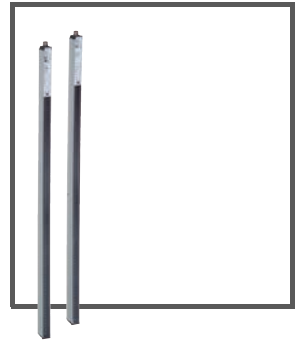


MANUAL

Safety light curtain SLCT



With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

1	Introduction.....	5
2	Declaration of conformity	6
2.1	Declaration of conformity	6
2.2	Conforms to EN/IEC 17050.....	6
3	Safety.....	7
3.1	Intended use	7
3.2	General safety instructions	7
4	Product Description	9
4.1	Use and application	9
4.2	Displays and controls	11
4.3	Interfaces and connections	12
4.4	Delivery package	13
5	Installation.....	14
5.1	Preparation	14
5.2	Assembly	17
5.3	Connection and operating mode setting	19
5.3.1	Signal outputs on the receiver unit.....	20
5.3.2	Signal inputs on the transmitter unit.....	21
5.3.3	Signal inputs on the receiver unit.....	22
5.3.4	Typical circuits	24
6	Commissioning.....	25
6.1	Functional testing	25
6.2	Multiple positions	26
7	Maintenance and Repair	28
7.1	Maintenance	28
7.2	Repair	28
8	Troubleshooting.....	29
8.1	Troubleshooting.....	29

9	Appendix.....	30
9.1	Technische Daten.....	30
9.2	Profile length and weight	33
9.3	Dimensional drawing.....	34
9.4	Designation code	35
9.5	Response times	37
9.6	Periodic checks	38
9.7	Application checklist.....	38
9.8	Accessories.....	40
9.8.1	Mounting Aid OMH-SLCT-01	41
9.8.2	Mounting Aid OMH-SLCT-02	42
9.8.3	Mounting Aids OMH-SLCT-03 and OMH-SLCT-04	43
9.8.4	Connecting cable.....	44
9.8.5	Alignment aid.....	45
9.8.6	Test rod	46
9.9	Standards.....	47

1 Introduction

Congratulations

You have chosen a device manufactured by Pepperl+Fuchs. Pepperl+Fuchs develops, produces and distributes electronic sensors and interface modules for the market of automation technology on a worldwide scale.

Before you install this device and put it into operation, please read the operating instructions thoroughly. The instructions and notes contained in this operating manual will guide you step-by-step through the installation and commissioning procedures to ensure trouble-free use of this product. By doing so, you:

- guarantee safe operation of the device
- can utilize the entire range of device functions
- avoid faulty operation and associated errors
- reduce costs from downtimes and incidental repairs
- increase the effectiveness and operating efficiency of your plant.

Store this operating manual somewhere safe in order to have it available for future work on the device.

Directly after opening the packaging, please ensure that the device is intact and that the package is complete.

Contact

If you have any questions about the device, its functions, or accessories, please contact us at:

Pepperl+Fuchs GmbH
Lilienthalstraße 200
68307 Mannheim
Telephone: +49 621 776-4411
Fax: +49 621 776-274411
E-Mail: fa-info@pepperl-fuchs.com

Symbols used

The following symbols are used in this manual:



Note!

This symbol draws your attention to important information.



Handling instructions

You will find handling instructions beside this symbol

2 Declaration of conformity

2.1 Declaration of conformity

This product was developed and manufactured under observance of the applicable European standards and guidelines.

Note!

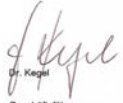
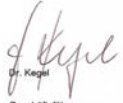
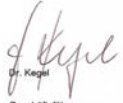
A Declaration of Conformity can be requested from the manufacturer.

The product manufacturer, Pepperl+Fuchs GmbH, D-68307 Mannheim, has a certified quality assurance system that conforms to ISO 9001.



ISO9001

2.2 Conforms to EN/IEC 17050

Konformitätserklärung / Declaration of Conformity nach EN ISO/IEC 17050-1:2004 / in accordance with EN ISO/IEC 17050-1:2004							
Konformitätserklärung / Declaration of Conformity: PF08CERT1281							
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This Declaration of Conformity is only valid in connection with the valid datasheet and/or instruction of Pepperl+Fuchs, for all Pepperl+Fuchs products that are relevant to the EC-directive 2004/108/EG (EMC) and 2006/42/EG (Machines)							
Die Pepperl+Fuchs GmbH, Lilienthalstr. 200, 68307 Mannheim, Deutschland erklärt hiermit in alleiniger Verantwortung, daß alle richtlinien-relevanten Produkte mit den angegebenen Normen oder normativen Dokumenten übereinstimmen und, wenn notwendig, von einer zuständigen Stelle freigegeben wurden.							
We, Pepperl+Fuchs GmbH, Lilienthalstr. 200, 68307 Mannheim, Germany hereby declare under our sole responsibility that all directive relevant products are in accordance with the listed harmonized standards or normative documents and, where necessary, a competent body has been released.							
Angewandte harmonisierte Normen : Applied harmonized standards							
Siehe gültiges Datenblatt, Betriebsanleitung See valid datasheet, instruction							
 Reg. Nr. 14 780-02	<table border="0"> <tr> <td> Hersteller Unterschrift : Signature of manufacturer </td> <td>  Dr. Adolphs </td> <td>  Dr. Kegel </td> </tr> <tr> <td> Funktion des Unterzeichners : Function of the signer </td> <td> Geschäftsführer Managing Director </td> <td> Geschäftsführer Managing Director </td> </tr> </table>	Hersteller Unterschrift : Signature of manufacturer	 Dr. Adolphs	 Dr. Kegel	Funktion des Unterzeichners : Function of the signer	Geschäftsführer Managing Director	Geschäftsführer Managing Director
Hersteller Unterschrift : Signature of manufacturer	 Dr. Adolphs	 Dr. Kegel					
Funktion des Unterzeichners : Function of the signer	Geschäftsführer Managing Director	Geschäftsführer Managing Director					
Datum / date : November 2008							
							

Note!

See technical data for applied harmonized standards.

3 Safety

3.1 Intended use

The SLCT safety light curtain may only be used in accordance with its intended purpose as non-contact safety equipment (NCSE) for securing hazardous areas and dangerous locations.

If used for any other purpose, the intended function of the system can no longer be guaranteed.

In addition to the notes in these instructions, the safety regulations, standards and other regulations concerning the application must be taken into consideration.

3.2 General safety instructions

Only instructed specialist staff may operate the device in accordance with the operating manual.

The following basic instructions must be observed at all times:

- The device must not be commissioned until the manual has been read and understood
- The device must not be used out of specification without suitable protective measures
- Tampering with the device is not permitted
- Do not remove the warning instructions or rating plates

Before selecting and using the product, an assessment must be made to determine whether it is suitable for the application in question. Pepperl+Fuchs has no influence on the selection and use of this product. Liability is therefore restricted to the consistent quality of the product.

The product must be regularly checked and maintained by specialist personnel. The outcome of inspection and maintenance work must be documented. Only original spare parts from Pepperl+Fuchs may be used for repairs.

Use only recommended original accessories. see chapter 9.8

The operating company bears responsibility for observing locally applicable safety regulations.

This device contains electrostatically-sensitive components. Opening the device for maintenance and repair work may only be undertaken by specialist personnel.

User modification and or repair are dangerous and will void the warranty and exclude the manufacturer from any liability. If serious faults occur, stop using the device. Secure the device against inadvertent operation. In the event of repairs, return the device to your local Pepperl+Fuchs representative or sales office.



Note!

Avoid electrostatic discharge through unprotected contact with the modules.

Components destroyed by electrostatic discharge will render the warranty null and void.

The protection of the system and operating personnel is not ensured if the module is not used according to its intended purpose.



Note!

Observe the laws and guidelines applicable for the use or the intended purpose. The device is only approved for appropriate and intended use. Ignoring these instructions will void any warranty and absolve the manufacturer from any liability.

Store the device in the original packaging when not in use. This offers the device optimal protection against impact and moisture.



Note!

Disposal

Electronic waste is hazardous waste. When disposing of the equipment, observe the current statutory requirements in the respective country of use, as well as local regulations.

4 Product Description

4.1 Use and application

Technical specifications

- Type 2 AOPD in accordance with EN IEC 61496-1
- Self-testing
- Obstacle size (depending on type) 14 mm, 30 mm, 60 mm, 90 mm
- Protection field heights up to 1200 mm (SCLT14)
Protection field heights up to 2400 mm (SLCT30, SLCT60, SLCT90)
- Protection field grids 100 mm (SLC14, SLC30)
- Protection field grids 300 mm (SLC60, SLC90)
- Selectable startup/restart interlock
- Selectable relay monitor
- Simple layout
- IP65 protection
- 2 OSSDs (Output Signal Switching Devices)

Description

The SLCT safety light curtain consists of a transmitter and receiver. The protection field is formed by infra-red light beams sent from the transmitter unit to the receiver unit. The distance between the individual beams determines the minimum obstacle size (14, 30, 60 and 90) that will be reliably detected in the protective field area.

The transmitter unit contains a certain number of transmitter diodes that emit protective beams. The number of transmitter diodes is determined by the protection field height and size of the obstacle. The A/B mode function allows the use of two safety light curtains in close proximity.

