Optoelectronic safety systems for the protection of man and machine

Product information

SCHMERSAL

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Schmersal offers its customers a comprehensive range of products for optoelectronic safeguarding of hazardous areas. The company has a large program of active optoelectronic protective devices (“AOPD”), ranging from light barriers, light grids and light curtains with different functions (e.g. blanking, muting, cascading) up to laser scanners. A large range of accessories, e.g. deflecting mirrors, mounting brackets etc. helps the user fitting and using the AOPD on his specific application.

This brochure contains a brief introduction of the individual optoelectronic product families as well as the main accessories for the AOPD systems of the Schmersal Group.

The technical data of the individual devices are completed with wiring examples, e.g. in combination with safety-monitoring modules or for integration in the AS-i Safety at Work System. Appropriate components can be wired into a complete safety system.

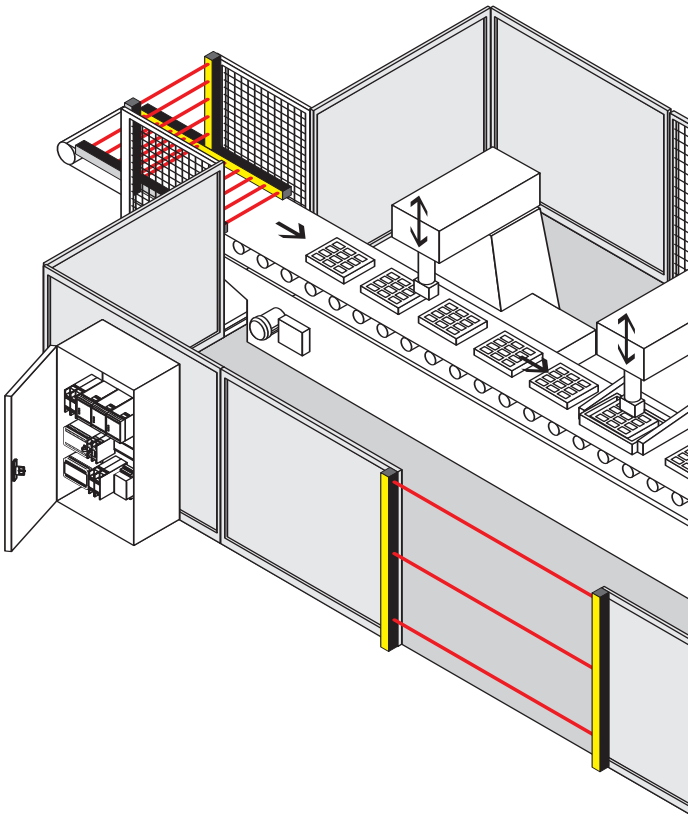
Descriptions of technical correlations, details on external control units, installation or operating instructions or similar have been provided to the best of our knowledge. However, this does not mean that any warranted characteristics or other properties under liability law may be assumed which extend beyond the “General Terms of Delivery of Products and Services of the Electrical Industry”. We trust that you will understand that the user must check our information and recommendations before using our equipment.

Subject to technical modifications and errors.

EN 61

The field of automation is subject to a permanent and innovative change of products and applications. The focus is on increasing the productivity and realising a smooth-running production process with a minimum of human interventions on machinery and systems. The ideal, a fully automatic and totally safe machine however will always remain a dream, though the robots used in production plants already are a big step towards this aim.
Human intervention and knowledge will always be required for the commissioning, monitoring and maintenance of modern industrial systems. Man however is not infallible and ignorance or lack of information, thoughtlessness or negligence often leads to damages.

For these reasons, harmonised standards, i.e. the Machinery Directive EC 98/37/EC and other regulations, were implemented at European level.
These standards aim at detecting and constructively avoiding all possible risks and hazards during the planning and project phase of machines and systems. Safety components must be used to minimise or eliminate the residual risks.
In this way, manufacturers and users are making equivalent efforts to set up an optimal process flow, which offers the highest possible protection to the operating staff. The challenge for all manufacturers of safety components is to design efficient and safe product solutions for mechanical engineers. Flaps and doors are the simplest means of access to the machine.
These separating hardguarding safety solutions offer an efficient and effective protection against hazardous movements and products being ejected from the machine. When these safety guards are opened, the machine is brought to standstill (through the corresponding safety sensor transmitting the “stop” signal to the control), which interrupts and therefore slows down the production. In case of continuous processes, which must not be interrupted, solenoid interlocks protect man and the work piece against damages.
Safety fences are not suitable for production processes requiring the material to be transported into the working area by means of conveyor belts, as it does not allow for an ergonomic and optimal work sequence.
A “virtual safety guard“ in the form of an active optoelectronic device (AOPD), e.g. a safety light curtain, is a perfect solution, offering both an optimal protection of human life and uninterrupted production process.



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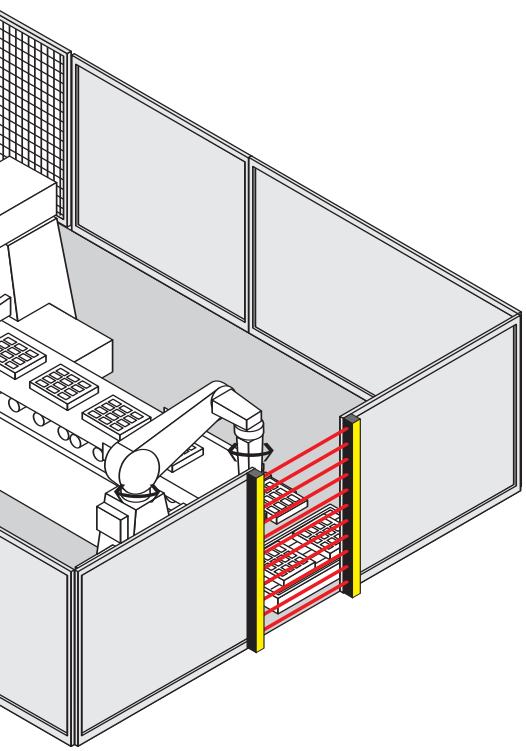
Typical applications:

- Power-driven machines
- Power-driven presses in metalworking, plastics, leather, stone working and rubber processing industry
- Folding presses and attachments
- Filter presses
- Punching machines in leather, textile and plastics processing
- Robots stations and welding booths
- Printing and injection moulding machines
- Transport engineering
- Pallet loaders and palletizers
- Materials handling and storage technology
- and so on



Depending on the application, the AOPD are used for danger point, danger zone and perimeter guarding. The user can choose from a large range of different optoelectronic safety solutions e.g. light barriers, light grids, light curtains and laser scanners.

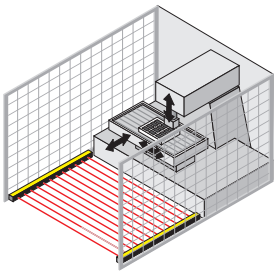
Optoelectronic

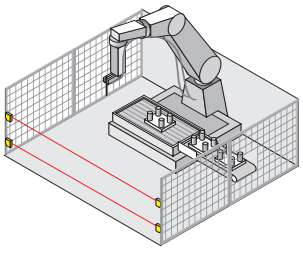
Safety light barriers

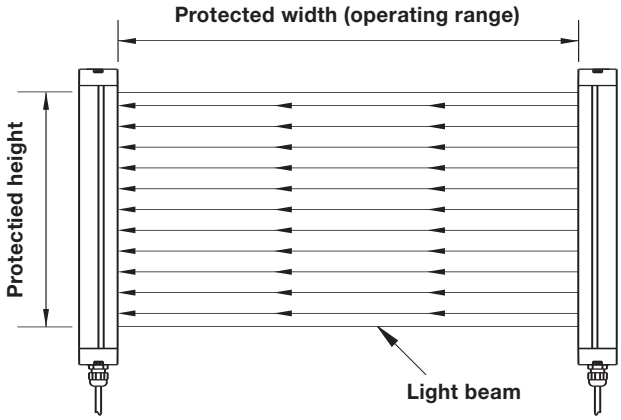
The safety light barrier systems of the SLB range are active optoelectronic protective devices (AOPD) fulfilling the Control Category 2 or 4 in accordance with EN 954-1 or EN 61496. These systems are used as entry guards on hazardous zones, danger points and entrances.
They protect human life without restricting the production flow.
Typical applications for safety light barriers are on robots, automatic-processing plants, transfer lines, rack storages and pallet loaders.
The entire safety light barrier system includes a light emitter, a light receiver and a safety-monitoring module.
The safety-monitoring module evaluates the signals of the emitter.
If the light beam is interrupted, a signal is emitted to bring the dangerous movement of the machine to standstill.
The safety-monitoring module integrates functions such as start and restart interlock as well as a contactor monitoring.
The maintenance-free safety sensors of the system with protection class IP 67 have an integrated soiling check.
Because of their small size, safety light barriers can be fitted almost everywhere.

Safety light grids / light curtains

The safety light curtains and safety light grids of the SLC and SLG meet the requirements of Control Category 2 or 4 to EN 954-1 and Type 2 or Type 4 to EN 61496.
They safeguard danger points and hazardous areas on different applications, e.g. presses, robot stations, injection moulding machines, pallet machines, etc.
In these active optoelectronic protective devices (AOPD), the emitter and receiver are fitted in two separate enclosures.
An invisible infrared signal is sent from the emitter and evaluated by the receiver. If the light beam is interrupted by an object or a person, a stop signal is emitted to bring the machine to standstill.
The protection field is defined by the height and width of the protection field. The protected height is the range between the first and last infrared light beam of a light curtain.
The protected height defines the physical size of the system to be used.
The protected width or operating range is the distance between the transmitter and receiver unit.
For an accurate detection of objects with different sizes in the hazardous area, the user can choose between light grids and light curtains with different resolutions. Here, the following rule applies: the smaller the distance between two adjacent light beams, the more accurate the detection sensitivity of the AOPD.
For the detection of body parts, a distinction is made between finger, hand and body protection.
EN 999 or EN 294 sets the biometric data for finger protection to 14 mm, for hand detection to 40 mm, for leg detection up to 70 mm and for body detection to over 70 mm.
Safety light grids with 2, 3 or 4 individual beams are generally used to detect the penetration of the entire human body.
Safety light curtains are multiple beam systems (> 5 individual beams) and can also detect smaller objects in case of intrusion into the protected field. The maintenance- free safety light curtains and light grids can be smoothly fitted using an M12 connector and have a diagnostic LED indication for status messages.
Depending on the type of safety light curtain or light grid used, the components have an integrated evaluation with start/restart interlock and contactor monitoring. Additional functions such as blanking, muting and cascading of the light curtains are available as well.
These functions are simply configured in the AOPD through the contact configuration (no configuration software required).
The SLC and SLG product series therefore offer a maximum of flexibility for safeguarding different danger points.





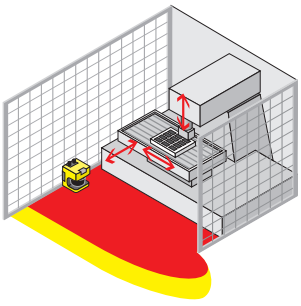


safety systems

Safety laser scanner

The safety laser scanners of the LS series are used for protection of man on machines, where dangerous movements can occur.
It is used for the horizontal and vertical protection of hazardous zones in front of or in stations and plants, e.g. tube-bending machines, industrial robots, feed points and automated guided vehicle systems (AGV's).
The safety laser scanners of the LS 30 series emit harmless, invisible laser beams. These beams are deflected through a rotating mirror, thus enabling the scanner to monitor semicircular areas.
If the laser beam detects an object (person or object) in the sensing range, the emitter registers the reflected light and calculates the time between the emission and the reception of the light. The internal evaluation uses the light propagation time and the corresponding angle information to calculate the exact position of the object in the monitored area.

In this monitored area, different warning and protection fields can be defined by means of the software.
The protection field must be adapted to the hazardous area of the machine concerned.
If a person enters the warning field, the system indicates this intrusion, however without switching-off the machine.
If a person enters the protection field, he or she is recognised by the laser scanner and the hazardous movement will be switched off.
The resolution of the LS 30 is adjustable from 30, 40, 50, 70 to 150 mm.



Important conditions for the use of optoelectronic safety devices:

In order to choose the appropriate active optoelectronic protective device (AOPD) such as light barriers, light curtains/grids and laser scanners and to use them correctly, both the requirements of the standards (EN 61496, EN 999, EN 294, C standards etc.) and product-specific features (detection sensitivity, range, etc.) must be taken into account.
AOPD's can be used, provided that:

- the dangerous movement can be stopped at all times and that it is ensured that the danger point can only be reached after the movement has come to standstill,
- the run-out time of the machine and all safety components is known,
- no objects (work pieces, sparks, liquids, etc.) can be ejected,
- the AOPD meet the requirements of Type 2 or Type 4 acc. to EN 61496,
- the danger point can only be reached by passing through the protected field of the AOPD,
- reaching over, under or through the protected field is impossible,
- the start or restart command devices are fitted in such a way that the entire hazardous area is completely visible from the outside and that it cannot be activated from outside the hazardous area
- and the safety distance is calculated and constructively applied in accordance with EN 999.

The effectiveness of the safety guard corresponds to the risk assessment, which was carried out during the planning and design phase, taking all important boundary conditions, e.g. environment, machine and function.

Safety dis

EN 999

Safety distances for light curtains

Between the interruption of a light beam and the standstill of the machine, a certain time expires. The safety light grid or light curtain must be sized and installed such that a stop would be signalled and the hazard ceased prior to a person or a body member accessing the hazard.
The standard EN 999 provides the user with detailed information about the calculation of the minimum safety distances. These include the following important influencing factors:

- run-out time of the entire system, taking the different reaction times of the individual systems into account (e.g. machine, safety-monitoring module, AOPD etc.)
- capacity of the AOPD to detect body parts (fingers, hand and entire human body)
- set-up of the safety guard in normal condition (vertical fitting), parallel condition (horizontal fitting) or at an arbitrary angle in front of the safety guard and
- the speed at which the protection field is approached.

For the calculation of the minimum safety distance **S** to the hazardous area, EN 999 presents the following general formula:

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

Where:
S the safety distance to the danger point (mm)

K the approach speed of the body or the body part (mm/s)

T the entire reaction time of the system(s)
(including the machine's run-out time, the reaction time of the safety guard and the safety-monitoring module etc.)

C additional distance (mm) in front of the safety guard

Normal approach for light curtains:
(resolution: max. 40 mm)

The minimum safety distance S is calculated in the following way:

$$S = 2000\ T + 8\ (D-14)$$

(D = resolution).

This formula applies to safety distances up to 500 mm.
The minimum safety distance Smin may not be less than 100 mm.

If the calculation produces a distance larger than 500 mm for **S**, the calculation can be repeated with a lower approach speed:

$$S = 1600\ T + 8\ (D-14)$$

In this case, Smin may not be less than 500 mm.

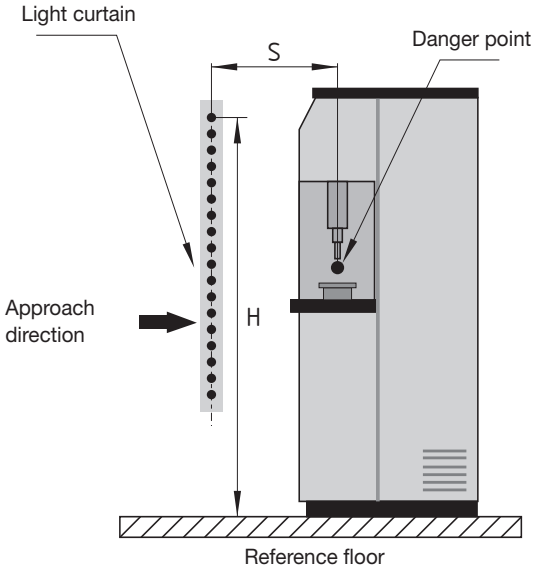
If the danger point of the machine is accessible from the top because of its particular construction, the height H of the topmost beam of the light barrier must be at least 1800 mm above the base G of the machine.

Normal approach for light curtains:
(resolution: from 40 mm up to max. 70mm)

The minimum safety distance **S** is calculated in the following way:

$$S = 1600\ T + 850$$

The height of the topmost light beam must be at least 900 mm, the height of the lowermost light beam maximum 300 mm above the bottom (for the protection of children younger than 14: 200 mm)



tance

Normal approach for light grids:
(resolution: > 70 mm)

The minimum safety distance **S** is calculated using the following formula:

$$S = 1600\ T + 850$$

For safety guards with multiple beams, height H (mm) above the reference floor of the individual beams must be applied in the following way:

Number of beams	Height above the reference floor
2	400, 900
3	300, 700, 1100
4	300, 600, 900,1200

When using light curtains or light grids, particular attention must be paid to the tampering possibilities of the safety guard and to the mechanical risks (e.g. crushing, shearing, cutting, ejection).

