



> SLIM
Safety Light Curtains



ORIGINAL INSTRUCTIONS (ref. 2006/42/EC)

Datalogic S.r.l.
Via S. Vitalino 13
40012 Calderara di Reno
Italy

SLIM Instruction Manual

Ed.: 05/2017 Rev.A

© 2015 – 2017 Datalogic S.p.A. and/or its affiliates ♦ ALL RIGHTS RESERVED. ♦ Without limiting the rights under copyright, no part of this documentation may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means, or for any purpose, without the express written permission of Datalogic S.p.A. and/or its affiliates.

Datalogic and the Datalogic logo are registered trademarks of Datalogic S.p.A. in many countries, including the U.S.A. and the E.U. All other trademarks and brands are property of their respective owners.

Datalogic shall not be liable for technical or editorial errors or omissions contained herein, nor for incidental or consequential damages resulting from the use of this material.



Product Service

CERTIFICATE

No. Z10 17 01 70800 039

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 62061:2005/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

Page 1 of 2

(Guido Neumann)





Product Service

CERTIFICATE

No. Z10 17 01 70800 040

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 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)

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

Page 1 of 2

(Guido Neumann)



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 20th, 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.

1	GENERAL INFORMATION	8
1.1	General description	8
1.2	Package contents	9
1.3	How to choose the device	10
1.3.1	Detection capability	10
1.3.2	Height of the detection zone	11
1.3.3	Minimum installation distance	13
1.4	Typical applications	15
1.5	Safety information	18
2	INSTALLATION.....	19
2.1	Precautions to be observed for the choice and installation	19
2.2	General information on device positioning.....	20
2.2.1	Minimum distance from reflecting surfaces	21
2.2.2	Distance between homologous devices	23
2.2.3	Minimum distance for cascaded system	25
2.2.4	Emitter and Receiver Orientation.....	26
2.2.5	Use of deviating mirrors	27
2.2.6	Controls after first installation.....	28
3	MECHANICAL MOUNTING	29
3.1	Fixing with “O” type brackets	29
3.2	Fixing with “C” type brackets.....	31
3.3	Fixing with “L” type brackets	32
3.4	Fixing with “L” type brackets and “C” type brackets	33
3.5	Cascade resolution with different brackets	34
3.6	Cascade 90° resolution.....	35
4	ELECTRICAL CONNECTIONS.....	36
4.1	Pin-out and configuration pin connection.....	36
4.2	Notes on connections	37
4.3	CASCADE CONNECTION	39
5	ALIGNMENT PROCEDURE.....	40
5.1	CORRECT ALIGNMENT PROCEDURE	41
6	COMMISSIONING AND CONFIGURATION.....	42
6.1	Restart mode selection and Restart function.....	42
6.2	EDM function.....	43
6.3	Alignment procedure.....	45
7	USER INTERFACE AND DIAGNOSTICS	46
7.1	User interface.....	46
8	PERIODICAL CHECKS.....	48
8.1	General information and useful data.....	49
8.2	Warranty.....	49
9	DEVICE MAINTENANCE	50
9.1	Product disposal	50
10	TECHNICAL DATA	51
11	AVAILABLE MODELS	52
11.1	Cascade response times	54
12	OVERALL DIMENSIONS	55

13	INCLUDED ACCESSORIES	56
13.1	“C” type brackets kit	56
13.2	“O” type brackets kit	56
14	ACCESSORIES	57
14.1	(ST-K2-SL-C) “C” type brackets kit	57
14.2	(ST-K4-SL-O) “O” type brackets kit	57
14.3	(ST-K2-SL-L) “L” type brackets kit	57
14.4	(ST-K2-SL-C-OR) “C” type Orientable brackets kit	58
14.5	(SE-S) Columns and floor stands	59
14.6	(SG-DM) Deviating mirrors	60
14.7	(TP) Test piece	62
14.8	Connection cables	63
14.9	CASCADE CABLES	64
14.10	(SE-SR2) Safety relay	65
14.11	(CSME-03VU24-Y14) EDM relay box	65
15	GLOSSARY	66

1 GENERAL INFORMATION

1.1 GENERAL DESCRIPTION

The safety light curtains are optoelectronic multibeam 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 aluminium 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 cfr.**ELECTRICAL CONNECTIONS page 36**.

The synchronisation 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 (cfr.**USER INTERFACE AND DIAGNOSTICS page 46**).

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, an user interface facilitates the alignment of both units (cfr.**ALIGNMENT PROCEDURE page 40**).

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.

Some parts or sections of this manual containing important information for the user or installing operator are preceded by a note:



Notes and detailed descriptions about particular characteristics of the safety devices in order to better explain their functioning. Special instructions regarding the installation process.

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

However, specialised 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 (cfr. **USER INTERFACE AND DIAGNOSTICS page 46**).

1.2 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

1.3 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.

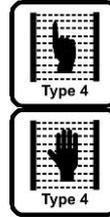
1.3.1 Detection capability

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.

R=14 mm finger protection

R=24 mm
R=34 mm hand protection



As shown in **Fig 1 - page 10**, the resolution only depends on the geometrical characteristics of the lenses, diameter and distance between centres, and is independent of any environmental and operating conditions of the safety light curtain.

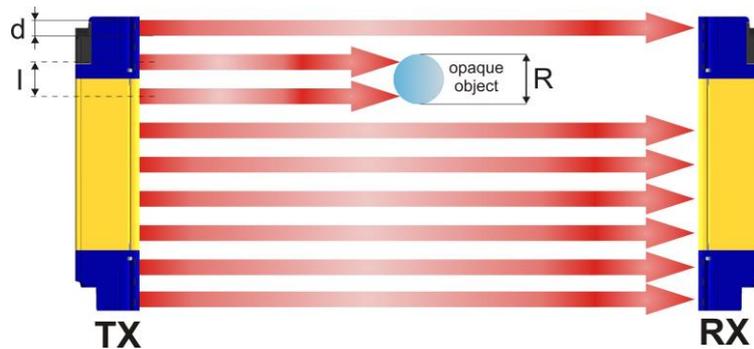


Fig 1 - Detection capability

The resolution value is obtained applying the following formula:

$$R = l + d$$

where:

l=Interaxes between two adjacent optics

d=Lens diameter

1.3.2 Height of the detection zone

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

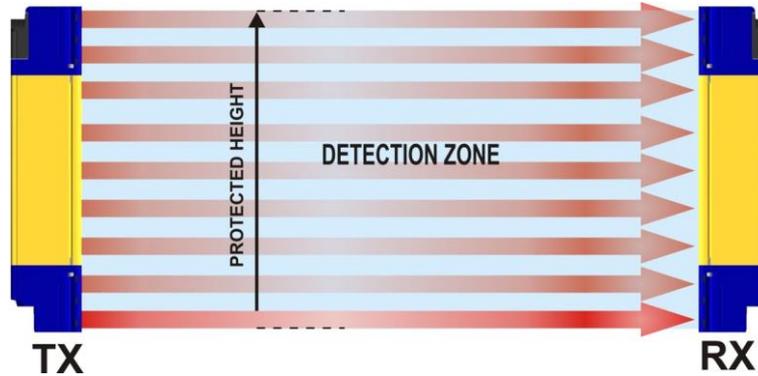


Fig 2 - Detection Zone

The SLIM controlled height extends up to the whole height of the product (zero dead-zone). Available dimensions are listed in the following table:

SL2 - 14 - 0150 - E

TYPE	
2	Type 2
4	Type 4

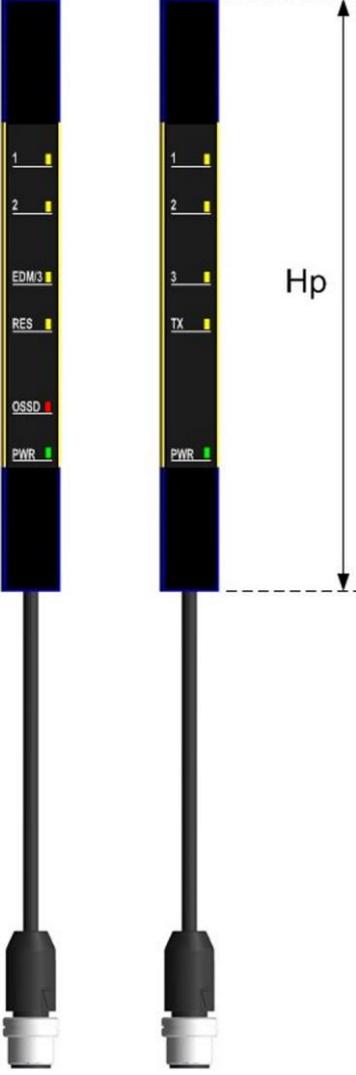
RESOLUTION	
14	Finger : 14 mm
24	Hand: 24 mm
34	Hand: 34 mm

MONITORED HEIGHT	
0150	150 mm
0210	210 mm
0270	270 mm
0300	300 mm
...	
1200	1200 mm

VERSION	
E	EDM, Restart

Fig 3 - Available Models and 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	270	
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	

1.3.3 Minimum installation distance

The safety device must be positioned at a specific safety distance (**Fig 4 - page 13**).

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

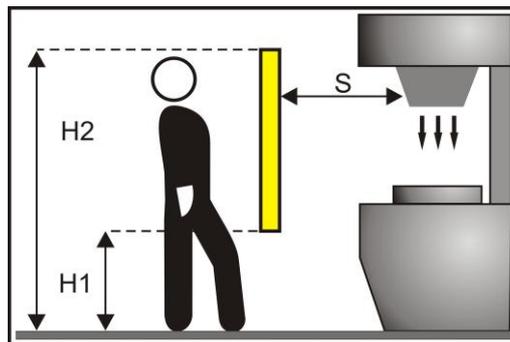


Fig 4 - Installation distance (vertical positioning)

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

$$S = K (t1 + t2) + C$$

where:

- S = Minimum safety distance in mm
 K = Speed of the object, limb or body approaching the dangerous area in mm/sec
 t1 = Response time of the ESPE in seconds (see cfr. **AVAILABLE MODELS AND RESPONSE TIMES page 52**)
 t2 = Machine stopping time in seconds (including the Safety Control System)
 C = Additional distance based on the possibility to insert the body or one of 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 ≥ 900 mm (H2) from machine supporting base while the height of the bottom beam has to be ≤ 300 mm (H1).

If the safety light curtain must be mounted in a horizontal position (**Fig 5 - page 14**) the distance between the dangerous area and the most distant optical beam must be equal to the value calculated using the following formula:

$$S = 1600 \text{ mm/s} (t1 + t2) + 1200 - 0,4 H$$

where:

- S = Minimum safety distance in mm.
- t1 = Response time of the ESPE in seconds (cfr. **TECHNICAL DATA page 51**)
- 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.

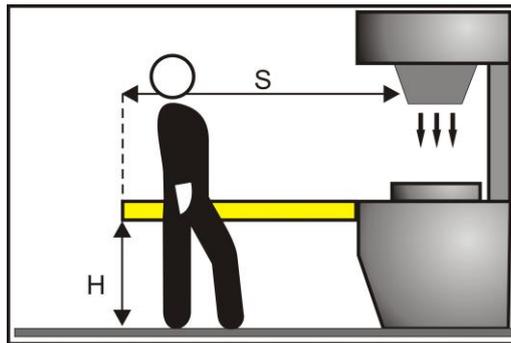


Fig 5 - Installation distance (horizontal positioning)

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 total stopping time (Including safety control system).
- T = (t1 + t2) Overall system stopping performance
- C = 8 * (R – 14) for devices with resolution ≤ 40 mm
- R = Resolution of the system

	SL4-14-0600-E	SL4-34-0600-E
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.

1.4 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 a automatic machine



Fig 6 -

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 SLIMlight 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



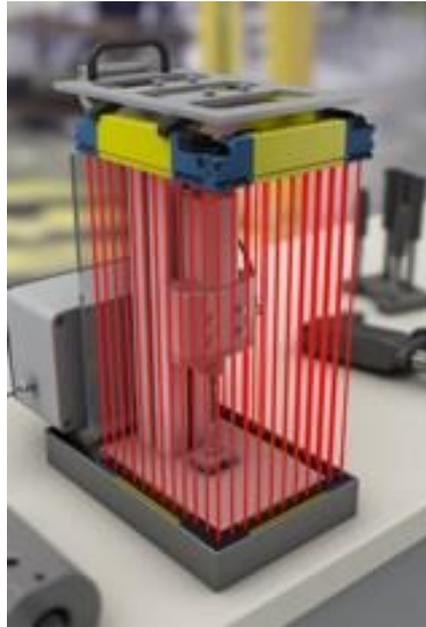
Fig 7 -

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**Fig 8 -**

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 curtains thanks to cascading and 15 mm width 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 protected, 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.

1.5 SAFETY INFORMATION



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

- 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 page 13** 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 sections **INSTALLATION page 19**, **MECHANICAL MOUNTING page 29**, **ELECTRICAL CONNECTIONS page 36**, **ALIGNMENT PROCEDURE page 40**) 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 section **INSTALLATION page 19**).
- 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.

2 INSTALLATION

2.1 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 page 51**.
- 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.

2.2 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.



Fig 9 - page 20 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 light curtain at sufficient height in order to completely cover the access to the dangerous area (Fig 10 - page 20) becomes necessary.

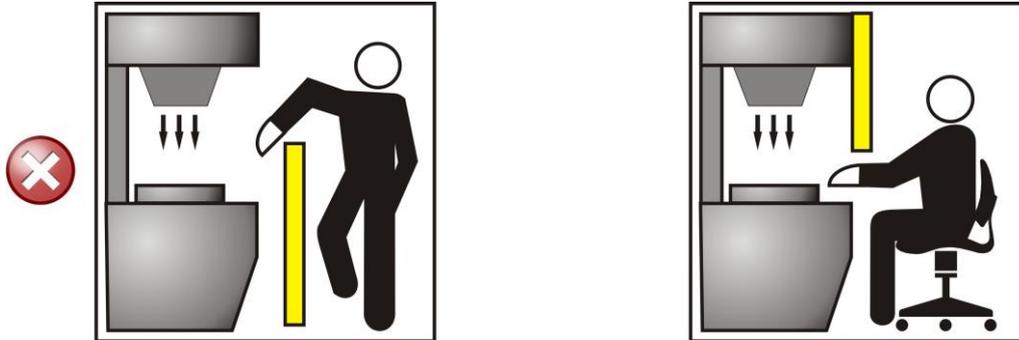


Fig 9 - Wrong light curtain positioning



Fig 10 - 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 Fig 12 - page 20.