The receiver unit detects the transmitted beams, controls the two OSSD safety outputs and carries out tests to ensure safety.

In addition to the displays behind the front panel of the receiver unit, there is one PNP output, which indicates operational readiness, a dirty lens, or fault states. If an internal fault occurs in the receiver unit, this output switches on and off at a frequency of 5 Hz. If an external fault occurs, this output switches on and off at a frequency of 1 Hz. If the received signal is too weak (e.g. due to a dirty lens), the output switches on and off at a frequency of 2.5 Hz.

The test input on the transmitter initiates a test sequence. The input is activated when 24 V DC is applied to the input for a defined period of time. See chapter 9.1

The relay monitor (RM) and restart (RI) inputs allow monitoring of the switching elements connected externally to the OSSDs and activation of the startup/restart interlock function.

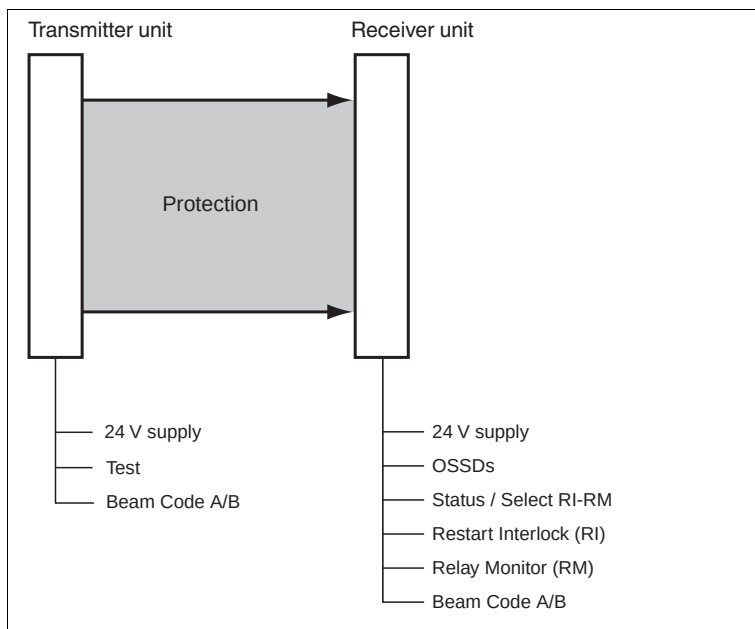


Figure 4.1 Schematic diagram of a detection device of the series SLCT

4.2 Displays and controls

The transmitter unit has two LEDs to display its operating status.

The receiver unit has five LEDs to display its operating status.

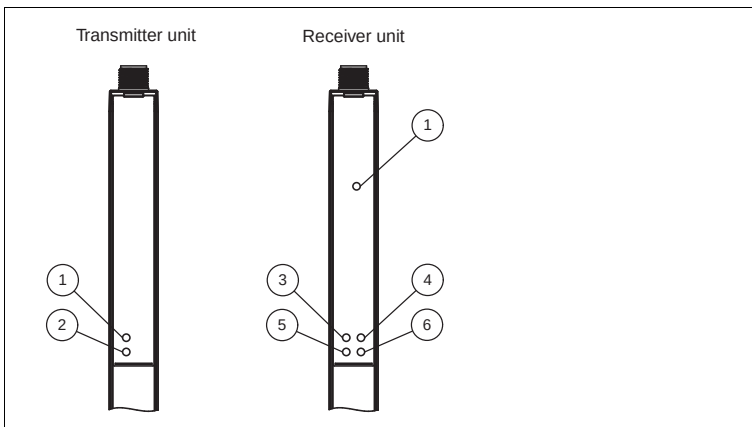


Figure 4.2 Displays from the transmitter unit and receiver unit

Description of the LED indicators

No.	Designation	LED color	Meaning
1	Power	Green	Transmitter and receiver operating
2	A/B mode, status	Yellow	Off: Mode A On: Mode B Indicator flashes with 1 Hz: Test time exceeded or A/B mode input level change Indicator flashes with 5 Hz: Internal fault
3	OSSD OFF	Red	OSSDs switched off
4	OSSD ON	Green	OSSDs switched on
5	Restart/status	Yellow	On: Protection field clear; system ready to start Indicator flashes with 1 Hz: External fault Indicator flashes with 2.5 Hz: Below weak signal strength level Indicator flashes with 5 Hz: Internal error
6	Mode A/B	Yellow	Off: Mode A On: Mode B

4.3 Interfaces and connections

The electrical connections of the safety light curtain are made using M12 connectors. The transmitter has a 4-pin connector and the receiver an 8-pin connector.

Connect the power supply and the test signal to the transmitter unit. In addition, the mode can be selected via the A/B mode input.

Connect the fail-safe outputs (OSSD), the status/select output and the inputs for the startup enable, relay monitor and A/B mode to the receiver unit.

The housing profile is connected internally to +24 V and 0 V with approx. 2.3 MOhm// 33 nF. Internal varistors limit any surges that occur at approx. 85 V. A separate grounding or connection between the housing and functional ground is not required.

Transmitter:

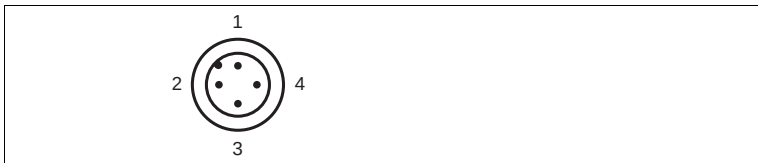


Figure 4.3 Pin assignment transmitter unit

- 1 24 V DC
- 2 Mode A/B
- 3 0 V DC
- 4 Test

Receiver:

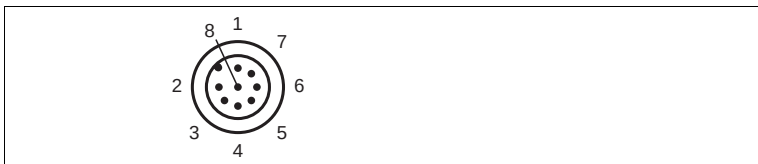


Figure 4.4 Pin assignment receiver unit

- 1 Restart Interlock (RI)
- 2 24 V DC
- 3 Relaismonitor (RM)
- 4 Status / Select RI-RM
- 5 OSSD 1
- 6 OSSD 2
- 7 0 V DC
- 8 Mode A/B

4.4 Delivery package

The delivery package contains:

- Packaging unit 1: Transmitter:
- Packaging unit 2: Receiver:
- Operating instructions
- Test rod

Bracket and cable are not included in the delivery package. Visit [for a selection of compatible mounting brackets and recommended cables](#).

5

Installation

5.1

Preparation

Minimum distance

In accordance with EN ISO 13855, the minimum distance S is calculated as follows:

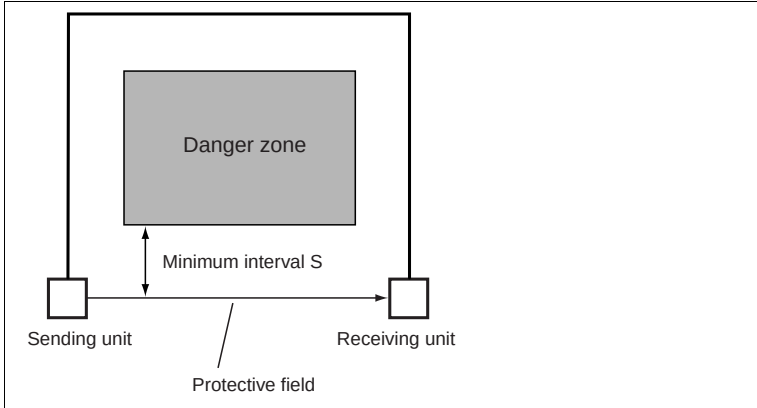


Figure 5.1 Minimum distance between NCSE and hazardous area

In accordance with prEN ISO 13855 and EN 999, the following applies:

$$S = K \times T + C$$

$$T = (t_1 + t_2)$$

Accordingly:

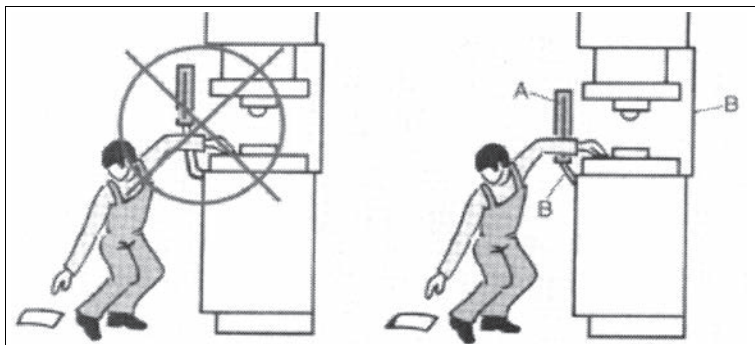
S	Minimum safety distance in mm between hazardous area and protection field
K	Constant in mm/s, based on the speed at which body parts approach the machine
C	additional distance in mm This distance depends on how far a person can enter into the danger area before the protective device triggers.
T	Total response time of the protective device in s
t ₁	Response time of the safety light curtain (max. 54 ms, see chapter 9.1) e.g. 20 ms (semiconductor OSSD) or 40 ms (relay OSSD)
t ₂	Response time of the protective device of the machine until standstill

Notes on setting up safety light curtains

The protective equipment must be arranged in such a manner that it is impossible to reach under, reach over, or walk behind the protection field. If the distance from the safety equipment is too great, additional safety equipment must be put in place. (see illustration below).

