7.7.2 Connecting a new device in an existing cascade

#### Overview

If you use an unconfigured device to extend a cascade or to replace a (defective) device in a cascade, the unconfigured device adopts the configuration for the restart interlock and external device monitoring from the existing devices.

#### Approach

1. Install and wire the device.
2. Set the DIP switches for the beam coding on the receiver of the host system.
3. Switch on the voltage supply.
- ✓ The device is in configuration mode, the field indicator flashes green.
4. If the restart interlock or external device monitoring was configured for at least one existing device, the configuration is adopted.
5. Wait until all receivers indicate the correct cascade configuration. If a cascade has 1 guest, alignment quality light emitting diode 2 flashes; if it has 2 guests, alignment quality light emitting diodes 2 and 3 flash.
6. Wait approx. 3 s longer.
7. Disconnect the device from the voltage supply.
- ✓ The device can now be put into operation.

#### Further topics

- ["Reset to factory settings", page 63](#)
- ["Configuring beam coding", page 65](#)

### 7.7.3 Connecting preconfigured devices in an existing cascade

If you use a device that may already have been configured to extend a cascade or to replace a (defective) device in a cascade, reset the device to the factory settings and re-configure it:

#### Approach

1. Set both DIP switches to ON for the beam coding.
2. Install and wire the device.
3. Switch the voltage supply on and within 10 s <sup>3)</sup> disconnect it again. The field indicator flashes yellow or green.
4. Set both DIP switches to OFF for the beam coding.
5. Switch on the voltage supply.
- ✓ The device is reset to the factory settings and is in configuration mode. The field indicator flashes green.
6. If the restart interlock or external device monitoring was configured for at least one existing device, the configuration is adopted.
7. Wait until all receivers indicate the correct cascade configuration. If a cascade has 1 guest, alignment quality light emitting diode 2 flashes; if it has 2 guests, alignment quality light emitting diodes 2 and 3 flash.
8. Wait approx. 3 s longer.
9. Disconnect the device from the voltage supply.
10. If the host has been reset or replaced to the factory settings, adjust the beam encoding to the existing devices.
- ✓ The device can now be put into operation.

#### Further topics

- ["Configuring beam coding", page 65](#)

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

## 7.8 Status indication on both sides

The OSSD status and the status of the protective field are indicated at the sender and receiver via LEDs when the sender and receiver are connected in the control cabinet or via a T-connector.

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 35](#)

## 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.



#### DANGER

Hazard due to lack of effectiveness of the protective device

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

#### Further topics

- ["Minimum distance to reflective surfaces", page 26](#)

### 8.2 Overview

#### Prerequisites

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

#### Approach

1. If required, connect up to three devices to a cascade.
2. Check the DIP switches at the sender and receiver and set them correctly if required.
3. Fitting the system plug.
4. 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.
5. Configure the restart interlock if required.
6. Once configuration is complete, briefly interrupt the voltage supply, then switch it back on.
7. If the configuration for the cascading of the restart interlock or external device monitoring needs to be changed, reset the device to factory settings.



8. Once configuration is complete and the device has been restarted, align the sender and receiver.
9. Briefly interrupt the voltage supply, then switch it back on.
10. Check alignment.
11. Check the contactors.

#### Further topics

- ["Project planning", page 22](#)
- ["Mounting", page 47](#)
- ["Electrical installation", page 58](#)
- ["Configuration", page 63](#)
- ["Mounting the system plug", page 48](#)
- ["Configuration mode", page 65](#)
- ["Configuring the restart interlock", page 67](#)
- ["Factory settings", page 63](#)
- ["Sender and receiver alignment", page 73](#)
- ["Check during commissioning and modifications", page 78](#)

## 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 the alignment quality LEDs indicate the current configuration
- After a few seconds, the receiver indicates the alignment quality by means of four blue LEDs
- If the safety light curtain is aligned and the protective field is clear (field indicator: flashing yellow or lit up green), the alignment quality LEDs switch off after a certain period of time and only the field indicator, the STATE LED of the sender, and the OSSD LED of the receiver continue to light up

### Further topics

- ["Configuration mode", page 65](#)
- ["Indications when switching on", page 84](#)

## 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

During the alignment, note the alignment quality indication and the bracket that is used to attach the sender and receiver.

---

### Further topics

- "Alignment with the QuickFix bracket", page 75
- "Alignment with the FlexFix bracket or with the upgrade bracket", page 76
- "Indication of the alignment quality", page 77
- "Diagnostic LEDs", page 84

### 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.
- 

#### Prerequisites

- Sender and receiver have been mounted correctly

#### 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. Rotate the sender so that the beam of the integrated laser alignment aid hits the longitudinal axis of the receiver in the area of the alignment quality LEDs.
- 3. Align the receiver with the sender: Rotate the receiver so that as many blue alignment quality light emitting diodes as possible light up on the receiver.
- 4. If required, align the sender more precisely with the receiver so that as many alignment quality light emitting diodes as possible light up on the receiver.
- 5. If required, align the receiver more precisely with the sender so that as many alignment quality light emitting diodes as possible light up on the receiver.
- 6. When at least three (preferably four) alignment quality LEDs light up on the receiver, fasten the components in the brackets. Torque: 2.5 Nm ... 3 Nm.
- 7. Switch the voltage supply off and then on again.
- 8. Check the alignment quality light emitting diodes to make sure that the components are still correctly aligned with each other.

**NOTE**

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

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

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

**Further topics**

- ["Indication of the alignment quality", page 77](#)
- ["Mounting", page 47](#)
- ["Accessories", page 106](#)
- ["Laser alignment aid", page 36](#)

**8.4.2 Alignment with the QuickFix bracket****Prerequisites**

- The sender and receiver are mounted with a QuickFix bracket

**Important information****NOTE**

If the alignment cannot be adjusted with the QuickFix bracket, use the optional FlexFix bracket.

### Alignment with the QuickFix bracket

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

- Shift vertically

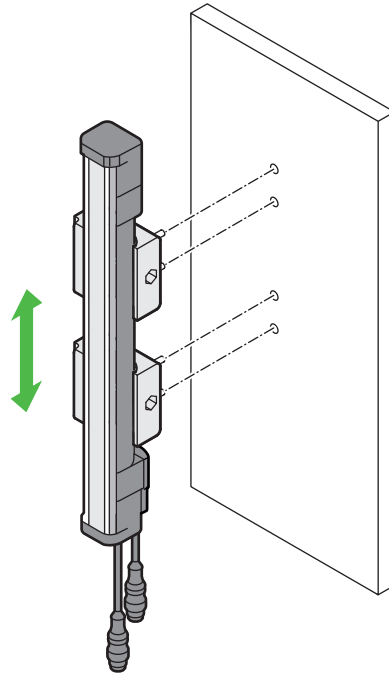


Figure 44: QuickFix bracket: adjust vertically

### 8.4.3 Alignment with the FlexFix bracket or with the upgrade bracket

#### Prerequisites

- A FlexFix bracket or upgrade bracket is used to mount the sender and receiver.

#### Alignment with the FlexFix bracket or the upgrade bracket

The FlexFix bracket or upgrade bracket offer you the following adjustment options for aligning the sender and receiver with each other:

- Shift vertically
- Rotate ( $\pm 15^\circ$ )

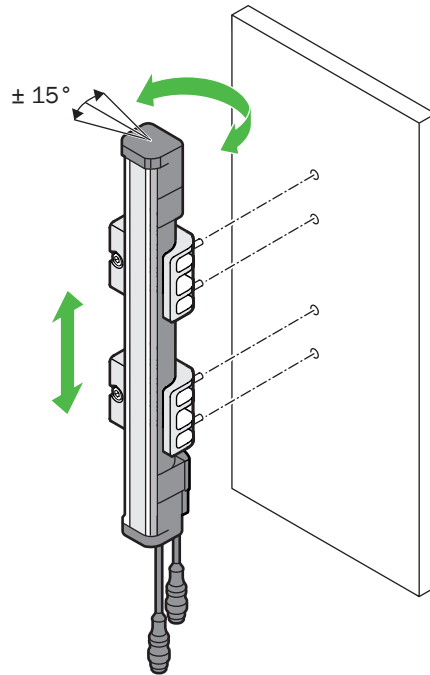


Figure 45: FlexFix bracket: adjust vertically/rotate



**NOTE**

Recommendation for aligning a long device so that it rotates uniformly in both brackets:

- ▶ Grab the alignment device roughly in the center between the two brackets.

#### 8.4.4 Indication of the alignment quality

##### Important information



**NOTE**

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

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

##### Indication of the alignment quality

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 12: Indication of the alignment quality

LEDs		Meaning
Alignment quality light emitting diodes	Field	
No light emitting diode lights up	● Red	Alignment is insufficient or the protective field is interrupted at least partially. The receiver cannot synchronize with the sender.
1 light emitting diode lights up	● Red	Alignment is insufficient or the protective field is interrupted at least partially.
2 light emitting diodes light up	● Red	Alignment is insufficient or the protective field is interrupted at least partially.
2 light emitting diodes light up	● Green OR ☀ Yellow <sup>1)</sup>	Alignment is not yet sufficient for stable availability. OR The receiver is getting a weak signal from the sender, e.g. because the front screen is contaminated.
3 light emitting diodes light up	● Green OR ☀ Yellow <sup>1)</sup>	Alignment is good, stable availability. <sup>2)</sup>
4 light emitting diodes light up	● Green OR ☀ Yellow <sup>1)</sup>	Alignment is very good.

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

- 1) When the protective field is clear, the field indicator lights up green. If the restart interlock is configured and a reset is required, the field indicator flashes yellow when the protective field is clear. If external device monitoring is configured and an EDM warning is present, alignment quality LED 1/E flashes but the other alignment quality LEDs still indicate the alignment quality. When the protective field is interrupted, the field indicator lights up red.
- 2) If the protective fields are very wide, there is a possibility that all four alignment quality LEDs will not light up even when alignment is good.

#### Further topics

- ["Indications when switching on", page 84](#)

## 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 26](#)

### 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.

Table 13: LEDs on the sender in normal operation (sender and receiver are connected to each other by a wire)

LEDs		OSSD status	Status of protective field	Status of protective fields at other safety light curtains in a cascade
STATE	Field			
● Green	● Green	ON	Clear	Clear
● Red	● Green	OFF	Clear	If the laser alignment aid is switched off: At least 1 protective field is interrupted or there is fault with another device.
● Red	● Red	OFF	Interrupted	The indicator is independent of the status of the other protective fields.
● Red	☀ Yellow	OFF, reset required.	Clear	Clear
● Red	● Red	OFF, the reset pushbutton is currently pressed.	Clear	Clear

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

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.

Complete overview of the LED statuses and their meanings: see "Diagnostic LEDs", page 84.

### Receiver

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

Table 14: LEDs on the receiver during normal operation

LEDs		OSSD status	Status of protective field	Status of protective fields at other safety light curtains in a cascade
OSSD	Field			
● Green	● Green	ON	Clear	Clear
● Red	● Green	OFF	Clear	If the laser alignment aid is switched off: At least one protective field is interrupted or there is fault with another device.