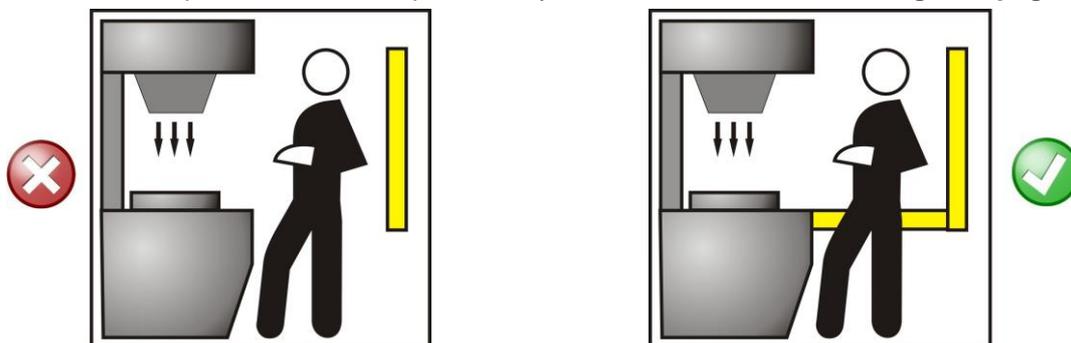


Fig 11 - Wrong light curtain positioning

Fig 12 - Correct light curtain positioning

2.2.1 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.

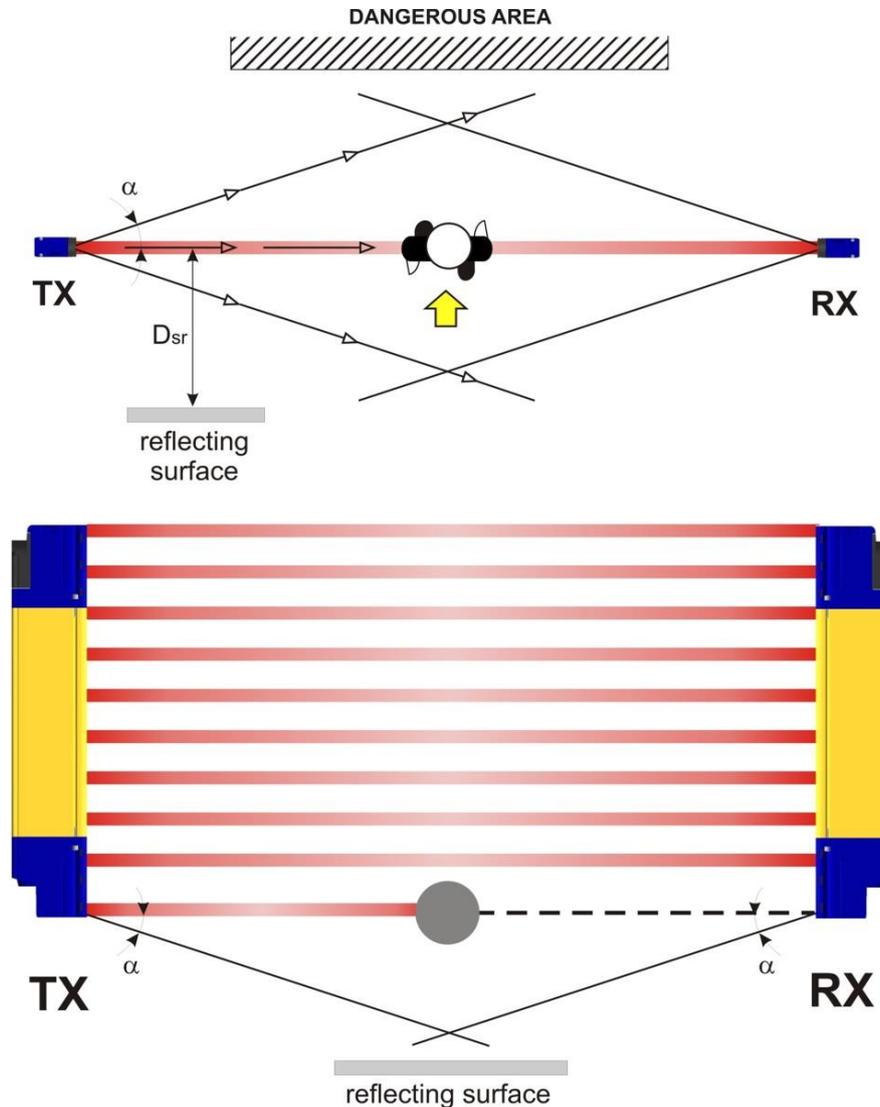


Fig 13 - Distances from reflective surfaces

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:

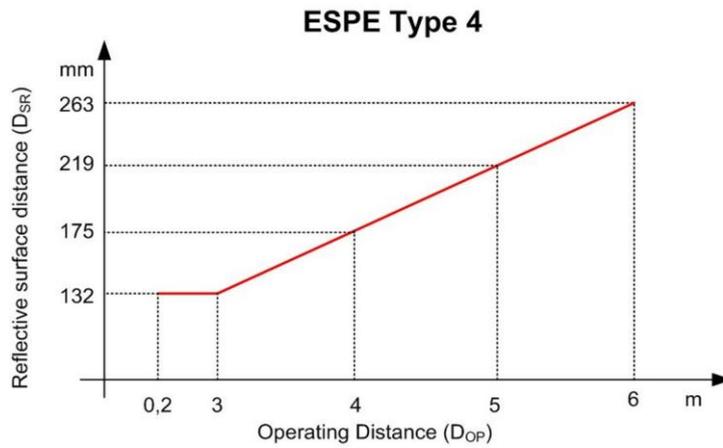


Fig 14 - Minimum distance from reflective surface for Type 4 ESPE

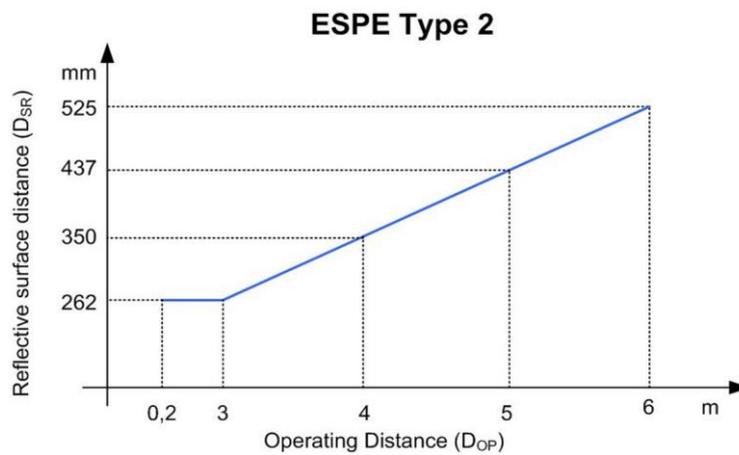


Fig 15 - Minimum distance from reflective surface for Type 2 ESPE

The formula to get Dsr is the following:

For ESPE Type 2:

$D_{sr} (m) = 0.26$ for operating distance < 3 m
 $D_{sr} (m) = 0.5 \times \text{operating distance (m)} \times \text{tg } 5^\circ$ for operating distance ≥ 3 m

For ESPE Type 4:

$D_{sr} (m) = 0.13$ for operating distance < 3 m
 $D_{sr} (m) = 0.5 \times \text{operating distance (m)} \times \text{tg } 2a$ for operating distance ≥ 3 m

2.2.2 Distance between homologous devices

The following graphic shows the distance from the interfering devices (D_{do}) according to the operating distance (D_{op}) 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 D_{do} distance from the TXA – RXA emitter-receiver couple axis.

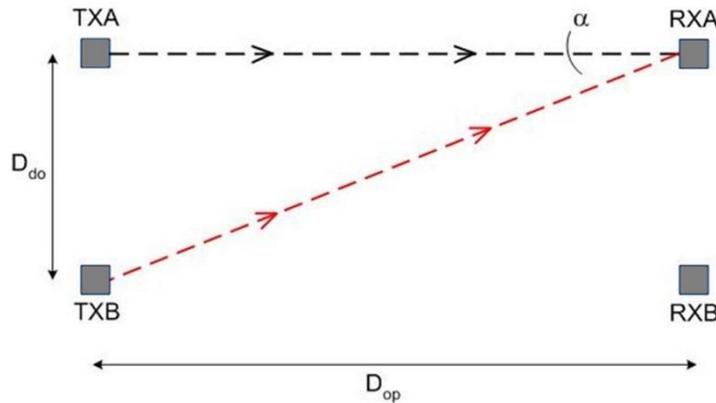


Fig 16 - Distance between homologous devices

This minimum D_{do} distance depends on:

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

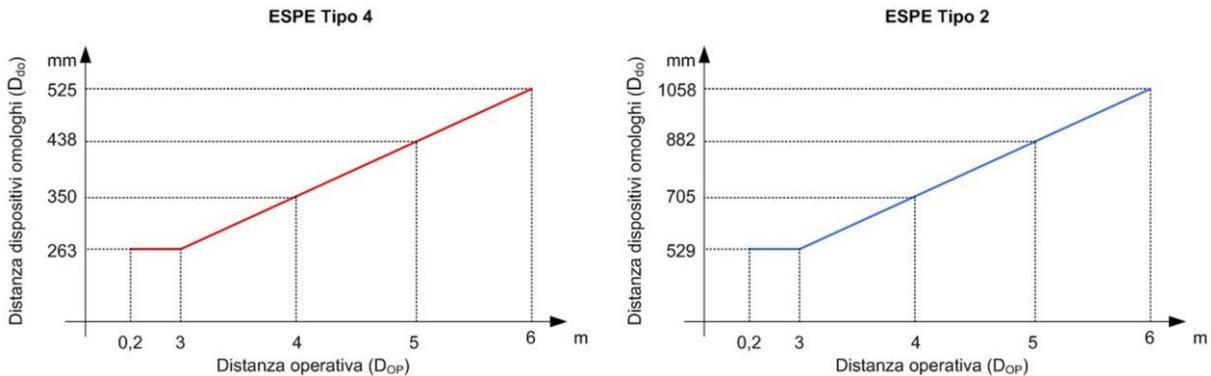


Fig 17 -

The formula to get D_{do} is the following:

For Type 4 ESPE:

D_{do} (mm) = 263 for Type 4 ESPE for operating distance < di 3 m

D_{do} (m) = operating distance (m) x tg 5° for operating distance => di 3 m

For Type 2 ESPE:

D_{do} (mm) = 529 for Type 4 ESPE for operating distance < di 3 m

D_{do} (m) = operating distance (m) x tg 10° for operating distance => di 3 m



The interfering device (TXB) must be positioned at the same D_{do} 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:

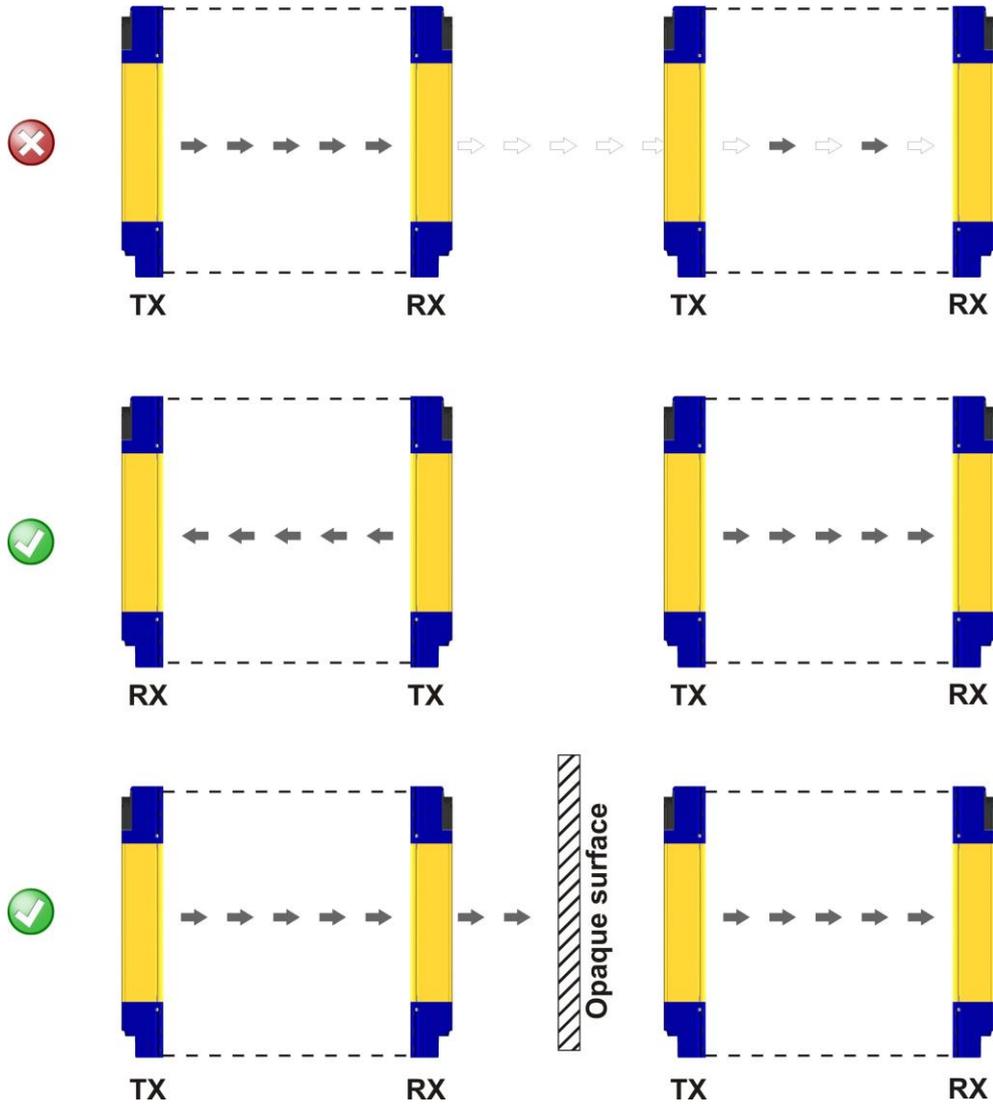


Fig 18 - Recommended positioning for homologous devices

2.2.3 Minimum distance for cascaded system

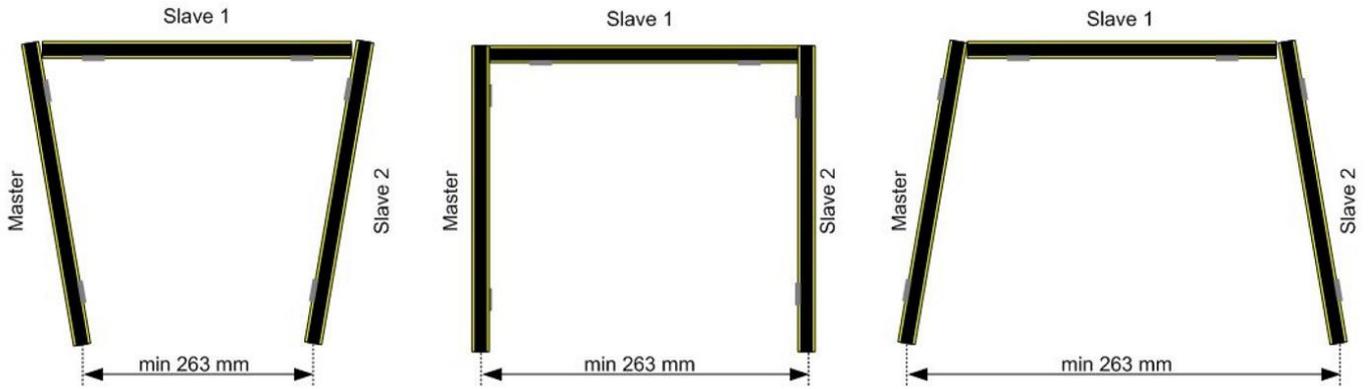


Fig 19 - Minimum distance for cascaded system

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 **Fig 19 - page 25** for Ddo calculation.