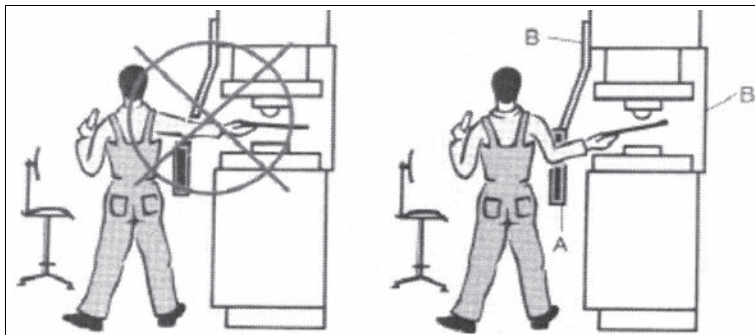
Reaching under

There must be no gaps underneath the protection field through which it is possible to reach into the hazardous area (A: Protection field, B: Mechanical protection).



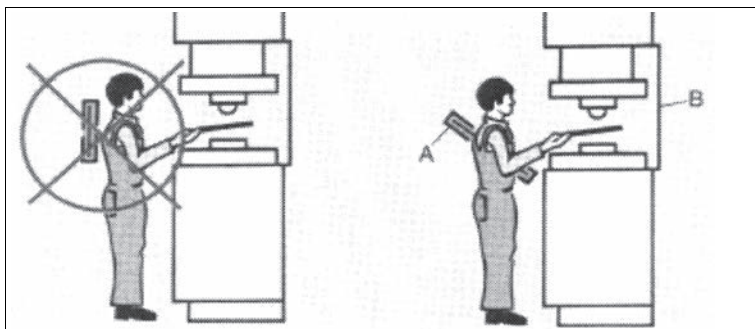
Reaching over

The user must not be able to reach over the protection field and into the hazardous area (A: Protection field, B: Mechanical protection).



Walking behind

The machine operator must not be able to walk between the light curtain and into the hazardous area (A: Protection field, B: Mechanical protection).





Note!

When positioning the safety light curtain, make sure that a minimum distance to reflective objects or surfaces is maintained.

This distance must be maintained from the protection level on all sides. This is the only way of ensuring that an object in the beam path of the safety light curtain is detected reliably. The minimum distances in the following table must be observed.

Minimum distances to object to prevent mirroring

Width of protective field/detection range [m]	Minimum distance a [mm]
0,2 - 0,4	350
> 0,4 - 3,0	135
4,0	175
5,0	220
6,0	265
8,0	350

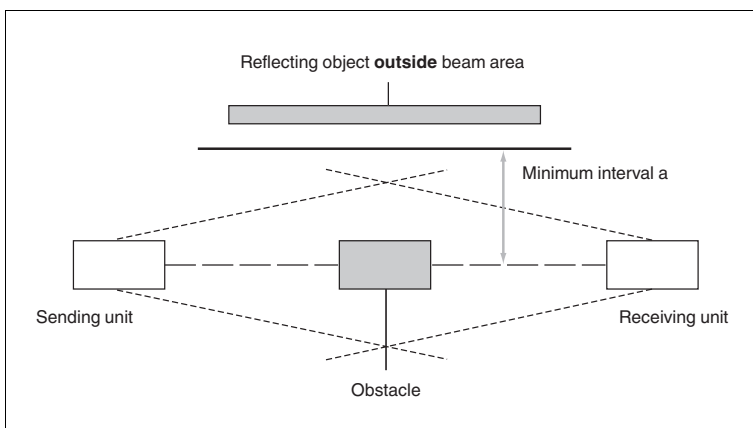


Figure 5.2 Explanation to the risk of radiation protection of remirroring

5.2 Assembly

Various brackets are available for securing the safety light curtain (see chapter 9.8).

Installation

1. Align the transmitter and receiver units so that they are parallel to one another and at the same height.
2. Align the transmitter and receiver units parallel with one another.
3. The weak signal indicator helps with correct alignment.

When installing the safety light curtain in a danger zone, a minimum distance must be maintained between the protection field and the danger zone. This distance will guarantee that movements that pose a danger to a person can be brought to a stop before that person comes in contact with the source of danger..

The distance is calculated from the lag time of the machine, the response time of the safety light curtain and the speed of movement of the person entering the hazardous area (EN ISO 13855, EN ISO 13857).

Vertical approach

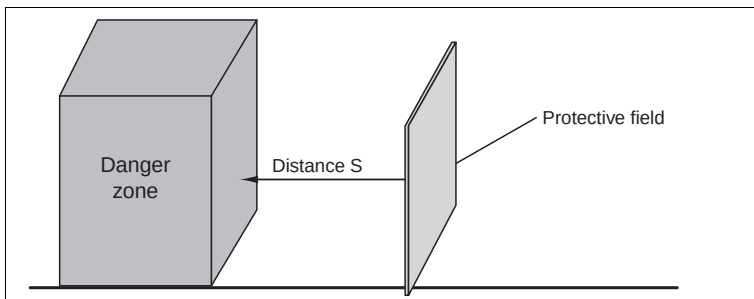


Figure 5.3 Explanation of the safety distance in a vertical arrangement of the protective field

When $K = 2000 \text{ mm/s}$ and $C = 0 \text{ mm}$ for SLCT14...

or $C = 128 \text{ mm}$ for SLCT30...

the calculation formula for a distance S of 105 mm up to and including 500 mm is:

$$S = 2000 \text{ mm/s} * (t_1 + t_2) + C$$



Note!

If S is greater than 500 mm, then $K = 1600 \text{ mm/s}$ must be used for calculations:

$$S = 1600 \text{ mm/s} * (t_1 + t_2) + C$$

S must be at least 500 mm. Lower results must be corrected to a minimum distance of 500 mm.

Example: vertical layout

$$t_1 = 50 \text{ ms}$$

$$t_2 = 300 \text{ ms}$$

Hand protection $C = 128 \text{ mm}$

$$S = 2000 \text{ mm/s} * (350 * 10^{-3} \text{ s}) + 128 \text{ mm}$$

$$S = 700 \text{ mm} + 128 \text{ mm} = 828 \text{ mm}$$

The minimum distance between protection field and hazardous area must therefore be **828 mm**. In accordance with OSHA 1910.217 and ANSI, the minimum distance S is calculated as follows:

$$S = K * T + D$$

Where:

- S Minimum distance in inches (in) (1 inch = 25.4 mm)
- K Approach speed of body parts = 63 in/s
- T Total response time of the protective device in s
- C Penetration depth in accordance with the detection capability of the safety light curtain (see ANSI B11.1-1988).

Parallel approach

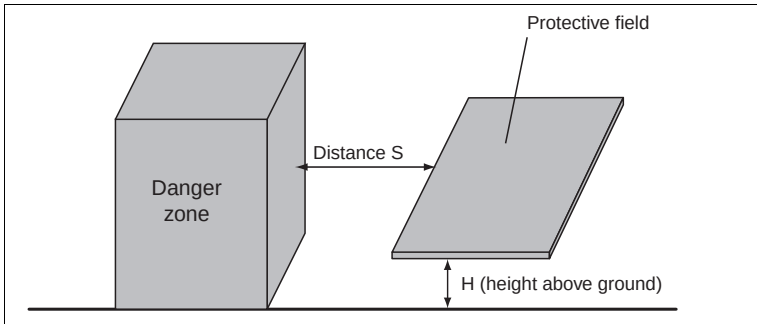


Figure 5.4 Explanation of the safety distance in a horizontal arrangement of the protective field

If the safety light curtain is aligned in a horizontal position, the safety distance will also depend on the height of the light curtain above the floor. The maximum height H must not exceed 1000 mm.



Note!

If H is greater than 300 mm, there is a risk that access will be possible under the safety light curtain.

This must be considered in the risk analysis, otherwise additional protection will be required.

The safety distance is calculated as follows:

$$S = 1600 \text{ mm/s} * (t_1 + t_2) + (1200 \text{ mm} - 0.4 H)$$

5.3 Connection and operating mode setting

Both the power supply and the system settings can be connected to the transmitter and receiver. The following operating mode settings are also available:

- **Startup interlock operating mode**
- **Relay monitor operating mode**
- **A/B operating mode**

Startup interlock operating mode



Note!

When the input is open, the startup/restart interlock is activated.

The startup/restart interlock ensures that after the power supply has been turned on, or after an interruption in the protection field, the operational readiness status is signaled when the protection field is free and the startup enable has to be activated in order for the safety light curtain to switch on the OSSDs.



Note!

The function can be activated or deactivated at the 8-pin connector of the receiver SLCTs.

An NC contact between the restart and + 24 V DC input is required to trigger the startup/restart interlock. The startup/restart interlock function does not work if the restart input is connected to the status/select output. If the input is not connected, the startup/restart interlock is activated see chapter 5.3.4.

Relay monitor operating mode



Note!

An open relay monitor input results in a fault. The yellow indicator LED flashes at a frequency of 1 Hz in the event of a fault.