LEDs		OSSD status	Status of protective field	Status of protective fields at other safety light curtains in a cascade
OSSD	Field			
● Red	● Red	OFF	Interrupted	The indicator is independent of the status of the other protective fields
● Red	☀ Yellow	OFF, reset required	Clear	Clear
● Red	● Red	OFF, the reset pushbutton is currently pressed	Clear	Clear

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

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.

Information about the display of the alignment quality: [see table 12, page 78](#).

Complete overview of the LED statuses and their meanings: [see "Diagnostic LEDs", page 84](#).

### 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.
- 

#### 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 alignment quality light emitting diodes show that the receiver is getting a weak signal from the sender. <sup>4)</sup> 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**

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.
- 

<sup>4)</sup> Applies to devices marked “(Rev. 1)” on the “Ident No.” type label entry.

**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.
- ▶ We recommend anti-static cleaning agents.
- ▶ We recommend the use of anti-static plastic cleaner (SICK part number 5600006) and the SICK lens cloth (SICK part number 4003353).

**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 79](#)
- ["Minimum distance to reflective surfaces", page 26](#)

## 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 15: 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	☀️ Green Yellow/green	Reset of the configuration to factory settings is activated, see "Factory settings", page 63.
● Red	🟢 Green	Device is in configuration mode, see "Configuration mode", page 65.

○ 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 16: Indications on the receiver when switching on

LEDs					Meaning	
OSSD	Field	Alignment quality (blue)				
		1/E	2	3		4/R
	☀️ Yellow, flashes once					Beam coding, code 1 is configured.
	☀️ Yellow, flashes twice					Beam coding, code 2 is configured.
		🟡 Blue (3 s)				External device monitoring (EDM) is configured.
			🟡 Blue (3 s)			Cascade with one guest device is configured.
			🟡 Blue (3 s)	🟡 Blue (3 s)		Cascade with two guest devices is configured.
					🟡 Blue (3 s)	Restart interlock is configured.
● Red	☀️ Yellow/green					Reset of the configuration to factory settings is activated, see "Factory settings", page 63.
● Red	🟢 Green	○	○	○	○	Device is in configuration mode, see "Configuration mode", page 65.

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

Once the configuration has been indicated, the four blue LEDs indicate the alignment quality.

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 17: Indication of the alignment quality

LEDs		Meaning
Alignment quality light emitting diodes	Field	
No light emitting diode lights up	● Red	Alignment is insufficient or the protective field is interrupted at least partially. The receiver cannot synchronize with the sender.
1 light emitting diode lights up	● Red	Alignment is insufficient or the protective field is interrupted at least partially.
2 light emitting diodes light up	● Red	Alignment is insufficient or the protective field is interrupted at least partially.
2 light emitting diodes light up	● Green OR ☀ Yellow <sup>1)</sup>	Alignment is not yet sufficient for stable availability. OR The receiver is getting a weak signal from the sender, e.g. because the front screen is contaminated.
3 light emitting diodes light up	● Green OR ☀ Yellow <sup>1)</sup>	Alignment is good, stable availability. <sup>2)</sup>
4 light emitting diodes light up	● Green OR ☀ Yellow <sup>1)</sup>	Alignment is very good.

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

- 1) When the protective field is clear, the field indicator lights up green. If the restart interlock is configured and a reset is required, the field indicator flashes yellow when the protective field is clear. If external device monitoring is configured and an EDM warning is present, alignment quality LED 1/E flashes but the other alignment quality LEDs still indicate the alignment quality. When the protective field is interrupted, the field indicator lights up red.
- 2) If the protective fields are very wide, there is a possibility that all four alignment quality LEDs will not light up even when alignment is good.

## 11.2.2 Status indication

### Overview

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

The information in the tables applies both for single devices and for every device in a cascade.

### 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.

Table 18: LEDs on the sender in normal operation (sender and receiver are connected to each other by a wire)

LEDs		OSSD status	Status of protective field	Status of protective fields at other safety light curtains in a cascade
STATE	Field			
● Green	● Green	ON	Clear	Clear

LEDs		OSSD status	Status of protective field	Status of protective fields at other safety light curtains in a cascade
STATE	Field			
● Red	● Green	OFF	Clear	If the laser alignment aid is switched off: At least 1 protective field is interrupted or there is fault with another device.
● Red	● Red	OFF	Interrupted	The indicator is independent of the status of the other protective fields.
● Red	☀ Yellow	OFF, reset required.	Clear	Clear
● Red	● Red	OFF, the reset pushbutton is currently pressed.	Clear	Clear

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

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 19: LEDs on the receiver during normal operation

LEDs		OSSD status	Status of protective field	Status of protective fields at other safety light curtains in a cascade
OSSD	Field			
● Green	● Green	ON	Clear	Clear
● Red	● Green	OFF	Clear	If the laser alignment aid is switched off: At least one protective field is interrupted or there is fault with another device.
● Red	● Red	OFF	Interrupted	The indicator is independent of the status of the other protective fields
● Red	☀ Yellow	OFF, reset required	Clear	Clear
● Red	● Red	OFF, the reset pushbutton is currently pressed	Clear	Clear

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

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 77](#)

## 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.

The information in the tables applies both for single devices and for every device in a cascade.

When a device in a cascade shows a fault, the displays of the other devices in the cascade must also be observed. The fault cause is only shown on the device in which it occurs.

### 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. <sup>1)</sup>	–
● Yellow	● Red	Failure in the voltage supply	<ul style="list-style-type: none"> <li>▶ Check the voltage supply, <a href="#">see "Technical data", page 93</a>.</li> <li>▶ Switch the voltage supply off and then on again.</li> <li>▶ If the fault persists, replace the sender, <a href="#">see "Ordering information", page 101</a>.</li> </ul>
☀ Yellow	● Red	The sender identified an internal fault.	<ul style="list-style-type: none"> <li>▶ Switch the voltage supply off and then on again.</li> <li>▶ If the fault persists, replace the sender, <a href="#">see "Ordering information", page 101</a>.</li> </ul>
● Red	☀ Yellow/green	Reset of the configuration to factory settings is activated.	Additional information: <a href="#">see "Factory settings", page 63</a> .
● Red	● Green	The device is in configuration mode following a change to the configuration.	Additional information: <a href="#">see "Configuration mode", page 65</a> .
● Green	● Red	A problem occurred when resetting the configuration to factory settings.	<ul style="list-style-type: none"> <li>▶ Restart configuration, <a href="#">see "Factory settings", page 63</a>.</li> </ul>



LEDs		Possible cause	Rectification
STATE	Field		
● Red	● Red	Communication fault between the senders in a cascade.	<ul style="list-style-type: none"> <li>▶ Check the cascade wiring.</li> <li>▶ Switch the voltage supply off and then on again.</li> </ul>
● Red	● Red	Different beam codings in a cascade or impermissible cascade structure.	<ul style="list-style-type: none"> <li>▶ Check the configuration of the devices, particularly the beam coding.</li> <li>▶ If the sender and receiver are connected to each other, also check the configuration of the receiver.</li> <li>▶ Switch the voltage supply off and then on again.</li> </ul>
○	● Red	The voltage is or was too high when operating the sender.	<ul style="list-style-type: none"> <li>▶ Check the voltage supply, see <a href="#">"Technical data", page 93</a>.</li> <li>▶ Replace the sender, see <a href="#">"Ordering information", page 101</a>.</li> </ul>

○ LED off. ● 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	Rectification
OSSD	Field	Alignment quality (blue)					
		1/E	2	3	4/R		
● Red	● Red	● Blue	○	○	○	An internal fault has occurred.	<ul style="list-style-type: none"> <li>▶ Switch the voltage supply off and back on again.</li> <li>▶ If the fault continues to persist, replace the receiver, see <a href="#">"Ordering information", page 101</a>.</li> </ul>
● Red	● Red	○	● Blue	○	○	Fault in the supply voltage	<ul style="list-style-type: none"> <li>▶ Check the voltage supply and the voltage supply unit, see <a href="#">"Technical data", page 93</a>.</li> <li>▶ Switch the voltage supply off and back on again.</li> <li>▶ If the fault continues to persist, replace the receiver, see <a href="#">"Ordering information", page 101</a>.</li> </ul>

LEDs						Possible cause	Rectification
OSSD	Field	Alignment quality (blue)					
		1/E	2	3	4/R		
● Red	● Red	○	○	● Blue	○	The receiver has recognized beams from several senders.	<ul style="list-style-type: none"> <li>▶ Check the distance to senders of the same design.</li> <li>▶ Check the beam coding of the receiver and systems in close proximity.</li> <li>▶ Make sure that light beams from a different sender cannot hit the receiver (exception: when one of the two systems uses code 1 and the other uses code 2), see <a href="#">"Protection against interference from systems in close proximity to each other"</a>, page 28.</li> <li>▶ Switch the voltage supply off and back on again.</li> </ul>
● Red	● Red	○	○	○	● Blue	<p>A wiring fault has been identified at the OSSDs or at an input.</p> <p>E.g., at an OSSD: overvoltage, short-circuit, cross-circuit, permissible load capacity exceeded.</p> <p>E.g., at an input: invalid signal, unexpected signal.</p>	<ul style="list-style-type: none"> <li>▶ Check the system wiring for a fault. Make sure that the OSSDs and inputs have been wired correctly, see <a href="#">"Integration in electrical control"</a>, page 31.</li> <li>▶ Switch the voltage supply off and back on again.</li> <li>▶ If the fault continues to persist, replace the defective components, see <a href="#">"Ordering information"</a>, page 101.</li> </ul>
● Red		● Blue				<p>EDM warning (only if the external device monitoring function is active):</p> <p>The OSSDs have constantly been in the OFF state since the safety light curtain was switched on and no signal is present at the EDM input.</p>	<p>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:</p> <ul style="list-style-type: none"> <li>▶ Check the contactors.</li> <li>▶ Check the wiring of the contactors.</li> <li>▶ Switch the voltage supply off and back on again.</li> </ul>
● Red	● Red	● Blue	● Blue	○	○	<p>EDM fault (only if the external device monitoring function is active):</p> <p>Following a change to the OSSD status, the status of the EDM input has not changed within 300 ms.</p> <p>OR</p> <p>The status of the EDM input has changed even though the OSSD status has not.</p>	<ul style="list-style-type: none"> <li>▶ Check the contactors.</li> <li>▶ Check the wiring of the contactors.</li> <li>▶ Switch the voltage supply off and back on again.</li> </ul>
● Red	● Yellow/green	○	○	○	○	Reset of the configuration to factory settings is activated.	Additional information: see <a href="#">"Factory settings"</a> , page 63

LEDs						Possible cause	Rectification
OSSD	Field	Alignment quality (blue)					
		1/E	2	3	4/R		
● Red	● Green	○/● Blue	○/● Blue	○/● Blue	○/● Blue	The device is in configuration mode following a change to the configuration. The alignment quality LEDs flash to indicate the current configuration: 1/E = external device monitoring configured 2 = guest 1 present in cascade 3 = guest 2 present in cascade 4 = restart interlock configured	Additional information: see <a href="#">"Configuration mode"</a> , page 65
● Red	● Red	● Blue	● Blue	● Blue	● Blue	A problem occurred when resetting the configuration to factory settings.	▶ Restart configuration, see <a href="#">"Factory settings"</a> , page 63.
● Red	● Red	● Blue	○	● Blue	○	Incompatible configuration of the devices in a cascade	▶ Check the configuration of the devices, particularly the beam coding. If the sender and receiver are connected to each other, also check the configuration of the sender. ▶ Switch the voltage supply off and back on again. ▶ If the fault persists, reset the device to factory settings and reconfigure it, see <a href="#">"Configuration"</a> , page 63.
● Red	● Red	● Blue	○	○	● Blue	Communication fault between the receivers in a cascade	▶ Check the cascade wiring. ▶ Switch the voltage supply off and back on again. ▶ If the fault continues to persist, replace the defective components, see <a href="#">"Ordering information"</a> , page 101.
					● Blue	Fault with the reset pushbutton	▶ 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.

