



# SLIM

## INSTRUCTION MANUAL



Safety Light Curtains

 DATALOGIC

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**Original Instructions (ref. 2006/42/EC)**

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# PREFACE

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## ABOUT THIS MANUAL

This Product Reference Guide (PRG) is provided for users seeking advanced technical information, including connection, programming, maintenance and specifications. The Quick Reference Guide (QRG) and other publications associated with this product can be downloaded free of charge from the website listed on the back cover of this manual.

## Manual Conventions

The following conventions are used in this document:

The symbols listed below are used in this manual to notify the reader of key issues or procedures that must be observed when using the reader:



**NOTE** **Notes contain information necessary for properly diagnosing, repairing and operating the reader.**



**CAUTION** **The CAUTION symbol advises you of actions that could damage equipment or property.**



**WARNING** **The WARNING symbol advises you of actions that could result in harm or injury to the person performing the task.**

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# COMPLIANCE

ZERTIFIKAT ◆ CERTIFICATE ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

## C E R T I F I C A T E

No. Z10 17 01 70800 039



Product Service

Holder of Certificate: **Datalogic S.r.l.**

Via San Vitalino 13  
40012 Lippo di Calderara di Reno  
ITALY

Factory(ies): 70800, 96012

Certification Mark:



Product: **Electro-Sensitive Protective Equipment  
Safety Light Curtain (Type 2)**

Model(s): **SL2-Series**  
**For nomenclature see attachment**

Parameters: Supply Voltage: 24VDC ±20%  
Operating temperature: -10°C...+55°C  
Protection class: IP65

Tested according to: 2006/42/EC  
EN 61496-1:2013/AC:2015 (Type2)  
EN 61496-2:2013 (Type2)  
EN ISO 13849-1:2015 (Cat. 2, PL c)  
EN 61508-1:2010 (SIL1)  
EN 61508-2:2010 (SIL1)  
EN 61508-3:2010 (SIL1)  
EN 61508-4:2010 (SIL1)  
EN 62081:2005/A2:2015 (SILCL1)

The product was tested on a voluntary basis and complies with the essential requirements. The certification mark shown above can be affixed on the product. It is not permitted to alter the certification mark in any way. In addition the certification holder must not transfer the certificate to third parties. See also notes overleaf.

Test report no.: DM87118T

Valid until: 2022-01-29

Date, 2017-01-31

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Product Service

**C E R T I F I C A T E**

No. Z10 17 01 70800 040

**Holder of Certificate:** Datalogic S.r.l.

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40012 Lippo di Calderara di Reno  
ITALY

**Factory(ies):** 70800, 96012**Certification Mark:****Product:** Electro-Sensitive Protective Equipment  
Safety Light Curtain (Type 4)**Model(s):** SL4-Series  
For nomenclature see attachment**Parameters:**

Supply Voltage:	24VDC ±20%
Operating temperature:	-10°C...+55°C
Protection class:	IP65

**Tested according to:**

2006/42/EC  
EN 61496-1:2013/AC:2015 (Type4)  
EN 61496-2:2013 (Type4)  
EN ISO 13849-1:2015 (Cat. 4, PL e)  
EN 61508-1:2010 (SIL3)  
EN 61508-2:2010 (SIL3)  
EN 61508-3:2010 (SIL3)  
EN 61508-4:2010 (SIL3)  
EN 62061:2005/A2:2015 (SILCL3)

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Date, 2017-01-31

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## CE COMPLIANCE

CE marking states the compliance of the product with essential requirements listed in the applicable European directive. Since the directives and applicable standards are subject to continuous updates, and since Datalogic promptly adopts these updates, therefore the EU declaration of conformity is a living document. The EU declaration of conformity is available for competent authorities and customers through Datalogic commercial reference contacts. Since April 20<sup>th</sup>, 2016 the main European directives applicable to Datalogic products require inclusion of an adequate analysis and assessment of the risk(s). This evaluation was carried out in relation to the applicable points of the standards listed in the Declaration of Conformity. Datalogic products are mainly designed for integration purposes into more complex systems. For this reason, it is under the responsibility of the system integrator to do a new risk assessment regarding the final installation.

**Warning:** This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.



# CHAPTER 1

## GENERAL INFORMATION

---

### GENERAL DESCRIPTION

The safety light curtains are optoelectronic multi-beam devices that are used to protect working areas that, in presence of machines, robots, and automatic systems in general, can become dangerous for operators that can get in touch, even accidentally, with moving parts.

The light curtains are intrinsic safety systems used as accident-prevention protection devices and are manufactured in accordance with the international Standards in force for safety, in particular:

NORM	DESCRIPTION
EN 61496-1: 2013	Safety of machinery: electrosensitive protective equipment. Part 1: General prescriptions and tests.
EN 61496-2: 2013	Safety of machinery: electrosensitive protective equipment - Particular requirements for equipment using active optoelectronic protective devices.
EN ISO 13849-1: 2015	Safety of machinery. Safety-related parts of control systems. Part 1: General principles for design
EN 61508-1: 2010	Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 1: General requirements
EN 61508-2: 2010	Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems
EN 61508-3: 2010	Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 3: Software requirements
EN 61508-4: 2010	Functional safety of electrical/electronic/programmable electronic safety-related systems. Part 4: Definitions and abbreviations
EN 62061:2005/A1: 2013	Safety of machinery. Functional safety of electrical/ electronic/ programmable electronic safety-related control systems.

The device, consisting of one emitter and one receiver contained inside aluminum profiles, generates infrared beams that detect any opaque object positioned within the light curtain detection field.

The emitter and the receiver are equipped with the command and control functions.

The connections are made through one or more connectors as specified in "[Electrical Connections](#)" on page 27.

The synchronization between the emitter and the receiver takes place optically, i.e. no electrical connection between the two units is required.

The microprocessor guarantees the check and the management of the beams that are sent and received through the units: the microprocessor – through some LEDs – informs the operator about the general conditions of the safety light curtain (see "[User Interface and Diagnostics](#)" on page 39).

The receiver is the main controller for all functions. It monitors all safety actions in case of failure and performs general functions as well.

During installation, a user interface facilitates the alignment of both units (see "[Alignment Procedure](#)" on page 32).

As soon as an object, or a limb or the operator's body accidentally interrupts one or some of the infrared beams sent by the emitter, the receiver immediately opens the OSSD outputs or trigger Safety State over connected safety Fieldbus.

This manual contains all the information necessary for the selection and operation of the safety devices.

However, specialized knowledge not included in this technical description is required for the planning and implementation of a safety light curtain on a power-driven machine.

As the required knowledge may not be completely included in this manual, we suggest the customer to contact Datalogic Technical Service for any necessary information relative to the functioning of the light curtains and the safety rules that regulate the correct installation (see "[User Interface and Diagnostics](#)" on page 39).

## PACKAGE CONTENTS

Package contains the following objects:

- Receiver (RX)
- Emitter (TX)
- Quick Guide of safety light curtain
- Periodical checklist and maintenance schedule
- Mini-DVD with instruction manual and other documents
- 1 kit of 4pcs. "O" type brackets (ST-K4-SL-O) and specific fasteners
- 2 kits of 2pcs. "C" type brackets (ST-K2-SL-C) and specific fasteners
- An additional kit of "C" type brackets (ST-K2-SL-C) for models with heights above 600 mm

# HOW TO CHOOSE THE DEVICE

There are at least three different main characteristics that should be considered when choosing a safety light curtain, after having evaluated the risk assessment.

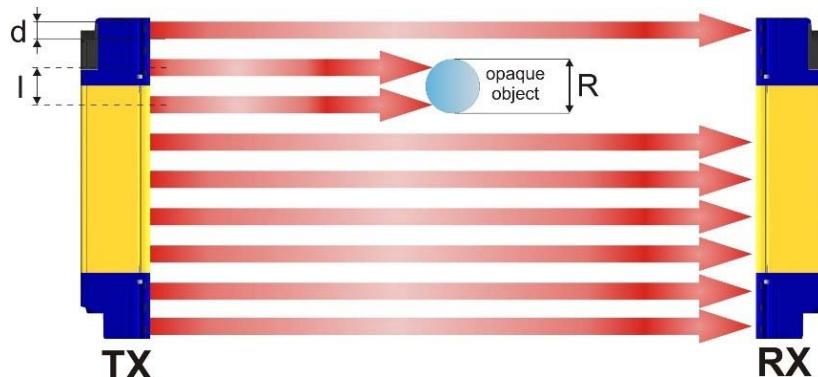
## Detection capability

The detection capability (or resolution) of the device is the minimum diameter that an opaque object must have in order to obscure at least one of the beams that constitute the detection zone and to actuate the sensing device.

The resolution is related to the part of the body to be protected.



As shown in Figure 1 the resolution only depends on the geometrical characteristics of the lenses, diameter and distance between centers, and is independent of any environmental and operating conditions of the safety light curtain.



**Figure 1 - Detection capability**

The resolution value is obtained applying the following formula:

$$R = I + d$$

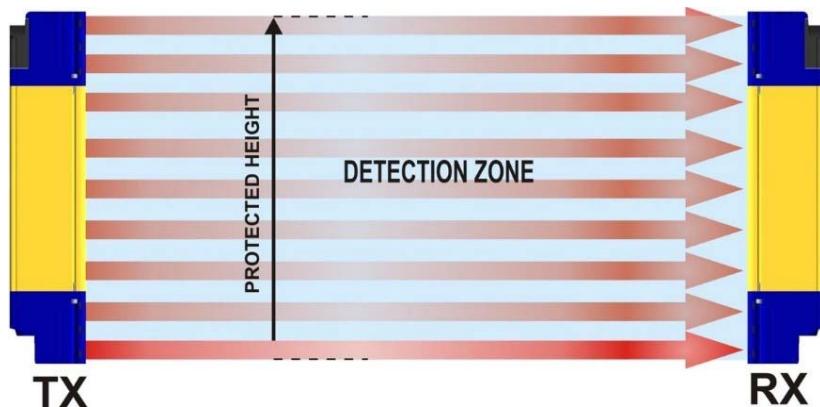
where:

I = Interaxes between two adjacent optics

d = Lens diameter

## Height of the detection zone

The controlled height is the height protected by the safety light curtain.



**Figure 2 - Detection zone**

The SLIM controlled height extends up to the whole height of the product (zero dead-zone).

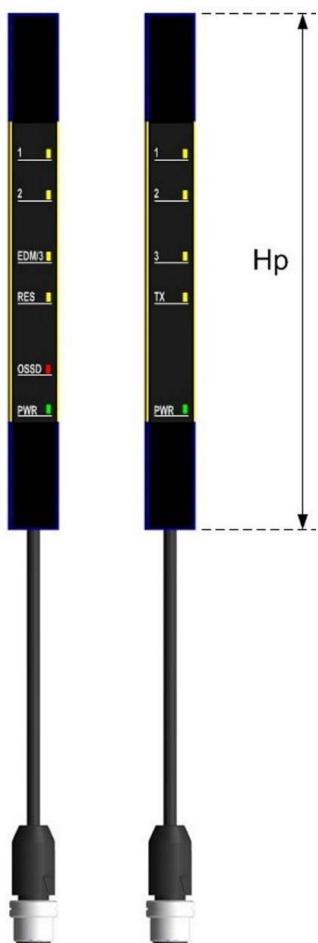
The available dimensions are listed in the following table:

<b>SL2 - 14 - 0150 - E</b>					
		<b>TYPE</b>	<b>MONITORED HEIGHT</b>		<b>VERSION</b>
2	Type 2	0150	150 mm		E
4	Type 4	0210	210 mm		EDM, Restart
		0270	270 mm		
		0300	300 mm		
		...			
		1200	1200 mm		
<b>RESOLUTION</b>					
	14	Finger : 14 mm			
	24	Hand: 24 mm			
	34	Hand: 34 mm			

**Figure 3 - Available models an protected heights**

Referring to the figure above the protected height is reported in the table here below.

MODEL	CONTROLLED HEIGHT Hp (mm)
SLX-XX-0150-E	150
SLX-XX-0210-E	210
SLX-XX-0270-E	170
SLX-XX-0300-E	300
SLX-XX-0330-E	330
SLX-XX-0360-E	360
SLX-XX-0390-E	390
SLX-XX-0420-E	420
SLX-XX-0450-E	450
SLX-XX-0480-E	480
SLX-XX-0510-E	510
SLX-XX-0540-E	540
SLX-XX-0570-E	570
SLX-XX-0600-E	600
SLX-XX-0630-E	630
SLX-XX-0660-E	660
SLX-XX-0690-E	690
SLX-XX-0720-E	720
SLX-XX-0750-E	750
SLX-XX-0780-E	780
SLX-XX-0810-E	810
SLX-XX-0840-E	840
SLX-XX-0870-E	870
SLX-XX-0900-E	900
SLX-XX-0930-E	930
SLX-XX-0960-E	960
SLX-XX-0990-E	990
SLX-XX-1020-E	1020
SLX-XX-1050-E	1050
SLX-XX-1080-E	1080
SLX-XX-1110-E	1110
SLX-XX-1140-E	1140
SLX-XX-1170-E	1170
SLX-XX-1200-E	1200



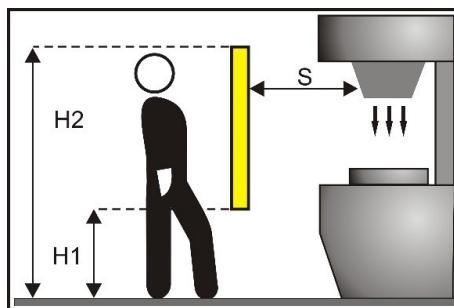
## Minimum installation distance

The safety device must be positioned at a specific safety distance (Figure 4).

This distance must ensure that the dangerous area cannot be reached before the dangerous motion of the machine has been stopped by the Safety Control System.

The safety distance depends on 4 factors, according to the EN ISO 13855 Standard:

- Response time of the ESPE (the time between the effective beam interruption and the opening of the OSSD contacts)
- Machine stopping time including Safety Control System computing and actuating time if present.
- ESPE resolution
- Approaching speed of the object to be detected



**Figure 4 - Installation distance (vertical positioning)**

The following formula is used for the calculation of the safety distance:

$$S = K(t_1 + t_2) + C$$

where:

- S = Minimum safety distance in mm
- K = Speed of the object, limb or body approaching the dangerous area in mm/s
- t<sub>1</sub> = Response time of the ESPE in seconds (see "[Available Models and Response Times](#)" on page 47)
- t<sub>2</sub> = Machine stopping time in seconds (including the Safety Control System)
- C = Additional distance based on the possibility to insert the body or one of the body parts inside the dangerous area before the protective device trips.  
C=8 (R - 14) for devices with resolution ≤ 40 mm  
C=850 mm for devices with resolution > 40 mm
- R = Resolution of the system



**K value is:**

**2000 mm/s if the calculated value of S is ≤ 500 mm**

**1600 mm/s if the calculated value of S is > 500 mm**

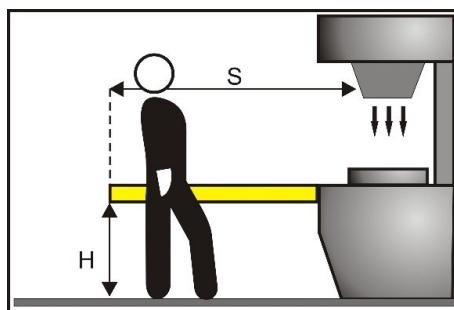
When devices with  $> 40$  mm resolution are used, the height of the top beam has to be  $\geq 900$  mm (H2) from machine supporting base while the height of the bottom beam has to be  $\leq 300$  mm (H1).

If the safety light curtain must be mounted in a horizontal position (Figure 5) the distance between the dangerous area and the most distant optical beam must be equal to the value calculated using the following formula:

$$S = 1600 \text{ mm/s} (t_1 + t_2) + 1200 - 0,4 H$$

where:

- S = Minimum safety distance in mm
- t1 = Response time of the ESPE in seconds (see "Technical Data" on page 44)
- t2 = Machine stopping time in seconds (including the Safety Control System)
- H = Beam height from ground; this height must always be less than 1,000 mm



**Figure 5 – Installation distance (horizontal positioning)**

### Practical examples

Let's suppose to have a light curtain with height = 600 mm

To calculate the distance of the device from the ESPE, in a vertical position, the following formula is used:

$$S = K * T + C$$

where:

- S = Minimum safety distance in mm
- t1 = ESPE response time
- t2 = Machine stopping time (including the Safety Control System)
- T = (t1 + t2) Overall system stopping performance
- C =  $8 * (R - 14)$  for devices with resolution  $\leq 40$  mm
- R = Resolution of the system

	<b>SL4-14-0600-E</b>	<b>SL4-34-0600-E</b>
t1	11 ms	10 ms
t2	100 ms	100 ms
T	111 ms	110 ms
C	0 mm	160 mm
S	222 mm	380 mm



**The reference standard is EN ISO 13855 “Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body”.**

**The following information is to be considered as indicative and concise.**

**For correct safety distance please refer to complete standard EN ISO 13855.**

## TYPICAL APPLICATIONS

The new SLIM safety light curtains, with their 15 x 32 mm profile, the absence of dead zone, their pigtail cable, and the large choice of available lengths (with 30 mm modularity) are the perfect solution to protect machines where space saving and simplicity of use are the main requirements.