The relay monitor monitors the switching positions of the two output relays. If the switching position of the relay does not match the signal from the OSSDs, the system switches to safe mode. The status LED indicates that safe mode is active.



Note!

The function can be activated or deactivated at the 8-pin connector of the receiver SLCTs.

NC contacts from the switching elements must be placed between 24 V DC and the relay monitor input in order to activate the relay monitor. The relay monitor function is deactivated if the relay monitor input is connected to the status/select output.

A/B operating mode



Note!

If the A/B mode input is open, the system operates in mode A.

Mode A or mode B must be configured both on the transmitter and on the receiver. The modes are used to prevent mutual interference from adjacent SLCT safety light curtains. See chapter 6.2.

The operating mode is selected by connecting the A/B mode input. When connected to 0 V (recommended) or an open input, the safety light curtain operates in mode A.

5.3.1

Signal outputs on the receiver unit

Status/Select RI-RM output

The output indicates the same states as the restart/status indicator.

This signal output indicates operational readiness and is active when the protection field is free and startup enable can be activated in order to switch on the OSSD. Internal or external faults and a dirty lens, are also signaled at this output.

If an external fault occurs, the output switches on and off at a frequency of 1 Hz. The following faults may be the cause:

- Relay monitor faulty
- Low supply voltage
- Short or crossed circuits at the OSSD outputs
- Level change at the mode input during operation

Internal faults cause the output to switch on and off at a frequency of 5 Hz.

If the safety light curtain is not adjusted correctly or the front lenses are not clean, the output switches on and off at a frequency of 2.5 Hz.

The output is also used to define the preset operating mode during startup. Bypassing this output to the restart and/or relay monitor inputs deactivates the relevant operating mode.

OSSDs

The receiver has two safe outputs, which are short circuit and cross circuit proof. The OSSDs switch off as soon as a light beam is interrupted. The switching time specifications appear in chapter see chapter 9.5 .

5.3.2 Signal inputs on the transmitter unit

The control inputs on the transmitter unit must be connected to NC contacts that switch at 24 V DC. The function is triggered if the external contact is open for a specific time.

Test input



Note!

During operation without a startup/restart interlock, the test time must be limited to 150 ms.

The test input is used to start a complete test of the safety light curtain. During this process, the OSSDs are switched off and all system components are checked.

Fault messages from the transmitter unit are acknowledged by initiating a test.



Note!

A complete test is also carried out when the operating voltage is switched on. This also applies to the receiver unit, which does not have a test input.

The time constraints of the test signal must be maintained for a test to be successful (→ see Figure 5.5 on page 21). On an SLCT30-600 safety light curtain, for example, the time between the test requirement and the response to the OSSDs is a minimum of 6 ms and a maximum of 18 ms. A test input actuation time of less than 0.02 s or more than 2.4 s switches the transmitter to an error state.



Note!

In the event of an error, an error reset can be triggered by activating the input between 1.2 s and 2.4 s.

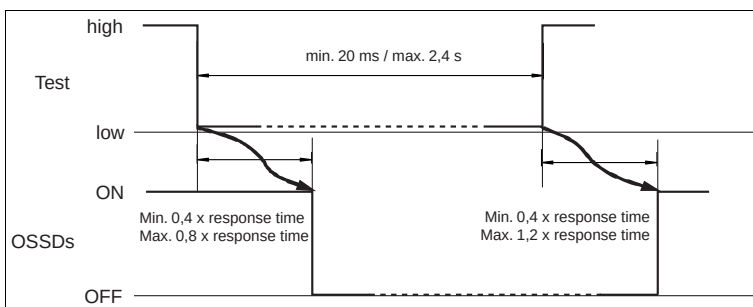


Figure 5.5 Graphs of the OSSD switching states when initiating a test or reset

A/B mode input

The A/B mode input is located both on the transmitter and on the receiver. If the input is open or connected to 0 V, the safety light curtain operates in mode A. The inputs must be connected to the supply voltage to switch to mode B.

After the power supply is switched on, the transmitter or receiver selects mode A or mode B, depending on the applied voltage.



Note!

Make sure that the transmitter and receiver are operating in the same mode.

If the level at the input changes during operation, this is identified as a fault and the system switches to safe mode.

5.3.3

Signal inputs on the receiver unit

The control inputs on the receiver unit must be connected to NC contacts that switch at 24 V DC. The function is triggered if the external control contact is open for a defined period.

Restart (RI), startup/restart interlock input

The startup/restart interlock prevents the OSSDs from switching to ON after the protection field is cleared or after the power supply is turned on when the protection field is free. The safety function is only activated once the startup enable button has been pressed.



Note!

If there are **no** people in the hazardous area and the hazardous area is vacant, the startup enable can be issued.

Position the startup enable button by the hazardous area so that

- the hazardous area is clearly visible and
- activation from within the hazardous area is not possible or cannot initiate a response (protection field is interrupted when the button is pressed).

An NC contact that switches the power supply must be connected to the input to activate the function. To disable the function, the input must be connected to the status/select output. An open input also activates the startup/restart interlock.

The input signal time is monitored and the signal should be active for 0.2 s to 1.2 s.

In the event of an error, an error reset can be triggered by pressing the button between 1.2 s and 2.4 s.

Relay monitor input

Auxiliary contacts on switching elements connected downstream of the OSSDs can be connected to the relay monitor input so that these elements can be monitored. Use NC contacts (see chapter 5.3.4). All monitored switching elements must be connected in series. One end of this series connection must be connected to the positive power supply and the other end to the relay monitor input.

The monitoring contacts on the external switching elements must guarantee a reliable contact at a voltage of 20 V DC and a current of 5 mA. A surge voltage strength of 6 kV must be guaranteed between the monitoring contacts and other contacts connected to a low voltage according to the Low Voltage Directive.

If the external switching element does not actuate within 200 ms, this is identified as a fault and safe mode is activated.

To disable the function, the input must be connected to the status/select output. An open input also activates the relay monitor function.

A/B mode input

The mode input is located both on the transmitter and on the receiver. If the input is open or connected to 0 V, the safety light curtain operates in mode A. The inputs must be connected to the supply voltage to switch to mode B.

After the power supply is switched on, the transmitter or receiver selects mode A or mode B, depending on the applied voltage. Make sure that the transmitter and receiver are operating in the same mode

If the level at the input changes during operation, this is identified as a fault and the system switches to safe mode.

5.3.4

Typical circuits

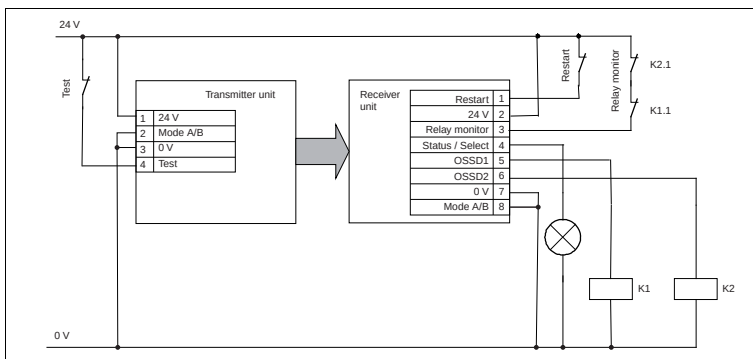


Figure 5.6 Connection example with relay monitor and restart in Mode A

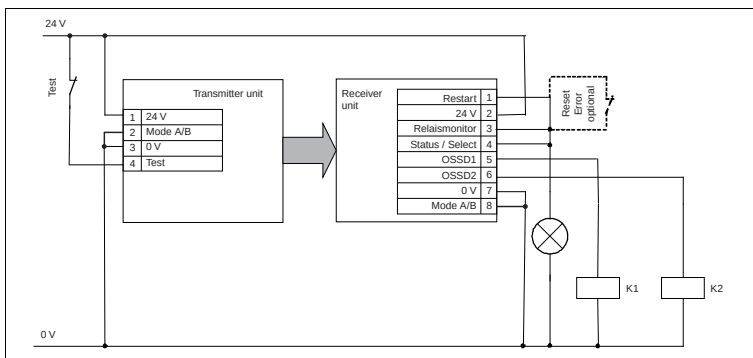


Figure 5.7 Connection example without relay monitor and without restart in Mode A

6 Commissioning

6.1 Functional testing



1. Check whether the transmitter and receiver are aligned parallel to one another and are at the same height.
2. Switch on the safety light curtain when the protection field is clear.
3. Adjust the transmitter and receiver so that the reception signal exceeds the weak signal strength.
 If the reception signal falls below this level, the yellow restart/status LED on the receiver flashes.
4. Check whether the two OSSD outputs switch on correctly. The message **'Ready to start'** appears unless this operating mode is deactivated by an external circuit.
5. Use the accompanying test rod to test the detection capability of the safety light curtain. (see chapter 9.8.6).
6. Check the effectiveness of the switch-off function of the safety light curtain and the response time of the safety function when a beam is interrupted.



Note!

If you are using startup/restart interlock mode, test whether the lock is enabled when the power is turned on and after the protection field is interrupted.

Check the function of the test input when the protection field is free. The OSSDs must switch off when 24 V is applied to the test input. Switch on the OSSDs again after the test is concluded successfully.

6.2

Multiple positions



Note!

If several safety light curtains/safety light grids are operating close to each other, care must be taken to prevent any mutual interference.