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

1) 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.

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## 13 Technical data

### 13.1 Data sheet

Table 22: General system data

	Minimum	Typical	Maximum
Protective field height, depending on type	300 mm to 2,100 mm, 150-mm steps		
Resolution (detection capability), depending on type	14 mm or 30 mm		
Protective field width <sup>1) 2) 3)</sup>			
Resolution 14 mm	0.15 m ... 16 m	0.15 m ... 20 m	
Resolution 30 mm	0.15 m ... 24 m	0.15 m ... 30 m	
Protection class <sup>4)</sup>	III (IEC 61140)		
Enclosure rating <sup>5)</sup>	IP65 (IEC 60529) IP67 (IEC 60529)		
Supply voltage U <sub>V</sub> at the device <sup>6) 7) 8)</sup>	19.2 V	24 V	28.8 V
Residual ripple <sup>9)</sup>			± 10%
Synchronization	Optical		
Type	Type 4 (IEC 61496-1)		
Category	Category 4 (ISO 13849-1)		
Performance level <sup>10)</sup>	PL e (ISO 13849-1)		
Safety Integrity Level <sup>10)</sup>	SIL3 (IEC 61508)		
SIL claim limit <sup>10)</sup>	SILCL3 (IEC 62061)		
PFHd (mean probability of a dangerous failure per hour)			
Single system	9.6 × 10 <sup>-9</sup>		
Cascade with one guest	1.9 × 10 <sup>-8</sup>		
Cascade with two guest devices	2.9 × 10 <sup>-8</sup>		
T <sub>M</sub> (mission time)	20 years (ISO 13849-1)		
Safe state when a fault occurs	At least one OSSD is in the OFF state.		
Power-up delay of sender and receiver before ready <sup>11)</sup>			
Single system		2 s	
Cascade with one guest		3 s	
Cascade with two guest devices		4 s	
Number of beams in a cascade <sup>12) 13)</sup>			
Beam coding uncoded			Unlimited
Beam coding code 1 or code 2			375 beams
Test rod speed at which the test rod is safely detected <sup>14)</sup>	0 m/s ... 1.6 m/s		

- 1) If the protective fields are very wide, there is a possibility that all four alignment quality LEDs will not light up even when alignment is good.
- 2) 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) 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.

- 7) 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.
- 8) 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.
- 9) Within the limits of  $U_v$ .
- 10) For more detailed information on the exact configuration of your machine, please consult your respective SICK subsidiary.
- 11) Following a change to the configuration, the power-up delay may be longer.
- 12) The maximum permissible current must be observed.
- 13) Calculation of number of beams:
  - Resolution 14 mm: protective field height/mm / 10 (example, protective field height 2,100 mm:  $2,100/10 = 210$  beams)
  - Resolution 30 mm: protective field height/mm / 25 (example, protective field height 2,100 mm:  $2,100/25 = 84$  beams)
- 14) Direction of movement and axis of the test rod perpendicular to the protective field.

Table 23: Technical specifications, sender

	Minimum	Typical	Maximum
Wavelength of sender		Near-infrared (NIR), invisible	
<b>Laser alignment aid</b>			
Wavelength		650 nm (red)	
Medium output power			390 $\mu$ W
Laser class	1		
<b>Laser alignment aid switch input (In1)</b>			
Input voltage HIGH (active)	13 V	24 V	30 V
Input current HIGH	2 mA	5 mA	7 mA
Input voltage LOW (inactive)	-3 V	0 V	3 V
Input current LOW	-0.1 mA	0 mA	0.5 mA
<b>Laser alignment aid pushbutton input (In2)</b>			
Input voltage HIGH (active)	13 V	24 V	30 V
Input current HIGH	2 mA	5 mA	7 mA
Input voltage LOW (inactive)	-3 V	0 V	3 V
Input current LOW	-0.1 mA	0 mA	0.5 mA
Control switch actuation time	50 ms		
<b>Permissible conductor resistance<sup>1)</sup></b>			
Supply cable <sup>2)</sup>			2.5 $\Omega$
Cable between host and guest			1 $\Omega$

- 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.
- 2) If a T distributor is used, the specified values apply to the resistance of the entire cable from the system connection of the device to the connection in the control cabinet.  
For a cascade, the specified values apply to the resistance of the entire cable from the system connection of the last guest device to the connection in the control cabinet.

Table 24: Technical specifications, receiver

	Minimum	Typical	Maximum
<b>Output signal switching devices (OSSDs)</b>	2 PNP semiconductors, short-circuit protected <sup>1)</sup> , cross-circuit monitored		
Response time	"Response time", page 96		
Duration of OFF state	100 ms		

	Minimum	Typical	Maximum
Switch-on delay		3 × response time	
ON state, switching voltage HIGH ( $U_{rms}$ ) <sup>2)</sup>	$U_V - 2.25 V$	24 V	$U_V$
OFF state, switching voltage LOW <sup>2) 3)</sup>	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 $\mu F$
Load inductance			2.2 H
Test pulse data <sup>4)</sup>			
Test pulse width		150 $\mu s$	300 $\mu s$
Test pulse rate	3 s <sup>-1</sup>	5 s <sup>-1</sup>	10 s <sup>-1</sup>
Discrepancy time (time offset between switching of OSSD2 and OSSD1)			1 ms
<b>External device monitoring input (EDM)</b>			
Input voltage HIGH (active) <sup>2)</sup>	11 V	24 V	30 V
Input current HIGH	6 mA	10 mA	20 mA
Input voltage LOW (deactivated) <sup>2)</sup>	-30 V	0 V	5 V
Input current LOW	-2.5 mA	0 mA	0.5 mA
Connected contactors			
Permissible dropout time			300 ms
Permissible pull in time			300 ms
<b>Reset pushbutton input (RES)</b>			
Input voltage HIGH (active) <sup>2)</sup>	11 V	24 V	30 V
Input current HIGH	6 mA	10 mA	20 mA
Input voltage LOW (inactive) <sup>2)</sup>	-30 V	0 V	5 V
Input current LOW	-2.5 mA	0 mA	0.5 mA
Control switch actuation time	50 ms		
<b>Application diagnostic output (ADO)</b>	PNP semiconductor, short-circuit protected <sup>1)</sup>		
Output voltage HIGH (active)	$U_V - 3 V$		
Output voltage LOW (inactive)		High resistance	
Output current HIGH (active)			100 mA
<b>Permissible conductor resistance<sup>5)</sup></b>			
Supply cable <sup>6) 7)</sup>			1 $\Omega$ <sup>8)</sup>
Cable between host and guest			1 $\Omega$
Cable between OSSD and load			2.5 $\Omega$
All additional conductors at the system connection and extension connection <sup>6)</sup>			2.5 $\Omega$

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) If a T distributor is used, the specified values apply to the resistance of the entire cable from the system connection of the device to the connection in the control cabinet.  
For a cascade, the specified values apply to the resistance of the entire cable from the system connection of the last guest device to the connection in the control cabinet.
- 7) The supply cable must not be used to connect other loads with the exception of the senders.
- 8) If a T distributor is used and the input current is greater than 1.2 A, the conductor resistance must not exceed 0.5 Ω.  
If the device is not used in a cascade, a T-connector is not used, and no inductive OSSD loads (e.g., contactors) are applied, the conductor resistance must not exceed 2 Ω.

Table 25: Operating data

	Minimum	Typical	Maximum
System connection	Male connector, M12, 5-pin or M12, 8-pin		
Extension connection	Optional, female connector, M12, 5-pin		
Lengths of cable for connecting cables and in cascades	"Length of cable", page 98		
Ambient operating temperature <sup>2) 3) 4)</sup>	-30 °C		+55 °C
Air humidity (non-condensing)	15%		95%
Storage temperature	-30 °C		+70 °C
Housing cross-section	31 mm × 34 mm, plus bracket, see "Dimensional drawings", page 100		
Vibration resistance <sup>5)</sup>	5 g, 10 Hz ... 55 Hz (IEC 60068-2-6)		
Shock resistance	10 g, 16 ms (IEC 60068-2-27)		

- 1) The temperature difference between sender and receiver must not exceed 25 K.
- 2) The cable belonging to the device incl. the associated connection plug must not be flexibly mounted under -25 °C.
- 3) 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.
- 4) Test conditions per axis: 1 octave/minute, amplitude: 0.35 mm, 20 sweeps.
- 5) Test conditions per axis: 1,000 shocks.

## 13.2 Response time

### Overview

The response time is subject to the following parameters:

- Resolution
- Protective field height
- Beam coding.
- Number of cascaded devices

### Response time for a single device

Table 26: Response time for a single device

Protective field height in mm	Response time in ms			
	Resolution 14 mm		Resolution 30 mm	
	Uncoded	Code 1 or code 2	Uncoded	Code 1 or code 2
300	11	16	9	12
450	12	19	10	14
600	13	22	10	15
750	13	25	11	16



Protective field height in mm	Response time in ms			
	Resolution 14 mm		Resolution 30 mm	
	Uncoded	Code 1 or code 2	Uncoded	Code 1 or code 2
900	14	28	11	17
1050	15	31	11	18
1200	16	34	12	20
1350	17	37	12	21
1500	18	40	13	22
1650	19	42	13	23
1800	20	45	13	24
1950	21	48	14	25
2100	22	51	14	27

**Response time for a cascade of two devices**

- ▶ Calculate the response time of the cascade using the following formula:

$$t_c = t_H + t_{G1}$$

Where:

- $t_c$  = response time of the cascade
- $t_H$  = response time of the device used as host, [see table 26](#) <sup>5)</sup>
- $t_{G1}$  = response time of the device used as guest 1, [see table 26](#)

**Response time for a cascade of three devices**

- ▶ Calculate the response time of the cascade using the following formula:

$$t_c = t_H + t_{G1} + t_{G2}$$

Where:

- $t_c$  = response time of the cascade
- $t_H$  = response time of the device used as host, [see table 26](#) <sup>6)</sup>
- $t_{G1}$  = response time of the device used as guest 1, [see table 26](#) <sup>7)</sup>
- $t_{G2}$  = response time of the device which is used as Guest 2, [see table 26](#)