In particular, the safety curtains can be used in:

- Primary packaging machinery (packing, filling, labelling, etc.)
- Cutting machinery
- Automatic assembly machines and lines
- Automatic and semi-automatic quality inspection machinery
- Material handling machinery
- Bending and metal-working machinery
- Process lines

Used mainly in following industries:

- Food & Beverage
- Electronics
- Metal working
- Textile
- Wood

### Example 1: Hazardous point protection on an automatic machine



The operator positions the products and takes them back after working and must be protected against possible harm by movable parts of the machine.

SLIM safety light curtain is especially suitable and flexible for this kind of applications: the 34 heights available from 150 to 1200 mm, the absence of any dead zone and the flexible pigtail on the rear of the light curtain makes it easy to find the right model to fit exactly the dimension of the opening through which the operator could reach the hazardous point.

The small dimensions of the profile of SLIM (15 mm x 32 mm) makes it also possible to hide the light curtain inside the structure of machine itself.

Depending on the risk evaluated on the machine, a Type 2 or a Type 4 light curtain can be used.

The three resolutions (14mm, 24mm and 34mm) of SLIM light curtain make it also possible to choose just the resolution needed to fulfill the safety requirements in terms of safety distance to be kept between the light curtain and the hazardous point, depending on the stopping time of the machine.

### Example 2: Hazardous point protection along an assembling line



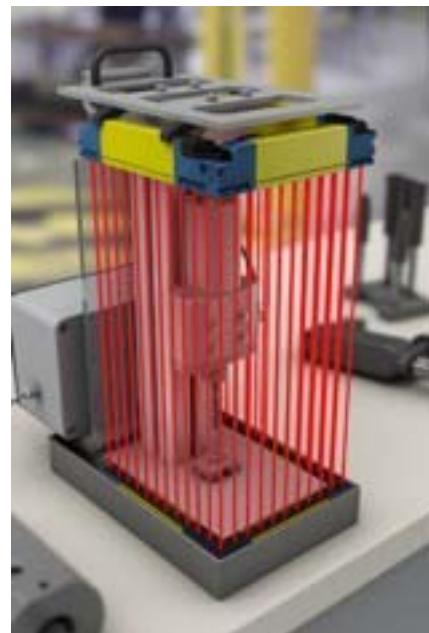
SLIM safety light curtains can be installed in line to each other, thanks to cascading, without losing resolution across the junction of one unit to the next one.

Three units can be cascaded and used as a single light curtain, reaching the total length of 3600 mm.

The small dimensions of the profile of SLIM (15 mm x 32 mm) makes it also possible to hide the light curtain inside the structure of machine itself.

The benefit of this kind of use is the absence of any physical obstacle along all the opening area, and the use of just 2 safety outputs for all three units, with saving of safety units into the cabinet.

### Example 3: Hazardous point protection over three sides in a small semi-automatic machine



The operator positions the products and takes them back after working and must be protected against possible harm by movable parts of the machine.

Thanks to cascading and 15 mm width, SLIM safety light curtains can be cascaded at 90° angles, keeping at least 20 mm resolution even in the angle.

The benefit of this kind of use is the absence of any physical obstacle along all the three sides of the machine to be protects, leaving maximum movement freedom to the operator, and the use of just 2 safety outputs for all three units, with saving of safety units into the cabinet.

# SAFETY INFORMATION



**For a correct and safe use of the safety light curtains, the following points must be observed:**

**CAUTION**

- The stopping system of the machine must be electrically controlled.
- This control system must be able to stop the dangerous movement of the machine within the total machine stopping time T as per paragraph "[Minimum installation distance](#)" on page 6 and during all working cycle phases.
- Mounting and connection of the safety light curtain must be carried out by qualified personnel only, according to the indications included in the special sections (refer to "[Installation](#)" on page 11, "[Mechanical Mounting](#)" on page 20, "[Electrical Connections](#)" on page 27, "[Alignment Procedure](#)" on page 32) and in the applicable standards.
- The safety light curtain must be securely placed in a particular position so that access to the dangerous zone is not possible without the interruption of the beams (refer to "[Installation](#)" on page 11).
- The personnel operating in the dangerous area must be well trained and must have adequate knowledge of all the operating procedures of the safety light curtain.
- The Restart button must be located outside the dangerous zone because the operator must check the dangerous zone during all Restart operations.



**Please carefully read the instructions for the correct functioning before powering the light curtain on.**

**NOTE**

# CHAPTER 2

## INSTALLATION

---

### PRECAUTIONS TO BE OBSERVED FOR THE CHOICE AND INSTALLATION



**Make sure that the protection level assured by the light curtain device is compatible with the real danger level of the machine to be controlled, according to EN ISO 13849-1: 2015 or EN 62061:2005/A1: 2013.**

- Use only matched emitter and receiver pairs with same serial no.
- The outputs (OSSD) of the ESPE must be used as machine stopping devices and not as command devices.
- The machine must have its own START command.
- The dimension of the smallest object to be detected must be larger than the resolution level of the device.
- The ESPE must be installed in an environment complying with the characteristics indicated in "[Technical Data](#)" on page 44.
- The ESPE must not be installed close to strong and/or flashing light sources, in particular close to the front window of receiving unit.
- The presence of intense electromagnetic disturbances could affect device's correct operation.
- This condition shall be carefully assessed with the advice of DATALOGIC Technical Service.
- The operating distance of the device can be reduced in presence of smog, fog or airborne dust.
- A sudden change in environment temperature, with very low minimum peaks, can generate a small condensation layer on the lenses and thus jeopardize correct operation.

## GENERAL INFORMATION ON DEVICE POSITIONING

The safety light curtain should be carefully positioned in order to provide the necessary protection. Access to the dangerous area must only be possible by passing through the protecting safety light beams.



**Figure 1 shows some examples of possible access to the machine from the top and the bottom sides. These situations may be very dangerous and so the installation of the safety curtain at sufficient height in order to completely cover the access to the dangerous area (Figure 2) becomes necessary.**

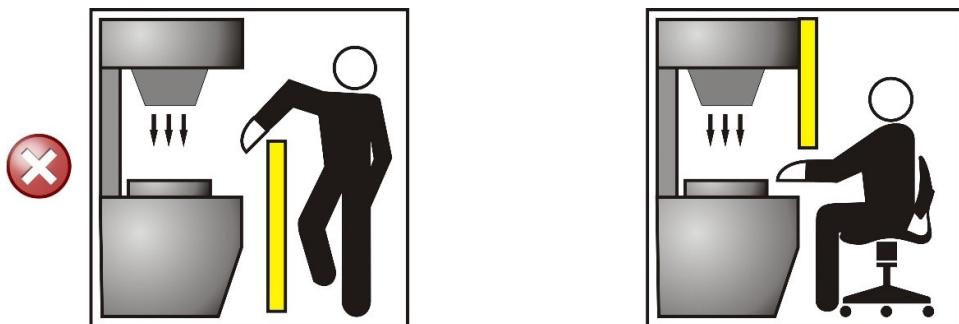


Figure 1 - Wrong light curtain positioning

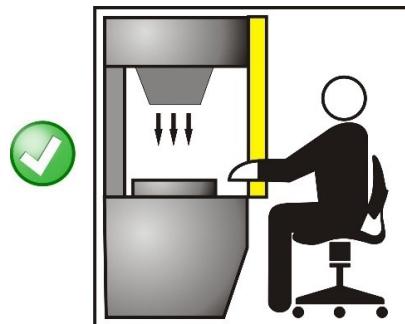


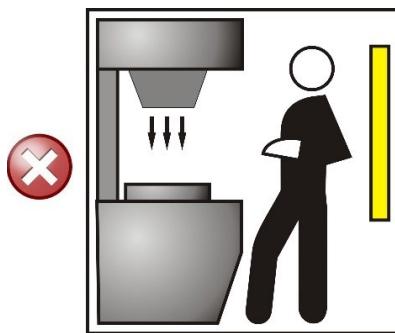
Figure 2 - Correct light curtain positioning



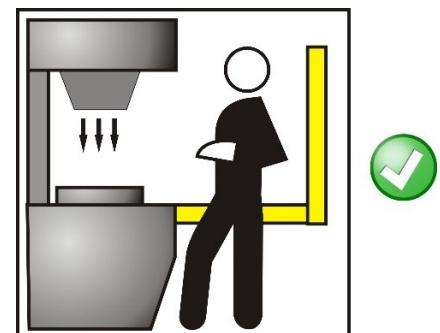
If the operator is able to enter in the dangerous area, an additional mechanical protection must be mounted to prevent the access.

Under standard operating conditions, machine starting must not be possible while operators are inside the dangerous area.

Where it is not possible to install safety light curtain very near to the dangerous zone, a second light curtain must be mounted in a horizontal position in order to prevent any lateral access, as shown in Figure 4.



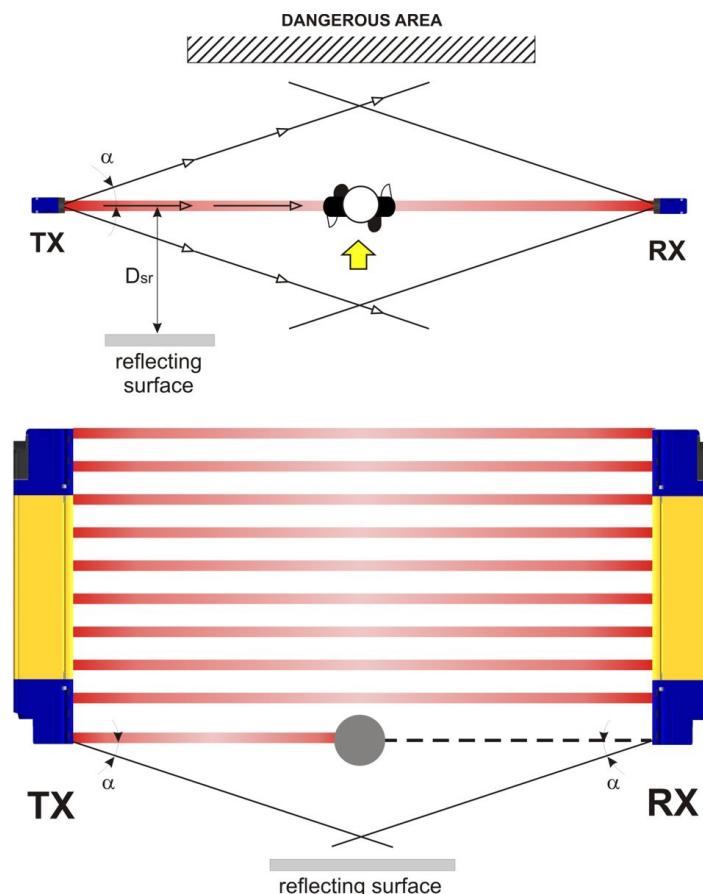
**Figure 3 - Wrong light curtain positioning**



**Figure 4 - Correct light curtain positioning**

## Minimum distance from reflecting surfaces

Reflecting surfaces placed near the light beams of the safety device (over, under or laterally) can cause passive reflections. These reflections can affect the recognition of an object inside the controlled area. Moreover, if the RX receiver detects a secondary beam (reflected by the side-reflecting surface) the object might not be detected, even if the object interrupts the main beam.



**Figure 5 - Distances from reflective surfaces**

It is important to position the safety light curtain according to the minimum distance from reflecting surfaces.

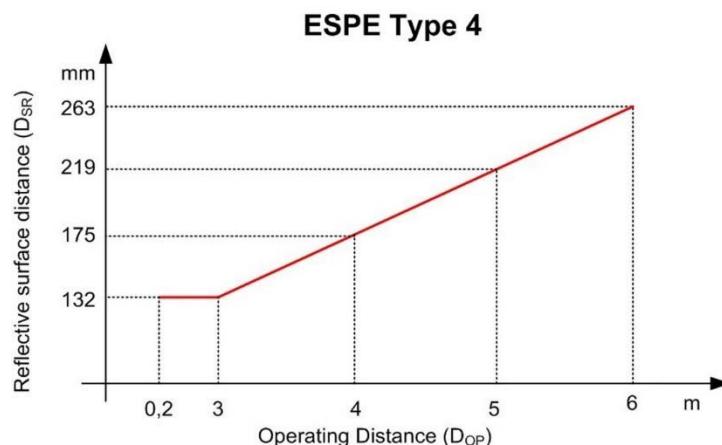
The minimum distance depends on:

- operating distance between emitter (TX) and receiver (RX);
- real aperture angle of ESPE (EAA); especially:

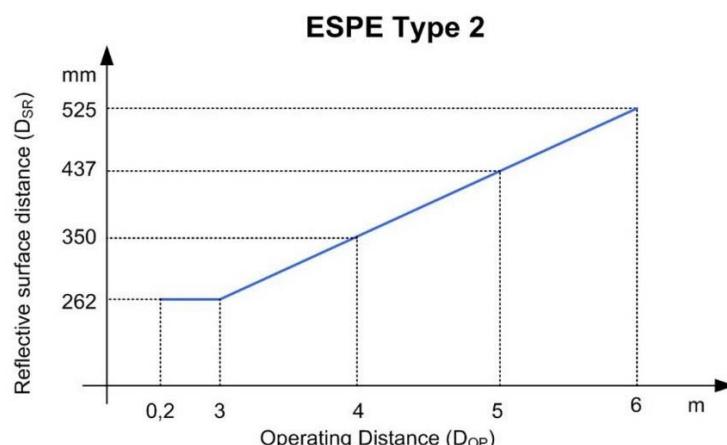
**for ESPE Type 4 EAA = 5° ( $\alpha = \pm 2.5^\circ$ )**

**for ESPE Type 2 EAA = 10° ( $\alpha = \pm 5^\circ$ )**

In the diagrams shows the minimum distance from the reflecting surface (DSR), based on the operating distance:



**Figure 6 - Minimum distance from reflective surface for Type 4 ESPE**



**Figure 7 - Minimum distance from reflective surface for Type 2 ESPE**

The formula to get Dsr is the following:

**For ESPE Type 2:**

$$D_{sr} (m) = 0.26 \quad \text{for operating distance} < 3 \text{ m}$$

$$D_{sr} (m) = 0.5 \times \text{operating distance (m)} \times \tan 5^\circ \quad \text{for operating distance} \geq 3 \text{ m}$$

**For ESPE Type 4:**

$$D_{sr} (m) = 0.13 \quad \text{for operating distance} < 3 \text{ m}$$

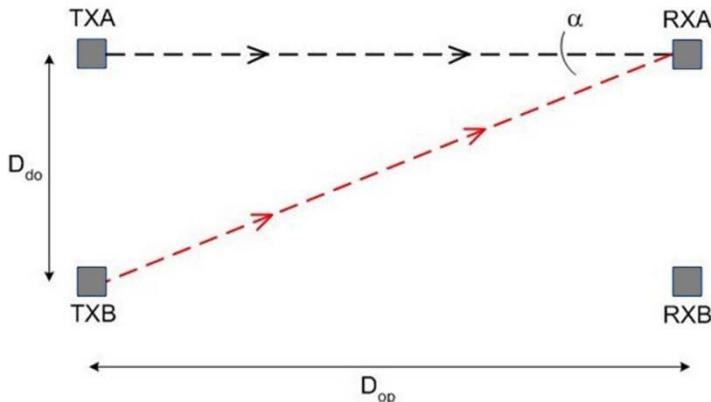
$$D_{sr} (m) = 0.5 \times \text{operating distance (m)} \times \tan 2.5^\circ \quad \text{for operating distance} \geq 3 \text{ m}$$

## Distance between homologous devices

The following graphic shows the distance from the interfering devices (Ddo) according to the operating distance (Ddo) of the couple (TXA – RXA).

If different safety devices have to be installed in adjacent areas, the emitter of one device must not interfere dangerously with the receiver of the other device.