2.2.4 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:

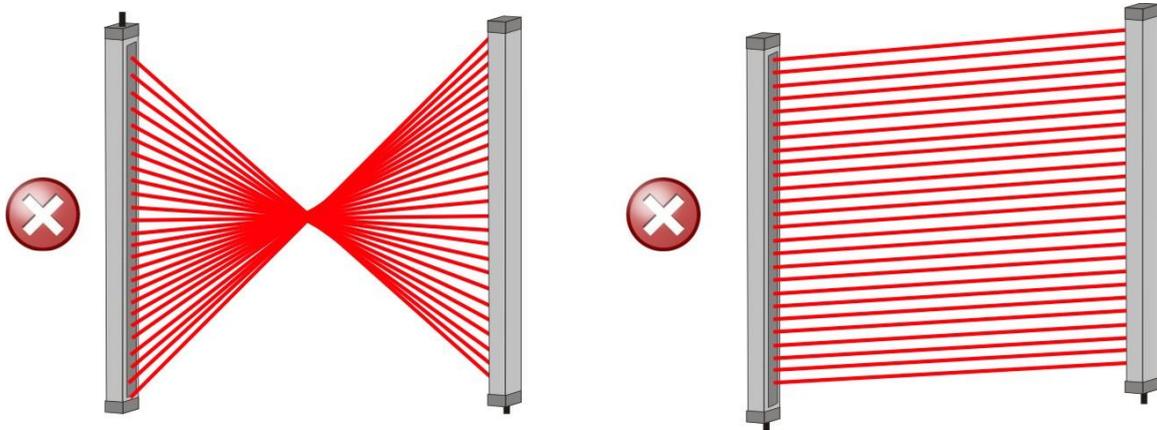


Fig 20 - Wrong light curtain TX-RX orientations

2.2.5 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 three different access sides, using two mirrors placed at 45° with respect to the beams.

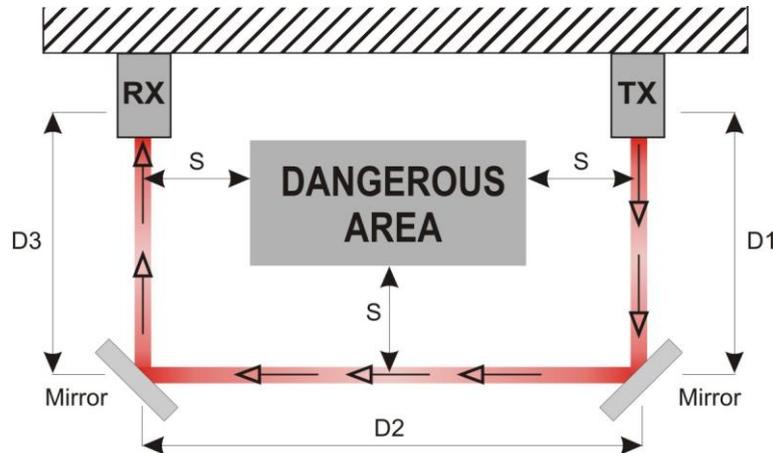


Fig 21 - Use of deviating mirrors

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 percentage further decreases by using 2 or more mirrors (for more details refer to the technical specifications of the mirrors used).

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

Number of mirrors	Maximum Operating Distance
1	4.8 m
2	3.5 m

- Do not use more than two mirrors for each device.
- The presence of dust or dirt on the reflecting surface of the mirror causes a drastic reduction in the range.

2.2.6 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.

Verify that:

- L'ESPE remains in Safe State (OSSD led lit RED) intercepting the beams along the detection zone using the specific test piece, following the **Fig 22 - page 28** scheme (cfr.**ACCESSORIES page 57**).

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

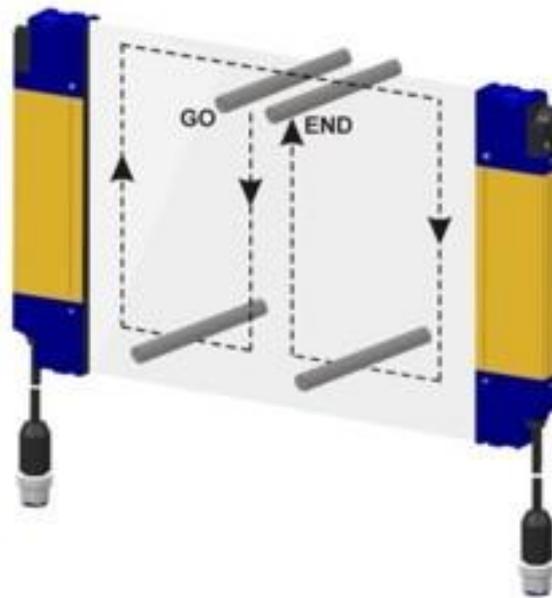


Fig 22 - First installation check with Test Piece

- 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 section **Minimum installation distance page 13**).
- The safety distance between the dangerous parts and ESPE must comply with the requirements indicated in section **Minimum installation distance page 13**.
- 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 (cfr.**ACCESSORIES page 57**)
- Verify the correspondence of all the accessory functions, activating them in the different operating conditions.

3 MECHANICAL MOUNTING

3.1 FIXING WITH "O" TYPE BRACKETS

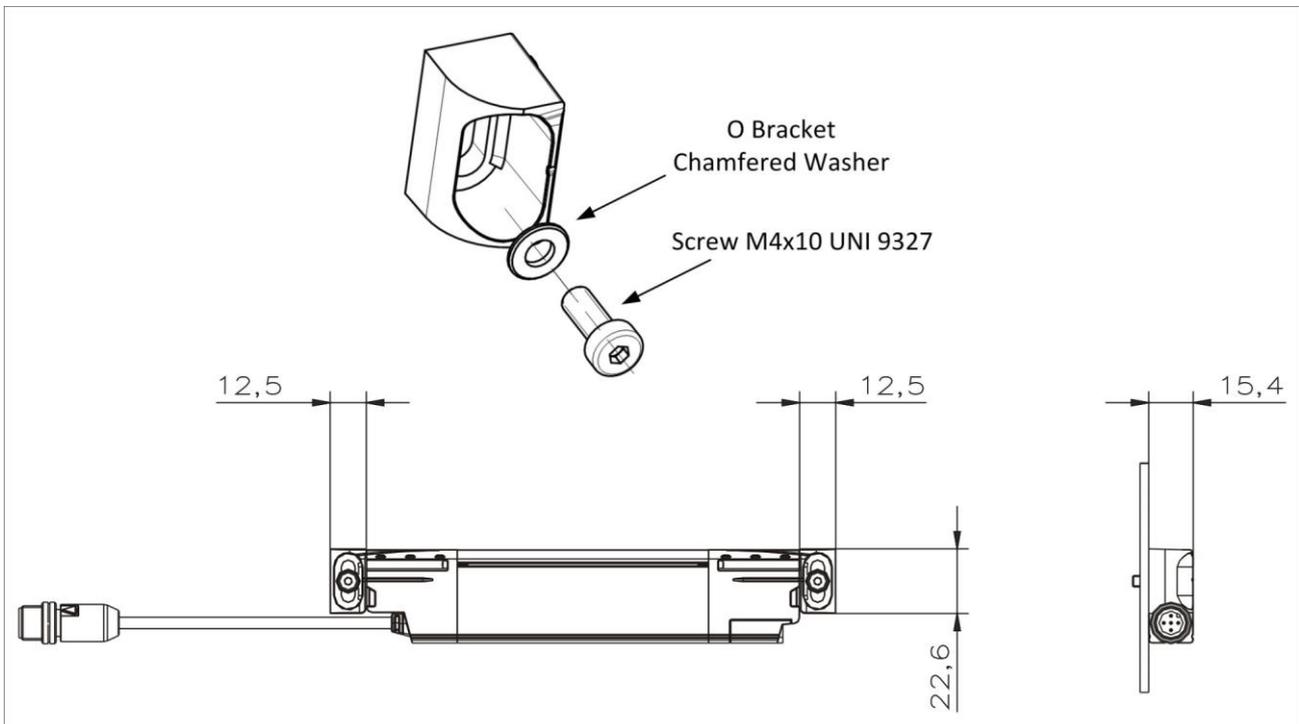


Fig 23 - Staffa di tipo "O"

- 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).

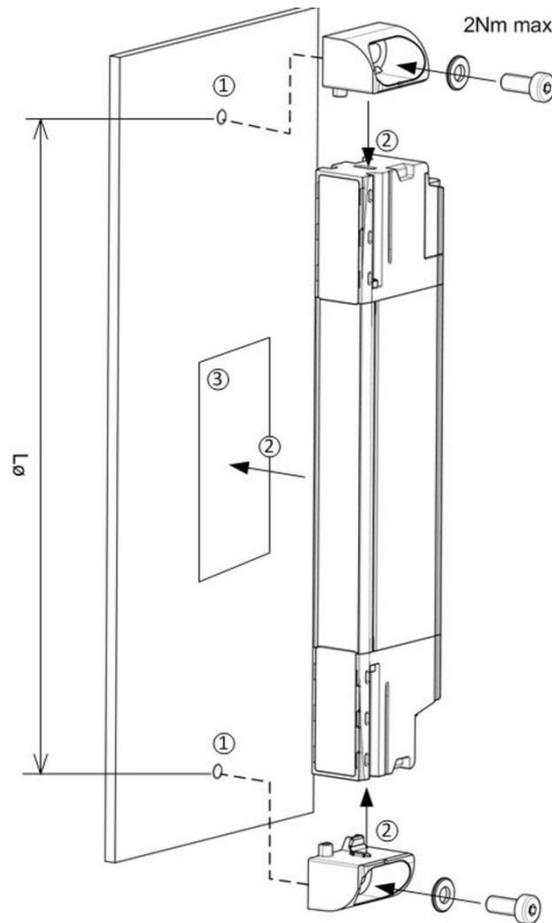


Fig 24 - Fixing with "O" type brackets

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

3.2 FIXING WITH “C” TYPE BRACKETS

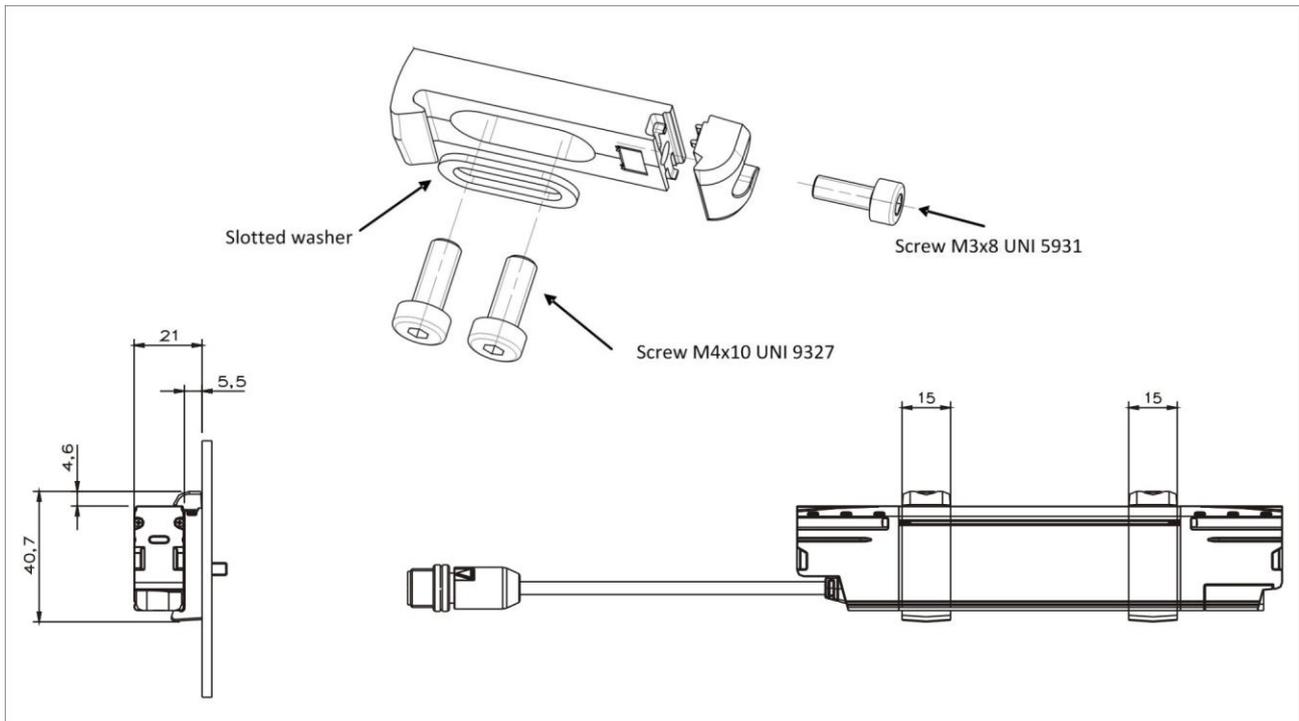


Fig 25 - Staffa di tipo "C"

- 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.