### 13.3 Power consumption

Table 27: Power consumption, sender and receiver

Protective field height in mm	Typical power consumption of sender in W		Typical power consumption for receiver in W <sup>1)</sup>	
	Resolution 14 mm	Resolution 30 mm	Resolution 14 mm	Resolution 30 mm
300	1.42	1.23	3.43	3.23
450	1.51	1.31	3.60	3.30
600	1.60	1.38	3.76	3.36
750	1.68	1.45	3.93	3.43
900	1.77	1.53	4.09	3.50
1050	1.85	1.60	4.26	3.56
1200	1.94	1.68	4.42	3.63
1350	2.03	1.75	4.59	3.69

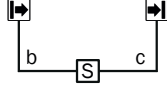
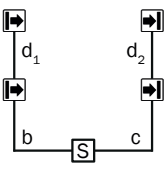
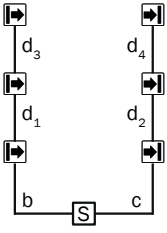
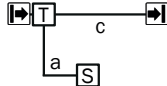
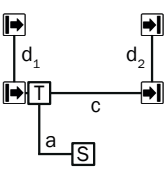
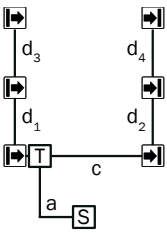
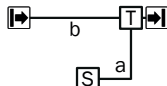
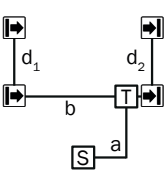
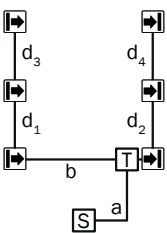
5) The response time of the host within the cascade is  $t_c - 6$  ms.  
 6) The response time of the host within the cascade is  $t_c - 12$  ms.  
 7) The response time of guest 1 within the cascade is  $t_c - 6$  ms.

Protective field height in mm	Typical power consumption of sender in W		Typical power consumption for receiver in W <sup>1)</sup>	
	Resolution 14 mm	Resolution 30 mm	Resolution 14 mm	Resolution 30 mm
1500	2.11	1.82	4.75	3.76
1650	2.20	1.90	4.92	3.83
1800	2.29	1.97	5.08	3.89
1950	2.37	2.05	5.25	3.96
2100	2.46	2.12	5.41	4.02

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

### 13.4 Length of cable

Table 28: Maximum lengths of cable for wire cross-section 0.34 mm<sup>2</sup>, copper wire

	Single system	Cascade with 1 guest	Cascade with 2 guest devices
Separate connecting cables for sender and receiver	 <p><math>b \leq 85 \text{ m}</math>   <math>c \leq 15 \text{ m}</math></p>	 <p><math>b \leq 85 \text{ m}</math>   <math>c \leq 15 \text{ m}</math> <math>d_1, d_2 \leq 10 \text{ m}</math></p>	 <p><math>b \leq 50 \text{ m}</math>   <math>c \leq 10 \text{ m}</math> <math>d_1, d_2, d_3, d_4 \leq 10 \text{ m}</math></p>
Connection of sender and receiver via T-connector on the sender	 <p><math>a, c \leq 10 \text{ m}</math></p>	 <p><math>a \leq 10 \text{ m}</math>   <math>c \leq 7 \text{ m}</math> <math>d_1, d_2 \leq 10 \text{ m}</math></p>	 <p><math>a, c \leq 5 \text{ m}</math> <math>d_1, d_2, d_3, d_4 \leq 10 \text{ m}</math></p>
Connection of sender and receiver via T-connector on the receiver	 <p><math>a \leq 15 \text{ m}</math>   <math>b \leq 85 \text{ m}</math></p>	 <p><math>a \leq 15 \text{ m}</math>   <math>b \leq 50 \text{ m}</math> <math>d_1, d_2 \leq 10 \text{ m}</math></p>	 <p><math>a \leq 10 \text{ m}</math>   <math>b \leq 35 \text{ m}</math> <math>d_1, d_2, d_3, d_4 \leq 10 \text{ m}</math></p>

**S** Control cabinet with safety relay or safety controller  
**T** T-connector

### 13.5 Table of weights

Table 29: Weight of sender and receiver

Protective field height in mm	Weight in g <sup>1)</sup>	
	☛ Sender	☛ Receiver
300	230	240
450	370	380
600	510	520
750	640	650
900	780	790
1050	910	920
1200	1050	1060
1350	1180	1190
1500	1320	1330
1650	1450	1460
1800	1590	1600
1950	1730	1740
2100	1860	1870

<sup>1)</sup> Tolerance: ± 50 g.

13.6 Dimensional drawings

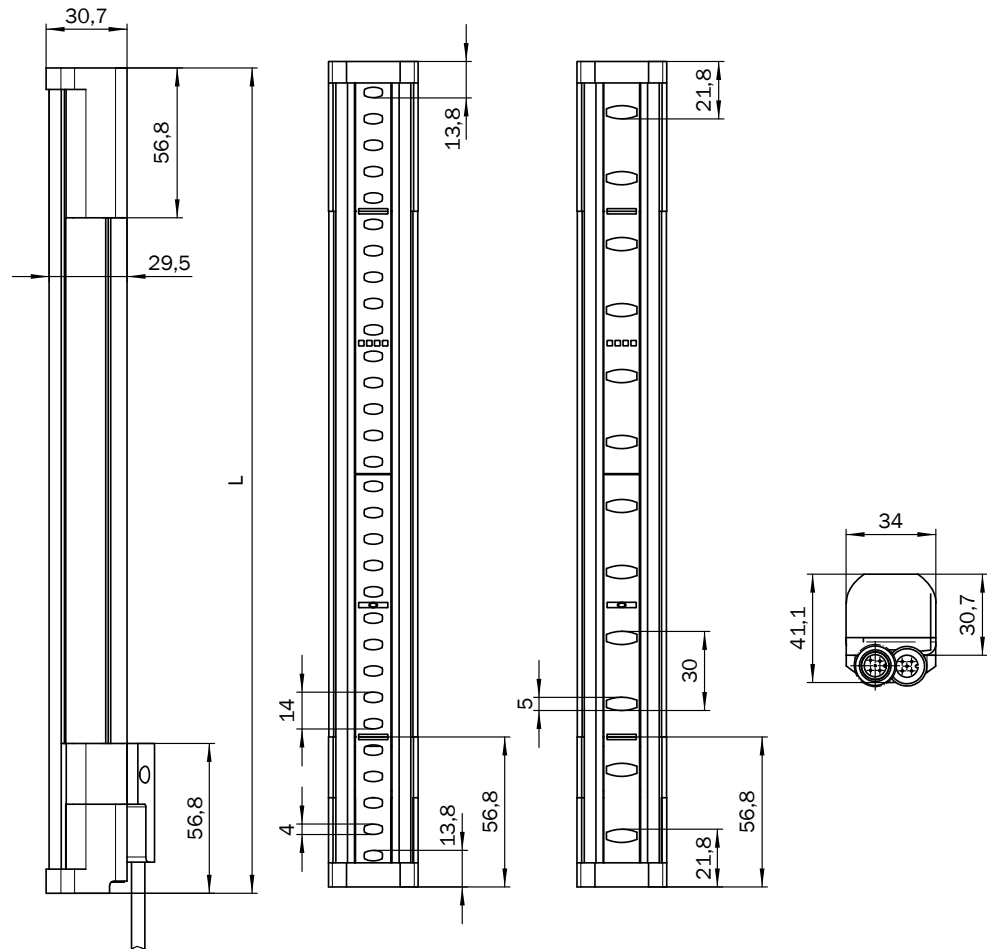


Figure 46: Dimensional drawing of sender and receiver

Table 30: Dimensions based on the protective field height, sender and receiver

Protective field height, nominal in mm	Protective field height, effective = dimension L in mm <sup>1)</sup>
300	313
450	463
600	613
750	763
900	913
1050	1063
1200	1213
1350	1362
1500	1512
1650	1662
1800	1812
1950	1962
2100	2112

<sup>1)</sup> The effective protective field corresponds to the entire length of the housing. The test object defined in the standard IEC 61496-1 is recognized over the entire length of the housing. The limits of the protective field are identical to ends of the housing.

## 14 Ordering information

### 14.1 Scope of delivery

#### Scope of delivery, sender

- Sender
- System plug (only deTec4 Prime with system plug)

#### Scope of delivery, receiver

- Receiver
- System plug (only deTec4 Prime with system plug)
- Test rod with diameter corresponding to the resolution of the safety light curtain
- Safety note
- Mounting instructions
- Operating instructions for download: [www.sick.com](http://www.sick.com)

### 14.2 Variants

You can order the safety light curtain with or without a system plug as required.

The system plugs are available as accessories, see "Connectors", page 109.

The type code for a safety light curtain with a system plug consists of the type code of the same safety light curtain without a system plug and the type code of the system plug. Example:

Table 31: Example of type code

	Sender	System plug	Receiver	System plug
deTec4 Prime, resolution 14 mm, protective field height 300 mm				
Device with system plug	C4P-SA03010A00 1000		C4P-EA03010A00 1000	
Device and system plug separate	C4P-SA03010A00	1000	C4P-EA03010A00	1000

### 14.3 Ordering information deTec4 Prime

#### deTec4 Prime without system plug

Table 32: Ordering information for deTec4 Prime, resolution 14 mm

Protective field height in mm	Sender		Receiver	
	Part number	Type code	Part number	Type code
300	1215244	C4P-SA03010A00	1215245	C4P-EA03010A00
450	1215276	C4P-SA04510A00	1215277	C4P-EA04510A00
600	1215279	C4P-SA06010A00	1215280	C4P-EA06010A00
750	1215281	C4P-SA07510A00	1215282	C4P-EA07510A00
900	1215283	C4P-SA09010A00	1215284	C4P-EA09010A00
1050	1215285	C4P-SA10510A00	1215286	C4P-EA10510A00
1200	1215287	C4P-SA12010A00	1215288	C4P-EA12010A00
1350	1215289	C4P-SA13510A00	1215290	C4P-EA13510A00
1500	1215291	C4P-SA15010A00	1215292	C4P-EA15010A00
1650	1215293	C4P-SA16510A00	1215294	C4P-EA16510A00
1800	1215295	C4P-SA18010A00	1215296	C4P-EA18010A00
1950	1215297	C4P-SA19510A00	1215298	C4P-EA19510A00
2100	1215299	C4P-SA21010A00	1215300	C4P-EA21010A00

Table 33: Ordering information for deTec4 Prime, resolution 30 mm

Protective field height in mm	Sender		Receiver	
	Part number	Type code	Part number	Type code
300	1215301	C4P-SA03030A00	1215302	C4P-EA03030A00
450	1215303	C4P-SA04530A00	1215304	C4P-EA04530A00
600	1215305	C4P-SA06030A00	1215306	C4P-EA06030A00
750	1215307	C4P-SA07530A00	1215308	C4P-EA07530A00
900	1215309	C4P-SA09030A00	1215310	C4P-EA09030A00
1050	1215311	C4P-SA10530A00	1215312	C4P-EA10530A00
1200	1215313	C4P-SA12030A00	1215314	C4P-EA12030A00
1350	1215315	C4P-SA13530A00	1215316	C4P-EA13530A00
1500	1215317	C4P-SA15030A00	1215318	C4P-EA15030A00
1650	1215319	C4P-SA16530A00	1215320	C4P-EA16530A00
1800	1215321	C4P-SA18030A00	1215322	C4P-EA18030A00
1950	1215323	C4P-SA19530A00	1215324	C4P-EA19530A00
2100	1215325	C4P-SA21030A00	1215326	C4P-EA21030A00