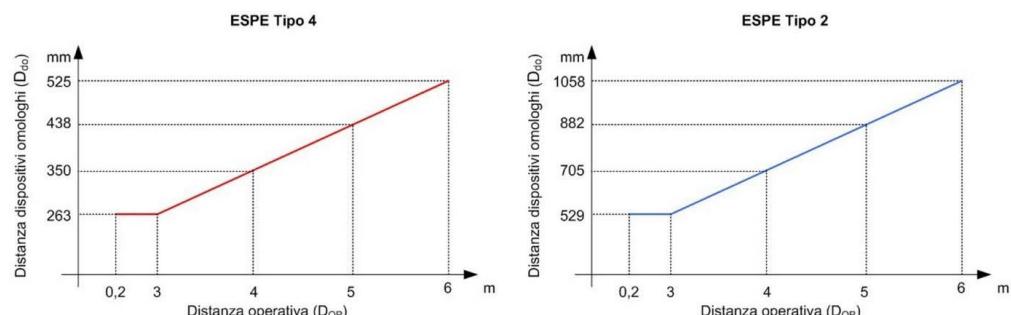
The TXB interfering device must be positioned outside a minimum Ddo distance from the TXA – RXA emitter-receiver couple axis.



**Figure 8 - Distance between homologous devices**

This minimum Ddo distance depends on:

- the operating distance between emitter (TXA) and receiver (RXA)
- the effective aperture angle of the ESPE (EAA)



The formula to get Ddo is the following:

**For Type 4 ESPE:**

$Ddo \text{ (mm)} = 263 \text{ for Type 4 ESPE}$  for operating distance  $< 3 \text{ m}$

$Ddo \text{ (m)} = \text{operating distance (m)} \times \tan 5^\circ$  for operating distance  $\geq 3 \text{ m}$

**For Type 2 ESPE:**

$Ddo \text{ (mm)} = 529 \text{ for Type 2 ESPE}$  for operating distance  $< 3 \text{ m}$

$Ddo \text{ (m)} = \text{operating distance (m)} \times \tan 10^\circ$  for operating distance  $\geq 3 \text{ m}$



**The interfering device (TBX) must be positioned at the same Ddo distance, calculated as shown above, even if closer to TXA respect to RXA.**

**Installation precautions have to be taken to avoid interference between homologous devices. A typical situation is represented by the installation areas of several adjacent safety devices aligned one next to the other, for example in plants with different machines.**

The figure provides two examples:

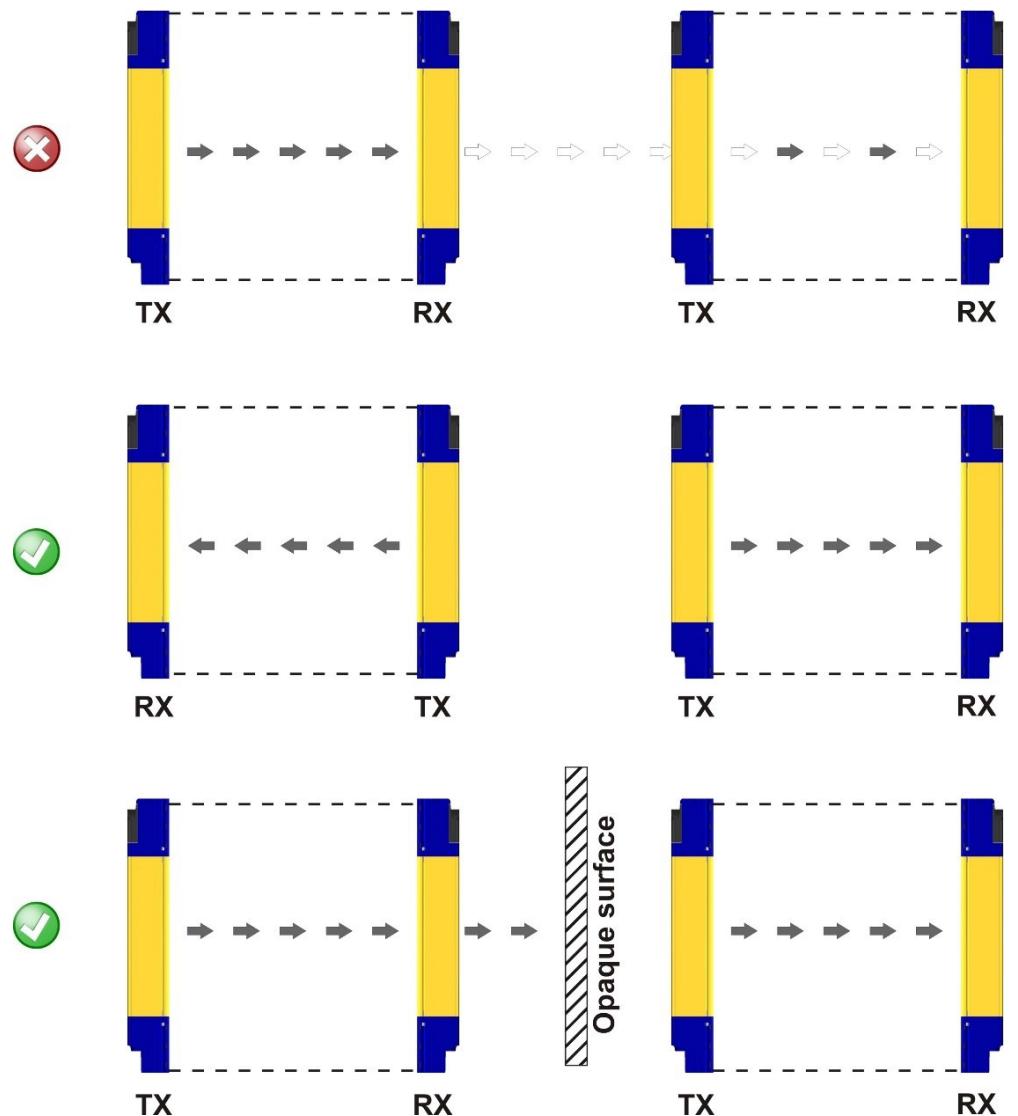
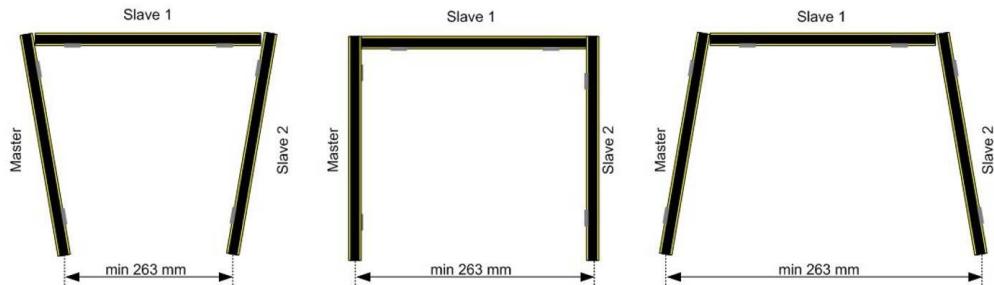


Figure 9 - Recommended positioning for homologous devices

## Minimum distance for cascaded system



**Figure 10 - Minimum distance for cascaded system**

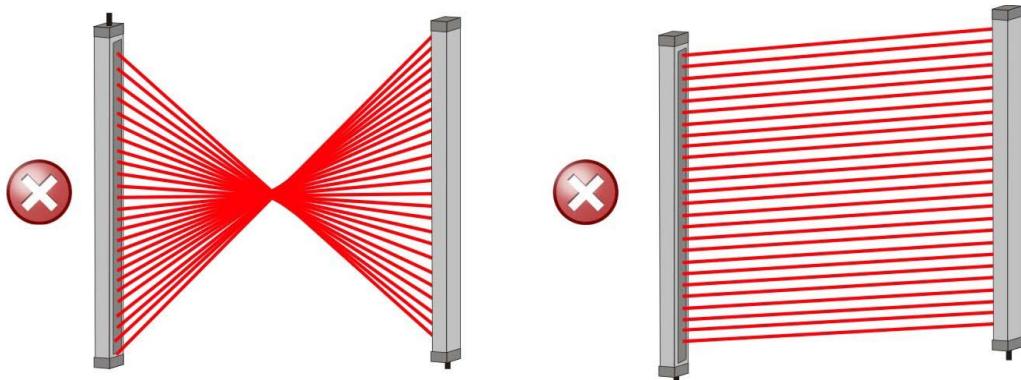
In a cascade system with a protective field width of up to 3m a minimum distance Ddo of 263mm must be maintained between Master and Slave 2 unit in order to avoid interference.

For protective field width of more than 3m refer to Figure 10 for Ddo calculation.

## Emitter and receiver orientation

The two units shall be assembled parallel each other, with the beams arranged at right angles with the emission and receiving surface, and with the connectors pointing to the same direction.

The configurations shown in the figure must be avoided:

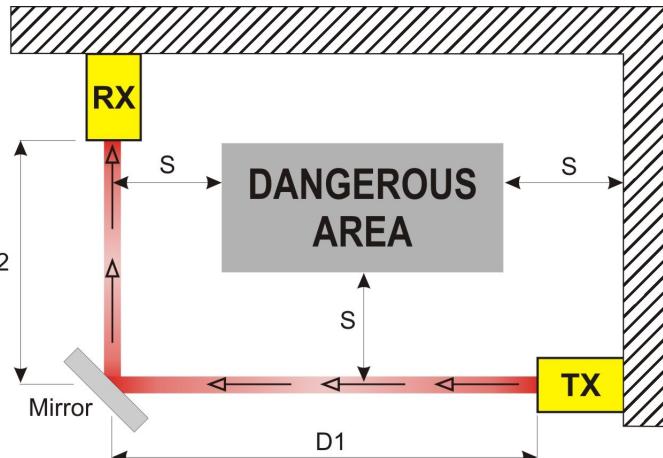


**Figure 11 - Wrong light curtain TX-RX orientations**

## Use of deviating mirrors

The control of any dangerous area, with several but adjacent access sides, is possible using only one safety device and well-positioned deviating mirrors.

The figure shows a possible solution to control two different access sides, using one mirror placed at 45° with respect to the beams.



**Figure 12 - Use of deviating mirrors**

The operator must respect the following precautions when using the deviating mirrors:

- The alignment of the emitter and the receiver can be a very critical operation when deviating mirrors are used. Even very small displacements of the mirror is enough to lose alignment.
- The use of DATALOGIC laser pointer accessory is recommended under these conditions.
- The minimum safety distance (S) must be respected for each single section of the beams.
- The effective operating range decreases by about 20% by using only one deviating mirror.

The following table shows estimated operating distances relating to the number of mirrors used.

NUMBER OF MIRRORS	MAX. OPERATING DISTANCE
0	6 m
1	4.8 m

- The presence of dust or dirt on the reflecting surface of the mirror causes a drastic reduction in the range.

## Controls after first installation

The control operations to carry-out after the first installation and before machine start-up are listed hereinafter. The controls must be carried-out by qualified personnel, either directly or under the strict supervision of the person in charge of machinery Safety.

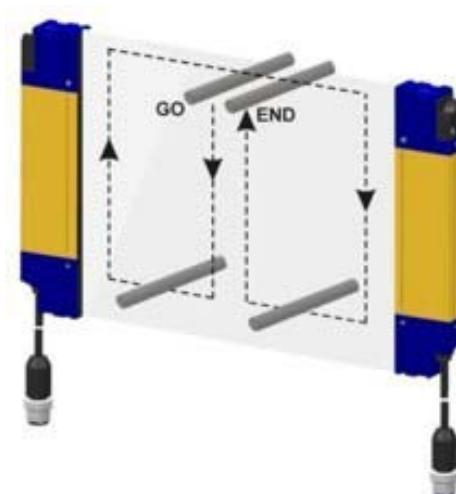
Check that:

- The ESPE remains in Safe State (OSSD led lit RED) intercepting the beams along the detection zone using the specific test piece, following the scheme shown in Figure 13 (see "[Accessories](#)" on page 51).

**TP-14 for light curtains with 14 mm resolution:SLx-14-xxxx-E**

**TP-24 for light curtains with 24 mm resolution:SLx-24-xxxx-E**

**TP-34 for light curtains with 30 mm resolution:SLx-34-xxxx-E**



**Figure 13 - First installation check with test piece**

- ESPE has to be correctly aligned: press slightly on the product side in both directions, ESPE shall remain in Normal Operation (OSSD LED lit GREEN).
- The response time at machine STOP, including the ESPE and machine response times, must be included in the limits defined in the calculation of the safety distance (refer to "[Minimum installation distance](#)" on page 6).
- The safety distance between the dangerous parts and ESPE must comply with the requirements indicated in "[Minimum installation distance](#)" on page 6.
- A person must not access or remain between ESPE and the dangerous parts of the machine.
- Access to the dangerous areas of the machine must not be possible from any unprotected area.
- ESPE must not be disturbed by external light sources, ensure that it remains in Normal Operation for at least 10-15 minutes when the beams are not intercepted and remains in Safe State for the same period when intercepted with the proper Test Piece (see "[Accessories](#)" on page 51).
- Verify the correspondence of all the accessory functions, activating them in the different operating conditions.

# CHAPTER 3

## MECHANICAL MOUNTING

### FIXING WITH "O" TYPE BRACKETS

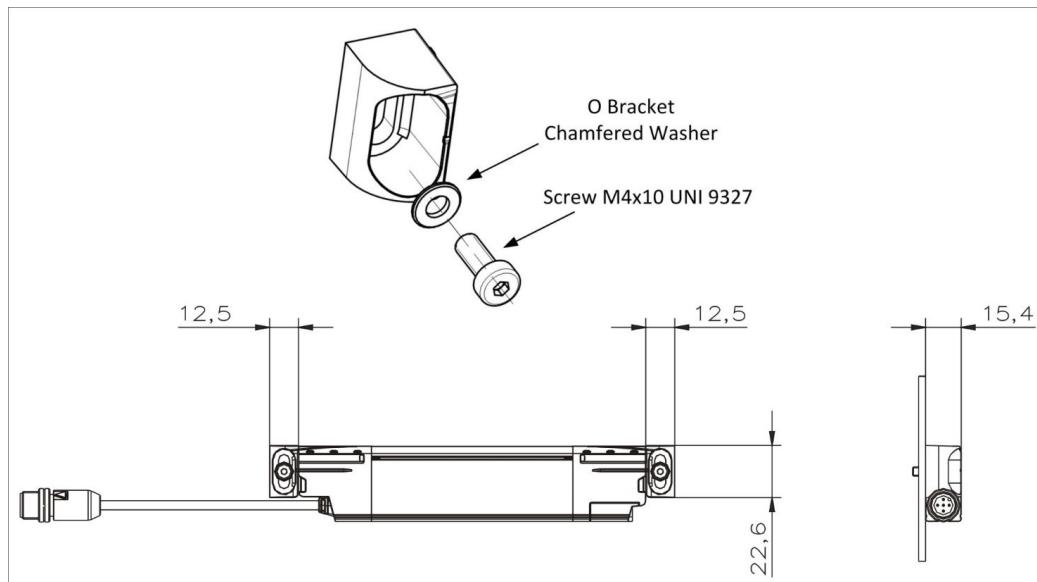


Figure 1 - "O" type brackets

- Drill two holes in the support with inter-axis Lø as specified in table.
- Fit two "O" type fixing brackets in the correct position, without completely tightening M4 screws (1).
- Position the product between the two brackets engaging the end parts in the brackets themselves. (2)
- Tighten the screws to a maximum torque of 1.2 Nm.
- For ESPE length longer than 600 mm, a double-sided tape strip in the middle is suggested in case of vibrations (3).