Horizontal approach for light curtains/grids
(resolution: > 50 mm)

The minimum safety distance **S** is calculated using the following formula:

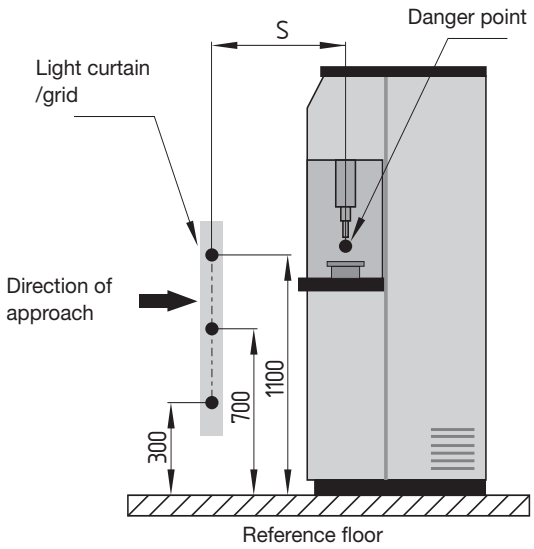
$$S = 1600\ T + 1200 - 0.4\ H$$

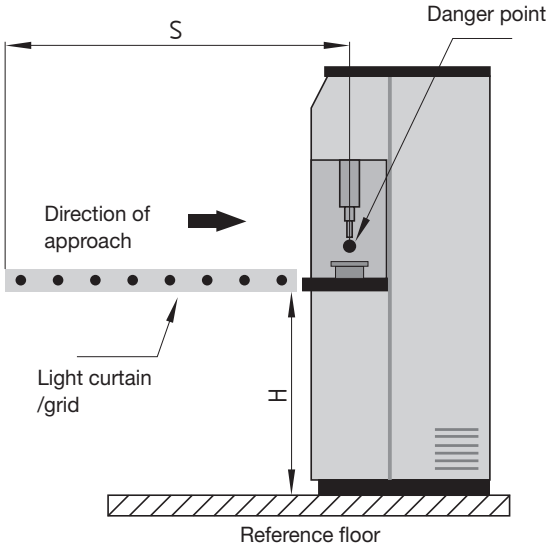
Here, Smin is 850 mm.
The lowest authorised height H depends on the resolution D of the light curtain:

$$H = 15\ (D-50)$$

For this type of safety guard, the maximum height H is 1000 mm.
In the risk analysis, special attention must be paid to the prevention of unintentional undetected access from underneath the protection field.

Further calculation examples can be found in DIN EN 999 as well as in the mounting instructions of the SLC/SLG safety sensors.





Modes of operation and functions

Master/Slave cascading

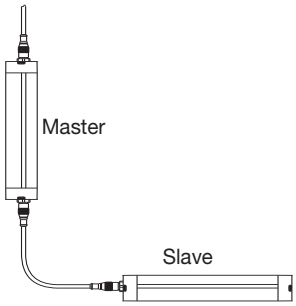
For the SLC/SLG…M/S product series, the master light curtain can be extended with another (slave) light curtain (cascading). In this way, multiple protection fields can be generated. A protection field is created between the emitter and receiver of the master as well as other protection fields between the slave components.
This device cascading provides for a comfortable and efficient protection of contiguous protection fields against reaching over or through the protection field. The slave light curtains are connected to the master by means of an M12 connector.
The master and slave light curtains are available in different sizes and resolutions and allow for almost any combination.

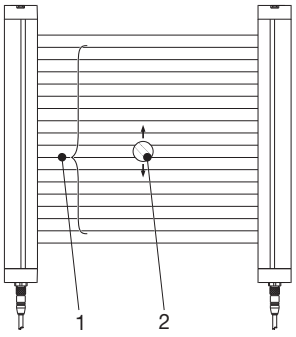
Muting

If goods or objects must be transported in or out of the hazardous area without stopping the machine, the safety light curtain must be automatically and temporarily suspended by the safety-related parts of the control system.
To this end, two or four muting sensors are used to detect whether a person is approaching the hazardous area or a transport system enters or leaves the hazardous area.
Suitable muting sensors are light barriers, proximity switches or position switches.
The integrated safety-muting controller of the safety light curtain or light grid monitors and controls the muting process.
The safety outputs are not disabled.When the muting function is used, an external muting lamp must be connected as well in order to enable the system being activated. Any malfunction of the monitored signal source will cause the OSSD's to be switched off.
Depending on the application, different light curtains with integrated muting function as well as external or internal muting sensors are available.
Detailed product information can be found in this brochure from page 33.

Blanking /Floating Blanking

If continuity of the production process is required, a part of the protection field can be blanked without triggering a stop signal
In this way, objects such as work pieces can be fed or a conveyor belt can be positioned at a fixed position in the protection field.
The integrated floating blanking function of the SLC…B light curtains enables a flexible blanking of up to three adjacent light beams in the protection field of the light curtain.
This function is required to ensure that one, two or three adjacent light beams can be interrupted at an undefined position in the protection field.
In this way, objects such as fixtures or materials with slightly varying heights can be fed through the light curtain without triggering a stop signal. Five different floating blanking functions are available. The distinguishing feature of the different modes is the number of light beams that can be interrupted by an object. In addition to that, it can be defined whether the object may interrupt the protection field permanently or only temporarily.
The interrupted light beams can be at any position in the protection field.
Aport from the first infrared light beam (the beam closest to the connector), any light beam can be used for floating blanking.
A complex programming through software and computer or complicated teach-in procedures is not required, as the floating blanking functions are configured in the connector of the AOPD's receiver unit.
When floating blanking is applied, the resolution of the light curtain changes. The technical documentation of the different light curtains includes the tables with the effective resolutions D to calculate the minimum safety distance to EN 999.
Further technical product information can be found in this brochure.





1 Floating-Blanking-Area
2 movable object

More Details

Detailed technical information at:
www.schmersal.com

Notes

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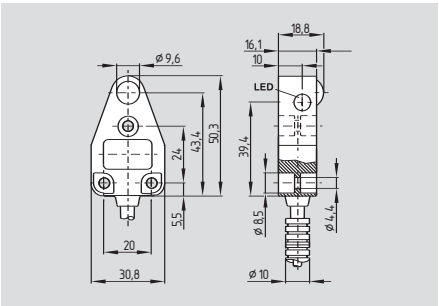
Safety light barriers

System features:

- Control Category 2 and 4 acc. to EN 954-1 or acc. to EN 61496, Type 2 and Type 4
- Up to 4 pairs of one-way light barriers can be connected
- Different functions
  - Start/Restart interlock
  - Contactor monitoring
  - Cyclic testing
- Integrated soiling check
- Status and error indication
- Signalling outputs for external indications
- Free of maintenance
- Extremely compact design
- Simple and flexible mounting and adjustment

SLB 200



- Control Category 2* to EN 954-1
- Range up to 4 m
- LEDs visible from both sides
- Protection class IP 67

Approvals

TÜV CE

Technical data

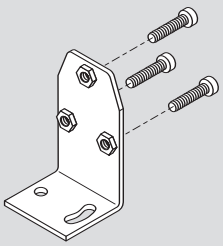
Standards:	IEC/EN 61496
Control Category:	2 *
Enclosure:	ABS 10 % GF
Enclosure dimensions:	31 x 50.5 x 19 mm
Connection:	emitter: 10 cm conductor, M 8 x 1, 3-pole coupler socket receiver: 10 cm conductor, M 8 x 1, 4-pole coupler socket
Max. cable length:	50 m
Protection class:	IP 67 to EN 60529
Response time:	30 ms *
Range:	4 m
Start/Restart interlock:	*
Contactor control:	*
Light emission wavelength:	880 nm
U_e:	24 VDC ± 20%
Safety outputs:	*
Angle of radiation:	± 4°
Min. size of object:	9 mm Ø
LED status indication:	soiling, switching condition and power on
Ambient temperature:	– 10 °C ... + 55 °C
Storage and transport temperature:	– 20 °C ... + 80 °C

* (only in combination with SLB 200-C)

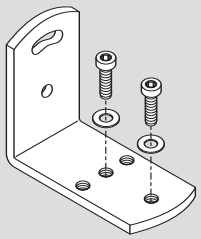
System components

SLB 200-C04-1R

Connector plug M 8 x 1 (with cable)



Mounting angle BF 31



Mounting angle BF UNI 1

Ordering details

SLB 200-①31-21

No.	Replace	Description
①	E/R	Emitter / Receiver

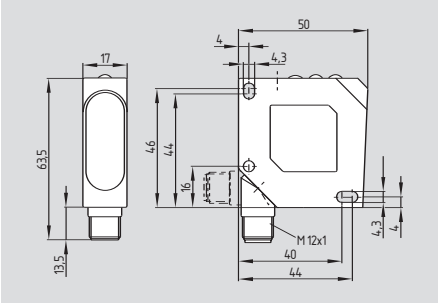
Note

The system components (safety monitoring module, cable, etc.) are not included in the delivery.

Ordering details

Monitoring of safety light barriers	
SLB 200-C04-1R	**refer to page 4-6**
Connector plug M 8 x 1	
emitter:	**KDE M8-3**
	KDE M8-3-2m
	KDE M8-3-5m
receiver:	**KDR M8-4**
	KDR M8-4-2m
	KDR M8-4-5m
Mounting angles	**BF 31**
Mounting angles universal	**BF UNI 1**

SLB 400



- Control Category 4* to EN 954-1
- Range up to 15 m
- LED switching conditions display
- Protection class IP 67

Technical data

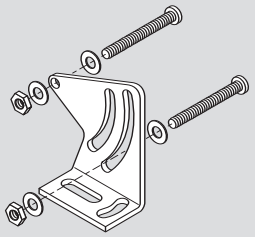
Standards:	IEC/EN 61496
Control Category:	4 *
Enclosure:	ABS
Enclosure dimensions:	50 x 50 x 17 mm
Connection:	M 12 x 1, 4-pole coupler socket, can be rotated
Max. cable length:	100 m
Protection class:	IP 67 to EN 60529
Response time:	25 ms *
Range:	15 m
Start/Restart interlock:	*
Contactor control:	*
Light emission wavelength:	880 nm
U_e:	24 VDC ± 20%
Safety outputs:	*
Angle of radiation:	± 2°
Min. size of object:	13 mm Ø
LED status indication:	soiling, switching condition and power on
Ambient temperature:	0 °C ... + 60 °C
Storage and transport temperature:	– 20 °C ... + 80 °C

* (only in combination with SLB 400-C)

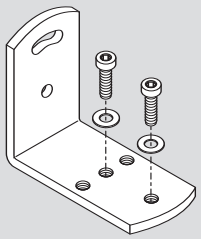
System components

SLB 400-C10-1R

Connector plug M 12 x 1 (with cable)



Mounting angle BF 50



Mounting angle BF UNI 1

Approvals

cULus CE

Ordering details

SLB 400-①50-21P

No.	Replace	Description
①	E/R	Emitter / Receiver

Note

The system components (safety monitoring module, cable, etc.) are not included in the delivery.

Ordering details

Monitoring of safety light barriers	
SLB 400-C10-1R	**refer to page 4-8**
Connector plug M 12 x 1 emitter/receiver:	**KD M12-4**
	KD M12-4-2m
	KD M12-4-5m
Mounting angles	**BF 50**
Mounting angles universal	**BF UNI 1**

SLB 200-C

- To IEC 61496
- Control Category 2 to EN 954-1, BWS-T
- Up to two pairs of light barrier devices can be connected
- 1 enabling path
- 1 signalling output
- Operating voltage 24 VDC
- Test input
- LED display of switching conditions
- Response time ≤ 30 ms
- Start/Restart interlock can be switched active or inactive
- Contactor monitoring can be switched active or inactive
- Additional cyclic testing
- Co-ordinated for use with SLB 200 R/E safety light barriers

Approvals

TÜV CE

Technical data

Standards:	IEC/EN 61496-1/-2, EN 954-1
Control category:	2
Start-up test:	yes
Start conditions:	Test button, start-reset button, on/off coding
Feedback circuit:	yes
Enclosure:	polycarbonate
Mounting:	snaps onto standard DIN rail to EN 50022
Connection:	screw terminals
Cable section:	max. 4 mm^2 (incl. conductor ferrules)
Protection class:	IP 20 to EN 60529
U_e:	24 VDC ± 20%
I_e:	180 mA
Power consumption:	–
Inputs:	test input: command device: NC contact release start/restart interlock (start/reset): enable via command device (NO contact), contactor monitoring (NC contacts)
Monitored inputs	max. 2 pairs of light barriers
Input resistance:	–
Max. cable length:	–
Test and feedback:	potential-free contact
Outputs:	1 enabling path
Enabling contacts:	1 enabling path
Utilisation category:	AC-15, DC-13
I_e/U_e:	2 A / 250 VAC, 2 A / 24 VDC
Contact load capacity:	max. 250 VAC, max. 2 A (cos φ = 1)
Switching voltage:	max. 250 VAC
Load current:	8 A
Max. fuse rating:	4 A gG D-fuse
Signalling output:	1 transistor output
Switch-on conditions:	test duration: ≤ 150 ms (without relay control) ≤ 450 ms (with relay control)
Switch-off time:	response time (complete sy.): ≤ 30 ms
Indications:	red LED for light barrier interrupted green LED for light barrier free soiling: flashing red/green
Function display:	4 LEDs
EMC rating:	conforming to EMC Directive
Max. switching frequency:	10 Hz
Overvoltage category:	II to DIN VDE 0110
Degree of pollution:	3 to DIN VDE 0110
Resistance to vibration:	10 ... 55 Hz / amplitude 0.35 mm
Resistance to shock:	10 g / 16 ms
Ambient temperature:	0 °C ... + 50 °C
Storage and transport temperature:	– 20 °C ... + 80 °C
Dimensions:	45 x 84 x 118 mm
Note:	Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Ordering details

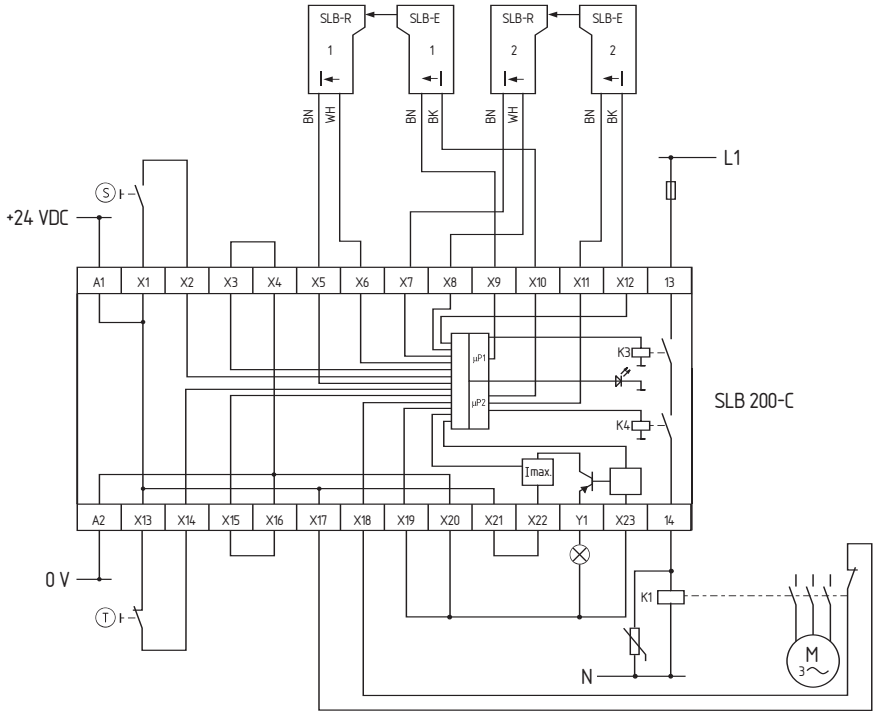
SLB 200-C04-1R ①

No.	Replace	Description
①		24 VDC

Note

- For protection in Control Category 2 to EN 954-1
- Monitoring two pairs of light barrier devices and the power contactor using the SLB 200-C safety monitoring module
- Test push button Ⓣ
  The test push button is connected to X13 and X14 in order to carry out a check of the light barrier monitoring function. The terminals X15 and X16 must be bridged.
- The wiring diagram is shown for the de-energised condition.
- Contactor monitoring
  To monitor an external contactor, the feedback circuit is connected to X17 and X18. The terminals X19 and X20 must be bridged.
- Start push button Ⓢ
  The start push button can be used to start the monitoring of the light barriers for a new start or after an interruption. The terminals X3 and X4 must be bridged.
- It is also possible to connect only one pair of light barrier devices.

Wiring diagram



Note

In order to set for the desired mode of operation and number of light barriers connected, remove the front cover of the safety monitoring module. On delivery, all switches are in position 1.

Note

The required functions can be selected by means of the internal DIP switches.