**deTec4 Prime with system plug, 5-pin system connection**

Table 34: Ordering information for deTec4 Prime, resolution 14 mm

Protective field height in mm	Sender		Receiver	
	Part number	Type code	Part number	Type code
300	1215556	C4P-SA03010A001000	1215583	C4P-EA03010A001000
450	1215651	C4P-SA04510A001000	1215652	C4P-EA04510A001000
600	1215653	C4P-SA06010A001000	1215654	C4P-EA06010A001000
750	1215655	C4P-SA07510A001000	1215656	C4P-EA07510A001000
900	1215657	C4P-SA09010A001000	1215658	C4P-EA09010A001000
1050	1215659	C4P-SA10510A001000	1215660	C4P-EA10510A001000
1200	1215661	C4P-SA12010A001000	1215662	C4P-EA12010A001000
1350	1215663	C4P-SA13510A001000	1215664	C4P-EA13510A001000
1500	1215665	C4P-SA15010A001000	1215666	C4P-EA15010A001000
1650	1215667	C4P-SA16510A001000	1215668	C4P-EA16510A001000
1800	1215669	C4P-SA18010A001000	1215670	C4P-EA18010A001000
1950	1215671	C4P-SA19510A001000	1215672	C4P-EA19510A001000
2100	1215673	C4P-SA21010A001000	1215674	C4P-EA21010A001000

Table 35: Ordering information for deTec4 Prime, resolution 30 mm

Protective field height in mm	Sender		Receiver	
	Part number	Type code	Part number	Type code
300	1215753	C4P-SA03030A001000	1215754	C4P-EA03030A001000
450	1215755	C4P-SA04530A001000	1215756	C4P-EA04530A001000
600	1215757	C4P-SA06030A001000	1215758	C4P-EA06030A001000
750	1215759	C4P-SA07530A001000	1215760	C4P-EA07530A001000
900	1215761	C4P-SA09030A001000	1215762	C4P-EA09030A001000
1050	1215763	C4P-SA10530A001000	1215764	C4P-EA10530A001000
1200	1215765	C4P-SA12030A001000	1215766	C4P-EA12030A001000
1350	1215767	C4P-SA13530A001000	1215768	C4P-EA13530A001000
1500	1215769	C4P-SA15030A001000	1215770	C4P-EA15030A001000
1650	1215771	C4P-SA16530A001000	1215772	C4P-EA16530A001000
1800	1215773	C4P-SA18030A001000	1215774	C4P-EA18030A001000

Protective field height in mm	Sender		Receiver	
	Part number	Type code	Part number	Type code
1950	1215775	C4P-SA19530A001000	1215776	C4P-EA19530A001000
2100	1215777	C4P-SA21030A001000	1215778	C4P-EA21030A001000

### deTec4 Prime with system plug, 8-pin system connection

Table 36: Ordering information for deTec4 Prime, resolution 14 mm

Protective field height in mm	Sender		Receiver	
	Part number	Type code	Part number	Type code
300	1215701	C4P-SA03010A001200	1215702	C4P-EA03010A001200
450	1215703	C4P-SA04510A001200	1215704	C4P-EA04510A001200
600	1215705	C4P-SA06010A001200	1215706	C4P-EA06010A001200
750	1215707	C4P-SA07510A001200	1215708	C4P-EA07510A001200
900	1215709	C4P-SA09010A001200	1215710	C4P-EA09010A001200
1050	1215711	C4P-SA10510A001200	1215712	C4P-EA10510A001200
1200	1215713	C4P-SA12010A001200	1215714	C4P-EA12010A001200
1350	1215715	C4P-SA13510A001200	1215716	C4P-EA13510A001200
1500	1215717	C4P-SA15010A001200	1215718	C4P-EA15010A001200
1650	1215719	C4P-SA16510A001200	1215720	C4P-EA16510A001200
1800	1215721	C4P-SA18010A001200	1215722	C4P-EA18010A001200
1950	1215723	C4P-SA19510A001200	1215724	C4P-EA19510A001200
2100	1215725	C4P-SA21010A001200	1215726	C4P-EA21010A001200

Table 37: Ordering information for deTec4 Prime, resolution 30 mm

Protective field height in mm	Sender		Receiver	
	Part number	Type code	Part number	Type code
300	1215805	C4P-SA03030A001200	1215806	C4P-EA03030A001200
450	1215807	C4P-SA04530A001200	1215808	C4P-EA04530A001200
600	1215809	C4P-SA06030A001200	1215810	C4P-EA06030A001200
750	1215811	C4P-SA07530A001200	1215812	C4P-EA07530A001200
900	1215813	C4P-SA09030A001200	1215814	C4P-EA09030A001200
1050	1215815	C4P-SA10530A001200	1215816	C4P-EA10530A001200
1200	1215817	C4P-SA12030A001200	1215818	C4P-EA12030A001200
1350	1215819	C4P-SA13530A001200	1215820	C4P-EA13530A001200
1500	1215821	C4P-SA15030A001200	1215822	C4P-EA15030A001200
1650	1215823	C4P-SA16530A001200	1215824	C4P-EA16530A001200
1800	1215825	C4P-SA18030A001200	1215826	C4P-EA18030A001200
1950	1215827	C4P-SA19530A001200	1215828	C4P-EA19530A001200
2100	1215829	C4P-SA21030A001200	1215830	C4P-EA21030A001200

### deTec4 Prime with system plug, 5-pin system connection, and 5-pin extension connection

Table 38: Ordering information for deTec4 Prime, resolution 14 mm

Protective field height in mm	Sender		Receiver	
	Part number	Type code	Part number	Type code
300	1215675	C4P-SA03010A001100	1215676	C4P-EA03010A001100
450	1215677	C4P-SA04510A001100	1215678	C4P-EA04510A001100
600	1215679	C4P-SA06010A001100	1215680	C4P-EA06010A001100
750	1215681	C4P-SA07510A001100	1215682	C4P-EA07510A001100

Protective field height in mm	Sender		Receiver	
	Part number	Type code	Part number	Type code
900	1215683	C4P-SA09010A001100	1215684	C4P-EA09010A001100
1050	1215685	C4P-SA10510A001100	1215686	C4P-EA10510A001100
1200	1215687	C4P-SA12010A001100	1215688	C4P-EA12010A001100
1350	1215689	C4P-SA13510A001100	1215690	C4P-EA13510A001100
1500	1215691	C4P-SA15010A001100	1215692	C4P-EA15010A001100
1650	1215693	C4P-SA16510A001100	1215694	C4P-EA16510A001100
1800	1215695	C4P-SA18010A001100	1215696	C4P-EA18010A001100
1950	1215697	C4P-SA19510A001100	1215698	C4P-EA19510A001100
2100	1215699	C4P-SA21010A001100	1215700	C4P-EA21010A001100

Table 39: Ordering information for deTec4 Prime, resolution 30 mm

Protective field height in mm	Sender		Receiver	
	Part number	Type code	Part number	Type code
300	1215779	C4P-SA03030A001100	1215780	C4P-EA03030A001100
450	1215781	C4P-SA04530A001100	1215782	C4P-EA04530A001100
600	1215783	C4P-SA06030A001100	1215784	C4P-EA06030A001100
750	1215785	C4P-SA07530A001100	1215786	C4P-EA07530A001100
900	1215787	C4P-SA09030A001100	1215788	C4P-EA09030A001100
1050	1215789	C4P-SA10530A001100	1215790	C4P-EA10530A001100
1200	1215791	C4P-SA12030A001100	1215792	C4P-EA12030A001100
1350	1215793	C4P-SA13530A001100	1215794	C4P-EA13530A001100
1500	1215795	C4P-SA15030A001100	1215796	C4P-EA15030A001100
1650	1215797	C4P-SA16530A001100	1215798	C4P-EA16530A001100
1800	1215799	C4P-SA18030A001100	1215800	C4P-EA18030A001100
1950	1215801	C4P-SA19530A001100	1215802	C4P-EA19530A001100
2100	1215803	C4P-SA21030A001100	1215804	C4P-EA21030A001100

**deTec4 Prime with system plug, 8-pin system connection, and 5-pin extension connection**

Table 40: Ordering information for deTec4 Prime, resolution 14 mm

Protective field height in mm	Sender		Receiver	
	Part number	Type code	Part number	Type code
300	1215727	C4P-SA03010A001300	1215728	C4P-EA03010A001300
450	1215729	C4P-SA04510A001300	1215730	C4P-EA04510A001300
600	1215731	C4P-SA06010A001300	1215732	C4P-EA06010A001300
750	1215733	C4P-SA07510A001300	1215734	C4P-EA07510A001300
900	1215735	C4P-SA09010A001300	1215736	C4P-EA09010A001300
1050	1215737	C4P-SA10510A001300	1215738	C4P-EA10510A001300
1200	1215739	C4P-SA12010A001300	1215740	C4P-EA12010A001300
1350	1215741	C4P-SA13510A001300	1215742	C4P-EA13510A001300
1500	1215743	C4P-SA15010A001300	1215744	C4P-EA15010A001300
1650	1215745	C4P-SA16510A001300	1215746	C4P-EA16510A001300
1800	1215747	C4P-SA18010A001300	1215748	C4P-EA18010A001300
1950	1215749	C4P-SA19510A001300	1215750	C4P-EA19510A001300
2100	1215751	C4P-SA21010A001300	1215752	C4P-EA21010A001300



Table 41: Ordering information for deTec4 Prime, resolution 30 mm

Protective field height in mm	Sender		Receiver	
	Part number	Type code	Part number	Type code
300	1215831	C4P-SA03030A001300	1215832	C4P-EA03030A001300
450	1215833	C4P-SA04530A001300	1215834	C4P-EA04530A001300
600	1215835	C4P-SA06030A001300	1215836	C4P-EA06030A001300
750	1215837	C4P-SA07530A001300	1215838	C4P-EA07530A001300
900	1215839	C4P-SA09030A001300	1215840	C4P-EA09030A001300
1050	1215841	C4P-SA10530A001300	1215842	C4P-EA10530A001300
1200	1215843	C4P-SA12030A001300	1215844	C4P-EA12030A001300
1350	1215845	C4P-SA13530A001300	1215846	C4P-EA13530A001300
1500	1215847	C4P-SA15030A001300	1215848	C4P-EA15030A001300
1650	1215849	C4P-SA16530A001300	1215850	C4P-EA16530A001300
1800	1215851	C4P-SA18030A001300	1215852	C4P-EA18030A001300
1950	1215853	C4P-SA19530A001300	1215854	C4P-EA19530A001300
2100	1215855	C4P-SA21030A001300	1215856	C4P-EA21030A001300