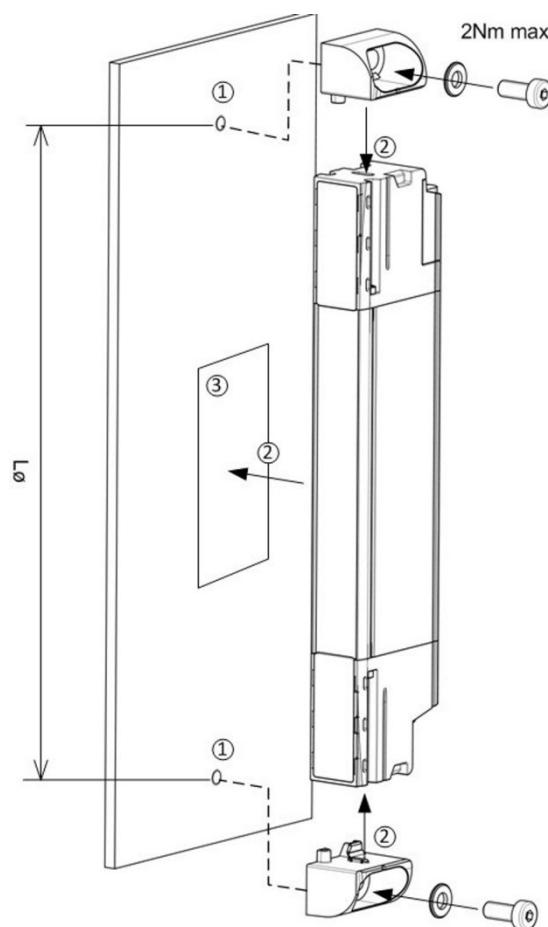
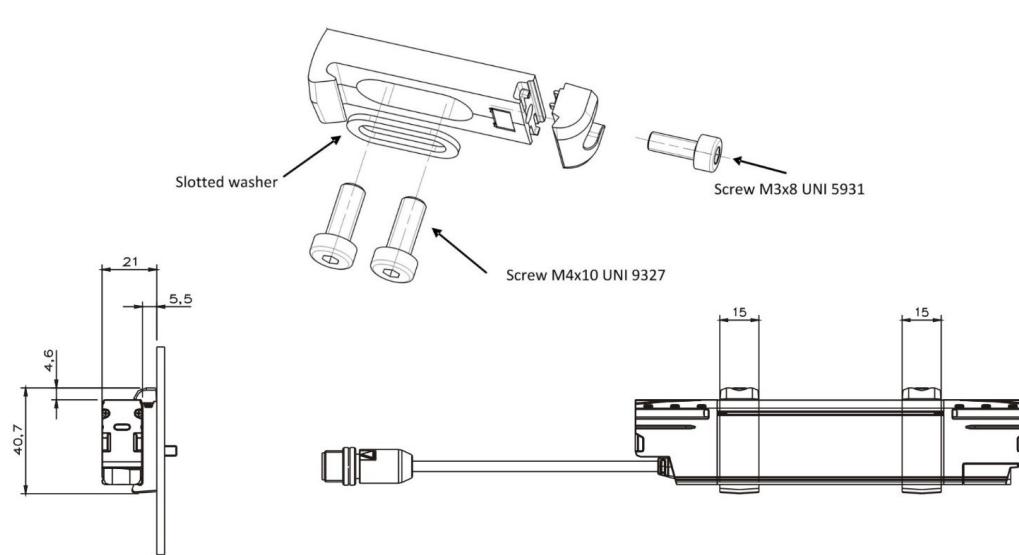


Figure 2 - Fixing with "O" type brackets

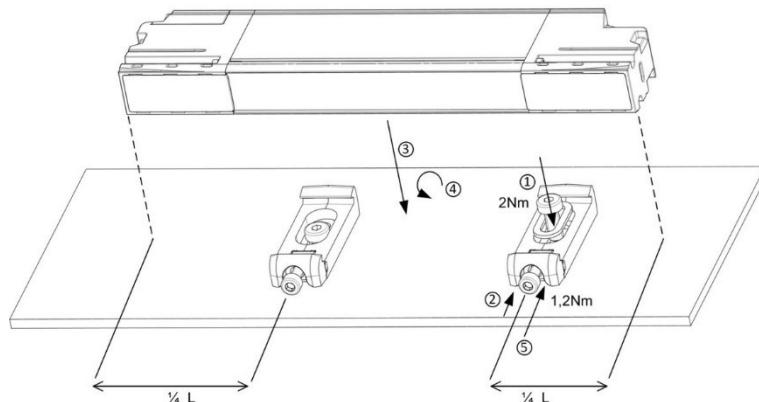
MODEL	L (mm)
SLx-xx-0150-E	162.20
SLx-xx-0210-E	222.10
SLx-xx-0270-E	282.00
SLx-xx-0300-E	312.00
SLx-xx-0330-E	341.90
SLx-xx-0360-E	371.90
SLx-xx-0390-E	401.70
SLx-xx-0420-E	431.70
SLx-xx-0450-E	461.70
SLx-xx-0480-E	491.60
SLx-xx-0510-E	521.60
SLx-xx-0540-E	551.50
SLx-xx-0570-E	581.50
SLx-xx-0600-E	611.50

## FIXING WITH “C” TYPE BRACKETS



**Figure 3 - “C” type brackets**

- Mount the “C” type brackets in the desired position. The distance suggested for each “C” type bracket, related to product length, is equal to about  $\frac{1}{4}$  of the length, measuring from the light curtain head face to the tail face. Tighten the screws M4 to a torque of 1.2 Nm.
- Position the upper clamp of the “C” type bracket by starting the M3 screw without tightening it (2).
- Place the product slightly tilted in the lower seat of the “C” type bracket using dedicated longitudinal groove of the bar (3).
- Rotate the product until fitting it in the upper clamp (4).
- Tighten the M3 screw to a maximum torque of 1.2 Nm (5).
- For lengths up to 600 mm, 2 “C” type brackets are sufficient, for greater lengths it is recommended to use 3 “C” type brackets, the third one as an additional support in the middle.



**Figure 4 - Fixing with “C” type brackets**

## FIXING WITH "L" TYPE BRACKETS

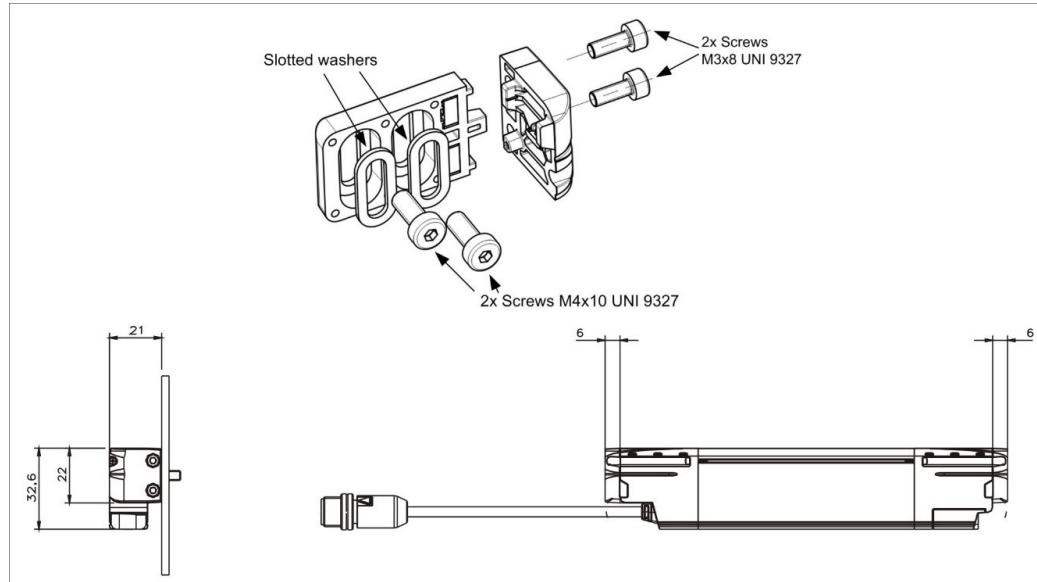


Figure 5 - "L" type brackets

- Mount the "L" type bracket at the desired height. Tighten the M4 screws to a torque of 1.2 Nm. (1)
- Mount the side plate of "L" type bracket so that the product end face sticks out of the side plate upper coupling face by a maximum of 1 mm. (2)
- Fit the product in the lower bracket by matching the relevant reference shapes (3)
- Fix the "L" part of the upper bracket working on the M3 screws. (4)
- Tighten the M3 screws to a torque of 1.2 Nm.

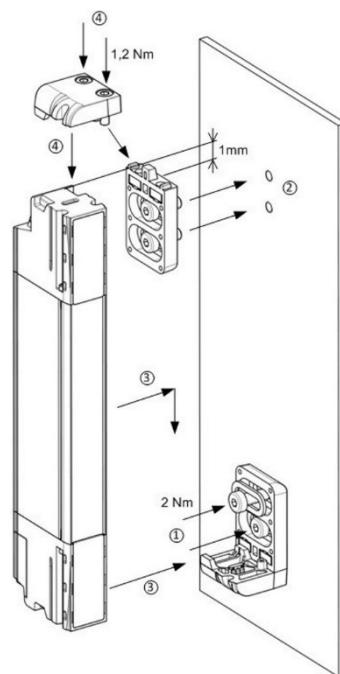


Figure 6 - Fixing with "L" type brackets

## FIXING WITH “L” TYPE BRACKETS AND “C” TYPE BRACKETS

- Mount the “L” type bracket in the lower side at the desired height. Tighten the screws M4 to a torque of 2 Nm and the screws M3 to a torque of 1.2 Nm. (1)
- Mount the “C” type bracket at the desired height. The distance suggested, related to product length, for the “C” type bracket is equal to about  $\frac{1}{4}$  of the length, measuring the head or the tail plane of the light curtain. Tighten the M4 screws to a torque of 1.2 Nm. (2)
- Position the upper clamp of the “C” type bracket by partially tightening the M3 screw (3).
- Place the product slightly tilted in the lower seat of the “C” type bracket using dedicated longitudinal groove of the bar (see “C” type bracket assembly) (4)
- Slide the product until mechanical stop on the “L” type bracket (5).
- Tighten the M3 screw of the “C” type bracket to a torque of 1.2 Nm. (6)

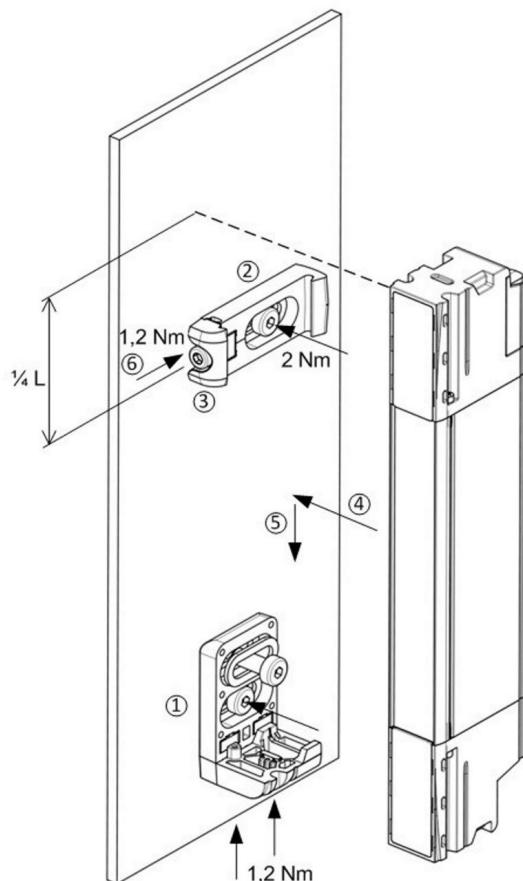


Figure 7 - Mixed fixing with “L” type and “C” type brackets

# CASCADE RESOLUTION WITH DIFFERENT BRACKETS

## Fixing with “O” type brackets

Cascade resolution at junction drops to 40 mm.

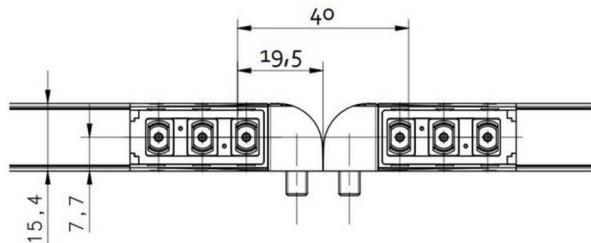


Figure 8 - Fixing with “O” type brackets

## Fixing with “C” type brackets

Cascade resolution at junction remains 14 mm.

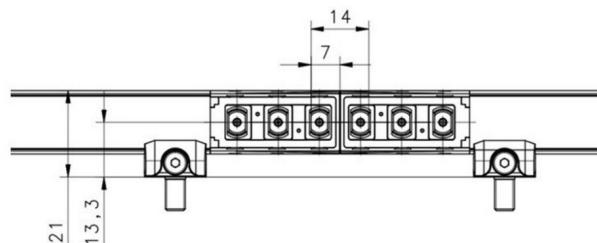


Figure 9 - Fixing with “C” type brackets

## Fixing with “L” type brackets

Cascade resolution at junction drops to 26 mm.

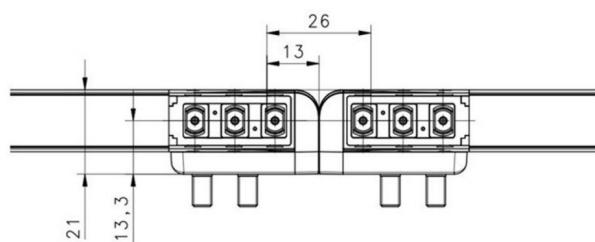


Figure 10 - Fixing with “L” type brackets

## CASCADE 90° RESOLUTION

When cascading two SLIM light curtains at 90° like in Figure 11, the resolution at junction drops to 18mm if "C" type brackets are used or any bracket combination that allows the top of one light curtain to touch the side of the other.

For 24mm and 34mm resolution models the resolution is always maintained in cascade junctions when properly fixed with provided brackets.

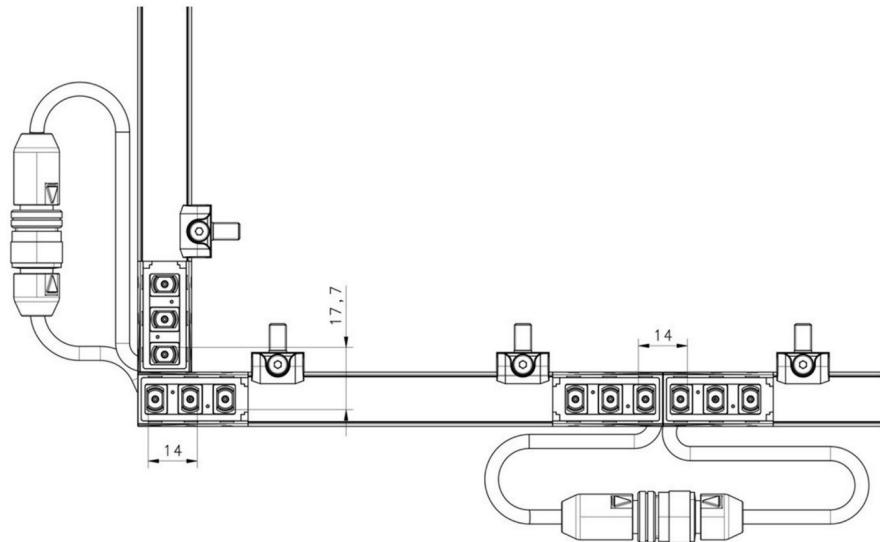


Figure 11 - Cascade resolution at 90° junction

# CHAPTER 4

## ELECTRICAL CONNECTIONS

### PIN-OUT AND CONFIGURATION PIN CONNECTION

All electrical connections to the emitting and receiving units are made through a male M12 connector, carried by a pig-tail cable located on the lower part of the two units.

For both the receiver and the emitter M12 5-pole connector is used.

#### Receiver (RX)

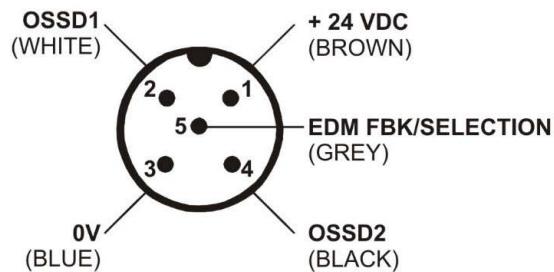
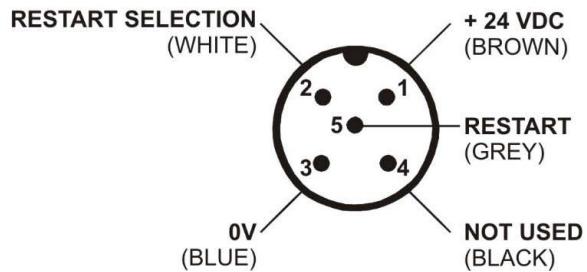


Figure 1 - Receiver

FUNCTION	CONNECTION TO	STATUS
EDM FBK / SELECTION	Normally closed contact for a force-guided relay	EDM ENABLE
	OSSD1	EDM DISABLE

**Emitter (TX)****Figure 2 - Emitter**

FUNCTION	CONNECTION TO	STATUS
RESTART	Normally closed contact to 24 Vcc	MANUAL RESTART
	RESTART SELECTION	AUTOMATIC RESTART
	FLOATING	ALIGN MODE

## NOTES ON CONNECTIONS

For the correct operation of the safety light curtains, the following precautions regarding the electrical connections have to be respected:

- Do not place connection cables in contact with or near high-voltage cables and/or cable undergoing high current variations (e.g. motor power supplies, inverters, etc.);
  - **Do not connect in the same multi-pole cable the OSSD wires of different light curtains.**
    - The power supply must provide safe mains isolation (SELV/PELV), no PE (Protective Earth) is therefore required.
    - The RESTART wire must be connected through a N.C. button to the supply voltage of the ESPE.