	DIP switch 1	DIP switch 2	DIP switch 3
Position 1	With contactor check	With start/restart interlock	Connection of two light barriers
Position 2	Without contactor check	Without start/restart interlock	Connection of one light barrier

SLB 400-C

- To IEC 61496
- Control Category 4 to EN 954-1, BWS-S
- Cross-wire monitoring
- ISD Integral System Diagnostics
- Operating voltage 24 VDC
- Feedback circuit to monitor external contactors
- Two short-circuit proof additional transistor outputs
- Response time ≤ 30 ms
- Start/Restart interlock can be switched active or inactive
- Contactor monitoring can be switched active or inactive
- Can be coded
- Up to 4 light barrier pairs SLB 400 can be connected

Approvals

Technical data

Standards:	IEC/EN 61496-1/-2, EN 954-1
Control category:	4
Start-up test:	yes
Start conditions:	Start-reset button, on/off coding
Feedback circuit:	yes
Enclosure:	glass-fibre reinforced thermoplastic
Mounting:	snaps onto standard DIN rail to EN 50022
Connection:	screw terminals
Cable section:	max. 4 mm² (incl. conductor ferrules)
Protection class:	terminals IP 20, enclosure IP 40 to EN 60529
U_e:	24 VDC ± 15%
I_e:	0.3 A without additional transistor outputs
Power consumption:	–
Inputs:	S1, S2
Monitored inputs	max. 4 pairs of light barriers
Input resistance:	approx. 2 kΩ to ground
Input signal „1“:	10 ... 30 VDC
Input signal „0“:	0 ... 2 VDC
Max. cable length:	100 m of 0.75 mm² conductor
Outputs:	2 enabling paths
Enabling contacts:	2 enabling paths
Utilisation category:	AC-15, DC-13
I_e/U_e:	2 A / 250 VAC, 2 A / 24 VDC
Contact load capacity:	max. 250 VAC, max. 2 A (cos φ = 1)
Switching voltage:	max. 250 VAC
Load current:	max. 2 A
Switching capacity:	max. 500 VA
Max. fuse rating:	2 A gG D-fuse
Additional outputs:	additional transistor outputs Y1, Y2, Ue – 4 V, 100 mA total, short-circuit proof, p-type
Signalling output:	2 transistor outputs, Y1 + Y2 = max. 100 mA, p-type, short-circuit proof
Switch-on time:	–
Response time:	≤ 25 ms
Monitoring for synchronism of muting sensors:	–
Indications:	ISD
Function display:	9 LEDs (ISD*)
EMC rating:	conforming to EMC Directive
Max. switching frequency:	10 Hz
Overvoltage category:	II to DIN VDE 0110
Degree of pollution:	3 to DIN VDE 0110
Resistance to vibration:	10 ... 55 Hz / amplitude 0.35 mm, ± 15 %
Resistance to shock:	30 g / 11 ms
Ambient temperature:	0 °C ... + 55 °C
Storage and transport temperature:	– 25 °C ... + 70 °C
Dimensions:	99.7 x 75 x 110 mm
Note:	Inductive loads (e.g. contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Ordering details

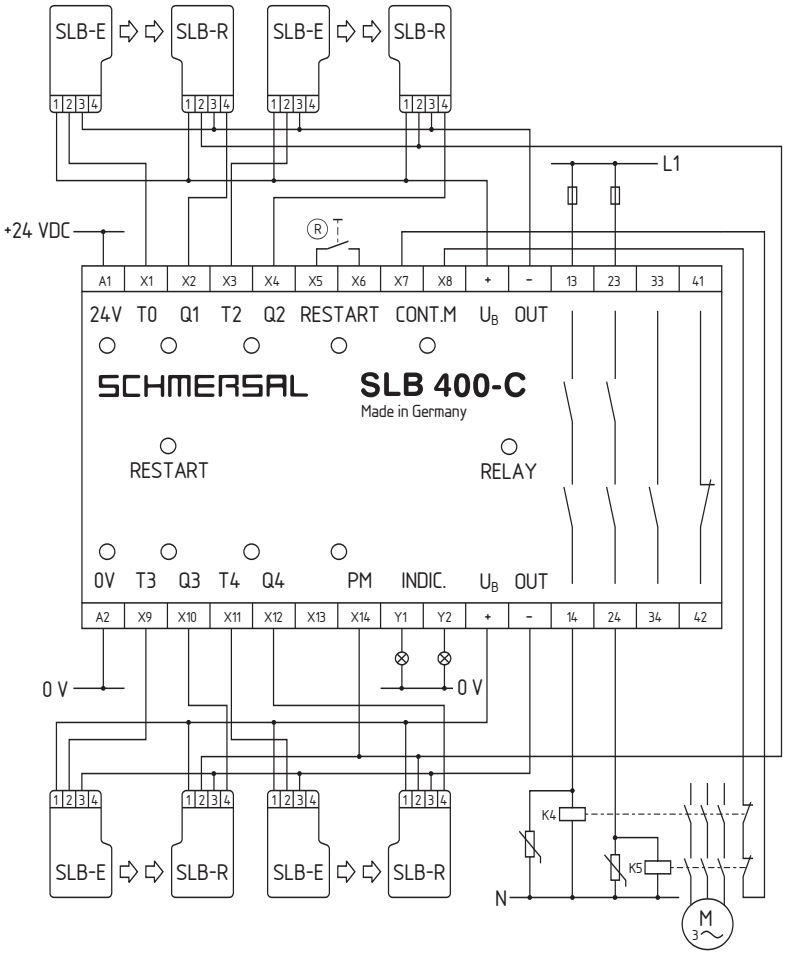
SLB 400-C10-1R ①

No.	Replace	Description
①		24 VDC

Note

- For protection in Control Category 4 to EN 954-1
- Monitoring up to four pairs of light barrier devices and the power contactors using the SLB 400-C safety monitoring module
- The wiring diagram is shown for the de-energised condition.
- Connection of two pairs of safety light barrier devices
  When two pairs of safety light barriers are connected, the terminals X9-X10 and X11-X12 must be bridged.
- Restart push button Ⓡ
  The restart function can be selected by means of the DIP switches. When a start push button is connected to X5 and X6, it must be operated for min. 250 ms and max. 5 s after an interruption of the safety light barriers.

Wiring diagram



ISD

The following faults are registered by the safety monitoring modules and indicated by ISD

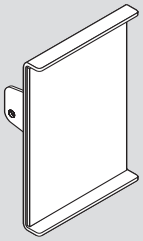
- Short-circuit on the connecting leads
- Interruption of the connecting leads
- Failure of the safety relay to pull-in or drop-out
- Fault on the input circuits or the relay control circuits of the safety monitoring module
- Mutual influence between the connected pairs of light barrier device and others on neighbouring systems

Note

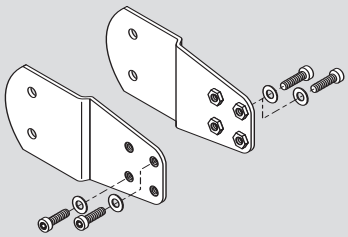
The ISD tables (Intergral System Diagnostics) for analysis of the fault indications and their causes are shown in the appendix.

Safety light barriers accessories SLB 200 and SLB 400

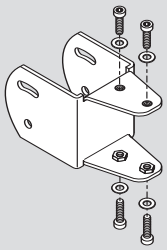
System components



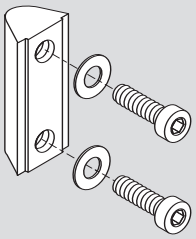
Mirror SLB 200/400 SMA 80



Mounting angle BF SMA 80-1



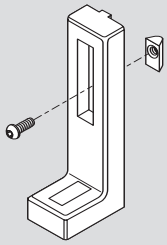
Mounting angle BF SMA 80-2



T-slot nut NST 20-8

System components

Mounting post ST 1250



Floor-stand base STB 1

Ordering details

Mirror	**SMA 80**
Mounting angles for mirror	**BF SMA 80-1** **BF SMA 80-2**
T-slot nut	**NST 20-8**

Ordering details

Mounting post	**ST 1250**
Floor-stand base	**STB 1**

Safety light grids and safety light curtains

System features:

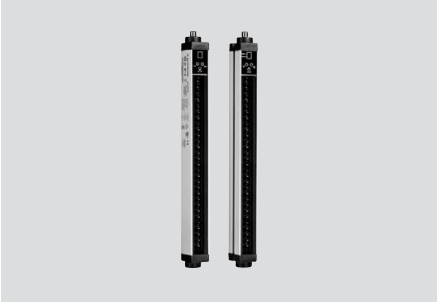
- Control Category 2 and 4 acc. to EN 954-1 or acc. to EN 61496, Type 2 and Type 4
- Different integrated functions:
  - Start/Restart interlock
  - Contactor monitoring
  - Muting
  - Blanking
  - Master/Slave configuration
- Diagnostic display
- Optical synchronisation
- Maintenance- free
- Compact design
- Simple, flexible mounting and adjustment

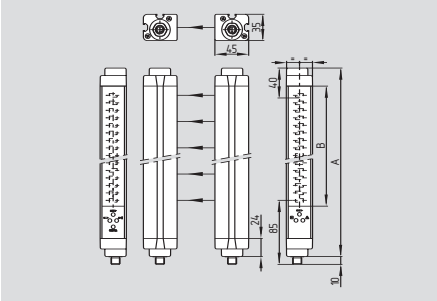
Selection table:

	Type EN 61496	Detection sensitivity (mm)	Protected height (mm)	Range (m)	Contactor monitoring	Start/ restart interlock	Master / Slave	Muting	Blanking	Page
SLC/G 210	2	20-30-40 50-90 2-3-4	160 – 1810	16	X	X				**23**
SLC/G 210 -RF	2	20-30-40 50-90 2-3-4	160 – 1810	18	•	•				**24**
SLC/G 210 -RFM/S	2	30-40-50	160 – 1510	18	•	•	•			**25**
SLC/G 210 -RFLC	2	20-40 2-3-4	160 – 1210	8	•	•				**26**
SLC/G 410	4	14-20-30 40-50-90 2-3-4	160 – 1810	18	X	X				**27**
SLC/G 410 -RF	4	14-20-30 40-50-90 2-3-4	160 – 1810	18	•	•				**28**
SLC/G 410 -RFM/S	4	14-20-30	160 – 1810	18	•	•	•			**29**
SLC 410 -B	4	14-20-90	160 – 1810	18	X	X			•	**30**
SLC 410-BM	4	14-20	160 – 1810	18	X	X	•		•	**30**
SLC/G 415I	4	30-40-90 2-3-4	310 - 1810	60	•	•		•		**36**
SLG 415L	4	2-3	510, 810	2,5	•	•		•		**37**
SLG 415T	4	2-3	510, 810	3,5	•	•		•		**38**
SLC/G 412	4	40 2-3-4	510 – 1210	60	•	•				**31**
SLG 412-P	4	2	510	6	•	•				**32**

X only in combination with safety-monitoring module
• integrated
• Not available

SLC 210





- Control category Type 2 to IEC/EN 61496-1, -2
- Resolution 20, 30, 40, 50 and 90 mm
- Protection field height from 160 mm to 1810 mm
- 2- ,3- or 4-beam Light grid
- Range from 0 ... 16 m
- Self-test every 0.5 s
- semiconductor outputs
- Optical synchronisation
- Status display
- Protection class IP 65

Legend:
A: Total lenght (B + 91 mm)
B: Protection field height
C: 85 mm (SLC), 135 mm (SLG)

Approvals

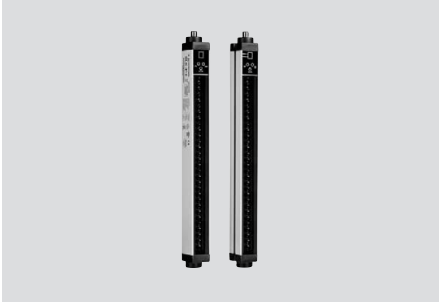
TÜV cULus CE

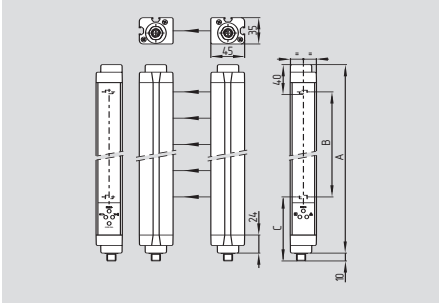
Ordering details

SLC 210-E/R①-②-12-③

No.	Replace	Description
①	xxxx	Height of protection field Available lengths:
		0160 mm*** 0310 mm
		0460 mm 0610 mm
		0760 mm 0919 mm
		1060 mm 1210 mm
		1360 mm 1510 mm
		1660 mm 1810 mm
②	20, 30	Resolution 20, 30 mm
	40, 50	Resolution 40, 50 mm
	90	Resolution 90 mm
③		Range 6 m
	H	Range 1 ...16 m High Range

SLG 210





* only in combination with safety-monitoring module

Approvals

TÜV cULus CE

Ordering details

SLG 210-E/R①-12-②

No.	Replace	Description
①		Distance between outermost beams:
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
	0900-04	900 mm, 4-beam
②		Range 0 ... 6 m
	H	Range 1 ...16 m High Range

Mounting brackets and T-slots are not included in the delivery

*** only for resolution 20, 30 mm

Technical data

Standards:	IEC/EN 61496-1/-2
Control Category to IEC/EN 61496-1, -2	Type 2
Enclosure:	Aluminium
Enclosure dimensions:	35 x 45 mm
Connection:	
Emitter:	connector plug M 12, 5-pole
Receiver:	connector plug M 12, 5-pole
Max. cable length:	100 m
Protection class:	IP 65 to EN 60529
Response time:	5,5 – 28 ms (depends on length and resolution)
Detection sensitivity	
Resolution:	20, 30, 40, 50 und 90 mm
Protection field height	
Resolution: 20, 30 mm	160 ... 1810 mm
Resolution:40, 50, 90 mm	310 ... 1810 mm
2-, 3-, 4--beam	510, 810, 910 mm
Protection field width, range	
Resolution 20 - 90 mm	0 ... 6 m (Standard), 1 ... 16 (High range)
2-, 3-, 4-beam	0 ... 6 m (Standard), 1 ... 16 (High range)
Start/Restart interlock:	*
Contactor control:	*
Light emission wavelength:	950 nm (infrared), coded
U_e:	24 VDC ± 20%
Safety outputs:	2 x PNP, 500 mA
Leakage current **	
Safety outputs:	< 0,3 mA
Power consumption:	Emitter 2 W, Receiver 3 W
Data interface:	–
Status and diagnostics display	LED indication
Ambient temperature:	0 °C ... + 55 °C
Storage and transport temperature:	– 20 °C ... + 70 °C

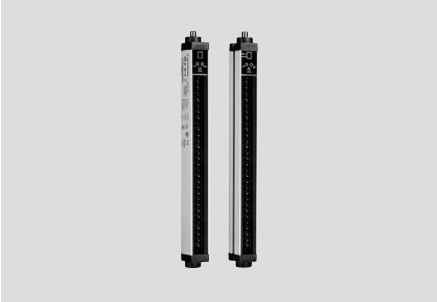
** In case of failure (interruption of the 0 V supply) the maximum leakage current is 0.3 mA.

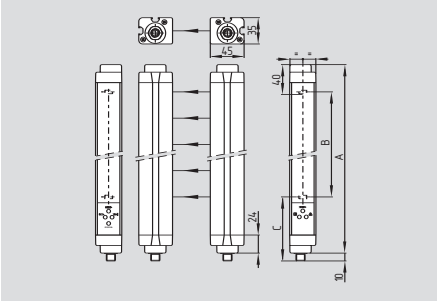
Ordering details

Accessories:

Connector plug M 12 x 1 for Emitter/ Receiver	**KD M12-5-5 m**
	KD M12-5-15 m
for Emitter/ Receiver (pre-wiring possible, however without cable)	
R = angled connector	**KD M12-5-R**
S = straight connector	**KD M12-5-S**

SLC 210...RF





- Control category Type 2 to IEC/EN 61496-1, -2
- Resolution 20, 30, 40, 50 and 90 mm
- Protection field height from 160 mm to 1810 mm
- 2- ,3- or 4-beam Light grid
- Integrated Start/Restart interlock
- Integrated Contactor control
- Range from 0 ... 18 m
- Self-test every 0.5 s
- Semiconductor outputs
- Optical synchronisation
- Status display
- Protection class IP 65

Legend:
A: Total lenght (B + 91 mm)
B: Protection field height
C: 85 mm (SLC), 135 mm (SLG)

Approvals

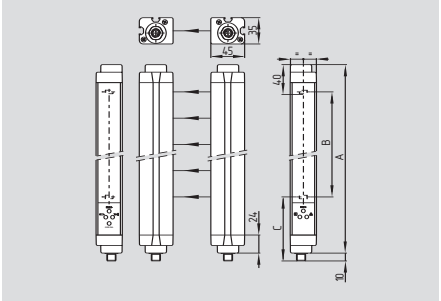
TÜV cULus CE

Ordering details

SLC 210-E/R①-②-RF

No.	Replace	Description
①	xxxx	Protected heights (mm) Available lengths:
		0160 mm** 0310 mm
		0460 mm 0610 mm
		0760 mm 0910 mm
		1060 mm 1210 mm
		1360 mm 1510 mm
		1660 mm 1810 mm
②	20	Resolution 20 mm
	30	Resolution 30 mm
	40	Resolution 40 mm
	50	Resolution 50 mm
	90	Resolution 90 mm

SLG 210...RF



Approvals

TÜV cULus CE

Ordering details

SLG 210-E/R①-RF

No.	Replace	Description
①		Distance between outermost beams:
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
	0900-04	900 mm, 4-beam

Mounting bracket and T-slot nuts are included in delivery

** only for resolution 20, 30 mm

Technical data

Standards:	IEC/EN 61496-1/-2
Control category to IEC/EN 61496-1, -2	Type 2
Enclosure:	Aluminium
Enclosure dimensions:	35 x 45 mm
Connection:	
Emitter:	connector plug M 12, 5-pole,
Receiver:	connector plug M 12, 8-pole
Max. cable length:	100 m
Max. cable length: Master/Slave	50 m
Protection class:	IP 65 to EN 60529
Response time:	5,5 - 28 ms (depends on length and resolution)
Detection sensitivity (Resolution):	20, 30, 40, 50 and 90 mm
Protected height	
Resolution 20, 30 mm	160 ... 1810 mm
Resolution 40, 50, 90 mm	310 ... 1810 mm
2-, 3-, 4-beam	510, 810, 910 mm
Protected width, operating range	
Resolution 20 - 90 mm	0 ... 18 m
2-, 3-, 4-beam	0 ... 18 m
Start/Restart interlock:	integrated
Contactor control:	integrated
Cascading: (Master/Slave)	–
Light emission wavelength:	950 nm (infrared), coded
U_e:	24 VDC ± 20%
Safety outputs:	2 x PNP, 500 mA
Leakage current*	
Safety outputs:	< 0,3 mA
Power consumption:	Emitter 2 W, Receiver 3 W
Data interface:	–
Status and diagnostics:	7-segment and LED display
Ambient temperature:	0 °C … + 55 °C
Storage and transport temperature:	– 20 °C … + 70 °C

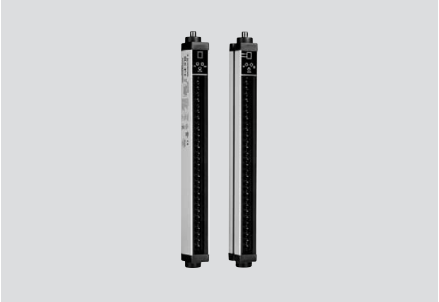
* In case of failure (interruption of the 0 V supply) the maximum leakage current is 0.3 mA.