## 15 Accessories

### 15.1 Brackets

Table 42: Brackets ordering information

Part	Type code	Part number
QuickFix bracket (2x)	BEF-3SHABPKU2	2066048
FlexFix bracket (4x)	BEF-1SHABPKU4	2066614
FlexFix mounting kit (2x FlexFix brackets, alignment tool, and assembly materials for installation in device columns)	BEF-1SHABBKU2	2073543
Exchange bracket (kit with 4 brackets, mounting kit for replacement of swivel mount brackets 2019649 and 2019659 or side bracket 2019506 with the FlexFix bracket when using the bore holes provided)	BEF-1SHABS004	2100345
Replacement bracket (kit with 4 brackets, mounting kit for replacement of swivel mount brackets 2030510 or side bracket 2019506 with the FlexFix bracket when using the bore holes provided)	BEF-1SHABU004	2099282

#### QuickFix bracket

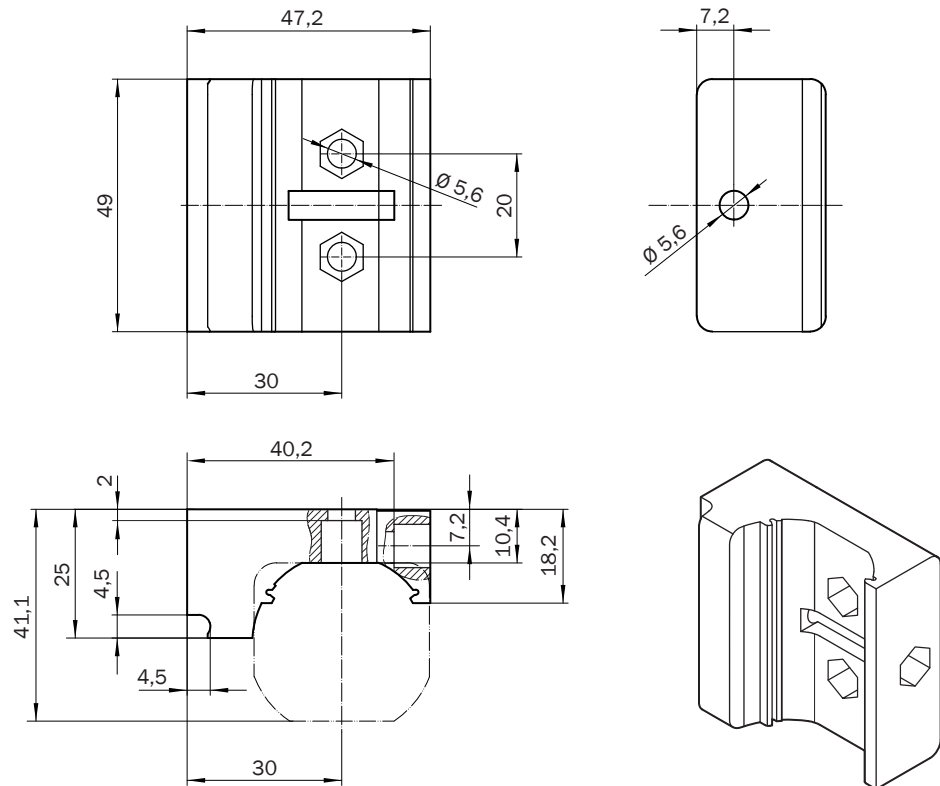


Figure 47: Dimensional drawing of the QuickFix bracket (2066048)

**FlexFix bracket**

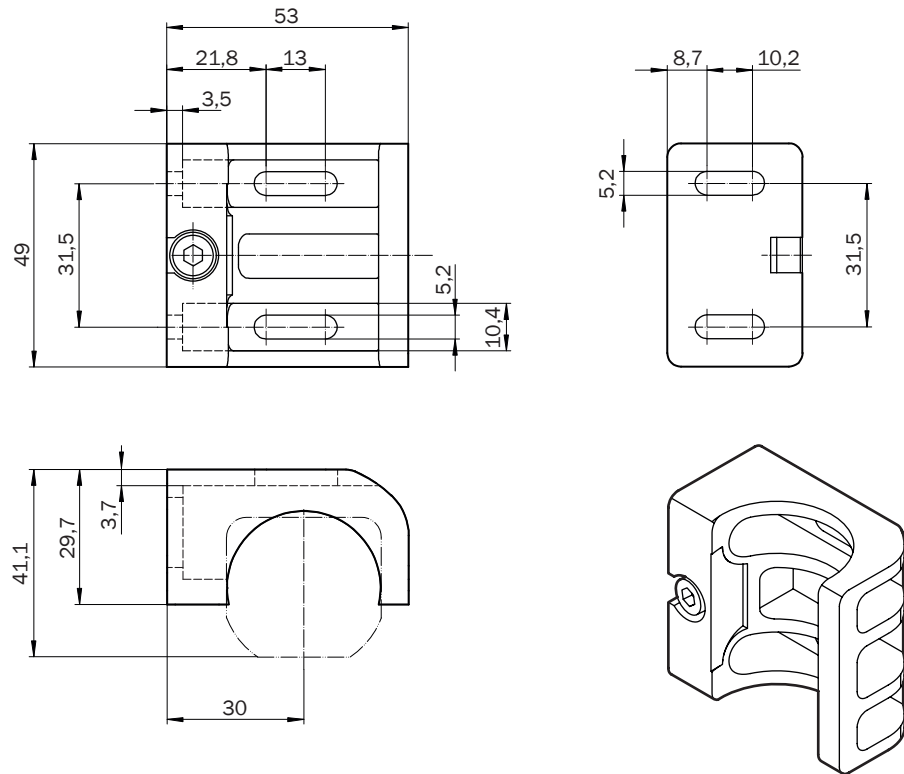


Figure 48: Dimensional drawing of the FlexFix bracket (2066614)

**15.2 Mounting accessories**

Table 43: Mounting accessories ordering information

Part	Part number
Alignment tool	4084133

**15.3 Weld spark guard**

**Overview**

The weld spark guard can be used to protect the front screen of the safety light curtain. The weld spark guard reduces the scanning range of the system by 15 %.

**Important information**



**DANGER**

Hazard due to lack of effectiveness of the protective device

The weld spark guard may influence the optical properties of the safety light curtain, leading to persons or body parts that should be protected being reflected and therefore remaining undetected.

- ▶ Make sure that all reflective surfaces and objects maintain the correct minimum distance from the protective field.

**Differing minimum distance to reflective surfaces for devices with a resolution of 30 mm with weld spark guard**

If a device with a resolution of 30 mm is used with the weld spark guard, the following applies in contrast to other specifications in order to determine the minimum distance from reflective surfaces:

1. Determine the distance D between sender and receiver in meters (m).
2. Read the minimum distance a in millimeters (mm) in the graph or calculate it based on the respective formula (see table 44).

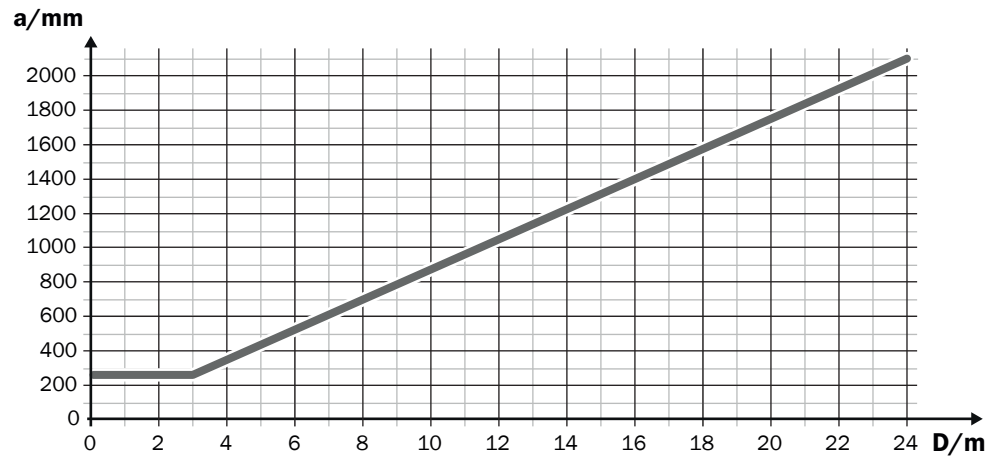


Figure 49: Diagram minimum distance to reflective surfaces for devices with a resolution of 30 mm with weld spark guard

Table 44: Formula for calculating the minimum distance to reflective surfaces for devices with a resolution of 30 mm with weld spark guard

Distance D between sender and receiver in m	Calculation of the minimum distance (a) from reflective surfaces in mm
$D \leq 3$ m	$a = 262$ mm
$D > 3$ m	$a = \tan(5^\circ) \times 1000$ mm/m $\times D = 87,49 \times 1$ mm/m $\times D$

**Ordering information**

Table 45: Weld spark guard ordering information

Part	Part number
Weld spark guard	2069268

## Mounting

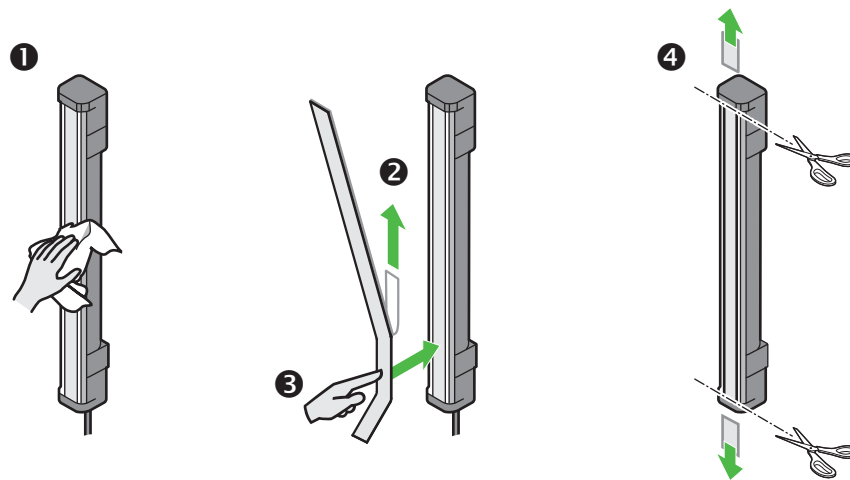


Figure 50: Mounting the weld spark guard

- ① Clean the front screen.
- ② Remove backing film
- ③ Press against the weld spark guard
- ④ Cut off excess ends

## Further topics

- ["Minimum distance to reflective surfaces", page 26](#)

## 15.4 Connectors

Table 46: SP1 system plug ordering information

Connection type	Type codes	Part number
System connection (M12, 5-pin)	1000	2076832
System connection (M12, 8-pin)	1200	2076834
System connection (M12, 5-pin) and extension connection (M12, 5-pin)	1100	2076833
System connection (M12, 8-pin) and extension connection (M12, 5-pin)	1300	2076835

Table 47: Ordering information for M12 connecting cable, 5-pin (0.34 mm<sup>2</sup>)<sup>8)</sup>

Part	Type code	Part number
Female connector, straight, 2 m cable, flying leads	YF2A15-020UB5XLEAX	2095617
Female connector, straight, 5 m cable, flying leads	YF2A15-050UB5XLEAX	2095618
Female connector, straight, 10 m cable, flying leads	YF2A15-100UB5XLEAX	2095619
Female connector, straight, 15 m cable, flying leads	YF2A15-150UB5XLEAX	2095620
Female connector, straight, 20 m cable, flying leads	YF2A15-200UB5XLEAX	2095614
Female connector, straight, 30 m cable, flying leads	YF2A15-300UB5XLEAX	2095621

<sup>8)</sup> Ambient operating temperature: Down to  $-30^{\circ}\text{C}$  with fixed installation.