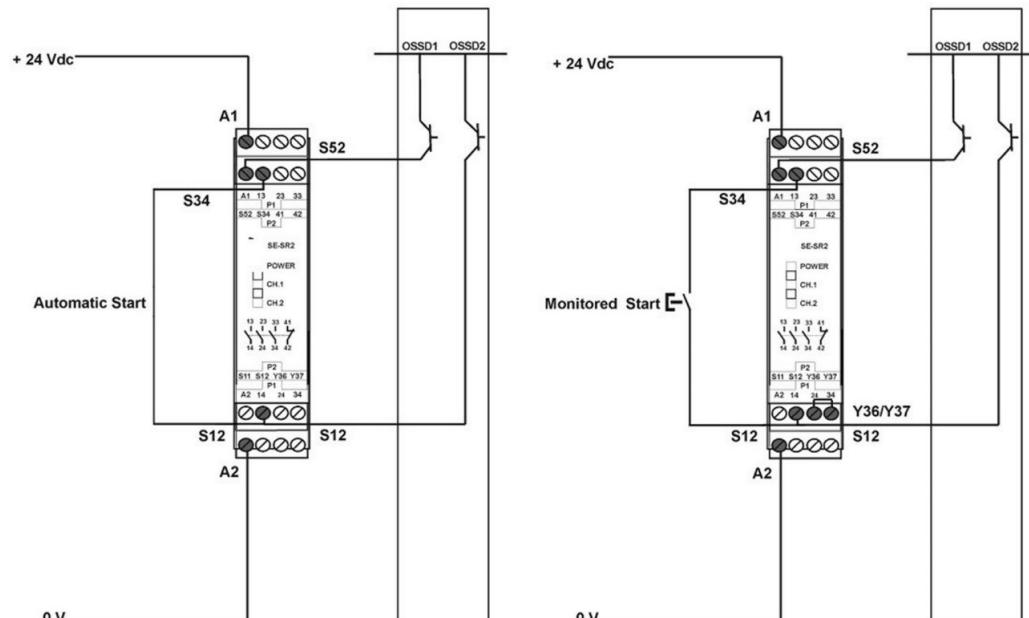
To meet the requirements of the relevant product standards (e.g. EN 61496-1: 2013), the external voltage supply for the devices must be able to filter out the 10ms-100% dip on rated voltage allowed in EN 60204-1.



**The Restart button must be located in such a way that the operator can check the dangerous zone during any reset operation (see "Commissioning and Configuration" on page 35).**

- The device is already equipped with internal overvoltage and overcurrent suppression devices.
  - **The use of other external components is not recommended.**

#### **Example: connection to the safety relay SE-SR2**



### Figure 3 – Connection to SE-SR2 Safety Relays

The figures show the connection between the safety light curtains and the safety relay of the SE-SR2 series functioning in the Automatic Restart mode (left side) and Manual Restart with monitoring (right side).

- Do not use varistors, RC circuits or LEDs in parallel at relay inputs or in series at OSSD outputs.
- The OSSD1 and OSSD2 safety contacts cannot be connected in series or in parallel, but can be used separately, conforming to the plant's safety requirements.
- If one of these configurations is erroneously used, the device enters the output failure condition (see "User Interface and Diagnostics" on page 39).
- Connect both OSSDs to the device to control.
- Failure to connect an OSSD to the activating device jeopardizes the system safety degree that the light curtain has to control.

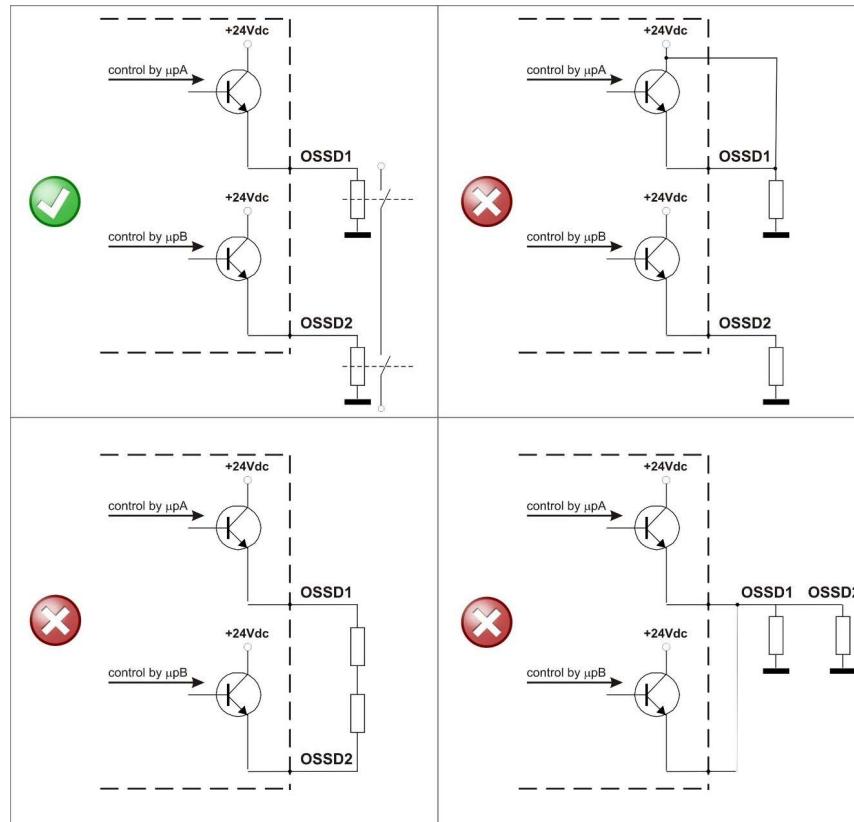


Figure 4 - OSSDs connection

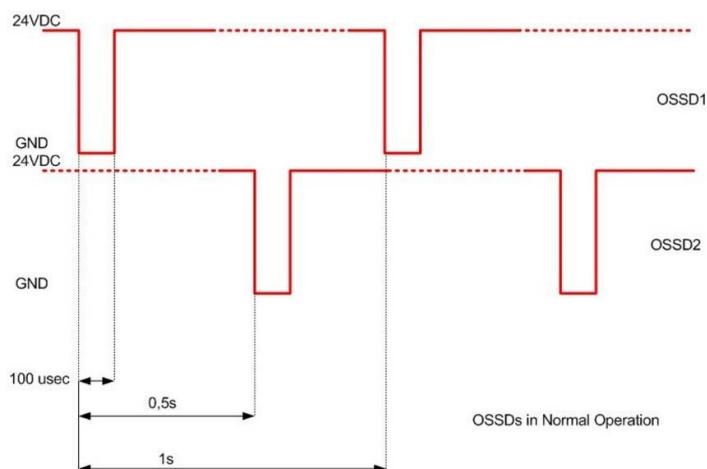


Figure 5 - OSSDs test timing pattern

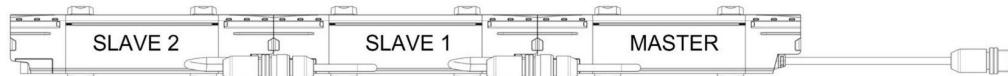
## CASCADE CONNECTION

Up to three SLIM light curtains can be connected in a cascade series.

The cascade connection allows to monitor up to three areas with only two Safety Outputs connected to Master unit.

Master unit takes care of collecting safety optic scan results from Slave units and the synchronization between them to avoid mutual interference.

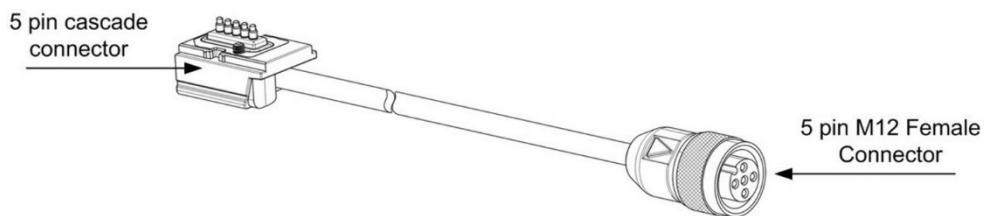
Each SLIM unit can either be used as Master or Slave, only depending on cable connection.



**Figure 6 - Cascade composition**

For cascaded system connection three Cascade Cables are available as accessory:

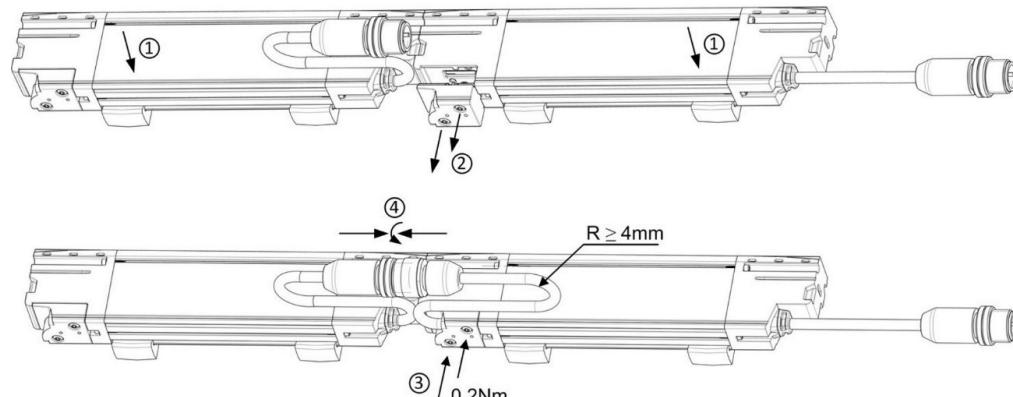
MODEL	DESCRIPTION	L +/- 10 (mm)	CODE
CS-H1-03-B-001	CASCADE cable 0.1 m	90	95A252950
CS-H1-03-B-005	CASCADE cable 0.5 m	490	95ASE2550
CS-H1-03-B-01	CASCADE cable 1 m	990	95ASE2560



**Figure 7 - Cascade accessory cables**

To connect the cascade unit:

- Fix all cascade units with proper brackets as described in "Mechanical Mounting" on page 20. (1)
- Remove Terminator Caps at the end of Master and Slave 1 (if present) by loosening the two fixing screws for both emitter and receiver. (2)
- Fasten the cascade cables in place of removed terminator caps, ensure all cables bend radius it's not less than 4mm (3)
- Connect Slaves M12 male connectors to M12 Female connectors from cascade cables (4).



**Figure 8 - Mounting**

# CHAPTER 5

## ALIGNMENT PROCEDURE

The alignment between the emitting and the receiving units is necessary to obtain the correct operation of the light curtain.

A good alignment prevents outputs instability caused by dust or vibrations.

The alignment is perfect if the optical axes of the first and the last emitting unit's beams coincide with the optical axes of the corresponding elements of the receiving unit.

The beam used to synchronize the two units is the closest one to the pig-tail cable: SYNC optic.

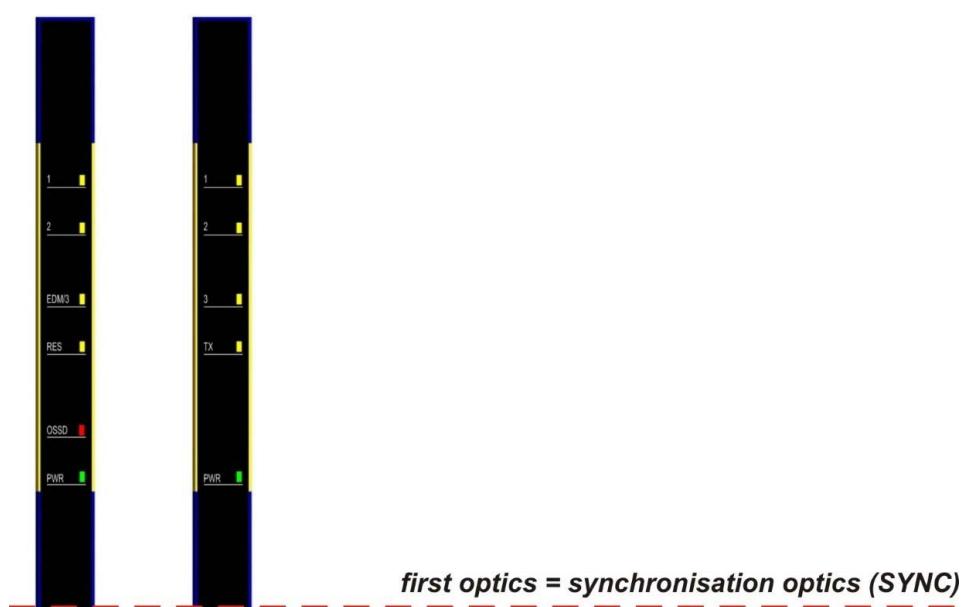


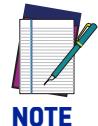
Figure 1 - Synchronization Optics

In alignment mode user interface inform the user about quality and level of alignment.



To activate Alignment Mode, leave Restart input floating on TX unit at power on (see "Pin-out and configuration pin connection" on page 27).

INDICATION	LED CONFIGURATION	OSSD STATUS RESULT IN NORMAL OPERATION
NOT ALIGNED SYNC NOT ENGAGED		OFF
SYNC ENGAGED ONE OR MORE BEAMS INTERCEPTED		OFF
MIN. SIGNAL LEVEL ALL BEAMS FREE		ON
MED. SIGNAL LEVEL ALL OPTICS FREE		ON
MAX. SIGNAL LEVEL ALL OPTICS FREE		ON



**The signal level decreases as the operating distance increases. Therefore, at the maximum operating distance the signal level could be minimum, but sufficient for proper operation of the light curtain.**

The light curtain alignment can be effected only after having completed the mechanical installation and the electrical connections as described above. Compare alignment results with those given in the table above.

Activate Alignment Mode leaving Restart input floating on TX unit at power on (see "Pin-out and configuration pin connection" on page 27).

Keep the receiver in a steady position and adjust the emitter until the "1" Yellow LED on the receiver is ON. This condition shows the alignment of the first synchronization beam.

Rotate the emitter, pivoting on the lower optics axis, until the "OSSD" Green LED is BLINKING ON.

Delimit the area in which the OSSD LED blinks Green through some adjustments for the emitter first then for the receiver unit - and then place both units approximately at the center of this area where as many yellow LEDs are steady ON.

- Fix the two units firmly using provided brackets.
  - Verify that the Green OSSD LED on the RX unit is blinking ON and beams are not interrupted, then verify that the red OSSD LED turns blinking ON if even one single beam is interrupted (condition where an object has been detected).
  - This verification shall be made with the special cylindrical "Test Piece" having a size suitable to the resolution of the device used (see "Controls after first installation" on page 19).
- Switch OFF and ON the device in normal operating mode.



**To check alignment level for periodical maintenance ESPE must be restarted in Alignment Mode.**

**For cascaded system start the alignment procedure always from Master unit, then proceed with Slaves.**



**OSSDs are not enabled on alignment mode.**

# CHAPTER 6

## COMMISSIONING AND CONFIGURATION

### RESTART MODE SELECTION AND RESTART FUNCTION

The interruption of a beam due to an opaque object causes the opening of OSSD outputs and the stop of the safety light curtain, SAFE condition.

ESPE standard operation can be reset (OSSD safety contact closing = NORMAL OP. condition) in two different ways:

- **Automatic Restart**, After activation, ESPE resets to Normal Operation once the object has been removed from the controlled area.
- **Manual Restart**, After activation, ESPE resets to Normal Operation only once the RESTART function has been activated (see [Figure 3 on page 36](#)) and provided that the object has been removed from the controlled area.

This condition, called interlock, is signaled on the display (see "User interface" on page 39).

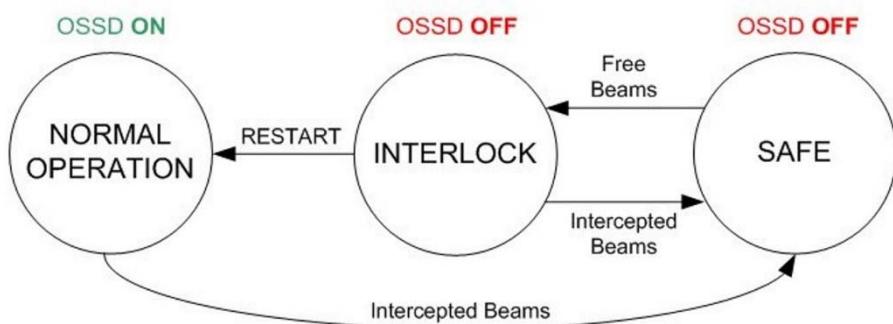


Figure 1 - Auto/Manual Restart selection

Select either automatic or manual restart by properly connecting **RESTART** input and **RESTART SELECTION** output of TX connector (see "Electrical Connections" on page 27).