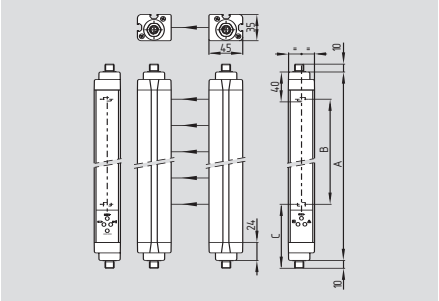
Ordering details

Accessories:

Connector plug M 12 x 1 for emitter	**KD M12-5-5 m**
	KD M12-5-15 m
(pre-wiring possible, however without cable)	
R = angled connector	**KD M12-5-R**
S = straight connector	**KD M12-5-S**
for receiver	**KD M12-8-5 m**
	KD M12-8-15 m

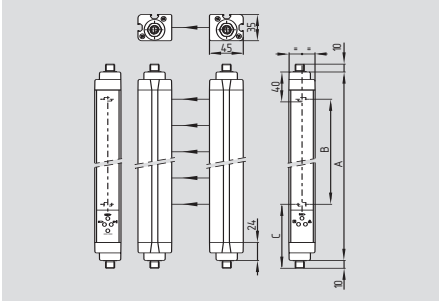
SLC 210...RFM/S





- Control category Type 2 to IEC/EN 61496-1, -2
- Resolution 30, 40 and 50 mm
- Protection field height-Master from 310 mm to 1510 mm
- Protection field height-Slave from 160 mm to 1510 mm
- 2- oder 3-beam Light grid
- Integrated Start/Restart interlock
- Integrated Contactor control
- Cascading of Master and Slave devices
- Range from 0 ... 18 m
- Semiconductor outputs
- Optical synchronisation
- Status display
- Protection class IP 65

SLG 210...RFM/S



Legend:
A: Total lenght
Slave/ Master (B + 91 mm)
B: Protection field height
C: 85 mm (SLC), 135 mm (SLG)

Technical data

Standards:	IEC/EN 61496-1/-2
Control category to IEC/EN 61496-1, -2	Type 2
Enclosure:	Aluminium
Enclosure dimensions:	35 x 45 mm
Connection:	
Emitter:	connector plug M 12, 5-pole,
Receiver:	connector plug M 12, 8-pole
Max. cable length:	100 m
Max. cable length: Master/Slave	50 m
Protection class:	IP 65 to EN 60529
Response time:	5,5 - 28 ms (depends on length and resolution)
Detection sensitivity (Resolution):	30, 40 and 50 mm
Protected height	
Resolution 30 mm	160 ... 1510 mm
Resolution 40, 50 mm	310 ... 1510 mm
2-, 3-beam	510, 810mm
Protected width, operating range	
Resolution 30 - 50 mm	0 ... 18 m
2-, 3-beam	0 ... 18 m
Start/Restart interlock:	integrated
Contactor control:	integrated
Cascading: (Master/Slave)	possible
Light emission wavelength:	950 nm (infrared), coded
U_e:	24 VDC ± 20%
Safety outputs:	2 x PNP, 500 mA
Leakage current*	
Safety outputs:	< 0,3 mA
Power consumption:	Emitter 2 W, Receiver 3 W
Data interface:	–
Status and diagnostics:	7-segment and LED display
Ambient temperature:	0 °C … + 55 °C
Storage and transport temperature:	– 20 °C … + 70 °C

Approvals

TÜV cULus CE

Approvals

TÜV cULus CE

* In case of failure (interruption of the 0 V supply) the maximum leakage current is 0.3 mA.

Ordering details

SLC 210-E/R①-②-RF③

No.	Replace	Description
①	xxxx	Protected heights (mm) Available lengths:
		0160 mm 0310 mm
		0460 mm 0610 mm
		0760 mm 0910 mm
		1060 mm 1210 mm
		1360 mm 1510 mm
②	30	Resolution 30 mm
	40	Resolution 40 mm
	50	Resolution 50 mm
③	M	Masterfunktion
	S	Slavefunktion

Ordering details

SLG 210-E/R①-RF-②

No.	Replace	Description
①		Distance between outermost beams:
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
②	M	Master function
	S	Slave function

Mounting brackets and T-slot nuts are included in delivery

Different lengths and resolutions can be combined for Master/Slave

Ordering details

Accessories:

Connector plug M 12 x 1

for emitter **KD M12-5-5 m**
KD M12-5-15 m

(pre-wiring possible, however without cable)

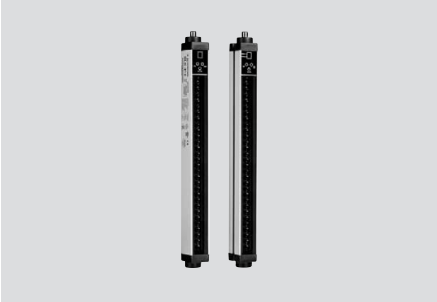
R = angled connector **KD M12-5-R**

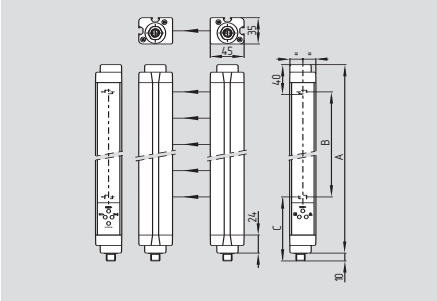
S = straight connector **KD M12-5-S**

for receiver **KD M12-8-5 m**
KD M12-8-15 m

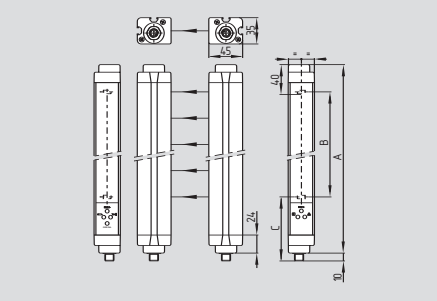
for Master/ Slave connection
VL M/S-M12-5-0,3 m
VL M/S-M12-5-3 m
VL M/S-M12-5-5 m
VL M/S-M12-5-10 m

SLC 210...RFLC





SLG 210...RFLC



- Control category Type 2 to IEC/EN 61496-1, -2
- Resolution 30 and 40 mm
- Protection field heights from 160 mm to 1210 mm
- 2- ,3- or 4-beam Light grid
- Range 0 ... 8 m
- Self-test every 0.5 s
- Semiconductor outputs
- Optical synchronisation
- Status display
- Protection class IP 65

Legend:
A: Total lenght (B + 91 mm)
B: Protection field height
C: 85 mm(SLC), 135 mm (SLG)

Technical data

Standards:	IEC/EN 61496-1/-2
Control category to IEC/EN 61496-1, -2	Type 2
Enclosure:	Aluminium
Enclosure dimensions:	45 x 35 mm
Connection:	
Emitter:	connector plug M 12, 5-pole,
Receiver:	connector plug M 12, 8-pole
Max. cable length:	100 m
Max. cable length: Master/Slave	-
Protection class:	IP 65 to EN 60529
Response time:	2 - 25 ms (depends on length and resolution)
Detection sensitivity (Resolution):	30 and 40 mm
Protected height	
Resolution 20 and 40 mm	160 ... 1210 mm
2-, 3-, 4-beam	510, 810, 910 mm
Protected width, operating range	
Resolution 20 and 40 mm	0 ... 8 m (Standard)
2-, 3-, 4-beam	0 ... 8 m (Standard)
Start/Restart interlock:	integrated
Contactor control:	integrated
Cascading: (Master/Slave)	-
Light emission wavelength:	950 nm (infrared), coded
U_e:	24 VDC ± 20%
Safety outputs:	2 x PNP, 500 mA
Leakage current**	
Safety outputs:	< 0,3 mA
Power consumption:	Emitter 2 W, Receiver 3 W
Data interface:	–
Status and diagnostics:	7-segment and LED display
Ambient temperature:	0 °C … + 55 °C
Storage and transport temperature:	– 20 °C … + 70 °C

** In case of failure (interruption of the 0 V supply) the maximum leakage current is 0.3 mA.

Approvals

TÜV cULus CE

Ordering details

SLC 210-E/R①-②-RFLC

No.	Replace	Description
①	xxxx	Protected heights (mm)
		Available lengths:
		0160 mm* 0310 mm
		0460 mm 0610 mm
		0760 mm 0910 mm
		1060 mm 1210 mm
②	30	Resolution 30 mm
	40	Resolution 40 mm

Approvals

TÜV cULus CE

Ordering details

SLG 210-E/R①-RFLC

No.	Replace	Description
①		Distance between outermost beams:
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
	0900-04	900 mm, 4-beam

Mounting brackets and T-slot plugs are included in delivery

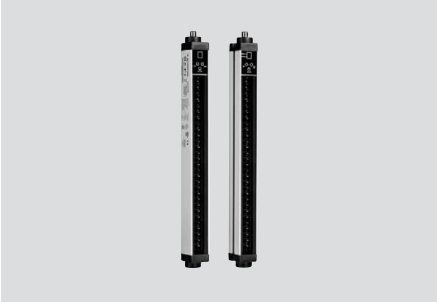
* only for resolution 30 mm

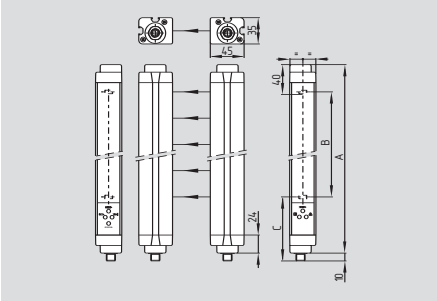
Ordering details

Accessories:

Connector plug M 12 x 1	
for emitter	**KD M12-5-5 m**
	KD M12-5-15 m
(pre-wiring possible, however without cable)	
R = angled connector	**KD M12-5-R**
S = straight connector	**KD M12-5-S**
for receiver	**KD M12-8-5 m**
	KD M12-8-15 m

SLC 410





- Control category Type 4 to IEC/EN 61496-1, -2
- Resolution 14, 20, 30, 40, 50 and 90mm
- Protection field heights from 160 mm to 1810 mm
- 2- ,3- or 4-beam Light grid
- Range 0 ... 5 m or 0 ... 18 m
- Semiconductor outputs
- Optical synchronisation
- Status display
- Protection class IP 65

Legend:
A: Total lenght (B + 91 mm)
B: Protection field height
C: 85 mm (SLC), 135 mm (SLG)

Approvals

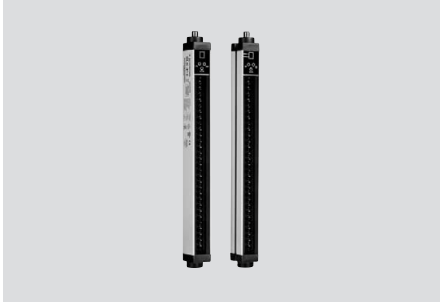
TÜV cULus CE

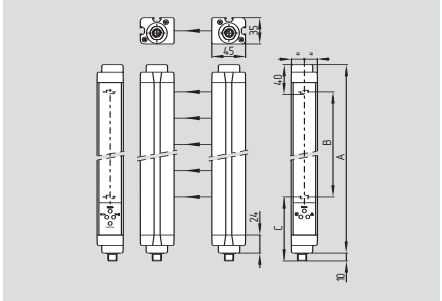
Ordering details

SLC 410-E/R①-②-12

No.	Replace	Description
①	xxxx	Protected heights (mm) Available lengths:
		0160 mm*** 0310 mm
		0460 mm 0610 mm
		0760 mm 0910 mm
		1060 mm 1210 mm
		1360 mm 1510 mm
		1660 mm 1810 mm
②	14	Resolution 14 mm
	20	Resolution 20 mm
	30	Resolution 30 mm
	40	Resolution 40 mm
	50	Resolution 50 mm
	90	Resolution 90 mm

SLG 410





* only in combination with safety-monitoring module

Approvals

TÜV cULus CE

Ordering details

SLG 410-E/R①-12

No.	Replace	Description
①		Distance between outermost beams:
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
	0900-04	900 mm, 4-beam

Mounting brackets and T-slot plugs are included in delivery

*** only for resolutions 14, 20, 30 mm

Technical data

Standards:	IEC/EN 61496-1/-2
Control category to IEC/EN 61496-1, -2	Type 4
Enclosure:	Aluminium
Enclosure dimensions:	35 x 45 mm
Connection:	
Emitter:	connector plug M 12, 5-pole,
Receiver:	connector plug M 12, 5-pole
Max. cable length:	100 m
Max. cable length: Master/Slave	–
Protection class:	IP 65 to EN 60529
Response time:	6 - 27 ms (depends on length and resolution)
Detection sensitivity (Resolution):	14, 20, 30, 40, 50 and 90 mm
Protected height	
Resolution 14, 20, 30 mm	160 ... 1810 mm
Resolution 40, 50, 90 mm	310 ... 910 mm
2-, 3-, 4-beam	510, 810, 910 mm
Protected width, operating range	
Resolution 14mm	0 ... 5 m
Resolution 20 to 90 mm	0 ... 18 m
2-, 3-, 4-beam	0 ... 18 m
Start/Restart interlock:	*
Contactor control:	*
Cascading: (Master/Slave)	–
Light emission wavelength:	950 nm (infrared), coded
U_e:	24 VDC ± 20%
Safety outputs:	2 x PNP, 500 mA
Leakage current**	
Safety outputs:	< 0,3 mA
Power consumption:	Emitter 2 W, Receiver 3 W
Data interface:	–
Status and diagnostics:	7-segment and LED display
Ambient temperature:	0 °C … + 55 °C
Storage and transport temperature:	– 20 °C … + 70 °C

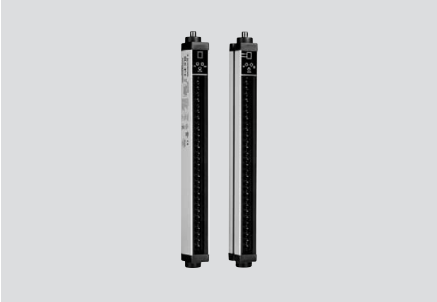
** In case of failure (interruption of the 0 V supply) the maximum leakage current is 0.3 mA.