Part	Type code	Part number
Female connector, angled, 2 m cable, flying leads	YG2A15-020UB5XLEAX	2095772
Female connector, angled, 5 m cable, flying leads	YG2A15-050UB5XLEAX	2095773
Female connector, angled, 10 m cable, flying leads	YG2A15-100UB5XLEAX	2095774

Table 48: Ordering information for M12 connecting cable, 8-pin (0.25 mm<sup>2</sup>)<sup>9)</sup>

Part	Type code	Part number
Female connector, straight, 2.5 m cable, flying leads	YF2A18-025UA5XLEAX	2099229
Female connector, straight, 5 m cable, flying leads	YF2A18-050UA5XLEAX	2095653
Female connector, straight, 7.5 m cable, flying leads	YF2A18-075UA5XLEAX	2099230
Female connector, straight, 10 m cable, flying leads	YF2A18-100UA5XLEAX	2095654
Female connector, straight, 15 m cable, flying leads	YF2A18-150UA5XLEAX	2095679
Female connector, straight, 20 m cable, flying leads	YF2A18-200UA5XLEAX	2095680
Female connector, straight, 30 m cable, flying leads	YF2A18-300UA5XLEAX	2095681
Female connector, angled, 2 m cable, flying leads	YG2A18-020UA5XLEAX	2095779
Female connector, angled, 5 m cable, flying leads	YG2A18-050UA5XLEAX	2095780
Female connector, angled, 10 m cable, flying leads	YG2A18-100UA5XLEAX	2095781

Table 49: Ordering information for M12 connection cable, 5-pin (0.34 mm<sup>2</sup>)<sup>10)</sup>

Part	Type code	Part number
Female connector, straight, 0.6 m cable, male connector, straight	YF2A15-C60UB5M2A15	2096006
Female connector, straight, 1 m cable, male connector, straight	YF2A15-010UB5M2A15	2096007
Female connector, straight, 2 m cable, male connector, straight	YF2A15-020UB5M2A15	2096009
Female connector, straight, 5 m cable, male connector, straight	YF2A15-050UB5M2A15	2096010
Female connector, straight, 10 m cable, male connector, straight	YF2A15-100UB5M2A15	2096011
Female connector, straight, 15 m cable, male connector, straight	YF2A15-100UB5M2A15	2096171

Table 50: Ordering information for M12 connection cable, 8-pin (0.25 mm<sup>2</sup>)<sup>11)</sup>

Part	Type code	Part number
Female connector, straight, 0.6 m cable, straight male connector	YF2A18-C60UA5M2A18	2096031

<sup>9)</sup> Ambient operating temperature: Down to -30 °C with fixed installation.

<sup>10)</sup> Ambient operating temperature: Down to -30 °C with fixed installation.

<sup>11)</sup> Ambient operating temperature: Down to -30 °C with fixed installation.

Part	Type code	Part number
Female connector, straight, 1 m cable, straight male connector	YF2A18-010UA5M2A18	2096032
Female connector, straight, 20 m cable, straight male connector	YF2A18-020UA5M2A18	2096033
Female connector, straight, 1 m cable, straight male connector	YF2A18-050UA5M2A18	2096034
Female connector, straight, 10 m cable, straight male connector	YF2A18-100UA5M2A18	2096035

Table 51: Ordering information for connection cable (replacement of C4000 with deTec4 Prime)<sup>12)</sup>

Part	Type code	Part number
Connection cable M12, 5-pin to M12, 8-pin	DSL-1285GM25034KM1	2070987
Connection cable M12, 5-pin to M26, 7-pin	DSL-6187GM25034KM1	2070988
Connection cable M12 5-pin to M26, 12-pin	DSL-6182GM25034KM1	2070989
Connection cable M12, 8-pin to M12, 8-pin	DSL-6108GM25034KM1	2034865
Connection cable M12, 8-pin to M26, 7-pin	DSL-6130GM25034KM1	2081443
Connection cable M12 8-pin to M26, 12-pin	DSL-6129GM25034KM1	2081442

Table 52: Ordering information for distributor

Part	Type code	Part number
T distributor, 5-pin	DSC-1205T000025KM0	6030664
T distributor, 8-pin	DSC-1208T000025KM0	6058647
T-connector with pushbutton for laser alignment aid, M12, 5-pin		2077933

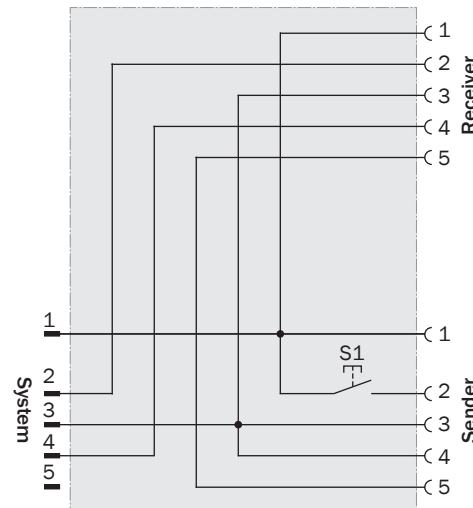


Figure 51: Internal circuitry: T-connector with pushbutton for laser alignment aid (5-pin)

Table 53: Protective cap ordering information

Part	Part number
Protective cap, M12 for female connector	5310772

<sup>12)</sup> Ambient operating temperature: Down to -30° C with fixed installation.

Table 54: Ordering information for power supply

Part	Type code	Part number
Output 24 V DC, 50 W (2.1 A), voltage supply NEC Class 2, SELV, PELV, input 120 V ... 240 V AC	PS50WE24V	7028789
Output 24 V DC, 95 W (3.9 A), voltage supply NEC Class 2, SELV, PELV, input 100 V ... 120 V/220 V ... 240 V AC	PS95WE24V	7028790

Table 55: Ordering information for reset pushbutton

Part	Type code	Part number
Reset pushbutton, M12, 5-pin	ER12-SB3C5	6045316

Table 56: Ordering information for pushbutton

Part	Part number
Pushbutton for laser alignment aid, M12, 5-pin	2082166
Pushbutton for laser alignment aid, M12, 8-pin	2082167

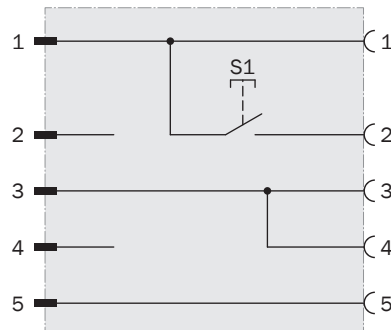


Figure 52: Internal circuitry: pushbutton for laser alignment aid (5-pin)

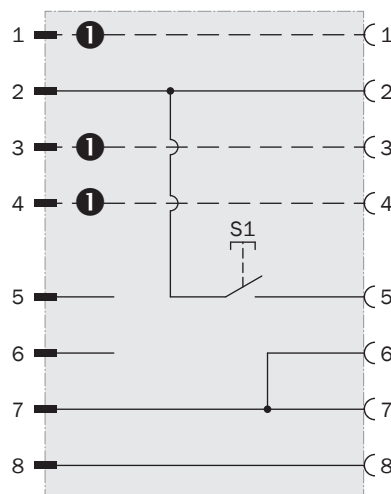


Figure 53: Internal circuitry: pushbutton for laser alignment aid (8-pin)

① Unused. The connection is not required but may be present.



## 15.5 Alignment aid

Table 57: Alignment aid ordering information

Part	Part number
Laser alignment aid AR60	1015741
Adapter	4070854

## 15.6 Deflector mirrors

### 15.6.1 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.

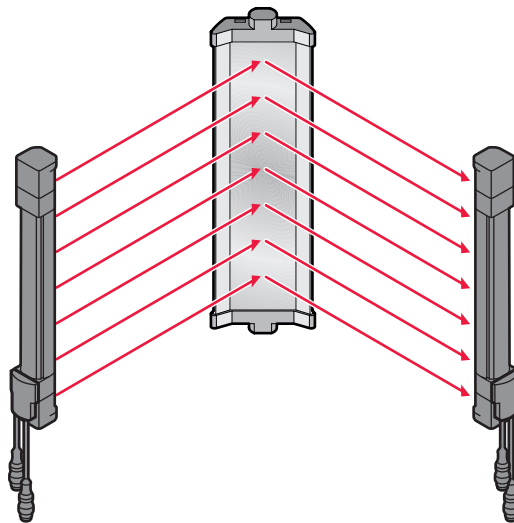


Figure 54: Example of use of deflector mirrors

#### 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 115](#)

### 15.6.2 Mounting

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

15.6.3 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 58: Scanning range with and without 1 or 2 deflector mirrors

Type	Resolution	Scanning range, typical	Scanning range with 1 deflector mirror	Scanning range with 2 deflector mirrors
PNS75, PNS125	14 mm	20 m	$D_1 + D_2 \leq 18 \text{ m}$	$D_1 + D_2 + D_3 \leq 16.2 \text{ m}$
PNS75, PNS125	30 mm	30 m	$D_1 + D_2 \leq 27 \text{ m}$	$D_1 + D_2 + D_3 \leq 24.3 \text{ m}$

Example: Recommended distance when using deflector mirrors

This example assumes a 90° beam deflection per mirror, and a protective field height of 900 mm.

When using a PNS75 deflector mirror, a distance of  $D_1, D_2, D_3 \leq 4 \text{ m}$  between the deflector mirror and the device, or between 2 mirrors is recommended.

When using a PNS125 deflector mirror, a distance of  $D_1, D_2, D_3 \leq 8 \text{ m}$  between the deflector mirror and the device, or between 2 mirrors is recommended.