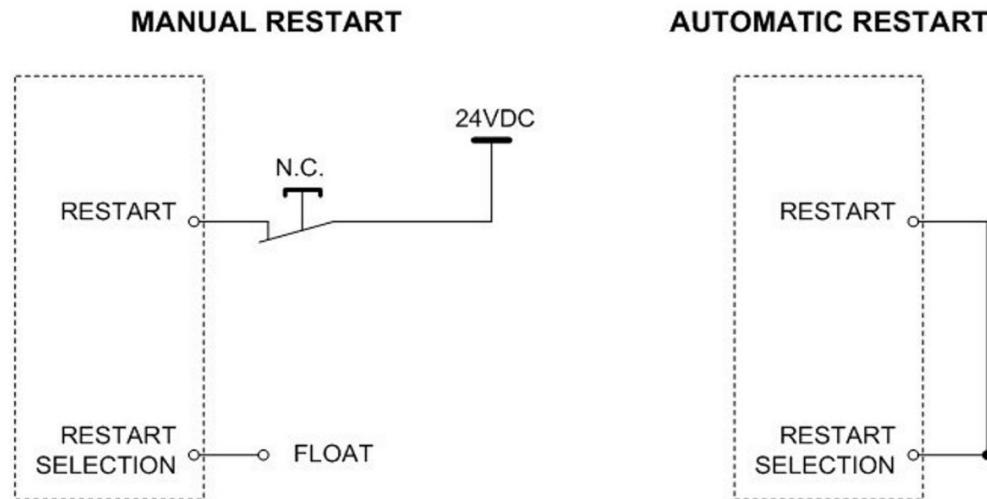


Figure 2 – Auto/Manual Restart selection



**Leave RESTART SELECTION floating when selecting Manual Restart mode.**

**NOTE**

Since mode selection is read by TX unit, at startup RX unit always start in alignment mode (see "Alignment Procedure" on page 32) then switches to selected functioning mode after first correct alignment.



**Carefully assess risk conditions and restart modes.**

**In applications protecting access to dangerous areas, the automatic restart mode is potentially unsafe if it allows the operator to pass completely beyond the sensitive area. In this case, the manual restart or, for example, the manual restart of the SE-SR2 relay is necessary.**

#### Time chart (Manual Restart)

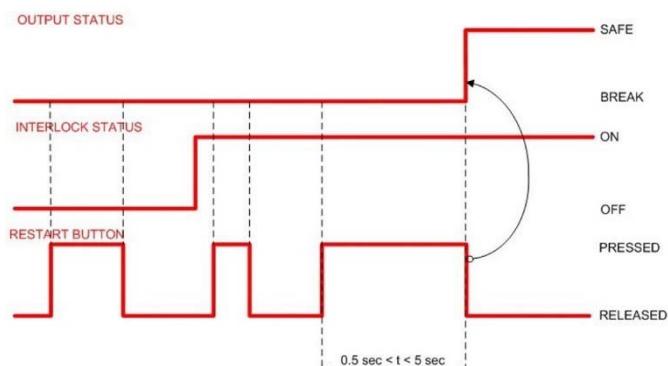


Figure 3 – Manual Restart timing

## EDM FUNCTION

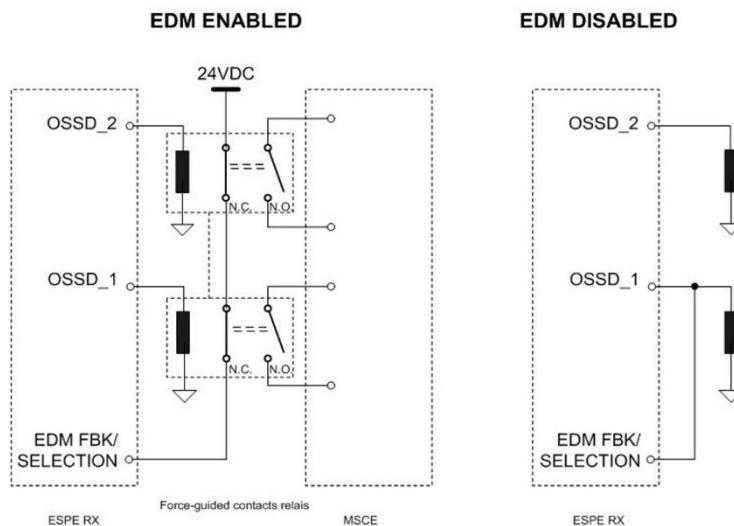


Figure 4 - EDM connection

The light curtain has a function for monitoring actuation of external devices (EDM). This function can be enabled or deactivated.

### EDM enabled

Connect EDM FBK/SELECTION input at normally closed contacts to 24 VDC of the devices to be monitored.

When in Normal Operation led LED/3 is lit to indicate the EDM function is enabled.

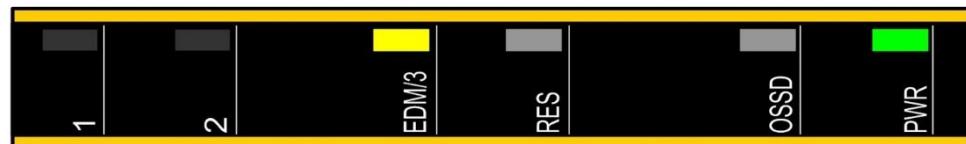


Figure 5 - EDM UI indication

When EDM function is enabled EDM FBK/SELECTION input is monitored to be antivalent to OSSDs status. Monitoring timings are specified in Figure 6:

### OSSD STATUS

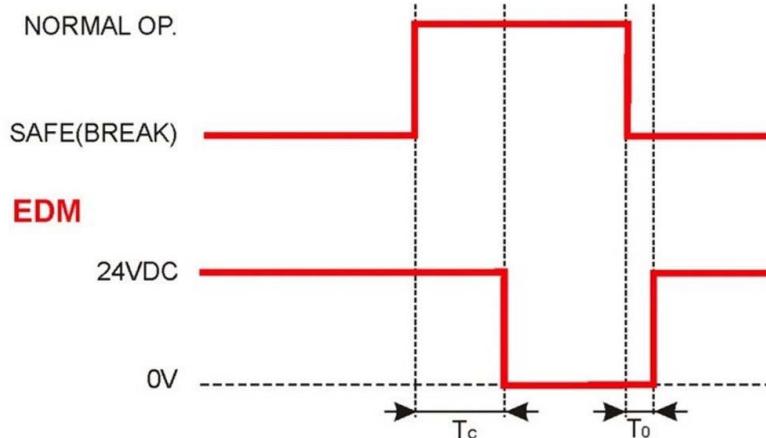


Figure 6 - EDM timings

TC ≤350 msec: time after OSSD OFF-ON switch when EDM test is performed.

T0 ≤100 msec: time after OSSD ON-OFF switch when EDM test is performed.

**EDM disabled**

Connect EDM FBK/SELECTION input to OSSD1 to disable the EDM function.

# CHAPTER 7

## USER INTERFACE AND DIAGNOSTICS

### USER INTERFACE

Light Curtain operating status is visualized through a LED User Interface present on both the receiver and emitter units.

The table below shows all LEDs signaling modes: the operator can evaluate the main causes of the system stop or failure through the display and signaling LEDs.



**With a Cascade configuration, the user interface on the Receiver Master unit shows the operating status and diagnostic messages, while on the Receiver Slave units it shows the alignment status.**

TX side

ESPE WORKING MODE	INDICATION	LED CONFIGURATION	RECOMMENDATIONS
Failure lockout	Normal operation		
	F1: Failure on microprocessor		Internal Failure, check for operating condition (see " <a href="#">Technical Data</a> " on page 44) and any cause of electrical interference, power cycle the ESPE.
	F2: Failure on optics		Failure on optic scan, check for any cause of electrical interference, power cycle the ESPE
	F12: Cascade Failure		Failure on cascade communication, check cascade connection or terminator cap fixing (see " <a href="#">Cascade connection</a> " on page 31)
	F13: Failure on restart		Failure on Restart function, check RESTART SELECTION connection (see " <a href="#">Restart mode selection and Restart function</a> " on page 35)

If failure persists after recommended checks and ESPE power cycle, please contact **DATALOGIC**.

## RX side

ESPE WORKING MODE	INDICATION	LED CONFIGURATION	RECOMMENDATIONS
Alignment	Not aligned, SYNC not engaged		Refer to "Alignment Procedure" on page 32 for correct Alignment Procedure or properly connect RESTART input on TX unit to enter Normal Operation mode (see "Restart mode selection and Restart function" on page 35)
	Minimum signal level, SYNC engaged		
	Maximum signal level		
Normal operation Manual restart only	Interlock free beams		Press RESTART button for at least 0.5sec to restart ESPE in Normal Operation
Normal operation	OSSD ON		Normal operation
	OSSD OFF		Safe status, remove any blocking object or correctly align the ESPE
	EDM active		EDM Function Enabled
Lockout error	F1: failure on microprocessor		Internal Failure, check for operating condition (see "Technical Data" on page 44 and any cause of electrical interference, power cycle the ESPE)
	F2: failure on optics		Failure on optic scan, check for any cause of optical and electrical interference, power cycle the ESPE
	F3: failure on EDM		Failure on EDM, check connection to relay (see "EDM function" on page 37), then power cycle the ESPE
	F12: cascade failure		Failure on cascade communication, check cascade connection or terminator cap fixing (see "Cascade connection" on page 31)
	F13: failure on restart		Failure on Restart function, check for Restart Button connection and any cause of optical interference, then power cycle the ESPE
	F23: failure on OSSDs		Failure on Safety Outputs, check for proper connection (see "Electrical Connections" on page 27) and any cause of electrical interference, then power cycle the ESPE
	Power supply failure		Check for proper connection (see "Electrical Connections" on page 27)
If failure persists after recommended checks and ESPE power cycle, please contact DATALOGIC.			

# CHAPTER 8

## PERIODICAL CHECKS

---

The following is a list of recommended check and maintenance operations that should be periodically carried-out by qualified personnel (see "[Controls after first installation](#)" on [page 19](#)).

Check that:

- The ESPE remains in Safe State (Red OSSD LED ON) during beam interruption along the entire detection zone, using the appropriate "Test Piece" according to the scheme in [Figure 13 on page 19](#).

**TP-14 for light curtains with 14 mm resolution:** SLx-14-xxxx-E

**TP-24 for light curtains with 24 mm resolution:** SLx-24-xxxx-E

**TP-34 for light curtains with 30 mm resolution:** SLx-34-xxxx-E

- The response time upon machine STOP (including response time of the ESPE and of the machine) is within the limits defined for the calculation of the safety distance (see "[Commissioning and Configuration](#)" on [page 35](#)).
- The safety distance between the dangerous areas and the ESPE are in accordance with the instructions included in see "[Installation](#)" on [page 11](#).
- Access of a person between ESPE and machine dangerous parts is not possible nor is it possible for him/her to stay there.
- Access to the dangerous area of the machine from any unprotected area is not possible.
- The ESPE and the external electrical connections are not damaged.

The frequency of checks depends on the particular application and on the operating conditions of the safety light curtain.

## GENERAL INFORMATION AND USEFUL DATA



**Safety MUST be a part of our conscience.**

### NOTE

The safety devices fulfil their safety function only if they are correctly installed, in accordance with the Standards in force.

If you are not certain to have the expertise necessary to install the device in the correct way, DATALOGIC Technical Support is at your disposal to carry out the installation.

The device uses fuses that are not self-resetting. Consequently, in presence of short-circuits causing the cut-off of these fuses, both units shall be sent to DATALOGIC Technical Support department.

A power failure caused by interferences may cause the temporary opening of the outputs, but the safe functioning of the light curtain will not be compromised.

## WARRANTY

The warranty period for this product is 36 months.

See the General Terms and Conditions of Sales at [www.datalogic.com](http://www.datalogic.com) for further details.

DATALOGIC will not be liable for any damages to persons and things caused by the non-observance of the correct installation modes and device use.

In presence of a non-functioning device, always return the emitting and receiving units for repair or replacement.

# CHAPTER 9

## DEVICE MAINTENANCE

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DATALOGIC safety light curtains do not require special maintenance operations.

To avoid the reduction of the operating distance, optic protective front surfaces must be cleaned at regular intervals.

Use soft cotton cloths damped in water.

Do not apply too much pressure on the surface in order to avoid making it opaque.

Please do not use on plastic surfaces or on light curtain painted surfaces:

- **alcohol or solvents**
- **wool or synthetic cloths**
- **paper or other abrasive materials**

## PRODUCT DISPOSAL

Under current Italian and European laws, DATALOGIC is not obliged to take care of product disposal at the end of its life.

DATALOGIC recommends disposing of the product in compliance with local laws or contact authorized waste collection centers.

# APPENDIX A

## TECHNICAL DATA

---

SAFETY CATEGORY
Type 2 (rif. EN 61496-1: 2013)
SIL 1 (rif. EN 61508)
SIL CL 1 (rif. EN 62061:2005/A1: 2013)
PL c, Cat. 2 (rif. EN ISO 13849-1: 2015)
PFHd [1/h] = 1.04E -08
MTTFd [years] = 273

SAFETY CATEGORY
Type 4 (rif. EN 61496-1: 2013)
SIL 3 (rif. EN 61508)
SIL CL 3 (rif. EN 62061:2005/A1: 2013)
PL e, Cat. 4 (rif. EN ISO 13849-1: 2015)
PFHd [1/h] = 2.64E -09
MTTFd [years] = 444

ELECTRICAL DATA	
<b>Power supply (Vdd)</b>	24 VDC ± 20%
<b>Consumption (TX)</b>	1.6 W max (55 mA at 28.8 VDC)
<b>Consumption (RX)</b>	4.2 W max (145 mA at 28.8 VDC – no load on OSSD)
<b>OSSD outputs</b>	2 PNP
<b>OSSD short-circuit protection</b>	0.6 A type
<b>OSSD output current</b>	0.3 A max / each output
<b>OSSD output voltage - status ON</b>	Vdd – 1 V min
<b>OSSD output voltage - status OFF</b>	0.2 V max
<b>OSSD capacitative load</b>	1 uF at 24 VDC max
<b>OSSD Test pulses width</b>	100 µs (see "Notes on connections" on page 29)
<b>OSSD Test pulses frequency</b>	1/s
<b>Response times</b>	7-17 ms (see "Available Models and Response Times" on page 47)
<b>Controlled height</b>	150...120 mm
<b>Auxiliary functions</b>	Manual/Automatic Restart; EDM
<b>Electrical protection</b>	Class III (see "Notes on connections" on page 29)
<b>Connections</b>	M12 5-pole for emitter M12 5-pole for receiver
<b>Cable length (for power supply)</b>	20 m max.

OPTICAL DATA	
<b>Light emission (I)</b>	Infrared, LED (850 Nm)
<b>Risk group EN 62471</b>	Exempt
<b>Resolution</b>	14 - 24 - 34 mm
<b>Operating distance</b>	0.2...6 m
<b>Ambient light rejection</b>	EN 61496-2: 2013

MECHANICAL AND ENVIRONMENTAL DATA	
<b>Operating temperature</b>	-10...+55 °C
<b>Storage temperature</b>	-25...+70 °C
<b>Temperature class</b>	T6
<b>Humidity</b>	15...95 % (non condensing)
<b>Mechanical protection</b>	IP65 (EN 60529)
<b>Vibrations</b>	Width 0.35 mm, Frequency 10...55 Hz 20 sweep per axis, 1 octave/min (EN 60068-2-6)
<b>Shock resistance</b>	10G (16 ms) 1,000 shocks per axis (EN 60068-2-29)
<b>Housing material</b>	Painted aluminum (yellow RAL 1003)
<b>Front glass material</b>	PMMA
<b>Cap material</b>	Painted Zamak (Blue RAL 5002)
<b>Weight</b>	$W [g] = L [mm] \times 5 + 50$ (single unit TX or RX)

# APPENDIX B

## AVAILABLE MODELS AND RESPONSE TIMES

### AVAILABLE MODELS

CONTROLLED HEIGHT	14mm RESOLUTION		24mm RESOLUTION		34mm RESOLUTION	
	BEAMS NO.	RESPONSE TIME	BEAMS NO.	RESPONSE TIME	BEAMS NO.	RESPONSE TIME
<b>150</b>	15	7	8	7	6	7
<b>210</b>	21	8	11	7	8	7
<b>270</b>	27	8	14	8	10	8
<b>300</b>	30	8	16	8	11	8
<b>330</b>	33	9	17	8	12	8
<b>360</b>	36	9	19	8	13	9
<b>390</b>	39	10	20	8	14	9
<b>420</b>	42	10	22	9	15	9
<b>450</b>	45	10	24	9	16	9
<b>480</b>	48	10	25	9	17	10
<b>510</b>	51	11	27	9	18	10
<b>540</b>	54	11	28	9	19	10
<b>570</b>	57	11	30	9	20	10
<b>600</b>	60	11	32	9	21	10
<b>630</b>	63	12	33	10	22	11
<b>660</b>	66	12	35	10	23	11
<b>690</b>	69	13	36	10	24	11
<b>720</b>	72	13	38	10	25	11
<b>750</b>	75	13	40	10	26	11
<b>780</b>	78	13	41	10	27	12
<b>810</b>	81	14	43	11	28	12
<b>840</b>	84	14	44	11	29	12
<b>870</b>	87	14	46	11	30	12
<b>900</b>	90	14	48	11	31	12
<b>930</b>	93	15	49	11	32	13
<b>960</b>	96	15	51	11	33	13
<b>990</b>	99	16	52	12	34	13
<b>1020</b>	102	16	54	12	35	13
<b>1050</b>	105	16	56	12	36	14
<b>1080</b>	108	16	57	12	37	14
<b>1110</b>	111	17	59	12	38	14
<b>1140</b>	114	17	60	12	39	14
<b>1170</b>	117	17	62	13	40	15
<b>1200</b>	120	17	64	13	41	15