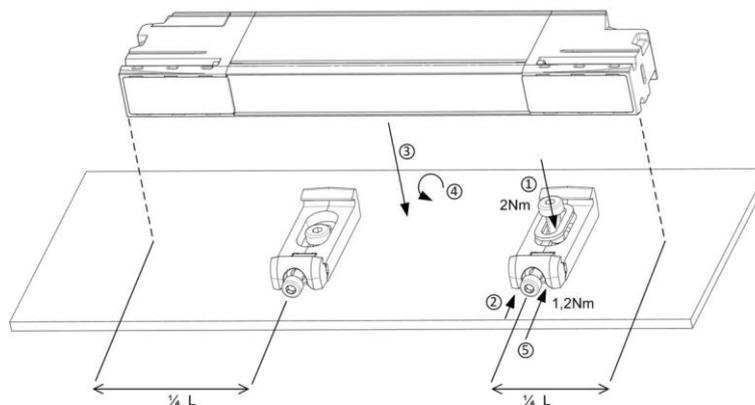


Fig 26 - Fixing with "C" type brackets

3.3 FIXING WITH “L” TYPE BRACKETS

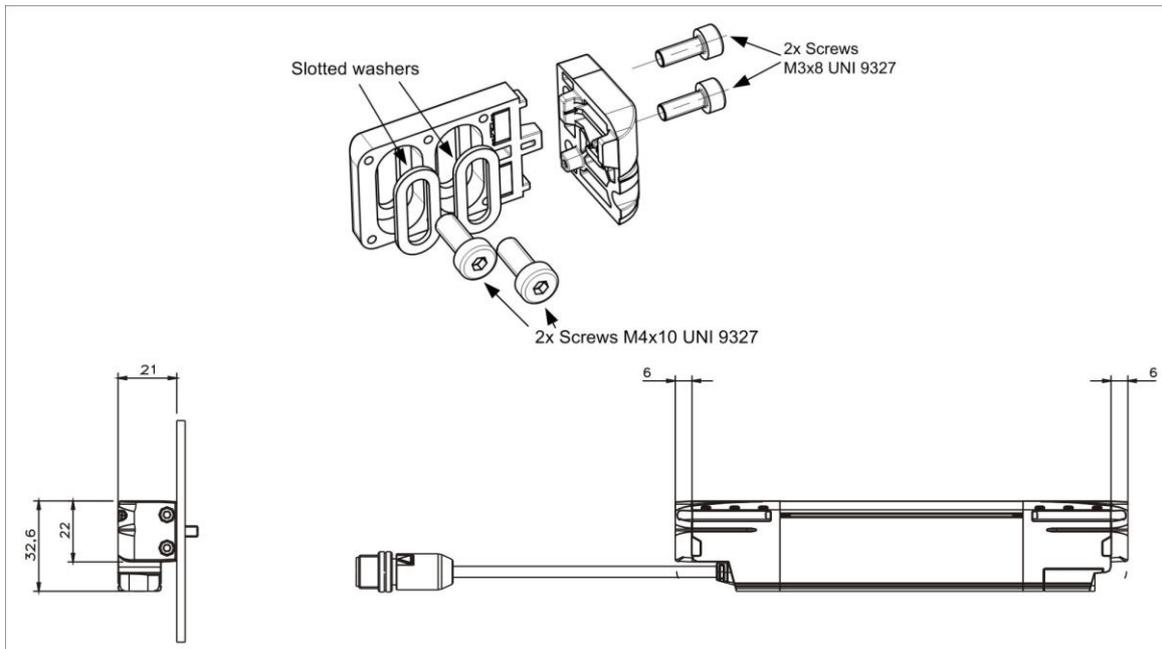


Fig 27 - Staffa di tipo "L"

- 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.

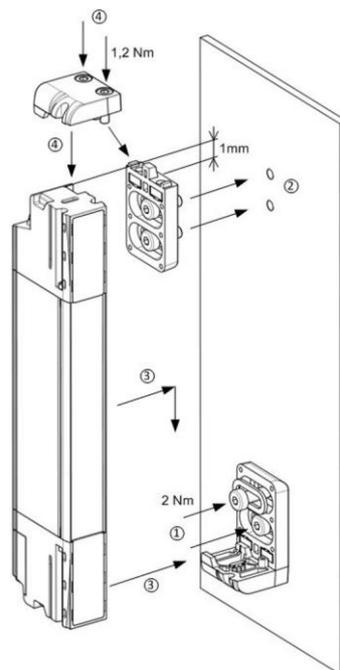


Fig 28 - Fixing with “L” type brackets

3.4 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)

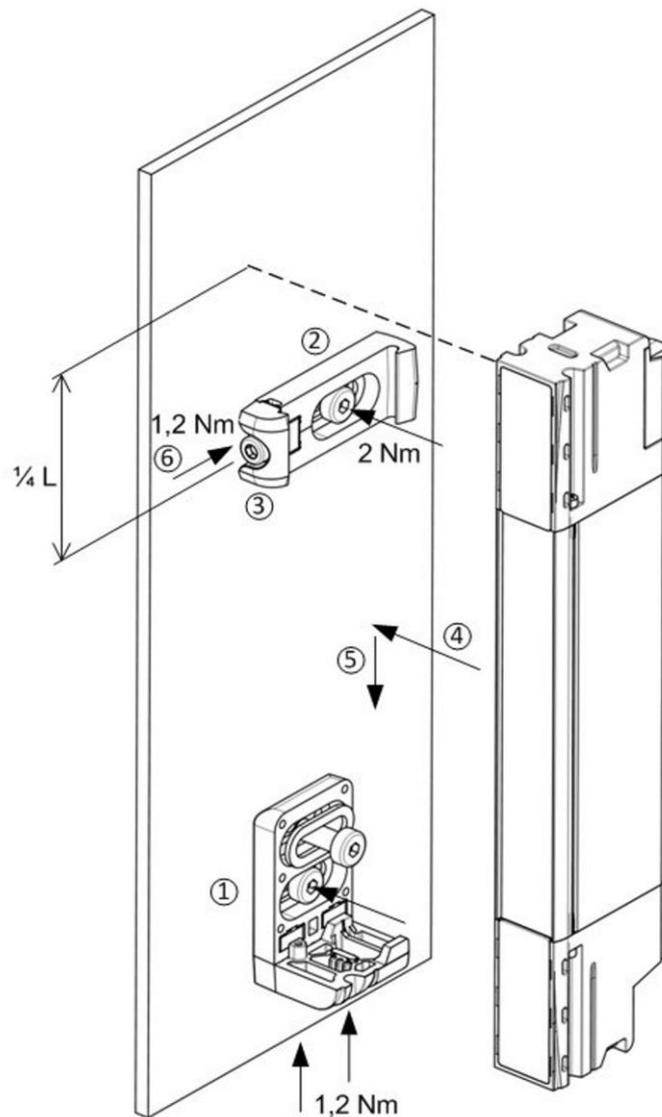


Fig 29 - Mixed fixing with “L”-type brackets and “C”-type brackets

3.5 CASCADE RESOLUTION WITH DIFFERENT BRACKETS

Fixing with “O” type brackets

Cascade resolution at junction drops to 40 mm.

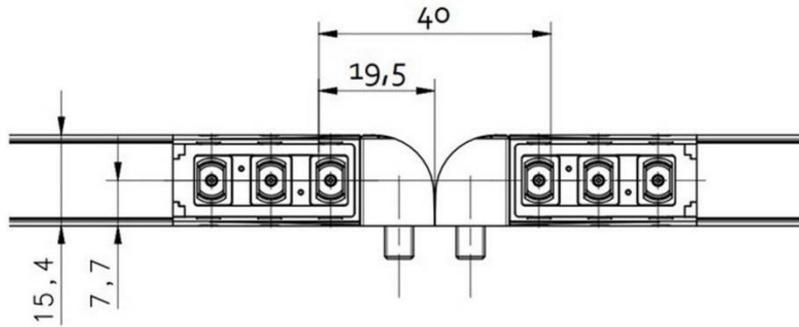


Fig 30 - Fixing with “O” type brackets

Fixing with “C” type brackets

Cascade resolution at junction remains 14mm.

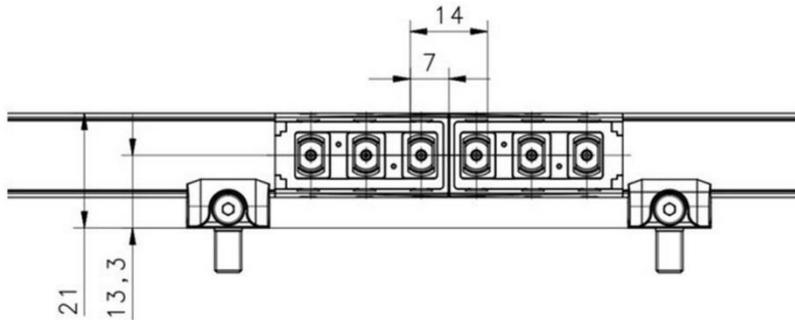


Fig 31 - Fixing with “C” type brackets

Fixing with “L” type brackets

Cascade resolution at junction drops to 26mm.

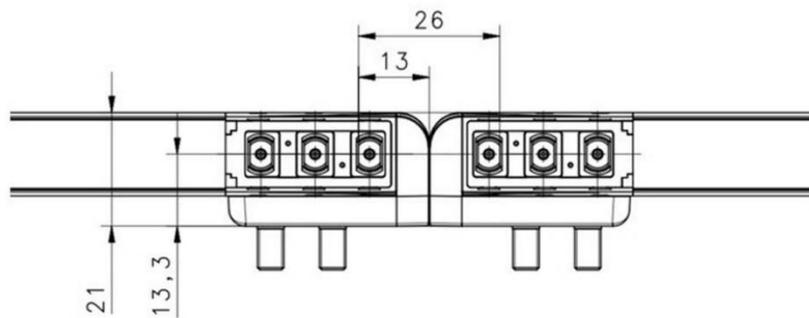


Fig 32 - Fixing with “L” type brackets

3.6 CASCADE 90° RESOLUTION

When cascading two SLIM light curtains at 90° like in **Fig 33 - page 35** 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.

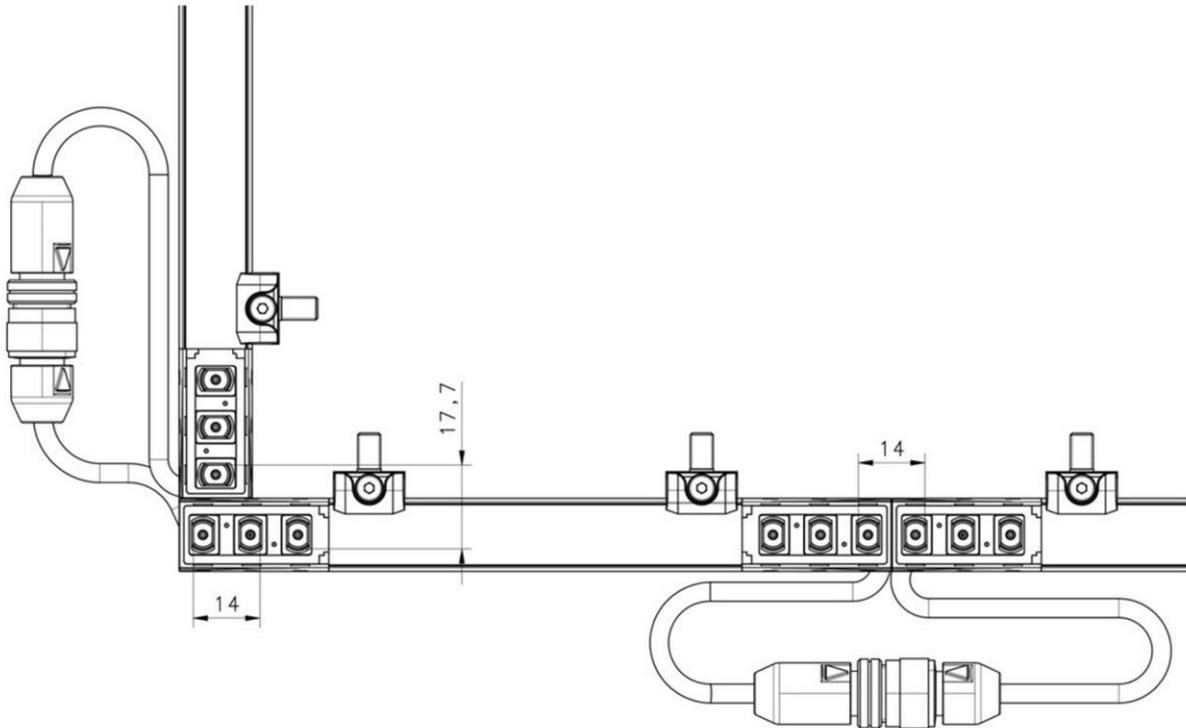


Fig 33 - Cascade resolution at 90° junction

4 ELECTRICAL CONNECTIONS

4.1 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):

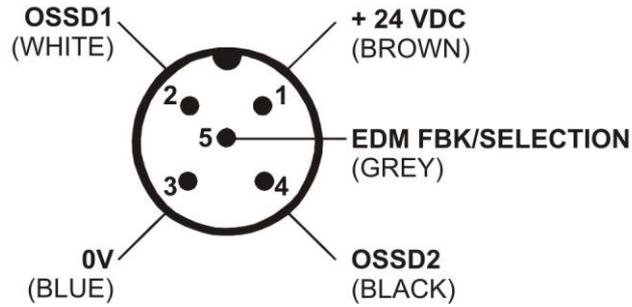


Fig 34 - Receiver

- 1 = brown = +24 VDC
- 2 = white = OSSD1
- 3 = blue = 0 V
- 4 = black = OSSD2
- 5 = grey = EDM FBK/SELECTION

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

EMITTER (TX):

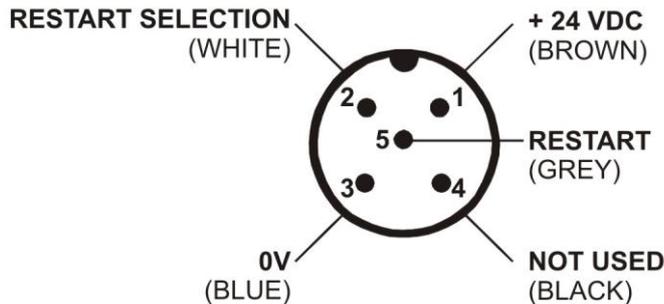


Fig 35 - Emitter

- 1 = brown = +24 VDC
- 2 = white = RESTART SELECTION
- 3 = blue = 0 V
- 4 = black = NOT USED
- 5 = grey = RESTART

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

4.2 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 cfr.COMMISSIONING AND CONFIGURATION page 42).

- 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

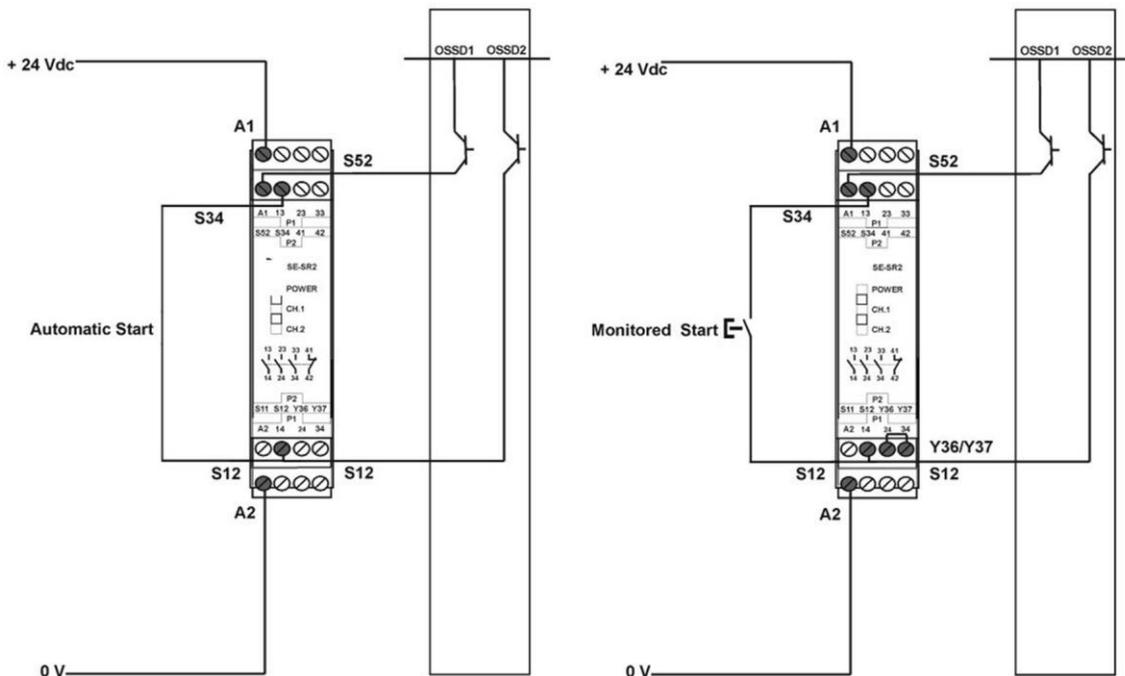


Fig 36 - Connection to SE-SR2 Safety Relais

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 into the output failure condition (see cfr.USER INTERFACE AND DIAGNOSTICS page 46).