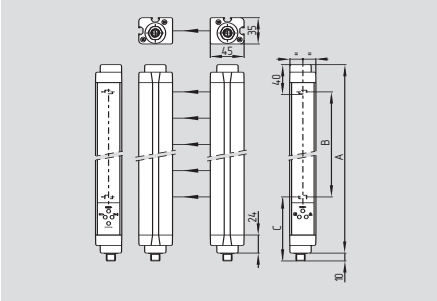
Ordering details

Accessories:

Connector plug M 12 x 1	
for emitter/ receiver	**KD M12-5-5 m**
	KD M12-5-15 m
(pre-wiring possible, however without cable)	
R = angled connector	**KD M12-5-R**
S = straight connector	**KD M12-5-S**
for emitter/ receiver (pre-wiring possible)	**KD M12-5-R** **KD M12-5-S**

SLC 410...RF





- Control category Type 4 to IEC/EN 61496-1, -2
- Resolution 14, 20, 30, 40, 50 und 90mm
- Protection field height from 160 mm to 1810 mm
- 2- ,3- or 4-beam light grid
- Integrated Start/Restart interlock
- Integrated Contactor control
- Range 0 ... 5 m or 0 ... 18 m
- Semiconductor outputs
- Optical synchronisation
- Status display
- Protection class IP 65

Legend:
A: Total lenght (B + 91 mm)
B: Protection field height
C: 85 mm (SLC) 135 mm (SLG)

Approvals

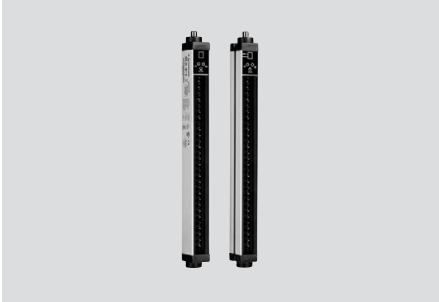
TÜV cULus CE

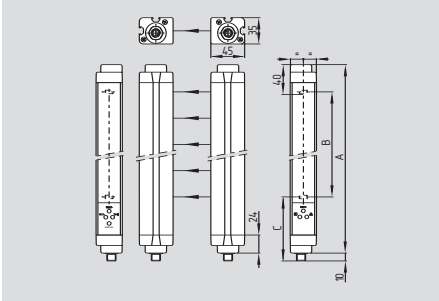
Ordering details

SLC 410-E/R①-②-RF

No.	Replace	Description
①	xxxx	Protected heights (mm) Available lengths: 0160 mm 0310 mm 0460 mm 0610 mm 0760 mm 0910 mm 1060 mm 1210 mm 1360 mm 1510 mm 1660 mm 1810 mm
②	14	Resolution 14 mm
	20	Resolution 20 mm
	30	Resolution 30 mm
	40	Resolution 40 mm
	50	Resolution 50 mm
	90	Resolution 90 mm

SLG 410...RF





Approvals

TÜV cULus CE

Ordering details

SLG 210-E/R①-RF

No.	Replace	Description
①		Distance between outermost beams:
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
	0900-04	900 mm, 4-beam

Mounting brackets and T-slot plugs are included in delivery

Technical data

Standards:	IEC/EN 61496-1/-2
Control category to IEC/EN 61496-1, -2	Type 4
Enclosure:	Aluminium
Enclosure dimensions:	45 x 35 mm
Connection:	
Emitter:	connector plug M 12, 5-pole,
Receiver:	connector plug M 12, 8-pole
Max. cable length:	100 m
Max. cable length: Master/Slave	–
Protection class:	IP 65 to EN 60529
Response time:	6 - 27 ms (depends on length and resolution)
Detection sensitivity (Resolution):	14, 20, 30, 40, 50 and 90 mm
Protected height	
Resolution 14, 20, 30 mm	160 ... 1810 mm
Resolution 40, 50, 90 mm	310 ... 1810 mm
2-, 3-, 4-beam	510, 810, 910 mm
Protected width, operating range	
Resolution 14mm	0 ... 5 m
Resolution 20 bis 90 mm	0 ... 18 m
2-, 3-, 4-beam	0 ... 18 m
Start/Restart interlock:	Integrated
Contactor control:	Integrated
Cascading: (Master/Slave)	–
Light emission wavelength:	950 nm (infrared), coded
U_e:	24 VDC ± 20%
Safety outputs:	2 x PNP, 500 mA
Leakage current*	
Safety outputs:	< 0,3 mA
Power consumption:	Emitter 2 W, Receiver 3 W
Data interface:	–
Status and diagnostics:	7-segment and LED display
Ambient temperature:	0 °C ... + 55 °C
Storage and transport temperature:	– 20 °C ... + 70 °C

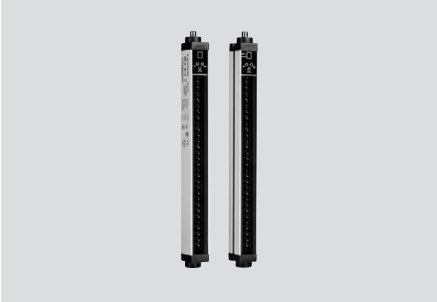
* In case of failure (interruption of the 0 V supply) the maximum leakage current is 0.3 mA.

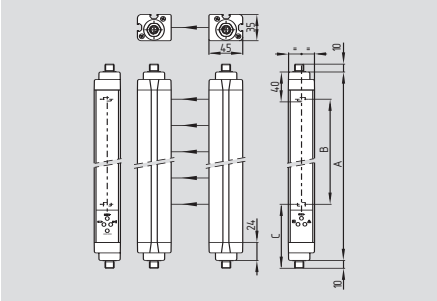
Ordering details

Accessories:
Connector plug M 12 x 1
for emitter **KD M12-5-5 m**
KD M12-5-15 m
(pre-wiring possible, however without cable)
R = angled connector **KD M12-5-R**
S = straight connector **KD M12-5-S**

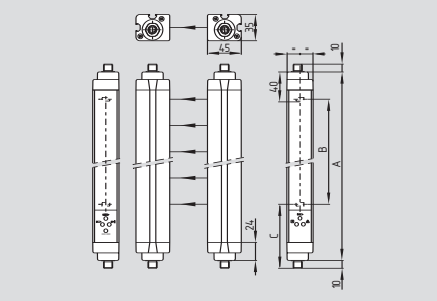
for receiver **KD M12-8-5 m**
KD M12-8-15 m

SLC 410...RFM/S





SLG 410...RFM/S



- Control category Type 4 to IEC/EN 61496-1, -2
- Resolution 14, 20, 30 und 50 mm
- Protection field height from 160 mm to 1510 mm
- 2- or 3-beam Light grid
- Integrated Start/Restart interlock
- Integrated Contactor control
- Cascading of Master and Slave devices
- Range 0 ... 5 m or 0 ... 18 m
- Semiconductor outputs
- Optical synchronisation
- Status display
- Protection class IP 65

Legend:
A: Total lenght
Slave/ Master (B + 91 mm)
B: Protection field height
C: 85 mm (SLC), 135 mm (SLG)

Technical data

Standards:	IEC/EN 61496-1/-2
Control category to IEC/EN 61496-1, -2	Type 4
Enclosure:	Aluminium
Enclosure dimensions:	35 x 45 mm
Connection:	
Emitter:	connector plug M 12, 5-pole,
Receiver:	connector plug M 12, 8-pole
Max. cable length:	100 m
Max. cable length: Master/Slave	50 m
Protection class:	IP 65 to EN 60529
Response time:	3 - 27 ms (depends on length and resolution)
Detection sensitivity (Resolution):	14, 20, 30 und 50 mm
Protected height	
Resolution 14, 20, 30 mm	160 ... 1510 mm
Resolution 50 mm	310 ... 1510 mm
2-, 3-beam	510, 810mm
Protected width, operating range	
Resolution 14 mm	0 ... 5 m
Resolution 20, 30, 50 mm	0 ... 18 m
2-, 3-beam	0 ... 18 m
Start/Restart interlock:	integrated
Contactor control:	integrated
Cascading: (Master/Slave)	possible
Light emission wavelength:	950 nm (infrared), coded
U_e:	24 VDC ± 20%
Safety outputs:	2 x PNP, 500 mA
Leakage current*	
Safety outputs:	< 0,3 mA
Power consumption:	Emitter 2 W, Receiver 3 W
Data interface:	–
Status and diagnostics:	7-segment and LED display
Ambient temperature:	0 °C … + 55 °C
Storage and transport temperature:	– 20 °C … + 70 °C

* In case of failure (interruption of the 0 V supply) the maximum leakage current is 0.3 mA.

Approvals

TÜV cULus CE

Approvals

TÜV cULus CE

Ordering details

SLC 410-E/R①-②-RF③

No.	Replace	Description
①	xxxx	Protected heights (mm) Available lengths: 0160 mm 0310 mm 0460 mm 0610 mm 0760 mm 0910 mm 1060 mm 1210 mm 1360 mm 1510 mm
②	14	Resolution 14 mm
	20	Resolution 20 mm
	30	Resolution 30 mm
	50**	Resolution 50 mm
③	M**	Masterfunktion
	S***	Slavefunktion

Ordering details

SLG 410-E/R①-RF②

No.	Replace	Description
①		Distance between outermost beams:
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
②	M	Masterfunktion
	S	Slavefunktion

Mounting brackets and T-slot plugs are included in delivery

** minimum protection field height 310 mm
*** for resolution 50 mm, minimum protection field height 310 mm

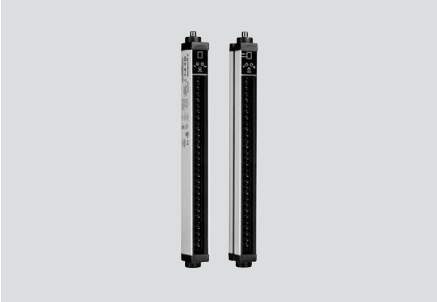
Note

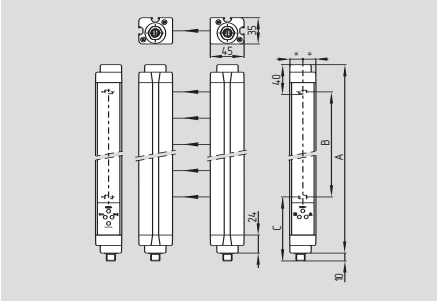
Accessories:
Connector plug M 12 x 1
for emitter **KD M12-5-5 m**
KD M12-5-15 m
(pre-wiring possible, however without cable)
R = angled connector **KD M12-5-R**
S = straight connector **KD M12-5-S**

for receiver **KD M12-8-5 m**
KD M12-8-15 m

For Master/Slave connection
VL M/S-M12-5-0,3 m
VL M/S-M12-5-3 m
VL M/S-M12-5-5 m
VL M/S-M12-5-10 m

SLC 410...B





- Control category Type 4 to IEC/EN 61496-1, -2
- Resolution 14, 20 und 90 mm
- Protection field height from 160 mm to 1810 mm
- Integrated blanking function
- Cascading of Master and slave devices
- Range 0 ... 5 m or 0 ... 18 m
- Semiconductor outputs
- Optical synchronisation
- Status display
- Protection class IP 65

Legend:
A: Total lenght
B: Protection field height
C: 85 mm (SLC), 135 mm (SLG)

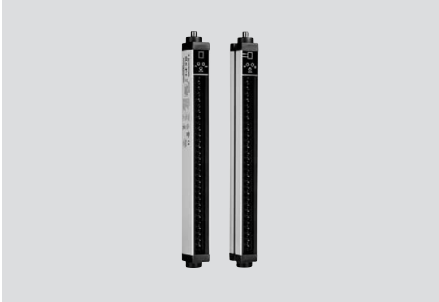
Approvals

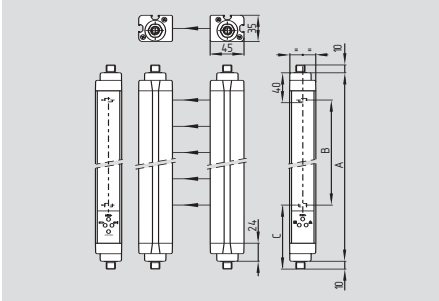
Ordering details

SLC 410-E/R①-②-③-B

No.	Replace	Description
①	xxxx	Protected heights (mm) Available lengths: 0160 mm 0310 mm 0460 mm 0610 mm 0760 mm 0910 mm 1060 mm 1210 mm
②	14	Resolution 14 mm
	20	Resolution 20 mm
	90***	Resolution 90 mm
③	M	Master function (for resolution 14 and 20 mm)

SLC 410...BM





* only in combination with safety-monitoring module

Approvals

Note

The SLC 410 BM Master can be combined with all slaves of the SLC 410...RFS series.

Mounting brackets and T-slot plugs are included in delivery

*** minimum protection field height 610 mm

Technical data

Standards:	IEC/EN 61496-1/-2
Control category to IEC/EN 61496-1, -2	Type 4
Enclosure:	Aluminium
Enclosure dimensions:	35 x 45 mm
Connection:	
Emitter:	connector plug M 12, 5-pole,
Receiver:	connector plug M 12, 8-pole
Max. cable length:	100 m
Max. cable length: Master/Slave	50m
Protection class:	IP 65 gem. EN 60529
Response time:	6 - 27 ms (depends on length and resolution)
Detection sensitivity (Resolution):	14, 20 und 90 mm
Protected height	
Resolution 14, 20 mm	160 ... 1810 mm
Resolution 90 mm	610 ... 1810 mm
Protected width, operating range	
Resolution 14 mm	0 ... 5 m
Resolution 20, 90 mm	0 ... 18 m
Start/Restart interlock:	*
Contactor control:	*
Cascading: (Master/Slave)	only for SLC 410...BM
Blanking function:	5 modes
Light emission wavelength:	950 nm (infrared), coded
U_e:	24 VDC ± 20%
Safety outputs:	2 x PNP, 500 mA
Leakage current**	
Safety outputs:	< 0,3 mA
Power consumption:	Emitter 2 W, Receiver 3 W
Data interface:	–
Status and diagnostics:	7-segment and LED display
Ambient temperature:	0 °C ... + 55 °C
Storage and transport temperature:	– 20 °C ... + 70 °C

** In case of failure (interruption of the 0 V supply) the maximum leakage current is 0.3 mA.

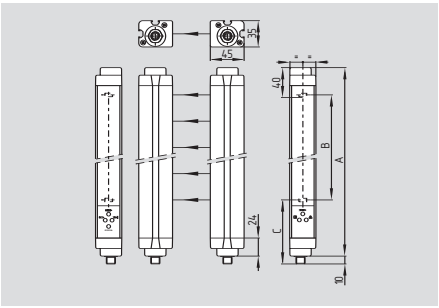
Ordering details

Accessories:

Connector plug M 12 x 1 for emitter	**KD M12-5-5 m**
	KD M12-5-15 m
(pre-wiring possible, however without cable)	
R = angled connector	**KD M12-5-R**
S = straight connector	**KD M12-5-S**
for receiver	**KD M12-8-5 m**
	KD M12-8-15 m
For Master/Slave connection	
	VL M/S-M12-5-0,3 m
	VL M/S-M12-5-3 m
	VL M/S-M12-5-5 m
	VL M/S-M12-5-10 m

Safety light grids for high operating range

SLC 412



- Control category Type 4 to IEC/EN 61496-1, -2
- Resolution 40 mm
- Protection field heightn from 510 mm to 1210 mm
- 2-, 3- or 4-beam light grid
- Integrated Start/Restart interlock
- Integrated Contactor control
- Range 0 ... 16 m or 0 ... 60 m
- Semiconductor outputs
- Optical synchronisation
- Status display
- Protection class IP 65

Legend:
A: Total lenght (B + 91 mm)
B: distance of the outermost beams
C: 85 mm (SLC), 135 mm (SLG)

Approvals

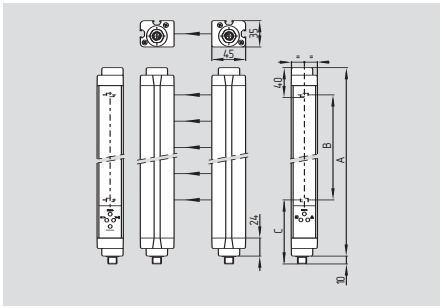
TÜV cULus CE

Ordering details

SLC 412-E/R①-40-12-H

No.	Replace	Description
①	xxxx	Protected heights (mm)
		Available lengths:
		0610 mm
		0910 mm
		1210 mm
	40	Resolution 40 mm

SLG 412



Approvals

TÜV cULus CE

Ordering details

SLG 412-E/R①-12-②

No.	Replace	Description
①		Distance between outermost beams:
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
	0900-04	900 mm, 4-beam
②		Range 0 ...16 m
	H	Range 0 ...60 m (High Range)

Mounting brackets and T-slot plugs are included in delivery

Technical data

Standards:	IEC/EN 61496-1/-2
Control category to IEC/EN 61496-1, -2	Type 4
Enclosure:	Aluminium
Enclosure dimensions:	50 x 60 mm
Connection:	
Emitter:	connector plug M 12, 5-pole,
Receiver:	connector plug M 23, 19-pole
Max. cable length:	100 m
Protection class:	IP 65 gem. EN 60529
Response time:	7 – 28,5 ms (depends on length and resolution)
Detection sensitivity (Resolution):	40 mm
Protected height	
Resolution 40 mm	510, 810, 910
Resolution 40 mm (H)	610, 910, 1210
2-, 3-. 4-beam (H)	510, 810, 910
Protected width, operating range	
Resolution 40 mm	0 ... 16m (Standard), 0 … 60m (High Range)
2-, 3-. 4-beam (H)	0 … 60m (High Range)
Start/Restart interlock:	integrated
Contactor control:	integrated
Light emission wavelength:	950 nm (infrared), coded
U_e:	24 VDC ± 20%
Safety outputs:	2 x PNP, 500 mA
Leakage current**	
Safety outputs:	< 0,3 mA
Power consumption:	Emitter 2 W, Receiver 3 W
Data interface:	–
Status and diagnostics:	7-segment and LED display
Ambient temperature:	0 °C … + 55 °C
Storage and transport temperature:	– 20 °C … + 70 °C

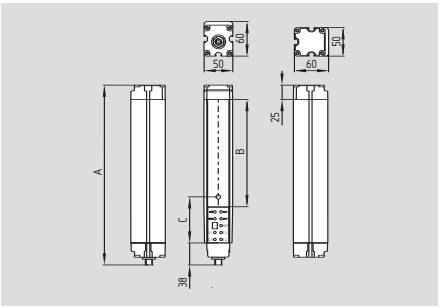
** In case of failure (interruption of the 0 V supply) the maximum leakage current is 0.3 mA.