The illustrations below show the preferred layout options.

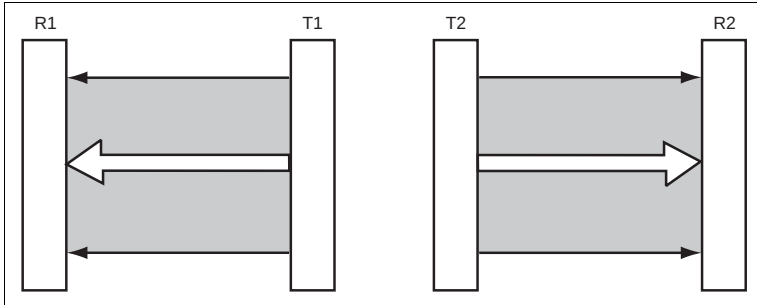


Figure 6.1 Multiple layout with the same beam coding (Mode)

If transmitter and receiver from two safety light curtains are operated in **different** modes, a position can be selected according to the illustrations below.

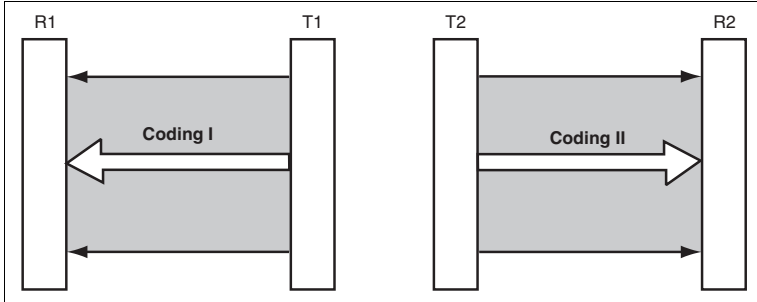


Figure 6.2 Multiple arrangements with different beam coding (Mode)

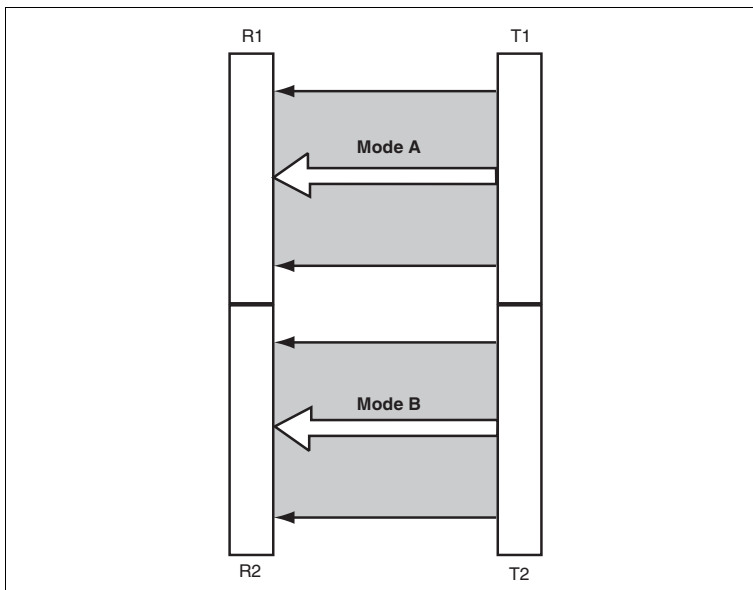


Figure 6.3 Head to head arrangement with different beam coding (Mode)



Caution!

Position with different beam coding

To prevent dangerous operating conditions, select a different beam coding (Mode) on both transmitter and receiver. Operating in this position with the same beam coding may lead to undefined protection fields with the result that the safety function cannot be guaranteed.

When operating two safety light curtains with different modes (A and B) another arrangement is possible by positioning the transmitter and receiver directly on top of each other. The connecting plugs extend outwards in the opposite direction. The SLCT30 provides a continuous protection field that is divided into 2 security areas. This arrangement can be configured using safety light curtains with a maximum protection field height of 1200 mm per strip so the height of the continuous protection field can reach a maximum of 2400 mm.

7 Maintenance and Repair

7.1 Maintenance

The safety light curtain is maintenance free.

The prescribed periodic checks must be performed and documented. The checks must determine whether the components are fitted securely and whether the optical surfaces are clean.



Note!

Use a damp, soft, lint-free cloth to clean the surfaces, especially the lens. Alcohol or mineral spirits may be used as cleaning fluids. Other cleaning agents are not permitted as they may damage the mirror surfaces.

7.2 Repair

The devices must not be repaired, changed or manipulated. If there is a defect, the product must always be replaced with an original device.



Note!

If it appears that safe operation of the sensor system is no longer possible, it must be taken out of operation and secured against inadvertent use.

8 Troubleshooting

8.1 Troubleshooting



Note!

Always carry out a function check on the device after rectifying a fault.

If a fault occurs, press the test contact (Reset). The receiver removes the fault state by performing a system reset.

If this process does not succeed, switch off the power supply for at least 1 second. After switching the power back on again, attempt to return to normal mode.

Eliminating sources of noise

Fault source	Cause	Action
Transmitter: Status display flashes with 1 Hz	External fault: a) Test signal faulty b) A/B mode input error	a) Check test sequence b) Check wiring A/B input mode
Transmitter: Status display flashes with 5 Hz	Internal error	Briefly interrupt power supply or press the restart button. If the error occurs again, send for repair.
Receiver: Status display flashes with 5 Hz	Internal error	Briefly interrupt power supply or press the restart button for approx. 1.5 s. If the error occurs again, send for repair.
Receiver: Status display flashes with 2.5 Hz	Weak signal fault	Clean the front panels and adjust the transmitter and receiver units.
Receiver: Status display flashes with 1 Hz	External error: a) Relaismonitor error b) Low voltage c) A/B mode input error d) OSSD error	a) Check relay monitor connection b) Check the supply voltage c) Check wiring A/B input mode d) Check the OSSDs for crossed or short circuits
Receiver: OSSD status LED permanently red	Beam interrupted or adjustment error	Remove object from protection field or adjust transmitters and receivers.
Receiver: "Ready to start" status indicator cannot be acknowledged	Faulty restart button connection	Check restart connection

9

Appendix

9.1

Technische Daten

General specifications

Effective detection range	0.2 ... 8 m
Light source	IREDD
Light type	modulated infrared light , 850 nm
Error: 'attrid' nicht vorhanden	Error: 'attrid' nicht vorhanden
Tests	EN IEC 61496, IEC 61508 part 1,2,3,4, EN ISO 13849, EN 50178, EN 60870-5-1, EN 61000-6-3 Die aufgeführten Normen beziehen sich auf den aktuellen Ausgabestand.
Safety type according to IEC/EN 61496	2
Safety Integrity Level (SIL)	SIL2 (IEC 61508)
Performance level (PL)	PL d (EN ISO 13849-1)
Error: 'attrid' nicht vorhanden	Error: 'attrid' nicht vorhanden
Protection field height	See chapter 9.2
Operating mode	Startup/restart disable, deactivateable
Detectable obstacle size (resolution)	SLCT14: 14 mm; SLCT30: 30 mm; SLCT60: 60 mm; SLCT90: 90 mm
Angle of divergence	5 °
Ambient light limit	Not sensitive to ambient light in accordance with EN 61496-2

Functional safety related parameters

Safety Integrity Level (SIL)	SIL 2
Performance level (PL)	PL d
Category	Cat. 3
Mission Time (T_M)	20 a

Indicators/operating means

Operation indicator	green: Power on
Function indicator	Green: OSSD ON , Red: OSSD OFF
Status indicator	Emitter unit: LED yellow: Mode, test or error Receiver: LED yellow: Start readiness, function reserve or error

Electrical specifications

Operating voltage	24 V DC (-20%, +30%) ; Power supply with safe isolation: 24 V DC The upstream power supply for an safety light curtain must be capable of withstanding power failures of up to 20 ms.
No-load supply current	Emitter unit: ≤ 150 mA Receiver: ≤ 150 mA (outputs open)
Power consumption	Emitter unit: 5 W Receiver: 15 W
Protection class	III , IEC 61140

Inputs on the transmitter unit

Test input	
Input format	Break contact
Switching voltage	24 V DC (acting on the contact)
Input current	5 mA
Activation time	0,02 s ... 2,4 s
Mode A/B input	
Function	Mode A: open or 0 V Mode B: 24 V DC, 5 mA

Inputs on the receiver unit

Relais monitor input	
Input format	Break contact
Switching voltage	24 V DC (acting on the contact)
Activation current	5 mA
Activation time	200 ms
Start release input	
Input format	Break contact
Switching voltage	24 V DC (acting on the contact)
Activation current	5 mA
Activation time	0,2 ... 1,2 s
Mode A/B input	
Function	Mode A: open or 0 V Mode B: 24 V DC, 5 mA

Outputs on the receiver unit

OSSD output	
Output format	pnp-semiconductor, monitored for short and cross circuits
Switching voltage	ON: $U_B - 2\text{ V}$ OFF: $< 1\text{ V}$
Switching current (max.)	ON: max. 0.1 A OFF: $< 5\text{ }\mu\text{A}$
Load inductance (max.)	$1,0\text{ H}$
Load capacity (max.)	220 nF
Note	The outputs are permanently monitored by short $120\text{ }\mu\text{s}$ sampling pulses. You must ensure that this has no effect on the following circuit.
Message output	
Output format	pnp-semiconductor, short-circuit protected
Switching current	$0,1\text{ A}$