- 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.

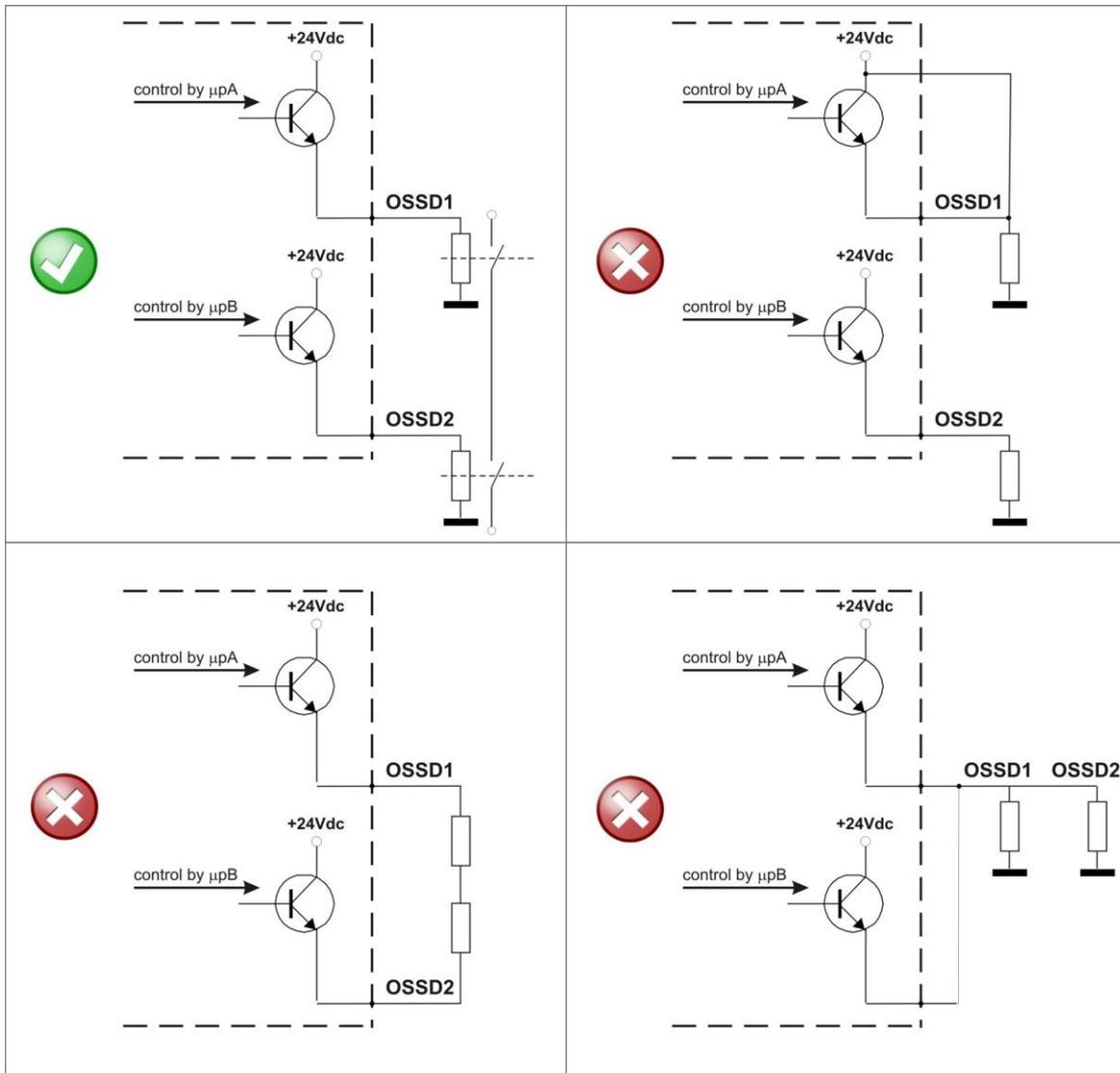


Fig 37 - OSSDs connection

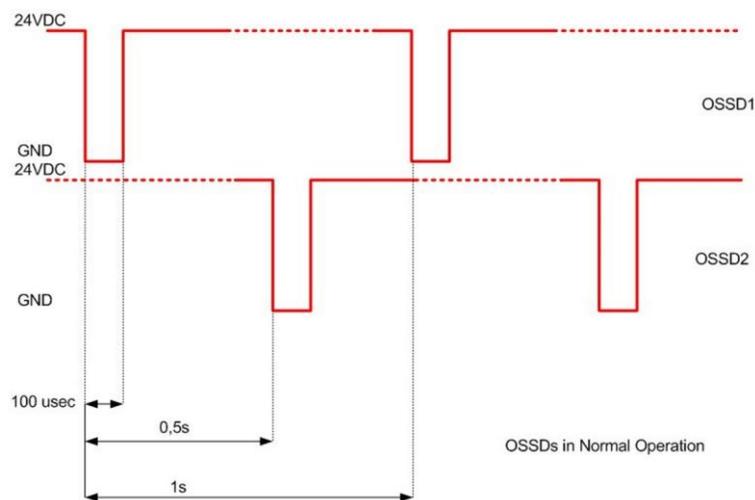


Fig 38 - OSSDs test timing pattern

4.3 CASCADE CONNECTION

Up to three SLIM light curtain 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.

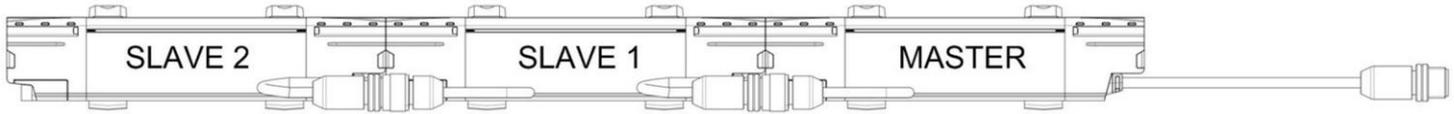


Fig 39 - Cascade composition

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

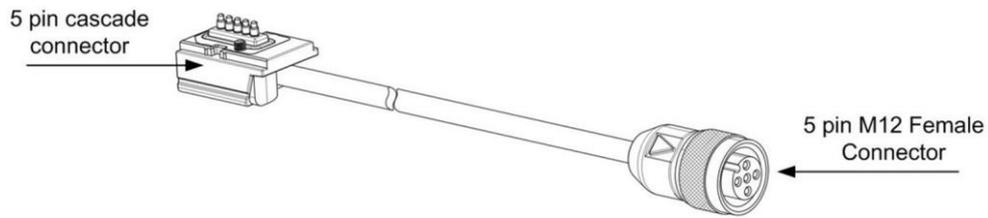


Fig 40 - Cascade accessory cables

To connect cascade unit:

- Fix all cascade units with proper brackets as described in **MECHANICAL MOUNTING page 29**. (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).

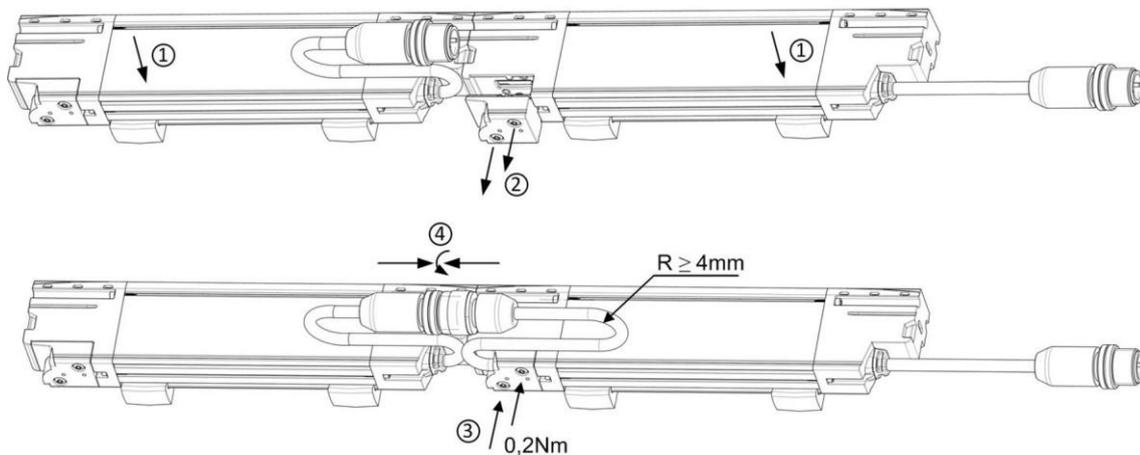


Fig 41 - Mounting

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 synchronise the two units is the closest one to the pig-tail cable: SYNC optic.

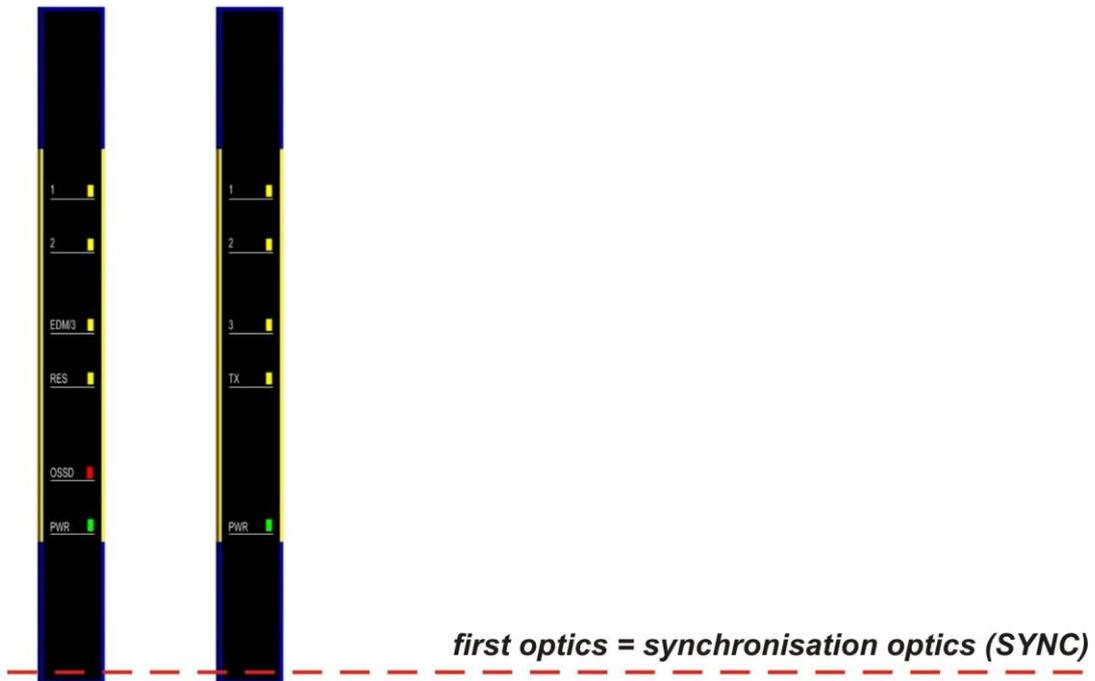
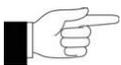


Fig 42 - Synchronization Optic

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 (cfr. Pin-out and configuration pin connection page 36).

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

5.1 CORRECT ALIGNMENT PROCEDURE

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 (cfr. **Pin-out and configuration pin connection page 36**).
- 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 synchronisation 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 the centre of this area where as many yellow LEDs are steady ON.



Ensure that at least two yellow LEDs (1/2) 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 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 cfr. **Controls after first installation page 27**).
- 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.**

6 COMMISSIONING AND CONFIGURATION

6.1 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 (cfr. **Fig 45 - page 43**) and provided that the object has been removed from the controlled area.

This condition, called interlock, is signalled on the display (cfr. **User interface page 46**)

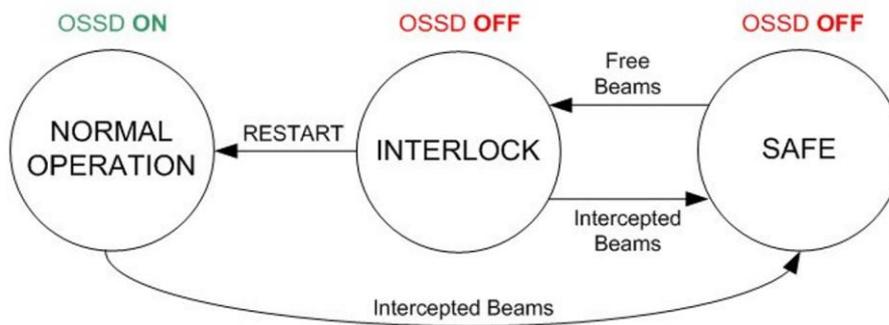


Fig 43 - Auto/Manual Restart selection

Select either automatic or manual restart by properly connecting **RESTART** input and **RESTART SELECTION** output of TX connector (cfr. **ELECTRICAL CONNECTIONS page 36**)

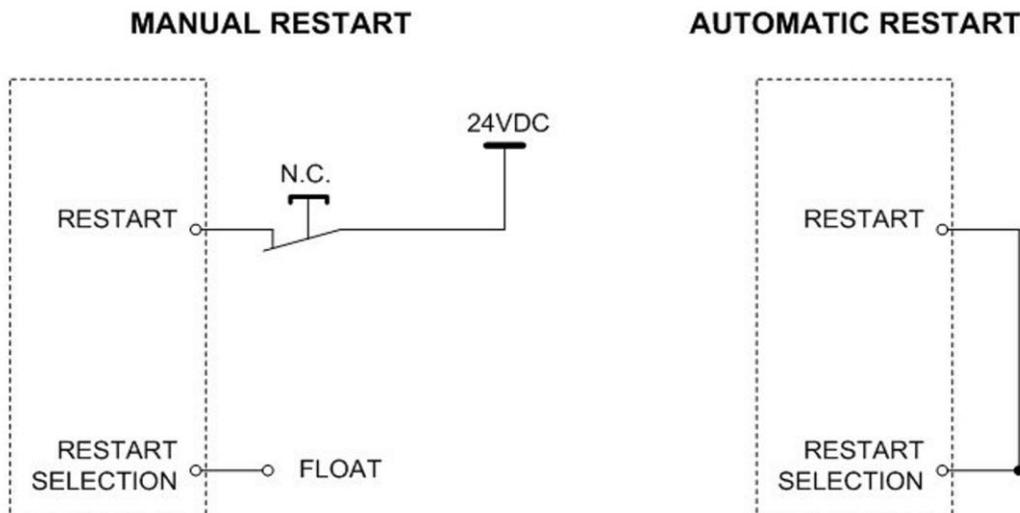


Fig 44 - Auto/Manual Restart selection



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

Since mode selection is read by TX unit, at startup RX unit always start in alignment mode (see paragraph **Alignment procedure page 45**), then switches to selected functioning mode after first correct alignment.