Note

Accessories:
Connector plug M 12 x 1
for emitter **KD M12-5-5 m**
KD M12-5-15 m
(pre-wiring possible, however without cable)
R = angled connector **KD M12-5-R**
S = straight connector **KD M12-5-S**

for receiver **KD M12-8-5 m**
KD M12-8-15 m

SLG 412-P



- Emitter and receiver in one enclosure
- Control category Type 4 to IEC/EN 61496-1, -2
- Protection field heightn 510 mm
- 2-beam light grid
- Integrated Start/Restart interlock
- Integrated Contactor control
- Semiconductor outputs
- Optical synchronisation
- Status display
- Protection class IP 65

Legend:
A: Total lenght
B: Distance of the outermost beams
C: 120 mm

Approvals

TÜV cULus CE

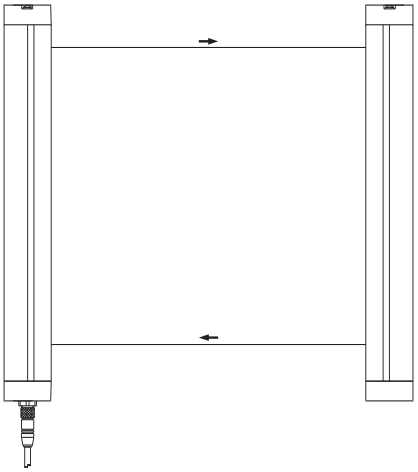
Ordering details

SLC 412-P-E/R0500-02-12

Technical data

Standards:	IEC/EN 61496-1/-2
Control category to IEC/EN 61496-1, -2	Type 4
Enclosure:	Aluminium
Enclosure dimensions:	50 x 60 mm
Connection:	
Emitter/ Receiver:	connector plug M 12, 8-pole
Max. cable length:	100 m
Protection class:	IP 65 to EN 60529
Response time:	7 ms
Detection sensitivity (Resolution):	–
Protected height 2-beam	510
Protected width, operating range 2-beam	0 ... 6m
Start/Restart interlock:	integrated
Contactor control:	integrated
Light emission wavelength:	950 nm (infrared), coded
U_e:	24 VDC ± 20%
Safety outputs:	2 x PNP, 500 mA
Leakage current**	
Safety outputs:	< 0,3 mA
Power consumption:	Emitter 2 W, Receiver 3 W
Data interface:	–
Status and diagnostics:	7-segment and LED display
Ambient temperature:	0 °C ... + 55 °C
Storage and transport temperature:	– 20 °C ... + 70 °C

** In case of failure (interruption of the 0 V supply) the maximum leakage current is 0.3 mA.



Ordering details

Accessories:	
Connector plug M 12 x 1 for emitter/receiver	**KD M12-8-5 m**
	KD M12-8-15 m

Safety light curtain/ light grid with integrated muting function

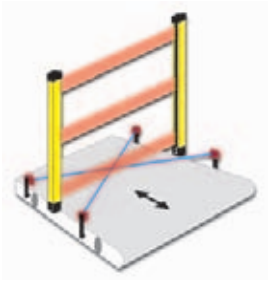
System features:

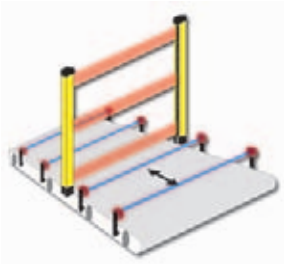
- Control Category 4 acc. to EN 954-1 or acc. to IEC 61496, Type 4
- Integrated muting function
- External and internal muting sensors
- Integrated override function
- Diagnostics display
- Optical synchronisation
- Compact design
- Simple, flexible mounting and adjustment

Safety light curtain/ light grid with integrated muting function

SLC/SLG 415I

The SLC/SLG 415I is a system for universal use with integrated muting function.
The M12 connectors allow a direct connection and flexible positioning of the different muting sensors (e.g. inductive, capacitive or optical sensors). In this way, a safe triggering of the muting function can be obtained for objects of different sizes. The additional integrated override function allows for a controlled restart of the machine to transport the accumulated material out of the protection field after a failure.
The safety light curtains/grids with muting function enable a smooth and trouble-free material feeding (input and output), whilst offering a permanent protection of human life.

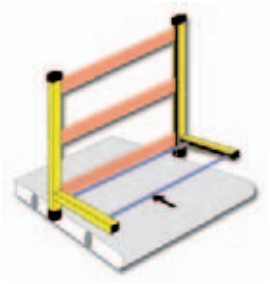




- Integrated muting function for material transport in 1 or 2 directions
- Connection of 2 or 4 external muting sensors
- Connection of different muting sensors
- Direct connection (M12) of the muting sensors to the SLC/SLG
- Muting controller for crosswise or parallel arrangement of the external sensors
- Adjustable muting time of 30s, 90 min or unlimited
- Integrated override function
- Range up to 16m or 60m
- Optional muting box with integrated muting lamp, restart and override function

SLG 415L

The SLG 415L is a safety light grid with integrated muting function. The muting sensors are integrated in the horizontal arms and mechanically and electrically connected to the light grid. This simplifies fitting and positioning of the prepared muting sensors and provides a fault free installation.
The additional integrated override function allows for a controlled restart of the machine to transport accumulated material out of the protection field after a failure. The SLG 415L allows for a smooth and trouble-free material output (e.g. on pallet loaders) whilst offering a permanent protection of human life.



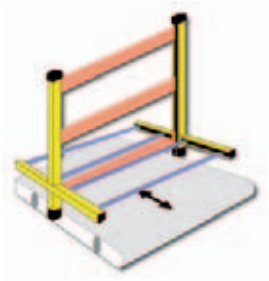
- Integrated muting function for transporting material out of the hazardous area
- 2 integrated optical muting sensor blocks
- Muting controller for crosswise and parallel arrangement of the integrated sensors
- Adjustable muting time of 30s or 90min
- Integrated override function
- Range: with crosswise arranged sensors: between 1 – 2.5 m; with parallel arranged sensors: between 0 – 2 m
- Integrated sensors with adjustable height and angle position
- Optional muting box with integrated muting lamp, restart and override function
- Parallel muting sensors with green light for the detection of transparent objects (glass, bottles, film, etc.)

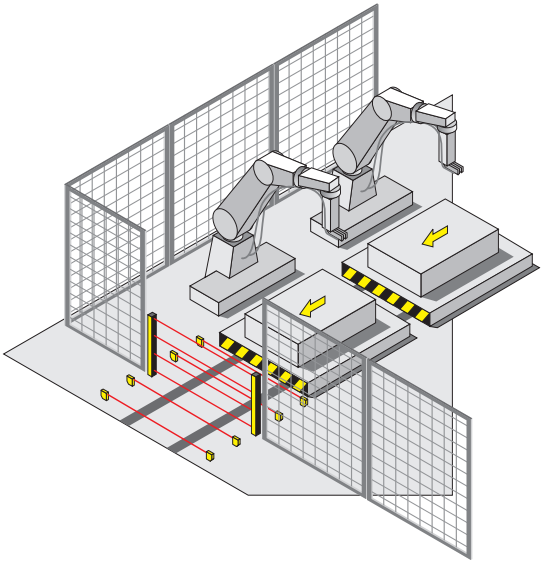
Safety light curtain/ light grid with integrated muting function

SLG 415T

The SLG 415T is a safety light grid with integrated muting function. The muting functions are integrated in two horizontal arms and mechanically and electrically connected to the light grid (right and left). This simplifies fitting and positioning of the muting sensor block and provides for a fault free installation.
The additional integrated override function allows for a controlled restart of the machine to transport accumulated material out of the protection field after a failure. The SLG 415T safety light grid enables a smooth and trouble-free material feeding (input and output), whilst offering a permanent protection of human life.

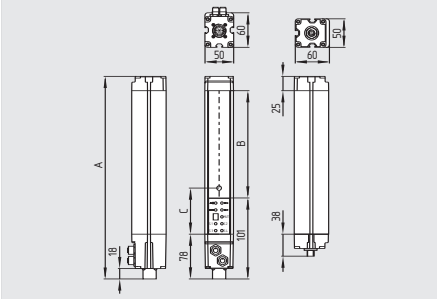
- Integrated muting function for material transport in 2 directions
- Integrated optical muting sensor blocks
- Muting controller for crosswise and parallel arrangement
- Adjustable muting time of 30s, 90min or unlimited
- Integrated override function
- Range: crosswise arranged sensors: between 1 – 2.5 m; parallel arranged sensors: between 0 – 2 m
- Integrated sensors with adjustable height and angle position
- Optional muting box with integrated muting lamp, restart and override function
- Parallel muting sensors with green light for the detection of transparent objects (glass, bottles, film etc.)





Safety light curtain/ light grid with integrated muting function

SLC 415I



- Control category Type 4 to IEC/EN 61496-1, -2
- Resolution 30, 40 and 90 mm
- Protection field heights from 310 mm to 1810 mm
- 2-, 3-, 4-beames light grid
- Integrated Start/Restart interlock
- Integrated Contactor control
- Integrated muting- and override function
- Range 0 ... 16 m or 0 ... 60 m
- Semiconductor outputs
- Optical synchronisation
- Status display
- Protection class IP 65

Legend:
A: Height of the receiver
B: Protection field height
C: 72 mm (SLC), 120 mm (SLG)

Approvals

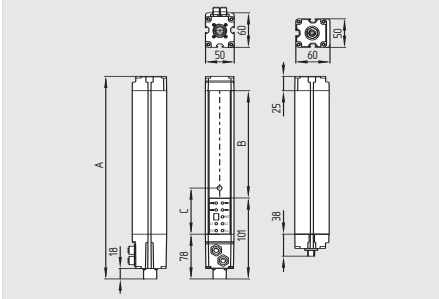
TÜV cULus CE

Ordering details

SLC 415I-E/R①-②-12-③

No.	Replace	Description
①	xxxx	Protected heights (mm) Available lengths:
		0310 mm 0460 mm
		0610 mm 0760 mm
		0910 mm 1060 mm
		1210 mm 1360 mm
		1510 mm 1660 mm
		1810 mm
②	30****	Resolution 30 mm
	40	Resolution 40 mm
	90	Resolution 90 mm
③		Range 0 ...16 m
	H***	Range 0 ...60 m High Range

SLG 415I



** In case of failure (interruption of the 0 V supply) the maximum leakage current is 0.3 mA.

Approvals

TÜV cULus CE

Ordering details

SLG 415I-E/R①-12-②

No.	Replace	Description
①		Distance between outermost beams:
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
	0900-04	900 mm, 4-beam
②		Range 0 ... 16 m
	H	Range 0 ...60 m High Range

*** only for resolution 40 mm
**** Protection field height 1210 mm

Mounting brackets and T-slot plugs are included in delivery

Technical data

Standards:	IEC/EN 61496-1/-2
Control category to IEC/EN 61496-1, -2	Type 4
Enclosure:	Aluminium
Enclosure dimensions:	50 x 60 mm
Connection:	
Emitter:	connector plug M 12, 5-pole,
Receiver:	connector plug M 23, 19-pole,
Muting sensors:	2 x connector plug M 12, 5-pole
Max. cable length:	100 m
Protection class:	IP 65 to EN 60529
Response time:	7 – 28,5 ms (depends on length and resolution)
Detection sensitivity (Resolution):	30, 40 and 90 mm
Protected height	
Resolution 30 mm	310 ... 1210 mm
Resolution 40, 90 mm	310 ... 1810 mm
2-, 3-, 4-beam	510, 810, 910
Resolution 40 (H)	610, 910, 1210
Protected width, operating range	
Resolution 30, 40 mm	0 ... 16m (Srandard)
2-, 3-. 4-beam	0 ... 16m (Standard), 0 … 60m (High Range)
Resolution 40 (H)	0 … 60m (High Range)
Start/Restart interlock:	integrated
Contactor control:	integrated
Muting and override function:	integrated
Muting sensors:	2 or 4 external sensors
Light emission wavelength:	950 nm (infrared), coded
U_e:	24 VDC ± 20%
Safety outputs:	2 x PNP, 500 mA
Leakage current**	
Safety outputs:	< 0,3 mA
Power consumption:	Emitter 2 W, Receiver 3 W
Data interface:	–
Status and diagnostics:	7-segment and LED display
Ambient temperature:	0 °C … + 55 °C
Storage and transport temperature:	– 20 °C … + 70 °C

Ordering details

Accessories:

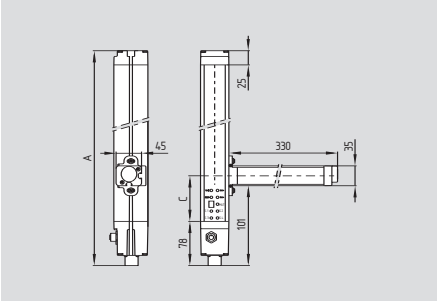
Connector plug M 12 x 1	
for emitter	**KD M12-5-3 m**
	KD M12-5-5 m
	KD M12-5-15 m
for muting sensors	**KSW M12-5-5 m**
(without cable, angled)	**KWS M12-5**

(pre-wiring possible, however without cable)

R = angled connector	**KD M12-5-R**
S = straight connector	**KD M12-5-S**

Connector plug M 23 x 1	
for receiver	**KD M23-19-3 m**
	KD M23-19-5 m
	KD M23-19-10 m
	KD M23-19-15 m
	KD M23-19-20 m

SLG 415L

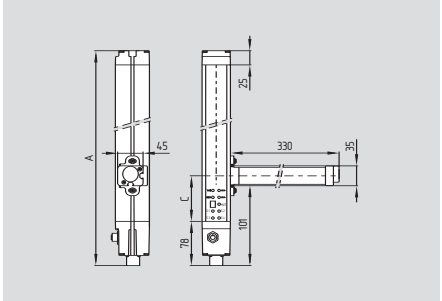


- Control category Type 4 to IEC/EN 61496-1, -2
- 2-, 3-beam light grid
- Integrated Start/Restart interlock
- Integrated Contactor control
- Integrated muting- und override function
- Integrated muting sensors
- Semiconductor outputs
- Optical synchronisation
- Status display
- Protection class IP 65

Legend:
A: Height of the receiver
C: 72 mm

Approvals

SLG 415L...PB



Approvals

Technical data

Standards:	IEC/EN 61496-1/-2
Control category to IEC/EN 61496-1, -2	Type 4
Enclosure:	Aluminium
Enclosure dimensions:	50 x 60 mm
Connection:	
Emitter:	connector plug M 12, 5-pole,
Receiver:	connector plug M 23, 19-pole,
Muting sensors (integrated):	2 x connector plug M 12, 5-pole
Max. cable length:	100 m
Protection class:	IP 65 to EN 60529
Response time:	7 – 28,5 ms (depends on length and resolution)
Detection sensitivity (Resolution):	–
Protected height	
2-, 3-beam	510, 810
Muting-Sensoren, range	
2 parallel	0 ... 2,0 m (PB = parallele beams)
2 crosswise	1 ... 2,5 m
Start/Restart interlock:	integrated
Contactor control:	integrated
Muting- and override function:	integrated
Light emission wavelength:	950 nm (infrared), coded
U_e:	24 VDC ± 20%
Safety outputs:	2 x PNP, 500 mA
Leakage current**	
Safety outputs:	< 0,3 mA
Power consumption:	Emitter 2 W, Receiver 3 W
Data interface:	–
Status and diagnostics:	7-segment and LED display
Ambient temperature:	0 °C ... + 55 °C
Storage and transport temperature:	– 20 °C ... + 70 °C

** In case of failure (interruption of the 0 V supply) the maximum leakage current is 0.3 mA.

Approvals

Ordering details

SLG 415L-E/R①-12-②

No.	Replace	Description
①		Distance between outermost beams:
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
②	PB	Muting-Sensors parallel crosswise

Note

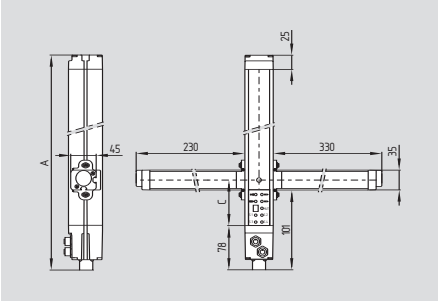
Mounting brackets and T-slot plugs are included in delivery

Ordering details

Accessories:

Connector plug M 12 x 1 for emitter	**KD M12-5-3 m**
	KD M12-5-5 m
	KD M12-5-15 m
(pre-wiring possible, however without cable)	
R = angled connector	**KD M12-5-R**
S = straight connector	**KD M12-5-S**
Connector plug M 23 x 1 for receiver	**KD M23-19-3 m**
	KD M23-19-5 m
	KD M23-19-10 m
	KD M23-19-15 m
	KD M23-19-20 m

SLG 415T



- Control category Type 4 to IEC/EN 61496-1, -2
- 2-, 3-beam light grid
- Integrated Start/Restart interlock
- Integrated Contactor control
- Integrated muting- und override function
- Integrated muting sensors
- Semiconductor outputs
- Optical synchronisation
- Status display
- Protection class IP 65

Legend:
A: Height of the receiver
C: 72 mm

Approvals

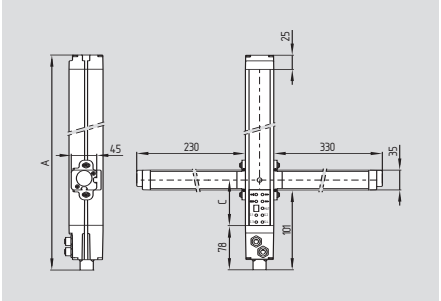
TÜV cULus CE

Ordering details

SLG 415T-E/R①-12-②

No.	Replace	Description
①		Distance between outermost beams:
	0500-02	500 mm, 2-beam
	0800-03	800 mm, 3-beam
②	PB	Muting-sensors parallel crosswise