Ambient conditions

Ambient temperature	$-30 \dots 60\text{ }^{\circ}\text{C}$ ($-22 \dots 140\text{ }^{\circ}\text{F}$)
Storage temperature	$-30 \dots 70\text{ }^{\circ}\text{C}$ ($-22 \dots 158\text{ }^{\circ}\text{F}$)
Relative humidity	max. 95% , not condensing

Mechanical specifications

Housing length L	See chapter 9.2
Degree of protection	IP65 , For indoor use only
Connection	Emitter unit: 4-pin, M12 x 1 connector Receiver: 8-pin, M12 x 1 connector Cable cross section min. 0.25 mm^2 Max. cable length 50 m
Material	
Housing	extruded aluminum section , Silver anodized
Optical face	Plastic pane , Transparent polycarbonate
Mass	See chapter 9.2

9.2 Profile length and weight

Profile length and weight

Protection field height [mm]	Overall length of the transmitter / receiver unit [mm]	Weight of transmitter / receiver unit [g]
100	219	140
200	319	200
300	419	250
400	519	310
500	619	370
600	719	430
700	819	480
800	919	540
900	1019	600
1000	1119	650
1100	1219	710
1200	1319	760
1300	1425	820
1400	1525	880
1500	1625	940
1600	1725	990
1700	1825	1050
1800	1925	1100
1900	2025	1160
2000	2125	1210
2100	2225	1270
2200	2325	1320
2300	2425	1380
2400	2525	1440

9.3

Dimensional drawing

Safety light curtain SLCT14-...

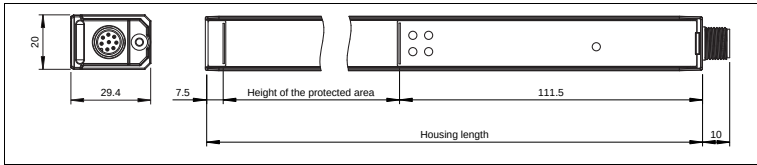


Figure 9.1 Dimensions of the Safety Light Curtain SLCT14

Safety light curtain SLCT30, SLCT60, SLCT90 (protection field height up to 1200 mm)

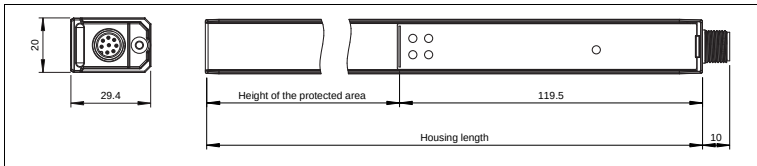


Figure 9.2 Dimensions of the Safety Light Curtains SLCT30, SLCT60 or SLCT90 with height of the protected area up to 1200 mm

Safety light curtain SLCT30, 60, 90 (protection field height above 1200 mm)

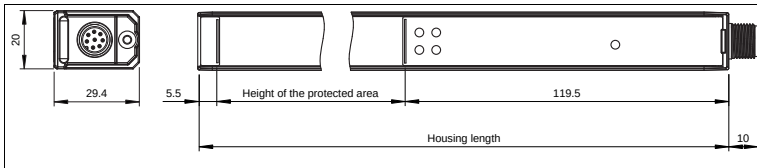


Figure 9.3 Dimensions of the Safety Light Curtains SLCT30, SLCT60 or SLCT90 with height of the protected area greater than 1200 mm

Line markings on the transmitter strip and receiver strip indicate the limits of the protection field. For protection field heights up to 1200 mm on the SLCT30, SLCT60 and SLCT90, the profile end represents one of the two markings.

9.4 Designation code

Safety light curtains from the SLCT series are designated a code according to the following format:

S L C T XX - YYYY - Z - AAAA

Here, **XX** represents the obstacle size, **YYYY** the protection field height, **Z** the device type, i.e. transmitter (T) or receiver (R) and **AAAA** a design specification which applies in individual cases.

Obstacle size	Protection field height	Device type	Design specification
XX [mm]	YYYY [mm]	Z	AAAA
14	100, 200, 300, ... 1200	T, R	No specification
30	100, 200, 300, ... 2400	T, R	No specification
60	300, 600, 900, ... 2400	T, R	No specification
90	300, 600, 900, ... 2400	T, R	No specification

Designation code

Obstacle size [mm]	Protection field height [mm]	Complete	Transmitter (-T)	Receiver (-R)
14	100	SLCT14-100	SLCT14-100-T	SLCT14-100-R
	200	SLCT14-200	SLCT14-200-T	SLCT14-200-R
	300	SLCT14-300	SLCT14-300-T	SLCT14-300-R
	400	SLCT14-400	SLCT14-400-T	SLCT14-400-R
	500	SLCT14-500	SLCT14-500-T	SLCT14-500-R
	600	SLCT14-600	SLCT14-600-T	SLCT14-600-R
	700	SLCT14-700	SLCT14-700-T	SLCT14-700-R
	800	SLCT14-800	SLCT14-800-T	SLCT14-800-R
	900	SLCT14-900	SLCT14-900-T	SLCT14-900-R
	1000	SLCT14-1000	SLCT14-1000-T	SLCT14-1000-R
	1100	SLCT14-1100	SLCT14-1100-T	SLCT14-1100-R
	1200	SLCT14-1200	SLCT14-1200-T	SLCT14-1200-R

Obstacle size [mm]	Protection field height [mm]	Complete	Transmitter (-T)	Receiver (-R)
30	100	SLCT30-100	SLCT30-100-T	SLCT30-100-R
	200	SLCT30-200	SLCT30-200-T	SLCT30-200-R
	300	SLCT30-300	SLCT30-300-T	SLCT30-300-R
	400	SLCT30-400	SLCT30-400-T	SLCT30-400-R
	500	SLCT30-500	SLCT30-500-T	SLCT30-500-R
	600	SLCT30-600	SLCT30-600-T	SLCT30-600-R
	700	SLCT30-700	SLCT30-700-T	SLCT30-700-R
	800	SLCT30-800	SLCT30-800-T	SLCT30-800-R
	900	SLCT30-900	SLCT30-900-T	SLCT30-900-R
	1000	SLCT30-1000	SLCT30-1000-T	SLCT30-1000-R
	1100	SLCT30-1100	SLCT30-1100-T	SLCT30-1100-R
	1200	SLCT30-1200	SLCT30-1200-T	SLCT30-1200-R
	1300	SLCT30-1300	SLCT30-1300-T	SLCT30-1300-R
	1400	SLCT30-1400	SLCT30-1400-T	SLCT30-1400-R
	1500	SLCT30-1500	SLCT30-1500-T	SLCT30-1500-R
	1600	SLCT30-1600	SLCT30-1600-T	SLCT30-1600-R
	1700	SLCT30-1700	SLCT30-1700-T	SLCT30-1700-R
	1800	SLCT30-1800	SLCT30-1800-T	SLCT30-1800-R
	1900	SLCT30-1900	SLCT30-1900-T	SLCT30-1900-R
	2000	SLCT30-2000	SLCT30-2000-T	SLCT30-2000-R
	2100	SLCT30-2100	SLCT30-2100-T	SLCT30-2100-R
	2200	SLCT30-2200	SLCT30-2200-T	SLCT30-2200-R
	2300	SLCT30-2300	SLCT30-2300-T	SLCT30-2300-R
	2400	SLCT30-2400	SLCT30-2400-T	SLCT30-2400-R
Obstacle size [mm]	Protection field height [mm]	Complete	Transmitter (-T)	Receiver (-R)
60	300	SLCT60-300	SLCT60-300-T	SLCT60-300-R
	600	SLCT60-600	SLCT60-600-T	SLCT60-600-R
	900	SLCT60-900	SLCT60-900-T	SLCT60-900-R
	1200	SLCT60-1200	SLCT60-1200-T	SLCT60-1200-R
	1500	SLCT60-1500	SLCT60-1500-T	SLCT60-1500-R
	1800	SLCT60-1800	SLCT60-1800-T	SLCT60-1800-R
	2100	SLCT60-2100	SLCT60-2100-T	SLCT60-2100-R
	2400	SLCT60-2400	SLCT60-2400-T	SLCT60-2400-R
90	300	SLCT90-300	SLCT90-300-T	SLCT90-300-R
	600	SLCT90-600	SLCT90-600-T	SLCT90-600-R
	900	SLCT90-900	SLCT90-900-T	SLCT90-900-R
	1200	SLCT90-1200	SLCT90-1200-T	SLCT90-1200-R
	1500	SLCT90-1500	SLCT90-1500-T	SLCT90-1500-R
	1800	SLCT90-1800	SLCT90-1800-T	SLCT90-1800-R
	2100	SLCT90-2100	SLCT90-2100-T	SLCT90-2100-R
	2400	SLCT90-2400	SLCT90-2400-T	SLCT90-2400-R

9.5 Response times

The safety light curtain response time is shown on the rating plate.