		EN ISO 13849-1	EN 954-1	EN ISO 13849-1	EN IEC 61508	Prob. of danger failure/hour	Life span	Mean Time to Dangerous Failure	Average Diagnostic Coverage	Safe Failure Structure	Hardware Fault Tolerance
Product	PL	CAT	SIL	SIL CL	PFHd (1/h)	T1 (years)	MTTFd (years)	DC	SFF	HFT	
<b>SL2-xx-xxxx-E</b>	c	2	1	1	7.89E-09	20	191	98.80%	98.93%	0	
<b>SL4-xx-xxxx-E</b>	e	4	3	3	2.64E-09	20	144	98.80%	98.93%	1	

## CASCADE RESPONSE TIMES

For cascade systems, independently of unit length, response times are the following:

- 2-Unit Cascade: 18 ms
- 3-Unit Cascade: 20 ms



**Make sure that installation conditions indicated in "Minimum distance for cascaded system" on page 17 are met for 3-unit cascade systems.**

# APPENDIX C

## OVERALL DIMENSIONS

---

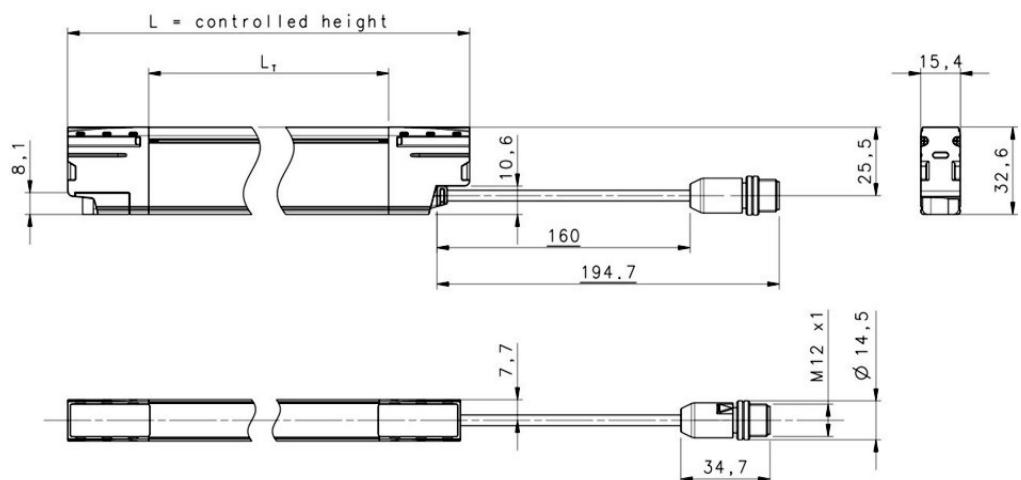


Figure 1 - Overall dimensions (mm)

MODEL	L	LT = (L-63)
<b>SLx-xx-0150-E</b>	150	87
<b>SLx-xx-0210-E</b>	210	147
<b>SLx-xx-0270-E</b>	270	207
<b>SLx-xx-0300-E</b>	300	237
...	...	...
<b>SLx-xx-1170-E</b>	1170	1107
<b>SLx-xx-1200-E</b>	1200	1137

SLx- = Type 2 or Type 4

-xx- = Resolution 14, 24, and 34 mm

# APPENDIX D

## INCLUDED ACCESSORIES

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### “C” TYPE BRACKETS KIT

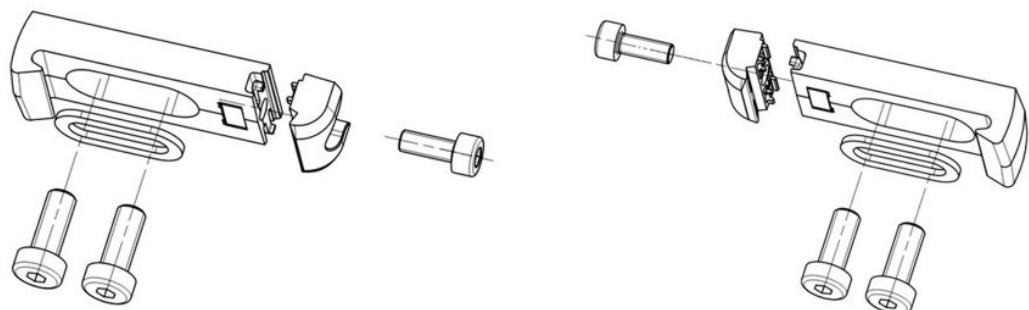


Figure 1 - “C” type brackets kit

### “O” TYPE BRACKETS KIT

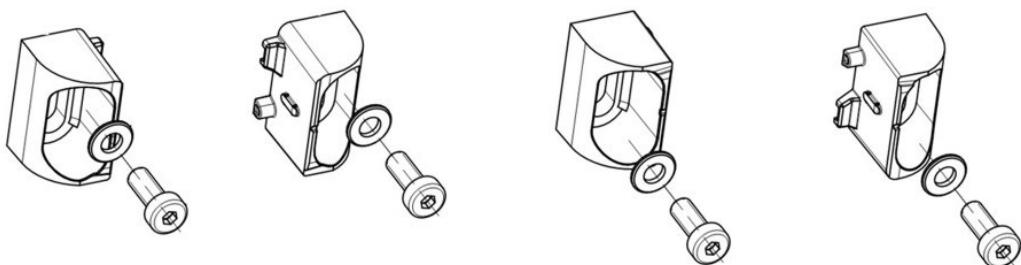


Figure 2 - “O” type brackets kit

# APPENDIX E

## ACCESSORIES

### (ST-K2-SL-C) "C" TYPE BRACKETS KIT

MODEL	DESCRIPTION	CODE
ST-K2-SL-C	"C" type brackets (2 pcs kit)	95ASE2510

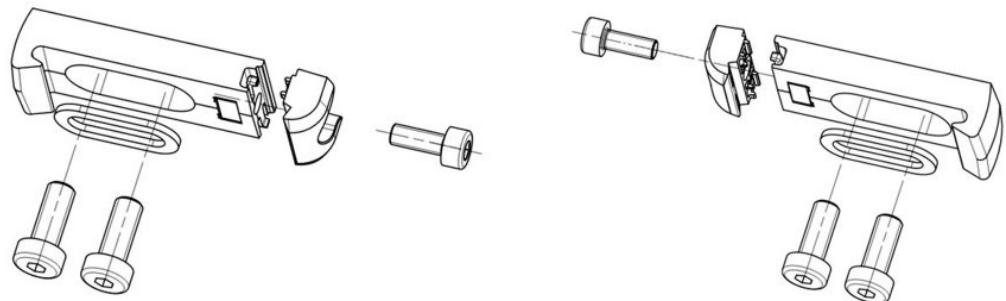


Figure 1 - "C" type brackets kit

### (ST-K4-SL-0) "O" TYPE BRACKETS KIT

MODEL	DESCRIPTION	CODE
ST-K4-SL-0	"O" type brackets (2 pcs kit)	95ASE2520

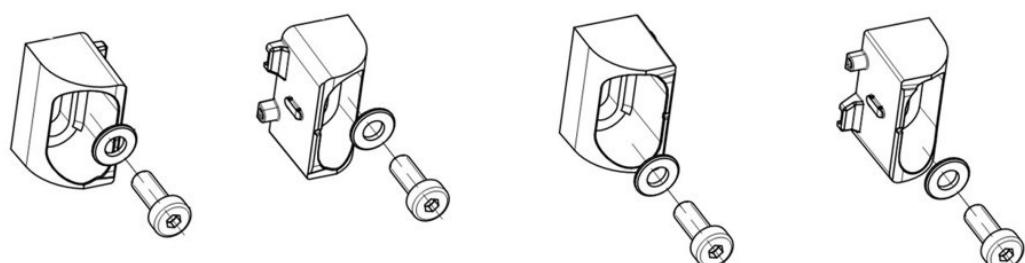


Figure 2 - "O" type brackets kit

## (ST-K2-SL-L) "L" TYPE BRACKETS KIT

MODEL	DESCRIPTION	CODE
ST-K2-SL-L	"L" type brackets (2 pcs kit)	95ASE2540

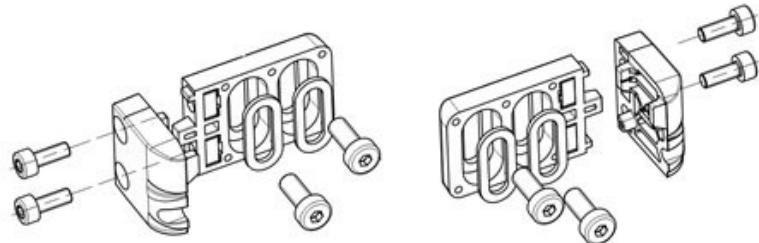


Figure 3 - "L" type brackets kit

## (ST-K2-SL-C-OR) "C" TYPE ORIENTABLE BRACKETS KIT

MODEL	DESCRIPTION	CODE
ST-K2-SL-C-OR	"C" type orientable brackets (2 pcs kit)	95ASE2530

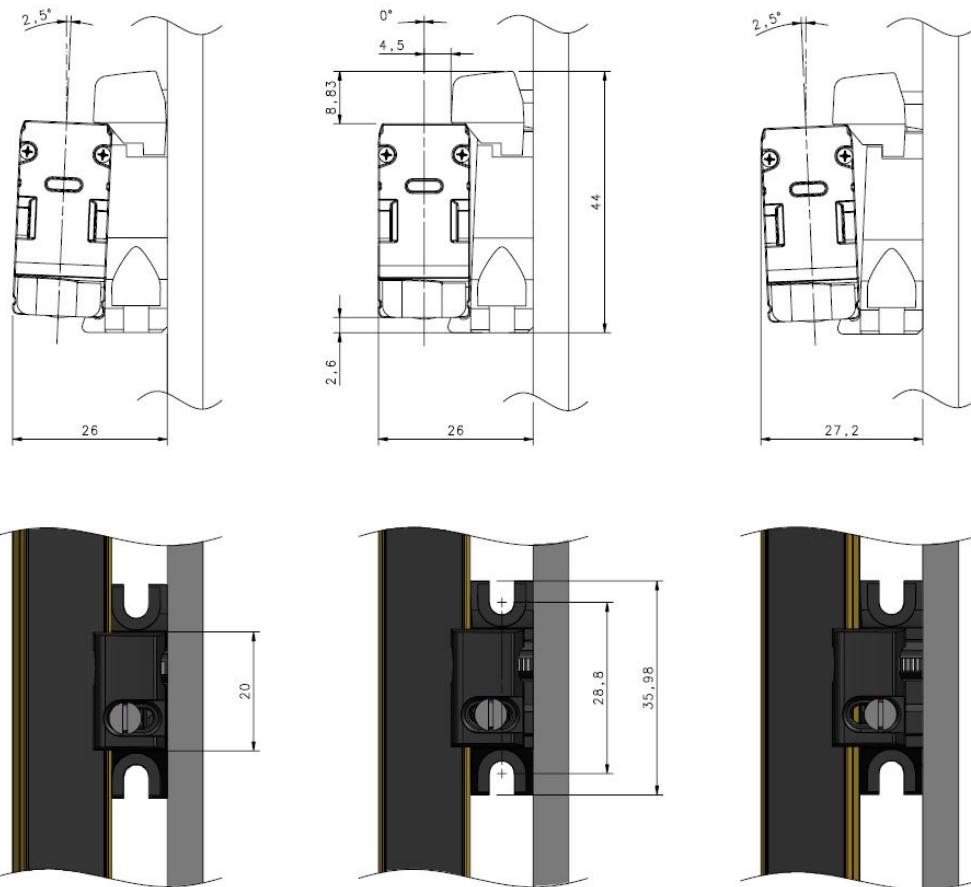


Figure 4 - "C" type orientable brackets kit

## (SE-S) COLUMNS AND FLOOR STANDS

MODEL	DESCRIPTION	L (mm)	X (mm)	CODE
SE-S 800	Column and floor stand H = 800 mm	800	30x30	95ACC1730
SE-S 1000	Column and floor stand H = 1000 mm	1000	30x30	95ACC1740
SE-S 1200	Column and floor stand H = 1200 mm	1200	30x30	95ACC1750
SE-S 1500	Column and floor stand H = 1500 mm	1500	45x45	95ACC1760
SE-S 1800	Column and floor stand H = 1800 mm	1800	45x45	95ACC1770

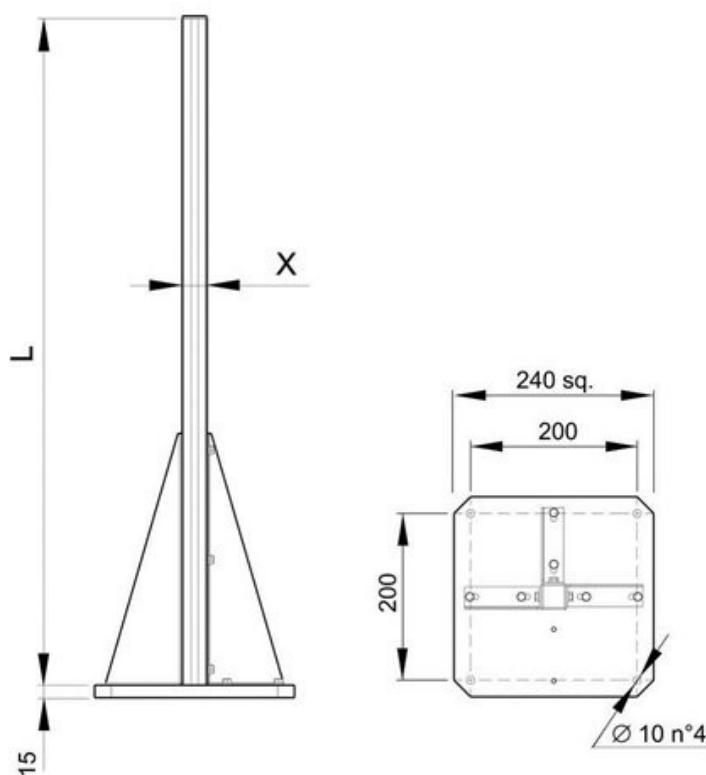


Figure 5 - Dimensions (mm)

## (SG-DM) DEVIATING MIRRORS

MODEL	DESCRIPTION	L1 (mm)	L2 (mm)	L3 (mm)	CODE
SG-DM 600	Deviating mirror version 600 mm	545	376	580	95ASE1680
SG-DM 900	Deviating mirror version 900 mm	845	676	880	95ASE1690
SG-DM 1200	Deviating mirror version 1200 mm	1145	976	1180	95ASE1700
SG-DM 1650	Deviating mirror version 1650 mm	1595	1426	1630	95ASE1710
SG-DM 1900	Deviating mirror version 1900 mm	1845	1676	1880	95ASE1720

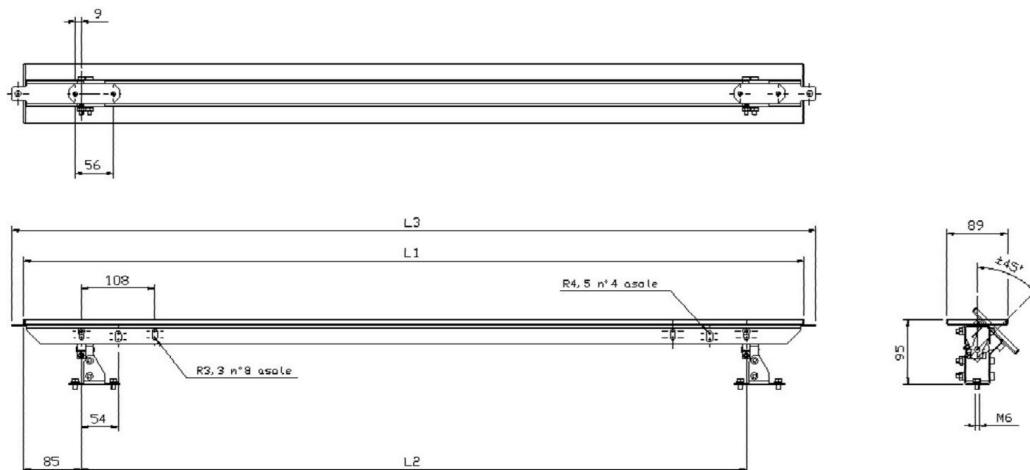


Figure 6 - Deviating mirrors (mm)

The image includes the mirror SG-DM and a mounting kit ST-DM.