SLG 415T...PB



Approvals

TÜV cULus CE

Mounting brackets and T-slot plugs are included in delivery

Technical data

Control category to IEC/EN 61496-1, -2	Type 4
Enclosure:	Aluminium
Enclosure dimensions:	50 x 60 mm
Connection:	
Emitter:	connector plug M 12, 5-pole;
Receiver:	connector plug M 23, 19-pole;
Muting sensors (integrated):	2 x connector plug M 12, 5-pole
Max. cable length:	100 m
Protection class:	IP 65 to EN 60529
Response time:	7 – 28,5 ms (depends on length and resolution)
Detection sensitivity (Resolution):	-
Protected height	
2-, 3-beam	510, 810
Muting sensors, range	
2 crosswise	0 ... 2,0 m (PB = parallel beams)
4 parallel	1 ... 2,5 m
Start/Restart interlock:	integrated
Contactor control:	integrated
Muting- and override -function:	integrated
Light emission wavelength:	950 nm (infrared), coded
U_e:	24 VDC ± 20%
Safety outputs:	2 x PNP, 500 mA
Leakage current**	
Safety outputs:	< 0,3 mA
Power consumption:	Emitter 2 W, Receiver 3 W
Data interface:	
Status and diagnostics:	7-segment and LED display
Ambient temperature:	0 °C ... + 55 °C
Storage and transport temperature:	– 20 °C ... + 70 °C

** In case of failure (interruption of the 0 V supply) the maximum leakage current is 0.3 mA.

Ordering details

Accessories:

Connector plug M 12 x 1 for emitter	**KD M12-5-3 m**
	KD M12-5-5 m
	KD M12-5-15 m
(pre-wiring possible, however without cable)	
R = angled connector	**KD M12-5-R**
S = straight connector	**KD M12-5-S**
Connector plug M 23 x 1 for receiver	**KD M23-19-3 m**
	KD M23-19-5 m
	KD M23-19-10 m
	KD M23-19-15 m
	KD M23-19-20 m

SLG-MCB

- Control unit for the SLG415/412 series
- Integrated restart pushbutton
- Integrated muting lamp
- Integrated override key selector switch
- Two safety relay outputs and one signalling contact
- DIP switch to configure the light grid/light curtain
- Plug-in terminal blocks for cable connection
- Possibility to connect an external muting lamp
- Possibility to connect an internal or external feedback loop
- Cable entry for machine connection

Technical data

Enclosure:	glass-fibre reinforced thermoplastic
Fixation:	4 mounting holes
Connection:	M23 or M12 connector, metric thread coupling
Protection class:	Gehäuse IP 66 gem. EN 60529
U_e:	19 – 30 VDC
I_e:	depending on the connected SLG type
Input signal "1":	> 12 VDC
Input signal "0":	> 5 VDC
Max. cable length:	100 m
Outputs:	2 enabling paths
Utilisation category:	AC-15, DC-13
Switching voltage:	max. 250 VAC
Load current:	max. 2 A (cos = 1)
Switching capacity:	max. 500 VA
Short-circuit protection:	6 A (slow blow)
Signalling output:	1 relay output (NO contact) for SLG- MCB3/4
EMC rating:	EMC Directive to EN 61496-1
Overvoltage category:	II to DIN VDE 0110
Ambient temperature:	- 10 °C … + 55 °C
Storage and transport temperature:	– 10 °C … + 55 °C
Dimensions:	110 x 180 x 110 mm
Note:	Inductive loads (contactors, relays, etc.) are to be suppressed by means of a suitable circuit.

Approvals

TÜV cULus CE

Ordering details

SLG-MCB①

No.	Replace	Description
①	1	Restart pushbutton, key selector switch for override function, muting lamp, 2 safety relays per enabling contact
	2	Restart pushbutton, 2 safety relays per enabling contact

Ordering details

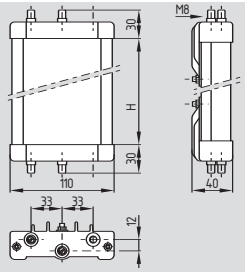
No.	Replace	Description
	3	Restart pushbutton, key selector switch for override function, muting lamp, 2 safety relays per enabling contact, 1 signalling contact
	4	Restart pushbutton, 2 safety relays per enabling contact, 1 signalling contact

Ordering details

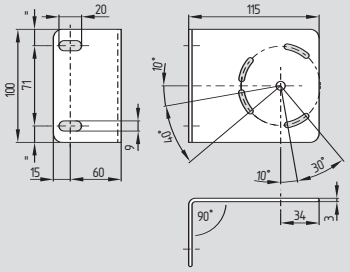
Accessories SLG-MCB

for emitter - Mutingbox	**VL MB-M12-19-3 m**
	VL MB-M12-19-5 m
for receiver- Mutingbox	**VL MB-M23-19-3 m**
	VL MB-M23-19-5 m
	VL MB-M23-19-10 m

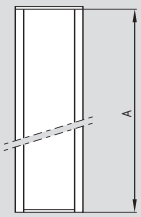
System components



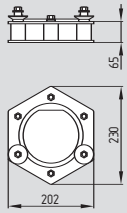
Deflecting mirror SMB



Mounting angle for deflecting mirror BF SMB

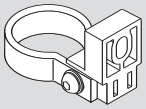


Deflecting mirror ST LGM



Floor-stand STB LG

System components



Mounting angle BFLC-01-D

Ordering details

Deflecting mirror:

Mirror height	250 mm	**SMB 250**
	Up to 1900 mm	**SMB 1900**
	Other heights available on request	
Mounting angle for deflecting mirror		**BF SMB**
Floor-stand (empty enclosure)		**ST LG**
Floor-stand with integrated deflecting mirror		
		ST LGM-02 : A = 1000 mm
		ST LGM-03 : A = 1200 mm
		ST LGM-04 : A = 1330 mm
		ST LGM-2000 : A = 1970 mm
Floor-stand base for ST LG/LGM		**STB LG**

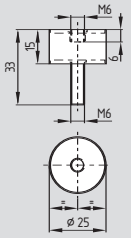
Selection table

SLC	SLG	SMB
0160		**250**
0310		**400**
0460		**540**
0610	**2**	**715**
0760		**885**
0910	**3**	**1060**
1060	**4**	**1230**
1210		**1400**
1360		**1450**
1510		**1600**
1660		**1750**
1810		**1900**

Ordering details

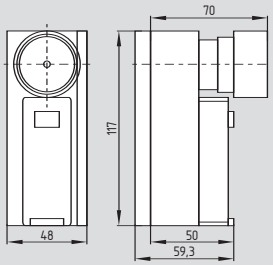
Mounting angle (rotating) **BFLC-01-D**

System components



Vibration absorber VA 15-6

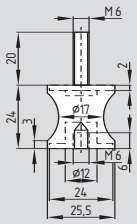
System components



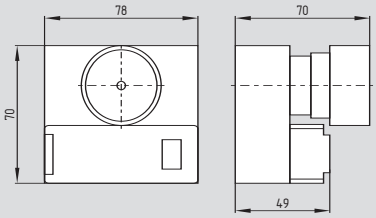
Alignment kit LAT SLC-2

System components

Test rods



Vibration absorber VA 210/410-2/-3



Alignment kit LAT SLC-4

Ordering details

Vibration absorber	**VA 15-6**
Vibration absorber	**VA 210/410-2**
	VA 210/410-3

Ordering details

Alignment kit	
	LAT SLC-2
	LAT SLC-4

Ordering details

Test rods	
With resolution 14 mm	**SLC TR-14**
With resolution 20 mm	**SLC TR-20**
With resolution 30 mm	**SLC TR-30**
With resolution 40 mm	**SLC TR-40**
With resolution 50 mm	**SLC TR-50**

Around the clock

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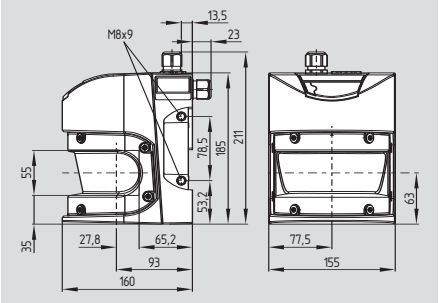
www.schmersal.com

Safety laser scanner

The safety laser scanners of the LS 30 series monitor a surface over an angle of 190° invisibly and without physical contact and are mainly used as hazardous area guards. The zone to be monitored can be individually adjusted to the specific application through the software. The laser scanners of the LS 30 series are basically used if safeguarding the hazardous area by means of conventional means is not possible or requires serious investments, e.g. on tube-bending machines, industrial robots or automatic guided vehicle systems. The safety laser scanners meet the requirements of Control Category 3 acc. to EN 954-1.

LS 30



- Electro-sensitive protective device for protection of persons or for detection of objects which operates by measuring the time taken for light to travel
- Compact device with integrated evaluation
- Monitoring zones can be freely and precisely defined
- 4 warning and 4 protection zones, freely programmable
- System connector with integrated configuration memory
- Various modes of operation can be selected
- 7-segment display for diagnosis
- Interactive, user-friendly computer configuration, parameter setting and error diagnosis
- Serial interfaces for start-up and configuration
- Simple flexible mounting and adjustment
- Large range
- Short response time
- Safe, wearproof and maintenance-free semi-conductor outputs
- Complete soiling check and contamination control

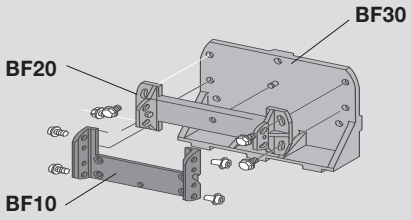
Approvals

TÜV CE

Technical data

Standards:	EN 61496-1/-3
Range:	Protection zone: 4 m radius Warning zone: 49 m radius Monitoring area: 49 m
Scanning angle:	190°
Angle resolution:	max. 0.25° min. 0.50°
Response time:	60 ms
Light source:	laser diode
Light emission wavelength:	905 nm
Laser protection class:	1
Configuration:	configuration software SCS
U_e:	24 VDC
Outputs:	2 safe solid state outputs, short-circuit proof; 3 not safe signalling outputs
Dimensions:	185 x 155 x 160 mm
Weight:	3,3 kg
Connection:	30 pin system connector
Ambient temperature:	– 10 °C ... + 50 °C
Protection class:	IP 65 to EN 60529
Number of warning zones:	4
Number of protection zones:	4
Serial interface:	RS 232

System components



Mounting angle

System connector

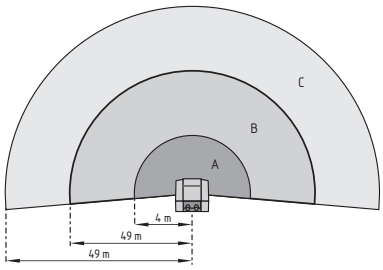
Connecting cable

Ordering details

LS 30-4015 CAS01 4 warning and 4 protection zones

The system connector is not included in delivery of the safety laser scanner.

Function table



Legend
A protection zone
B warning zone
C monitoring area

Ordering details

Mounting bracket for direct mounting at the rear on wall or machine. No adjustment facility	**BF10**
Bracket only in conjunction with BF10. Mounting at the rear on wall or machine. Longitudinal and cross-wise adjustment	**BF20**
Bracket only in conjuction with BF10 and BF20. Mounting at the rear or below on wall, floor or machine. Longitudinal and cross-wise adjustment	**BF30**
System connector without cable	**S0VA-A0000BS01**
5 m cable, 13 cores, pre-assembled	**SV00-B1305BS01**
Verbindungsleitung Connection cable between the PC and the configuration interface	**SRS02**

Safety-monitoring modules for optoelectronic safety components

Besides the traditional safety relay controls, Schmersal offers CE-type tested safety controls or other safety-oriented bus systems (e.g. AS-i Safety at Work) for different levels of complexity and combination depths, which provide the user with many visualization and diagnostic possibilities.

SCR 1R

- Suitable for signal processing of outputs connected to potentials (AOPDs), e.g. safety light grids/curtains
- 1 or 2 channel control
- 2 enabling paths, Stop 0
- Reset with edge detection or automatic start
- 2 LEDs to show operating conditions
- Control Category 4 to EN 954-1

Technical data

Standards:	IEC/EN 60204-1, EN 954-1, BG-GS-ET-20
Stop category	2x Stop 0
Control category:	4
Start conditions:	Reset button with edge detection, auto start
Enclosure:	glass-fibre reinforced thermoplastic
Connection:	screw terminals
Cable section:	max. 2.5 mm^2 solid or multi-strand lead (incl. conductor ferrules)
U_e:	24 VDC – 15 % / + 20 %, residual ripple max. 10%
I_e:	max. 0.10 A
Protection class:	terminals IP 20 enclosure IP 40 to EN 60529
Power consumption:	max. 2.6 VA
Max. fuse rating:	Internal electronic trip F1, tripping current > 0.6 A, reset after approx. 1 s
Monitored inputs	1 or 2 channels
Drive circuits:	max. 28 VDC
Enabling contacts:	2 enabling paths
Utilisation category:	AC-15, DC-13
Switching capacity:	enabling paths: 6 A/230 VAC, 6 A/24 VDC
Fuse rating:	enabling paths: 6 A gG D-fuse
Max. switching frequency:	5 Hz
Contact material:	AgNi, AgSnO, self-cleaning, positive action
Contact resistance:	max. 100 mΩ in new condition
Pull-in delay:	≤ 330 ms / ≤ 720 ms (start button / auto start)
Drop-out delay:	≤ 20 ms
Air clearances and creepage distances:	DIN VDE 0110-1 (04.97), 4 kV/2
Overvoltage category:	III to DIN VDE 0110
Degree of pollution:	2 to DIN VDE 0110
Ambient temperature:	– 25 °C … + 45 °C (Derating curve on request)
Mechanical life:	10 million operations
Function display:	2 LEDs
Weight:	190 g
Dimensions:	22.5 x 82 x 98.8 mm

Approvals

Ordering details

SCR 1R ①

No.	Replace	Description
①		24 VDC

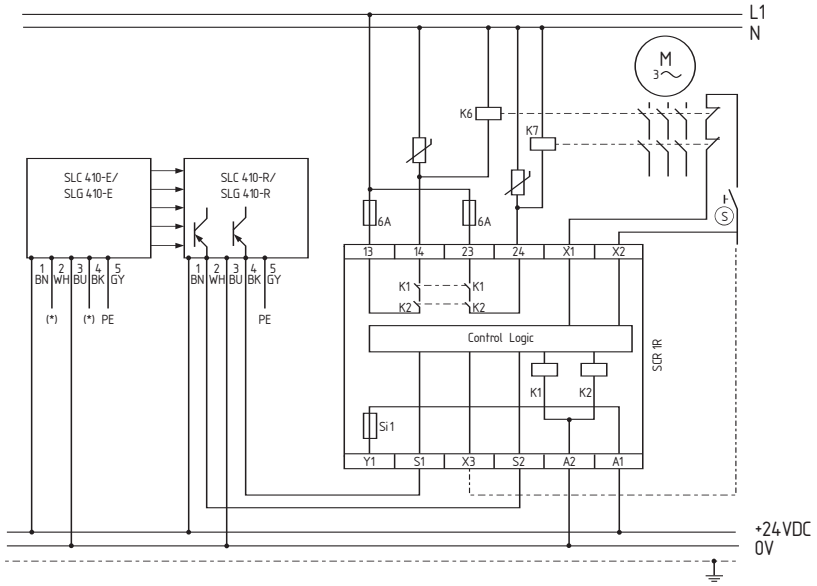
Note

- Input level: dual-channel control (Example AOPD, with two OSSDs with external start/restart button Ⓡ).
- The control recognises cable break and earth leakages in the monitoring circuit.
- Si1 = electronic fuse
- Relay outputs: Suitable for 2 channel control, for increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.

- For a 1-channel control, connect NC contact to Y1/S1 and bridge S1/S2
- Connect potential (p-type) outputs of safety light grids/curtains to S1/S2. The devices must have the same reference potential.

- Automatic start:
  The automatic start is programmed by connecting the feedback circuit to the terminals X1/X3. If the feedback circuit is not required, establish a bridge

Wiring diagram



LED

Function indication:
The integrated LEDs indicate the following operational states.
- Position relay K1
- Position relay K2

Note

The wiring diagram is shown for the de-energised condition.