SLCT response times

Protective field height [mm]	Response time [ms]			
	SLCT14-...	SLCT30-...	SLCT60-...	SLCT90-...
100	11	8	-	-
200	15	10	-	-
300	19	11	9	8
400	23	12	-	-
500	26	14	-	-
600	30	15	11	10
700	34	16	-	-
800	38	17	-	-
900	42	19	13	11
1000	46	20	-	-
1100	50	21	-	-
1200	54	23	15	12
1300	-	24	-	-
1400	-	25	-	-
1500	-	26	17	14
1600	-	28	-	-
1700	-	29	-	-
1800	-	30	19	15
1900	-	32	-	-
2000	-	33	-	-
2100	-	34	21	16
2200	-	35	-	-
2300	-	37	-	-
2400	-	38	23	17

The switch-on time after beam interruption without a restart function is between 80 ms and 200 ms. The time depends on the number of protective beams.

9.6 Periodic checks

The test intervals and scope of the periodic checks are determined according to requirements.



Daily check

1. Make sure the protection field is clear.
2. Activate the startup enable.
3. Interrupt the protection field inside the protection field range using the test rod. A test rod with suitable obstacle size must be used.
4. Check the entire protection field at several points parallel to the transmitter or receiver units, in particular in front of the transmitter and receiver and in the center between the transmitter and receiver.

↳ The OSSD outputs switch off.

5. Slowly move the test rod through the protection field while watching the indicators on the receiver.

↳ If the startup/restart interlock is **activated**, the yellow operational readiness indicator must **not** light up. If the startup/restart interlock is **deactivated**, the green status indicator on the OSSD display must **not** light up.



Note!

After the protection field has been cleared, the outputs must switch back on when the startup/restart interlock is **deactivated**.



Note!

The OSSD outputs must be switched on again after the protection field is cleared and the startup enable is activated.



Note!

The safety light curtain must be included in any general checks on machine safety functions. This includes checking for proper alignment and installation. In addition, check that the required response times are maintained (see chapter 9.5).

9.7

Application checklist

A list of important points should help you avoid errors when planning, setting up, and using the protective equipment. This application checklist is not complete and must be modified to suit each specific application.

Before installation

- Have all the applicable standards and regulations been observed?
- Do the technical data of the SLCT meet the requirements of the application? This especially applies to detection capability, the protection field height and the operating voltage.
- Is the overvoltage category required by EN 50178 met at the receiver unit connections?
- Is there enough space for fitting and removing components?
- Are the distances between the protection field and the hazardous area as well as the reflective surfaces maintained as required?
- Is the SLCT used indoors?

After installation

- Is the startup enable input connected when the startup/restart interlock is activated?
- Is the ready to start signal lamp connected?
- Is the test input connected?
- Is the red/green indicator for signaling the status of the OSSD outputs in a visible location?
- Are all components correctly connected?
- Has the SLCT been positioned so that the protection field cannot be bypassed and people cannot enter the hazardous area undetected?
- Is the SLCT aligned?
- Are the necessary safety distances maintained?
- Are there current limitations that prevent the contacts from welding together when using an SLC with a relay contact output?

Commissioning

- Has the detection capability of the SLCT been tested over the entire protection field height using the test rod? This test should take place at multiple locations and at least once in front of the transmitter and receiver units as well as at the central point between the transmitter and receiver units.
- Do the OSSD switch outputs trigger the requisite stop?
- Has the response time of the overall protective device been checked?

Periodic check

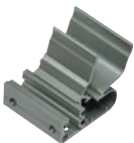
- Have the requisite tests and test intervals been determined?
- Is the detection capability of the SLCT tested regularly over the entire protection field height using the test rod?
- Are the response times checked at regular intervals?
- Is all machine safety equipment inspected at the required intervals?
- Are all checks documented?

9.8

Accessories

The following products are available as accessories:

Compatible accessories for safety light curtains from the SLCT series

No.	Designation	Illustration	Description
1	OMH-SLCT-01		Mounting aid
2	OMH-SLCT-02		Mounting aid
3	OMH-SLCT-03		Mounting aid
4	OMH-SLCT-04		Mounting aid
5	AA SLCT-01		Profile alignment tool
6	TR 14/30/50/60		Test rod

A description of the individual accessories can be found in the appendix (see chapter 9.8).

207483 2014-03

9.8.1 Mounting Aid OMH-SLCT-01

Model number: OMH-SLCT-01

The emitters/receivers can be secured using mounting aids that grip the dovetail guide. Dovetail guides are located on three sides of the profile. When mounting and aligning the unit, avoid subjecting the profile to mechanical tension.

A minimum of two mounting aids must be used to secure the emitter and receiver unit. If vibrations or shocks are expected, we recommend attaching mounting aids at intervals of 500 mm.

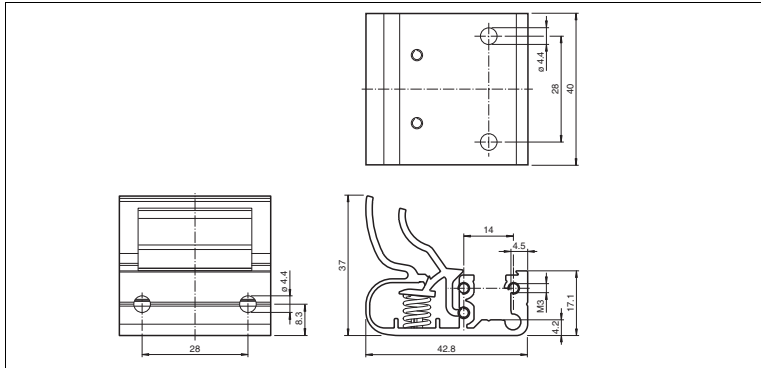


Figure 9.4 Dimensional drawing of the mounting aid OMH-SLCT-01

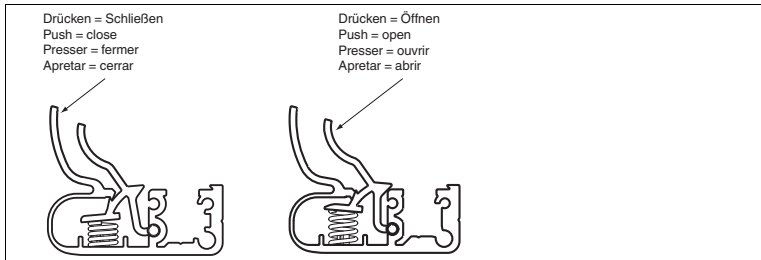


Figure 9.5 Opening and closing of the mounting aid OMH-SLCT-01

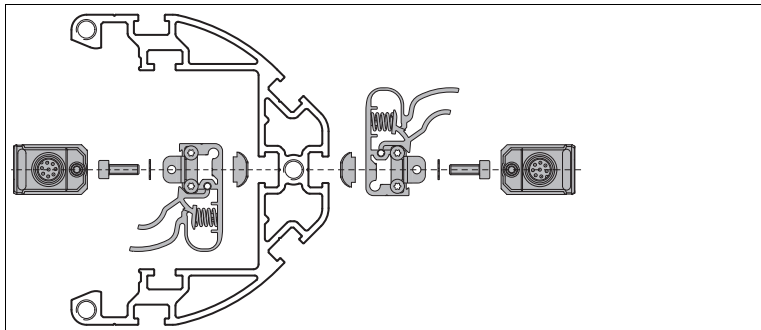


Figure 9.6 Example of mounting a mounting aid OMH-SLCT-01 to a mounting column

9.8.2 Mounting Aid OMH-SLCT-02

Model number: OMH-SLCT-02

The OMH-SLCT-02 mounting aid is used as a fixed bearing and secures the position of the light curtain in the event of thermal expansion, vibration, or shock.

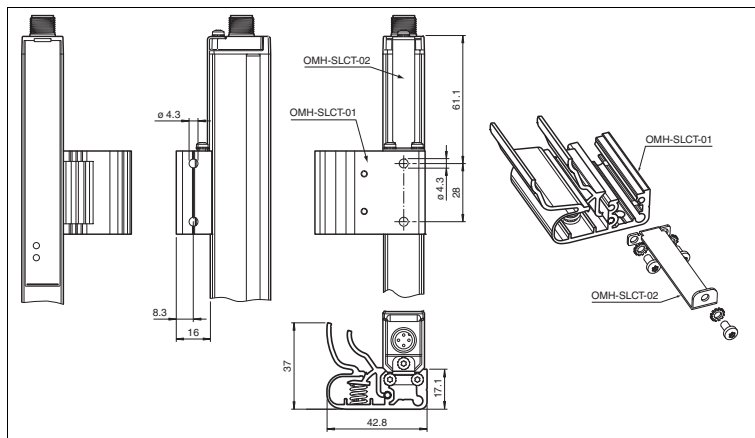


Figure 9.7 Dimensional drawing and assembly of the mounting aid OMH-SLCT-02

9.8.3

Mounting Aids OMH-SLCT-03 and OMH-SLCT-04

Model number (fixed bearing): OMH-SLCT-03

Model number (moveable bearing): OMH-SLCT-04

The longer mounting aid OMH-SLCT-03 has a higher clamping force than the shorter mounting aid OMH-SLCT-04 and is therefore the preferred option for assuming the function of the fixed bearing. A minimum of one fixed bearing and one moveable bearing is required to mount the device. If more than two mounting aids are required for reasons of stability, the use of further moveable bearings is recommended. If vibrations or shocks are expected, we recommend attaching mounting aids at intervals of 500 mm.