WARNING: 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 (see Moduli di sicurezza & Interfacce page 64)

Time chart (Manual Restart)

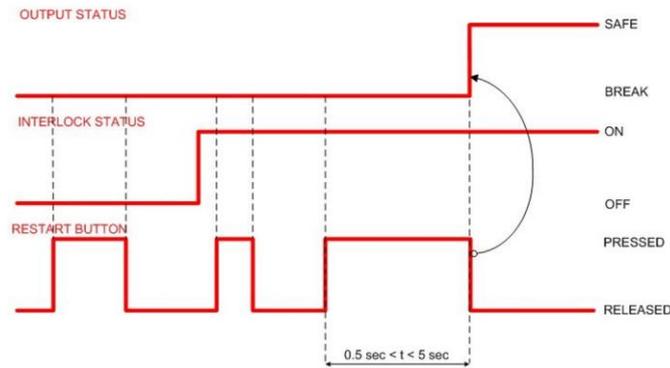


Fig 45 - Manual Restart timing

6.2 EDM FUNCTION

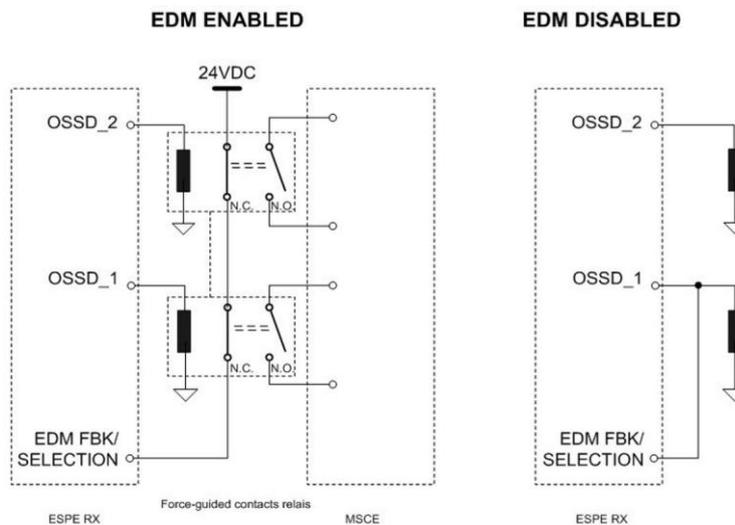


Fig 46 - EDM connection

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 EDM function is enabled.

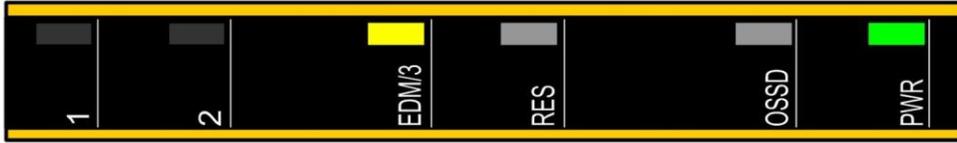


Fig 47 - EDM UI indication

When EDM function is enabled EDM FBK/SELECTION input is monitored to be antivalent to OSSDs status. Monitoring timings are specified in **Fig 48 - page 44**.

OSSD STATUS

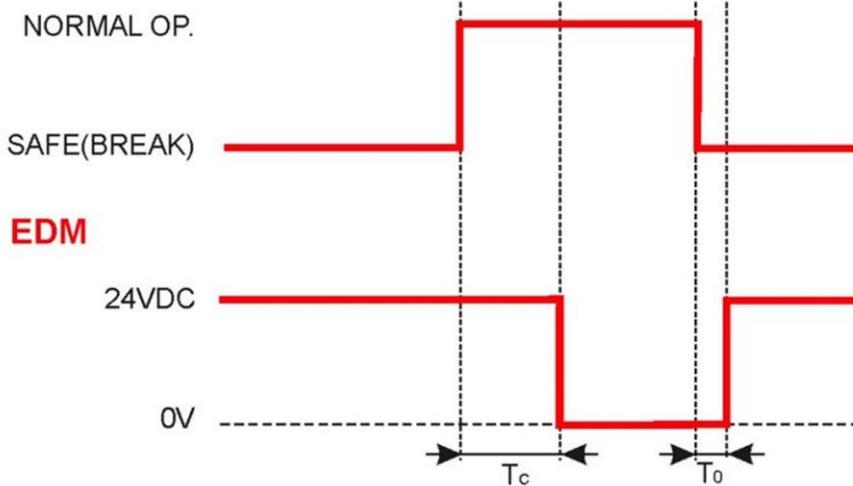


Fig 48 - EDM Timings

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 EDM function.

6.3 ALIGNMENT PROCEDURE

[INLINE-1:44 light curtain is fitted with a system which informs the user about alignment quality.

The alignment function can be selected on device starting by keeping opened RESTART contact for at least 1 second ([XREF-2:107])

Alignment mode timing

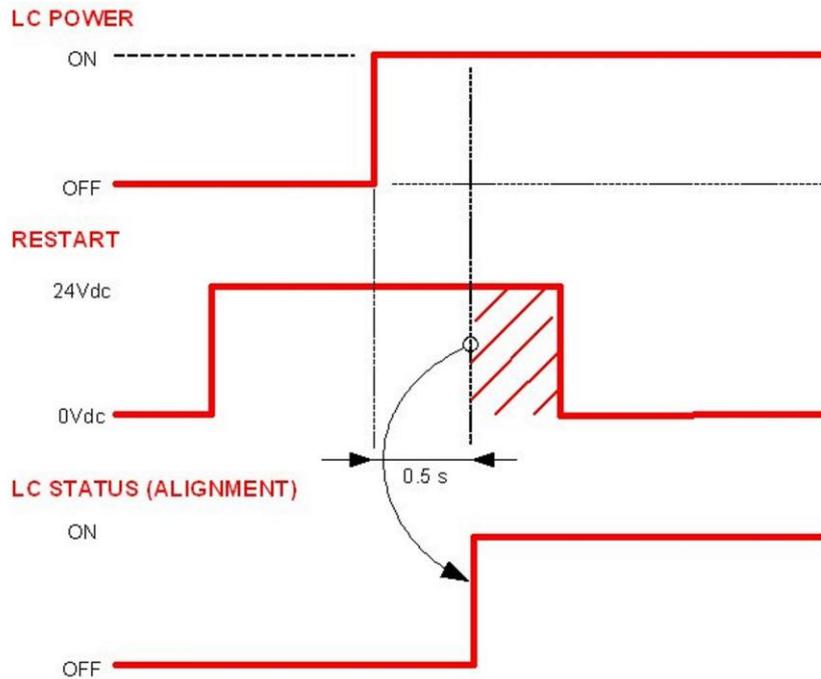


Fig 49 - Alignment Mode Timing

In alignment mode LED UI visualize the signal level measured by Receiver unit as in the table.

INDICATION	CONFIGURAZIONE LED						OSSD STATUS RESULT IN NORMAL OPERATION
	BLINK	INDIFFERENT	OFF	ON			
NOT ALIGNED AT LEAST ONE BEAM INTECEPTED	1	2	EDM13	RES	OSSD	PWR	OFF
MINIMUM SIGNAL LEVEL	1	2	EDM13	RES	OSSD	PWR	OFF
MEDIUM SIGNAL LEVE SYNC ENGAGED	1	2	EDM13	RES	OSSD	PWR	ON
MEDIUM SIGNAL LEVE SYNC ENGAGED	1	2	EDM13	RES	OSSD	PWR	ON
MAXIMUM SIGNAL LEVEL	1	2	EDM13	RES	OSSD	PWR	ON

Once optimal alignment has been reached, the device can return to normal operation by powering off and then powering both RX and TX unit with RESTART contact properly connected.



OSSDs are not enabled on alignment mode.

7 USER INTERFACE AND DIAGNOSTICS

7.1 USER INTERFACE

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

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

TX side:

ESPE WORKING MODE	INDICATION	LED CONFIGURATION				RECOMMENDATIONS
		BLINK	INDIFFERENT	OFF	ON	
NORMAL OPERATION	Emission					
FAILURE LOCKOUT	F1: Failure ON Microprocess or					Internal Failure, check for operating condition (cfr. TECHNICAL DATA page 51) 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 (cfr. Cascade connection page 39)
	F13: Failure ON Restart					Failure on Restart function, check RESTART SELECTION connection (cfr. Restart mode selection and Restart function page 42)
If failure persist 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		Follow chapter ALIGNMENT PROCEDURE page 40 for correct Alignment Procedure or properly connect RESTART input on TX unit to enter Normal Operation mode (cfr. Restart mode selection and Restart function page 42).
	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 microprocess or		Internal Failure, check for operating condition (cfr. TECHNICAL DATA page 51) 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 (cfr. EDM function page 43), then power cycle the ESPE
	F12: cascade failure		Failure on cascade communication, check cascade connection or terminator cap fixing (cfr. Cascade connection page 39)
	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 (cfr. ELECTRICAL CONNECTIONS page 36) and any cause of electrical interference, then power cycle the ESPE.
	Power supply Failure		Check for proper connection (cfr. ELECTRICAL CONNECTIONS page 36).
<p style="text-align: center;">If failure persist after recommended checks and ESPE power cycle, please contact DATALOGIC.</p>			

8 PERIODICAL CHECKS

The following is a list of recommended check and maintenance operations that should be periodically carried-out by qualified personnel (cfr. **Controls after first installation page 27**)

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 **Fig 22 - page 28**.

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 (cfr. **COMMISSIONING AND CONFIGURATION page 42**)
- The safety distance between the dangerous areas and the ESPE are in accordance with the instructions included in cfr. **INSTALLATION page 19**.
- 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.

8.1 GENERAL INFORMATION AND USEFUL DATA



Safety MUST be a part of our conscience.

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.

8.2 WARRANTY

The warranty period for this product is 36 months.

See the General Terms and Conditions of Sales at 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.

9 DEVICE MAINTENANCE

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 dampened 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**

9.1 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 to dispose of the product in compliance with local laws or contact authorised waste collection centres.

10 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 (ref. 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	
Power supply (Vdd):	24 VDC \pm 20%
Consumption (TX):	1.6 W max (55 mA at 28.8 VDC)
Consumption (RX):	4.2 W max (145 mA at 28.8 VDC – no load on OSSD)
OSSD outputs:	2 PNP
OSSD short-circuit protection:	0.6 A type
OSSD output current:	0.3 A max / each output
OSSD output voltage – status ON:	Vdd – 1 V min
OSSD output voltage – status OFF:	0.2 V max
OSSD capacitive load	1 μ F at 24 VDC max
OSSD Test pulses width	100 μ s (cfr. Notes on connections page 37)
OSSD Test pulses frequency	1/s
Response times:	7-17 ms (cfr. AVAILABLE MODELS AND RESPONSE TIMES page 52)
Controlled height:	150...1200 mm
Auxiliary functions:	Manual/Automatic Rrestart; EDM;
Electrical protection:	Class III (CFR. Notes on connections page 37)
Connections:	M12 5-pole for emitter M12 5-pole for receiver
Cable length (for power supply):	20 m max.

OPTICAL DATA	
Light emission (I):	Infrared, LED (850 Nm)
Risk Group EN62471	Exempt
Resolution:	14 - 24 - 34 mm
Operating distance:	0.2...6 m
Ambient light rejection:	EN 61496-2: 2013

MECHANICAL AND ENVIRONMENTAL DATA	
Operating temperature:	-10...+ 55 °C
Storage temperature:	- 25...+ 70 °C
Temperature class:	T6
Humidity:	15...95 % (no condensation)
Mechanical protection:	IP 65 (EN 60529)
Vibrations:	Width 0.35 mm, Frequency 10 ... 55 Hz 20 sweep per axis, 1 octave/min (EN 60068-2-6)
Shock resistance:	10G (16 ms) 1,000 shocks per axis (EN 60068-2-29)
Housing material:	Painted aluminium (yellow RAL 1003)
Front glass material:	PMMA
Cap material:	Painted Zamak (Blue RAL 5002)
Weight:	W [g] = L [mm] x 5 + 50 (single unit TX or RX)

11 AVAILABLE MODELS

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

	<i>EN ISO 13849-1</i>	<i>EN 954-1</i>	<i>EN IEC 61508</i>	<i>EN IEC 62061</i>	<i>Prob. of danger failure/hour</i>	<i>Life span</i>	<i>Mean Time to Dangerous Failure</i>	<i>Average Diagnostic Coverage</i>	<i>Safe Failure Fraction</i>	<i>Hardware Fault Tolerance</i>
Product	PL	CAT	SIL	SIL CL	PFHd (1/h)	T1 (years)	MTTFd (years)	DC	SFF	HFT
SL2-xx-xxxx-E	c	2	1	1	7,89E-09	20	191	98,80%	98,93%	0
SL4-xx-xxxx-E	e	4	3	3	2.64E-09	20	444	98,80%	98,93%	1

11.1 CASCADE RESPONSE TIMES

For cascade systems, independently from unit lengths, response times are the following:

2 Units Cascade: 18ms

3 Units Cascade: 20ms



Please assure that installation condition from Minimum distance for cascaded system page 24 are met for 3 units cascade systems.