SCR 402R-301

- Suitable for signal processing of outputs connected to potentials (AOPDs), e.g. safety light grids/curtains
- 1 or 2 channel control
- 3 enabling paths, Stop 0
- 1 indication contact (NC)
- With hybrid fuse
- Reset with edge detection or automatic start
- 4 LEDs to show operating conditions
- Control Category 4 to EN 954-1
- Plug-in screw terminals

Technical data

Standards:	IEC/EN 60204-1, EN 954-1, BG-GS-ET-20
Stop category	3x Stop 0
Control category:	4
Start conditions:	Reset button with edge detection, auto start
Enclosure:	glass-fibre reinforced thermoplastic, ventilated
Connection:	plug-in, screw terminals
Cable section:	max. 2.5 mm^2 solid or multi-strand lead (incl. conductor ferrules)
U_e:	24 VDC –15%/+20%, residual ripple max. 10% 24 VAC –15%/+10%
Frequency range:	50/60 Hz (on AC operational voltage)
I_e:	max. 0.08 A
Protection class:	terminals IP 20 enclosure IP 40 to EN 60529
Power consumption:	max. 3.8 VA, 2.4 W
Max. fuse rating:	Internal electronic trip F1, tripping current > 0.5 A, reset after disconnection of supply voltage
Monitored inputs	1 or 2 channels
Feedback circuit:	yes
Drive circuits:	S11/S12, S21/S22: max. 28 VDC
Enabling contacts:	3 enabling paths
Utilisation category:	AC-15, DC-13
Switching capacity:	enabling paths: 6 A/230 VAC, 6 A/24 VDC
Max. switching frequency:	5 Hz
Fuse rating:	enabling paths: 6 A gG D-fuse
Signalling contacts:	1 NC contact
Switching capacity:	Indicating contact: 2 A/24 VDC
Contact material:	AgNi, AgSnO, self-cleaning, positive action
Contact resistance:	max. 100 mΩ in new condition
Pull-in delay:	≤ 200 ms
Drop-out delay:	≤ 20 ms
Air clearances and creepage distances:	DIN VDE 0110-1 (04.97), 4 kV/2
Overvoltage category:	III to DIN VDE 0110
Degree of pollution:	2 to DIN VDE 0110
Ambient temperature:	– 25 °C … + 45 °C (Derating curve on request)
Mechanical life:	10 million operations
Function display:	4 LEDs
Weight:	230 g
Dimensions:	22.5 x 100 x 121 mm

Approvals

cULus CSA CE

Ordering details

SCR 402R-301 ①

No.	Replace	Description
①		24 VAC/DC

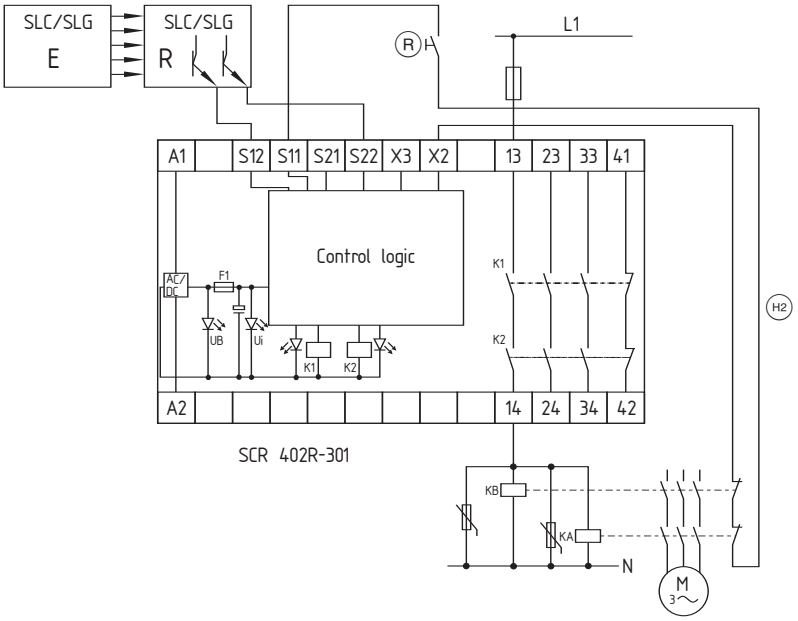
Note

- Input level: dual-channel control (Example AOPD, with two OSSDs with external start/restart button Ⓡ.
- The control recognises cable break and earth leakages in the monitoring circuit.
- F1 = Hybrid fuse
- Ⓗ2 = Feedback circuit
- Relay outputs: Suitable for 2 channel control, for increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.

- For 1-channel control, connect NC contact to S11/S12 and bridge S12/S22
- Connect potential p-type outputs of safety light grids/curtains to S12/S22. The devices must have the same reference potential.

- Automatic start:
  The automatic start is programmed by connecting the feedback circuit to terminals S12/X3. If no feedback circuit is required, establish a bridge.

Wiring diagram



LED

Function display:
The integrated LEDs indicate the following operational states.

- Position relay K1
- Position relay K2
- Supply voltage U_B
- Internal operating voltage U_i

Note

The wiring diagram is shown with guard doors closed and in de-energised condition.

AZR 311 TL

- Suitable for signal processing of potential-free outputs, e.g. emergency-stop command devices, interlocking equipment etc..
- Suitable for signal processing of outputs connected to potentials (AOPD's), e.g. safety light grids/curtains
- 1 or 2 channel control
- 4 enabling paths, 1 delayed: 1 … 30 s
- Acknowledgement output, normally-closed function (potential-free)
- Optionally:
  – Manual reset with edge detection in fail-safe circuit
  – Automatic reset function
- Green LED-indications for relay K2, K3, K4, K5, supply voltage U_B and internal fuse U_i
- Control Category 4 to EN 954-1

Technical data

Standards:	IEC/EN 60204-1, EN 954-1, BG-GS-ET-20
Stop category	3x Stop 0, 1x Stop 1 (1 … 30 s delayed)
Control category:	4
Start conditions:	Start, reset button (trailing edge), autostart
Enclosure:	glass-fibre reinforced thermoplastic
Connection:	self-opening screw terminals
Cable section:	min. 0.6 mm^2 , max. 2.5 mm^2 solid or multi-strand lead (incl. conductor ferrules)
U_e:	24 VDC – 15 % / + 20 %, residual ripple max. 10% 24 VAC – 15 % / + 10 %
Frequency range:	50/60 Hz (on AC operational voltage)
I_e:	max. 0.21 A
Protection class:	terminals IP 20 enclosure IP 40 to EN 60529
Power consumption:	max. 5 W
Max. fuse rating:	Glass fuse F1, tripping current 0,5 A
Monitored inputs	1 or 2 channels
Feedback circuit:	yes
Drive circuits:	S11/S12, S11/S22: max. 28 VDC
Enabling contacts:	4 enabling paths
Utilisation category:	AC-15, DC-13
Switching capacity:	enabling paths: 6 A/230 VAC, 6 A/24 VDC
Fuse rating:	enabling paths: 6 A gG D-fuse
Max. switching frequency:	5 Hz
Auxiliary contacts:	55/56
Switching capacity:	Auxiliary contacts: 2 A/24 VDC
Contact material:	AgNi, AgSnO, self-cleaning, positive action
Contact resistance:	max. 100 mΩ in new condition
Pull-in delay:	≤ 200 ms
Drop-out delay:	≤ 30 ms
Air clearances and creepage distances:	DIN VDE 0110-1 (04.97), 4 kV/2
Overvoltage category:	III to DIN VDE 0110
Degree of pollution:	2 to DIN VDE 0110
Ambient temperature:	– 25 °C … + 45 °C (Derating curve on request)
Mechanical life:	10 million operations
Function display:	6 LED
Weight:	280 g
Dimensions:	45 x 83 x 140 mm

Approvals

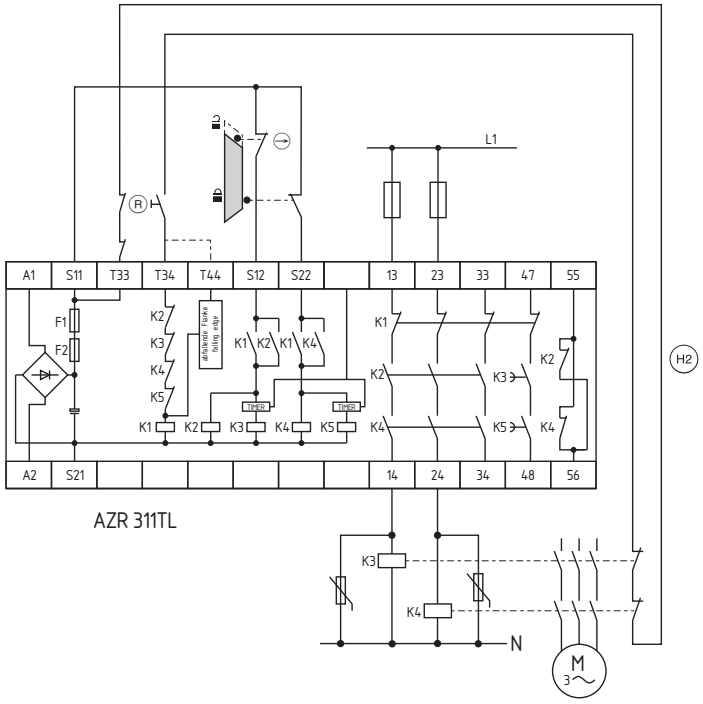
Ordering details

AZR 311 TL

Note

- Input level: the example shows a 2-channel control of a guard door monitoring with two position switches, whereof one with positive break, external reset button Ⓡ and feedback circuit H2
- The control recognises cable break and earth leakages in the monitoring circuit.
- For one channel operation S12 must be bridged with S22.
- For reset with edge detection T34 must be bridged with T44.
- Relay outputs: Suitable for 2 channel control, for increase in capacity or number of contacts by means of contactors or relays with positive-guided contacts.

Wiring diagram



LED

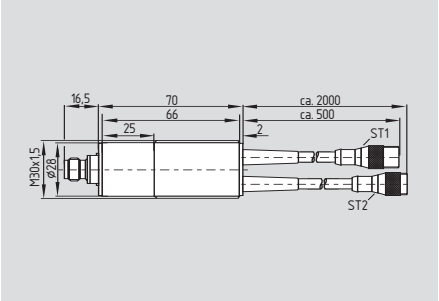
Function display:
The integrated LEDs indicate the following operating states.

- Position relay K2
- Position relay K3
- Position relay K4
- Position relay K5
- Supply voltage U_B
- Internal operating voltage U_i

Note

The wiring diagram is shown with guard doors closed and in de-energised condition.

AST LC ST-AS



- Input module for 2 monitored PNP semiconductor outputs for light curtains and light grids
- AS-Interface LED status display
- AS-Interface M12 connector
- Thermoplastic enclosure
- Long life
- Protection class IP 67

Approvals

Technical data

Standards:	EN 50295, EN 60947-5-1, EN 954-1, EN 61496-1
Enclosure:	glass-fibre reinforced thermoplastic, self-extinguishing
AS-Interface connection type:	connector M12
Protection class:	IP 67 to EN 60529
AS-Interface operating voltage:	26.5 ... 31.6 VDC, via AS-Interface, reverse-polarity proof
AS-Interface operating current:	≤ 50 mA
AS-Interface specification: (V 2.1)	
Profile:	S-0.B
IO-Code:	0x0
ID-Code:	0xB
ID-Code1:	0xF
ID-Code2:	0xE

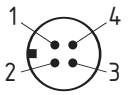
Inputs:

Contact	Status	Data bits
1	on	D0/D1 = dynamic code transmission
1	off	D0/D1 = static code “00”
2	on	D2/D3 = dynamic code transmission
2	off	D2/D3 = static code “00”

Outputs:	A0 ... A3 not used
Parameter bits:	P0 .. P3 not used
Input module address:	default on address 0, programmable via the AS-Interface Master or Hand-held programming device
Indications:	AS-Interface: voltage LED green, communication LED red, OSSD1/2;
Enabling status:	LED yellow
Power supply for AOPD:	PELV power supply to IEC 364-4-41
Reaction time:	≤ 20 ms
EMC rating:	conforming to EMC Directive
Ambient temperature:	– 25 °C … + 60 °C
Storage and transport temperature:	– 25 °C … + 85 °C

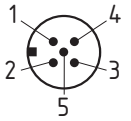
Note

Connector ST



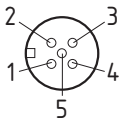
1: AS-i +
2: spare
3: AS-i –
4: spare

Connector ST1



1: + 24 VDC
2: OSSD 1
3: GND
4: OSSD 2
5: FE (functional earth)

Connector ST2



1: + 24 VDC
2: spare
3: GND
4: spare
5: FE (functional earth)

Ordering details

AST LC ST-AS

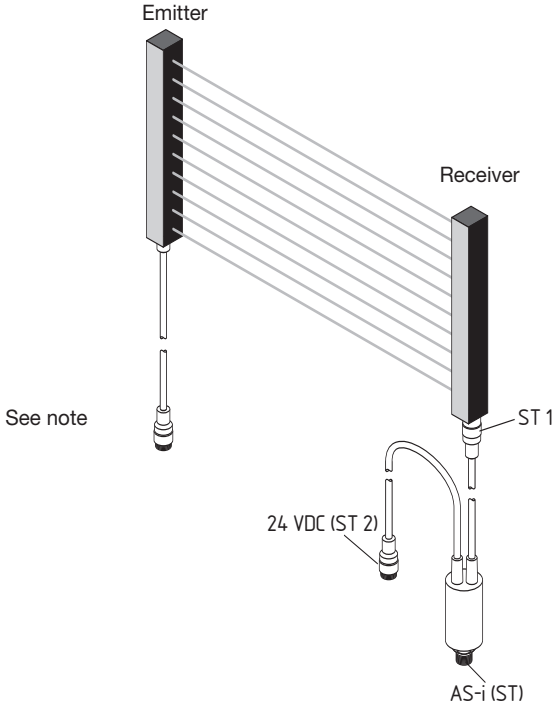
Note

A separate address jack is not available as an option. The addressing must take place via the cable end or the M12 connector.

Note

- The wiring diagram shows an active optoelectronic device (AOPD) (type SLC/SLG) with a safety input module AST LC ST-AS (Opto-Tube) connected to the AS-i Safety at Work system.
- The Opto-Tube is directly connected to the receiver module (ST1). The AOPD receives its 24 VDC power supply via the second M12-cable connection (ST2).
- The Opto-Tube itself is connected via the M12 connector (ST) to the AS-i network. Before hand the module has to be programmed with an individual adress (1 - 31).
- The emitter module has be wired up separately as described in its mounting and wiring instruction.

Wiring diagrame



Glossary

Definitions and terms:

Start interlock:
A device preventing the automatic release and therefore the automatic machine start when the power supply of the AOPD is switched on or interrupted and switched on again.

AOPD:
The abbreviation of **A**ctive **O**ptoelectronic **P**rotective **D**evice.

Resolution:
The resolution or minimum object sensitivity represents the minimum size of an object that is detected in each part of the protection field.

Optoelectronic safety devices:
The here described are optoelectronic safety guards (AOPD), e.g. safety light barriers, safety light curtains and safety light grids as well as laser scanners and their corresponding safety relay modules

Type 2 acc. to EN 61496-1:
The Type 2 AOPD is a protective device, whose safety function is checked by means of regular tests. These devices must meet the requirements of Control Category 2 acc. to EN 954-1.

Type 4 acc. to EN 61496-1:
The Type 4 AOPD is a protective device, whose safety function is not affected by a failure or error in the system. These devices must meet the requirements of Control Category 4 acc. to EN 954-1.

Blanking:
In this configurable operation mode a safety light curtain blanks out a precisely defined area in the protection field. The operation mode. “Blanking“ allows objects to be present in the sending area with out deactivating the light curtain safety outputs. “Fixed Blanking“ is when a fixed set of adjacent light beams are rendered inactive for the purpose of entering an object and pans into the protective area. “Floating Blanking“ is when a set member (one or more) of adjacent beams is allowed to ignore the presence of an object and not deactivating the OSSDs of the light curtain.

Muting:
Muting is a temporary automatic suspension of a safeguarding function by safety-related parts of the control system during otherwise safe conditions in the operation of a machine. The safeguarding function is realized through 2 or 4 muting sensors, which can distinguish between persons and objects. The suspension condition is signalled by means of a muting signal lamp.

OSSD:
Output **S**ignal **S**witching **D**evice of the AOPD (to EN 61496)

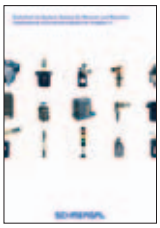
Protection field:
The protection zone is an invisible, two-dimensional light curtain consisting of infrared light beams, installed between the emitter and receiver unit. Depending on the chosen resolution (detection sensitivity) objects of a specific size intruding this light curtain will be detected.

Operating Range:
The operating range is the maximum distance that may exit between the light curtain´s ermitter and its receiver.

Protected height :
The protected height is a vertical area between the first and the last infrared light beam of an optoelectronic safety guard. (not the total housing lenght)
The beginning and the end of this area is marked with symbols on the SLC/SLG’s enclosure.

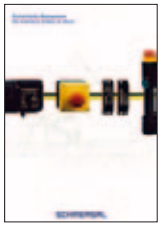
Restart interlock:
A device preventing the automatic restart of the machine, when the protection field is interrupted during a dangerous machine cycle or when the operating mode of the machine is set or changed.

Media

Main catalogues
- Safety technology
- Automation technology


Other catalogues
- Lift technology
- Ex switchgear


Brochures
For some product families, the Schmersal Group has published informative brochures. These brochures present the product range and provide the mechanical and safety engineer with general, practical notes as well as standard-compliant wiring examples

These brochures are available for the following subjects:
- Safety sensors
- Components for AS-Interface Safety at Work
- Solenoid interlocks
- Safety-monitoring modules

MRL News
Since 1996, the information series MRL News appears at irregular intervals. MRL News is intended to provide interesting interpretations and innovations relating to the complicated subject of safety and machinery and machine controls as well as information about standards and directives that are currently under development or revision.


Books on Machine Safety
Safety of machinery and plants is a complex matter. The mechanical engineer must observe numerous directives and standards, which are sometimes still under development or revision. To help you deal with complex subject, Schmersal has published two technical books in which notable authors deal with various aspects of the safety of machines and plants as well as the EC standards and regulations on machine safety: “Safety on machines and engineering plants“ and “Protection of human life in practice“.