The mounting aid OMH-SLCT-03 can also be used to connect two light grids. If the mounting aid is to be used for this application, the metal bracket should be removed.

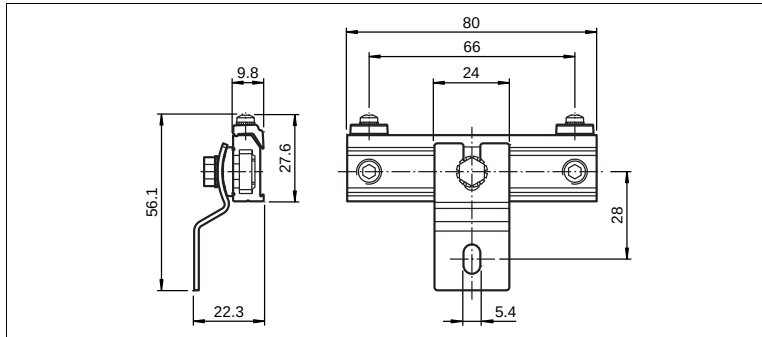


Figure 9.8 Mounting aid OMH-SLCT-03 (fixed bearing)

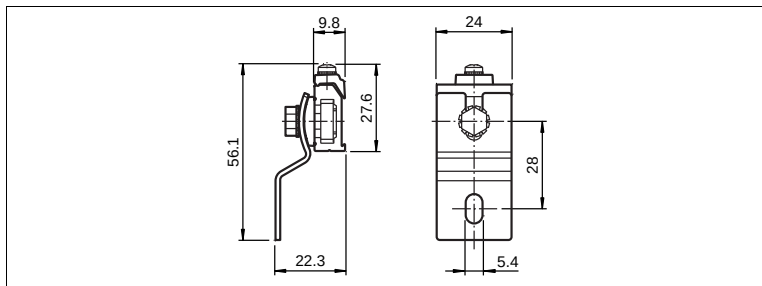


Figure 9.9 Mounting aid OMH-SLCT-04 (loose bearing)

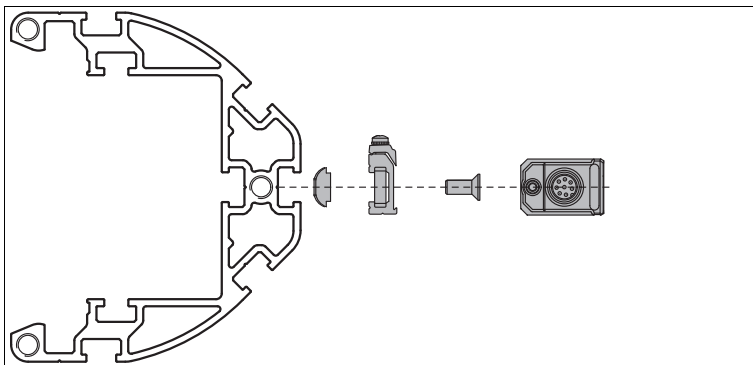


Figure 9.10 Example of mounting a mounting aid OMH-SLCT-03 or OMH-SLCT-04 to a mounting column

9.8.4

Connecting cable

Various 4-pin and 8-pin connecting cables are available in a range of lengths.

Connecting cables are not included in the delivery package of a safety light curtain.

Connecting cables for safety light curtains from the SLCT series

Use	Order code		
	Length 2 m	Length 5 m	Length 10 m
4-pin cable (transmitter)	V1-G-BK2M-PUR-UL	V1-G-BK5M-PUR-UL	V1-G-BK10M-PUR-UL
8-pin cable (receiver)	V19-G-BK2M-PUR	V19-G-BK5M-PUR	V19-G-BK10M-PUR

The specified cables are UL-certified and marked accordingly.

Alignment aid

The transmitter and receiver should always be aligned at the same height in parallel to one another. The AA-SLCT-01 alignment aid with bubble level assists the perpendicular alignment of the profile. The AA-SLCT-01 alignment aid is simply clipped into the groove on the side of the profile.

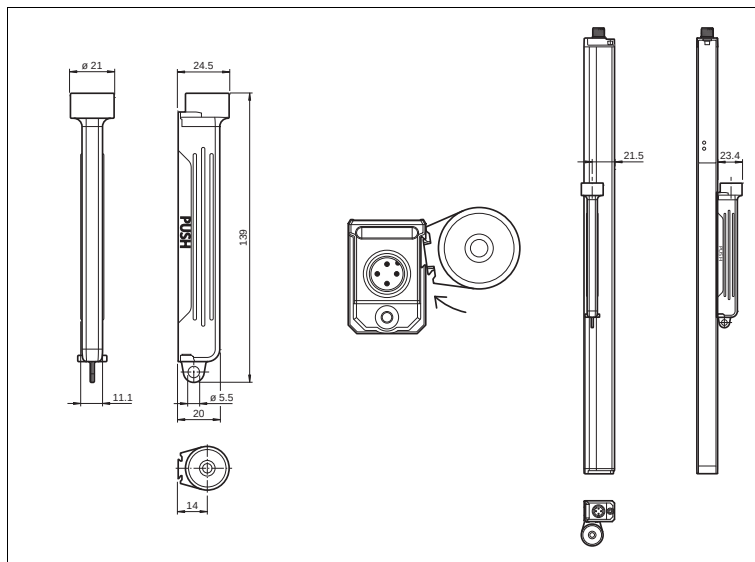


Figure 9.11 Dimensional drawing and assembly of the alignment AA-SLCT-01

9.8.6

Test rod

Order code: TR 14/30/50/60

The detection capability of a safety light curtain should be checked regularly using a test rod. The test rod must be kept next to the safety light curtain. At regular prescribed intervals, the protection field must be tested at different points over its entire height (in front of the transmitter and receivers and in the center between the transmitter and receiver) and the results must be documented.

The receiver of every SLCT safety light curtain comes with a test rod 230 mm in length. The rod is suitable for checking the detection capability of light curtains with different resolutions.

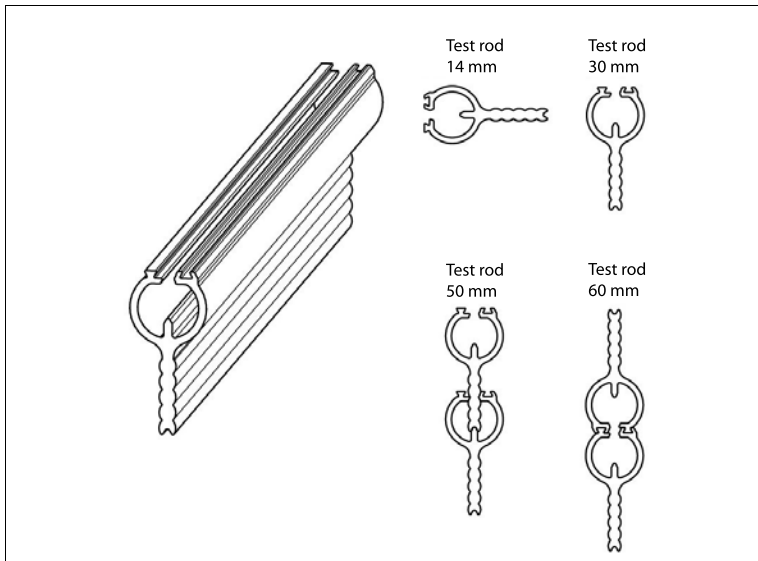


Figure 9.12 TR 14/30/50/60 test rod

9.9

Standards

The relevant laws and standards apply to the use of photoelectric protective devices. There are differences depending on the area of use. The following regulations are relevant within the EU and Germany.

Construction and equipping of protective equipment

IEC 61496-1	Safety of machinery. Electro-sensitive protective equipment
IEC 61508,	Functional safety of EEPES safety-related systems
DIN V VDE0801	Principles for computers in systems with safety tasks
DIN EN 62061	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems

Application and installation of protective devices

IEC 50178	Electronic equipment for use in power installations
DIN IEC 68	Electrical engineering; basic environmental testing procedures
DIN EN 60204-1	Safety of machinery - electrical equipment of machines
DIN EN 61140	Protection against electric shock - common aspects for installations and equipment (IEC 61140:2001 and A1:2004, modified)
DIN EN 60664-1	Coordination of the insulation of electronic equipment in low-voltage systems - Part 1: Principles, requirements and tests (IEC 60664-1:2007)
DIN EN 60068-1:1995-03	Environmental testing - Part 1: General matters and guidance
Directive 98/37/EC, from 29.12.2009 Directive 2006/42/EC	Machinery Directive
EN ISO 12100	Safety of machinery - electrical equipment of industrial machines
EN ISO 13849-1	Safety of machinery - safety relevant parts of controls- part 1: General design principles
DIN CLC/TS 62046, preliminary standard, 2005-09	Safety of machinery - Use of protective equipment to recognize the presence of people (IEC/TS 62046:2004) Safety of machinery - The positioning of protective equipment with respect to approach speeds of parts of the human body
EN999/EN ISO 13855	Safety of machinery - The positioning of protective equipment with respect to approach speeds of parts of the human body
ZH1/597	Safety rules for non-contact protective equipment on powered equipment
EN ISO 13857	Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs

In addition to the stipulations listed there may be other applicable standards for special machinery and applications that should be considered.

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