MODEL	DESCRIPTION	CODE
SG-DM 150	Deviating mirror version 150 mm	95ASEE1670

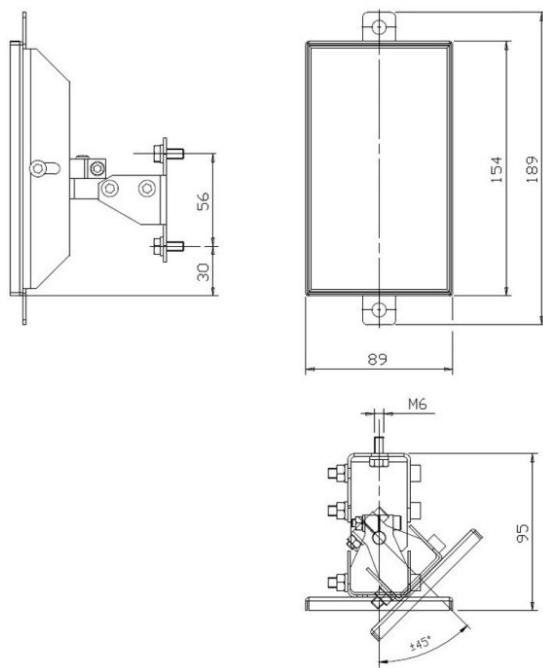


Figure 7 - SG-DM 150 (mm)

The image includes the mirror SG-DM and a mounting kit ST-DM.

## Mounting kit for SG-DM with SE-S column and floor stands

MODEL	DESCRIPTION	CODE
ST-DM	SG-DM mounting kit (2 pcs kit)	95ASEE1940

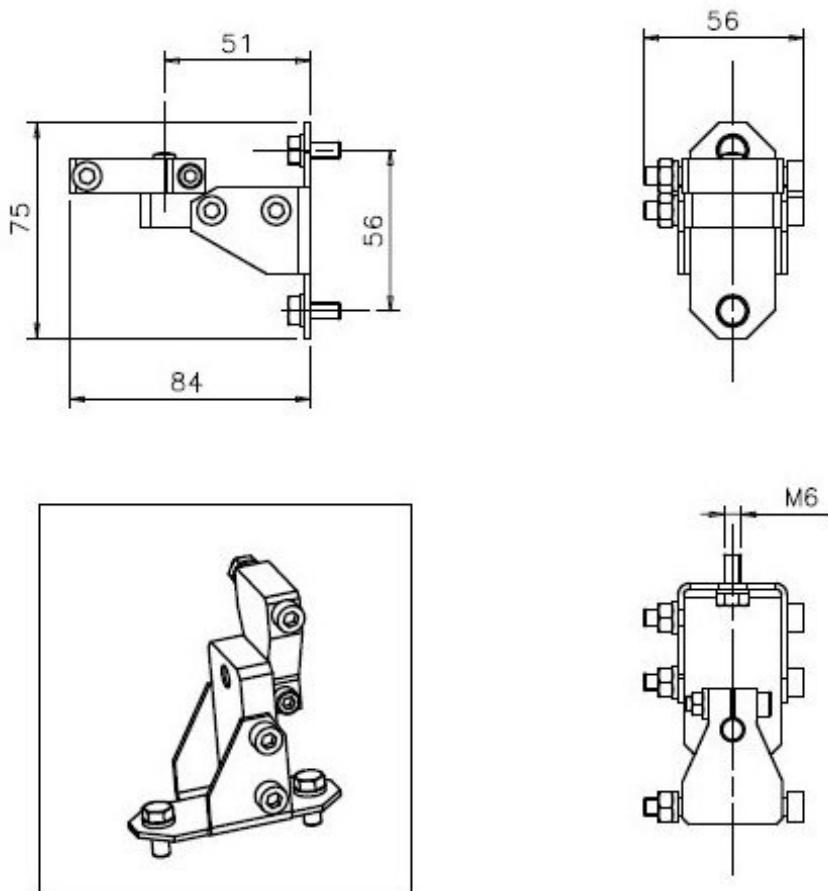


Figure 8 - Mounting kit

For each SG-DM mirror order 1 mounting kit ST-DM.

## (TP) TEST PIECE

MODEL	DESCRIPTION	CODE
TP-14	Test piece Ø 14 mm L = 300 mm	95ACC1630
TP-20	Test piece Ø 20 mm L = 300 mm	95ACC1640
TP-24	Test piece Ø 24 mm L = 200 mm	95ASE2570
TP-30	Test piece Ø 30 mm L = 300 mm	95ACC1650
TP-34	Test piece Ø 34 mm L = 200 mm	95ASE2580
TP-35	Test piece Ø 35 mm L = 300 mm	95ACC1660
TP-40	Test piece Ø 40 mm L = 300 mm	95ACC1820
TP-50	Test piece Ø 50 mm L = 300 mm	95ACC1790
TP-90	Test piece Ø 90 mm L = 300 mm	95ACC1800

## CONNECTION CABLES

MODEL	DESCRIPTION	CODE
CS-A1-03-U-03	5-pole M12 cable (axial) 3 m UL2464	95ASE1170
CS-A1-03-U-05	5-pole M12 cable (axial) 5 m UL2464	95ASE1180
CS-A1-03-U-10	5-pole M12 cable (axial) 10 m UL2464	95ASE1190
CS-A1-03-U-15	5-pole M12 cable (axial) 15 m UL2464	95ASE1200
CS-A1-03-U-25	5-pole M12 cable (axial) 25 m UL2464	95ASE1210
CS-A1-03-U-50	5-pole M12 cable (axial) 50 m UL2464	95A252700

## CASCADE CABLES

MODEL	DESCRIPTION	$L \pm 10$ (mm)	CODE
CS-H1-03-B-001	Cascade cable 0.1 m	90	95A25950
CS-H1-03-B-005	Cascade cable 0.5 m	490	95ASE2550
CS-H1-03-B-01	Cascade cable 1 m	990	95ASE2560

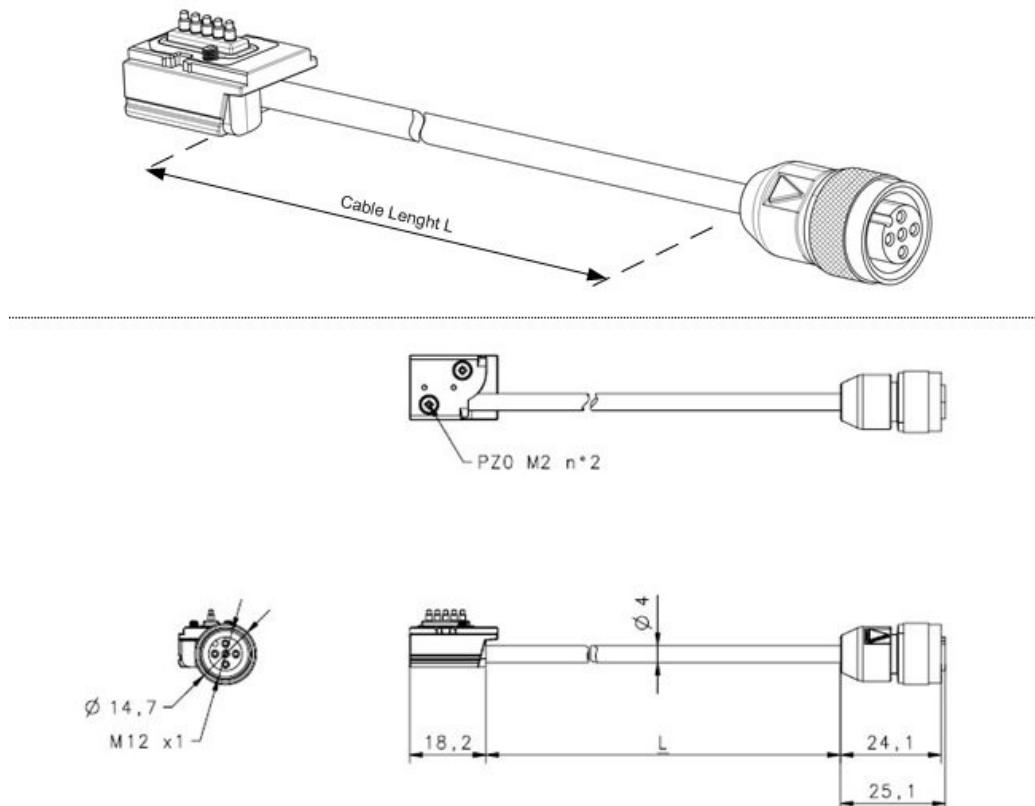


Figure 9 - Cascade cables

## (SE-SR2) SAFETY RELAY

MODEL	DESCRIPTION	CODE
SE-SR2	Type 4 safety relay - 3 NQ 1 NC	95ACC6170

The drawing shows the connection between the safety light curtain and the Type 4 safety relay of the SE-SR2 series operating in the automatic Restart mode.

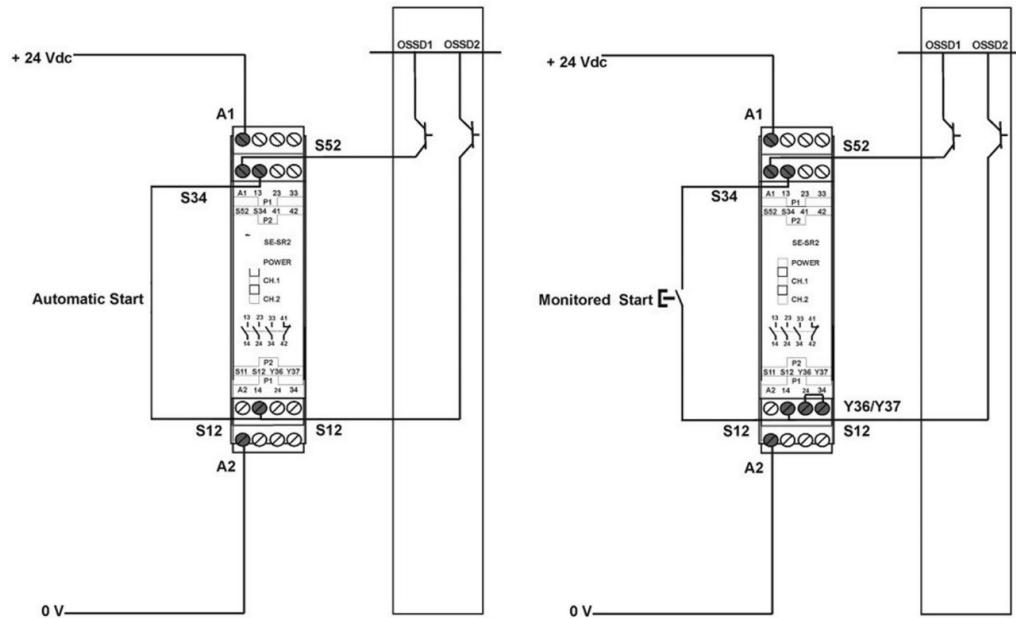


Figure 10 - Safety relay

## (CSME-03VU24-Y14) EDM RELAY BOX

MODEL	DESCRIPTION	CODE
CSME-03VU24-Y14	EDM relay	95ASE1270

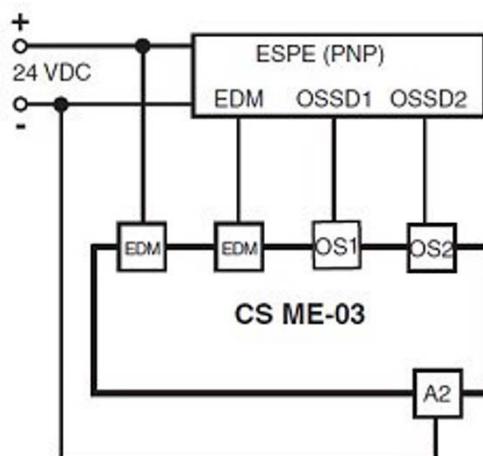


Figure 11 - EDM relay

# GLOSSARY

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## **AOPD (Active optoelectronic protective device)**

Its detection function is achieved thanks to the use of optoelectronic receivers and emitters detecting the optical beams interruptions inside the device caused by an opaque object present inside the specified detecting area.

An active optoelectronic protective device (AOPD) can operate both in emitter-receiver mode and in retro-reflective light curtains.

## **Block condition (=BREAK)**

Status of the light curtain taking place when a suitably-sized opaque object (see "[Detection capability](#)" on page 3) interrupts one or several light curtain beams.

Under these conditions, OSSD1 and OSS2 light curtain outputs are simultaneously switched OFF within the device response time.

## **Crossing hazard**

Situation under which an operator crossing the area controlled by the safety device and this latter stops and keeps the machine stopped until the hazard is eliminated, and then enters the dangerous area. Now the safety device could not be able to prevent or avoid an unexpected restart of the machine with the operator still present inside the dangerous area.

## **Dangerous area**

Area representing an immediate or imminent physical hazard for the operator working inside it or who could get in contact with it.

## **Detection capability (or Resolution)**

The minimum dimension which an opaque object must have in order to interrupt at least one beams of the ESPE whatever is position across the protected height.

## **Detection zone**

Zone within which a specified test piece will be detected by the ESPE

## **EDM (External device monitoring)**

Device used by the ESPE to monitor the status of the external command devices.

## **Emitter (TX)**

Unit emitting infrared beams, consisting of a set of optically-synchronized LEDs. The emitting unit, combined with the receiving unit (installed in the opposite position), generates an optical "curtain", i.e. the detecting area.

**ESPE (Electro-sensitive protective equipment)**

Assembly of devices and/or components working together to activate the protective disabling function or to detect the presence of something and including at least: a sensor, command/control devices and output signal switching devices.

**Force-guided contacts**

Relay contacts are force guided when they are mechanically connected so that they must switch simultaneously on input change.

If one contact of the series remains “welded”, no other relay contact is able to move.

That relay characteristic allows the use of EDM function.

**Interlock**

Operating state of ESPE in Manual Restart Mode when all beams are free but the Restart command hasn't been received yet.

**Machine operator**

Qualified person allowed to use the machine.

**Min. installation distance**

Min. distance necessary to allow machine dangerous moving parts to completely stop before the operator can reach the nearest dangerous point. This distance shall be measured from the middle point of the detecting area to the nearest dangerous point. Factors affecting min. installation distance value are machine stop time, total safety system response time and light curtain resolution.

**MPCE (Machine primary control element)**

Electrically-powered element having the direct control of machine regular operation so as to be the last element, in order of time, to operate when the machine has to be enabled or blocked.

**N.O.**

Normally opened

**N.C.**

Normally closed

**Normal Operation**

Operating state of ESPE when all beams are free, OSSD LED lit GREEN in SL light curtain OSSD1 and OSSD2 are switched ON.

**OSSD (Output signal switching device)**

Part of the ESPE connected to machine control system.

When the sensor is enabled during standard operating conditions, it switches to disabled status.

**Protective device**

Device having the function to protect the operator against possible risks of injury due to the contact with machine potentially-dangerous parts.

**Qualified operator**

A person who holds a professional training certificate or having a wide knowledge and experience and who is acknowledged as qualified to install and/or use the product and to carry out periodical test procedures.

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## **Receiver (RX)**

Unit receiving infrared beams, consisting of a set of optically-synchronized phototransistors. The receiving unit, combined with the emitting unit (installed in the opposite position), generates an optical "curtain", i.e. the detecting area.

## **Response time**

Maximum time between the occurrence of the event leading to the actuation of the sensing device and the output signal switching devices (OSSD) achieving the OFF-state

## **Restart interlocking device (=RESTART)**

Device preventing machine automatic restart after sensor activation during a dangerous phase of machine operating cycle, after a change of machine operating mode, and after a variation in machine start control devices.

## **Risk**

Probability of occurrence of an injury and severity of the injury itself.

## **Safe State**

Operating state of ESPE when at least one beam is intercepted, OSSD LED lit RED in SLIM light curtain. OSSD1 and OSSD2 are both switched OFF.

## **Safety light curtain**

It is an active optoelectronic protective device (AOPD) including an integrated system consisting of one or several emitting elements and one or several receiving elements forming a detection area with a detecting capacity specified by the supplier.

## **Start interlocking device (= START)**

Device preventing machine automatic start if the ESPE is live or the voltage is disabled and enabled once again.

## **Test piece**

Opaque object having a suitable size and used to test safety light curtain correct operation.

## **Type (of ESPE)**

The Electro-sensitive Protective Equipment (ESPE) have different reactions in case of faults or under different environmental conditions.

The classification and definition of the "type" (ex. type 2, type 4, according to EN 61496-1: 2013) defines the minimum requirements needed for ESPE design, manufacturing and testing.

## **Working point**

Machine position where the material or semi finished product is worked.

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