12 OVERALL DIMENSIONS

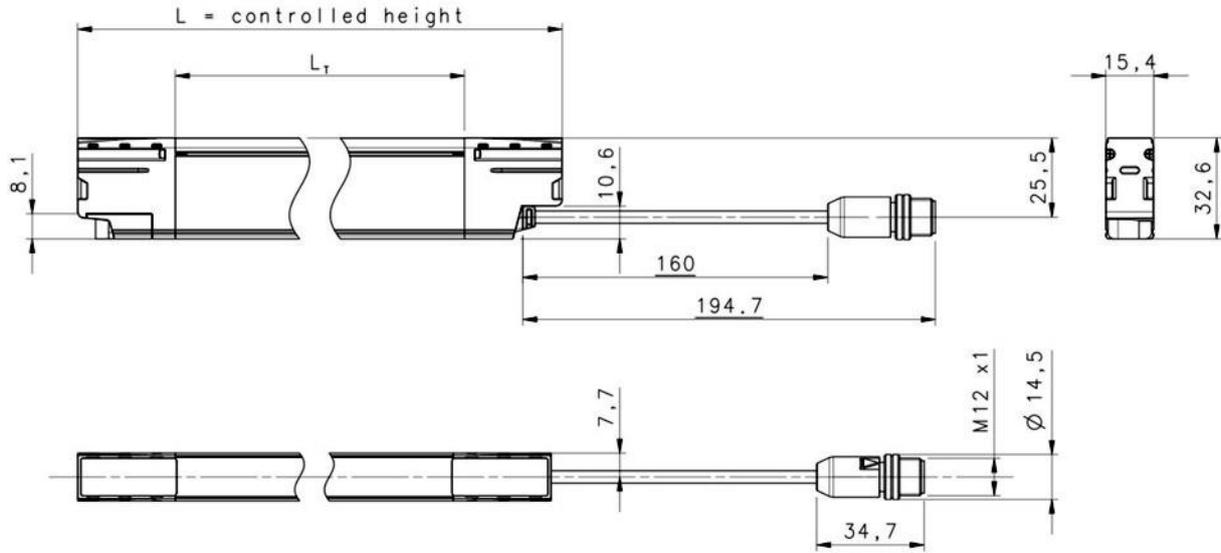


Fig 50 - Overall dimensions (mm)

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

SLx- = Type 2 or Type 4

-xx- = Resolutioni 14, 24 and 34 mm

13 INCLUDED ACCESSORIES

13.1 "C" TYPE BRACKETS KIT

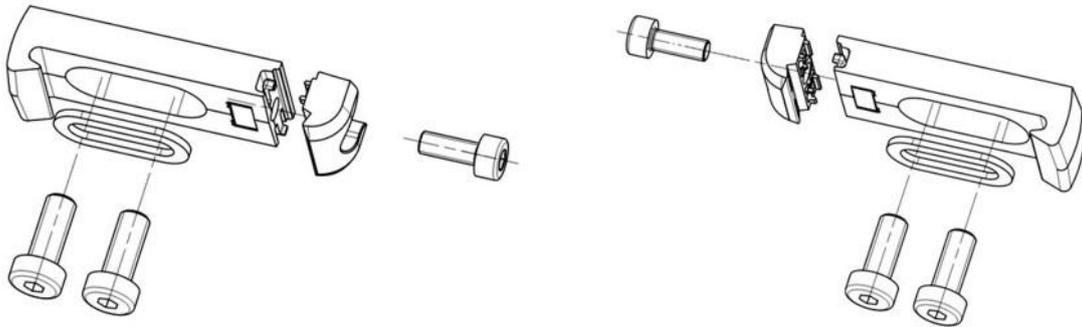


Fig 51 - "C" type brackets kit

13.2 "O" TYPE BRACKETS KIT

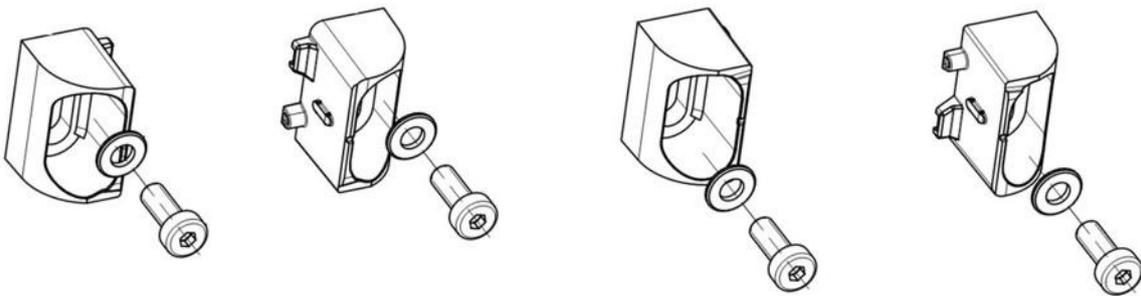


Fig 52 - "O" type brackets kit

14 ACCESSORIES

(dimensions in mm)

14.1 (ST-K2-SL-C) “C” TYPE BRACKETS KIT

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

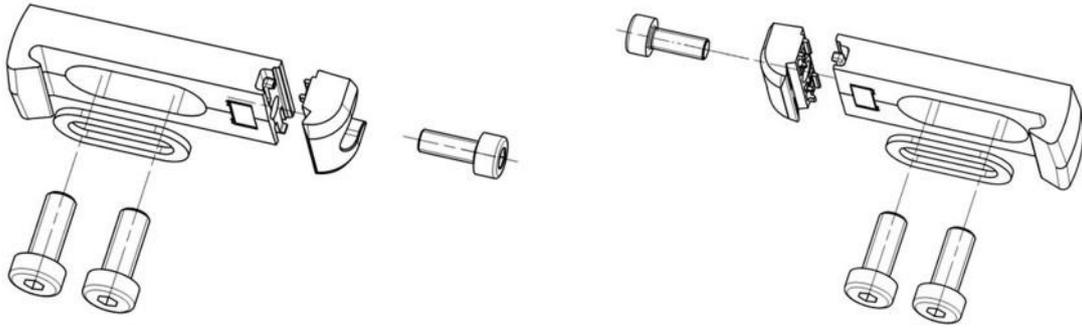


Fig 53 - “C” type brackets kit

14.2 (ST-K4-SL-O) “O” TYPE BRACKETS KIT

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

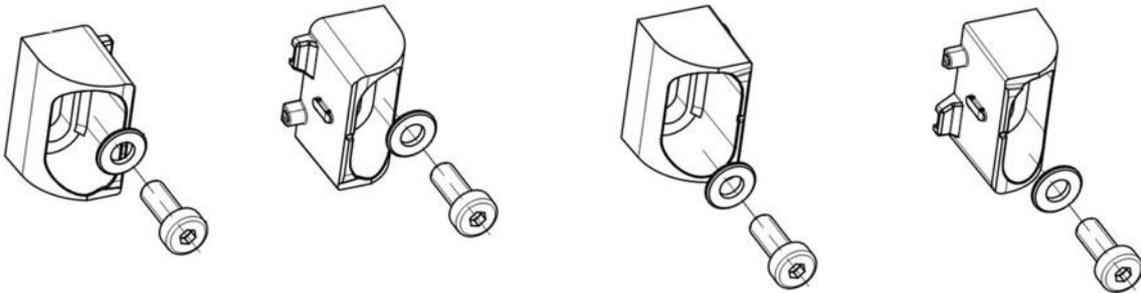


Fig 54 - “O” type brackets kit

14.3 (ST-K2-SL-L) “L” TYPE BRACKETS KIT

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

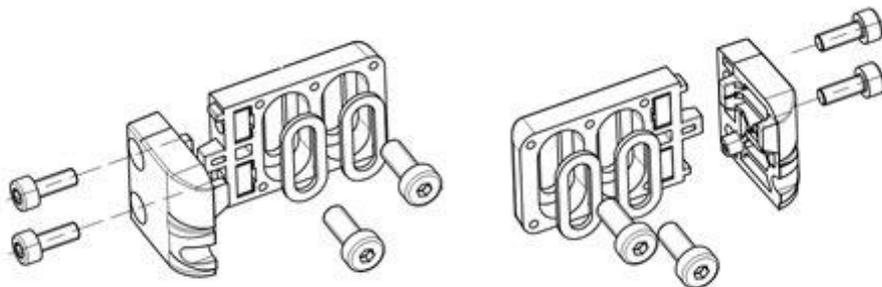


Fig 55 - “L” type brackets kit

14.4 (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

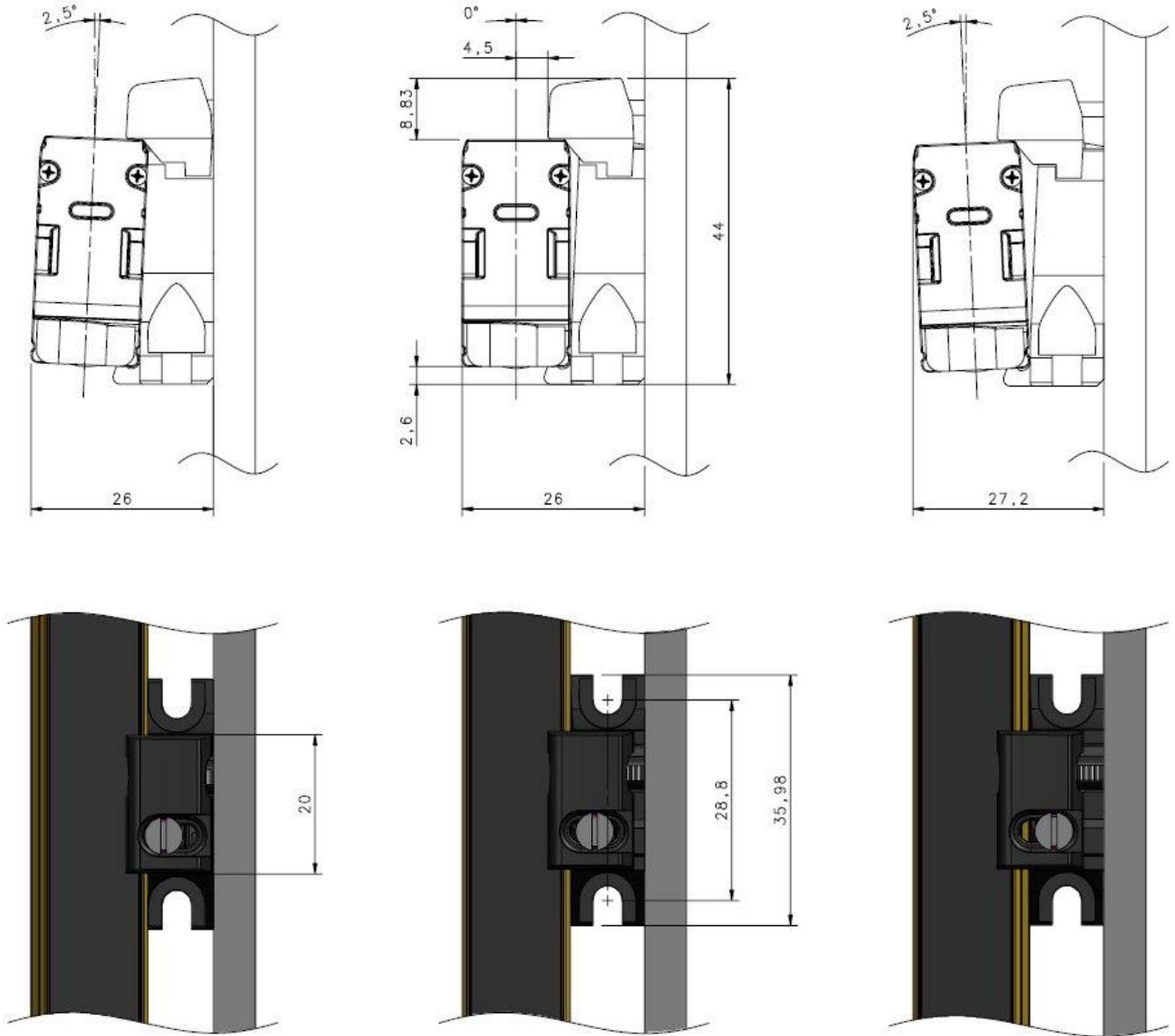


Fig 56 - “C” type orientable brackets kit

14.5 (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

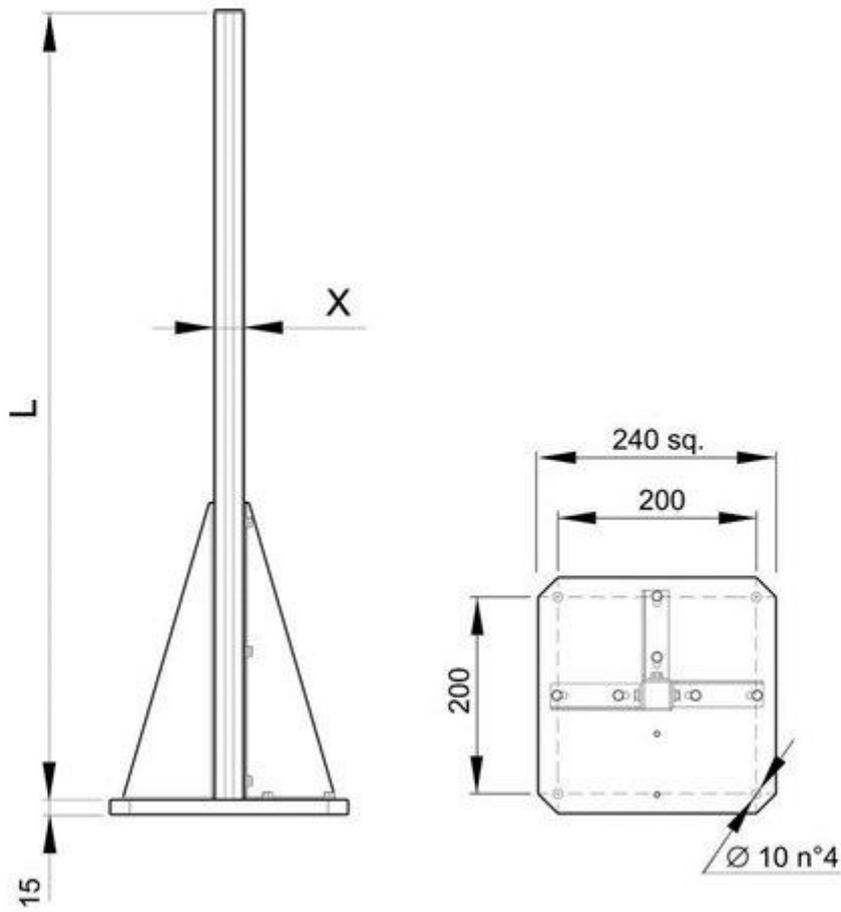


Fig 57 - Dimensions (mm)