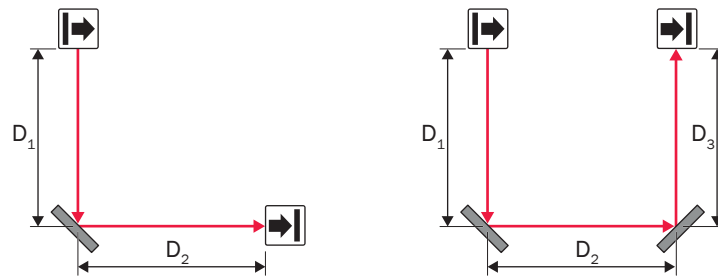


Figure 55: Recommended distance when using deflector mirrors

15.6.4 Deflector mirror PNS75 - ordering information

Table 59: Ordering information, deflector mirror PNS75

Mirror length in mm	Max. protective field height in mm	Type code	Part number
340	300	PNS75-034	1019414
490	450	PNS75-049	1019415
640	600	PNS75-064	1019416
790	750	PNS75-079	1019417
940	900	PNS75-094	1019418
1090	1050	PNS75-109	1019419
1240	1200	PNS75-124	1019420
1390	1350	PNS75-139	1019421
1540	1500	PNS75-154	1019422
1690	1650	PNS75-169	1019423
1840	1800	PNS75-184	1019424

## 15.6.5 Deflector mirror PSN125 - ordering information

Table 60: Ordering information, deflector mirror PSN125

Mirror length in mm	Max. protective field height in mm	Type code	Part number
340	300	PNS125-034	1019425
490	450	PNS125-049	1019426
640	600	PNS125-064	1019427
790	750	PNS125-079	1019428
940	900	PNS125-094	1019429
1090	1050	PNS125-109	1019430
1240	1200	PNS125-124	1019431
1390	1350	PNS125-139	1019432
1540	1500	PNS125-154	1019433
1690	1650	PNS125-169	1019434
1840	1800	PNS125-184	1019435

## 15.7 Mirror columns and device columns

### 15.7.1 Mirror columns

Table 61: Ordering information for mirror columns

Column height	Mirror length	Type code	Part number
1281.5 mm	1082 mm	PM3C13-00030000	1043453
1569 mm	1382 mm	PM3C15-00030000	1077525
1716.5 mm	1532 mm	PM3C17-00030000	1043454
2016.5 mm	1682 mm	PM3C19-00030000	1043455
2216.5 mm	1832 mm	PM3C20-00030000	1043456

#### Complementary information

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

#### Further topics

- ["Deflector mirrors", page 113](#)

### 15.7.2 Device columns

Table 62: 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 63: Cleaning agent ordering information

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

## 15.9 Test rods

Table 64: Ordering information, test rods

Part	Part number
Test rod 14 mm	2022599
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](http://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 65: 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 <input type="checkbox"/> No <input type="checkbox"/>
Are the applied directives and standards listed in the declaration of conformity?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Does the protective device comply with the required PL/SIL claim limit and PFHd in accordance with EN ISO 13849-1/EN 62061 and the required type in accordance with EN 61496-1?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Is access to the hazardous area or hazardous point only possible through the protective field of the ESPE?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Have appropriate measures been taken to protect (mechanical protection) or monitor (protective devices) any persons or objects in the hazardous area when protecting a hazardous area or hazardous point, and have these devices been secured or locked to prevent their removal?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are additional mechanical protective measures fitted and secured against manipulation which prevent reaching below, above or around the ESPE?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Has the maximum shutdown and/or stopping time of the machine been measured, specified and documented (at the machine and/or in the machine documentation)?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Has the ESPE been mounted such that the required minimum distance from the nearest hazardous point has been achieved?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are the ESPE devices properly mounted and secured against manipulation after adjustment?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are the required protective measures against electric shock in effect (protection class)?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Is the control switch for resetting the protective devices (ESPE) or restarting the machine present and correctly installed?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are the outputs of the ESPE (OSSDs or safety outputs via the network) integrated according to the required PL/SILCL in accordance with EN ISO 13849-1/EN 62061 and does the integration correspond to the circuit diagrams?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Has the protective function been checked in compliance with the test notes of this documentation?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are the specified protective functions effective at every operating mode that can be set?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are the switching elements activated by the ESPE, e.g. contactors, valves, monitored?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Is the ESPE effective over the entire period of the dangerous state?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Once initiated, will a dangerous state be stopped when switching the ESPE on or off and when changing the operating mode, or when switching to another protective device?	Yes <input type="checkbox"/> No <input type="checkbox"/>

## 17 List of figures

1.	Laser class 1.....	10
2.	Sender and receiver.....	13
3.	Device overview.....	14
4.	Sender indicators.....	18
5.	Receiver indicators.....	19
6.	Hazardous point protection.....	20
7.	Access protection.....	20
8.	Hazardous area protection.....	21
9.	Access protection with presence detection, implemented by cascade.....	21
10.	Minimum distance to the hazardous point for orthogonal (rectangular) approach to the protective field.....	25
11.	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.....	26
12.	Minimum distance from reflective surfaces.....	26
13.	Graph of minimum distance from reflective surfaces.....	27
14.	Preventing mutual interference from system ① and system ②.....	28
15.	Trouble-free operation due to beam coding.....	29
16.	Trouble-free operation due to reversed direction of transmission of system ① and system ②.....	30
17.	Trouble-free operation of 4 neighboring systems due to beam coding and reversed direction of transmission.....	30
18.	Dual-channel and isolated connection of OSSD1 and OSSD2.....	31
19.	No potential difference between load and protective device.....	32
20.	Schematic representation of operation with restart interlock.....	33
21.	Electrical diagram of the reset device.....	34
22.	Electrical diagram of external device monitoring (EDM).....	35
23.	Electrical diagram of the application diagnostic output.....	35
24.	Switch for the integrated laser alignment aid.....	37
25.	Cascade.....	38
26.	Connection diagram: 8-pin UE10-30S safety relay.....	40
27.	Connection diagram: 5-pin, T-connector, UE48-20S, with restart interlock and external device monitoring (EDM).....	41
28.	Connection diagram: cascade, 8-pin host, 5-pin guest, UE10-30S.....	42
29.	Test rod check: Step 1.....	45
30.	Test rod check: Step 3.....	45
31.	Mounting the system plug.....	49
32.	Sender and receiver must not be installed such that they are rotated 180° relative to each other.....	50
33.	Mounting the QuickFix bracket to a profile.....	54
34.	Mount FlexFix brackets to a profile frame.....	55
35.	Inserting the safety light curtain in the FlexFix brackets.....	56
36.	Mounting the FlexFix bracket to a device column (accessory).....	57
37.	Dual-channel and isolated connection of OSSD1 and OSSD2.....	59
38.	No potential difference between load and protective device.....	59
39.	System connection (male connector, M12, 5-pin).....	59
40.	System connection (male connector M12, 8-pin).....	60
41.	Extension connection (female connector M12, 5-pin).....	61
42.	Reset to factory settings.....	63
43.	Configuring beam coding.....	66
44.	QuickFix bracket: adjust vertically.....	76
45.	FlexFix bracket: adjust vertically/rotate.....	77
46.	Dimensional drawing of sender and receiver.....	100
47.	Dimensional drawing of the QuickFix bracket (2066048).....	106



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48. Dimensional drawing of the FlexFix bracket (2066614).....	107
49. Diagram minimum distance to reflective surfaces for devices with a resolution of 30 mm with weld spark guard.....	108
50. Mounting the weld spark guard.....	109
51. Internal circuitry: T-connector with pushbutton for laser alignment aid (5-pin)...	111
52. Internal circuitry: pushbutton for laser alignment aid (5-pin).....	112
53. Internal circuitry: pushbutton for laser alignment aid (8-pin).....	112
54. Example of use of deflector mirrors.....	113
55. Recommended distance when using deflector mirrors.....	114

## 18 List of tables

1.	Using the system plugs.....	17
2.	Formula for calculating the minimum distance from reflective surfaces.....	27
3.	Using the system plugs.....	39
4.	Lateral and rear mounting with the QuickFix bracket.....	53
5.	Lateral and rear mounting with the FlexFix bracket.....	55
6.	System connection pin assignment (male connector, M12, 5-pin).....	60
7.	System connection pin assignment for SP1 system plug (M12 male connector, 8-pin).....	60
8.	System plug extension connection pin assignment (M12 female connector, 5-pin).....	61
9.	Configurable functions when delivered.....	63
10.	Configuration mode.....	65
11.	DIP switches and beam coding.....	66
12.	Indication of the alignment quality.....	78
13.	LEDs on the sender in normal operation (sender and receiver are connected to each other by a wire).....	80
14.	LEDs on the receiver during normal operation.....	80
15.	Indications on the sender when switching on.....	84
16.	Indications on the receiver when switching on.....	85
17.	Indication of the alignment quality.....	86
18.	LEDs on the sender in normal operation (sender and receiver are connected to each other by a wire).....	86
19.	LEDs on the receiver during normal operation.....	87
20.	Fault indication on the sender.....	88
21.	Fault indication on the receiver.....	89
22.	General system data.....	93
23.	Technical specifications, sender.....	94
24.	Technical specifications, receiver.....	94
25.	Operating data.....	96
26.	Response time for a single device.....	96
27.	Power consumption, sender and receiver.....	97
28.	Maximum lengths of cable for wire cross-section 0.34 mm <sup>2</sup> , copper wire.....	98
29.	Weight of sender and receiver .....	99
30.	Dimensions based on the protective field height, sender and receiver.....	100
31.	Example of type code.....	101
32.	Ordering information for deTec4 Prime, resolution 14 mm.....	101
33.	Ordering information for deTec4 Prime, resolution 30 mm.....	102
34.	Ordering information for deTec4 Prime, resolution 14 mm.....	102
35.	Ordering information for deTec4 Prime, resolution 30 mm.....	102
36.	Ordering information for deTec4 Prime, resolution 14 mm.....	103
37.	Ordering information for deTec4 Prime, resolution 30 mm.....	103
38.	Ordering information for deTec4 Prime, resolution 14 mm.....	103
39.	Ordering information for deTec4 Prime, resolution 30 mm.....	104
40.	Ordering information for deTec4 Prime, resolution 14 mm.....	104
41.	Ordering information for deTec4 Prime, resolution 30 mm.....	105
42.	Brackets ordering information.....	106
43.	Mounting accessories ordering information.....	107
44.	Formula for calculating the minimum distance to reflective surfaces for devices with a resolution of 30 mm with weld spark guard.....	108
45.	Weld spark guard ordering information.....	108
46.	SP1 system plug ordering information.....	109
47.	Ordering information for M12 connecting cable, 5-pin (0.34 mm <sup>2</sup> ) .....	109
48.	Ordering information for M12 connecting cable, 8-pin (0.25 mm <sup>2</sup> ) .....	110
49.	Ordering information for M12 connection cable, 5-pin (0.34 mm <sup>2</sup> ) .....	110

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50. Ordering information for M12 connection cable, 8-pin (0.25 mm <sup>2</sup> ) .....	110
51. Ordering information for connection cable (replacement of C4000 with deTec4 Prime) .....	111
52. Ordering information for distributor.....	111
53. Protective cap ordering information.....	111
54. Ordering information for power supply.....	112
55. Ordering information for reset pushbutton.....	112
56. Ordering information for pushbutton.....	112
57. Alignment aid ordering information.....	113
58. Scanning range with and without 1 or 2 deflector mirrors.....	114
59. Ordering information, deflector mirror PNS75.....	114
60. Ordering information, deflector mirror PSN125.....	115
61. Ordering information for mirror columns.....	115
62. Ordering information for device columns.....	115
63. Cleaning agent ordering information.....	116
64. Ordering information, test rods.....	116
65. Note on specified standards.....	118

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