14.6 (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

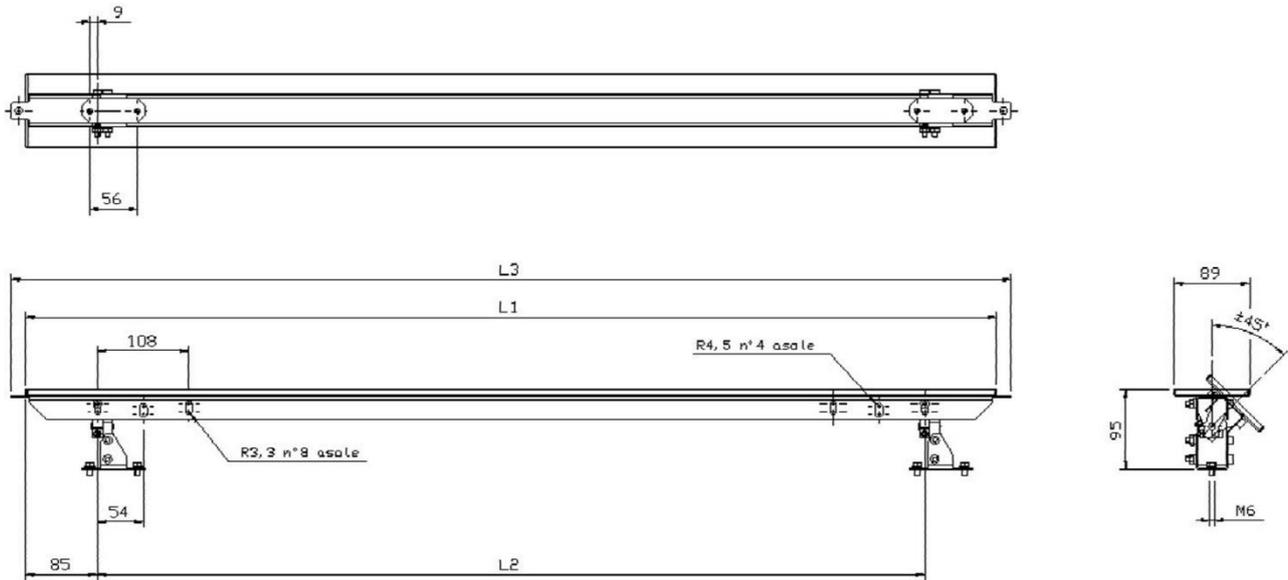


Fig 58 - Dimensions (mm)

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

MODEL	DESCRIPTION	CODE
SG-DM 150	Deviating mirror version 150 mm	95ASE1670

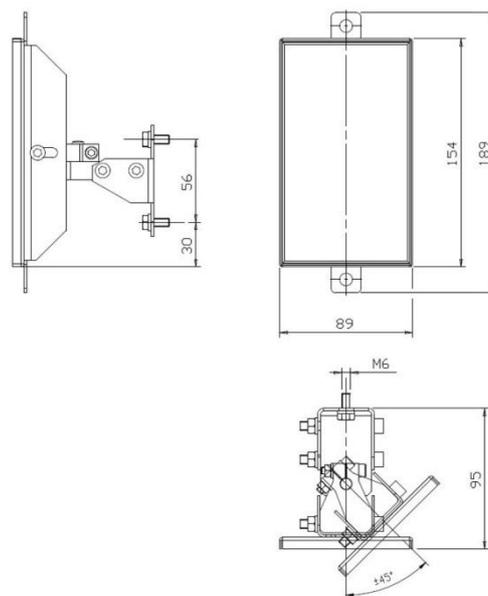


Fig 59 - SG-DM 150 Dimensions (mm)

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)	95ASE1940

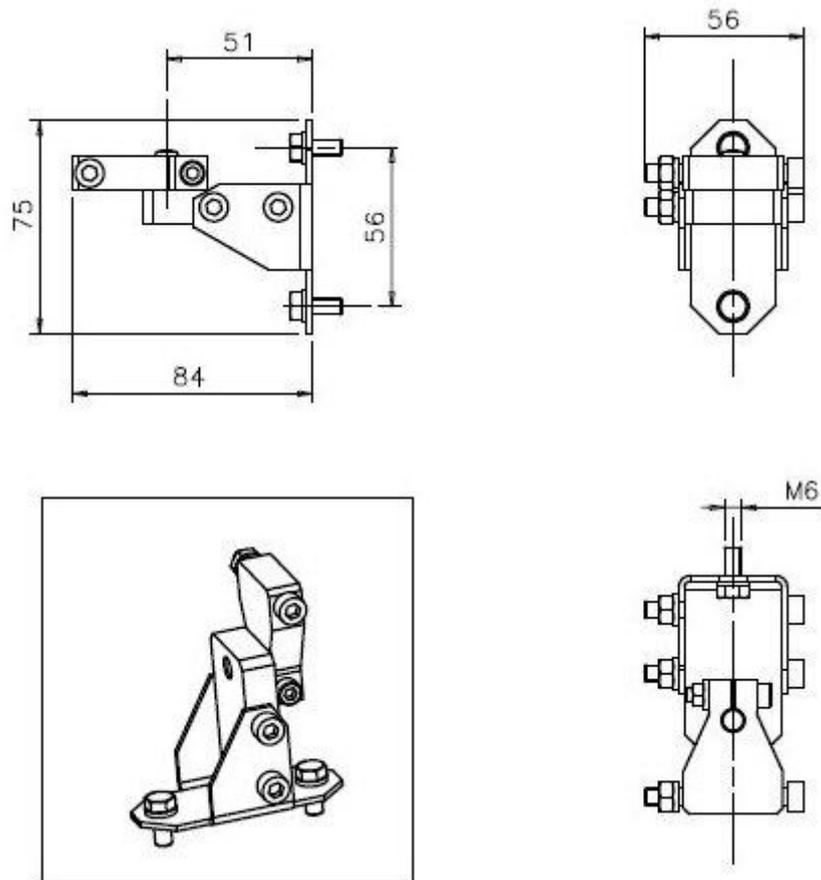


Fig 60 - Mounting kit

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

14.7 (TP) TEST PIECE

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

14.8 CONNECTION CABLES

5-pole M12 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

14.9 CASCADE CABLES

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

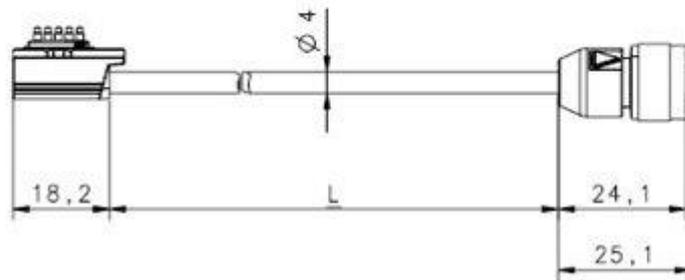
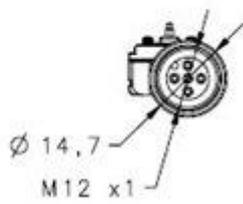
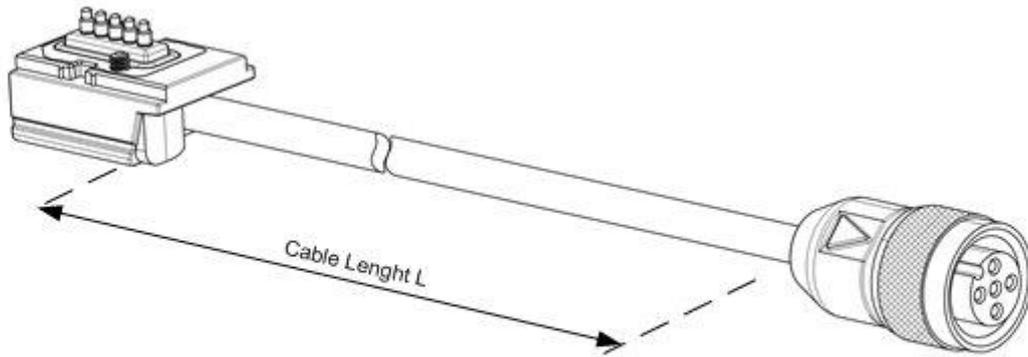


Fig 61 - Dimensions (mm)

14.10 (SE-SR2) SAFETY RELAY

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

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

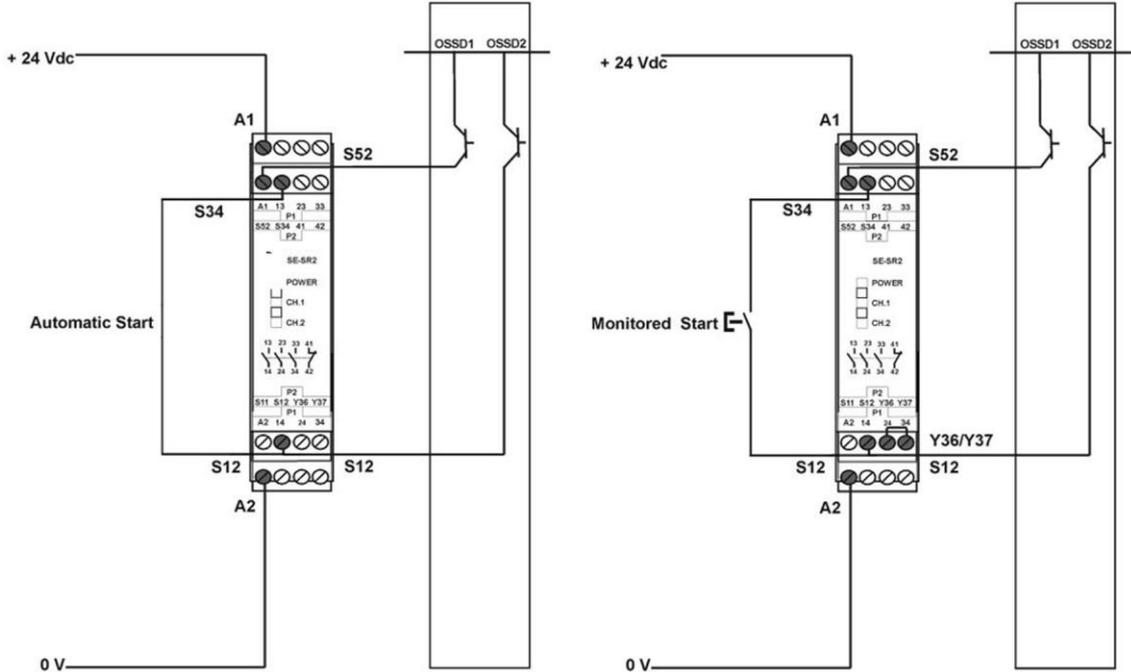


Fig 62 - Safety relay

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

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

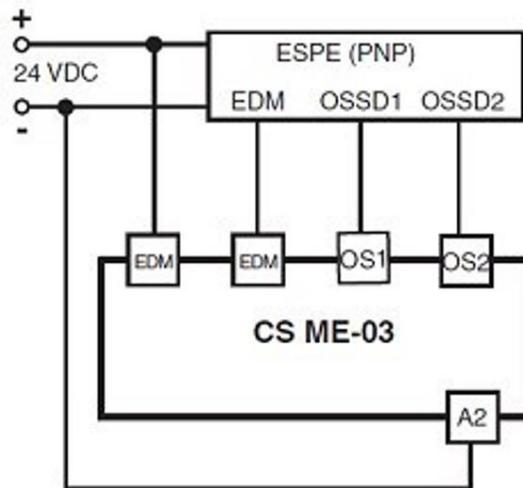


Fig 63 - EDM Relay

15 GLOSSARY

Detection zone: zone within which a specified test piece will be detected by the ESPE

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.

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.

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.

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.

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.

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.

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

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.

EDM (External device monitoring): device used by the ESPE to monitor the status of the external command devices.

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.

Emitter (TX): unit emitting infrared beams, consisting of a set of optically-synchronised LEDs. The emitting unit, combined with the receiving unit (installed in the opposite position), generates an optical “curtain”, i.e. the detecting area.

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.

Start interlocking device (= START): device preventing machine automatic start if the ESPE is live or the voltage is disabled and enabled once again.

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

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.

N.O.: normally opened

N.C.: normally closed

Machine operator: qualified person allowed to use the machine.

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.

Working point: machine position where the material or semifinished product is worked.

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

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.

Risk: probability of occurrence of an injury and severity of the injury itself.

Block condition (=BREAK): status of the light curtain taking place when a suitably-sized opaque object (see cfr.XREF-1:313) 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.

Safe State: operating state of ESPE when at least one beam is intercepted, OSSD LED lit RED in [INLINE-1:44 light curtain. OSSD1 and OSSD2 are both switched OFF.

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

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.

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

Fig 1 - Detection capability.....	10
Fig 2 - Detection Zone.....	11
Fig 3 - Available Models and Protected Heights	11
Fig 4 - Installation distance (vertical positioning).....	13
Fig 5 - Installation distance (horizontal positioning)	14
Fig 6 -.....	15
Fig 7 -.....	16
Fig 8 -.....	17
Fig 9 - Wrong light curtain positioning.....	20
Fig 10 - Correct light curtain positioning.....	20
Fig 11 - Wrong light curtain positioning.....	20
Fig 12 - Correct light curtain positioning.....	20
Fig 13 - Distances from reflective surfaces	21
Fig 14 - Minimum distance from reflective surface for Type 4 ESPE	22
Fig 15 - Minimum distance from reflective surface for Type 2 ESPE	22
Fig 16 - Distance between homologous devices.....	23
Fig 17 -.....	23
Fig 18 - Recommended positioning for homologous devices.....	24
Fig 19 - Minimum distance for cascaded system	25
Fig 20 - Wrong light curtain TX-RX orientations.....	26
Fig 21 - Use of deviating mirrors.....	27
Fig 22 - First installation check with Test Piece	28
Fig 23 - Staffa di tipo "O".....	29
Fig 24 - Fixing with "O" type brakets	30
Fig 25 - Staffa di tipo "C".....	31
Fig 26 - Fixing with "C" type brakets	31
Fig 27 - Staffa di tipo "L"	32
Fig 28 - Fixing with "L" type brakets	32
Fig 29 - Mixed fixing with "L"-type brackets and "C"-type brackets	33
Fig 30 - Fixing with "O" type brackets.....	34
Fig 31 - Fixing with "C" type brackets.....	34
Fig 32 - Fixing with "L" type brakets	34
Fig 33 - Cascade resolution at 90° junction.....	35
Fig 34 - Receiver.....	36
Fig 35 - Emitter	36
Fig 36 - Connection to SE-SR2 Safety Relais.....	37
Fig 37 - OSSDs connection.....	38
Fig 38 - OSSDs test timing pattern	38
Fig 39 - Cascade composition.....	39
Fig 40 - Cascade accessory cables	39
Fig 41 - Mounting.....	39
Fig 42 - Synchronization Optic.....	40
Fig 43 - Auto/Manual Restart selection	42
Fig 44 - Auto/Manual Restart selection	42
Fig 45 - Manual Restart timing	43
Fig 46 - EDM connection.....	43
Fig 47 - EDM UI indication	44
Fig 48 - EDM Timings	44
Fig 49 - Alignment Mode Timing	45
Fig 50 - Overall dimensions (mm)	55
Fig 51 - "C" type brackets kit.....	56

Fig 52 - "O" type brackets kit.....	56
Fig 53 - "C" type brackets kit.....	57
Fig 54 - "O" type brackets kit.....	57
Fig 55 - "L" type brackets kit.....	57
Fig 56 - "C" type orientable brackets kit	58
Fig 57 - Dimensions (mm).....	59
Fig 58 - Dimensions (mm).....	60
Fig 59 - SG-DM 150 Dimensions (mm)	60
Fig 60 - Mounting kit.....	61
Fig 61 - Dimensions (mm).....	64
Fig 62 - Safety relay	65
Fig 63 - EDM Relay.....	65



 **DATALOGIC**

www.datalogic.com